



Surat Gas Project (SGP) South

Environmental Authority (EA0001613)

EA Amendment #1
Supporting Information Report

Development of Wyalla & Kogan Creek on PL493 and
Tetris 1 & Boundary Rd Pt 1 on PL1040

22 April 2025

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1. Introduction

1.1 The Project Area

Arrow CSG (Australia) Pty Ltd.'s (Arrow Energy) Surat Gas Project (SGP) involves the phased development and supply of a number of gas tranches via a Gas Sales Agreement (GSA) and a Water Services Agreement with QGC Pty Ltd (QGC) under a collaboration opportunity which provides access to existing gas and water processing facilities within the Queensland Brigalow Belt Region (refer to **Figure 1-1**).

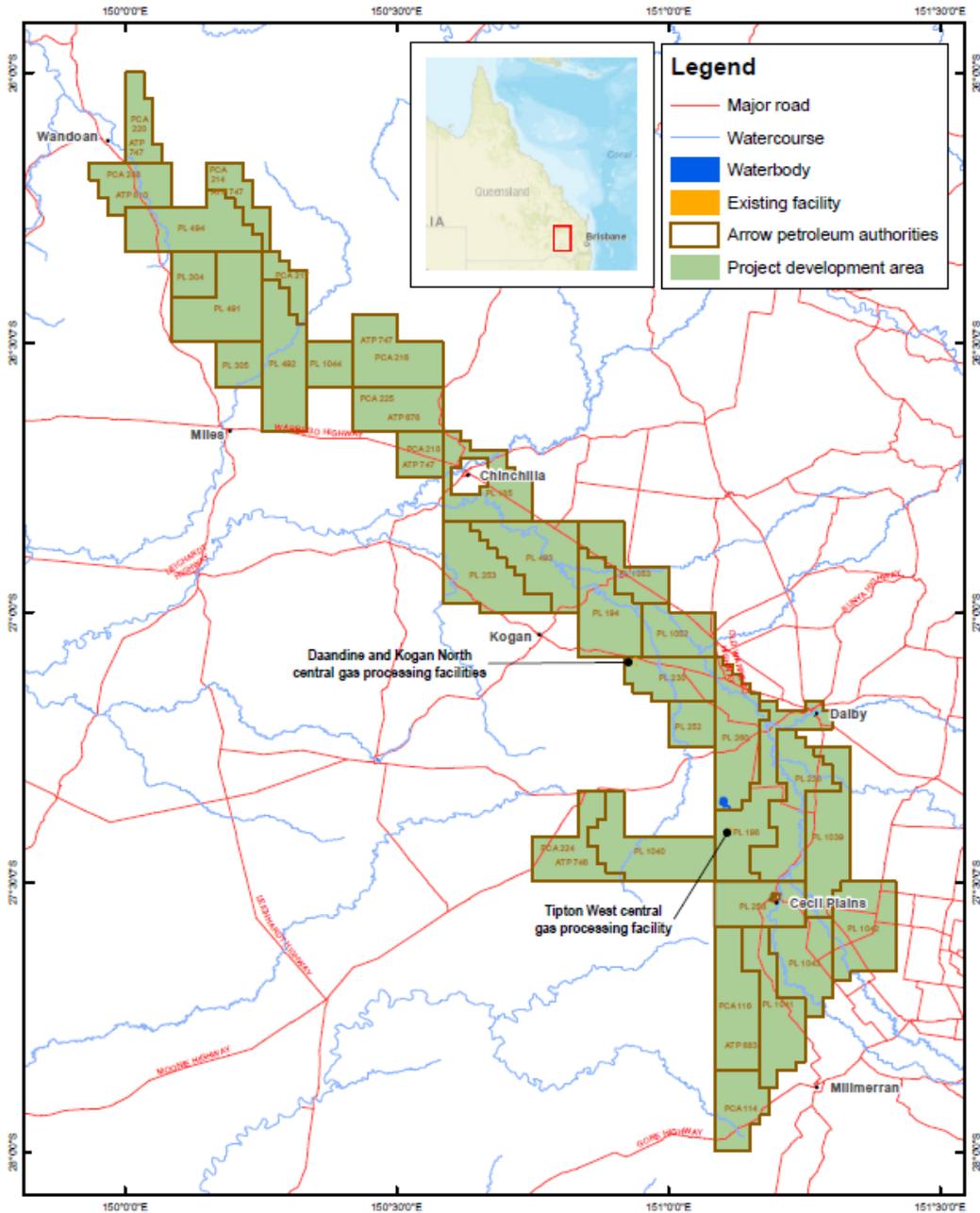


Figure 1-1 Surat Gas Project (SGP) Development Area

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The SGP covers an area of approximately 5,385 km² (538,500 ha) and is located approximately 160 km west of Brisbane in Queensland's Surat Basin.

As shown in **Figure 1-1**, the SGP development area extends from the township of Wandoan in the north towards Goondiwindi in the south, in an arc shape through the township of Dalby.

The SGP phased development currently comprises SGP North under environmental authority (EA) EA0001399, SGP South under EA EA0001613 (SGP South EA), the Dalby Expansion Project (DXP) under EA EPPG00972513, and Hopelands under EA EA0001401. As a reference, **Figure 1-2** shows the extent of the SGP gas tranches.

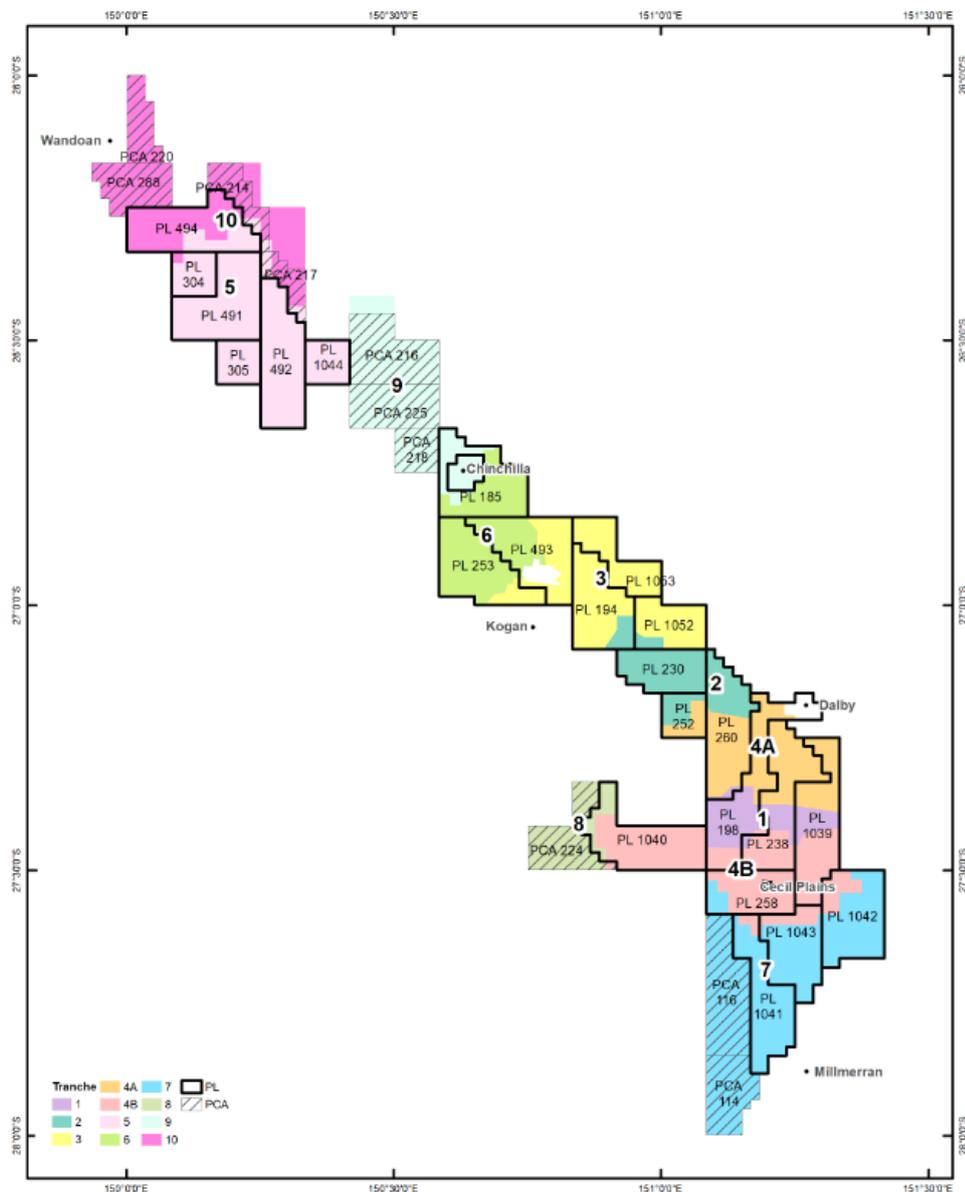


Figure 1-2 Extent of the SGP Gas Tranches – North and South

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SGP South is a coal seam gas (CSG) extraction operation that comprises petroleum leases (PLs) 185, 493, 1039, 1040, 1041, 1042, and 1043 (refer to **Figure 1-3**).

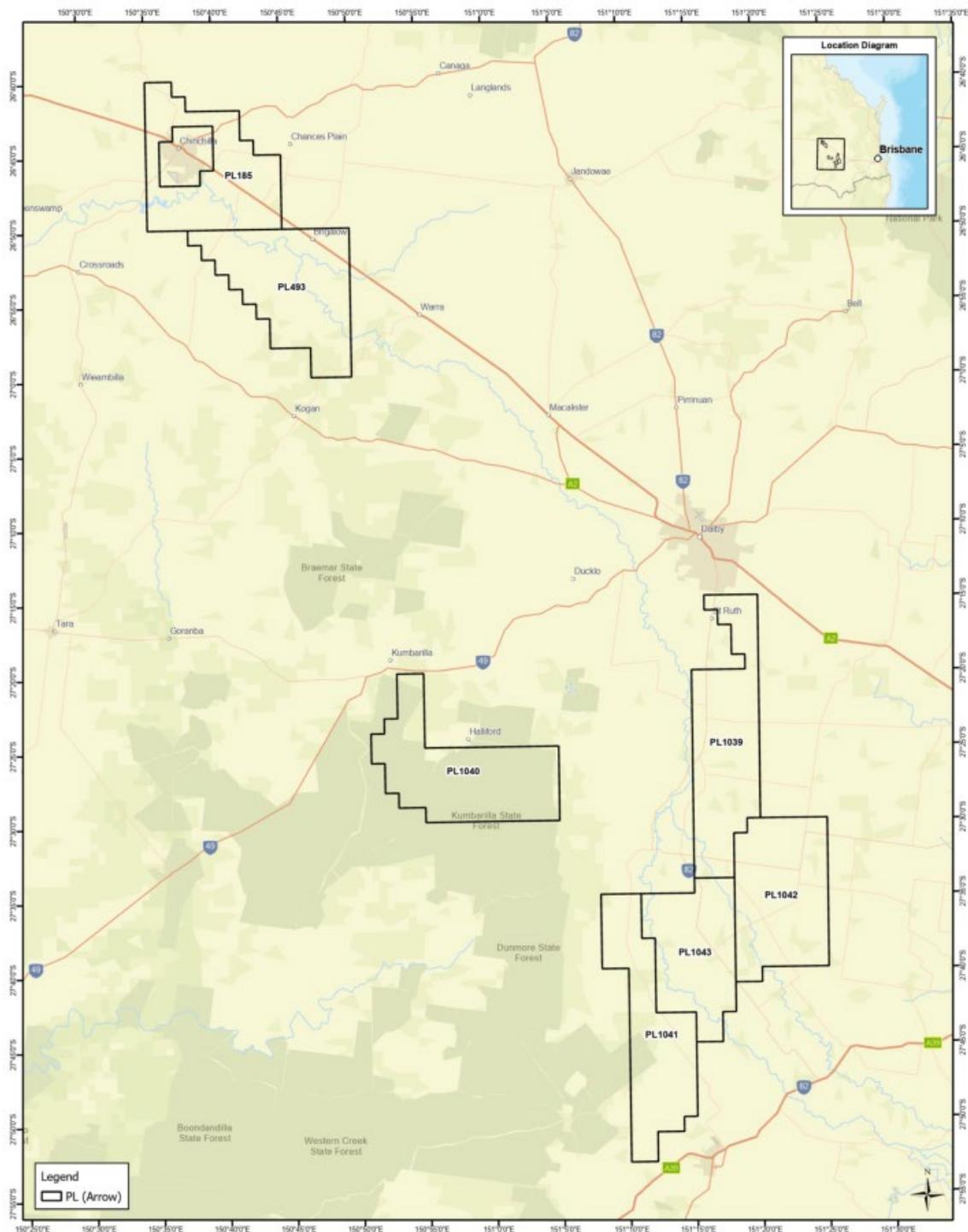


Figure 1-3 SGP South EA tenures

1.2 SGP South EA Amendment

The proposed development under this EA amendment application does not seek to authorise any additional wells and associated infrastructure from that already approved in the SGP South EA (EA0001613) (refer to Section 1.3 and **Table 1-1** and **Figure 1-6**). It seeks to update and reflect the biodiversity impacts to Environmentally Sensitive Areas (ESAs) and Prescribed Environmental Matters (PEMs) that should have been applicable at the time of the original approval in 2018. This update reflects a refined development footprint from the 2018 EA application and the subsequent conditioning linked to the staging of environmental offsets. This also ensures that Arrow Energy are only offsetting impacts to those specific biodiversity matters that are being impacted from the proposed development.

The Subject of this EA amendment, or SGP South EA Amendment #1, seeks the approval of updated impacts to ESAs and PEMs for three (3) gas areas within PLs 493 and PL1040, hereafter the Project Area. The scope detail regarding the Project Area location and its corresponding gas areas to be developed applicable to this EA amendment are as per the following:

- **Project scope located in PL493** – corresponds to the Wyalla gas area and also includes two (2) well pads located on the Kogan Creek gas area (refer to **Figure 1-4** which is proposed and subject to detailed design). This considers updates to ESAs and PEMs impacts for a total of 33 wells and associated gas and water gathering pipelines, rights-of-way, and incidental activities; and
- **Project scope located in PL1040** – corresponds to the Tetris 1 gas area and the Boundary Road Part 1 gas area (refer to and **Figure 1-5** which is proposed and subject to detailed design). This considers updates to ESAs and PEMs impacts for a total of 51 wells and associated gas and water gathering pipelines, rights-of-way, and incidental activities.

The development scope of the gas areas as described above, i.e., a total of 84 wells and associated infrastructure, are part of the already approved development footprint (i.e., disturbance footprint) under the SGP South EA (refer to Sections 1.3 and 1.4.1). These 84 wells constitute approximately 23% of the approved disturbance for PL493 and PL1040 combined (a total of 370 approved wells) and 12% of the approved disturbance for the whole SGP South development (a total of 715 approved wells).

It is important to note that this application does not seek to increase the disturbance footprint from the original approved SGP South EA application of December 2018 and there is no increase to the number of wells and associated infrastructure. This application looks to accurately reflect impacts to Matters of State Environmental Significance (MSES) that would be PEMs that should have been applicable at the time of the original application but were not included. As such, this EA amendment includes the updates to impacts to ESAs and

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PEMs as a result to and to align with the latest layout (refer to Section 4.2.3, **Appendix A**, **Appendix B**, and **Appendix C**).

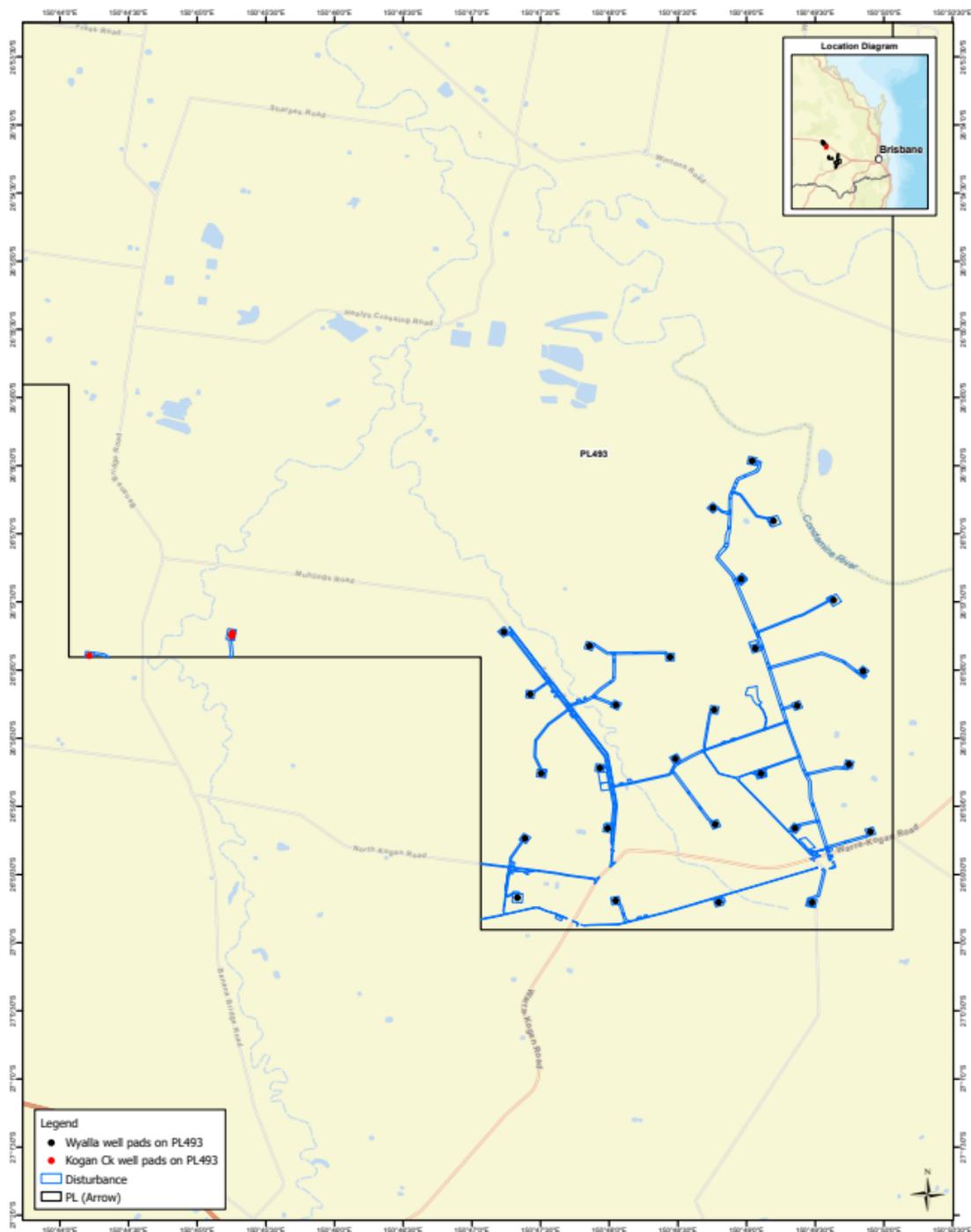


Figure 1-4 SGP South EA amendment scope on PL493 – Wyalla gas area and two wells on Kogan Creek gas area

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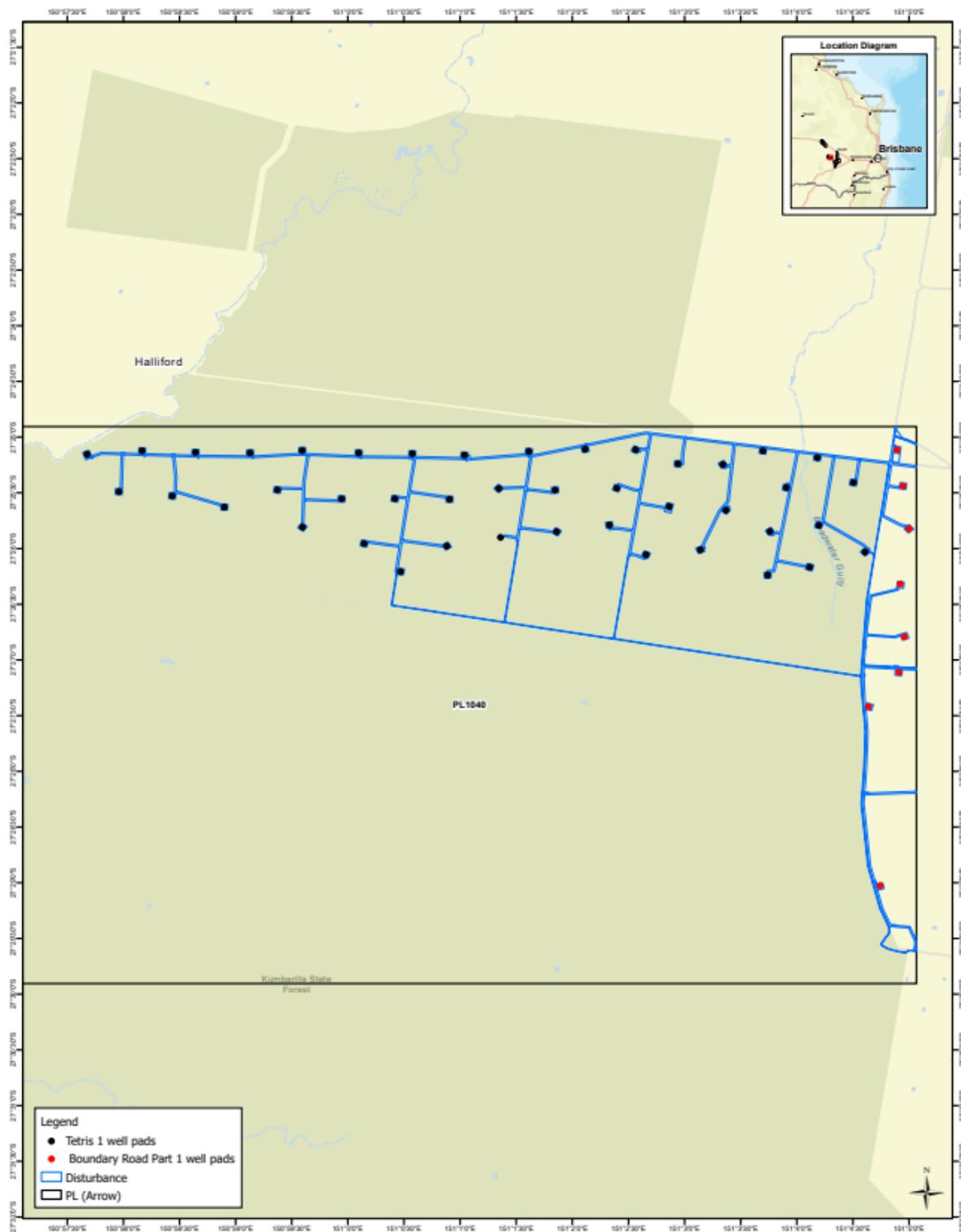


Figure 1-5 SGP South EA amendment scope on PL1040 – Tetrakis 1 and Boundary Rd Pt 1 gas areas

For further details and information on the proposed development please refer to Section 1.4.

1.3 Currently Authorised Petroleum Activities

Arrow Energy prepared an environmental impact statement under the *Environmental Protection Act 1994* (Qld) (EP Act), the SGPEIS¹, which was submitted to the Chief Executive of the then Department of Environment and Heritage Protection in March 2012. Public consultation to the SGPEIS was conducted from March to June 2012 and a Supplementary Report to the SGPEIS (SGPSREIS)¹ was prepared which summarised and addressed the comments from the consultation process.

The SGPEIS was approved by the Queensland Government in October 2013 and by the Commonwealth Government in December 2013. The SGP obligations under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act) are being managed under the EPBC 2010/5344 approval².

Arrow Energy's SGPEIS considered the inclusion of the following infrastructure components:

- Coal Seam Gas (CSG) production wells;
- CSG and water gathering lines;
- Production facilities, including field compression and water transfer stations;
- Water treatment and water storage facilities;
- Power generation facilities;
- High pressure gas pipelines; and
- Supporting infrastructure and logistics.

A site specific application for an environmental authority was submitted to the Queensland Government for the SGP South Development (refer to **Figure 1-3**) and the Environmental Authority (EA) EA0001613³ (SGP South EA) was approved and granted on 14 December 2018. The EA application sought approval for the full field development of the SGPS area including impacts to Environmentally Sensitive Area (ESA) and Prescribed Environmental Matters (PEMS) that were applicable (i.e. PEMS that were critically endangered, endangered and vulnerable) at the time of the approval based on the approved scope. This EA application included:

- Coal Seam Gas (CSG) production wells for the full field development;
- CSG and water gathering lines; and
- Supporting infrastructure (including a regulated structure (i.e., one pilot dam), and logistics and incidental activities.

¹ Arrow Energy Surat Gas Project Environmental Impact Statement, October 2013 (SGPEIS) and Supplementary Report ([Arrow Energy SGP EIS and Supplementary Report to the SGPEIS \(SGPSREIS\)](#)).

² Arrow Energy Surat Gas Project EPBC Approval, December 2013 ([EPBC 2010/5344](#)).

³ Arrow Energy SGP South EA ([EA0001613](#))

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The SGP South EA was subsequently amended in 2021 and approved as a minor amendment to include post permit changes and a change to groundwater monitoring frequency from 'at least biannually' to 'at least annually'. It was noted in this minor amendment application that the requested amendment did not increase or change in any way the impacts to environmental values as the changes were not based on any change to the scale and/or the extent of the activities authorised under the SGP South EA.

The current SGP South EA³, effective 28 June 2022, authorises petroleum activities for PLs 185, 493, 1039, 1040, 1041, 1042, and 1043.

A summary of all the currently authorised activities under the SGP South EA Authorised Activity Table, including those for PL493 and PL1040 subject of this EA amendment are provided in **Table 1-1**. These activities are included in EA0001613³ General conditions *Schedule A, Table 1 – Authorised petroleum activities* and consider CSG production wells and the associated gas and water gathering pipelines. SGP South EA's *Schedule A, Table 1 – Authorised petroleum activities* also includes the authorisation of one (1) regulated structure. This structure is located on PL1041 and is not subject of this EA amendment application.

Table 1-1 Scale and maximum size for currently authorised petroleum activities under SGP South EA (EA0001613) for the proposed Project gas fields

Activity(ies)	Location		Total scale of Authorised petroleum activities / infrastructure	Intensity / maximum size
	PL	Project Proposed Gas Area		
Coal seam gas (CSG) production wells	PL185	NA	25 wells	1.1 ha per single well pad 1.9 ha per multi-well pad
	PL493	Wyalla + two (2) well pads on Kogan Ck	70 wells	
	PL1039	NA	215 wells	
	PL1040	Tetris 1 and Boundary Rd Part 1	300 wells	
	PL1041	NA	15 wells	
	PL1042	NA	50 wells	
	PL1043	NA	40 wells	
Gas and water gathering pipelines	PL185	NA	25 km	535 km of pipeline

Activity(ies)	Location		Total scale of Authorised petroleum activities / infrastructure	Intensity / maximum size
	PL	Project Proposed Gas Area		
	PL493	Wyalla + two (2) well pads on Kogan Ck	95 km	
	PL1039	NA	100 km	
	PL1040	Tetris 1 and Boundary Rd Part 1	240 km	
	PL1041	NA	15 km	
	PL1042	NA	25 km	
	PL1043	NA	35 km	
Regulated Structures	PL1041	NA	1 dam (Hillview Pilot Dam)	19.2 ha

SGP South EA is the current EA subject of this EA amendment application, and under which the activities as per **Table 1-1** are already authorised. SGP South EA Condition General 1 also includes 'essential petroleum activities that are otherwise not specified relevant activities and are not required to be listed in the authorised activity table.

The proposed amendments to the SGP South EA are provided in Section 1.5, with further details provided in Section 2.

1.4 Proposed Development

1.4.1 Proposed Development and Current Approval

It is important to note that the SGP South maximum disturbance area has not changed from the original approved EA application of December 2018 and there is no increase to the number of wells and associated infrastructure. This amendment seeks an update of impacts to ESAs and PEMs that should have been applicable at the time of the original application but were not (refer to Section 4.2.3, **Appendix A**, **Appendix B**, and **Appendix C**).

As mentioned in Section 1.1, the Project consists of the development of three (3) gas areas located within PL493 and PL1040 (the Project Area) as per the following detail, and are subjected to final detailed design and the corresponding Conduct and Compensation Agreements (CCAs) with landholders. These wells are already authorised, and this amendment seeks only the approval of updated impacts to ESAs and PEMs for the following.

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- **Development on PL493:** Wyalla gas area, plus two (2) well pads located on the Kogan Creek gas area; and
- **Development on PL1040:** Tetris 1 gas area and the Boundary Road Part 1 gas area.

It is important to note that this proposed EA amendment does not significantly increase the level of environmental harm to that addressed and approved by the SGPEIS (2013) and its Supplementary Report (SGPSREIS, 2013) (refer to Section 4). It also does not significantly increase the level of environmental harm that was approved under the EA application granted in December 2018 (refer to **Figure 1-6**).

The EA application of 2018 sought the approval of impacts from the wells and associated infrastructure some of which is depicted in **Figure 1-6**. Impacts to ESAs and PEMs were assessed for this application, which were approved for the areas shown in **Figure 1-6** (i.e., well locations). This was also conditioned in the EA (i.e., EA0001613⁴) under Condition Biodiversity 8A and Condition Biodiversity 10.

The proposed development under this EA amendment application does not seek to authorise any additional wells and associated infrastructure from that already approved in the EA. It seeks to update the biodiversity impacts to ESAs and PEMs that should have been applicable at the time of the original approval in 2018. It also reflects a refined development footprint from the 2018 EA application and the subsequent conditioning linked to the staging of environmental offsets. This also ensures that Arrow Energy are not offsetting impacts to matters that are not being impacted on.

⁴ [Environmental Authority EA0001613 under the Environmental Protection Act 1994, 28 June 2022.](#)

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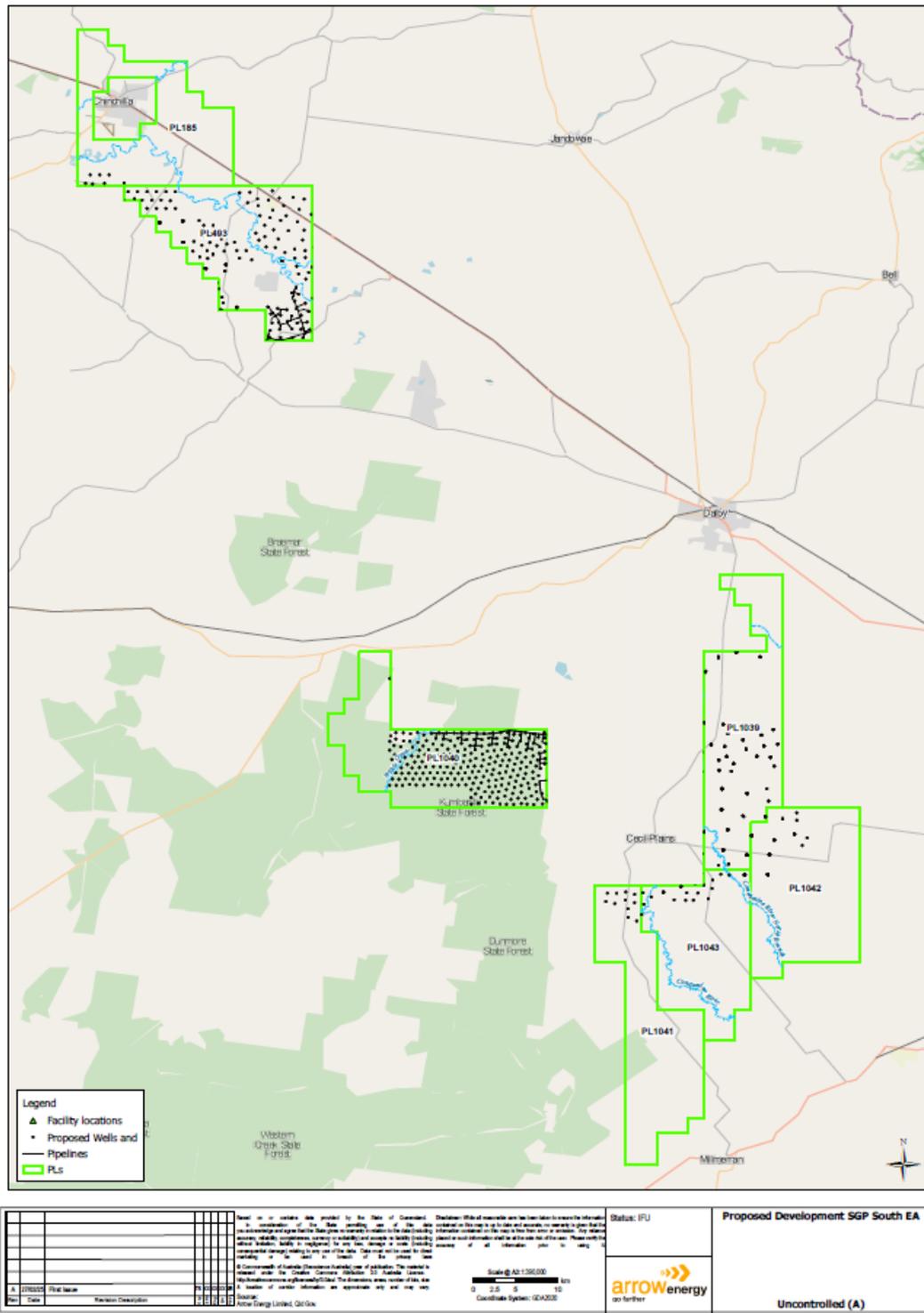


Figure 1-6 Location of wells - 2018 SGP South EA application

1.4.2 PL 493 Project Development

The PL493 Project Development comprises a series of well pads, gas and water gathering pipelines, and associated infrastructure and petroleum activities required to transfer coal seam gas and produced water on PL493. This development includes the Wyalla gas area and two (2) well pads on the Kogan Creek gas area.

The Wyalla gas area is located approximately 6 km north-east of Kogan in the Southern Brigalow Belt bioregion. This gas area considers the drilling of a total of a combination of single and multi-well pads (refer to **Figure 1-4**).

The development will also include gathering infrastructure, access tracks, and incidental activities, including but not limited to borrow pits, mobile drilling camps, extra work areas laydowns, and communications towers.

Based on a proposed Project footprint the total estimated disturbance footprint for the PL493 Project Development area is approximately 123.1 ha and is comprised of a mixture of previously cleared land, as well as remnant and regrowth vegetation. As explained in Section 1.4.1, the footprint of the proposed development has not changed from the original approved EA application of 2018 as there is no increase to the number of wells and associated infrastructure.

The Project's layout which is subject to final detail design and CCAs as shown in **Figure 1-4** has been designed to avoid impacts to environmental values with the majority of infrastructure proposed to be located in existing cleared areas and adjacent existing roads.

Pipeline and road alignment avoid or are located on the edge of remnant vegetation areas where possible to avoid further fragmentation and impacts to areas with less disturbance, such as along Healy's Crossing Road, Taylors Road and the powerline easement south of the Warra Kogan Road.

It is not possible to access the gas resource in this location without clearing remnant vegetation.

1.4.3 PL1040 Project Development

The PL1040 Project Development comprises a series of well pads, gas and water gathering pipelines, and associated infrastructure and petroleum activities required to transfer coal seam gas and produced water on PL1040. This development includes the Tetris 1 gas area and the Boundary Road Part 1 gas area.

The Tetris 1 and the Boundary Road Part 1 gas areas are located approximately 12 km northwest of Cecil Plains, with Tetris 1 located in the Kumbarilla State Forest. These gas

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areas consider the drilling of a combination of single and multi-well pads (refer to **Figure 1-5**).

The development will also include gathering infrastructure, access tracks and incidental activities, including but not limited to communications towers, extra work areas, and laydown areas.

Based on the proposed Project footprint, the total estimated disturbance footprint for the PL1040 Project Development area is approximately 182.7 ha and is comprised of a mixture of previously cleared land, as well as remnant and regrowth vegetation. As explained in Section 1.4.1, the footprint of the proposed development has not changed from the original approved EA application of 2018 as there is no increase to the number of wells and associated infrastructure.

The planned disturbance for the Tetris 1 gas area is all located in the Kumbarilla State Forest, which consists of remnant vegetation.

The proposed layout which is subject to final detail design and CCAs for Tetris 1 has been designed to avoid impacts to environmental values with the major linear infrastructure (i.e., roads and flow lines) located on or directly adjacent to existing tracks through the State Forest. In order to access the gas resource single spur lines are used away from the existing track network. The use of the existing track network will minimise further fragmentation and edge effect impacts. The development of the State Forest is also done in consultation with Queensland Parks and Wildlife Services (QPWS) on the proposed alignment and will ultimately be supported through an occupation permit/administration plan.

Where possible, the layout has avoided locating infrastructure that will result in impacts to riparian vegetation and habitat areas.

Land within the footprint for this gas area is comprised of a mixture of previously cleared land, and remnant and regrowth vegetation.

1.5 Proposed amendment to SGP South EA (EA0001613)

The proposed amendment seeks to update and reflect the biodiversity impacts to ESAs and PEMs that were applicable at the time of the original application as well as other administrative amendments. Impacts to PEMS, specifically the *Phascolarctos cinereus* (Koala) had been listed on the EA in Table 3 of condition Biodiversity 10 as MNES. The delivery of offsets for PEMS that were not considered MNES at the time of the EPBC referral decision (EPBC2010/5344) were to be delivered under QLD State legislation. i.e. offsets for significant residual impacts to the Koala are unable to be delivered through the EPBC Offset Strategy for EPBC 2010/5344 as the Koala in this instance are State matters

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(MSES). As such, impacts that were previously considered as MNES require assessment in order to be included and approved within the EA.

The proposed alignment for assessment will ensure the PEMs are accurately reported in the EA is shown in Figure 1-4 and Figure 1-5. Spatial files (polygon outlining the proposed footprint) for the alignments are provided in **Appendix D**. This layout has been used to assess the PEMs and ESA impacts presented in the BIA in **Appendix C**.

In summary, this EA amendment application seeks to:

- Update the already authorised impacts to Biodiversity, or Prescribed Environmental Matters (PEMs), including changes and/or updates to biodiversity conditions (refer to Section 2.1 and Section 4.2, and **Appendix C**);
- Include updates or changes to other EA conditions, including the addition of new conditions (refer to Section 2.2, **Table 2-2**, and **Appendix A**); and
- Include minor administrative changes (refer to **Appendix A**).

Details of the proposed amendments to the previously lodged SGP South EA Amendment are provided in Section 2. The revised biodiversity impacts and PEMs for the Wyalla and Tetris 1 gas areas are within the approved limits specified in the EA (please refer to Section 2.1).

As explained in Section 6, **Table 6-1**, point (d) for demonstrating compliance with Section 223 of the EP Act, this EA amendment application does not seek to significantly increase the scale and intensity of the activity to what has previously been assessed and authorised under the SGP EIS, SREIS and the site-specific EA application of 2018 for SGP South. As mentioned, it seeks to update the already authorised impacts to biodiversity which were applicable at the time of the original EA application (ESAs and PEMs) (refer to Section 2.1 and Section 4.2) for the development of gas areas within PL493 and PL1040.

Given the above, Arrow Energy do not believe that the proposed amendment significantly increases the scale and intensity of the activity.

1.6 Details of the Proponent

Arrow Energy is an integrated energy company with interests in coal seam gas field developments, pipeline infrastructure, and electricity generation.

Arrow Energy is a Queensland based wholly owned subsidiary of Arrow Energy Holdings Pty Ltd, a 50:50 joint venture between a subsidiary of Royal Dutch Shell plc and a subsidiary of PetroChina Company Limited (PetroChina).

Arrow Energy is a Registered Suitable Operator (RSO) in accordance with the Department of Environment, Science, and Innovation (DESI) Suitable Operator Register, as required by

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the *Environmental Protection Act 1994* (Qld) (EP Act). Arrow Energy's RSO registered number is 632 276.

1.7 Legislative Context

The EP Act and the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) provide the principal legislative frameworks for facilitating resource projects in Queensland, including SGP South (EA0001613).

Arrow Energy requires an amendment to the existing SGP South EA under the EP Act to enable the construction of key infrastructure to support development of the gas fields located in PL493 and PL1040, as described in Section 1.4 and authorise impacts to prescribed environmental matters (PEMs). Further details regarding legislative requirements and compliance with the requirements under the EP Act are provided in Section 6).

1.8 Purpose and Scope of this Document

The purpose of this report is to support an EA amendment application to the Department of Environment, Tourism, Science, and Innovation (DETSI) to Arrow Energy's site-specific EA0001613 (SGP South EA), and to provide sufficient information to enable DETSI to decide on the application.

This report has been prepared in accordance with the relevant requirements under Section 226 of the *Environmental Protection Act 1994* (Qld) (EP Act) (refer to Section 6, **Table 6-2**), the *Environmental Protection Regulation 2019*, and the DES guideline *Major and minor amendments* (ESR/2015/1684), version 11.00, of 26 September 2023.

As mentioned in Section 1.5, this EA amendment application seeks to update the already authorised biodiversity impacts, update the EA biodiversity conditions; and include minor administrative changes. These minor administrative amendments are in order to comply with changes and updates to references, definitions, and other administrative matters.

The details of the abovementioned proposed amendments are provided within this supporting information report (refer to Section 2).

1.9 Plan of Operations

An updated Plan of Operations (PoO) addressing the development activities will be submitted to the DETSI as required under Section 293 of the EP Act.

1.10 Estimated Rehabilitation Cost

A revised ERC calculation will be submitted to the administering authority, as necessary and applicable in accordance with the EP Act, for the disturbance resulting from the additional activities. This revised ERC will be lodged prior to commencement.

2. Proposed EA Amendments

2.1 Update to Biodiversity Impacts and Biodiversity EA Conditions

2.1.1 Update to Biodiversity Impacts

Impacts to biodiversity that are currently authorised under the SGP South EA (EA0001613) are based on concept level design and layouts and as such are not inclusive of all disturbances necessary for the Project's development. Coal seam gas developments apply an iterative process in terms of locating wells and gathering lines to manage competing constraints associated with the location of surface infrastructure, including ecological values, landholder preferences, geological features, existing infrastructure, and access tracks. Planning and management of surface activities and ground disturbance is undertaken utilising a set of hierarchical management principles to avoid, minimise and mitigate impacts to environmental values.

As contemplated, the proposed amendments reflect updates and refinements to the Project layout, as well as updates to species distribution and habitat mapping. While avoiding disturbance to land is a priority, clearing and disturbance within environmentally sensitive areas (ESAs) and impacts to matters of State environmental significance (MSES) are unavoidable. The layouts identified in Figure 1-4 and Figure 1-5 have been used to determine the impacts for the PEMs and ESA table for the Projects development. This will ensure the most up to date layout has been used for assessment and more accurately reflect the correct values to be presented in the application and approval.

Arrow Energy engaged Attexo Consulting to calculate the anticipated impacts on biodiversity values and Significant Residual Impact (SRI) assessment due to the Project (refer to Section 1.4) and to confirm whether these impacts are already approved under the current EA or trigger an amendment. The results from this biodiversity impact assessment (BIA) are provided in the report in **Appendix C**.

It is important to note that the BIA report:

- Relates only to terrestrial biodiversity values and does not include those associated with groundwater dependent ecosystems as there are no impacts related to these proposed as part of this amendment;
- includes a 'Likelihood of Occurrence Assessment' as the basis for determining which State listed threatened species were to be considered for the impact assessment;
- only includes the description of ecological values of those individual species considered '*Known to occur*' or '*Likely to occur*', and only assessed the impact on these species, which have mapped habitat in the Project footprint, in accordance with the Significant Residual Impact (SRI) Guidelines (DEHP, 2014);

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- only considers species that were relevant (i.e., listed species conservation status) at the time of the approval of the original EA application in 2018. For example, Diamond Firetail (*Stagonopleura guttata*) and Brigalow Woodland Snail (*Adclarkia cameroni*) were not listed in 2018 and therefore have not been included in the BIA. However, the BIA does acknowledge species that were relevant at the time of the approval but have been subsequently uplisted.

The BIA considered the calculation of predicted impacts to:

- Environmentally Sensitive Areas (ESAs) protected under the *Environmental Protection Act 1994* (Qld) (EP Act); and
- Prescribed Environmental Matters (PEMs) protected under the *Environmental Offsets Act 2014* (Qld) (EO Act).

A review of desktop biodiversity information and ecological field surveys were used to identify any new values relevant to this EA amendment application. An analysis of the extent to which the predicted impacts were already approved under the current SGP South EA was conducted, including the identification of any further impacts that would trigger the need to amend the EA. It also looks to ensure that Arrow Energy are not offsetting for impacts they won't impact on through a reduction in impacts through optimisation of layouts.

Impacts to ESAs and PEMs include the assessment with regards to certain biodiversity conditions under the current EA, namely:

- Interactions with Category A, B, or C ESAs and the extent to which these are authorised by biodiversity conditions in the current SGP South EA under Condition (Biodiversity 8) which restricts the types of activities that can be undertaken in ESAs and their protection zones;
- Compliance with Condition (Biodiversity 8A), which limits the maximum significant disturbance footprint that can be undertaken in ESAs; and
- Interactions with values that are PEMs and the extent to which these are authorised under Condition (Biodiversity 10).

Impacts on ESAs or PEMs that are within the existing approved limits under the current SGP South EA are taken to be approved and no further consideration has been given to these impact values. Impacts on ESAs or PEMs that exceed the existing approved limits, or are not mentioned in the current SGP South EA are included in this EA amendment application (refer to Section 5.0 of **Appendix C**).

It is important to note that all impact calculations are based on Ground-truthed⁵ Regional Ecosystem (GTRE) mapping in accordance with Condition (Biodiversity 3) under the current

⁵ Ground-truthed means field based assessments.

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SGP South EA, which states “*where mapped biodiversity values from those confirmed under conditions (Biodiversity 1) and (Biodiversity 2), petroleum activities may proceed in accordance with the conditions of the environmental authority based on the confirmed on-the-ground biodiversity value.*”

The most significant biodiversity impact associated with the development of the Project is the direct loss of remnant and native regrowth vegetation resulting from the establishment of well pads, gathering, and associated infrastructure. This summarises as approximately:

- 178.1 ha of remnant vegetation; and
- 63.7 ha of native regrowth vegetation.

The clearing of remnant vegetation and associated habitat is an unavoidable aspect of the Project development; however, the majority of the proposed clearing is in widespread, least concern vegetation types, predominantly Regional Ecosystems RE 11.5.1, 11.5.20, 11.7.4, and 11.7.7). The summary of the total area of remnant and regrowth vegetation to be disturbed by the Project development are provided in Table 4.1 of **Appendix C**. While the overall clearing areas are large, clearing within remnant vegetation for gas field developments is undertaken in ‘chunks’, with disturbance areas of approximately 1 ha for individual well pads and linear corridors of approximately 20 to 40 m in width with surrounding vegetation left intact.

The application of the Landscape Fragmentation and Connectivity (LFC) Tool has determined that impacts to connectivity areas are not significant using DETSI RE mapping, although significant based on Arrow Energy’s GTRE mapping, with a total area of RVM Category B clearing of 178.3 ha. The outputs from the LFC Tool are provided in **Appendix C**.

The Project layout footprint has been designed to minimise impact to vegetation where possible with a particular emphasis on minimising impacts to riparian vegetation through RoW minimisation and by locating any temporary workspaces outside of these areas. Riparian vegetation represent habitats that are likely to contain large trees due to their position in the landscape, which may include large trees with potential hollows that some species utilise for nesting. Based on field assessments, a significant proportion of the Project areas do not contain large trees containing hollows. In any case, during construction activities, hollow bearing trees are flagged for retention and exclusion zones to avoid potential impacts where possible.

The PL1040 project development corresponding to the Tetris 1 gas area includes impacts to the Kumbarilla State Forest, with an approximate disturbance of 137.3 ha, of which 80% comprises remnant vegetation, with the remaining 20% occurring in already cleared land and regrowth vegetation. It is not possible to access the gas resource in this location without

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clearing remnant vegetation. The entire State Forest area is a Category C ESA, with small areas of Category C ‘Of concern’ remnant vegetation and Category C ‘Essential Habitat’ throughout the Kumbarilla State Forest.

The development of the Project will result in impacts to terrestrial flora values and to terrestrial fauna values (refer to Section 4.2.3 and **Appendix C**).

It is important to note that the Likelihood of Occurrence Assessment was conducted to an area defined as the proposed development footprint disturbance (i.e., the Project footprint) plus a 500 m buffer, while the PEMs values were calculated based on the area of impacted habitat *within* the Project footprint (refer to Section 1.2.2 of **Appendix C**).

The BIA (refer to **Appendix C**) provides the details of impacts to ESAs, PEMs, terrestrial flora values, and terrestrial fauna values on which Arrow Energy bases the requirement to amend the current SGP South EA (EA0001613).

In summary, Arrow Energy is seeking amendments to its current EA to specifically:

- Update impacts to identified PEMs values via amendment to SGP South EA condition (Biodiversity 10) due to a revised layout and to ensure that the correct ESAs, PEMs and offset impacts are authorised.

Details of the biodiversity impact assessments are provided in Section 4.2 and **Appendix C**. The details of changes and/or updates to biodiversity conditions under the current SGP South EA are provided in Section 2.1.2.

Further details of the proposed amendments and inclusions to biodiversity values are specified in Section 4.2.3 and **Appendix A**, with specific changes and updates being requested to the PEMs table provided in **Appendix B**. The detailed biodiversity impact assessment conducted by Attexo Consulting is provided in **Appendix C**.

2.1.2 Changes and/or updates to Biodiversity Conditions

An update to biodiversity conditions under the current SGP South EA is required. These changes or updates are described in **Table 2-1** and provided in **Appendix A**.

Table 2-1 Changes and/or Updates to SGP South EA Biodiversity Conditions

Condition	Change/Update or Add New ?	Description
Biodiversity 4	Add New	Include new condition relating to keeping spatial records for demonstrating compliance with the following biodiversity conditions: <ul style="list-style-type: none"> • Biodiversity 8 and Biodiversity 9 – relating to impacts to ESAs and their Primary Protection Zones (PPZ);

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Condition	Change/Update or Add New ?	Description
		<ul style="list-style-type: none"> Biodiversity 11– relating to impacts to PEMs; and Biodiversity 12 – relating to records keeping for impacts to PEMs. <p>Please refer to specific wording of this new condition as provided in Appendix A (i.e., marked-up EA).</p>
Biodiversity 4	Change/Update	Minor administrative change in number sequence from current Biodiversity 4 to Biodiversity 5
Biodiversity 5	Change/Update	Minor administrative change in number sequence from current Biodiversity 5 to Biodiversity 6
Biodiversity 7	Add New	Include new condition relating to what constitutes Extra Work Areas (EWAs) (refer to Appendix A).
Biodiversity 8	Change/Update	Minor administrative changes, i.e., table naming convention and formatting.
Biodiversity 8A	Change/Update	<ul style="list-style-type: none"> Minor administrative change in number sequence from current condition Biodiversity 8A to Biodiversity 9. Renaming of table <i>Protecting biodiversity values, Table 2 – Maximum significant disturbance to Schedule F, Table 2 – Maximum ESA disturbance</i>, and specifically remove: <ul style="list-style-type: none"> Location of activities; and Disturbance area by Petroleum Lease (PL). Rewording of this <i>new</i> Condition Biodiversity 9 to the following new wording (please also refer to Appendix A): <p><i>“Despite condition Biodiversity 8, petroleum activities are permitted in ESAs, as well as their primary protection zones (PPZs) and secondary protection zones (SPZs), if they satisfy the following:</i></p> <ul style="list-style-type: none"> (a) do not exceed the maximum area for each environmentally sensitive area as shown in Schedule F, Table 2 – Maximum ESA disturbance; and (b) are undertaken within the footprint prescribed in Schedule F, Figure 1 – SGP South Stage 1 Maximum Boundary.” Add Figure <i>Schedule F, Figure 1 – SGP South Stage 1 Maximum Boundary</i> – to provide the approximate boundary for SGP South Stage 1 Offsets.
Biodiversity 9	Change/Update	Minor administrative change in number sequence from current condition Biodiversity 9 to Biodiversity 10, and references to other conditions within this condition.
Biodiversity 10	Change/Update	<ul style="list-style-type: none"> Minor administrative change in number sequence from current Biodiversity 10 to Biodiversity 11, plus the following relevant changes:

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Condition	Change/Update or Add New ?	Description
		<ul style="list-style-type: none"> Change the title of table from Protecting biodiversity values, <i>Table 3 – Significant residual impacts to prescribed environmental matters</i>, to: Schedule F, Table 3 Authorised impacts to Prescribed Environmental Matters (PEMs). Update the wording of condition Biodiversity 10 to: “<i>Unless authorised by an existing authority issued before the commencement of the Environmental Offsets Act 2014, impacts to Prescribed Environmental Matters (PEMs) are only authorised for the maximum extent of impact and within the relevant SGP South boundary stated in Schedule F, Table 3— Authorised impacts to PEMs.</i>” Update biodiversity impacts – i.e., maximum extent of impact in table <i>Schedule F, Table 3 Authorised impacts to Prescribed Environmental Matters (PEMs)</i> to the limits as provided in the marked-up SGP South EA provided in Appendix A. Also refer to updated PEMs table provided in Appendix B, and biodiversity impact assessment report provided in Appendix C.
Biodiversity 11	Change/Update	<p>Minor administrative change in number sequence from current Biodiversity 11 to Biodiversity 12, and the following changes:</p> <ul style="list-style-type: none"> Change wording to add the wording “.. <i>compliance to Condition Biodiversity 11.</i>”
Biodiversity 12	Change/Update	<p>Minor administrative change in number sequence from current Biodiversity 12 to Biodiversity 13, and the following changes:</p> <ul style="list-style-type: none"> Change in wording to include “ .. <i>unless the administering authority confirms that the impact to the prescribed environmental matter is as follows:</i> <ol style="list-style-type: none"> the same, or substantially the same, impact; and the same, or substantially the same, prescribed environmental matter; and has been assessed under a relevant Commonwealth Act.”
Biodiversity 13	Change/Update	<p>Minor administrative change in number sequence from current Biodiversity 13 to Biodiversity 14, and references to other conditions.</p>
Biodiversity 14, Biodiversity 15, Biodiversity 16, and Biodiversity 17.	Change/Update	<p>Minor administrative change in number sequence and references to other conditions.</p>

2.2 Changes to other relevant EA conditions

In addition to the amendments mentioned in Section 2.1 for changes to biodiversity conditions, Arrow Energy also proposes to amend a number of other conditions which are

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provided in **Table 2-2** and **Appendix A**, and also proposes the inclusion of administrative changes within the SGP South EA (refer to Section 2.3).

Table 2-2 provides the detail of the changes requested through this EA amendment to other relevant EA conditions and the justifications for change.

Table 2-2 Amendments to other relevant EA conditions and justifications for change ^{6,7}

Condition and/or Table	Proposed change	Justification
General (requested to be renamed to Schedule A - General)		
General 1	Modify condition dot point (b) to (in bold): (b) Incidental activities that are not otherwise specified relevant activities.	Modify dot point (b) to: <ul style="list-style-type: none"> • remove 'essential petroleum activities' and replace it with 'incidental activities' as: <ul style="list-style-type: none"> ○ petroleum activities to be authorised by the EA are included in Schedule A, Table 1 – Authorised petroleum activities; ○ incidental activities are required to be included as activities necessary for the carrying out of the resource activities indicated in Schedule A, Table 1 – Authorised petroleum activities; and ○ to align with industry standard for environmental authorities.
Schedule A, Table 1 – Authorised petroleum activities	Modify Table to: <ul style="list-style-type: none"> • include a maximum size of 1.5 ha for each single well pad, where it applies; and • include a maximum size of 2.5 ha for each multi-well pad, where it applies. 	Modify Schedule A, Table 1 – Authorised petroleum activities to: <ul style="list-style-type: none"> • Change 'Coal seam gas (CSG) production wells' to 'Total coal seam gas (CSG) wells' (i.e., remove the word production); • Allow 1.5 ha as maximum size for each single well pad; and • Allow 2.5 ha as maximum size for each multi-well pad; • Add 'Scale' to column 4 title and remove 'maximum size' to align with industry standard for environmental authorities. <p>Please note:</p> <ul style="list-style-type: none"> • the requested maximum size limits is consistent with other Arrow Energy approved EAs (e.g., SGP North EA (EA0001399)).

⁶ Please note that Schedule titles are being requested to be renamed for compliance with the *Streamlined model conditions for petroleum activities* Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024)

⁷ Please use this table in conjunction with **Appendix A**, marked-up EA.

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Condition and/or Table	Proposed change				Justification																																					
	<table border="1"> <thead> <tr> <th data-bbox="450 400 687 504">Activities</th> <th data-bbox="687 400 855 504">Location</th> <th data-bbox="855 400 1081 504">Total Scale of petroleum activities / infrastructure</th> <th data-bbox="1081 400 1263 504">Scale³ / Intensity</th> </tr> </thead> <tbody> <tr> <td data-bbox="450 504 687 711" rowspan="6">Total coal seam gas (CSG) wells²</td> <td data-bbox="687 504 855 533">PL 185</td> <td data-bbox="855 504 1081 533">25 wells</td> <td data-bbox="1081 504 1263 608" rowspan="3">1.5 ha per single well pad</td> </tr> <tr> <td data-bbox="687 533 855 561">PL 493</td> <td data-bbox="855 533 1081 561">70 wells</td> </tr> <tr> <td data-bbox="687 561 855 590">PL 1039</td> <td data-bbox="855 561 1081 590">215 wells</td> </tr> <tr> <td data-bbox="687 590 855 619">PL 1040</td> <td data-bbox="855 590 1081 619">300 wells</td> <td data-bbox="1081 608 1263 711" rowspan="4">2.5 ha per multi-well pad</td> </tr> <tr> <td data-bbox="687 619 855 647">PL 1041</td> <td data-bbox="855 619 1081 647">15 wells</td> </tr> <tr> <td data-bbox="687 647 855 676">PL 1042</td> <td data-bbox="855 647 1081 676">50 wells</td> </tr> <tr> <td data-bbox="687 676 855 705">PL 1043</td> <td data-bbox="855 676 1081 705">40 wells</td> </tr> <tr> <td data-bbox="450 711 687 919" rowspan="6">Gas and water gathering pipelines</td> <td data-bbox="687 711 855 740">PL 185</td> <td data-bbox="855 711 1081 740">25 km</td> <td data-bbox="1081 711 1263 919" rowspan="6">535 km of pipeline</td> </tr> <tr> <td data-bbox="687 740 855 769">PL 493</td> <td data-bbox="855 740 1081 769">95 km</td> </tr> <tr> <td data-bbox="687 769 855 798">PL 1039</td> <td data-bbox="855 769 1081 798">100 km</td> </tr> <tr> <td data-bbox="687 798 855 826">PL 1040</td> <td data-bbox="855 798 1081 826">240 km</td> </tr> <tr> <td data-bbox="687 826 855 855">PL 1041</td> <td data-bbox="855 826 1081 855">15 km</td> </tr> <tr> <td data-bbox="687 855 855 884">PL 1042</td> <td data-bbox="855 855 1081 884">25 km</td> </tr> <tr> <td data-bbox="450 919 687 991">Regulated structures</td> <td data-bbox="687 919 855 991">PL 1041</td> <td data-bbox="855 919 1081 991">One (1) dam (Hillview Pilot Dam)</td> <td data-bbox="1081 919 1263 991">19.2 ha</td> </tr> </tbody> </table>	Activities	Location	Total Scale of petroleum activities / infrastructure	Scale ³ / Intensity	Total coal seam gas (CSG) wells ²	PL 185	25 wells	1.5 ha per single well pad	PL 493	70 wells	PL 1039	215 wells	PL 1040	300 wells	2.5 ha per multi-well pad	PL 1041	15 wells	PL 1042	50 wells	PL 1043	40 wells	Gas and water gathering pipelines	PL 185	25 km	535 km of pipeline	PL 493	95 km	PL 1039	100 km	PL 1040	240 km	PL 1041	15 km	PL 1042	25 km	Regulated structures	PL 1041	One (1) dam (Hillview Pilot Dam)	19.2 ha	<p>1. The petroleum activities are authorised petroleum activities for the purposes of the Petroleum and Gas (production and Safety) Act 2004 and the Petroleum Act 1923.</p> <p>2. A well variation of 10% per tenure is permitted, provided the overall well count does not exceed 715 wells.</p> <p>3. Meaning of project scale as defined in DETSI Guideline Application requirements for petroleum activities (ESR/20106/2357, Version 4.01, 27 JUN 2024) as maximum area of disturbance.</p>	<ul style="list-style-type: none"> the 1.5 ha limit for single well pads is required for development of the Project due to some single well pads located on sloping terrain and to ensure constructability. The proposed changes to increase the maximum well size for single well pads to 1.5 ha from 1.1 ha and multi well pads to 2.5 ha from 1.9 ha is to ensure compliance with the EA. Currently the authorised activity table specifies a maximum size for single and multi-well pads. Based on Arrows current well design, multi well pads could be up to 2.5 ha and have 8 wells on them. Where some single well pads on sloping terrain will require up to 1.5 ha to deal with safe battering of slopes and drainage. As such, Arrow would be non-compliant and would need to seek this to be changed or explicit despite clauses to authorise. Furthermore, the authorised activity table would be in conflict with the essential petroleum definition for infrastructure in an ESA which allows well sites with monitoring equipment for multi-well pads no greater than 2.0 ha. Arrow Energy are not seeking a blanket authorisation for all well pads to be 1.5 ha or 2.5 ha but to ensure that, where applicable, the maximum scale/intensity can be applied. Arrow Energy is already subject to multiple restrictions through the PEMs, ESA, ERC and Plan of Operations (PoO) requirements which would further restrict the number and size of well pads. Regardless of this, Arrow Energy will not exceed the number of total wells authorised, and continue to consider minimum constructible disturbance in well pad design The greater area required for multi well pads i.e. 2.5 ha would result in a greater positive environmental outcome through a reduction in disturbance as 8 wells could be drilled on a multi well pad at 2.5 ha compared to 8 single well pads at 1.1 ha saving 6.3 ha. Arrow Energy believes that the area nominated for multi-well pads in the current EA is no longer the industry standard from when the draft
Activities	Location	Total Scale of petroleum activities / infrastructure	Scale ³ / Intensity																																							
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		<p>model conditions had been developed. As such, the increase to 2.5 ha is more realistic based on a larger number of wells that can be drilled now on a multi-well pad, it also allows for safe drilling and operations due to the number of wells present and the area required. As such Arrow Energy believes that its appropriate to increase the maximum multi-well size to 2.5 ha noting that Arrow would look to reduce its well pad size where possible to reduce CCA costs but also the costs of land rehabilitation that come with clearing larger pad sizes.</p> <ul style="list-style-type: none"> • This increase in maximum disturbance per well pad does not see any increase to the maximum disturbance area already approved under this EA (See Table 1-1 that shows disturbance by PL).
General 13, General 14, and General 15	Remove conditions.	<p>Remove conditions to:</p> <ul style="list-style-type: none"> • update EA in line with the Estimated Rehabilitation Cost (ERC) decision under s298 of the <i>Environmental Protection Act 1994</i> (EP Act).
Waste (requested to be renamed to Schedule B – Waste Management)		
New Waste 5	<p>Insert <i>new</i> condition:</p> <p>Vegetation waste may be burned if it relates to a state forest, timber reserve or forest entitlement area administered by the Forestry Act 1959 and a permit has been obtained under the Fire and Rescue Service Act 1990.</p>	<p>Insert new condition to:</p> <ul style="list-style-type: none"> • Align EA with the <i>Streamlined model conditions for petroleum activities</i> Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024) (condition Waste 5).
Waste 7	<p>Modify condition to add dot point (b):</p> <p>(b) stimulation activities</p>	<p>Modify by inserting dot point (b) to condition to:</p> <ul style="list-style-type: none"> • Align EA with the <i>Streamlined model conditions for petroleum activities</i> Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024) (condition Waste 7).

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Condition and/or Table	Proposed change	Justification
Waste 11	<p>Remove condition:</p> <p>Treated sewage effluent or <u>greywater</u> can be released to land provided it:</p> <p>(a) meets or exceeds secondary treated class B standards for a treatment system with a daily peak design capacity of between 150 EP and 1500 EP; or</p> <p>(b) meets or exceeds secondary treated class C standards for a treatment system with a daily peak design capacity of less than 150 EP.</p>	<p>Remove condition as:</p> <ul style="list-style-type: none"> the proposal is to include new conditions linked to Sewage Treatment Plant (STP) release limits and delete references to secondary treated class B standards and class C standards to allow to link to similar STP limits across the industry and STP suppliers.
New Waste 11	<p>Insert <i>new</i> condition:</p> <p>Irrigation of produced water is authorised providing it ensures:</p> <p>(a) that soil structure, stability, and productive capacity can be maintained or improved;</p> <p>(b) toxic effects to crops do not result; and</p> <p>(c) yields and produce quality are maintained or improved.</p>	<p>Insert new condition to:</p> <ul style="list-style-type: none"> Align EA with the <i>Streamlined model conditions for petroleum activities</i> Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024) (condition Waste C1).
New Waste 12	<p>Insert <i>new</i> condition:</p> <p>Irrigation of <u>produced water</u> is authorised providing a written report is provided to the chief executive which:</p> <p>(a) certifies that the outcomes in condition (Waste 11) will be achieved;</p> <p>(b) states water quality criteria, which has been determined in accordance with the assessment procedures outlined in Schedule B, Table 1 — Assessment procedures for water quality criteria; and</p> <p>(c) includes a water monitoring program to monitor that the outcomes listed in condition (Waste C1) are being achieved.</p>	<p>Insert new condition to:</p> <ul style="list-style-type: none"> Align EA with the <i>Streamlined model conditions for petroleum activities</i> Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024) (condition Waste C2 and Waste management schedule, Table 1 – Assessment procedures for water quality criteria).

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Condition and/or Table	Proposed change	Justification						
	<p>Schedule B, Table 1 — Assessment procedures for water quality criteria</p> <table border="1"> <thead> <tr> <th data-bbox="463 416 728 496">Water quality criteria</th> <th data-bbox="728 416 1249 496">Assessment procedure</th> </tr> </thead> <tbody> <tr> <td data-bbox="463 496 728 1082"> electrical conductivity sodium adsorption ratio pH </td> <td data-bbox="728 496 1249 1082"> Salinity Management Handbook, with reference to Chapter 11; and/or Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapter 4 and Volume 3 Chapter 9. The assessment should consider: <ul style="list-style-type: none"> • soil properties within the root zone to be irrigated (e.g., clay content, cation exchange capacity, exchangeable sodium percentage) • water quality of the proposed resource (e.g., salinity, sodicity) • climate conditions (e.g., rainfall) • leaching fractions • average root zone salinity (calculated) • crop salt tolerance (e.g., impact threshold and yield decline) • management practices and objectives (e.g., irrigation application rate, amelioration techniques) • broader landscape issues (e.g., land use, depth to groundwater) • any additional modelling and tests undertaken to support the varied water quality parameters. </td> </tr> <tr> <td data-bbox="463 1082 728 1254">heavy metals</td> <td data-bbox="728 1082 1249 1254"> Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapters 3 and 4 and Volume 3 Chapter 9. The assessment should aim to derive site specific trigger values (e.g., cumulative contaminant loading limit) based on the methodology provided in the above-mentioned procedure. </td> </tr> </tbody> </table>	Water quality criteria	Assessment procedure	electrical conductivity sodium adsorption ratio pH	Salinity Management Handbook, with reference to Chapter 11; and/or Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapter 4 and Volume 3 Chapter 9. The assessment should consider: <ul style="list-style-type: none"> • soil properties within the root zone to be irrigated (e.g., clay content, cation exchange capacity, exchangeable sodium percentage) • water quality of the proposed resource (e.g., salinity, sodicity) • climate conditions (e.g., rainfall) • leaching fractions • average root zone salinity (calculated) • crop salt tolerance (e.g., impact threshold and yield decline) • management practices and objectives (e.g., irrigation application rate, amelioration techniques) • broader landscape issues (e.g., land use, depth to groundwater) • any additional modelling and tests undertaken to support the varied water quality parameters. 	heavy metals	Australian and New Zealand Guidelines for Fresh and Marine Water Quality, with reference to Volume 1 Chapters 3 and 4 and Volume 3 Chapter 9. The assessment should aim to derive site specific trigger values (e.g., cumulative contaminant loading limit) based on the methodology provided in the above-mentioned procedure.	
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Condition and/or Table	Proposed change	Justification
Waste 12	<p>Modify current condition to (in bold, noting the start of the wording condition 'The release of' has also been removed):</p> <p>Treated sewage effluent or greywater from a treatment system with a daily peak design capacity of less than 50 EP may be released to land provided it:</p> <p>(a) is to a fenced and signed contaminant release area(s);</p> <p>(b) does not result in pooling or run-off or aerosols or spray drift or vegetation die-off;</p> <p>(c) minimises deep drainage below the root zone of any vegetation;</p> <p>(d) does not adversely affect the quality of shallow aquifers;</p> <p>(e) does not adversely impact soil quality; and</p> <p>(f) is to a contaminant release area(s) that is kept vegetated with groundcover, that is:</p> <ul style="list-style-type: none"> i. not a declared pest species ii kept in a viable state for transpiration and nutrient uptake; and iii. grazed or harvested and removed from the contaminant release area as needed, but not less than every three 	<p>Modify condition to include:</p> <ul style="list-style-type: none"> • STPs with a capacity less than 50 EP (Equivalent Persons); and • outcome focused conditions. <p>Please note that:</p> <ul style="list-style-type: none"> • STPs greater than 21 EP will require a MEDLI model; and • STPs for less than 21 EP are considered low risk based on DETSI's risk assessment for petroleum activities.
Waste 13	<p>Modify condition to:</p> <p>Notwithstanding condition (Waste 11) Treated sewage effluent that meets or exceeds secondary treated class A standards may be used for dust suppression or construction activities, provided the use meets the criteria in condition (Waste 8) or (Waste 9), as relevant to the use.</p>	<p>Modify wording of condition to:</p> <ul style="list-style-type: none"> • Remove reference to condition (Waste 11) (crossed out) as the proposal is to remove condition (Waste 11).

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Condition and/or Table	Proposed change	Justification																						
<p>New Waste 17</p>	<p>Insert <i>new</i> condition:</p> <p>Coal seam gas water may be transferred to a third party to be used for the following purposes subject to compliance with conditions (Waste 17 (a)-(d)), (Waste 18) and (Waste 19):</p> <p>(a) dust suppression if the <u>coal seam gas water</u> quality complies with the limits specified in <i>Schedule B, Table 3 – Water Contaminant Release Limits</i>;</p> <p>(b) <u>construction and operational purposes</u> if the <u>coal seam gas water</u> quality complies with the limits specified in <i>Schedule B, Table 2 – Water Contaminant Release Limits</i>;</p> <p>(c) irrigation and livestock watering purposes;</p> <p>(d) the following industrial purposes:</p> <ol style="list-style-type: none"> i. coal washing; ii. power stations; and iii. water treatment facilities. <p style="text-align: center;">Schedule B, Table 2 – Water Contaminant Release Limits</p> <table border="1" data-bbox="533 954 1182 1228"> <thead> <tr> <th>Water Quality Characteristics</th> <th>Unit</th> <th>Limit</th> <th>Limit Type</th> </tr> </thead> <tbody> <tr> <td>pH</td> <td>pH unit</td> <td>6.0 to 9.0</td> <td>Range</td> </tr> <tr> <td rowspan="2">Sodium Adsorption Ratio</td> <td rowspan="2">ratio</td> <td>6</td> <td>80th Percentile</td> </tr> <tr> <td>12</td> <td>Maximum</td> </tr> <tr> <td>Total Dissolved Solids (TDS)</td> <td>mg/L</td> <td>1500</td> <td>Maximum</td> </tr> <tr> <td>Total Petroleum Hydrocarbons (TPH)</td> <td>mg/L</td> <td>10</td> <td>Maximum</td> </tr> </tbody> </table>	Water Quality Characteristics	Unit	Limit	Limit Type	pH	pH unit	6.0 to 9.0	Range	Sodium Adsorption Ratio	ratio	6	80 th Percentile	12	Maximum	Total Dissolved Solids (TDS)	mg/L	1500	Maximum	Total Petroleum Hydrocarbons (TPH)	mg/L	10	Maximum	<p>Insert new condition to:</p> <ul style="list-style-type: none"> Link water contaminant release limits to MEDLI outputs. <p>Please note that:</p> <ul style="list-style-type: none"> any MEDLI assessment submitted to DETSI will include a determination of the predicted Total Dissolved Solids (TDS), Dissolved Oxygen (DO), Total Nitrogen (TN) and Total Phosphorous (TP) nutrient concentration of the effluent in question and will determine the area required for long-term average limits for the sustainable management of nutrients irrigated. The limits proposed in <i>Schedule B, Table 2 – Water contaminant release limits</i> would therefore provide a proxy for aforementioned limits, with the MEDLI ensuring the release of effluent is managed and irrigated appropriately. The proposed limits are similar to that of secondary treated class B standards, but as noted above TN and TP have been removed to link to outputs from the MEDLI model. The release limits proposed which remove TN and TP are consistent with the QLD plumbing and waste water code guideline 2008 for a multi dwelling with medium human contact end use. As such Arrow Energy believe the proposed conditions are consistent with existing effluent compliance values based on the exposure risk.
Water Quality Characteristics	Unit	Limit	Limit Type																					
pH	pH unit	6.0 to 9.0	Range																					
Sodium Adsorption Ratio	ratio	6	80 th Percentile																					
		12	Maximum																					
Total Dissolved Solids (TDS)	mg/L	1500	Maximum																					
Total Petroleum Hydrocarbons (TPH)	mg/L	10	Maximum																					

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Condition and/or Table	Proposed change	Justification
New Waste 18	Insert <i>new</i> condition: Any coal seam gas water supplied to a third party for irrigation and/or livestock watering purposes in accordance with Condition (Waste 16)(c) must comply with the relevant trigger values contained in ANZECC and ARMCANZ Water Quality Guidelines 2000, or subsequent versions thereof.	Insert new condition to: • include provision within the EA for the ability to transfer water to a third party rather than through an EOW code, whilst aligning with the limits within the EOW Codes.
New Waste 19	Insert new condition: If the responsibility of <u>coal seam gas water</u> is given or transferred to a third party in accordance with Condition (Waste 16), the <u>holder</u> of this environmental authority must ensure that: (a) the responsibility of the <u>coal seam gas water</u> is given or transferred in accordance with a written agreement (the third party agreement); and (b) the third party is made aware of the General Environmental Duty under section 319 of the <i>Environmental Protection Act 1994</i> .	Insert new condition to: • include provision within the EA the ability to transfer water to third party rather than through an EOW code.
Water (requested to be renamed to Schedule G – Protecting Water Values)		
Water 1A	Remove condition: The extraction of groundwater as part of the petroleum activity(ies) from underground aquifers must not directly or indirectly influence the mobilisation of existing groundwater contamination on Lot 40 DY85, in such a way that increases the risk of harm to groundwater environmental values.	Remove conditions due to: • These conditions being no longer applicable to the SGP South EA (EA0001613). They were originally imposed in 2018 due to concerns by the then Queensland Government regarding potential contamination from Lot Plan 40DY85.

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Condition and/or Table	Proposed change	Justification
Water 1B	Remove condition: The environmental authority holder must not locate any coal seam gas production wells within 10 kilometres of the centre of Lot 40 DY85.	<ul style="list-style-type: none"> Groundwater monitoring and modelling is currently conditioned under Environmental Authority for PL253 (EA0001401), which makes this condition no longer valid as a requirement of this environmental authority. As required by EA0001401, an “Annual Report” summarising Arrow Energy’s groundwater monitoring and modelling efforts, has been submitted to DETSI on 30 November 2024.
Water 1C	Remove condition: Groundwater impact modelling The administering authority may require the environmental authority holder to model the impacts of coal seam gas production activities on groundwater contamination around Lot 40DY85 at any time and present the findings to the administering authority within 30 days from the date of the request or a timeframe that has been agreed with the administering authority.	<ul style="list-style-type: none"> It should be noted that, Arrow Energy’s monitoring network and reporting obligations, imposed by EA0001401, provide early detection and mitigation capability as an effective risk management layer. Over the past seven (7) years, Arrow Energy has conducted extensive modelling and monitoring in compliance with EA EA0001401, demonstrating that the risk of residual contamination migrating from Lot Plan 40DY85 is minimal. Quarterly investigation reports, summarising the groundwater monitoring results, submitted to DETSI confirm that groundwater flow in both the Springbok Sandstone and Macalister coal seams continues to be very slow and directed toward the gasifier area, and therefore residual contaminants — related to the past underground gasification operations — will remain local to Lot Plan 40 DY85. Furthermore, groundwater monitoring results show a long-term declining trend in concentrations of the contaminants, e.g., Benzene and Naphthalene, detected in the monitoring bores located within Lot Plan 40DY85. Groundwater monitoring results has been confirmed by predictive groundwater flow and contaminant modelling. It is also important to note the ongoing diminishing nature of the contaminants, controlled mainly by the natural attenuation processes (e.g., sorption and degradation). Given the regional groundwater movement remains from north-east to south-west across Lot Plan 40DY85 and the absence of contaminants

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		of concern in all monitoring bores close to PL493, Arrow Energy believes that it is timely to remove these conditions as they are no longer relevant and that the existing suite of monitoring, reporting, and regulatory safeguards ensures that groundwater risks are actively managed and detected early, making these conditions redundant under current risk profile.
Water 10	Remove condition: Measures must be taken to minimise negative impacts to, or reversal of, any river improvement works carried out in River Improvement Areas by Queensland's River Improvement Trusts.	Remove condition due to: <ul style="list-style-type: none"> it not being applicable as the Project is not located within a River Improvement Area.
Regulated Dam conditions (requested to be renamed to Schedule J – Structures)		
New Dams 4	Insert <i>new</i> condition: All affected persons must be provided with a copy of the emergency action plan in place for each regulated structure (a) for existing structures that are regulated structures, within 10 business days of this condition taking effect; (b) prior to the operation of the new regulated structure; and (c) if the emergency action plan is amended, within 5 business days of it being amended.	Insert new condition: <ul style="list-style-type: none"> To comply with Queensland Government Guideline <i>Structures which are dams or levees constructed as part of environmentally relevant activities</i> (ESR/2016/1934, Version 9.04, 1 October 2024) under the EP Act, Appendix A – Model conditions schedule 'X' structures, Section 4, Explanatory notes – People and communities, regarding 'Notification of affected persons'.
Definitions (requested to be renamed to Schedule K – Definitions)		
New declared pest species	Insert <i>new</i> definition:	Insert new definition to: <ul style="list-style-type: none"> provide a definition of <i>declared</i> pest species as stipulated in relevant applicable legislation, and as required by the <i>Streamlined model</i>

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Condition and/or Table	Proposed change	Justification
	means a 'prohibited matter' or 'restricted matter' species under the Biosecurity Act 2014; or 'Weeds of National Significance' under the Australian Weeds Strategy 2017–2027.	<i>conditions for petroleum activities</i> Guideline (ESR/2016/1989, Version 2.04 of 13 May 2024).
essential petroleum activities	<p>Add the following dot points (refer to Appendix A for detail of location within this definition):</p> <ul style="list-style-type: none"> on-site disposal of Residual Drilling Material (RDM) <p>And remove the following (in bold and crossed-out) from this other dot point:</p> <ul style="list-style-type: none"> activities necessary to achieve compliance with the conditions of the environmental authority in relation to another essential petroleum activity (e.g. sediment and erosion control measures, rehabilitation, on-site disposal of residual drilling material). <p>An Add:</p> <ul style="list-style-type: none"> communication tower pads and collocated access tracks and fibre optic cable, not exceeding 1.0 hectares of disturbance 	<p>Add dot point to the definition of <i>essential petroleum activities</i>:</p> <p>Regarding RDM:</p> <ul style="list-style-type: none"> to align with industry standard for environmental authorities (i.e., these are included in the definition of essential petroleum activities for other oil & gas environmental authorities). Consequently, remove from the other dot point as indicated in the proposed change for this definition. <p>Add dot point regarding communication towers:</p> <ul style="list-style-type: none"> To explicitly authorise communication towers not exceeding 1 ha (same size as a well pad) to be defined as essential petroleum activities.
New incidental activity	<p>Insert <i>new</i> definition:</p> <p>means an activity that is not specified relevant activity and is necessary to carry out the activities listed in Schedule A, Table 1 – Authorised petroleum activities</p>	<p>Insert new definition:</p> <ul style="list-style-type: none"> for consistency with the change to condition General 1 requested as part of this EA amendment. as incidental activities are required to be included as activities necessary for the carrying out of the resource activities indicated in Schedule A, Table 1 – Authorised petroleum activities; and to align with industry standard for environmental authorities.

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Condition and/or Table	Proposed change	Justification
secondary treated class A standards	Remove definition.	Remove definition as: <ul style="list-style-type: none"> the proposal is to move to specific treated sewage effluent discharge limits.
secondary treated class B standards	Remove definition.	Remove definition as: <ul style="list-style-type: none"> the proposal is to move to specific treated sewage effluent discharge limits.
secondary treated class C standards	Remove definition.	Remove definition as: <ul style="list-style-type: none"> the proposal is to move to specific treated sewage effluent discharge limits.
Significantly disturbed or significant disturbance or significant disturbance to land or areas	Modify definition to add dot points (a) and (b) (in bold): has the meaning in Schedule 12, section 4 of the <i>Environmental Protection Regulation 2008</i> . Land is significantly disturbed if— (a) it is contaminated land; or (b) it has been disturbed, and human intervention is needed to rehabilitate it – (i) to a condition required under the relevant environmental authority; or (ii) if the environmental authority does not require the land to be rehabilitated to a particular condition—to the condition it was in immediately before the disturbance.	Modify definition to: <ul style="list-style-type: none"> correct it to what is in Schedule 12, section 4 of the <i>Environmental Protection Regulation 2008</i> (EP Reg 2008) (this definition is not in the EP Reg 2019); and to align definition with industry standard for environmental authorities.
New suitably qualified and	Insert <i>new</i> definition: in relation to regulated structures means a person who is a Registered Professional Engineer of Queensland (RPEQ) under the provisions of the	Insert new definition to: <ul style="list-style-type: none"> align definition with industry standard for environmental authorities.

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Condition and/or Table	Proposed change	Justification
experience person	<p><i>Professional Engineers Act 2002</i>, and has demonstrated competency and relevant experience:</p> <ul style="list-style-type: none"> • for regulated dams, an RPEQ who is a civil engineer with the required qualifications in dam safety and dam design • for regulated levees, an RPEQ who is a civil engineer with the required qualifications in the design of flood protection embankments. <p><i>Note: It is permissible that a suitably qualified and experienced person obtain subsidiary certification from an RPEQ who has demonstrated competence and relevant experience in either geomechanics, hydraulic design or engineering hydrology.</i></p>	
<p>New</p> <p>suitably qualified person</p>	<p>Insert <i>new</i> definition:</p> <p>means a person who has professional qualifications, training or skills or experience relevant to the nominated subject matters and can give authoritative assessment, advice, and analysis about performance relevant to the subject matters using relevant protocols, standards, methods, or literature.</p>	<p>Insert new definition to:</p> <ul style="list-style-type: none"> • align definition with industry standard for environmental authorities.

2.3 Administrative changes

Administrative changes are proposed with this EA amendment in order to align with model conditions and/or for consistency with changes to other recent Arrow Energy EA approvals.

These changes include:

- Updating cover page table to group petroleum lease location(s) with the corresponding applicable Environmentally Relevant Activities (ERAs);
- Changing Schedule titles and sections under each Schedule to align with the *Streamlined model conditions for petroleum activities* Guideline⁸ and other recent Arrow Energy EA approvals;
- Updating the conditions numbering sequences from adding or removing conditions as requested in Section 2.1 and Section 2.2;
- Updating references to most recent versions of policies, legislation, and/or other documentation;
- Updating references to other conditions *within* a condition (e.g., Condition General 12);
- Completing missing or detailed wordings in some conditions and/or definitions (e.g., Condition General 16 (f), General 19, Waste 9, definition of *significantly disturbed or significant disturbance or significant disturbance to land or areas*, etc.); and
- Correcting minor 'typo errors' (e.g. Condition Land 6).

The detail for these changes can be found in the marked-up EA provided in **Appendix A**.

⁸ DETSI Guideline ESR/2016/1989, Version 2.04 of 13 May 2024.

3. Description of the Petroleum Tenures

3.1 General Project Area Location

Arrow Energy has interests in more than 65,000 Km² of petroleum tenures, mostly within Queensland’s Bowen basin and Surat basin (refer to **Figure 1-1**).

The petroleum tenures relevant to the SGP South Environmental Authority (EA), or EA0001613, are, as mentioned in Section 1.1 and **Figure 1-3**, are the petroleum leases (PLs) PL185, PL493, PL1039, PL1040, PL1041, PL1042, and PL1043. These tenures are located within the Western Downs Regional Council (WDRC) local government area and to the northwest, southwest and south of the township of Dalby (refer to **Figure 1-3**).

Table 3-1 identifies the blocks and sub-blocks of the PLs within the Project Area (i.e., PL493 and PL1040).

Table 3-1 Blocks and Sub-blocks of the Project Area.

Petroleum Tenure	Locality	Lease commence date	Lease size, ha	Block	Sub-blocks	Total sub-blocks/Block	Total Sub-blocks
PL493	Northwest of Dalby	26 February 2019	22,932.38	BRIS2456	d, e, k	3	75
				BRIS2457	a, b, c, d, e, f, g, h, j, k, l, m, n, o, p, r, s, t, u, x, y, z	22	
				BRIS2458	all	25	
				BRIS2529	d, e, k, p	4	
				BRIS2530	a, b, c, d, e, f, g, h, j, k, l, m, n, o, p, s, t, u, x, y, z	21	
PL1040	Southwest of Dalby	26 February 2019	22,822.82	BRIS2891	d, e, j, k, o, p, s, t, u, w, x, y, z	13	75
				BRIS2963	b, c, d, e, h, j, k, n, o, p, t, u	12	
				BRIS2964	all	25	
				BRIS2965	all	25	

Figure 1-3 depicts the boundaries of the SGP South EA PLs and **Figure 3-1** shows the relevant blocks and sub-blocks within these PLs.

3.2 Land Use

Land use across the Project Area and the broader surroundings is predominantly characterised by grazing and bushland, including the Kumbarilla State Forest on PL1040, with this State Forest within the Project Area (refer to **Table 3-2**).

Table 3-2 Queensland State Forests and Resource Reserves within the Project Area (PL493 and PL1040)

Petroleum Tenure	State Forest Name	Resource Reserve	Lot on Plan
PL493	N/A	Reserve for quarry	18 on DY478
PL1040	Kumbarilla State Forest	N/A	155 on FTY1778

Key industries in the wider region surrounding the Project area include CSG exploration and agriculture. Additionally, mineral extraction encroaches on the western and southern boundaries of the Project area. Thus, depending on the location of infrastructure, post operational land use will include forestry, mining, grazing, or cropping.

The Regional Planning Interest Act 2014 (Qld) identifies and protects areas of regional interest throughout Queensland, manages the impact of resource activities, supports resource activities to cohabitate with other activities, for example highly productive agricultural activities and assists in resolving land use conflicts. There are four areas of regional interest defined: priority agricultural areas (PAAs), priority living areas (PLAs), strategic environmental areas (SEAs) and strategic cropping area (SCA). Where Arrow Energy's resource activities are carried out in areas of regional interest, a Regional Interest development Approval (RIDA) will be sought where required.

There are two parcels of unallocated State land in the area of this EA amendment application, Lot on plans 51 on USL48216 and 66 on USL48215 on PL493.

There are no timber reserves within the Project Area for this EA amendment application.

3.3 Relationship to Overlapping Tenure and Renewable Energy Projects

There are some overlapping coal resource authorities within the Project Area, as per detail provided in **Table 3-3** and **Figure 3-2**.

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Table 3-3 Overlapping tenures within the Project Area

Coal resource authority	Resource authority holder	Relevant petroleum lease
EPC897	New Emerald Energy Pty Ltd	PL493
EPC898		
EPC938		PL1040
EPC1247	Nec No.2 Pty Ltd	PL493
ML50074	Aberdare Collieries Pty Ltd (CS Energy)	PL493
MDL335		
MDL382		

Arrow Energy has a number of commercial arrangements and Joint Interaction Management Plans (JIMPs) for some of these overlapping tenures

In addition to overlapping tenure, there are also a number of existing and proposed renewable energy projects (i.e. Solar Farms) located across the Project area. The potential for these to limit the footprint of development will be considered on an ongoing basis. These renewable energy projects are not subject to the provisions of the *Mineral and Energy Resources (Common Provisions) Act 2014* but are subject to approval under the Planning Act 2016.

4. Assessment of Environmental Impacts

4.1 Air Quality and Noise

The subject of this EA amendment application does not seek to change or increase impacts to air quality over what has previously been assessed and approved through the SGPEIS, SREIS, and initial EA application for SGP South. It is accepted that there will be emissions to air related to building and operating petroleum activities as part of the Project proposed development, however, the proposed development does not change the likely emissions to air as would have been previously considered and approved under the original EA application of 2018. Furthermore, it is not anticipated that there will be additional risks to air posed by the Project activities to be undertaken in accordance and in compliance with the current EA.

Acoustic environmental values and any potential impacts, managed and authorised by the existing approved EA conditions, are expected to remain unchanged as a result of the proposed EA amendment. Section 5 describes the environmental values identified as relevant to the proposed activity (the Project) and assesses the potential impacts to the identified values, in this case, Air Quality and Noise (refer to **Table 5-1**).

Project activities will be undertaken in accordance and in compliance with the conditions under the current EA for Air and Noise, specifically, Conditions Air 1 and Noise 1 to Noise 3.

4.2 Biodiversity

4.2.1 Applicable legislation

The legislation, policy and guidelines relevant to identifying values and mitigating and managing impacts on biodiversity for the Project are presented in **Table 4-1**.

Table 4-1 Biodiversity Impact Assessment Applicable Legislation

Relevant Legislation	Objective
<i>Environmental Protection Act 1994</i> (Qld) (EP Act)	The objective of the EP Act is to protect Queensland's environment by promoting ecologically sustainable development.
<i>Environmental Protection Regulation 2019</i> (Qld) (EP Reg)	This regulation provides a mechanism to enforce the EP Act and allows for an assessment of the risk that an environmentally relevant activity poses to ESAs.
<i>Environmental Offsets Act 2014</i> (Qld) (EO Act)	The main purpose of this act is to counterbalance the significant residual impacts of particular activities on prescribed environmental matters through the use of environmental offsets, by: (a) establishing a framework for environmental offsets; (b) recognising the level of protection given to prescribed environmental matters under other legislation; (c) providing for national, State, and local matters of environmental significance to be prescribed environmental matters for

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Relevant Legislation	Objective
	the purpose of this act; (d) coordinating the implementation of the framework in conjunction with other legislation.
<i>Environmental Offsets Regulation 2014</i> (EO Reg) (Qld)	This regulation provides details of the prescribed activities regulated under the existing legislation and prescribed environmental matters to which the EO Act applies.
Queensland Environmental Offsets Policy, Version 1.14	This policy provides a single, consistent, whole-of-government policy for the assessment of offset proposals to satisfy offset conditions.
<i>Environment Protection and Biodiversity Act 1999</i> (Cwlth) (EPBC Act)	This Commonwealth act provides for the protection of matters of national environmental significance, including groundwater resources that relate to coal seam gas development. Any action with the potential for a significant impact on these matters must be referred to the Minister for the Department of Climate Change, Energy, the Environment and Water and may require approval under this act.
<i>Vegetation Management Act 1999</i> (Qld) (VM Act)	This act regulates the clearing of vegetation in a way that: (a) conserves remnant vegetation that is an 'endangered' or an 'of concern' or a 'least concern' regional ecosystem; and (b) conserves vegetation in declared areas; and (c) ensures the clearing does not cause land degradation; and (d) prevents the loss of biodiversity; and (e) maintains ecological processes; and (f) manages the environmental effects of the clearing; and (g) reduces greenhouse gas emissions; and (h) allows for sustainable land use.
<i>Planning Act 2016</i> (Qld)	This act establishes an efficient, effective, transparent, integrated, coordinated, and accountable system of land use planning, development, assessment, and related matters that facilitates the achievement of ecological sustainability.
<i>Nature Conservation Act 1992</i> (Qld) (NC Act)	This act regulated the clearing of native plants in Queensland to protect 'critically endangered', 'endangered', 'vulnerable', and 'near threatened' plants. Provides for the gazettal of protected areas, including nature refuges; prescribes classes of wildlife; and sets out restrictions on the taking or harm to native wildlife without a valid permit.
<i>Nature Conservation (Plants) Regulation 2020</i> (Qld) (NC Reg Plants)	This regulation contains the clearing regulatory requirements and the list of 'critically endangered', 'endangered', 'vulnerable', or 'near threatened' plants.
<i>Nature Conservation (Animals) Regulation 2020</i> (Qld) (NC Reg Animals)	This regulation provides for the conservation and management of protected animals in Queensland by: listing animal species under the conservation classifications under the NC Act; providing a management approach for each classification based on the threat of extinction to the species; providing general authorisations for interactions with animals in the wild; providing a permitting and authorisation framework for taking, keeping, and using native animals outside of protected areas; streamlining the licencing framework for keeping and using animals; including administrative arrangements for permitting and licencing frameworks; specifying offences and associated penalties; and including transitional provisions to allow continuity and preserve existing rights.

Relevant Legislation	Objective
Queensland Government Protected Plants Framework and Species Management Program	establishes the requirement for proponents to complete flora surveys prior to clearing, to locate any extinct, extinct in the wild, critically endangered, endangered, vulnerable, or near threatened plants within a clearing impact area. Pre-clearing surveys are typically conducted twelve months prior to construction to support for a clearing permit under the NC Act.

4.2.2 Description on environmental values

Ecological values

The Project is located to the north-east and south-east of Tara in the Brigalow Belt bioregion. The majority of the Project areas are located within the Inglewood Sandstones sub-bioregion. However, a section of the Project is also within the Eastern Darling Downs sub-bioregion. Further details are provided in **Appendix C**.

The portion of the Project located within PL493 can generally be described as grazing lands dominated by dry eucalypt woodlands to open woodlands interspersed with small areas of open forest to woodland dominated by Poplar Box (*Eucalyptus populnea*) or Silver-leaved Ironbark (*E. melanophloia*) and Spotted Gum (*Corymbia citriodora*). These dominant vegetation types are dissected by riparian open forests to woodlands associated with Eastern Branch Creek and Kogan Creek. There are no Terrestrial Biodiversity Corridors or buffers within the area of the Development on PL493. However, riparian corridors for the Condamine River, Eastern Branch Creek and Kogan Creek intersect the area considered for the biodiversity impact assessment (refer to **Appendix C**, but are not within the Project footprint).

The portion of the Project located within PL1040 is mostly in the Kumbarilla State Forest and can generally be described as dry eucalypt woodland to open forests on sand plains and lateritic duricrusts. The woodlands are dominated by Gum Top Ironbark (*Eucalyptus decorticans*), Narrow-leaved Ironbark (*E. Crebra*) and/or Poplar Box (*Eucalyptus populnea*). There are no Terrestrial Biodiversity Corridors or buffers within this area. However, riparian corridor for Wilkie Creek intersect the area considered for the biodiversity impact assessment (refer to **Appendix C**), but are not within the Project footprint.

The area used for the purposes of the biodiversity impact assessment, environmental values and impacts, considered using a 500 m buffer around the footprint of the proposed developments on both PL493 and PL1040.

Environmentally Sensitive Areas (ESAs)

Category A and B ESAs as defined in the *Environmental Protection Regulation 2019* (EP Reg) and DETSI’s definition of Category C ESAs that is Protected Wildlife Habitat relevant

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to the Project are summarised in **Table 4-2**. This definition of Category C ESA has been used for completeness of assessment, but Arrow Energy notes that it is not defined nor conditioned in the current SGP South EA (EA0001613). ESAs relating to marine areas is excluded as these are not applicable to the Project. For further details please refer to **Appendix C**.

Table 4-2 ESAs relevant to the Project

Category	Type	Occurrence relevant to the Project gas areas
Category A	Any of the following under the Nature Conservation Act 1992: <ul style="list-style-type: none"> • a national park (scientific) • a national park • a national park (Aboriginal land) • a national park (Torres Strait Islander land) • a national park (Cape York Peninsula Aboriginal land) • a conservation park • a special wildlife reserve • a forest reserve. 	None
	The Wet Tropics Area under the Wet Tropics World Heritage Protection and Management Act 1993.	
	The Great Barrier Reef Region under the Great Barrier Reef Marine Park Act 1975 (Cwlth).	
	A marine park under the Marine Parks Act 2004, other than a part of the park that is a general use zone under that Act.	
Category B	Any of the following areas under the <i>Nature Conservation Act 1992</i> : <ul style="list-style-type: none"> • a coordinated conservation area • an area of critical habitat or major interest identified under a conservation plan • an area subject to an interim conservation order. 	None
	An area subject to the following conventions to which Australia is a signatory: <ul style="list-style-type: none"> • the 'Convention on the Conservation of Migratory Species of Wild Animals' (Bonn, 23 June 1979); • the 'Convention on Wetlands of International Importance, especially as Waterfowl Habitat' (Ramsar, Iran, 2 February 1971); • the 'Convention Concerning the Protection of the World Cultural and Natural Heritage' (Paris, 23 November 1972). 	
	A zone of a marine park under the <i>Marine Parks Act 2004</i> that is within a general use zone of the marine park under that Act.	
	An area to the seaward side of the highest astronomical tide.	

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Category	Type	Occurrence relevant to the Project gas areas
	The following under the <i>Queensland Heritage Act 1992</i> : a place of cultural heritage significance a Queensland heritage place, unless there is an exemption certificate issued under that Act.	
	An area recorded in the Aboriginal Cultural Heritage Register established under the Aboriginal Cultural Heritage Act 2003, section 46, other than the area known as the 'Stanbroke Pastoral Development Holding', leased under the Land Act 1994 by lease number PH 13/5398.	
	A feature protection area, State forest park or Scientific area under the <i>Forestry Act 1959</i> .	
	A declared fish habitat area under the <i>Fisheries Act 1994</i> .	
	An 'Endangered Regional Ecosystem' identified in the Regional Ecosystem Description Database (REDD) (by biodiversity status).	RE 11.3.1 and RE 11.4.3 have been mapped within the PL493 Project Development (refer to Appendix C).
Category C	Nature refuges as defined in the conservation agreement for that refuge under the <i>Nature Conservation Act 1992</i> .	None
	Koala habitat areas as defined under the Nature Conservation (Koala) Conservation Plan 2006.	None
	State forests or timber reserves as defined under the <i>Forestry Act 1959</i> .	The PL1040 Project Development is located within the Kumbarilla State Forest (refer to Appendix C).
	Regional parks (previously known as resource reserves) under the <i>Nature Conservation Act 1992</i> .	None
	An area validated as from ground-truthing surveys as 'essential habitat' on the Queensland Government essential habitat map in accordance with section 20AC of the <i>Vegetation Management Act 1999</i> for a species of wildlife listed as critically endangered, endangered, vulnerable under the <i>Nature Conservation Act 1992</i> .	Mapped essential habitat for Koala are discussed in Appendix C .
	An area validated from ground-truthing surveys as 'protected wildlife habitat' that is category A, B or C on the remnant vegetation management map, in accordance with section 20A of the <i>Vegetation Management Act 1992</i> , for a species of wildlife listed as critically endangered, endangered or vulnerable under the <i>Nature Conservation Act 1992</i> .	Protected wildlife habitat for endangered and vulnerable species occurs within the biodiversity impact assessment areas (refer to Appendix C).
	'Of concern regional ecosystems' that are remnant vegetation and identified in the database called 'RE description database' containing regional ecosystem numbers and descriptions.	RE 11.3.2, 11.3.3, 11.3.4, 11.3.25, and 11.3.27f are mapped in the biodiversity impact assessment area (refer to Appendix C).

DETSI's revised definition of 'essential habitat' has not yet been adopted and is currently not included in conditions under the SGP South EA. Arrow Energy will discuss with DETSI about how the new definition is applied retrospectively to existing ESAs where the impact had previously been assessed and approved.

Terrestrial Flora

Vegetation communities

The biodiversity impact assessment retains significant native vegetation cover compared with other parts of the Brigalow Belt bioregion, with approximately 77% of the total land area supporting remnant native vegetation, i.e., a total of 6,045 ha (refer to Table 3.2 of **Appendix C**).

Current vegetation mapping prepared by the Department of Resources (DoR) identifies 15 REs within the biodiversity impact assessment area (refer to **Appendix C**). These are:

- One (1) RE classified as 'Endangered';
- Five (5) REs classified as 'Of concern'; and
- Nine (9) REs classified as 'Least concern'.

Of the 15 REs originally mapped by the DoR for the Study area (i.e., 500 m buffer from the Project footprint), RE 11.3.17 was not recorded during the field survey, and of the 17 GTREs recorded during the field survey, three were not mapped by DoR (RE 11.3.1, 11.3.14, and 11.3.27f). Descriptions and total areas of these mapped REs are provided in **Appendix C**.

Protected plants trigger mapping

There are several areas shown as 'high risk' on the Protected Plants Flora Survey Trigger Map within the proposed Project footprint, occurring both in the PL493 Project Development area and in the PL1040 Project Development area.

Conservation-significant flora

The desktop assessment conducted in the biodiversity impact assessment (refer to **Appendix C**) identified 37 threatened and 8 near-threatened flora species listed under the NC Act within 50 km of the biodiversity impact assessment area. Of these species, three (3) have been listed as either "Known to Occur" or "Likely to Occur" (refer to **Appendix C**). These are:

- *Philothea sporadica* (Kogan Waxflower) – Known to Occur – NC Act Near Threatened⁹
- *Rutidosis glandulosa* – Likely to Occur – NC Act Near threatened

⁹This is the NC Act status of the Kogan Waxflower at the time of the approval of the original EA application in 2018. At the time of this EA Amendment application, this status had been subsequently uplisted to endangered.

- *Rutidosia lanata* – Likely to Occur – NC Act Near threatened

There are three locations within the Project footprint where Kogan Waxflower is present (refer to **Appendix C**).

Terrestrial fauna

Habitat types and condition

The biodiversity impact assessment area is dominated by eucalypt woodland to open forest habitats on lateritic duricrusts, sand plains and remnant surfaces. Ecosystem types on soils of low fertility, typically those REs associated with land zones 5 and 7, form the largest and most continuous tracts of vegetation.

These habitats have been heavily used in the PL493 Project Development area for their timber resources with varying degrees of impact. In particular, habitats dominated by Narrow-leaved Ironbark (*Eucalyptus crebra*), Narrow-leaved Grey Box (*E. woollsiana*) and *E. elegans* have been logged to a such a degree that all mature canopy trees have been removed. The remaining vegetation comprises secondary growth with a thickened shrub layer forming the canopy. The impact of logging is also evident in the majority of remnant vegetation on freehold land. The future of these areas may be affected by changes to fire regime.

The PL1040 Project Development area is mostly within the Kumbarilla State Forest and is dominated by Eucalypt woodlands on lateritic duricrust and contains extensive areas of *Eucalyptus crebra*, *E. populnea*, *E. chloroclada*, *Callitris glaucophylla* woodlands on sand plains and remnant surfaces.

Based on GTRE mapping, the following broad habitat types are present within the biodiversity impact assessment area (refer to **Appendix C**):

- Eucalypt woodlands to open forests – 6,480 ha
- Riparian and alluvial woodlands to open forests – 168.2 ha
- Brigalow open forests to woodlands – 13.6 ha (small discrete patches)
- Heaths – 27.1 ha
- Freshwater wetlands – 1.6 ha (very small discrete area)
- Regrowth and non-remnant woody vegetation (i.e., cleared, fragmented, or disturbed)

Watercourses

Major watercourses are important landscape elements which act as significant migratory and dispersal pathways for many species of fauna. They contain important habitat resources, including food, water, sheltering, roosting and nesting sites, as well as provide refuge during periods of drought. Similar to most areas within the Brigalow Belt bioregion,

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waterways within the biodiversity impact assessment area (refer to **Appendix C**) often provide the only remaining landscape connectivity.

The major creek systems in the PL493 Project Development area represent habitats that are often less impacted by historical clearing and also more likely to contain large trees due to their position in the landscape. The biodiversity impact assessment area is located within the Balonne-Condamine River catchment (refer to **Appendix C**). The main drainage features are associated with Kogan Creek and Eastern Branch Creek which drain into the Condamine River. The larger drainage features intersected by the PL493 Project Development area include the Eastern-Branch Creek, with a stream order 2, and unnamed tributaries of the Eastern-Branch Creek, with stream orders 1 and 2.

In the PL1040 Project Development area there are minor drainage features draining into Wilkie Creek in the west and Broadwater Gully in the east. Wilkie Creek flows into the Condamine River over 50 km to the north and Broadwater Gully flows into Lake Broadwater 7 km north and then into Wilkie Creek. The larger drainage features intersected by the PL1040 Project Development area include an unnamed tributary of Wilkie Creek, with a stream order 2, and Broadwater Gully, with stream order 2.

State Forests

Kumbarilla State Forest occurs within the PL1040 Project Development area. The main habitats in and around Kumbarilla State Forest include remnant and regrowth eucalypt woodlands (RE 11.5.1, 11.5.20 and 11.7.4) on land zones 5 and 7, along with taller forests (RE 11.5.4). Habitat quality in the area has been impacted by historic logging, particularly that associated with the Kumbarilla State Forest and fires (refer to **Appendix C**).

Kumbarilla State Forest area (including the adjacent Waar Waar and Vickery State Forests) is located immediately south of the Moonie Highway. Kumbarilla State Forest is part of a large contiguous patch of vegetation that forms part of a State-significant biodiversity corridor that runs east-west to Kogan Creek (south of Kogan) and north-south between Dalby State Forest and Western Creek State Forest (east of Millmerran). The buffer applied to this corridor by the Brigalow Belt Biodiversity Planning Assessment is 5 km in width (DES, 2018).

Conservation-significant fauna

The desktop assessment conducted on the biodiversity impact assessment (refer to **Appendix C**) identified records for 65 threatened fauna species considered as part of the *Likelihood of Occurrence Assessment*. Of these, 15 are listed as MNES but are not listed as threatened under the NC Act. These were excluded from the biodiversity impact assessment for the Project, and are the following:

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- Black-tailed Godwit (*Limosa limosa*);
- Common Greenshank (*Tringa nebularia*);
- Common Sandpiper (*Actitis hypoleucos*);
- Fork-tailed Swift (*Apus pacificus*);
- Marsh Sandpiper (*Tringa stagnatilis*);
- Oriental Cuckoo (*Cuculus optatus*);
- Osprey (*Pandion haliaetus*);
- Pectoral Sandpiper (*Calidris melanotos*);
- Sharp-tailed Sandpiper (*Calidris acuminata*);
- Wood Sandpiper (*Tringa glareola*);
- Yellow Wagtail (*Motacilla flava*);
- Grey-headed Flying-fox (*Pteropus poliocephalus*);
- Northern Quoll (*Dasyurus hallucatus*);
- Murray cod (*Maccullochella peelii*); and
- Silver Perch (*Bidyanus bidyanus*).

It is noted that habitat for a near threatened species does not constitute an ESA, nor a PEM under the EO Act (Qld). The presence or potential presence of a near threatened species triggers requirements under the NC Act which are approved and managed separately to the EA under the EP Act. Therefore, the occurrence or potential occurrence of near threatened species or their habitat does not trigger any requirement to amend the EA.

Of those species included in the NC Act, there are eight (8) that were assessed as 'Known to Occur' or 'Likely to Occur' within the biodiversity impact assessment area. Seven (7) of these species are Prescribed Environmental Matters under the EO Act. These results from this assessment are provided in **Table 4-3**.

Table 4-3 Likelihood of Occurrence Assessment

Species	Likelihood of Occurrence Assessment (LOO)
Bird species	
Glossy Black-cockatoo (south-eastern), <i>Calyptorhynchus lathami lathami</i>	Known to Occur
Painted Honeyeater, <i>Grantiella picta</i>	Likely to Occur
White-throated Needletail, <i>Hirundapus caudacutus</i>	Likely to Occur
Invertebrates	
Pale Imperial Hairstreak, <i>Jalmenus eubulus</i>	Likely to Occur
Mammals	
Koala, <i>Phascolarctos cinereus</i>	Known to Occur
Short-beaked Echidna, <i>Tachyglossus aculeatus</i>	Likely to Occur
Reptiles	
Grey Snake, <i>Hemiaspis damelii</i>	Likely to Occur

Details regarding each of the above species are provided in **Appendix C**.

Species that were assessed as 'Unlikely to occur' or 'Potential to occur' in the biodiversity impact assessment area do not have a significant residual impact and are not considered a PEM under the EO Act for the Project.

The Golden-tailed Gecko, *Strophurus taenicauda* is a 'near threatened' reptile specie that was identified as 'Likely to Occur' within the biodiversity impact assessment area, but *does not* constitute an ESA nor a PEM under the EO Act. It is important to note that the presence or potential presence of this specie triggers requirements under the NC Act which are approved and managed separately to the EA. As such, the occurrence or potential occurrence of this species, or their habitat, does not trigger any requirement to amend the SGP South EA (EA0001613) regarding this species.

Essential habitat

The biodiversity impact assessment (refer to **Appendix C**) identified the following mapped essential habitat for *endangered* species:

- *Philotheca sporadica* (Kogan Waxflower)¹⁰; and
- *Phascolarctos cinereus* (Koala).

The biodiversity impact assessment (refer to **Appendix C**) identified the following mapped essential habitat for *vulnerable* species:

- *Petaurus australis australis* (Yellow-bellied Glider (southern subspecies)¹⁰).

The essential habitat map, including the lot location for the above species is provided in **Appendix C**.

4.2.3 Assessment of environmental impacts

Impact assessment methodology

As mentioned in Section 2.1.1, coal seam gas developments apply an iterative process in terms of locating wells and gathering lines to manage competing constraints associated with the location of surface infrastructure, including ecological values, landholder preferences, geological features, existing infrastructure, and access tracks. Planning and management of surface activities and ground disturbance is undertaken utilising a set of '*hierarchical management principles*' to avoid, minimise and mitigate impacts to environmental values. Arrow Energy is also committed to actively remediate and rehabilitate impacted areas to promote and maintain long-term recovery. Arrow Energy will offset impacts to PEMs where these are unavoidable.

¹⁰ Noting that this is the conservation status for Kogan Waxflower and Yellow-bellied Glider post 2018.

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Arrow Energy's first preference is to avoid PEMs, threatened ecological communities and threatened species habitat. Where other competing constraints or the scale and/or location of PEMs communities or species habitat dictate that avoidance is not possible, Arrow Energy will preferentially locate infrastructure in a manner that minimises the impact to these values. Mitigation measures are implemented to further minimise the direct and indirect impacts on ecological values.

The biodiversity impact assessment area retains significant native vegetation cover compared with other parts of the Brigalow Belt bioregion, with approximately 77% of the total land area (7,885 ha) supporting remnant native vegetation and a further 6% supporting regrowth and other non-remnant vegetation. Therefore, it is not possible to access the gas resource for SGP South without clearing remnant vegetation. The implementation of the mitigation hierarchy has limited impacts to remnant vegetation within the Project footprint, to only 58% of the total disturbance area.

The proposed layouts for the Project Area development were designed using the abovementioned hierarchical management principles. The proposed flowlines and other linear infrastructure were co-located adjacent to existing infrastructure or in already disturbed areas as much as possible to avoid fragmenting vegetated areas, which also allows for less temporary construction disturbance. There are a number of significant planning and access constraints that have also influenced the proposed field layout and limited the choice of infrastructure locations. For example, the Warra-Kogan Road and Eastern Branch Creek.

Regarding watercourse crossings, a range of pipeline construction methods are available, including standard 'open cut' trenching, watercourse flow diversion and trenchless technology. All pipe crossings will use standard 'open cut' trenching methods, and the use of bed-level crossings will be undertaken in accordance with the accepted development requirements (ADR) of the waterway barrier (WWB) self-assessable code or the temporary WWB code.

The biodiversity impact assessment provided in **Appendix C** and summarised in the following sections inform the updates required to the Prescribed Environmental Matters in the SGP South EA, i.e., species impacted and SRI values as per Condition Biodiversity 10, *Protecting biodiversity values, Table 3 – Significant residual impacts to prescribed environmental matters*, which is the subject of this EA amendment. The proposed PEMs table values are presented in **Appendix B**.

Overview of impacts

Vegetation Clearing

The most significant impact associated with the Project development from the establishment of well pads, gathering and associated infrastructure is the direct loss of approximately 178.1 ha of remnant vegetation and approximately 63.7 ha of native regrowth vegetation. Details of the biodiversity impact assessment are presented in **Appendix C**.

Given the highly vegetated nature of the biodiversity impact assessment area, the clearing of remnant vegetation and associated habitat is an unavoidable aspect of the Project development. However, **the majority of the proposed clearing is in widespread, least concern vegetation types**, predominantly RE 11.5.1, 11.5.20, 11.7.4 and 11.7.7 (refer to **Appendix C**).

Specific vegetation clearing areas by Regional Ecosystem type is provided in **Appendix C**, Table 4.1. In summary, vegetation clearing from the Project development will impact a total of 305.8 ha of land, specifically:

- 178.1 ha of remnant vegetation;
- 63.7 ha of regrowth vegetation; and
- 64 ha of non-remnant vegetation.

Impacts on habitat fragmentation and landscape connectivity

Habitat fragmentation occurs when continuous areas of habitat are subdivided into a number of smaller, separate components. This term encompasses two interrelated components; habitat loss (i.e. a reduction in the amount of habitat) and fragmentation (i.e. the breaking apart of habitat which increases 'edge effects') (Bennet, 2006). The impacts of habitat fragmentation are scale-dependent and may differ depending on the species or community under consideration. For example, loss of small areas of habitat that do not present a significant barrier to movement by highly mobile species (e.g. birds of prey) may represent a much greater barrier to dispersal of less mobile or far-ranging species (e.g. amphibians or small reptiles).

As mentioned in Section 2.1.1, the application of the Landscape Fragmentation and Connectivity (LFC) Tool has determined that impacts to connectivity areas are not significant using DETSI RE mapping, although significant based on Arrow Energy's GTRE mapping, with a total area of RVM Category B clearing of 178.3 ha. The outputs from the LFC Tool are provided in **Appendix C**.

Loss of connectivity at the patch scale largely depends on the species under consideration. Impacts associated with linear infrastructure corridors and waterway crossings were

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considered in further detail for individual threatened species in the biodiversity impact assessment (refer to **Appendix C**).

Impacts on hollow-bearing trees

The project layout and footprint was designed to minimise impact to vegetation where possible and with particular emphasis on minimising impacts to riparian vegetation through RoW minimisation and by locating any temporary workspaces outside of these areas.

The Glossy Black-cockatoo is a species assessed as known to occur in the biodiversity impact assessment area which can be described as hollow-dependant species. Field surveys can capture large trees with potential hollows, including trees with hollows greater than 50 cm. This data would allow the identification of habitat suitable for nesting by the Glossy Black-cockatoo as it requires these large hollows for nesting. The data analysed in biodiversity impact assessment indicated that the biodiversity impact assessment area does not contain large trees that contain hollows.

Indirect impacts

Indirect impacts on ecological values that may arise as a result of the Project development can include:

- edge effects: resulting from the creation of smaller patches of vegetation with a greater edge to surface ratio, including increased exposure to weed invasion, light and wind penetration, which can alter microclimate features, potentially resulting in changes in community structure and composition over time;
- dust generation: dust generated during construction with the potential to smother plants, reducing photosynthesis and resulting in decreased vegetation health and condition;
- increased noise: noise generated from vegetation clearing operations due to the operation of machinery and vehicle traffic which may affect the behaviour of wildlife, which is typically limited to the construction period;
- increased lighting: during construction and operation increased lightning has the potential to disrupt the behaviour of nocturnal species; and
- wildlife mortality: from vehicle collision.

Indirect impacts on the ecological values will be managed in accordance with Arrow Energy's existing Environmental Management Framework.

Impacts on State Forests

The PL1040 project development corresponding to the Tetris 1 gas area includes impacts to the Kumbarilla State Forest, with an approximate disturbance of 137.3 ha, of which 80%

comprises remnant vegetation, with the remaining 20% occurring in already cleared land and regrowth vegetation.

Impacts on terrestrial flora values

Habitat for endangered flora species

The Kogan Waxflower was listed as a near threatened species at the time of the original EA approval in 2018, but has subsequently been uplisted to an endangered status under the NC Act. As discussed in Section 3.2.3 of **Appendix C**, the occurrence of near threatened species or their habitat does not trigger any requirement to amend the EA.

Any impacts to Kogan Waxflower will be managed in accordance with the requirements of protected plant clearing permits under the Nature Conservation Act 1992.

There are a total of three locations where Kogan Waxflower species have been identified within the Project footprint. In accordance with the NC Act, protected plant surveys and a clearing permit application (or exempt clearing notification) with an impact management plan to avoid and minimise impact on threatened plants community will be developed and submitted undertaken prior to clearing. Impacts to Kogan Waxflower are also managed and offset under the EPBC Act approvals for the broader SGP Project.

Endangered REs by VM Class

There will be 0.3 ha of endangered RE 11.3.1 impacted by the Project.

Of concern REs by VM Class

Within the Study area, 'of concern' REs are restricted to alluvial systems, typically occurring as linear remnants or small patches along waterways and drainage features.

No 'of concern' REs will be impacted by the Project.

Impacts on watercourse vegetation

The Project will result in disturbance to approximately 1.6 ha of regulated vegetation within a defined distance from the defining banks of watercourses. The majority of this vegetation is associated with minor waterways (stream order 1 or 2), and the majority of these creek crossings will be trenched outside the wet season in accordance with Arrow Energy's standard crossing methodologies. These proposed impacts on are within the existing approved limits specified in the SGP South EA.

The biodiversity impact assessment methodology utilised the watercourse centre line has been used to calculate the GTRE mapped vegetation within the defined distance relevant to the watercourse (refer to **Appendix C**).

Impacts to terrestrial fauna values

Summary of impacts on Protected Wildlife Habitat

Whilst the definition of protected wildlife habitat (PWH) is not currently defined nor conditioned in the SGP South EA, Arrow Energy has taken a conservative approach based on correspondence with DETSI to assess the impact based on DETSI’s interpretation of PWH.

The Project will have an impact on protected wildlife habitat for the species ‘Known to Occur’ or considered ‘Likely to Occur’ within the Project development area as listed in Section 4.2.2. A summary of the impacts on protected wildlife habitat from the Project is provided in **Table 4-4** (also refer to **Appendix C** (Table 4.2)).

Table 4-4 Summary of impacts on protected wildlife

Protected Wildlife Species under the NC Act	Area of impact (ha)
Endangered wildlife	
Koala, <i>Phascolarctos cinereus</i>	222.8
Grey Snake, <i>Hemiaspis damelii</i>	1.0
Vulnerable wildlife	
Glossy Black-cockatoo (south-eastern), <i>Calyptorhynchus lathami lathami</i>	76.6
Painted Honeyeater, <i>Grantiella picta</i>	0.4
White-throated Needletail, <i>Hirundapus caudacutus</i>	0.0
Pale Imperial Hairstreak, <i>Jalmenus eubulus</i>	0.3
Special Least concern wildlife	
<i>Tachyglossus aculeatus</i> , Short-beaked Echidna	0.0

The Project will also impact on habitat for the Golden-tailed Gecko. However, as previously mentioned, habitat for a near threatened species does not constitute a PEM under the EO Act so there is no requirement to offset this impact. Instead, impacts on habitat for Golden-tailed Gecko will be limited by restrictions imposed under the EA on petroleum pipeline activities in ESAs. As such, impacts on habitat for Golden-tailed Gecko have been excluded from **Table 4-4**.

Significant Residual Impact Assessment on identified Protected Wildlife species

Significant Residual Impact (SRI) assessments were undertaken in accordance with the SRI Guidelines (the then DEHP, 2014) for endangered, vulnerable and special least concern fauna species and are documented in the sections below.

Sections 4.5.1, 4.5.2, and 4.5.3 of **Appendix C** present the significant residual impact assessments for the species identified in **Table 4-4**.

Table 4-5 provides a summary of the results from the SRI assessments conducted within the biodiversity impact assessment (refer to **Appendix C**).

Table 4-5 SRI assessment on identified Protected Wildlife species within the Project Area

Protected Wildlife Species under the NC Act	SRI due to the Project Development
Endangered wildlife	
Koala, <i>Phascolarctos cinereus</i>	Likely
Grey Snake, <i>Hemiaspis damelii</i>	Likely
Vulnerable wildlife	
Glossy Black-cockatoo (south-eastern), <i>Calyptorhynchus lathami lathami</i>	Likely
Painted Honeyeater, <i>Grantiella picta</i>	Likely
White-throated Needletail, <i>Hirundapus caudacutus</i>	Unlikely
Pale Imperial Hairstreak, <i>Jalmenus eubulus</i>	Likely
Special Least concern wildlife	
<i>Tachyglossus aculeatus</i> , Short-beaked Echidna	Unlikely

Details regarding the outcomes of the SRI assessments are provided in **Appendix C**.

Impacts on mapped essential habitat

Pursuant to *Protecting biodiversity values*, *Table 1* of the SGP South EA, activities in Category C ESAs that are ‘essential habitat’ are limited to low impact petroleum activities only (i.e., no ground disturbance). There are no impacts to essential habitat that meets the definition of a Category C ESA based on species that were listed at the time of the original EA approval in 2018 (refer to **Appendix C**).

Impacts on fish passage

The construction of the Project will involve crossing 19 Green (Low impact), seven Amber (Moderate impact) mapped waterway crossings. All the creek crossings associated with the Project (1st and 2nd order drainage features) will be bed level crossings that will comply with the ‘Accepted development requirements for operational work that is constructing or raising waterway barrier works” (ADR) (DAF 2018). There will be no culvert crossings or other structures placed in the waterways.

In order to assess the potential impacts to fish passage, waterways have been reviewed based on their level of risk for impacts to fish passage. In the biodiversity impact area, the majority of the waterways are open depressions with no defined bed or banks and do not contain water outside of irregular flow events. These are considered to be low risk waterways. The SRI assessment is presented in **Appendix C**, Table 4.10, and it's considered **Unlikely**.

4.2.4 Proposed management practices

Arrow Energy implements environmental management controls and practices through its Environmental Management Framework (the framework) and the Health Safety and Environment Management System (HSEMS).

The principal objective of the environmental framework is to protect the environmental values of the project development area (as defined in government policies and regulations or as an attribute of the environment that is conducive to ecological health, public amenity, or safety), and to identify appropriate environmental management controls for the Project activities having regard to the constraints imposed by the environment values.

Implementation of the environmental framework allows Arrow Energy to:

- Address uncertainty about potential impacts of the location and timing of coal seam gas infrastructure development;
- Identify constraints to coal seam gas development in the project development area having regard to the sensitivity of identified environmental values;
- Document the constraints through mapping or the establishment of guidelines (including buffers, thresholds, and trigger levels) to inform site and route selection for coal seam gas infrastructure;
- Develop environmental management controls to address the identified constraints; and
- Integrate the environmental framework with the HSEMS.

The framework approach ensures planning and development of coal seam gas fields will occur in an orderly manner through the application of environmental management controls such as avoidance, mitigation, and management, that are reflective of the level of sensitivity of environmental values. The sensitivity or vulnerability of an environmental value to change provides an indication of the level of constraint it poses to the development of coal seam gas infrastructure, which then determines the recommended environmental management controls, such as avoidance, separation distances, or buffers, or site specific management.

In summary, the level of environmental constraints provides an indication of the Project activities that could occur in a particular area, subject to the application of appropriate environmental management controls, and also of those activities that should not occur in

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certain areas. Controls and mitigation measures are incorporated into the standard operating procedures.

The standard operating procedures describe the process and frequency of updates to the constraints maps (i.e., GIS layers), and incorporate the following requirements:

- A periodic review of the constraints criteria to ensure they reflect state and federal government policy, guidelines and listings, and the results of any environmental impact assessment undertaken by Arrow Energy;
- A periodic update of the Project GIS to incorporate updated government datasets and the results of any ecological surveys, and any environmental impact assessment processes undertaken by Arrow; and
- A constraints analysis, as required, to ensure constraints mapping is up to date.

Specific standard operating procedures include:

- Site and route selection;
- Ecological and pre-construction clearance surveys; and
- Equipment and materials selection and facility design.

For further detail and information regarding Arrow Energy's Environmental Framework, refer to [SGPEIS Chapter 8 Environmental Framework](#).

4.3 Surface Water and Groundwater

The environmental values of wetlands to be enhanced or protected, relevant to this application are:

- Health of wetland ecosystems;
- Natural state and biological integrity; and
- Natural hydrological cycle; and interaction with other ecosystems.

The environmental values of waters to be enhanced or protected, relevant to this application are described in the *Condamine River Basin Environmental Values and Water Quality Objectives*:

- Aquatic ecosystems;
- Irrigation;
- Farm supply/use;
- Stock water;
- Aquaculture;
- Human consumers;
- Visual recreation;

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- Industrial use; and
- Cultural and spiritual values.

As mentioned in Section 4.2.2, the major creek systems in the PL493 Project Development area represent habitats that are often less impacted by historical clearing and also more likely to contain large trees due to their position in the landscape. The impact assessment area is located within the Balonne-Condamine River catchment (refer to **Appendix C**), and the main drainage features are associated with Kogan Creek and Eastern Branch Creek which drain into the Condamine River. The larger drainage features intersected by the PL493 Project Development area include the Eastern-Branch Creek, with a stream order 2, and unnamed tributaries of the Eastern-Branch Creek, with stream orders 1 and 2.

In the PL1040 Project Development area there are minor drainage features draining into Wilkie Creek in the west and Broadwater Gully in the east. Wilkie Creek flows into the Condamine River over 50 km to the north and Broadwater Gully flows into Lake Broadwater 7 km north and then into Wilkie Creek. The larger drainage features intersected by the PL1040 Project Development area include an unnamed tributary of Wilkie Creek, with a stream order 2, and Broadwater Gully, with stream order 2.

The proposed activities avoid watercourses and wetlands, with field surveys conducted by suitably qualified persons confirming that all proposed activities are located outside wetlands, lakes, springs, and watercourse buffers.

Erosion and generation of sediment (i.e, sediment control) would be appropriately managed, in accordance with the existing SGP South EA (EA0001613) conditions and Arrow Energy's management plans. The proposed activities would comply with existing SGP South EA conditions regarding the water and wetlands environment.

Water and wetland environmental values and any potential impacts, managed and authorised by the existing SGP South EA conditions, are expected to remain unchanged as a result of the proposed activities.

As per **Table 5-1**, potential groundwater impacts of the Broader SGP have been assessed in the SGPEIS and the SREIS, while the Underground Water Impact Report 2021 (i.e., the UWIR, prepared by the OGIA (Office of Groundwater Impact Assessment)) has assessed potential impacts on groundwater levels arising from CSG extraction in the Surat Basin CMA (Cumulative Management Area). It is important to note that this report relates only to terrestrial biodiversity values and does not include those associated with groundwater dependent ecosystems as there are no impacts related to these proposed as part of this amendment.

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As mentioned in Section 2.2 and **Table 2-2**, an update to the current Water conditions Schedule is being requested as part of this EA amendment, specifically, the removal of conditions Water 1A, Water 1B, and Water 1C as these conditions are no longer applicable to the SGP South EA (EA0001613). These conditions were originally imposed to the SGP South EA in 2018 due to concerns at the time regarding potential contamination from Lot Plan 40DY85 located on PL253 which is adjacent to PL493, and which are related to past underground gasification operations on that Lot Plan within the Macalister coal seam. Groundwater monitoring and modelling is currently conditioned under the environmental authority for PL253 (EA0001401), which makes this condition no longer valid as a requirement of this environmental authority.

Over the past seven (7) years, Arrow Energy has conducted extensive modelling and monitoring in compliance with EA EA0001401, demonstrating that the risk of residual contamination migrating from Lot Plan 40DY85 is minimal, and that Arrow Energy's monitoring network and reporting obligations, imposed by EA0001401, provide early detection and mitigation capability as an effective risk management layer.

Given the regional groundwater movement remains from north-east to south-west across Lot Plan 40DY85, the absence of contaminants of concern in all monitoring bores close to PL493, and that the wells in the Kogan North area of PL493 will not produce from the Macalister coal seam, Arrow Energy believes that it is timely to remove these conditions as they are no longer relevant to EA0001613 and that the existing suite of monitoring, reporting, and regulatory safeguards ensures that groundwater risks are actively managed and detected early, making these conditions redundant under current risk profile.

4.4 Waste

The subject of this EA amendment application does not seek to change or increase impacts from waste over what has previously been assessed and approved through the SGPEIS, SREIS, and the initial EA application for SGP South.

It is not anticipated that there will be additional risks and differences in waste production and management posed by the proposed amendment to those previously considered under the original EA application.

Waste production and management will be undertaken in accordance and in compliance with the conditions under the current EA, specifically, Conditions Waste 1 to Waste 19.

4.5 Cultural Heritage

Assessment undertaken to prepare the SGPEIS, identified that the key Indigenous cultural values were associated with either archaeological significance (i.e., including physical evidence) or cultural significance (i.e., of significance to indigenous peoples for cultural,

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spiritual, or historical reasons). In relation to non-Indigenous heritage, no sites of national or world heritage significance were identified within the SGP area. Sites with state heritage values identified are all located within town centres and will not be impacted by the Project.

No sites of world heritage, national, State, or local significance have been identified within the development area the subject of this EA amendment application. Potential impacts to non-Indigenous sites could occur through chance-find discoveries of previously unknown sites that are uncovered during construction activities. Arrow Energy operates on an 'Avoidance Principal' in relation to impacts on cultural heritage and management of heritage sites, whether Indigenous or non-Indigenous, and aims to avoid impacts or provide mitigation measures to ensure the least amount of impact.

Arrow Energy has agreed Cultural Heritage Protocols (CH Protocols) within the Arrow Energy and Western Downs *Unclaimed Area Indigenous Land Use Agreement* (WD ILUA) that determines how cultural heritage impacts in the Project area will be managed. The WD ILUA includes eleven aboriginal groups within the agreement.

As stated in **Table 5-1**, the Aboriginal Party for the area surveyed the location and provided recommendations with respect to aboriginal cultural duty of care in line with Arrow Energy's ILUA. Arrow Energy meets its aboriginal cultural heritage Duty of Care under a Cultural Heritage Management Plan developed with the Aboriginal Party for the area.

To manage potential impacts in relation to chance finds, site inductions provide cultural heritage awareness for places and objects (to avoid) and guidance on the appropriate procedures to follow should there be any new discoveries. Arrow Energy implements a 'chance finds' procedure for the discovery of unknown sites during construction. This includes a stop work requirement on initial discovery, appropriate reporting and recording, and management measures such as avoidance, salvage, or destruction.

5. Impact Assessment for Environmental Values and Matters of State Environmental Significance (MSES)

5.1 Potential impacts to identified environmental values

Table 5-1 describes the environmental values identified as relevant to the proposed activity, based on surveyed and indicative alignments, and assesses potential impacts to identified values.

Table 5-1 Assessment of potential for proposed activities to affect environmental values

Environmental Aspect	Relevant Environmental Values	Assessment of Impact
Air	<p>The proposed activity is located in a rural area, predominantly characterised by grazing and bushland, which also includes the Kumbarilla State Forest.</p> <p>The <i>Environmental Protection (Air) Policy 2019</i> identifies environmental values to be enhanced or protected in relation to the air environment.</p> <p>The environmental values to be enhanced or protected under the policy, which are relevant to this application are <i>the qualities of the air environment that are conducive to human health and wellbeing</i>.</p>	<p>Particulate matter (i.e., dust) emissions are likely to be caused by construction activities and due to the disturbance and handling of material. Air quality impacts from dust will be minor and restricted to the worksite for a minimal period during construction; and dust suppression measures will be implemented to minimise dust deposition as required.</p> <p>Construction emissions will be infrequent and transient, and will be managed through best practice measures to avoid and minimise dust emissions through a Construction Environmental Management Plan.</p> <p>During operation the air quality criteria for protection of all air quality values listed in the <i>Environmental Protection (Air) Policy 2019</i> will be achieved in the immediate area.</p> <p>The proposed activity would comply with existing EA conditions regarding the air environment.</p> <p>Air environmental values and any potential impacts, managed and authorised by the existing conditions, are expected to remain unchanged as a result of the proposed activities.</p> <p>Refer to Section 4.1</p>

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Environmental Aspect	Relevant Environmental Values	Assessment of Impact
Noise	<p>The proposed activity is situated in a rural location that is expected, in general, to have a low background noise level.</p> <p>The location is also within active petroleum tenure, so some values of the noise environment may be affected by authorised resource activities.</p> <p>The <i>Environmental Protection (Noise) Policy 2019</i> (EPP (Noise)) sits under the EP Act and aims to protect and enhance environmental values relating to Queensland’s noise environment. The EPP (Noise) provides noise quality objectives for the protection and enhancement of the environmental values.</p> <p>The environmental values to be enhanced or protected under the EPP (Noise) are:</p> <ul style="list-style-type: none"> • The qualities of the acoustic environment that are conducive to protecting the health and biodiversity of ecosystems. • The qualities of the acoustic environment that are conducive to human health and wellbeing, including by ensuring a suitable acoustic environment for individuals to do any of the following: sleep, study or learn or be involved in recreation, including relaxation and conversation. • The qualities of the acoustic environment which are conducive to protecting the amenity of the community. 	<p>Construction and operational noise impacts on the surrounding amenity of the rural community are assessed and are appropriately managed by Arrow Energy, including stakeholder engagement, low-noise equipment, restricted hours of operation and/or alternative arrangements as required. Noise assessments are conducted on each rig Contractor, and these are used to determine required separation distances to achieve Arrow Energy’s noise limits.</p> <p>The proposed activity would comply with existing SGP South EA (EA0001613) conditions regarding the acoustic environment (i.e, EA0001613 conditions Noise 1, Noise 2, and Noise 3).</p> <p>Acoustic environmental values and any potential impacts, managed and authorised by the existing EA conditions, are expected to remain unchanged as a result of the proposed EA amendment.</p>
Land and Biodiversity	<p>Land use across the Project Area and the broader surroundings is predominantly characterised by grazing and bushland, including the Kubarilla State Forest on PL1040, with this State Forest within the Project Area (refer to Section 3.2).</p> <p>Key industries in the wider region surrounding the Project area include CSG exploration and agriculture. Additionally, mineral extraction encroaches on the western and southern boundaries of the Project area. Thus, depending on the location of infrastructure, post operational land use will include forestry, mining, grazing, or cropping.</p>	<p>For activities that involve disturbance to land, vegetation and soil, Arrow Energy undertakes activities in accordance with its Land Disturbance Procedure, which outlines mandatory environmental requirements to avoid, minimise or mitigate environmental harm associated with land disturbance activities, and covers:</p> <ul style="list-style-type: none"> • vegetation clearing; • soil management; • site preparation; and • erosion and sediment control.

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Environmental Aspect	Relevant Environmental Values	Assessment of Impact
	<p>Environmental values to be protected and enhanced in relation to land are not identified by an environmental protection policy under the <i>Environmental Protection Act 1994</i> (Qld).</p> <p>Regional Ecosystems</p> <p>The Queensland Herbarium has developed a methodology for mapping regional ecosystems across Queensland in the Regional Ecosystem Description Database.</p> <p>Regional ecosystems are vegetation communities in a bioregion that are consistently associated with a particular combination of geology, landform, and soil.</p> <p>Protected species</p> <p>Areas with a validated record of, and/or containing habitat likely to have, one or more endangered, vulnerable or near threatened (E V NT) species, are identified in State mapping as Essential Habitat for fauna, or Flora Trigger Map 'high risk' areas for flora. Please refer to Appendix C for a description of protected species habitat at the locations of proposed activities.</p>	<p>These processes are applied to all Arrow Energy controlled activities during exploration, drilling, construction, and operating phases. Site stabilisation and rehabilitation are undertaken in accordance with Arrow Energy's Land Rehabilitation Procedure</p> <p>For a description of potential impacts to regulated vegetation and protected species at the locations of proposed activities, please refer to the attached third-party biodiversity impact assessment report provided in Appendix C.</p> <p>The proposed activities' locations avoid and/or minimise disturbance in regulated vegetation, ESAs/PZs, protected plants and EVNT species habitat, to the greatest extent practicable.</p> <p>Due to the extent of ESAs/PZs on the properties, some activities in these areas is unavoidable. However, proposed activities within ESAs/PZs have been collocated on, or with, areas of pre-existing disturbance wherever practicable, for example, by upgrading and using existing landholder access tracks.</p> <p>The proposed activities would comply with existing SGP South EA (EA0001613) conditions regarding land, biodiversity, and rehabilitation.</p> <p>The environmental values of the land, including soils, landforms, rehabilitation and flora and fauna would be appropriately managed in accordance with Arrow Energy's existing management plans.</p> <p>No material change to the environmental values protected by the current SGP South (EA0001613) EA conditions, are expected as a result of the proposed activities.</p> <p>Refer to Section 4.2</p>

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Environmental Aspect	Relevant Environmental Values	Assessment of Impact
Community	<p>Persons and communities that may be impacted by the proposed EA amendment are the surrounding sensitive receptors.</p> <p>The proposed petroleum activities are located in the Western Downs Regional Council area.</p> <p>The closest settlement to the Project development is Dalby, approximately 32 km to the North-East of the PL1040 gas area, and approximately 50 km to the South East of the PL493 gas area.</p>	<p>Environmental and social factors are considered as part of Arrow Energy's Area Wide Planning (AWP) process, in deciding appropriate locations for proposed petroleum activities.</p> <p>Construction and operational noise impacts on the surrounding amenity of the rural community are assessed and are appropriately managed including stakeholder engagement, restricted hours of operation and / or alternative arrangements as required.</p> <p>There will be no greater impact on any affected persons or affected community as a result of this amendment application.</p>
Waste	<p>The environmental values to be protected from the waste streams through the management of waste, including the management of CSG water are:</p> <ul style="list-style-type: none"> • Biodiversity • Water resources • Land and soils • Visual amenity • Health and safety. 	<p>The proposed amendment will not generate any waste expected to affect existing environmental values, including the life, health, and wellbeing of people; the diversity of ecological processes and associated ecosystems; and the land use capability.</p> <p>Refer to Section 4.3.</p>
Water and Wetlands, and Cultural Heritage.	<p>The <i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019</i> identifies environmental values for waters and wetlands to be enhanced and protected.</p> <p>The environmental values of wetlands to be enhanced or protected, relevant to this application are:</p> <ul style="list-style-type: none"> • Health of wetland ecosystems; • Natural state and biological integrity; and • Natural hydrological cycle; and interaction with other ecosystems. <p>The environmental values of waters to be enhanced or protected, relevant to this application are described in the <i>Condamine River Basin Environmental Values and Water Quality Objectives</i>:</p> <ul style="list-style-type: none"> • Aquatic ecosystems; 	<p>The proposed activities avoid watercourses and wetlands. Field surveys conducted by suitably qualified persons confirmed that all proposed activities are located outside wetlands, lakes, springs, and watercourse buffers.</p> <p>Erosion and generation of sediment (i.e, sediment control) would be appropriately managed, in accordance with the existing SGP South EA (EA0001613) conditions and Arrow Energy's management plans.</p> <p>The proposed activities would comply with existing SGP South EA conditions regarding the water and wetlands environment.</p> <p>Water and wetland environmental values and any potential impacts, managed and authorised by the existing SGP South EA</p>

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Environmental Aspect	Relevant Environmental Values	Assessment of Impact
	<ul style="list-style-type: none"> • Irrigation; • Farm supply/use; • Stock water; • Aquaculture; • Human consumers; • Visual recreation; • Industrial use; and • Cultural and spiritual values. <p>State mapping identifies:</p> <ul style="list-style-type: none"> • all wetlands, lakes, or springs in locations greater than 200 m away from the proposed activities; and • all watercourses in locations greater than 100 m away from the proposed activities. <p>The Aboriginal Party for the area surveyed the location and provided recommendations with respect to aboriginal cultural duty of care.</p>	<p>conditions, are expected to remain unchanged as a result of the proposed activities.</p> <p>Arrow Energy meets its aboriginal cultural heritage Duty of Care under a Cultural Heritage Management Plan developed with the Aboriginal Party for the area.</p>
Underground water rights	<p>Potential groundwater impacts of the Broader SGP have been assessed in the SGPEIS and the SREIS, while the Underground Water Impact Report 2021 (i.e., the UWIR, prepared by the OGIA (Office of Groundwater Impact Assessment)) has assessed potential impacts on groundwater levels arising from CSG extraction in the Surat Basin CMA (Cumulative Management Area).</p>	<p>Arrow Energy will implement the commitments it made in the SGPEIS and updated in the SREIS in order to effectively manage and monitor the effects of CSG water extraction on local and regional groundwater values.</p> <p>The proposed EA amendment involves above ground activity that will not affect the exercise of underground water rights. (refer to Section 6.3.1).</p>

5.2 Summary of Matters of State Environmental Significance

Table 5-2 also describes MSES identified as relevant to the proposed activity based on surveyed and indicative alignments, and assesses potential impacts to identified MSES Environmental Values.

Table 5-2 Assessment of potential for proposed activities to affect MSES

MSES	Presence	Impact
Regulated Vegetation	Please refer to Section 3.2 of Appendix C , attached third-party report ' <i>Biodiversity Impact Assessment for Environmental Authority (EA0001613) Amendment #1</i> ' for a description of regional ecosystems at the locations of proposed activities.	Please refer to <i>Section 4.0 Impact Assessment</i> of the attached third-party report provided in Appendix C for a description of potential impacts to regulated vegetation at the locations of proposed activities. Activities with a Significant Residual Impact (SRI) on 'endangered' and 'of concern' Regional Ecosystems are within the existing approved limits set under the current SGP South EA.
Connectivity Areas	DETSI's Landscape Fragmentation and Connectivity (LFC) tool was used to assess potential for the proposed activity to affect remnant ecosystem connectivity.	The output from the LFC tool indicates that there is a Significant Residual Impact (SRI) on connectivity areas as a result of the activities proposed in this application. An SRI of 178.3 ha is proposed for inclusion in <i>Protecting biodiversity values, Table 3 – Significant residual impacts to prescribed environmental matters</i> .
Wetlands and Watercourses	The <i>Environmental Protection (Water and Wetland Biodiversity) Policy 2019</i> identifies environmental values for waters and wetlands to be enhanced and protected. The environmental values of wetlands to be enhanced or protected, relevant to this application are: <ul style="list-style-type: none"> • Health of wetland ecosystems; • Natural state and biological integrity; and • Natural hydrological cycle; and interaction with other ecosystems. The environmental values of waters to be enhanced or protected, relevant to this application are described in the	The proposed activity avoids wetlands. Field surveys conducted by suitably qualified persons confirmed all proposed activities are located outside wetlands, lakes, springs, and watercourse buffers. Impacts on waterways are generally restricted to waterway crossings for linear infrastructure ROWs. Erosion and sediment control would be appropriately managed, in accordance with the existing SGP South EA, i.e., comply with existing SGP South EA conditions regarding the water and wetlands environment and also with Arrow Energy's management plans.

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MSES	Presence	Impact
	<p>Dawson River Sub-basin Environmental Values and Water Quality Objectives:</p> <ul style="list-style-type: none"> • Protection of aquatic ecosystems; • The suitability of the water for agricultural purposes • Suitability for visual recreational use; and • Cultural and spiritual values of the water. <p>State mapping identifies all wetlands, lakes, or springs in locations greater than 200 m away from the proposed activities; and all watercourses in locations greater than 100 m away from the proposed activities.</p>	<p>Water and wetland environmental values and any potential impacts, managed and authorised by the existing conditions, are expected to remain unchanged as a result of the proposed activities.</p>
Protected Wildlife Habitat	<p>Please refer to Section 3.1.1 of the attached third-party report '<i>Biodiversity Impact Assessment for Environmental Authority (EA0001613) Amendment #1</i>' (refer to Appendix C) for a description of protected wildlife habitat at the locations of proposed activities.</p>	<p>Please refer to Section 4.4 of the attached third-party report (refer to Appendix C) for a description of potential impacts to protected wildlife habitat at the locations of proposed activities.</p> <p>Impact areas for affected species have been included in the proposed amendments to <i>Protecting biodiversity values, Table 3 – Significant residual impacts to prescribed environmental matters</i>.</p> <p>Arrow Energy would implement the management strategies and mitigation measures described in its Surat Gas Project Species Impact Management Plan.</p> <p>Planned actions include:</p> <ul style="list-style-type: none"> • marking of adjacent no-go zones; • the presence of a suitably qualified fauna spotter during vegetation clearing; and • slow sequential clearing to allow movement of wildlife away from activities and avoid habitat fragmentation.
Koala Habitat in SEQ	<p>The surveyed area of the proposed Project activities is not within SEQ.</p>	<p>None.</p>
Protected Areas	<p>The surveyed area of the proposed Project activities is not within any National Parks, Regional Parks, or Nature Refuges (refer to Appendix C).</p>	<p>None.</p>

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MSES	Presence	Impact
Highly protected zones of State marine parks	The surveyed area of the proposed Project activities is not within any Conservation park zones, Marine national park zones, or Preservation zones (refer to Appendix C).	None.
Fish Habitat	The surveyed area of the proposed activities is not within any declared fish habitat areas (refer to Appendix C).	None.
Fish Passage	State mapping identifies all wetlands, lakes, or springs in locations greater than 200 m away from the proposed activities; and all watercourses in locations greater than 100 m away from the proposed activities. Field surveys by suitably qualified persons confirmed all proposed activities are located outside wetlands, lakes, springs, and watercourse buffers.	None.
Marine Plants	The surveyed area of the proposed Project activities is terrestrial and inland.	Not applicable.
Offset Areas	No legally secured offset areas were identified within the surveyed area of the proposed activities.	None.

6. Legislative Requirements

6.1 EIS Process and Compliance with the EP Act

Arrow Energy prepared a voluntary Environmental Impact Statement (SGPEIS) and Supplementary Report to the EIS (SREIS) for the SGP under the EP Act. The EIS and the SREIS received both State and Federal government approval in 2013.

As stated in Section 1.3, the SGP South EA (EA0001613) was granted on 14 December 2018 which included the infrastructure for the development of the gas fields to which the SGP South EA applies (refer to **Figure 1-3**).

The SGPEIS for the SGP was completed as per Section 139 (1) (b) of the EP Act. Arrow Energy considers that the proposed amendment to the SGP South EA does not significantly increase the level of environmental harm to that which was assessed and approved under the SGPEIS, as the way in which the approved activities will be carried out have not materially changed since the SGPEIS process was completed.

This EA amendment only seeks to update impacts to Environmentally Sensitive Areas (ESAs) and to Prescribed Environmental Matters (refer to Section 2.1, Section 4.2, and **Appendix C**), and to include infrastructure to be listed under authorised petroleum activities.

However, the information stage, i.e, public notification as per Section 139 (2) (a), applies to this application as it is a variation to a site-specific EA.

This Supporting document to amend the SGP South EA (EA0001613) is to satisfy Section 125 (1) (l) of the EP Act, and has included the likely impacts of each relevant activity on the corresponding environmental values (refer to Section 4).

6.2 Requirements for Amendment Applications

Arrow Energy is applying to amend its SGP South EA (EA0001613) as per Section 224 of the EP Act as it proposes to carry out additional resource activities as part of the SGP Project for the development of the SGP South Stage 1 (refer to Section 1.4).

An assessment of the proposed EA amendment has been conducted against the requirements under Section 223 of the EP Act for minor amendment (threshold) which is presented in **Table 6-1**.

Table 6-1 Threshold criteria for a minor amendment to an EA and SGP South EA Amendment assessment

Minor Amendment Threshold Criteria (EP Act Section 223)	This EA Amendment Application assessment (i.e., SGP South EA Amendment)
minor amendment (threshold), for an environmental authority, means and amendment that –	
a) is not a change to a condition identified in the authority as a standard condition, other than – (i) a change that is a condition conversion ¹¹ ; or (ii) a change that is not a condition conversion but that replaces a standard condition of the authority with a standard condition for the environmentally relevant activity to which the authority relates; or (iii) a change that will not result in a change to the impact of the relevant activity on an environmental value; and	True. The proposed EA amendment does not change standard EA conditions as the current EA is a site-specific environmental authority.
b) does not significantly increase the level of environmental harm caused by the relevant activity; and	True. Although the environmental risks associated with the Project activities as assessed in the SGPEIS and those in the site-specific EA application of 2018 to authorise the SGP South development impacts, have not materially changed, the proposed amendment may lead to an increase in the risk of environmental harm, as there are changes and/or updates to impacts to ESAs and PEMs from the proposed development subject of this EA amendment (refer to Section 4.2.3).
c) does not change any rehabilitation objectives stated in the authority in a way likely to result in significantly different impacts on environmental values than the impacts previously permitted under the authority; and	True. There will be no change to the rehabilitation objective in the EA as a result of the proposed amendment.
d) does not significantly increase the scale or intensity of the relevant activity; and	True. The application does not seek to significantly increase the scale and intensity of the activity to what has previously been assessed and authorised under the SGP EIS, SREIS and the site-specific EA application of 2018 for SGP South. This application seeks to update the, as mentioned, already authorised impacts to biodiversity (ESAs and PEMs) (refer to Section 2.1 and Section 4.2) for the development of gas areas within PL493 and PL1040, to facilitate the development of a total of 84 wells of the already approved 370 wells on PL493 and on PL1040 combined, with 33 to be developed in PL493 and 51 in PL1040.

¹¹ **condition conversion**, for an environmental authority, means an amendment replacing all of the conditions of the authority with the standard conditions for the environmentally relevant activity to which the authority relates ([Environmental Protection Act 1994 \(Qld\) \(EP Act\)](#))

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Minor Amendment Threshold Criteria (EP Act Section 223)	This EA Amendment Application assessment (i.e., SGP South EA Amendment)
minor amendment (threshold), for an environmental authority, means and amendment that –	
	<p>The original site-specific EA application of 2018 assessed and approved in December 2018 the impacts to ESAs and PEMs for the full development of the gas fields within the SGP South tenures. In 2024/2025, following a final detailed design of infrastructure, Arrow Energy are updating the ESA and PEMs table of the SGP South EA to more accurately reflect the impacts from the revised design and to ensure the correct impact of PEMS and offsets are authorised.</p> <p>Arrow Energy considers that the new updates to ESAs definitions and PEMs listings cannot be applied retrospectively to the EAs that have been already granted and approved. This is, if Arrow Energy was authorised to certain impacts on listed PEMs species at the time of the approval of the EA (in this case in 2018), and if sometime later new species have been listed, there is no requirement to apply to have that PEM impact authorised again as the approval is at that point in time, and if Arrow Energy could also comply with the EA conditions under the approved EA.</p> <p>The assessed impacts do not constitute a significant increase in scale or intensity, but more accurately reflect the most recent applications of the legislation and its interpretation at the time of this EA amendment application.</p> <p>As presented in this EA amendment application, Arrow Energy believes that the total footprint and activities have been authorised through previous approvals (refer to Section 1.4.1 and Figure 1-6), and that the revised footprint which is the subject of this application is therefore assessed against the most recent PEMs listings and ESAs definitions, but is not an increase in scale or intensity of the relevant activity.</p> <p>As such, Arrow do not believe that the proposed amendment significantly increases the scale and intensity of the activity.</p>
<p>e) does not relate to a new relevant resource tenure for the authority that is –</p> <ul style="list-style-type: none"> (i) a new mining lease; or (ii) a new petroleum lease; or (iii) a new geothermal lease under the Geothermal Energy Act 2010; or (iv) a new greenhouse gas injection and storage lease under the Greenhouse Gas Storage Act 2009; and 	<p>True.</p> <p>No new resource tenure is proposed as part of this amendment.</p>

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Minor Amendment Threshold Criteria (EP Act Section 223)	This EA Amendment Application assessment (i.e., SGP South EA Amendment)
minor amendment (threshold), for an environmental authority, means and amendment that –	
f) involves an addition to the surface area of the relevant activity of no more than 10% of the existing area; and	Not applicable. The proposed amendment will <u>not</u> increase the surface area for the relevant activity greater than 10% of the existing area, nor does it seek to authorise more than 10% of the existing authorised disturbance area (refer to Section 1.4).
g) for an environmental authority for a petroleum activity: (i) involves constructing a new pipeline that does not exceed 150km; or (ii) involves extending an existing pipeline so that the extension does not exceed 10% of the existing length of the pipeline; and	Not applicable. The current EA Amendment application does not involve the construction of a new pipeline, nor does it include extending an existing pipeline.
h) if the amendment relates to a new relevant resource tenure for the authority that is an exploration permit or greenhouse gas permit — seeks, in the amendment application under section 224, an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit.	Not applicable. No new resource tenure is required for the proposed amendment.

The assessment as outlined in **Table 6-1** demonstrates that the proposed amendment to the SGP South EA considered in this application is a **minor amendment**.

The statutory requirements for amending an EA are set out in sections 226 and 226A of the EP Act. **Table 6-2** summarises the statutory requirements under Section 226 and the responses from Arrow Energy to each of these requirements.

Table 6-2 EP Act Section 226 requirements for an amendment application generally and Arrow Energy’s response

Statutory requirement under s226 of the EP Act	Arrow Energy’s Response
(1) An amendment application must –	
(a) be made to the administering authority; and	Compliant. This EA amendment application has been logged with the Department of Environment, Tourism, Science, and Innovation (DETSI) which is the administering authority for this EA (EA0001613) under the Environmental Protection Act 1994 (EP Act).
(b) be in the approved form; and	Compliant. Arrow Energy has applied for this EA amendment via DETSI’s online Connect system. This report is provided as supporting information to this application.

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Statutory requirement under s226 of the EP Act	Arrow Energy's Response
(c) be accompanied by the fee prescribed under a regulation; and	Compliant. Arrow Energy has elected to pay the fee prescribed under regulation by credit card on the DETSI's online Connect system.
(d) describe the proposed amendment; and	Compliant. Full details of this proposed EA amendment are included in this Supporting Document (refer to Section 2, Section 4.2, and Appendix A (i.e., marked-up EA)), so that the administering authority, i.e., DETSI, can clearly determine the requested changes to the SGP South EA (EA0001613). The justifications of how this proposed EA amendment meets the criteria for a minor amendment is provided in Section 6.2 and Table 6-2 . This document and its appendices provide the supporting information documentation to the SGP South amendment application.
(e) describe the land that will be affected by the proposed amendment; and	Compliant. The Project will be carried out within the existing designated areas of the SGP South EA applicable to the Project Development, i.e., within PL493 and PL1040. No new areas are included as part of this EA amendment. Maximum disturbance to ESAs and PEMs are discussed and provided in Section 4.2.3 and Appendix C .
(f) include any other document relating to the application prescribed by regulation.	Not applicable. No other documents relating to this EA amendment application are required as part of this application.

Table 6-3 summarises the statutory requirements under Section 226A and the responses from Arrow Energy to each of these requirements.

Table 6-3 EP Act Section 226A requirements for amendment application and Arrow Energy's response

Statutory requirement under s226A of the EP Act	Arrow Energy's Response
(1) An amendment application must also –	
(a) describe any development permits in effect under the Planning Act for the carrying out of the relevant activity for the authority; and	Compliant. The EA subject to this EA amendment application (SGP South EA (EA0001613)) is for a resource activity on PL493 and PL1040. Accordingly, pursuant to Schedule 6, Part 5, Section 22 of the Planning Regulation 2017, a development permit is not required for the proposed activity. Arrow Energy does not have any development permits in effect under the Planning Act for the carrying out of the relevant activities for the authority.

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Statutory requirement under s226A of the EP Act	Arrow Energy's Response
(b) state whether each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity; and	Compliant. This is not relevant to Arrow Energy's application as the application is a site-specific EA amendment application.
(c) if the application states that each relevant activity will, if the amendment is made, comply with any eligibility criteria for the activity – include a declaration that the statement is correct; and	Not applicable. This is not relevant to Arrow Energy's application as the application is a site-specific EA amendment application.
(d) state whether the application seeks to change a condition identified in the authority as a standard condition; and	Compliant. No changes to standard conditions are proposed with this EA amendment.
(e) if the application relates to a new relevant resource tenure for the authority that is an exploration permit or GHG permit – state whether the applicant seeks an amended environmental authority that is subject to the standard conditions for the relevant activity or authority, to the extent it relates to the permit; and	Not applicable. This EA amendment application relates to the existing PLs authorised by the SGP South EA (EA0001613) and does not seek to include any new resource authorities.
(f) include an assessment of the likely impact of the proposed amendment on the environmental values, including – (i) a description of the environmental values likely to be affected by the proposed amendment; and	Compliant. (i) See Section 4.
(ii) details of emissions or releases likely to be generated by the proposed amendment; and	Compliant. (ii) See Section 4.
(iii) a description of the risk and likely magnitude of impacts on the environmental values; and	Compliant. (ii) See Section 4.
(iv) details of the management practices proposed to be implemented to prevent or minimise adverse impacts; and	Compliant. (ii) See Section 4.
(v) if a PRCP schedule does not apply for each relevant activity – details of how the land the subject of the application will be rehabilitated after each relevant activity ends; and	Not applicable.
(g) include a description of the proposed measures for minimising and managing waste generated by amendments to the relevant activity; and	Compliant. The proposed amendment does not change any generation of waste by the relevant activities covered under the existing SGP South EA and the SGPEIS and SREIS. See Section 1.3 and Section 4.3.
(h) include details of any site management plan or environmental protection order that relates to the land the subject of the application.	Not applicable. There are no compliance actions relevant to PL493 and PL1040, or EA0001613 (SGP South EA).

6.3 Requirements for Amendment Applications for CSG Activities

6.3.1 CSG water management and underground water rights

Section 227 of the EP Act is not applicable to this proposed EA amendment as the proposed activities would not result in changes to the management of CSG water. Please refer to details provided in **Table 6-4**.

Table 6-4 EP Act Section 227 and Section 227AA requirements for amendment application and Arrow Energy's response

Amendment application for CSG activities	Arrow Energy's response	
Statutory requirements under s227 of the EP Act – CSG Activities		
(1) This section applies for an amendment application if –		Applicability
(a) the application relates to an environmental authority for a CSG activity; and	Yes. This EA amendment relates to an environmental authority for a CSG activity.	This legislative requirement is deemed not applicable to this EA amendment.
(b) the proposed amendment would result in changes to the management of CSG water; and	No. This EA amendment will not result in changes to the management of CSG water. Arrow Energy's CSG Water Management Plan is consistent with the proposed changes in the EA conditions and EOW Codes.	
(c) the CSG activity is an ineligible ERA.	Yes. The CSG activity is an ineligible ERA.	
(2) the application must also –		Applicability
(a) state the matters mentioned in section 126 (1); and	The matters under s126 (1) are stated in Arrow Energy's CSG Water Management Plan.	The requirements under this section are included in Arrow Energy's CSG Water Management Plan. This plan can be made available to the administering authority upon request.
(b) comply with section 126 (2)	Best environmental management practices for managing CSG water and alternative ways for managing water are included in Arrow Energy's CSG Water Management Plan.	
Statutory requirements under s227AA of the EP Act – underground water rights		
(1) This section applies for an amendment application if –		
(a) the application relates to a site-specific environmental authority for -		Applicability
(i) a resource project that includes a resource tenure that is a mineral development licence, mining lease or petroleum lease; or	Yes. The application relates to a site-specific environmental authority that relates to a resource project which includes a resource tenure for a petroleum lease.	Applicable.
(ii) a resource activity for which the relevant tenure is a mineral development licence, mining lease or petroleum lease; and	Yes. The application relates to a site-specific environmental authority for which the relevant tenure is a petroleum lease.	Applicable.

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Amendment application for CSG activities	Arrow Energy's response	
(b) the proposed amendment involves changes to the exercise of underground water rights.	The proposed EA amendment involves above ground activity. The proposed amendments will not involve changes to the exercise of underground water rights.	Not applicable.

6.3.2 Transfer of CSG water

Arrow Energy has proposed to insert conditions into the SGP South EA (EA0001613) as proposed conditions Waste 17 to Waste 19 (refer to **Appendix A**) to mimic the End of Waste (EoW) Code for *Associated water (including coal seam gas water)* (EoW ENEW07547018)¹², and to be consistent with the DES guideline for *Streamlined model conditions for petroleum activities*¹³. This proposed inclusion of conditions will also not result in changes to the management of CSG water in relation to what is already authorised through other legislation, or as described in Arrow Energy's CSG Water Management Plan.

¹² End of Waste Code *Associated Water (including coal seam gas water)* ([ENEW07547018](#)), *Waste Reduction and Recycling Act 2011* (ESR/2019/4713, Version 1.03, 18 August 2023).

¹³ Guideline *Streamlined model conditions for petroleum activities* ([SMC](#)) under the EP Act (ESR/2016/1989, Version 2.02, 5 May 2016).

Appendix A. Marked-up SGP South EA (EA0001613)

Appendix B. Proposed Updated Impacts to Prescribed Environmental Matters (PEMs) – SGP South EA Amendment (Stage 1 & 2 Offsets)

This EA amendment proposes the following *Schedule F, Table 3 – Authorised impacts to prescribed environmental matters (PEMs)* in Environmental Authority (EA) EA0001613.

Prescribed environmental matter	Significant Residual Impact (SRI) and Offset required? (Yes/No/NA)	Maximum extent of impact	Maximum extent of impact – Stage 1 Offsets Limited to within the SGP South Maximum Boundary as per Schedule F, Figure 1	Maximum extent of impact – Stage 2 Offsets
REGULATED VEGETATION				
Endangered regional ecosystem				
RE 11.3.1	Yes	MNES ^{1,2}	0.3 ha	TBC
RE 11.4.3	NA	MNES ^{1,2}	0 ha	TBC
RE 11.4.12	NA	5 ha	0 ha	5 ha
Of concern regional ecosystem (not within and urban area)				
RE 11.3.2	NA	1 ha	0 ha	1 ha
RE 11.3.4	NA	9 ha	0 ha	9 ha
RE 11.3.21	NA	12 ha	0 ha	12 ha
Regional ecosystems (not within an urban area) that intersect a wetland on the vegetation management wetlands map				
RE 11.3.25	NA	0.5 ha	0 ha	0.5 ha
RE 11.5.1	NA	0.5 ha	0 ha	0.5 ha
RE 11.5.20	NA	0.5 ha	0 ha	0.5 ha
Regional ecosystems (not within an urban area) within the defined distance from the defining banks of a relevant watercourse on the vegetation management watercourse map				
RE 11.3.14 (BVG 18a)	NA	0.5 ha	0 ha	0.5 ha
RE 11.3.25 (BVG 16a)	Yes	18 ha	0.2 ha	17.8 ha
RE 11.3.4 (BVG 16c)	NA	2 ha	0 ha	2 ha
RE 11.4.3 (BVG 25a)	NA	1 ha	0 ha	1 ha
RE 11.4.12 (BVG 17a)	NA	1 ha	0 ha	1 ha
RE 11.5.1 (BVG 18b)	Yes	10 ha	0.6 ha	9.4 ha
RE 11.5.4 (BVG 18 b)	Yes	5 ha	0.1 ha	4.9 ha
RE 11.5.20 (BVG 13d)	Yes	11 ha	0.2 ha	10.8 ha

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Prescribed environmental matter	Significant Residual Impact (SRI) and Offset required? (Yes/No/NA)	Maximum extent of impact	Maximum extent of impact – Stage 1 Offsets Limited to within the SGP South Maximum Boundary as per Schedule F, Figure 1	Maximum extent of impact – Stage 2 Offsets
RE 11.7.4 (BVG 12a)	Yes	2 ha	0.4 ha	1.6 ha
RE 11.7.7 (BVG 12a)	Yes	1 ha	0.1 ha	0.9 ha
ESSENTIAL HABITAT				
Essential habitat (not in an urban areas) on the essential habitat map for endangered wildlife (plant or animal)				
<i>Hemiaspis daemeli</i> (Grey Snake)	NA	35 ha	0 ha	35 ha
<i>Phascolarctus cinereus</i> (Koala)	NA	MNES ^{1,2}	0 ha	TBC
CONNECTIVITY AREAS				
Connectivity area that is a regional ecosystem (not in urban area)				
Connectivity areas	Yes	13.9 ha	178.3 ha	178.3 ha
WETLANDS AND WATERCOURSES				
A wetland of high ecological significance shown on the Map of referable wetlands	NA	0.5 ha	0 ha	0.5 ha
PROTECTED WILDLIFE HABITAT				
An area shown as high risk area on the flora survey trigger map that contains plants that are endangered or vulnerable wildlife				
<i>Solanum papaverifolium</i>	NA	1 ha	0 ha	1 ha
<i>Fimbristylis vagans</i>	NA	2.7 ha	0 ha	2.7 ha
Habitat for an animal that is endangered wildlife				
<i>Phascolarctos cinereus</i> (Koala)	No	MNES ^{1,2}	222.8 ha	TBC
<i>Hemiaspis damelii</i> (Grey Snake)	Yes	NA	1.0 ha	TBC
Habitat for an animal that is vulnerable wildlife				
<i>Acanthophis antarcticus</i> (Death Adder)	NA	3.2 ha	0 ha	3.2 ha
<i>Calyptorhynchus lathami</i> (Glossy Black Cockatoo)	Yes	3.2 ha	76.6 ha	TBC
<i>Furina dunmalli</i> (Dunmall's Snake)	NA	MNES ^{1,2}	0 ha	TBC

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Prescribed environmental matter	Significant Residual Impact (SRI) and Offset required? (Yes/No/NA)	Maximum extent of impact	Maximum extent of impact – Stage 1 Offsets Limited to within the SGP South Maximum Boundary as per Schedule F, Figure 1	Maximum extent of impact – Stage 2 Offsets
<i>Grantiella picta</i> (Painted Honeyeater)	Yes	NA	0.4 ha	TBC
<i>Jalmenus eubulus</i> , Pale Imperial Hairstreak)	Yes	NA	0.3 ha	TBC
<i>Nyctophilus corbeni</i> (Corben's Long-eared Bat)	NA	MNES ^{1,2}	0 ha	TBC
Habitat for an animal that is special least concern wildlife				
<i>Tachyglossus aculeatus</i> (Short-beaked Echidna)	NA	45.2 ha	0 ha	45.2 ha
WATERWAY PROVIDING FOR FISH PASSAGE				
Fish passage (not in an urban area)				
Broadwater Gully, Kogan Creek, Eastern Branch Creek, Condamine Reiver, Wilkie Creek, Jingi Jingi Creek, Cooranga Creek, Ashall Creek.	NA	82 ha	0 ha	82 ha

- Matter(s) of National Environmental Significance (MNES) have been prescribed and will be offset in accordance with the Environment Protection and Biodiversity Conservation Act 1999 (EPBC Act) Species Impact Management and Offset Plans, specifically the EPBC approval for the Surat Gas Project Environment Impact Statement (EPBC Approval 2010/5344, Tables 1 and 2).
- No significant residual impacts to prescribed environmental matters are authorised under this environmental authority unless they are covered within EPBC Approval 2010/5344.

Appendix C. Biodiversity Impact Assessment (Attexo Consulting)

Appendix D. SGP South EA Amendment Spatial Files