26 July 2024

Rachel Burgess-Dean
Department of Environment, Science, and Innovation
GPO Box 2454
Brisbane QLD 4001

Via email: EnergyandExtractive@des.qld.gov.au

Subject: SGP North EA (EA0001399) major amendment application response to the Request for Further Information (RFI) (reference A-EA-AMD-100565408)

Arrow Energy Pty Ltd (Arrow Energy) is responding to a request for further information (RFI) issued by the Department of Environment, Science, and Innovation (DESI) received on 31 May 2024 in relation to its application to amend Environmental Authority (EA) EA0001399 for the scope of the Surat Gas Project (SGP) North Stage 1 which considers 214 wells and gathering, and associated infrastructure (SGP North Stage 1).

Arrow's responses to the items as per the RFI are provided in **Table 1**.

This response also includes appendices containing the following supporting information:

- Appendix A: Updated EA (EA0001399) Amendment Supporting Information Report (V3.0 26-07-2024)
- Appendix B: Draft EA (marked-up EA0001399) (i.e, updated Appendix B of EA Amendment application 05/04/2024)
- Appendix C: Updated Noise Impact Assessment report (SLR Consultants)
- Appendix D: Flare Noise Study report (GASCO for Arrow Energy, Doc Ref. Q12551A-C01 Rev0, Surat Upstream Development, 15 August 2019)
- Appendix E: Updated Air Quality Impact Assessment report (SLR Consultants)
- Appendix F: FCS Power station engine specifications
- Appendix G: Greenhouse Gas (GHG) Abatement Plan – SGP North Stage 1
- Appendix H: SGP North Stage 1 Additional infrastructure spatial files
- Appendix I: Model for Effluent Disposal using Land Irrigation (MEDLI) Assessment Reports (GHD Consulting) – SGP North
    - Appendix I.1.a: MEDLI SGP North Temporary Accommodation Camp 500 EP (Option 1)
    - Appendix I.1.b: MEDLI SGP North Temporary Accommodation Camp 500 EP (Option 2)

- Appendix I.2: MEDLI SGP North Warehouse-Office Facility
- Appendix I.3: MEDLI SGP North Temporary Mobile Drilling Camps

- Appendix J: Treated Sewage Effluent and Greywater Management guide
- Appendix K: SGP North Stage 1 Updated spatial files (Gov format)
- Appendix L: Updated Biodiversity Impact Assessment (Attexo Consulting)
- Appendix M: Area Wide Planning (AWP) procedure

Should you require further information or wish to discuss, please do not hesitate to contact Tyson Croll on 07 3012 4417 or via email to tyson.croll@arrowenergy.com.au.

Yours sincerely

Rachael Cronin
Vice President Safety, Sustainability, and People

Table 1 Request for Further Information (RFI) and response from Arrow Energy

Item	Issue	Action required	Arrow Energy's response
Noise			
1.	The Operational Noise Assessment for the proposed new compressor facility contains no assessment of the existing background acoustic environment and the associated environmental values. Even when using a "deemed background", an assessment of the existing environmental noise is required to justify the use of these values. The assessment of the existing values informs what is an acceptable level of noise impact for sensitive receptors.	1. Identify and provide an assessment of impacts against the tenure-specific acoustic environmental values. 2. Provide background noise monitoring data at sensitive receptors. It is recommended monitoring occurs for a minimum of seven consecutive days in the cooler time of the year to avoid insect influence on monitoring results.	1. The noise impact assessment conducted by SLR Consultants has been done considering the most stringent noise criteria of 28 dBA LAeq, 15min for addressing exceedances and/or compliance from the proposed SGP North Stage 1 activities. Where compliance has been achieved under this criterion, then compliance for all other criteria (and other acoustic environmental values) has been achieved. The noise impact assessment report has been updated to include commentary regarding the other assessment criterion where applicable (refer to **Appendix C** of this RFI response). 2. SGP North Stage 1 has not undertaken site specific background noise monitoring for the purpose of varying the deemed minimum background noise levels as stated in DESI's guideline *Prescribing noise conditions for environmental authorities for petroleum activities* (DESI Guideline, 2024). For this assessment, the Project has adopted the deemed minimum background noise levels specified in the DESI Guideline in lieu of site specific noise monitoring which is considered applicable given the rural nature of the SGP North (or Girrawheen) FCS area and the expected low background noise levels within this area. In accordance with DESI Guideline 2024, background noise monitoring is not deemed to be a requirement () or expected to change the outcome of the noise impact assessment. Section 2.4 of the updated noise assessment report (refer to **Appendix C** of this RFI response) has been updated to incorporate the above explanation.
2.	Further information on the noise modelling inputs is required to verify the accuracy of the modelling results.	1. Provide a table of conditions entered for the model, for both normal and adverse conditions. This may include, but is not limited to: • windspeed, • wind direction, • temperature, • temperature inversions, • ground factors, • source of contour data used, • receiver height	1. A new section in the noise impact assessment report has been added to the updated version provided with this RFI response. Refer to Section 4.2.2. of **Appendix C** of this RFI response and Section 4.3 for modelled meteorological conditions.

Item	Issue	Action required	Arrow Energy's response
3.	The noise modelling only includes indicative locations of noise sources considered in the model. While the noise modelling appears to have considered all noise sources, the absence of set GPS coordinates of noise sources and modelling heatmaps makes the modelling results difficult to validate without a visual reference.	1. Provide GPS coordinates (in GDA2020) for all noise sources considered in the modelling. 2. Provide a "heatmap" generated from the noise modelling (for both normal and flare operations, and both normal and adverse weather conditions) which includes the sensitive receptor locations. The heatmap provided is recommended to be of the same scale as Figure 2 (page 16) to show the noise sources and its immediate surroundings which includes the identified sensitive receptors.	1. General Plant Area Coordinates were added to Table 9 of the updated noise impact assessment (refer to **Appendix C** of this RFI response). 2. Noise contour maps have been provided in Appendices B and C of the updated noise impact assessment report (refer to **Appendix C** of this RFI response).
4.	Section 4.4.1 of the Operational Noise Assessment identifies the Multi-point Ground Flare Radiation Fence (MPGF) as a noise mitigation measure which will beget an 8.7 dB noise reduction correction from the measured Sound Pressure Levels (SPL) inside to outside of the radiation fence.` The report references the following document as the source of the MPGF noise attenuation value: GASCO Flare Noise Study report, document reference Q12551A-C01 Rev 0 Surat Upstream Development, dated 15 August 2019.	1. Provide the Arrow flare noise study report: GASCO Flare Noise Study report, document reference Q12551A-C01 Rev0 Surat Upstream Development, dated 15 August 2019.	1. The Flare Noise Study report (GASCO Flare Noise Study report (Arrow Energy document reference Q12551A-C01 Rev 0 is provided in **Appendix D** of this RFI response.
Air			
5.	Section 4.3.2 Summary of Meteorological Data Used in the Air Quality Impact Assessment provides a summary of the meteorological conditions used in the model, however, does not validate these by comparison to measured weather data. Meteorological monitoring data captured during 2016 at Arrow's weather stations located near the Tipton and Daandine CGPFs was selected as the modelling year for the air assessment.	1. Further information is required to: a. Validate the Weather Research and Forecast (WRF) model against the measured weather data from Arrow's Tipton and Daandine CGPFs. b. Validate the modelled meteorology at the site of the proposed compressor station compared to that measured at the Miles Constance Street (Station 042112) monitoring site.	1. The Air quality impact assessment conducted by SLR Consultants has been updated (refer to Sections 4.2 and 4.3.1.1 of **Appendix E** of this RFI response) to: a. Remove the reference to Arrow's Daandine and Tipton CGPFs' meteorological station as it is far away from the SGP North Stage 1 FCS site and outside of the modelling domain. b. Revised air modelling was undertaken to use 2023 meteorological data generated using The Air Pollution Model (TAPM), which then informed the CALMET meteorological model. Hourly wind speed and wind direction data from the nearest Bureau of Meteorology (BoM) station located at Miles Constance Street were used to 'nudge' the TAPM model run. An appendix (Appendix B) has been added to the Air quality impact assessment report (refer to **Appendix E** of this RFI response) to show that the wind patterns recorded at the Miles Constance Street station for the 2023

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		c. Justify the appropriateness of the use of eight-year-old air monitoring data for the air modelling undertaken. Alternatively, provide revised air modelling using current, local meteorological data.	calendar year are consistent with the CALMET model predictions extracted at the same location. c. Refer to above response for RFI item 5.1.b).
6.	The Air Quality Impact Assessment does not specify what is meant by 'normal' operations as opposed to operations that lead to maximum emissions (excluding flaring). The report also does not provide detail on how the emission estimates were determined or information on the Girrawheen Field Compressor Station (FCS) power station engines that are proposed. It is likely that there are other air emission sources associated with the proposed activity, such as back-up generators and reboilers associated with gas treatment. While these sources are likely insignificant compared to generator emissions, having details of these emission sources will assist with ensuring that the environmental authority appropriately conditions all point source emissions (e.g. Air 2A Table 1- Authorised point sources).	1. Provide a description of normal or otherwise operating conditions, used in the air modelling. Your response should include a comparison of what 'normal' operations represent compared to maximum emissions from the generators. 2. Provide the engine specification data used for the Girrawheen FCS power station engines. 3. Confirm if all seven coal seam gas (CSG) fired internal combustion engines will be the Shelby 60 kVA engine. 4. Provide further detail on any additional, albeit temporary or emergency, point source emissions, to be authorised under condition Air 2A, Table 1- Authorised point sources.	1. What is described as 'normal operations' represent normal maximum operating conditions (i.e. concurrent operation of 16 power station generators at maximum load). This is included in Table 11 of the updated Air quality impact assessment report (refer to **Appendix E** of this RFI response). 2. The gas engines included in the Air quality impact assessment report, are 1875 kVA Aggreko GE J420E units. This report has been updated to explain this (see Section 1.1 and Section 5.2.2 of **Appendix E** of this RFI response) and to include specifications for these engines (refer to Appendix A of the updated Air quality impact assessment report). 3. Refer to response to RFI item 6.2 above. The types of engines proposed with this RFI response are no longer the ones proposed with the EA Amendment submitted on 5 April 2024. 4. The only other potential additional air emission source is the back-up diesel generator; however, this unit would only operate intermittently for short periods during maintenance and testing, or for a short period in the event of a gas feed failure to enable safe shutdown and restart of the FCS. The diesel back-up generator would not meet the definitions provided in Schedule 2 of the Queensland *Environmental Protection Regulation 2019*, for a "fuel burning or combustion facility" which is defined as permanent equipment that can burn more than 500 kg of fuel in an hour. Stand-by generators operating less than 200 hours per year are also specifically excluded from the environmentally relevant activity "fuel burning" in the *Qld Environmental Protection Regulation 2019*. Modelling of air emissions is therefore not warranted for this unit, which is also not required to be listed as an authorised point source in the EA (EA0001399). It is noted that when the stand-by generator is operational, the other sources of emissions (gas engines) would not be operational in maximum normal operating mode (as once a gas engine is started, the stand-by generator is not required). This has been addressed in Section 1.1 of the updated Air quality impact assessment report (refer to **Appendix E** of this RFI response).

Item	Issue	Action required	Arrow Energy's response
7.	The air modelling only includes indicative locations of emission sources considered in the model. The absence of set GPS coordinates or spatial data of emission sources makes the modelling results difficult to validate.	1. Provide GPS coordinates (in GDA2020) and/or spatial data for all point source emissions considered in the modelling.	The GPS coordinates of all point source emissions for the SGP North FCS that were considered in the updated air quality impact assessment (refer to **Appendix E** of this RFI response) are provided in Table 14 and 15 of this report. For completeness well pads have been modelled but are not the subject of this amendment application. The well pad sources were modelled at a nominal central location within the modelling domain (refer to **Appendix E** of this RFI response). This treatment is deemed appropriate to determine worst case offset distances to achieve air quality objectives from well pads.
8.	Table 19 Proposed Point Source Emission Limits for Girrawheen FCS proposes a NOx emission limit of 750 mg/Nm3 for each of the generators. This is substantially above emission rates that could be considered best practice and does not meet accepted practice (i.e. 450 mg/m3 at 3% O_2). For comparison, the EU directive 2015/2193 would place a limit of 190 mg/Nm3 for new engines, and the standard of concentration under the NSW Protection of the Environment Operations (Clean Air) Regulation 2021 is 450 mg/m^3 at 3% O_2. The US performance standard for NOx for engines of this type is 2g/hp/hr. For the proposed 3.36 MW engines, this equates to approximately 2.5 g/s as opposed to the 1.5 g/s used as model input. The modelling used an estimated emission of 1.5 g/s. In the absence of details of the proposed engines (see Item 6), the proposed emission limits and modelled emission estimates are unable to be verified.	1. As per item 6, further information is required to verify the proposed engines and how the NOx emission of 750 mg/Nm3 for each of the generators was determined. 2. Provide a discussion on what mitigative measures will be used for the generator/NOx emission limit of 450 mg/m^3 at 3% O_2.	1. The proposed NO_x emission limit has been reduced from 750 mg/Nm^3 to 500 mg/Nm^3 with the updated Air quality impact assessment (refer to **Appendix E** of this RFI response) based on the manufacturer's specifications for the 1875 kVA Aggreko GE J420E engines (see Section 7.3 of the updated Air quality impact assessment report (refer to **Appendix E** of this RFI response). 2. The mitigation measures for SGP North Stage 1 for NOx emissions are outlined in Table 18 of the updated Air quality impact assessment report (refer to **Appendix E** of this RFI response). It is not proposed that a NOx emission limit of 450 mg/Nm^3 be imposed. The region surrounding the SGP North FCS site is rural and remote, with the nearest sensitive receptor being approximately 3 kilometres from the FCS. There are only five sensitive receptors located between 3 and 4 kilometres from the FCS, with all other receptors located at greater distances (more than 4 km). The air quality modelling has shown that SGP North Stage 1 easily complies with ground level ambient air quality criteria for NO_2 with a NO_x release limit of 500 mg/Nm^3. The modelling shows the maximum 1 hour NO_2 ground level concentration is less than 50% of the air quality objective for NO_2 in the *Queensland Environmental Protection (Air) Policy* 2019. Noting that achieving a lower NO_x limit would result in increased GHG emissions.
9.	**Greenhouse Gas Emissions** The Greenhouse Gas Emissions (GHG) guideline requires medium and high emitters (those with emissions over 25,000 tonnes of carbon equivalent per year) to provide a greenhouse gas abatement plan for applications for new environmental authorities and applications to amend existing environmental authorities.	1. Identify the total annual GHG emissions, in CO_2 equivalent, relevant to the site for each of the following separately:	1. It should be noted that the subject of the EA amendment application relevant to GHG emissions is due to the inclusion of the SGP North Field Compression Station (SGP North FCS) which had been previously contemplated and approved during the bi-lateral assessment with the Federal and State Government EIS processes. Arrow Energy has provided a full assessment of the GHG emissions for the entire SGP North Stage 1 which includes the SGP North Stage 1 gas wells and the FCS for completeness, as the EA amendment application does not seek approval for the wells and gathering already authorised under EA0001399. This GHG detailed

Item	Issue	Action required	Arrow Energy's response
	It is unclear in the Supporting Information Report, which scope of works/infrastructure are accounted for in the Total Annual GHG Emissions (Scope 1 & 2) for the Girrawheen Stage 1 project presented under Table 5-7 Contribution of the Project to State and National total GHG.	a) The existing operations on site. b) The proposed new infrastructure and disturbance, as outlined in section 2.2 and Table 2-1 SGP North additional infrastructure and estimated proposed land disturbance in the Supporting Information Report. c) The 214 wells, their associated access and gathering lines, and incidental infrastructure, as discussed in section 2.1 of the Supporting Information Report.	assessment is provided in the updated documentation of the EA amendment application (refer to Table 5-9 and Table 5-10 of **Appendix A** of this RFI response). The GHG emissions estimates submitted to DESI with the EA amendment of 5 April 2024 were calculated considering the original scope of 450 wells for the SGP North Stage 1. Section 5.2 of **Appendix A** of this RFI response has been updated to reflect the latest case of 214 wells and associated infrastructure for SGP North Stage 1. a) There are currently no existing operations on site. However, there are some exploration wells and other pilot wells which were used for production testing into the Castledean and Punch Bowl Dams, after which they were plugged and abandoned. b) The total annual GHG emissions for the FCS and gas wells of the SGP North Stage1 are provided in in the updated Section 5.2.5 of **Appendix A** of this RFI response. This includes the Scope 1 GHG emissions associated with the SGP North FCS and also the SGP North gas fields emissions which are not subject of this EA amendment application (refer to Table 5-9 of **Appendix A** of this RFI response). c) GHG emissions from the construction of other infrastructure (e.g., communication towers, accommodation camps, gravel pits, extra work areas, etc.) are not expected to be material (refer to Table 5-7 of **Appendix A** of this RFI response. Similarly, GHG emissions from land use change were not included in this assessment, as stated in Section 5.2.5. of Appendix A of this RFI response, and detail provided below. Emissions due to land use change were excluded from the GHG assessment on the basis that: • SGP North Stage 1 includes a commitment/ requirement to minimise land disturbance and clearing, and an obligation to rehabilitate land to its original condition (refer to Section 4.3 of **Appendix A** of this RFI response). • Cleared areas are also subject to offset requirements under the Environment Protection and Biodiversity Conservation (EPBC) Act and Environmental Offsets Act. Offsets made under the EPBC Act or Environmental Offsets Act do not result in carbon credits under the Carbon Credits (Carbon Farming Initiative) Act 2011 due to 'regulatory additionality' and that the offset areas also offset the land clearing emissions.

Item	Issue	Action required	Arrow Energy's response
			• As such, over the life of the activity, GHG emissions due to land use change are forecast to be net zero due to rehabilitation and environmental offset activities. • These emissions are not required to be reported under the NGER Scheme. The total annual GHG emissions for the 214 wells and associated infrastructure are addressed in the updated Section 5.2.5 of **Appendix A** of this RFI response. Although the scope of the SGP North EA amendment application is not seeking to authorise wells and associated access and gathering lines, as they are already authorised under the EA and are not the subject of the amendment application Section 5.2.5 of **Appendix A** of this RFI has been updated to include all GHG emissions for completeness.
		2. In accordance with the GHG guideline, determine whether an abatement plan is required for new disturbance proposed in this amendment application. Should a greenhouse gas abatement plan be required, provide this plan in accordance with Appendix A of the Greenhouse Gas Emissions guideline: Guideline Greenhouse gas emissions Environmental Protection Act 1994, QLD Government, 15 May 2024 (ESR/2024/6819 V1.0, DESI).	2. SGP North Stage 1 GHG emissions consisting of the 214 wells and the FCS meet the medium to high GHG emission category in accordance with Section 3.2 of the *Greenhouse Gas Emissions Guideline* published by DESI in May 2024 (GHG Emissions Guideline); i.e., meets an expected GHG emissions (Scope 1 and Scope 2) of 25,000 tonnes CO_2-e or more per year (at any time during the life of the project). As such, and as per Table 3 of the GHG Emissions Guideline, a GHG abatement plan is required, which is provided in **Appendix G** of this RFI response. It is important to note that this plan was not provided with the application to amend the SGP North EA (EA0001399) submitted on 5 April 2024 as the new GHG Emissions Guideline had not been published at the time of the application. A GHG Abatement Plan (refer to **Appendix G** of this RFI response) is required in this instance due to the following reasons: a. As per Section 2.2 of the GHG Emissions Guideline, the Safeguard Mechanism is not an approval framework, so the GHG emissions information is still required for the Queensland Government to make a decision on new and amended EAs. b. Similarly, the Safeguard Mechanism does not require details of how emissions will be reduced. This information is required for the Queensland Government to determine whether the EA application can be approved. The GHG Abatement Plan for SGP North Stage 1 presented in **Appendix G** of this RFI response satisfies the requirements of the GHG Emissions Guideline.

<table>
<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td colspan="4">General</td></tr>
<tr><td>10.</td><td>It is understood that the location for the FCS and hybrid power station and related infrastructure has a high certainty of location, however the application does not clearly identify the location of the proposed activities.

Mapping provided in the Air quality impact assessment suggests the site will be located on PL491, however Ancillary environmentally relevant activities (ERAs) 14 and 15 have been applied for on PL305, while ERA 16, and 63 are proposed on PL305 and PL491.</td><td>1. Provide spatial information, ideally spatial files, of the intended footprint for the FCS, hybrid power station and other new infrastructure proposed in this amendment.

2. Clarify why the air and noise modelling reports suggest the location of the FCS to be on PL491, when the application proposes the location for the related ERAs on PL305.

3. Confirm the Air quality and Noise impact assessments have appropriately considered the location of the proposed new ERAs.

4. Confirm what ERAs are proposed against each tenure with supporting justification.</td><td>1. The shapefiles for the additional infrastructure requested in the SGP North EA (EA0001399) amendment, including the location of the Field Compression Station (FCS), the hybrid power station, and other new infrastructure, are provided in Appendix H of this RFI response.

2. The noise and air modelling reports suggesting the location of the FCS to be on PL491 was a 'typo' error. The new updated noise and air quality modelling reports (refer to Appendix C and Appendix E of this RFI response) have identified and included the location of the FCS in PL305.

3. The updated Noise and Air quality impact assessments, as provided in Appendix C and Appendix E of this RFI response, have considered the location of the FCS to be in PL305.

4. The proposed ERAs to be added to the SGP North EA (EA0001399) with this amendment against the corresponding facilities and tenures are provided in the table below.
<table>
<tr><th>Environmentally Relevant Activity (ERA)</th><th>New Proposed Infrastructure</th><th>Location</th></tr>
<tr><td>• ERA 15 Fuel Burning: using fuel burning equipment that is capable of burning at least 500 kg of fuel in an hour.</td><td>SGP North Field Compression Station (FCS), including a multi-point ground flare (MPGF).</td><td>PL305</td></tr>
<tr><td>• ERA 14 Electricity Generation, 1: Generating electricity by using gas at a rated capacity of 10 MW electricity or more.</td><td>SGP North FCS Hybrid power station (gas/battery/solar).</td><td>PL305</td></tr>
<tr><td>• ERA 63 Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of – (a-i) 21 to 100EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.</td><td>SGP North (Girrahween) Warehouse and offices facilities, including a treated sewage irrigation area</td><td>PL305</td></tr>
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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>• ERA 63 – Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of – (b-i) more than 100 but not more than 1,500EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.</td><td colspan="2">Temporary Accommodation Camp 500 EP (Options 1 and 2)</td><td>PL305</td></tr>
<tr><td rowspan="5">• ERA 63 Sewage Treatment, 1: Operating sewage treatment works, other than no-release works, with a total daily peak design capacity of – (a-i) 21 to 100EP if treated effluent is discharged from the works to an infiltration trench or through an irrigation scheme.</td><td rowspan="5">Temporary Mobile Drilling Camps (MDCs)</td><td>MDC#1</td><td>PL492</td></tr>
<tr><td>MDC#2</td><td>PL492</td></tr>
<tr><td>MDC#3</td><td>PL305</td></tr>
<tr><td>MDC#4</td><td>PL305</td></tr>
<tr><td>MDC#5</td><td>PL305</td></tr>
<tr><td>• ERA 16 Extractive .and screening activities, 1: Extracting, other than by dredging, in a year, the following quantity of material – (b) more than 100,000 t but not more than 1,000,000 t.</td><td colspan="2">Gravel pit (s)</td><td>PL305, PL491, and PL492</td></tr>
</table>

The location of the new additional ERAs has also been updated in Appendix A of this RFI response to be consistent with the above table.
</td></tr>
<tr><td colspan="4">Sewage treatment plants</td></tr>
<tr><td>11.</td><td>The application proposes a suite of Sewage Treatment Plant (STP) conditions, which propose to authorise treated releases to grazing lands.

The application material has not sufficiently addressed the nitrogen uptake of these lands, and how the release of treated sewage effluent or greywater may impact upon the total nitrogen levels within the grazing lands.

The application further did not address the anticipated release limits for total nitrogen or total phosphorous. It is also noted that the proposed water quality release limits for E. coli and pH vary from the streamlined model condition (SMC) limits.</td><td>1. In order to demonstrate compliance with Schedule 4 of the Environmental Protection Act 1994, provide the following further information around the environmental risks and management of on-site use of treated sewage:

○ location of proposed STPs
○ release characteristics for total nitrogen and total phosphorous.
○ irrigation area including minimum wet weather storage size.
○ irrigation frequency/rates
○ the irrigation area soil type and adsorption capability
○ method of irrigation</td><td>1. A computer based model for designing and analysing effluent disposal systems for sewage treatment plants using land irrigation as a reuse option, namely Model for Effluent Disposal Using Land Irrigation (MEDLI), was conducted across several offices and camp facilities within the area of the SGP North Stage 1. This tool is recommended by the Department of Environment, Science, and Innovation (DESI).

The site's (i.e., camps and offices areas) suitability to receive irrigated treated effluent from onsite package sewage treatment plants was assessed for each of these camp facilities and the office/warehouse facility. These sewage treatment plants are associated with the following facilities:

• Temporary accommodation camp in the proximity of the SGP North Field Compression Station (SGP North FCS),
• Warehouse and offices, and</td></tr>
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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
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<td></td>
<td>Where the limits vary from the SMCs, further supporting information is required to justify the varied limits and define the risk to the receiving environment.

MEDLI
The proposed conditions Waste 14-16 require MEDLI program modelling to be submitted to the department, with the department providing comments within 20 business days. MEDLI modelling is a useful tool and should be used in considering appropriate irrigation locations. Please note, the proposed method to have the department comment on the submission is not considered an appropriate pathway for approval and is not supported.</td>
<td>○ receiving environment attributes (including location of environmental values and other releases or activities)
○ the cumulative impact from irrigation to land on the receiving environment
○ any other common factors that could lead to an increased risk of environmental harm.</td>
<td>• Mobile drilling camps (MDCs).

These facilities are predominantly temporary in nature. Two (2) alternative location options were assessed for the temporary accommodation camp near the SGP North FCS, and five (5) mobile drilling camp locations and one (1) warehouse/offices location were considered.

The results from the MEDLI assessments are provided in Appendix I of this RFI response. These assessments contain the information as requested in item 11.1 of this RFI for the management of treated sewage and are also provided in the following tables.

Sewage Treatment Plant (STP) - Proposed Location, Irrigation area, Irrigation Frequency rate and Wet weather storage volume
<table>
<tr><th colspan="2">STP</th><th>Location</th><th>Land irrigation area (ha)*</th><th>Maximum Irrigation frequency rate (mm/day)</th><th>Wet weather storage volume (kL)*</th></tr>
<tr><td rowspan="2">Temporary Accommodation Camp (500EP** load scenario)</td><td>Option 1</td><td>PL305</td><td>3.215</td><td>3.7</td><td>300</td></tr>
<tr><td>Option 2</td><td>PL305</td><td>3.935</td><td>3.8</td><td>300</td></tr>
<tr><td colspan="2">Warehouse/Offices (28EP load scenario)</td><td>PL305</td><td>0.18</td><td>3.7</td><td>17</td></tr>
<tr><td colspan="2">MDC#1 (30EP load scenario)^</td><td>PL492</td><td>0.19</td><td>3.7</td><td>18</td></tr>
<tr><td colspan="2">MDC#2 (30EP load scenario)^</td><td>PL492</td><td>0.19</td><td>3.7</td><td>18</td></tr>
<tr><td colspan="2">MDC#3 (30EP load scenario)^</td><td>PL305</td><td>0.19</td><td>3.7</td><td>18</td></tr>
<tr><td colspan="2">MDC#4 (30EP load scenario)^</td><td>PL305</td><td>0.19</td><td>3.7</td><td>18</td></tr>
<tr><td colspan="2">MDC#5 (32EP load scenario)^</td><td>PL305</td><td>0.2025</td><td>3.7</td><td>19.2</td></tr>
</table>
* minimum required to achieve zero incidents of storage overflow and acceptable soil performance outcomes, or alternatively, at least three days minimum storage capacity (i.e., wet weather storage), whichever is greater.
** 1 EP=200 L/EP/day
^ The most likely operational loading scenario, with all modelled irrigation areas for the five (5) MDCs fitting within the inferred available irrigation areas of 1.3 ha, 1.0 ha, 2.0 ha, 1.2 ha, and 0.5 ha for MDC#1, MDC#2, MDC#3, MDC#4, and MDC#5, respectively.</td>
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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
STP Release characteristics for Total Nitrogen and Total Phosphorus, Type of Soil and Irrigation Method
<table>
<tr><th colspan="2" rowspan="2">STP</th><th colspan="2">Release characteristic</th><th colspan="2">Irrigation area soil</th><th rowspan="2">Irrigation Method</th></tr>
<tr><th>Total Nitrogen (TN)</th><th>Total Phosphorus (TP)</th><th>Type*</th><th>Adsorption capability</th></tr>
<tr><td rowspan="2">Temporary Accom. Camp</td><td>Option 1</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td>Option 2</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">Warehouse /Offices</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">MDC#1</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">MDC#2</td><td>30 mg/L</td><td>20 mg/L</td><td>Vertosol soils</td><td>V</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">MDC#3</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">MDC#4</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol Soils</td><td>S</td><td>Fixed sprinklers</td></tr>
<tr><td colspan="2">MDC#5</td><td>30 mg/L</td><td>20 mg/L</td><td>Sodosol soils</td><td>S</td><td>Fixed Sprinklers</td></tr>
</table>
* modelled soil profile, assuming Kikuyu crop cover (salt tolerant grass) is laid within the sized land irrigation area. For further details on soil type, please refer to Appendix I of this RFI response.
S: Adsorption capability of Sodosol type soil.
V: Adsorption capability of Vertosol (or Black Earth) type soil.

Sodosols
While Sodolsols have limited absorptivity properties due to their inherent sodicity, careful management of the treated effluent irrigation, including monitoring nutrient levels and employing soil amendments, can help mitigate adverse effects and improve soil structure and nutrient retention over the long term. To improve the absorptivity and reduce the negative impacts of sodicity, soil additives such as gypsum (Calcium sulphate) can be applied, which helps to replace sodium ions with calcium ions, improving soil structure and permeability.

Vertosols (also known as Vertisols)
Vertosol's absorptivity properties, particularly with respect to long term irrigation with treated effluent, can be influenced by several factors, including their high clay content, cation exchange capacity (CEC), and soil structure. Vertosols have a high water holding capacity, which can lead to prolonged water retention in the soil. Vertosols
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</table>

Item	Issue	Action required	Arrow Energy's response
			also have a high CEC which allows the soil to retain and exchange cations, including nutrient ions such as ammonium and phosphate (components of total Nitrogen (N) and total phosphorus (P) in the treated effluent. Vertosols have a high capacity to absorb and retain water and nutrients from treated effluent, but careful management is required to avoid issues such as waterlogging, nutrient leaching and soil degradation. Regular monitoring and appropriate soil management practices are essential to sustain long-term soil health and productivity. Further details regarding the MEDLI modelling results for each proposed camp location and its corresponding irrigation areas, soil types, adsorption capabilities, and risk prevention measures are provided within the corresponding MEDLI reports in **Appendix I** of this RFI response. **pH and *E.coli*** The values for pH and *E.coli* at the release are those corresponding to the secondary treated class B standard, i.e., pH range 6.0 to 8.5, and E.coli, 80th percentile based on at least 5 samples with not less than 30 minutes between samples of 1,000 CFU/100mL and a maximum of 10,000 CFU/100mL (refer to Condition (Waste 17). These release limits are provided in *Schedule B, Table 2 Treated Sewage Effluent Release Limits to Land* of the marked-up EA0001399 provided in **Appendix B** of this RFI response). **Total Nitrogen (TN) and Total Phosphorus (TP)** In addition to the MEDLI modelling, Arrow Energy believe that TN and TP limits are not required to be conditioned in the release limits table i.e., do not need to be included in Schedule B, Table 2 – Treated Sewage Effluent Release Limits to Land of the SGP North EA, due to the following considerations: • The Queensland Plumbing and Wastewater Code (2024) (the code) specifies effluent quality release limits depending on the potential end use as shown in screenshot of Table S2 of the code below; • This code establishes effluent compliance values for the release of greywater from treatment plants where there is a risk of a 'high level of human contact and multiple dwellings', compared to 'multi dwellings with medium human contact' (in grey); • This category (i.e., grey) is consistent with the type of effluents from the proposed camps for SGP North Stage 1, and it does not include TN and TP effluent release limits.

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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
The above considerations are consistent with the proposed limits in this EA amendment application (i.e., to include release limits for BOD, TSS, E.coli, and pH, and to not include limits for TN and TP.
Whilst the temporary accommodation camp will by up to 350EP at its peak, it will only operate for a few years and the effluent will be irrigated to a fenced off area to limit any human contact. As such, Arrow Energy believes the risk and likelihood of human contact from the effluent irrigation areas from camps to be low even at peak camp occupation. Therefore, the proposed release limits would be consistent with what is specified in the Plumbing and Wastewater Code Guidelines in the proposed conditions in the SGP North EA amendment application.
Table S2 – Potential end uses of greywater where a greywater treatment plant is installed on premises generating less than 3kL (<3kL) per day
<table>
<tr><th>Effluent Quality</th><th>Potential End Uses</th><th>Parameter</th><th>Effluent Compliance Value</th></tr>
<tr><td>High exposure quality effluent</td><td>End uses with a high level of human contact, including:
Sanitary flushing
Laundry use (cold water source to washing machines)
Vehicle washing
Path/Wall wash-down</td><td>Biochemical oxygen demand (BOD_5)
Total suspended solids (TSS)
Thermo-tolerant organisms (org/100ml)
pH
Turbidity
Disinfection</td><td>≤10 mg/L
≤10 mg/L
<10
6.5 – 8.5
<2 NTU (95%ile) / <5 NTU (maximum)
Cl: 0.2 – 1.0 mg/L residual (where used as primary disinfection)</td></tr>
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</table>

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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><td>Medium exposure quality effluent</td><td>End uses with a medium level of human contact, including:
• Lawn and garden spray irrigation</td><td>Biochemical oxygen demand (BOD_5)
Total suspended solids (TSS)
Thermo-tolerant organisms (org/100ml)
pH
Turbidity
Disinfection</td><td>≤20 mg/L
≤30 mg/L
<30
6.5 – 8.5
<5 NTU (95%ile)
Cl: 0.2 – 1.0 mg/L residual (where used as primary disinfection)</td></tr>
<tr><td>Low exposure quality effluent</td><td>End uses with a low level of human contact, including:
• Lawn and Garden manual bucketing, surface broadcasting, sub-surface irrigation</td><td>Biochemical oxygen demand (BOD_5)
Total suspended solids (TSS)
Thermo-tolerant organisms (org/100ml)
pH
Disinfection</td><td>≤240 mg/L
≤180 mg/L
N/A
N/A
N/A</td></tr>
</table>

Receiving environment attributes
Water: SGP North is located within the Maranoa Balonne Rivers Basin (Basin Plan WQ4222).

The Temporary accommodation camp Option 1 is located 2.5 km west of Bottle Tree Creek which runs 6.5 km south before feeding into Dogwood Creek. Within 1 km of this camp location, two non-perennial watercourses run eastward into Bottletree Creek. Supported by the topography of the areas, it is considered that site runoff would likely be directed to the south-east, following the watercourse lines into Bottletree Creek and eventually Dogwood Creek. The MEDLI model assessment for this camp option considered that no irrigated effluent should translate to runoff, and that runoff would comprise solely of rainfall.

The Temporary accommodation camp Option 2 is situated within 1 km west of Bottletree Creek which runs 6.5 km south before feeding into Dogwood Creek. Within 50 m of the northernmost boundary of the site there is an unnamed reservoir, situated along a non-perennial watercourse that runs southeast into Bottletree Creek. Supported by the topography of the areas, it is considered that runoff would likely be directed to the east-northeast, before following the watercourse lines into Bottle Tree</td></tr>
</table>

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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
Creek and eventually Dogwood Creek. The MEDLI model assessment for this camp option considered that no irrigated effluent should translate to runoff, and that runoff would comprise solely of rainfall.

Vegetation: A summary of the vegetation characteristics of the receiving environment for each of the proposed camp locations are provided in the table below.

Information regarding other releases and activities are provided in the table below.
<table>
<tr><th colspan="2" rowspan="2">STP</th><th colspan="3">Receiving Environment Attributes</th></tr>
<tr><th>Location of environmental values - Reg Veg category</th><th>Other releases</th><th>Other activities</th></tr>
<tr><td rowspan="2">Temporary Accom. Camp</td><td>Option 1</td><td>PL305 -Cat X</td><td>Nil</td><td>Nil</td></tr>
<tr><td>Option 2</td><td>PL305 - Cat X</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">Warehouse /Offices</td><td>PL305 - Cat X</td><td>Nil</td><td>Washdown* and Waste Management Facility**</td></tr>
<tr><td colspan="2">MDC#1</td><td>PL492 - Cat X</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">MDC#2</td><td>PL492 - Cat B</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">MDC#3</td><td>PL305 - Cat B</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">MDC#4</td><td>PL305 - Cat X</td><td>Nil</td><td>Nil</td></tr>
<tr><td colspan="2">MDC#5</td><td>PL305 - Cat X</td><td>Nil</td><td>Nil</td></tr>
</table>
* Washdown wastewater is recycled and trucked off-site when required.
** Regulated waste is transported off-site with an authorised waste management contractor to an authorised waste management site.

Information regarding risk of environmental harm from irrigation with treated sewage effluent is provided in the table below.
</td></tr>
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Item	Issue	Action required	Arrow Energy's response

STP		Risk of environmental harm	
		Cumulative impacts	Other factors
Temporary Accom. Camp	Option 1	Nil, The assumed effluent quality limits (averages) are suitable to achieve longevity in the soil lifespan of up to 38 years., which extends beyond the anticipated lifespan of the facility (3-10 years),	No irrigated effluent should translate into runoff
	Option 2	Nil. The levels of nutrients in deep drainage are considered sufficiently low to protect groundwater environmental values	No irrigated effluent should translate into runoff Minimise deep drainage. Potential surface water contamination risk (water reservoir in 50m distance)
Warehouse /Offices		Nil. The irrigation rate does not exceed the capacity of the soil to accommodate the discharged effluent. Low risk to groundwater environmental values in the land irrigation area. The modelling results suggest that salinity will not adversely impact on crop yield for Vertosols and Sodosol type soils.	The irrigation rate does not exceed the capacity of the soil to accommodate the discharged effluent. Withhold irrigation during wet weather days to reduce deep drainage rates. Runoff can only occur due to rainfall.
MDC#1, MDC#2, MDC3, MDC#4, and MDC#5		Nil. The assumed effluent quality limits (averages) are suitable to achieve longevity in the soil lifespan of up to 38 years., which extends beyond the anticipated lifespan of the facility (3-10 years), Irrigation does not contribute to runoff. The level of nutrients in deep drainage are considered sufficiently low to protect groundwater environmental values The modelling results suggest that salinity will not adversely	The irrigation rate does not exceed the capacity of the soil to accommodate the discharged effluent. The effluent volume is able to be assimilated by the endemic soil during wet days without mixing with runoff from precipitation. Crop selection and management are imperative to facilitating a high degree of nutrient uptake. Regular inspections of the irrigation area should be

Item	Issue	Action required	Arrow Energy's response
			<table><tr><td></td><td>impact on crop yield for Vertosols and Sodosol type soils.</td><td>conducted to identify waterlogging or crop stress.</td></tr></table> For further details on the receiving environment, please refer to **Appendix I** of this RFI response. 2. MEDLI modelling for the following facilities are provided in **Appendix I** of this RFI response: • Girrahween Accommodation Camp 500EP, with two (2) options for location (refer to Appendix I.1.a and Appendix I.1.b of this RFI response), both located in PL305. • Girrahween Warehouse/Office facility, located in PL305 (refer to Appendix I.2 of this RFI response). • Five (5) temporary Mobile Drilling Camps (MDCs), located in PL492 and PL305 (refer to Appendix I.3 of this RFI response). The corresponding MEDLI modelling conducted for each of the irrigation areas for the proposed camps confirm that the irrigation limits as proposed in condition Waste 17 to be added to EA0001399 (refer to **Appendix B** of this RFI response) can be met. 3. The proposed release limits for *E.coli* of 1,000 CFU/100 mL (80th percentile based on at least 5 samples with not less than 30 minutes between samples) and 10,000 CFU/100 mL (maximum) at the release pipe from the sewage treatment plant for a daily peak design capacity of greater than 100 Equivalent Persons (EP) (refer to Condition Waste 17 of **Appendix B** of this RFI response, i.e., draft EA (marked-up EA0001399)) are the prescribed values as per the secondary treated class B standard for treated sewage effluent or grey water as per the definition in EA0001399. This is consistent with the requirement under the Streamlined Model Conditions (SMCs) for petroleum activities (refer to condition Waste 11 of the SMCs) where treated sewage effluent or greywater can be released to land provided it meets or exceeds secondary treated class B standards for a treatment system with a daily peak capacity of between 150 EP and 15000 EP. The STP proposed for the temporary accommodation camp, with a loading scenario of 500EP, will be required to comply with these standard conditions. Given the lower loading scenarios proposed for the MDCs (lower than 32EP each), it is anticipated that the STPs for these locations will also comply with the proposed EA condition (Waste 17).
		2. Provide further information, including appropriate modelling which demonstrates the proposed limits within condition Waste 17 are suitable for irrigation over the proposed grazing land area.	
		3. Provide further justification for the E. coli release limits.	

Item	Issue	Action required	Arrow Energy's response
		Please refer to page 26 of the *Application requirements for petroleum activities guideline* (130325 I EM705) for further instruction on information requirements for sewage treatment and disposal activities.	It is also important to note that the proposed locations for the STPs will be required to comply with proposed changes to EA condition (Waste 12), including release to a 'fenced and signed contaminant release area' to minimise people access and contact with spray drift from irrigation where sprinklers are employed (i.e., restricted controlled access). The requirements as outlined in page 26 of the guideline Application requirements for petroleum activities (DESI, ESR/2016/2357, Version 4.01, 27 June 2024) are included in Arrow Energy's *Treated Sewage Effluent and Greywater Management* guide (refer to **Appendix J** of this RFI response).
Native Title			
12.	In 2013, Arrow entered into an Indigenous Land Use Agreement for disturbance located within the Western Downs Unclaimed Area Native Title Group. In 2018, an area that includes the majority of the site was registered as Native Title to Iman People #4 (QC2017/008). It is not understood whether an updated Indigenous Land Use Agreement is being sought for the proposed amendment and disturbances.	1. Confirm whether an updated or additional Indigenous Land Use Agreement will be sought for the proposed application and disturbances. 2. Outline what considerations have been made to accommodate Cultural rights— Aboriginal peoples and Torres Strait Islander peoples, as described in section 28 of the Human Rights Act 2019.	1. The Arrow Energy and Western Downs Unclaimed Area Native Title Group Indigenous Land Use Agreement (ILUA) included representatives of the Iman People and the descendants of apical ancestors listed on the Iman People #4 Native Title Application and are also listed in the ILUA. As the Iman People are part of the ILUA and have received benefits, the ILUA has been inherited by Iman People #4 and no new ILUA is required. The Cultural Heritage Protocol that forms part of the ILUA states that if a claimant application, or a subsequent approved determination, is made over a part of the ILUA area, only persons who are members of the Native Title claim group, or who are common law holders of Native Title, will have sole cultural heritage responsibility in that area. Arrow Energy took a further step with the Iman People #4 and entered into a separate Cultural Heritage Survey Agreement in 2021. This agreement sits under the ILUA. 2. The ILUA ensures that all cultural and intellectual property rights belong to the Native Title Group, including the Iman People. All Arrow Energy projects are subject to cultural heritage approvals and subject to on ground assessment by the Iman People. With ongoing access to their cultural heritage on Arrow Energy tenement and private property and through the cultural heritage fieldwork that is conducted by Arrow Energy and the Iman People, the Iman People can: (a) enjoy, maintain, control, protect and develop their identity and cultural heritage. (b) enjoy, maintain, control, protect, develop and use their language, including traditional cultural expressions; and (c) enjoy, maintain, control, protect and develop their kinship ties; and

Item	Issue	Action required	Arrow Energy's response
			(d) maintain and strengthen their distinctive spiritual, material and economic relationship with the land, territories, waters, coastal seas and other resources with which they have a connection under Aboriginal tradition or Island custom; and (e) conserve and protect the environment and productive capacity of their land, territories, waters, coastal seas and other resources. The age, gender, and level of knowledge amongst the Iman People that have participated in the cultural heritage fieldwork is varied, and they have used this to learn and impart cultural knowledge with their wider community. This has enabled kinship ties to be developed and maintained by the Iman People themselves. They have direct control over tangible and intangible heritage in relation to Arrow Energy's activity area, which includes environmental concerns, resources and areas of spiritual significance. With the Iman People, Arrow Energy has encouraged the furtherance of education of those who are younger or wish to learn more about their culture, through a series of cultural heritage workshops and material analysis run by the Iman People themselves and facilitated by Arrow Energy. This is seen as an expansion of their culture and, thoughtfully, they also invite Arrow Energy staff to participate in order to share their culture.
Petroleum Infrastructure			
13.	**Authorised petroleum activities** Arrow have proposed to apply a single number of wells for all tenures relevant to SGP north, as well as amend the types of wells included and remove the area limit per well site. The justification provided in Appendix A of the Supporting Information Report does not provide sufficient information to support why this is necessary for the relevant project and to what extend this aligns with the SGP EIS approvals. As stated in the pre-lodgement advice issued on 24 November 2023, the department does not support applying a single number for the EA.	1. Provide justification to support why it is necessary for tenures to be grouped for the whole EA and to what extent this aligns with the SGP Environmental Impact Statement (EIS) approval.	1. Arrow Energy's justification for removing the number of wells listed per tenure (i.e., Petroleum Lease (PL)) relevant to the SGP North EA and be replaced with a single number of wells for all tenures is to seek flexibility when it comes to the development of the gas fields. By having to list a fixed number of wells per PL it disincentivises proponents to adapt and consider new technologies and alternative field layouts. The original Surat Gas Project EIS (SGPEIS) considered single vertical well spacing based on an approximate 750 m to 800 m drill spacing as the worst-case scenario from a development layout (i.e, the least amount of space between wells). It is not in Arrow Energy's plans to drill more wells, or wells in a closer spacing than that considered in the SGPEIS, as it would impact on subsurface drainage and would also be cost prohibited. Over a full graticular block for which a PL may cover, which is approximately 75km^2 without any constraints applied and on a grid pattern, would equate to approximately 120 single vertical wells.

Item	Issue	Action required	Arrow Energy's response
			Arrow Energy's proposal to remove the limitation of a maximum number of wells on PLs would allow Arrow Energy to reduce footprints by adopting multi well pads and lateral wells (where possible from a technical and non-technical perspective) without the restriction of location by PL. If the EA establishes a limit of wells per PL this could not occur and would require the EA to be amended further, adding to the administrative burden that it entails. An example of the above is where a well is proposed to be drilled on the boundary of a PL which based on constraints might need to be located on the adjacent Arrow Energy PL, but since the EA limits the number of wells on that PL it could mean that the well could not be placed there. Or for the same example but Arrow Energy proposing a multi-well pad with 8 wells on the pad. In this case it would require an EA amendment even though the disturbance would be less, as the maximum number of wells authorised in that PL would be exceeded. The inclusion of well count per PL is a very prescriptive condition and by liberating the PL restriction it would allow for flexibility to the gas fields development without increasing environmental harm. Notwithstanding, Arrow Energy would still be constrained by the total number of wells authorised under the EA, and the Estimated Rehabilitation Costs (ERC) and the Plan of Operations for the EA. As such, Arrow Energy believes that the proposed change to remove the well count per PL would not necessarily increase the level of risk or environmental harm.
14.	**Well pad sizes proposal** Arrow have proposed to remove the maximum size per well pad in Schedule A, Table 1 stating: Remove max size per well pad of 1.1 ha due to conflict with essential petroleum definition which authorises 1.5 ha for multi well pad, within this EA. It creates a compliance issue and confusion as to what is the maximum size of well pad authorised, when its defined elsewhere in the EA. Request to remove the conflicting direction or standard within the same document (i.e., SGP North EA). It should be noted that the scoping table value is what identifies the authorised well pad size on site, not the definition of essential petroleum activities which is an SMC, and is a term used for restricting activities within	1. Per well pad type, identify the number of wells and associated areas proposed that make up the total 214 wells proposed, so to assist the assessment of surface disturbances.	1. As noted in the response to item 13 of this RFI response, the proposal to remove the maximum size of well pad is to provide Arrow Energy with flexibility in the development of the gas fields and, as stated in the EA amendment application Supporting Information report (refer to **Appendix A** of this RFI response), to avoid conflict with essential petroleum activities. The proposed condition of restricting the maximum well sizes is very prescriptive and restricts proponents' development concepts and disincentivises proponents to consider new technologies or new field layouts. The condition as it currently stands which limits well pad sizes to 1.1 ha restricts proponents to design alternative well spacing or well pad layouts as the project develops. There could be a scenario where instead of drilling single vertical wells, multi-wells pads might be considered. This condition currently limits along with the number of multi well pads authorised in the scoping table. Whilst there would be a reduction in disturbance as a result, the prescriptive nature of the conditions would require Arrow Energy to seek an EA amendment. As such, Arrow Energy proposes to remove this limit to provide flexibility, noting that other conditions such as authorised activity table (total well count), and *Schedule D Table 1, Impacts to*

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	environmentally sensitive areas (ESAs). DESI does not agree that there is a compliance conflict here and considers that Arrow must identify the number of wells and areas proposed. DESI notes that the Supporting Information Report, section 4.5 states: The majority of natural gas wells are drilled as a single well per well pad, with each well pad having a disturbance area of approximately 1 ha. Additionally, section 5.4.3 states: There are planned to be 95 deviated wells on 29 well pads. There are often 3 or 4 deviated wells per well pad with 1 well pad containing 8 deviated wells.		*Prescribed Environmental Matters (PEMs)* will also limit impacts and sufficiently condition the SGP North footprint. The conflict with the definition of essential petroleum activities and the scoping table (i.e., Schedule A, Table 1 – Authorised petroleum activities) occurs where a maximum well size of 1.1 ha is authorised (in the scoping table). There are examples where a well pad might need to be on a slope greater than 2% and based on the cut and fill the well pad size will be no greater than 1.5 ha. This level of detail won't be potentially known until a Conduct and Compensation Agreement (CCA) has been put in place with the landholder, and once construction teams have done their final construction set out. In this case, there is no flexibility with this condition and would require Arrow Energy to seek an EA amendment to allow for the construction of this specific well pad. Also, further limitations would be when it comes to Environmentally Sensitive Areas (ESA) and then the definition of essential petroleum activities as well as limits on PEMs if applicable, if in the example of the well pad on a slope, it could be proposed to be located in a cleared area where there is no limitation of ESA or PEMs, however, the scoping table would limit the well pad to 1.1 ha. The locations of the 214 well pads proposed for the SGP North Stage 1 and therefore their associated areas are provided in the shapefiles in **Appendix K** of this RFI response.
		2. Per well pad type, identify the number of wells and associated areas intended for the remaining of the 588 wells authorised on the EA.	2. Well pad type and identifying the number of wells and associated areas intended for the remaining of the 588 wells authorised is not the subject of this EA amendment application. Notwithstanding this, the number of wells and associated areas intended for the remaining 588 wells authorised under the SGP North EA (EA0001399) is unknown at the time of this EA amendment application as it depends on multiple factors, including, as stated above, on landholder agreements, amongst others.
		3. Identify the extent of pipelines per expected widths and identify these widths. Ensure the differences in the right of ways (RoW) are identifiable in the spatial information required by item 17.	3. The extent of the pipelines for SGP North Stage 1 and their expected widths are provided with the shapefiles included in **Appendix K** of this RFI response.

Item	Issue	Action required	Arrow Energy's response
15.	**Coal seam gas well type changes** The proposed changes to Schedule A, Table 1 include changing coal seam gas production wells to: "Total coal seam gas wells including: core wells, exploration wells, development wells, production wells and monitoring wells"	1. As only production wells are authorised, provide an assessment of the impacts associated with each type of well and identify how these compare to the impacts associated with a production well.	1. The proposed change to Schedule A, Table 1 – Authorised petroleum activities of the SGP North EA (EA0001399) to include total coal seam gas wells including different types of wells was to roll all the wells up into an aggregated well count and therefore allow for the development of these different types of wells and the full scale of the petroleum activities already authorised under the SGPEIS. This justification is also provided in **Appendix A** of this RFI response, the updated EA Amendment Supporting Information report. Adding this change also allows for incidental infrastructure associated with the development of wells of any type. This change to Schedule A, Table 1 will also allow consistency with other proponents and to progress towards an 'outcomes focused conditioning' rather than a 'prescriptive' one. The breakdown of the wells into different types of wells would be reported in the Estimated Rehabilitation Cost (ERC) and the Plan of Operations (PoOps) provided to DESI via the spatial schema and also visible via GeoResGlobe as part of Arrow Energy's requirement to supply Notice of Completions under the *Petroleum and Gas (General Provisions) regulation 2017*. Having an aggregate total wells count solves the conflict between the conditions under the SGP North EA and the need to amend Schedule A, Table 1 at a later date. For example, existing exploration wells could turn into a development well during its lifecycle. Given this case, having listed an explicit number of exploration wells vs production wells is prescriptive and not necessarily desirable. The total well count would already limit the number of wells to be drilled regardless of well status, as the existing exploration wells are not accounted for in the 588 production well count. There is also likely to be conflict with the well subtype as described in the GeoResGlobe to DOR compared to Schedule A, Table 1. Adding the existing exploration wells to Table1 to clearly identify they are authorised (refer to **Appendix B** (marked-up EA) of this RFI response). DESI notes in the RFI that only production wells are authorised. Under the Petroleum and Gas Act there is no limitation from what type of well can be drilled under the PL and as previously stated an exploration well could be drilled and turned into a production well. The proposed amendment does not seek to authorise the number of wells or change the type of wells, but merely remove the wording in the authorised activity table to be less prescriptive requiring an EA amendment to the activity table if a well changes its type from i.e. an exploration well to a production well. As such an update to the authorised activity table is proposed to include the existing exploration wells on top of the proposed 588 production wells. A general impact assessment by well type is provided in the table below.

<table>
<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td></td><td>
<table>
<tr><th>Well type</th><th>Potential impacts</th></tr>
<tr><td>Appraisal wells</td><td>• Surface impacts (i.e., clearing of vegetation, fauna impacts, sediment and erosion, surface contamination from leaks, etc.) during construction and rehabilitation (i.e., pad site preparation to allow construction and rehabilitation of land after abandonment)
• Surface impacts during operation – although for a shorter well life compared to development/production wells which can operate for approximately 20 years.
• Sub-surface impacts during construction and abandonment - limited due to shorter operational life compared to development/production wells.</td></tr>
<tr><td>Exploration wells</td><td>• Surface impacts (i.e., clearing of vegetation, fauna impacts, sediment and erosion, surface contamination from leaks, etc.) during construction and rehabilitation (i.e., pad site preparation to allow construction and rehabilitation of land after abandonment)
• Surface impacts during operation – limited, typically Plugged & Abandoned (P&A) immediately or soon after drilling.
• Sub-surface impacts during construction and abandonment.</td></tr>
<tr><td>Monitoring wells</td><td>• Surface impacts (i.e., clearing of vegetation, fauna impacts, sediment and erosion, surface contamination from leaks, etc.) during construction and rehabilitation (i.e., pad site preparation to allow construction and rehabilitation of land after abandonment).
• Surface impacts during operation.
• Sub-surface impacts during construction and abandonment.
Sub-surface impacts during operation – limited as only small volumes are extracted from monitoring bores.</td></tr>
<tr><td>Development/Production wells</td><td>• Surface impacts (i.e., clearing of vegetation, fauna impacts, sediment and erosion, surface contamination from leaks, etc.) during construction and rehabilitation (i.e., pad site preparation to allow construction and rehabilitation of land after abandonment).
• Surface impacts during operation.
• Sub-surface impacts during construction and abandonment.
• Sub-surface impacts during operation.</td></tr>
</table>

All wells require site preparation of a pad at surface to allow construction of a well and rehabilitation of the pad after abandonment of the well. The potential impacts
</td></tr>
</table>

Item	Issue	Action required	Arrow Energy's response
			of pad construction and rehabilitation for other wells are the same as for "production wells" All wells which are not immediately plugged and abandoned but are operated for a period of time require periodic operation and maintenance activities. The potential impacts during operation are the same as for "production wells" (i.e. sediment and erosion, surface contamination from leaks from equipment etc). Exploration wells are typically plugged and abandoned immediately after drilling. All wells are drilled and constructed using similar methods and have similar potential impacts as for production wells (i.e. connection of aquifers, loss of drill fluids etc). To manage this, all well types are drilled to the Code of Practice for the Construction and Abandonment of Petroleum Wells and Associated Bores in Queensland (State of Qld, 2019). The purpose of this Code is to ensure that all petroleum wells and associated bores are constructed, maintained and abandoned to a minimum acceptable standard resulting in long-term well integrity, containment of petroleum and the protection of groundwater resources. This Code identifies industry standards and good oilfield practice for oil and gas well design. Well integrity is fundamental to ensuring sustainable petroleum production, ensuring risk can be managed to an acceptable level and protecting aquifers during the well life cycle. This Code addresses safety and environmental issues in the construction, operation and abandonment (decommissioning) of petroleum wells and associated bores. In addition to potential subsurface impacts from construction and abandonment of the wellbore itself, operation of wells to produce water and gas has potential environmental impacts. These potential impacts are to water availability and quality of groundwater systems and associated environmental values including adjacent aquifers, springs, groundwater dependent ecosystems, conjunctive use of groundwater such as landholder bores, and surface water systems through connectivity. The impacts to surface infrastructure associated with the different types of wells is that for an exploration well/core holes, these would likely require the same surface footprint of a production well of around 1 ha, but the above ground infrastructure would be limited to a cap or riser. A production well on a 1ha well pad would have additional surface infrastructure including the well head, well skid, hydraulic power pack unit/generator and manifolds for the gas and water. With regards to monitoring wells, these may be collocated on an existing production or exploration well pad and will consist of a pressure gauge at the surface or some telemetry devices.

<table>
<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
<tr><td></td><td></td><td>2. Identify the number and type of wells existing on site.

3. Identify the number of core wells, exploration wells, development wells, production wells and monitoring wells proposed on site.</td><td>2. The number of existing wells on site is provided in the table below (see response to item 15.3).

3. The number and type of wells that Arrow Energy proposed in the original application of the SGP North EA (EA0001399), the authorised wells within the currently approved EA, and the proposed number of wells to be develop as part of SGP North Stage 1 are provided table below. This also includes the existing wells that have been part of appraisal and monitoring activities.

It is Arrow Energy's preference to not condition the EA as noted above to limit it to well types. This is also not the subject of this EA amendment application.

The table below lists the number of existing and proposed wells for the SGP North Stage 1, noting that those existing wells could evolve to become production wells.

<table>
<tr><th>Coal Seam Gas (CSG) Wells</th><th>Quantity</th><th>Well Type</th><th>Quantity</th><th>Existing or Proposed</th></tr>
<tr><td>Total authorised under EA0001399</td><td>588</td><td>Production wells</td><td>588</td><td>Proposed</td></tr>
<tr><td rowspan="2">From appraisal and monitoring activities conducted</td><td rowspan="2">56</td><td>Exploration/Core wells</td><td>35</td><td>Existing</td></tr>
<tr><td>Monitoring wells</td><td>21</td><td>Existing</td></tr>
<tr><td rowspan="2">Proposed for SGP North Stage 1 Development</td><td>214</td><td>Development/ Production wells</td><td>214</td><td>Proposed</td></tr>
<tr><td>11</td><td>Monitoring</td><td>11</td><td>Proposed</td></tr>
</table>
</td></tr>
<tr><td>16.</td><td>The application states the RoW width for co- located facilities will be up to 40m. It states this excludes the Girrawheen to Bellevue pipeline RoW, with a combined pipeline width of up to 47m.

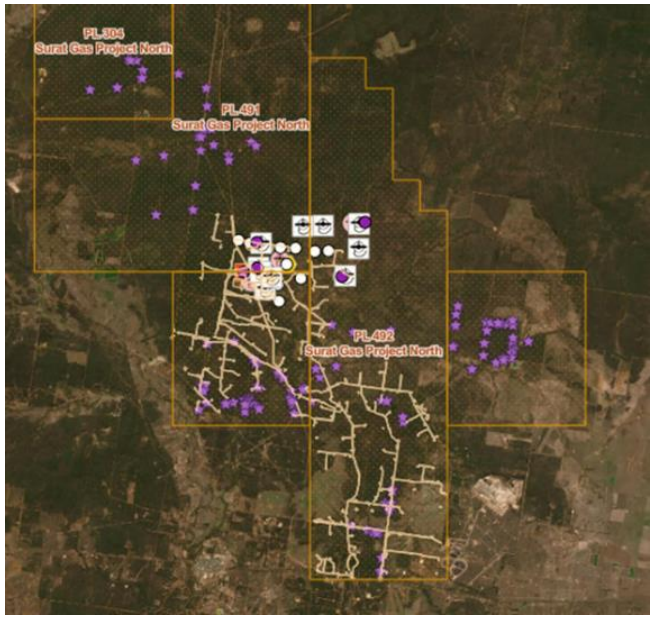
Further, in section 1.5 of the Supporting Information Report, the application states the 20km RoW required for the gathering lines, access tracks for wells and the water transfer export pipeline, from Girrawheen Field Compression Station to the southern limit of PL492, will be 27m in width.</td><td>1. Clarify the pipeline dimensions accounted for in the proposed amendment and surface disturbance areas.</td><td>1. The spatial files and disturbance to PEMS has been calculated based off "issued for design" concepts which takes into consideration number of pipelines and pipeline diameter and other infrastructure. This will depend on where the gathering lines are located, with smaller diameter pipes required closed to the well head, and larger diameter where the gathering lines act as header lines. Please refer to section 4.6 of the SGP North EA amendment application supporting report and 4.6.3 which details this (refer to Appendix A of this RFI response).
Arrow Energy's preferred method of laying gas and water gathering lines is by direct installation using standard pipeline trenching methodologies.</td></tr>
</table>

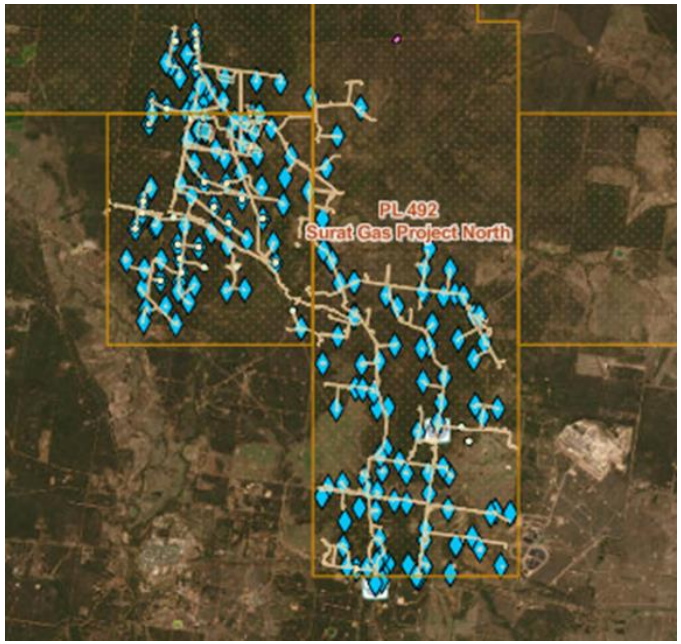
Item	Issue	Action required	Arrow Energy's response
			This involves the following: • Right of way (RoW) clearance, including vegetation clearing and topsoil stripping; • Pipe stringing: small diameter pipe (up to 160 mm) via coils, large diameter pipe via 21 m lengths; • Pipe welding to join supplied lengths into networks; • Trenching, pipe lowering and trench backfilling/compaction; • Pneumatic pressure and leak testing; • RoW rehabilitation including top soil re-instatement; and • Regular communication with affected landholders and patrols to monitor any subsidence for repair. Multiple work crews will progressively execute construction. Depth of pipe burial will comply with the requirements in the APGA Code of Practice for Upstream Polyethylene Gathering Networks – Coal Seam Gas Industry. Gas and water pipelines are collocated as much as possible. Generally, an average typical RoW width of 22 m is required to allow vegetation clearing, mulching, and stockpiling, stockpiling of subsoils and topsoils, and safe access and movement of personnel and heavy machinery (including trenching machines) and access tracks to the wells. The RoW width is dependent upon the number of gathering lines in the RoW (trenching required), stock piling of additional vegetation clearing, permanent access tracks to wells and work space during construction and/or operational phases. The current practice is an average ROW width of 24 m with a separate permanent access track. Arrow is planning to implement gathering before drilling strategy that will consider converting vehicle work area into access tracks thereby reducing ROW width (10%) with an average typical 22 m.
		2. Confirm that plans to co-locate impacts with the Girrawheen to Bellevue pipeline RoW and any other RoW authorised under separate EAs are excluded from the considerations surrounding surface disturbances in this application.	2. Arrow Energy confirms that: • the Girrawheen to Bellevue (G2B) pipeline ROW is the only co-located ROW proposed to be authorised under a separate EA in relation to the SGP North Stage 1 development; and • that the disturbance for the G2B pipeline has been excluded from the considerations surrounding surface disturbance in this EA amendment application and forms part of a separate assessment and a new EA application but has taken into consideration cumulative impacts i.e. fragmentation etc.

Item	Issue	Action required	Arrow Energy's response
Biodiversity			
17.	**Spatial information** It is not clear from the application material where impacts proposed to Prescribed Environmental Matters (PEMs) and ESAs will occur and, therefore, how they have been quantified.	1. Provide revised mapping (as layer files or individual shapefiles) which demonstrate the following: a) Existing disturbance areas b) Proposed disturbance areas (identifying the project name and activity type) c) Individual PEMs d) Arrow RE mapping e) Watercourse buffer zones f) ESAs and protection zones (identifying the individual ESA trigger) 2. Provide supporting information which further describes and quantifies the proposed impact to PEMs and ESAs for each project and activity. Ensure it is demonstrated why these impacts are necessary and desirable.	1. Revised shapefiles are provided with this RFI response for the proposed disturbance areas for the SGP North Stage 1 (refer to **Appendix K** of this RFI response). Existing disturbance areas were previously provided with the EA Amendment application of 5 April 2024. See details below. a) The existing disturbance areas were provided in Appendix E *SGP North Total Current Disturbance Area Spatial Data* of the SGP North Environmental Authority (EA0001399) amendment application of 5 April 20241 and published on Arrow Energy's website on 9 April 2024. b) The proposed disturbance for the scope of this EA amendment, corresponding to the SGP North Stage 1 is provided in **Appendix K** of this RFI response. c) Individual PEMs are provided in **Appendix K** of this RFI response. d) Arrow RE mapping is provided in **Appendix K** of this RFI response. e) Watercourse buffer zones are provided in **Appendix K** of this RFI response. f) ESAs and protection zones are provided in **Appendix K** of this RFI response. 2. The updated Biodiversity Impact Assessment report (refer to **Appendix L** of this RFI response) further describes and quantifies the proposed impacts to PEMs and ESAs for the scope of the SGP North Stage 1 activities. Arrow Energy utilises its Area Wide Planning (AWP) process (refer to **Appendix M** of this RFI response) to avoid, minimise and/or mitigate impacts to PEMs and ESAs whilst planning the locations of its activities (i.e., planning strategy). This process was used to determine the locations of the SGP North Stage 1 activities to the extent of accomplishing the abovementioned planning strategy, by: • Firstly, avoiding impacts to PEMs and ESAs by relocating activities: • Secondly, minimising extent and intensity of impacts to biodiversity where relocation is not feasible by reducing impacted areas (i.e., reducing areas of disturbance) or the duration or intensity of activities: and

Item	Issue	Action required	Arrow Energy's response
			• Finally, mitigating impacts by implementing control measures to protect biodiversity (e.g., adjusting project plans, using less destructive methods, etc.).
18.	**Quantifying PEM impacts** It is recognised that the location of impacts provided in the application material is indicative, however in a number of cases the impacts identified for PEMs are specific. It is also recognised that Arrow seeks to avoid the need for future amendments to adjust the values against PEMs and ESAs.	1. Identify the method used to quantify all impacts associated with the proposed activities, despite the 'indicative' nature of the proposed locations. 2. Identify why the areas identified should be considered as 'accurate' and how Arrow have accounted for 'leeway' in the proposed quantities. 3. Assess and identify the limitations of Arrow's proposed methodology, including risks associated with relocating proposed activity sites and the potential for unidentified or under quantified PEMs/ESAs to be appropriately regulated.	1. The methodology used to calculate impacts to PEMs is the Queensland Government's *Methodology for mapping matters of state environmental significance*, Version 7, DESI, April 2024. The methodology is used regardless of the locations being indicative or final. 2. The SGP North Stage 1 activities (i.e., project areas) are as 'accurate' as can be at this stage of the development of the SGP North Stage 1. The accuracy of project activities locations depends on multiple factors, including agreements with landholders through Conduct and Compensation Agreements (CCAs) and the normal Engineering design process and review. Arrow Energy has utilised its standard for engineering design to determine the footprint of the SGP North Stage 1 in the absence of a fully completed engineering design (i.e., using engineering logic to define the footprint of the 214 wells and its associated infrastructure).The reduced 214 wells scope from the original 450 wells scope, has all been surveyed and the RoWs have been reduced further through engineering design which provided the final footprint (refer to **Appendix K** of this RFI response). The final alignment will be subject to CCA and detailed design. As such a level of flexibility is required when conditioning relating to specificity. 3. The proposed methodology has limitations in determining the location of activities within the project area as it has been done in some cases from an indicative alignment. Until a CCA is signed and engineering done, this will still be limitations and subject to change. The proposal to appropriately regulate specificity when it comes to PEMs/ESAs is to specify a threshold limit to draw down upon. As infrastructure is built based on the indicative alignments used to determine the PEMs/ESAs impacts those values are drawn down on and proposed to be reported annually through the Annual Return process. This allows DESI to track impacts to PEMs and ESAs versus what is authorised in the EA also provides transparency. If through pre-clearance surveys that a PEMs/ESAs impact is not authorised in the EA, or the limits have been used up, then it would trigger an EA amendment.
19.	**Matters of National Environmental Significance (MNES)**	1. Identify and quantify impacts to all PEMs that are MSES regardless of whether approval is held under the EPBC Act.	1. The Biodiversity Impact Assessment (BIA) report has been revised (refer to **Appendix L** of this RFI response) to include all PEMs assessed as known or likely to occur in the EA amendment area, regardless of whether there are impacts approved under EPBC approval 2010/5344.

Item	Issue	Action required	Arrow Energy's response
	Section 3.2.2 of the Biodiversity Impact Assessment (BIA) for Environmental authority EA0001399 (BIA report) identifies species that are listed as MNES and were considered under the EPBC approval 2010/5344, the majority of which are also Matters of State Environmental Significance (MSES). Arrow have concluded that these species should be excluded from further assessment due to the existing Environmental Protection and Biodiversity Conservation Act 1999 (EPBC Act) approval. It is necessary for DESI to assess all PEMs under the Queensland Environmental Offsets Framework and ensure that appropriate approvals are in place for all relevant impacts. Where impacts are determined to be relevant to the same/substantially the same matter and the same/substantially the same impact, the offset delivery may be satisfied through obligations under the EPBC Act. This is confirmed through the assessment of a Notice of Election. The environmental authority must still identify and authorise the impacts to PEMs.		A summary of all species considered known and likely to occur is included in Table 3.4 (flora) and Table 3.5 (fauna) of the revised BIA report, with a full likelihood of occurrence provided in its Appendix D.
20.	**Fauna survey efforts** The BIA for Environmental Authority (EA0001399) completed by Attexo and provided as Appendix C of the application, identifies the survey efforts for field-based assessments for terrestrial fauna. According to Table 2.2, habitat assessments & koala surveys were conducted in 2023 by Richard Floyd and Kate Rigg. Habitat assessments have also been undertaken by Arrow Energy's Ecology Team although the timing is not stated. Prior to this, survey efforts were conducted in 2017 and prior. Figure 2.2 identifies the location and types of fauna survey efforts undertaken. This figure shows the majority of efforts are concentrated to PL305. The limited survey	1. Identify the duration of each survey effort undertaken. 2. Identify the species which were subject to targeted survey efforts and why these species were selected for targeted surveys.	The habitat types in the SGP North EA amendment area are widely distributed across the Brigalow Belt. The survey effort reported for the SGP North EA amendment area represents a subset of a substantial and sustained fauna survey effort across the broader SGP area between 2009 and 2024. As a result of this effort, fauna assemblages and characteristic microhabitats associated with the broad vegetation communities and habitats in the EA amendment area are well understood. 1. The methodology section of the BIA report (refer to **Appendix L** of this RFI response) has been updated to include more detailed information on the timing and duration of fauna survey (see Section 2.2.2 of the updated BIA report). 2. Targeted surveys were used to detect Greater Glider, Koala and Glossy Black-cockatoo in areas of suitable habitat as these are the threatened species most likely to be impacted by the Project. More detailed information is provided in Section 2.2.2.3 of the BIA report (refer to **Appendix L** of this RFI response).

Item	Issue	Action required	Arrow Energy's response
	efforts undertaken within PL492 appear mostly limited to roads.	3. Identify why efforts have been concentrated around PL305 while limited efforts are evident within PL492.	3. The BIA report has been updated to provide more detail on fauna survey effort (refer Section 2.2.2) and distinguishes between the: • Main survey effort, which comprises trapping surveys conducted for the Supplementary EIS and terrestrial fauna surveys conducted by EcoSmart in October 2016 and 2017 across the entire SGP; and • Supplementary survey effort, which comprises habitat assessments and SAT surveys undertaken by Arrow field ecologists since 2017 Given the intensive nature of trapping efforts, and animal ethics considerations around clearing traps, the focus of the main survey effort was to sample representative habitat types. This provides broad understanding of terrestrial fauna assemblages and habitat associations that can be then extrapolated to other areas and is consistent with the methodology set out in the Terrestrial Vertebrate Fauna Survey Guidelines. The distribution of sample sites for the main survey effort (see below) is therefore a function of the distribution of these habitat types. A more detailed discussion of site selection is provided in Section 2.2.2.1 of the updated BIA report (refer to **Appendix L** of this RFI response). 

Item	Issue	Action required	Arrow Energy's response
			The apparent concentration of survey effort around PL305, as shown in the figure above, was due to a concentration of habitat assessment sites undertaken by Arrow Energy field ecologists on that tenure. Subsequent data has been included in the survey effort that shows a more even distribution of habitat assessment sites across the Study area (refer Section 2.2.2 of the updated BIA report and the figure below). 
		4. Identify specific information on what survey efforts, including the durations, locations and types, have been completed since the 2017 surveys.	4. Refer response to item 20.3 above. Since 2017, these fauna surveys have been supplemented by: • 452 habitat assessments undertaken by Arrow field ecologists (see screenshot above) with data collected on Ecological Field Survey proforma sheets (refer Appendix E of the updated BIA report (**Appendix L** of this RFI response)). • Two (2) Koala SAT surveys undertaken by Arrow ecologists; and • 14 habitat assessments and 2 Koala SAT surveys on Girrahween Station (Lot 17AU199).

Item	Issue	Action required	Arrow Energy's response
		5. Identify what efforts have been made to identify habitat for difficult to find species that may reside within the area.	5. Survey efforts to identify difficult to find or 'cryptic' species are discussed at Section 2.2.2.4 of the updated BIA report (refer to **Appendix L** of this RFI response).
21.	**Identifying all PEMs** Appendix D - Likelihood of occurrence table in the BIA report identifies a number of species with habitat within the project area. Schedule 2, section 6(3) of the Environmental Offsets Regulation 2014 states that: "A habitat for an animal that is critically endangered wildlife, endangered wildlife or vulnerable wildlife or a special least concern animal is a matter of State environmental significance. Examples of habitat— an area of land used by an animal for foraging, roosting, nesting or breeding." The SRI guideline provides further context on what is considered habitat: "Habitat is the area occupied, or periodically or occasionally occupied, by any species, population or ecological community and includes all the different aspects (both biotic and abiotic) used by species during the different stages of their life cycles." Regardless of whether the proposed activities are causing a SRI, the application must identify the extent of impact to PEMs proposed so that the full extent of impact to Biodiversity related environmental values can be understood and assessed.	1. For all PEM species with habitat within the project area, identify the extent of impact (ha) expected to these habitat areas. 2. Ensure the effects of indirect impacts are also considered and identified. 3. DESI have noted that there is evidence of presence of the below listed species on site according to Wildnet records and/or the protected matters search tool (likely or known). However, these species have not been identified as having an SRI, and in some cases have not been determined likely/known to occur. Ensure these species are addressed in the justification for the likelihood of occurrence and these species are	1. The Biodiversity Impact Assessment (BIA) report submitted with the EA amendment application of 5 April 2024 has been revised (refer to **Appendix L** of this RFI response) to include all PEMs assessed as known or likely to occur in the EA amendment area. A full likelihood of occurrence is provided in Appendix D of the updated BIA. In the updated BIA, PEMs species habitat is mapped (refer to Section 3) and the extent of impacts (ha) are quantified (refer to Section 4). 2. Indirect impacts on ecological values that may arise as a result of the SGP North Stage 1 development are presented in Section 4.2.3 of the updated BIA report (refer to **Appendix L** of this RFI response). These 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 during construction, which has the potential to smother plants, reducing photosynthesis and resulting in decreased vegetation health and condition; • increased noise from the vegetation clearing operations, the operation of machinery and vehicle traffic which may affect the behaviour of wildlife (typically limited to the construction period); • increased lighting during construction and operation, with the potential to disrupt the behaviour of nocturnal species; and • mortality resulting from vehicle collision. The SRI assessment of the PEMs considers indirect impacts on relevant values (refer to Section 4.5 of the updated BIA report). 3. An updated likelihood of occurrence assessment is provided in Appendix D of the updated BIA report (refer to **Appendix L** of this RFI response). The justifications in relation to likelihood of occurrence and inclusion or exclusion from the SRI assessments for the specific species as requested in this RFI are provided in the table below. SRI is only conducted for species 'Known to Occur' or considered 'Likely to Occur' and that have habitat impacted within the Study area (the study area is 500 m buffer around the Project footprint).

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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
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considered in the SRI assessment as required in item 24.

It is noted that some of these species have been deliberately excluded as they are MNES (refer to item 19).
<table>
<tr><th>Common name</th><th>Scientific name</th><th>Arrow Likelihood of occurrence</th></tr>
<tr><td>White-throated needletail</td><td>Hirundapus caudacutus</td><td>Known to Occur and suitable habitat abundant</td></tr>
<tr><td>Squatter pigeon</td><td>Geophaps scripta scripta</td><td>Possibly occurring and suitable habitat present</td></tr>
<tr><td>Painted honeyeater</td><td>Grantiella picta</td><td>Likely to occur and suitable habitat present</td></tr>
<tr><td>N/A</td><td>Calytrix gurulmundensis</td><td>Likely to occur and suitable habitat present</td></tr>
<tr><td>Spotted tailed quoll</td><td>Dasyurus maculatus maculatus</td><td>Unlikely to occur. No suitable habitat is present</td></tr>
<tr><td>N/A</td><td>Homoranthus decumbens</td><td>Possibly occurring and suitable habitat present.</td></tr>
<tr><td>N/A</td><td>Xerothamnella herbacea</td><td>Possibly occurring and suitable habitat present.</td></tr>
<tr><td>Australian Painted Snipe</td><td>Rostratula australis</td><td>Possibly occurring and limited suitable habitat present.</td></tr>
<tr><td>Dulacca Woodland Snail</td><td>Adclarkia dulacca</td><td>Likely to occur and suitable habitat present</td></tr>
<tr><td>Curly-bark Wattle</td><td>Acacia curranii</td><td>Possibly occurring and suitable habitat present.</td></tr>
<tr><td>N/A</td><td>Westringia parvifolia</td><td>Unlikely to occur. No suitable habitat is present.</td></tr>
<tr><td>Black-breasted Button-quail</td><td>Turnix melanogaster</td><td>Unlikely to occur and suitable habitat present</td></tr>
<tr><td>Yakka Skink</td><td>Egernia rugosa</td><td>Unlikely to occur and suitable habitat present</td></tr>
<tr><td>Five-clawed Worm-skink,</td><td>Anomalopus mackayi</td><td>Unlikely to occur and suitable habitat present</td></tr>
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<td>
<table>
<tr><th>Scientific name (common name)</th><th>Justification on likelihood of occurrence and SRI inclusion/exclusion</th></tr>
<tr><td>Hirundapus caudacutus (White-throated needletail)</td><td>There are two records for White-throated Needletail in the EA amendment area, the most recent of which is from 2013 and it is now addressed in Section 3.2.2 of the updated BIA report despite being listed at the time of the SGP EPBC approval.
White-throated Needletail breeds in the northern hemisphere and is almost exclusively aerial. As such, the loss of individual areas of terrestrial habitat over such a large area is not expected to be significant and no SRI has been conducted for this species.</td></tr>
<tr><td>Geophaps scripta scripta (Squatter pigeon)</td><td>This species was erroneously assessed as 'possibly occurring' in the EA amendment area on the application of the 5 April 2024 and excluded on the basis that habitat impacts are approved under EPBC 2010/5344. There is, in fact, a record of a pair of Squatter Pigeons in the EA amendment area from 2012 and the assessment has been amended to 'Known to occur' (refer to Appendix L of this RFI response). However, remnant habitats in the EA amendment area are generally too heavily wooded to be considered high amenity, though non-remnant habitats are likely to be suitable. Despite suitable habitat being present, this species is likely to be vagrant with individuals not representing a resident or seasonal population and no SRI has been conducted for this species.</td></tr>
<tr><td>Grantiella picta (Painted honeyeater)</td><td>There is a record of Painted Honeyeater immediately to the west of the EA amendment area. Limited areas of suitable Brigalow habitat do occur, however, none of this habitat is impacted by the SGP North Stage 1 development. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Calytrix gurulmundensis (N/A)</td><td>This species was previously excluded from the assessment on the basis that habitat impacts are approved under EPBC approval 2010/5344. There are no known records for this species within the EA amendment area, however, areas ground-truthed as containing RE 11.7.4, 11.7.5, 11.7.6 and 11.7.7 are considered to represent 'general habitat'.
As this species is typically associated with ridge lines, it is likely that the area of general habitat significantly overestimates the area of occurrence for Calytrix gurulmundensis. There are no impacts on core habitat for this species, and as such, no PEMs values recorded. Pre-clearance surveys will be conducted in all proposed infrastructure areas prior to development proceeding in accordance with requirements under the NC Act. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Dasyurus maculatus maculatus</td><td>Being forest-dependent, this species is restricted to contiguous forested areas, such as the Barakula State Forest. The current status of this species in the Brigalow Belt is uncertain; most records are</td></tr>
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<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy's response</th></tr>
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<table>
<tr><td>Long-legged Worm-skink</td><td></td><td></td></tr>
<tr><td>Belson's Panic</td><td>Homopholis belsonii</td><td>Possibly occurring and suitable habitat present</td></tr>
<tr><td>Grey Falcon</td><td>Falco hypoleucos</td><td>Unlikely to occur and suitable habitat present</td></tr>
<tr><td>Ooline</td><td>Cadellia pentastylis</td><td>Known to occur and suitable habitat present</td></tr>
<tr><td>Heath Myrtle</td><td>Micromyrtus carinata</td><td>Likely to occur and suitable habitat present</td></tr>
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<tr><td>(Spotted tailed quoll)</td><td>greater than 40 years old with the exception of a single confirmed sighting of an injured animal near Tara and a record from 2022 on the Warrego Highway near Dalby. There is a single recent (1997) record to the south of the amendment area, however, the spatial uncertainty (54 km) means this record is unreliable. As such, this species is considered unlikely to occur. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Homoranthus decumbens (N/A)</td><td>While there is general habitat in the EA amendment area, extensive field survey did not identify any populations of this distinctive tree species. The nearest records are from Barakula State Forest, approximately 29 km to the north-east. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Xerothamnella herbacea (N/A)</td><td>While there is (limited) suitable habitat in the EA amendment area, the nearest record for this species is from 41 km to the east (ALA, 1984). Impacts on 110 ha of habitat for this species are approved under EPBC 2010/5344. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Rostratula australis (Australian Painted Snipe)</td><td>This species was re-examined in response to this RFI. The nearest reliable records for Australian Painted Snipe are from Lake Broadwater, with closer ALA records undated and spatially uncertain (10 km to 54 km). This species may be a rare visitor to freshwater wetlands associated with Dogwood and Punchbowl Creeks and – to a lesser extent – Bottle Tree Creek, however, its occurrence is 'possible' rather than likely. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Adclarkia dulacca (Dulacca Woodland Snail)</td><td>The nearest record for this species is 12.5 km to the east. It is associated primarily with Brigalow vegetation communities, which are very limited in extent in the Study area. General habitat (rather than core Brigalow habitat) was mistakenly included in the Biodiversity Impact Assessment report submitted with the EA amendment application on 5 April 2024. This mapping has been updated in the current revision of the report. Habitat for this species is not impacted by the Project footprint and no SRI has been conducted.</td></tr>
<tr><td>Acacia curranii (Curly-bark Wattle)</td><td>This species was re-examined in response to this RFI. Suitable habitat is present however, the only known population occurs near Gurulmundi State Forest where it is restricted to an area of less than 20 km in diameter. Records within the Study area were not reviewed by the QLD Herbarium and have since been discounted as misidentifications. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Westringia parvifolia (N/A)</td><td>This species is known only from four collections located over 100 km to the south of the EA amendment area (near Inglewood and Yelarbon). It was included based on the modelled distribution within the Protected Matters Search Tool (PMST) which appears to be contrary to the conservation advice for this species that restates the distribution information presented above. There are no nearby records. More detail has been included in the Likelihood of Occurrence assessment in Appendix D of the updated BIA report (refer to Appendix L of this RFI response). As such, no SRI has been conducted for this species.</td></tr>
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Item	Issue	Action required	Arrow Energy's response	
			Turnix melanogaster (Black-breasted Button-quail)	This species is associated with vine thicket and similar habitats (e.g. softwood scrubs, bottle tree scrubs) with a deep, well-developed and extensive leaf litter which are not present in the EA amendment area. The closest records are associated with RE 11.9.5 (Brigalow with vine thicket understorey) from north-eastern parts of Barakula State Forest (64 km to the north-east of the Study area). More detail has been included in the Likelihood of Occurrence assessment in Appendix D of the updated BIA report (refer to **Appendix L** of this RFI response) . As such, ***no SRI has been conducted for this species***.
			Egernia rugosa (Yakka Skink)	Whilst suitable habitat is present, this species is known to be rare and scattered in the east of its range. There have only been two records within 50 km of the SGP, one approximately 2 km east of Gurulmundi State Forest, and another approximately 6 km east of Condamine State Forest. Impacts to 310 ha of habitat for this species are approved under the EPBC approval 2010/5344. As such, ***no SRI has been conducted for this species***.
			Anomalopus mackayi (Five-clawed Worm-skink, Long-legged Worm-skink)	While there are some (limited) areas of cracking clay soils in the EA amendment area, this species has never been recorded west of the Condamine River. The nearest record is over 100 km to the south-east. As such, ***no SRI has been conducted for this species***.
			Homopholis belsonii (Belson's Panic)	Belson's Panic is typically associated with heavy clays, particularly Brigalow remnants. There are multiple records east of Dalby and in the north of the SGP around Wandoan but the closest records to the Study area are 16 km away. Brigalow remnants (RE 11.3.1 and 11.4.3) in the Study area represent general habitat only, and this species is regarded as 'possibly occurring'. There are no proposed impacts on any potential habitat areas for this species. As such, ***no SRI has been conducted for this species***.
			Falco hypoleucos (Grey Falcon)	This species typically occurs in drier, more open habitats than those present in the EA amendment area. There are four undated records within 50 km of the SGP and one old record (greater than 20 years) from Lake Broadwater (110 km to the south-east) is likely to represent a misidentifications or a very occasional vagrant. The species is rarely recorded within the Brigalow Belt and should be regarded as transient and unlikely to occur. More detail has been included in the Likelihood of Occurrence assessment in Appendix D of the updated BIA report. As such, ***no SRI has been conducted for this species***.
			Cadellia pentastylis (Ooline)	This species was originally included as 'Known to Occur' on the basis of two records within the EA amendment area. These were more closely examined in response to this RFI. A 1963 record at Myall Park is included in the Australian Virtual Herbarium, although accompanying notes indicate that this plant is cultivated. An additional low precision (5,121 m) observation is also shown in ALA approximately 5 km north of Myall Park. This is

<table>
<tr><th>Item</th><th>Issue</th><th>Action required</th><th>Arrow Energy’s response</th></tr>
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<tr><td></td><td>considered to be most likely the same cultivated record. Extensive searches for this distinctive species throughout the SGP have been unsuccessful and it is considered unlikely to occur. The nearest local collected samples is 23 km west of the Study area on the far side of Gurulmundi State Forest. Although Ooline occupies a range of substrates, local records from Gurulmundi State Forest are located in sandstone ravines. There are no known similar habitats in the EA amendment area. As such, no SRI has been conducted for this species.</td></tr>
<tr><td>Micromyrtus carinata (Heath Myrtle)</td><td>This species is only known from Gurulmundi State Forest, with a subpopulation located on the Wyona Property which is approximately 4 km west of the EA amendment area. Herbarium records indicate that Micromyrtus carinata is associated with the tops of laterised ridges. Associated habitats include heath and shrubland (RE 11.7.5) and low woodland (RE 11.7.4). These REs occur throughout the EA amendment area and are considered ‘general habitat’.
As this species is typically associated with ridge lines, it is likely that the area of general habitat significantly overestimates the area of occurrence for Micromyrtus carinata. There are no impacts on core habitat for this species, and as such, no PEMs values recorded. Pre-clearance surveys will be conducted in all proposed infrastructure areas prior to development proceeding in accordance with requirements under the NC Act. As such, no SRI has been conducted for this species.</td></tr>
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<tr><td>22.</td><td>Likelihood of occurrence relevant to SGP North

The Appendix D - Likelihood of occurrence table in the BIA report does not provide justification for the likelihood of occurrence status with conclusions that relate to the habitat characteristics of the site and the ecological needs/characteristics of the relevant species.

For example, the first species listed, the Australian Bittern is said to be unlikely to occur as "only scattered marginal habitat for this species is present within the project area." It is not evident from this description whether the context of this marginal habitat is important to the wider population of the Australian Bittern, whether the species has been recorded on site, what the wider known habitat distribution of the species is and where the site is located within that, how the species is expected to withstand the impacts associated with</td><td>1. Revise the likelihood of occurrence table to provide species specific and site-specific information to support the status identified for each species. Ensure that the justification for each species provides sufficient information to verify that the identified status is appropriate for that species.

2. To demonstrate a consistent approach has been applied to categorising the likelihood of occurrence for each species, provide the criteria used to identify each status i.e. unlikely to occur, possibly occurring, likely to occur and known to occur.</td><td>1. An updated likelihood of occurrence assessment is provided in Appendix D of the updated BIA report (refer to Appendix L of this RFI response) and includes specific information and justifications supporting the status of each identified species. Summaries of the likelihood of occurrence and the rationale for the assessment of the species is provided in the BIA report, in Section 3.1.3 for conservation of significant flora and in Section 3.2.3 for conservation of significant fauna.

2. The likelihood of occurrence criteria has been added to the updated BIA report in Section 2.1.2.1 (refer to Appendix L of this RFI response).</td></tr>
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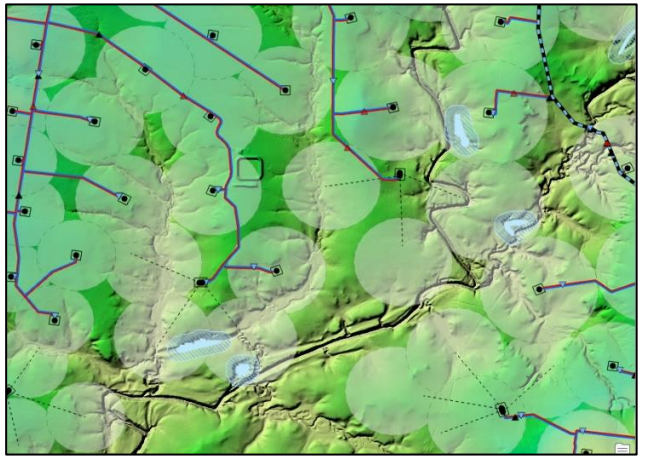
Item	Issue	Action required	Arrow Energy's response
	constructing wells and easements, whether there is feeding or breeding habitat characteristics present on site etc. Please note that absence of evidence (of species occurrence) should not be considered as evidence of absence.		
23.	The original application identified the following species as having a SRI, however, have not been identified in the proposed PEMs table: • Dulacca Woodland Snail - According to Figure 3.9 in the Attexo BIA report there are significant areas mapped as Dulacca Woodland Snail habitat that overlaps with the indicative infrastructure layout layer. This appears to be far greater than the originally quantified 1.2ha. • Painted Honeyeater - Appendix D of the Biodiversity Impact assessment (BIA) report identifies the Painted Honeyeater as likely to occur with suitable habitat present within the project area and historical records identified within 5km of the amendment area. The BIA report also identifies representative REs associated with the painted honeyeater as REs that are subject to disturbance. • Pale Imperial Hairstreak - Appendix A of the BIA report identifies the Pale Imperial Hairstreak as 'known' to occur and appendix D of the BIA report identifies the species as possibly occurring, due to suitable habitat present within the project area and historical records.	1. Ensure these species are investigated and it is appropriately justified why these species have been identified as present/not present or as having a significant residual impact (SRI) or not. Ensure the area of impact to habitat for these species, regardless of SRI, is quantified, as required by item 21.	1. The SGP North EA amendment application submitted on 5 December 2023, was for the development of 450 wells and included infrastructure on PL491. The well scope was reduced to 214 wells and the EA amendment was resubmitted on 5 April 2024. The likelihood of occurrence tables were revised to take account of the reduced scope, meaning that the records for Pale Imperial Hairstreak that were previously within 10 km of the SGP North development area, which is a key criteria for species to be considered 'likely to occur', are further away (10-50 km) with the reduced scope. As such, this species was downgraded to 'possibly occurring' and is no longer addressed in the main body of the BIA report. All three species, the Dulacca Woodland Snail, the Painted Honeyeater, and the Pale Imperial Hairstreak, have a particular association with Brigalow woodland habitats which are treated as 'core habitat' under Arrow Energy's existing arrangements with DESI. The initial 450 well infrastructure layout intersected 1.2 hectares of Brigalow habitat (a mixed polygon of RE 11.9.5/11.9.10) on PL491. This is no longer affected by the reduced layout of 214 wells. As such, there are no PEMs impacts associated with any of these species. With respect to mapping for the Dulacca Woodland Snail, the extent of mapping in Figure 3.9 of the updated BIA (refer to **Appendix L** of this RFI response) incorrectly displayed 'general habitat' rather than 'core habitat' for this species and therefore gave the impression that the extent of habitat was greater than indicated in the report. Similarly, habitat mapping for the Painted Honeyeater incorrectly mapped 'general habitat' rather than 'core habitat' as per the arrangements with DESI in relation to assessment of habitat impacts. This has been corrected in the updated BIA report (refer to **Appendix L** of this RFI response).
24.	**Significant residual impact assessment and Cumulative Impacts** The application does not provide a SRI assessment for PEMs identified as present or as having a likelihood of occurrence within the project area.	1. Taking into account the conclusions of the ecological report, provide a SRI Assessment for each relevant PEM, that addresses the suggested criteria according to the SRI Guideline.	1. The likelihood of occurrence assessment has been updated in the revised BIA report (refer to Section 2.1.2.1 and Appendix D of **Appendix L** of this RFI response), including the flora / fauna identified in item 21 of this RFI. A summary of the justifications for likelihood of occurrence and inclusion or exclusion from the SRI assessments have been provided in the table in the response to item 21.3 of this RFI.

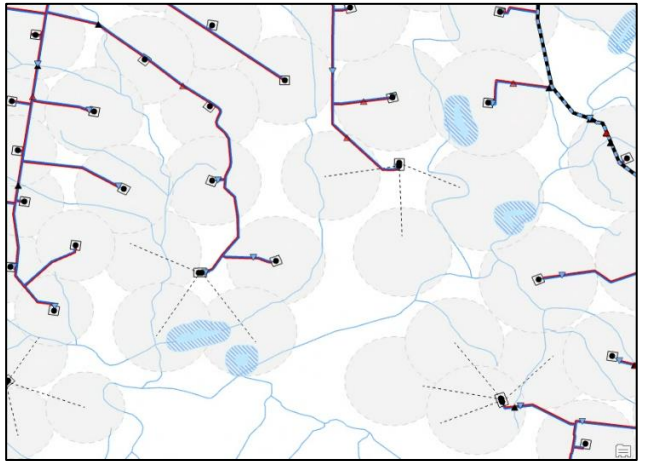
Item	Issue	Action required	Arrow Energy's response
	In order for DESI to identify whether there will be a SRI occurring to each relevant species, a suitably qualified person should: • clearly justify how the presence of the PEM and the likelihood of occurrence has been identified (refer to items 21 and 22) and • provide an assessment against the relevant criteria according to the SRI guideline or provide sufficient information for DESI to form conclusions against the relevant criteria. The Queensland Environmental Offsets Policy states the following: *"When an amendment to an existing authority is proposed (for example an amendment application for an existing environmental authority or development approval), the significant residual impact assessment relates to the cumulative impacts of the entire project - i.e. impacts proposed in both the existing authority and any additional impacts proposed in the amendment."* So that a SRI assessment can be made of the cumulative impacts of the entire project, the extent of impacts to PEMs on site to date, as well as those proposed, needs to be understood and quantified.	This SRI Assessment must be prepared by a suitably qualified person and must be representative of the site-specific characteristics of the habitat onsite and the behaviours of the relevant species identified. Should an SRI be triggered by the proposed activity, the application must demonstrate the 'avoid, mitigate, offset' mitigation hierarchy, as the department must be satisfied that all reasonable on- site avoidance and mitigation measures for the prescribed activity have been undertaken to address impacts on PEMs. 2. Identify the extent of impacts currently authorised on site to PEM (where relevant to activities authorised post the *Environmental Offsets Act 2014* (EO Act)) and quantify these impacts per PEM (regardless of SRI). a) Provide supporting information, including spatial data, to identify the applicant and extent of these impacts. b) Ensure that all proposed disturbances have been assessed cumulatively. 3. Ensure the response, as well as the actions to item 21, considers the cumulative impacts to PEMs in the preparation of SRI related information.	Significant Residual Impact (SRI) assessments have been undertaken in accordance with the Significant Residual Impact Guidelines (SRI Guidelines) (DEHP, 2014) in Section 4.4 of the SIA. The SRIs have been prepared by Senior Ecologists and reviewed by a Principal Environmental Scientist (refer to **Appendix L** of this RFI response). The mitigation hierarchy has been applied to address impacts on PEMs and planning and design considerations are presented in Section 4.1 of the BIA (refer to **Appendix L** of this RFI response). 2. The PEMs identified for the proposed development footprint for SGP North Stage 1 will be provided as spatial data (refer to **Appendix K** of this RFI response). Impacts to all PEMs are identified in Sections 4.2, 4.3 and 4.4 of the BIA. a) Spatial data is provided in **Appendix K** of this RFI response. b) All proposed disturbances for the SGP North Stage 1 development have been assessed (refer to **Appendix L** of this RFI response). Minimal disturbance has occurred on site which has complied with the current EA0001399 conditions. 3. The likelihood of occurrence assessment has been updated in the revised BIA report and actions to item 21 have been addressed. Cumulative impacts to PEMs have been addressed in Section 4.4 of the BIA report, including where there are adjacent impacts due to other historical disturbances. Arrow Energy believes that retrospectivity cannot be applied to cumulative impacts to PEMs due to existing infrastructure, as this existing infrastructure could have been constructed under previous versions of EAs with different PEMs values, or at a different time period where PEMs may not have been applicable and different regulatory and offset regimes.
25.	**Regulated vegetation within the defined distance of a watercourse** Section 4.4.3 of the BIA report states:	1. Identify how watercourse vegetation impacts have been quantified.	1. Impacts to watercourse vegetation have been calculated as per the distances set out in *Code 16: Native vegetation clearing of the State Development Assessment Provisions.* The following buffer distances have been defined to determine impacts on regulated vegetation within a defined distance from the defining banks of watercourses associated with the SGP North Stage 1 development:

Item	Issue	Action required	Arrow Energy's response
	Impacts on regulated vegetation within a defined distance from the defining banks of watercourses are within the existing approved limits specified in the EA. Table 5.3 identifies the proposed impact on watercourse vegetation for stage 1. It is not demonstrated how these numbers have been quantified and where the impacts will occur. Therefore, it is not evident to DESI whether these impacts have been appropriately calculated. Additionally, the proposed conditions have not sought to identify the stage 1 specific impact areas as identified in the BIA report Table 5.3 and also seeks to remove reference to which petroleum lease the impacts relate, which further un-identifies the location of such impacts. Some of these petroleum leases are not relevant to the proposed amendment which only relates to PL305, PL491 and PL492.	2. Identify the location of all proposed impact areas that have been used to quantify the overall impact to watercourse vegetation and describe the methodology used to identify these locations and areas. 3. Demonstrate how the relevant REs are consistent with the REs and occurrence in the area of interest, as identified in Table 3.3 of the BIA.	• Stream order 1 or 2 – 10 metres • Stream order 3 or 4 – 25 metres • Stream order 5 or greater – 50 metres. In the absence of Project-specific data defining the actual spatial location of defining banks, the watercourse centre line has been used to calculate the GTRE mapped vegetation within the defined distance relevant to the watercourse (refer to Section 4.3.2 of the BIA). 2. The impacts to major watercourse vegetation are specifically discussed in Section 4.4.3 of the revised BIA report (refer to **Appendix L** of this RFI response). Impacts on vegetation associated with the SGP North Stage 1 are provided in Table 5.4 of the revised BIA report. The majority of the creek crossings within the SGP North Stage 1 area are minor waterways, with three major crossings at Bottle Tree Creek (stream order 5), Dogwood Creek (stream order 5), and Punchbowl Creek (stream order 4). As per response to item 25.1, the impacts to watercourse vegetation have been calculated as per the distances set out in *Code 16: Native vegetation clearing of the State Development Assessment Provisions.* It is important to note that a review of the waterways crossing methodologies will be undertaken for the abovementioned major waterways (order 4 or higher) during the final engineering design phase of the SGP North Stage 1. in order to avoid environmental impacts on riparian woodland habitats and limit impacts to connectivity values for fauna habitat. The feasibility of utilising Horizontal Directional Drilling (HDD) is being assessed, as well as opportunities to reduce the RoW widths of creek crossings when they are open trenched. This is all subject to detailed design and engineering requirements. For further details please refer to Sections 4.1.3.1 and 4.1.3.2 of the updated BIA report (**Appendix L** of this RFI response). 3. Impacts on regulated vegetation within a defined distance from the defining banks of watercourses are within the existing approved limits specified in the EA apart from 0.2 ha of RE 11.5.1a (17a) and 0.2 ha of RE 11.7.2 (24a). The impact assessment in the updated BIA report includes identifying impacts and REs on regulated vegetation within a defined distance from the defining banks of the watercourses. The currently authorised EA already had sufficient REs identified.

Item	Issue	Action required	Arrow Energy's response
			Notwithstanding, based on the BIA report (refer to **Appendix L** of this RFI response), DESI can see where the impact assessment has been based upon.
26.	**Environmentally sensitive areas (ESAs)** The application identifies impacts to category C ESAs including essential habitat and of concern regional ecosystems. As per 13 May 2024, DESI has confirmed its position on the regulation of category C essential habitat ESAs via letter to the Australian Energy Producers. As per this letter DESI confirmed that impacts to 'essential habitat' will be addressed and conditioned as being both, areas validated by ground-truthing on the Queensland Government published essential habitat map and, areas validated by ground- truthing as protected wildlife habitat that is limited to the areas mapped as category A, B or C on the remnant vegetation management map. EA0001399 will be updated to reflect this clarified approach and therefore, this assessment should consider the confirmed approach and definition as identified in this letter. The application does not quantify impacts to ESAs or identify where these impacts will occur. It is noted the application seeks to group disturbances to ESAs to a single quantity for the whole site. The department's position remains consistent with what was stated in the pre-lodgement advice: *The applicant is welcome to provide proposed conditioning for the environmental authority for the department's consideration. However, the intent of the application should not be to seek authorisation for proposed conditioning, rather the intent should be to authorise proposed activities and associated impacts. Additionally, proposed conditioning should not interfere with providing the department the level of information*	1. Identify, with supporting information, the extent and location of impacts proposed to category C ESAs against each relevant trigger. 2. Provide the sum of ESA impacts, as requested above, per trigger at a tenure scale. 3. Ensure category C ESAs are considered consistent with the definition of category C ESAs as follows: Category C environmentally sensitive area means any of the following areas: • nature refuges as defined in the conservation agreement for that refuge under the Nature Conservation Act 1992 Guideline Streamlined model conditions for petroleum activities. • state forests or timber reserves as defined under the Forestry Act 1959 regional parks (previously known as resource reserves) under the Nature Conservation Act 1992. • 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 Vegetation Management Act 1999 for a species of wildlife listed as critically endangered, endangered, vulnerable under the Nature Conservation Act 1992. • 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 Vegetation Management Act 1992, for a species of wildlife listed	1. Impacted Category C ESAs are restricted to 'Of Concern' Regional Ecosystems (by Biodiversity status), mapped Essential Habitat and protected wildlife habitat. The extent and location of impacts on these areas are discussed in Section 3.2 of the revised BIA report (refer to **Appendix L** of this RFI response), with the SGP North Stage 1 footprint in relation to the spatial extent of these areas illustrated in Figure 3.2b of this report. 2. The sum of ESA impacts, per trigger at a tenure scale has been included in Section 5.1 of the revised BIA (refer to **Appendix L** of this RFI response). 3. The category C ESAs have been identified based on the definitions provided in this RFI with their location in the EA amendment area defined and identified in Section 3 of the revised BIA (refer to **Appendix L** of this RFI response).

Item	Issue	Action required	Arrow Energy's response
	needed to adequately assess environmental impacts and the appropriateness of approving offsets.	as critically endangered, endangered or vulnerable under the Nature Conservation Act 1992. • 'Of concern regional ecosystems' that are remnant vegetation and identified in the database called 'RE description database' containing regional ecosystem numbers and descriptions.	
27.	**Avoid mitigate hierarchy** Section 5.4.3 of the application Supporting Information Report identifies the biodiversity impact assessment methodology applied to the determination of locations for activities on site, relevant to the potential for biodiversity impacts. These principles do not clarify the efforts made relevant to the Stage 1, SGP North activities to avoid impacts to biodiversity matters and what particular matters were provided a larger weighing in these assessments.	1. Provide further discussion, relevant to the proposed locations for the SGP north Stage 1 activities, that identifies the site-specific characteristics that were considered in efforts to avoid and minimise impacts to PEMs.	1. Arrow Energy utilises its Area Wide Planning (AWP) procedure (refer to **Appendix M** of this RFI response) during the development planning process to determine the locations of its activities in order to avoid, minimise, or mitigate impacts from the planned activities. This strategy has allowed Arrow Energy to construct and operate in the Surat Basin. The AWP process utilises information from potentially affected landholders, the general community, and government requirements to determine the placement of infrastructure and well paths. Once the optimum layout is achieved in GIS, the data progresses to site scouting to verify in the field the well placement, the gathering alignments, and the locations for other infrastructure. During the AWP process, GIS data is used for constraints mapping when mapping the optimum layout for wells, gathering lines, access tracks, and other infrastructure. The constraints that are taken into account during the development planning process to achieve the optimum layout include: • Sensitive receptors, including landholder input and existing landholder infrastructure; • Reservoir quality, well drainage and deviated well paths; • Tenement boundaries; • Environmentally Sensitive Areas (ESAs); • Culturally significant sites; • Topography; • Major roads, rails, third-party pipeline crossings, and other surface constraints; • Well pad dimensions and well site infrastructure; and • Engineering designs. Arrow Energy also maintains a Land Disturbance Procedure that requires all proposed developments to follow the Avoid, Minimise & Mitigate hierarchy right from the Planning and Design phase. The application of this hierarchy will reduce the quantum of direct impacts to MNES and MSES and thus minimising the area requiring to be offset. Arrow Energy also uses its Offset Management Strategy,

Item	Issue	Action required	Arrow Energy's response
			which also seeks to prioritise the Avoid, Minimise, Mitigate, Rehabilitate & Offset hierarchy when it comes to project planning, and commits to the application of the Offset Principles specified in the Queensland Environmental Offsets Policy (DESI). The process as described above were used for determining the locations of the proposed activities for the SGP North Stage 1.
		2. Identify any matters or particular areas that were provided higher priority in efforts to avoid impacts and provide justification to support why these were priorities.	2. Some particular matters and areas that were provided higher priority in efforts to avoid impacts within the SGP North Stage 1 area were: • the location of the FCS in relation to distance to sensitive receptors; • the location of camps in already cleared areas where possible; • including deviated wells in the planning to avoid additional watercourse crossings (see example screenshots below); 

Item	Issue	Action required	Arrow Energy's response
			 • the use of already cleared areas to avoid further clearing (e.g., access tracks and gathering pipelines); • the use of colocation of infrastructure (e.g., gathering and access tracks in the same RoW to reduce impact); • avoidance of watercourses, Environmentally Sensitive Areas (ESAs), and Endangered or Of concern regional ecosystems; and • Avoidance of areas of cultural or indigenous significance. .
28.	The proposed amendment seeks significant disturbances and impacts to MSES and MNES including to endangered species. The impacts are proposed to be offset; however, it is noted that some offset sites can take up to 30 years to reach their full offset potential. Given this time lag between the offset being delivered in full and the impact this may result in long-term detrimental effects to the continuation of each MSES impacted. Depending on the offset location there may still be a significant reduction in available habitat in the local area.	1. Identify how the time difference between the impact and the offset reaching a conservation outcome will be minimised as much as possible.	1. If there is a Significant Residual Impact (SRI) to a MSES which requires offsets, offsets will be provided in accordance with the EO Act. This maybe through financial or land-based offsets. This is the legislative mechanism under the current legislation to offsets impacts to which there is a significant impact. If a financial offset is provided, once the payment has been made then the management of those offsets sits with the State Government. If a land based offset is to be provided, this will be done in accordance with the Queensland Environmental Offset Policy of which the suitability of the offset site relative to the impact site and the PEMS is measured and offset delivery plan submitted. The offset site must achieve a conservation outcome that counterbalances the SRI for which the offset is required. The land based offset will be done to minimise the time-lag between the impact and delivery of the offset.

Item	Issue	Action required	Arrow Energy's response
		Identify how these limitations in providing an offset have been considered in the determination that an offset is necessary and how an offset is to be provided.	The offset mechanisms available to Arrow Energy which are legislated under both the State and Federal Governments are limited when considering the time lags between delivering the offsets and the impacts of the Project. However, Arrow Energy have looked to avoid impacts that trigger offsets where possible based on its siting processes and engineering solutions as explained in the response to item 18.3. Notwithstanding, some impacts are unavoidable. Where these impacts result in an SRI, Arrow Energy are utilising the offset pathways available under the Offset Act and EPBC Act. Arrow Energy's offset strategy will use a combination of financial offsets and land based offsets.
Condition changes			
29.	Appendix A of the application provides summary of proposed SGP North EA (EA00010399) Amendments. However, in some instances, proposed changes to conditions have been requested with inadequate justification.	1. Provide further information to justify the proposed changes to conditions. 2. Where proposed changes are not administrative and result in changes to activities, identify how associated impacts to environmental values have been considered and where they have been addressed.	1. Further information to justify the proposed changes to conditions are provided in **Appendix A** of this RFI response. 2. Non-administrative changes addressing impacts to environmental values from changes in activities, i.e., addition of activities not included in the currently approved SGP North EA (EA0001399), were included in the corresponding sections of the EA amendment submitted on 5 April 2024, which is part of this RFI response and provided in **Appendix A** (refer to Section 5).
30.	To better inform changes to conditions of EA0001399, in a way that is concise and fit for purpose, consideration is required to the existing activities on site and how they relate to the ESA and PEM approvals.	1. In addition to identifying existing PEM impact areas, as required by item 24, identify: a. Existing ESA impacts areas and locations, identified per tenure and per relevant triggers; and b. The extent to which these existing impacts are authorised and the relevant authorising conditions.	1. In response to item 30: a. Consideration of impacts to ESA and PEMs from existing activities are not included as they are not the subject of this EA amendment application and because retrospectivity cannot be applied to ESA and PEMs impacts to existing infrastructure as this existing infrastructure could have been constructed under previous versions of the SGP North EA, or at a different time period where ESAs or PEMs may not have been conditioned. Existing exploration wells were drilled in 2011. As a result, Arrow Energy are unable to accurately identify existing infrastructure impacts to PEMS and ESAs as these are unlikely comparable to current conditioning. b. The extent to which existing impacts are authorised in the current EA is not the subject of this EA amendment application. Same as above, retrospectivity cannot be applied to ESA and PEMs impacts to existing infrastructure.

APPENDICES

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Appendix A. Updated EA (EA0001399) Amendment Supporting Information Report (V3.0) - DD MM 2024

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Appendix B. Draft EA (EA0001399) with marked-up changes (i.e, updated Appendix B of EA Amendment application 05/04/2024)

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Appendix C. Updated Noise Impact Assessment report (SLR Consultants)

Appendix D. Flare Noise Study report (GASCO for Arrow Energy, Doc Ref. Q12551A-C01 Rev0, Surat Upstream Development, 15 August 2019)

Appendix E. Updated Air Quality Impact Assessment report (SLR Consultants)

Appendix F. FCS Power station engine specifications

Appendix G. Greenhouse Gas (GHG) Abatement Plan SGP North Stage 1

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Appendix H. SGP North Stage 1 Additional infrastructure spatial files

Appendix I. Model for Effluent Disposal using Land Irrigation (MEDLI) Assessment Reports (GHD Consulting) – SGP North

Appendix I.1 a. MEDLI SGP North Temporary Accommodation Camp 500EP (Option 1)

Appendix I.1 b. MEDLI SGP North Temporary Accommodation Camp 500EP (Option 2)

T +61 7 3012 4000
F +61 7 3012 4001
ARROW ENERGY PTY LTD
ABN 73 078 521 936
LEVEL 39, 111 EAGLE ST
BRISBANE QLD
GPO BOX 5262 BRISBANE QLD 4001
ASX CODE AOE
info@arrowenergy.com.au
arrowenergy.com.au

Appendix I.2 MEDLI SGP North Warehouse/Office Facility

T +61 7 3012 4000
F +61 7 3012 4001
ARROW ENERGY PTY LTD
ABN 73 078 521 936
LEVEL 39, 111 EAGLE ST
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Appendix I.3 MEDLI SGP North Temporary Mobile Drilling Camps

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Appendix J. Treated Sewage Effluent and Greywater Management guide

Appendix K. SGP North Stage 1 updated spatial files (Government Format)

Appendix L. Updated Biodiversity Impact Assessment (Attexo Consulting)

Appendix M. Area Wide Planning procedure

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