21

SUBMISSION RESPONSES

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SUPPLEMENTARY REPORT TO THE EIS

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21 Submission Responses

This chapter presents Arrow's response to issues raised in public submissions on the Project EIS. Issues and responses are presented in this section in a series of tables according to the following:

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Note that Arrow's responses to the submission made by EHP (Submission S11) are provided in Section 22, and Arrow's responses to the submission made by SEWPaC (Submission S4) are provided in Section 23.

21.1 Project Approvals

Table 21-1 Project Approvals Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	3	There is no reference in this section or other parts of the EIS (e.g. Chapters 4, 17, 19, 32 & Appendix B) that unless an exemption and/or authorisation exists under another Act, DAFF approval is required for the use, interference and/or removal of any State-owned forest products and/or quarry material administered under the *Forestry Act 1959*. There is also no details on how the Project will avoid or minimise any adverse impacts (i.e. sterilisation including offset areas, restriction of utilisation and/or access) to currently exploited or other commercial deposits of quarry material authorised under the *Forestry Act 1959* by the project infrastructure. The Project should liaise with DAFF on all of matters concerning State-owned forest products and quarry materials as administered under the provisions of the *Forestry Act 1959*, forest products and quarry material on State lands and certain freehold lands, are owned by the State. The EIS should identify if any State-owned forest products administered under the *Forestry Act 1959* are likely to be used, interfered with or removed as a result of Project related activities. In such instances, the Project is to assist DAFF in arranging a timber salvage operation before the commencement of any Project related work. Where timber salvage is not possible and/or forest products are likely to be sterilised or restricted from utilisation (including offsets and loss of access for existing operations authorised under the *Forestry*	Project Approvals chapter (Section 2) of the SREIS	The EIS currently references the requirement of clearing permits for taking/interfering with protected plants / animals (Project Approvals chapter (Section 2.4.7) of the EIS). Also, Arrow acknowledged that any resource, including natural grown forest products and/or quarry material extracted, removed or sterilised from an area of State held tenure or State owner freehold land will require a sales permit under the *Forestry Act 1959.* The EIS identified that there are 84 Reserves and 53 allotments of Unallocated State Land in the Project area which may, over the life of the Project and in accordance with relevant approvals, be subject to activities related to the Project. In accordance with the Framework Approach developed for the impact assessment of the Project as per the ToR requirements, more detailed information regarding infrastructure locations will be presented at the EA application and EA amendment application stages of the approvals process. As specific locations of Project infrastructure is not yet available for the revised SREIS project description, the extent of forest products and quarry materials administered under the *Forestry Act 1959* which may be sterilised and/or restricted cannot be quantified accurately at this stage. Arrow will engage where required with DAFF to arrange

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		Act 1959) the Proponent may need to pay compensation to DAFF. The Project is obliged to contact DAFF to arrange authorisation and/or sales permit(s) before any work commences. However, if there are exemptions from the need to obtain such approvals from DAFF, the reasons why should be clearly stated. The EIS should identify the location and quantity of any State-owned quarry material, administered under the *Forestry Act 1959*, likely to be used by the Project. The Project is obliged to contact DAFF to arrange authorisation before any use of quarry material commences. If there are exemptions from the need to obtain such approvals from DAFF, the reasons why should be clearly stated. The Project should also identify where and if such quarry material could possibly be sterilised or restricted from utilisation (including offsets and loss of access for existing operations authorised under the *Forestry Act 1959*) and negotiate suitable arrangements with DAFF and other affected parties before any commencement of any Project related work. The Project should describe how infrastructure will be designed to avoid or minimise adverse impacts to currently exploited or other commercial deposits of quarry materials authorised under the *Forestry Act 1959*.		authorisation and/or sales permit(s) before any work commences and provide further details on the location and quantity of forest products and quarry materials when known.
S1	4	The Sustainable Planning Regulation 2009 describes various activities as 'Operational Works' rather than only those assessable under the *Fisheries Act 1994*. In particular, items 6, 7 and 8 in Table 4 relate to works that are for constructing or raising waterway barrier works, works in a declared fish habitat area; and removal, destruction or damage of marine plants respectively. The Project is advised of the relevance of the *Fisheries Act 1994* and that DAFF is the relevant authority. Approvals required under the *Fisheries Act 1994* for the Project will potentially include operational works approval for the construction or raising of waterway barrier works in a declared fish habitat area, and removal, destruction or damage of marine plants.	Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that Items 6, 7 and 8 in Table 4, Schedule 3 of the Sustainable Planning Regulation 2009 (SP Regulation) prescribes assessable development being 'Operational Works' for constructing or raising waterway barrier works, works in a declared fish habitat area; and removal, destruction or damage of marine plants. In relation to the applicability of such approval requirements for the Project, Arrow confirms that it may need to secure waterway barrier works permits to carry out activities through watercourses. However, as there is no declared Fish Habitat Areas and no marine plants in the Project area, Item 7 and 8 in Table 4, Schedule 3 of the SP Regulation

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		The Project should consult with DAFF during the detailed design stage for any and all waterway diversions, culvert or bed level crossings, rock armouring, or all and any other works within a waterway as defined under the *Fisheries Act 1994* for both permanent and temporary works, or works resulting in the disturbance of marine plants or within a declared Fish Habitat Area.		are not considered applicable to the Project. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more information regarding infrastructure locations will be presented at the EA application and EA amendment application stages of the approvals process. As specific locations of Project infrastructure are yet to be available for the revised project description for the SREIS, the location and quantity of waterway barrier works cannot be quantified accurately at the EIS stage. Arrow intend to engage with DAFF during the detailed design stage of the Project. This consultation will aim to identify all waterway diversions, culvert or bed level crossings, rock armouring, and any other works within a waterway as defined under the *Fisheries Act 1994* for both permanent and temporary works in order to secure the required approvals under the SP Act and *Fisheries Act 1994*. The presence of declared fish habitat areas has not been identified in the EIS and is not relevant to the Project area. As such, there are no requirements for approvals under the *Fisheries Act 1994* for the raising of waterway barrier works in declared fish habitat areas, including removal, destruction and/or damage to marine plants.
S1	5	Omission of policies developed by DAFF that should be considered in the assessment of the Project. The EIS should note that DAFF has developed the following policies under the Fisheries Act 1994 which are relevant to the Project. These polices should be referenced in the table as: • Management and protection of marine plants and other tidal fish	Project Approvals chapter (Section 2) of the SREIS	Arrow has included policy FHMOP008 in the revised Project Approvals chapter (Section 2) of the SREIS. As declared fish habitat areas have not been identified in the EIS and therefore not relevant for the Project, it has been determined that there are no requirements for approvals under the *Fisheries Act 1994*, for the raising of waterway barrier works in declared fish habitat areas, that

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		habitats FHMOP 001 http://www.daff.qld.gov.au/28_12908.htm#FHMOP001#FHMOP001 • Marine fish habitat offset policy FHMOP 005.2 http://www.daff.qld.gov.au/28_12908.htm#FHMOP005#FHMOP005 • Waterway barrier works approvals and fishway assessments: Departmental procedures FHMOP008 http://www.daff.qld.gov.au/documents/Fisheries_Habitats/FHMOP008-May-2012-V2.pdf • Management of declared fish habitat areas FHMOP 002 http://www.nprsr.qld.gov.au/managing/habitat-areas/index.html (now the responsibility of Department of National Parks, Recreation, Sport and Racing)		may include removal, destruction and/or damage to marine plants. As such, policies *FHMOP 001, FHMOP 005.2, FHMOP 002* are not considered relevant to the development of the Project. However, as waterway barrier works outside of declared fish habitat areas are still applicable to the Project, Arrow has included policy *FHMOP008* in the revised Project Approvals chapter (Section 2) of the SREIS.
S23	532	What are the ongoing governance requirements legislative and other? (including company policies, compliance, ongoing management).	Project Approvals chapter (Section 2) of the SREIS	Arrow's governance policies can be obtained freely: http://www.arrowenergy.com.au/careers/suppliers/corporate-governance.
S23	533	What are the strategies to ensure legislative change does not reduce the impact mitigation responsibilities in the regional area?	Project Approvals chapter (Section 2) of the SREIS	Prediction of future legislative change is not within the scope of the EIS. Legislative change will be complied with where relevant to the Project approvals.
S33	625	As a significant number of Vale's tenements are overlain by Arrow's petroleum tenements, Vale requires a schedule of Application for PLs, to assess the potential interruption to Vale's Development activities.	Project Approvals chapter (Section 2)	It is acknowledged that a number of Vale's tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining

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			of the SREIS	companies, such as Vale, to ensure that the value of the underlying gas and coal resources are maximised. It is acknowledged that Vale has requested Arrow to provide a schedule of applications for PLs, to assess the potential interruption to Vale's development activities, however, at this point in time a schedule of PL applications is not ready for issue to third parties. As specific locations of Project infrastructure are not currently available for the revised Project Description chapter (Section 3) of the SREIS, the timing and sequencing of PL / EA applications cannot be quantified accurately at this stage. Arrow will continue to liaise with Vale directly with respect to the rolling out of PL applications as the Project progresses. It is worth noting that the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • CSG tenements (overly non-coal / oil shale tenements) granted under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) and *Mineral Resources Act 1989*; • CSG (petroleum) tenements overlaid with coal / oil shale (mining) tenements; and • Tenements (applied for or granted) under the P&G Act that overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting

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				with all tenement holders which are overlaid by Project tenements.

21.2 Project Description, Gas Supply, Infrastructure Locations, Construction Materials, Development Schedule and Power Supply

Table 21-2 Project Description, Gas Supply, Infrastructure Locations, Construction Materials, Development Schedule, Power Supply and General Submission Responses

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S8	144	We note that there are currently no standards or legislation in place to guide recommended separation distances from gas field infrastructure. In lieu of such standards, the Department requests that the Department of Environment and Heritage Protection Landfill siting, design, operation and rehabilitation guideline (EM2319 v1) be used as a proxy. This standard stipulates in Table 1: Indicative buffer distances, 500 metres from a noise, dust or odour sensitive place is a recommended buffer distance. We request that a similar buffer zone be established from the boundary of the gas well enclosure, compressor or pipeline to the boundary of the no-go zone.	Environmental Framework chapter (Section 7.3.1.2 and 7.3.3) of the EIS.	Buffers used in the EIS were based on the current regulatory conditions at the time of the EIS, and may be subject to change in the future. The buffers that will be implemented for the Project will be in line with the regulatory requirements at the time of implementation. Arrow will locate wells and infrastructure away from homes in consultation with landholders (minimum of 200 m). The EIS assessed a worst-case scenario for potential impacts from air and noise emissions, as well as hazards, to establish the separation distance from wells, facilities and infrastructure that is required to meet statutory compliance limits at the nearest sensitive receptor. With specific regard to noise, an appropriate buffer distance, to be used for planning purposes, will be selected on the basis of attenuation options being considered during front end engineering design (FEED) and engineering detailed design.
S10	148	DEWS are concerned about the cumulative impact of LNG approvals on access to gas supply by domestic customers. References to domestic supply in the EIS are potentially confusing and may not provide domestic customers with sufficient reassurance that supply will continue or expand to support growth in the industrial sector. DEWS has received feedback from large domestic gas customers	Project Need chapter (Section 3.2.1) of the EIS.	The Project Need chapter (Section 3.2.1) of the EIS discussed the estimates of domestic gas resources by Geoscience Australia and Australian Bureau of Agricultural and Resource Economics and Sciences (ABARES). Estimates of gas reserves in eastern Australia are estimated to be sufficient to meet the projected growth in domestic gas and export consumption over the forecast

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		indicating that negotiation for new gas supply contracts over the last several years has been increasingly difficult and reports of completed contracts have been low. The scale of the LNG industry already committed has exceeded the reference case in the 2009 study referred to in Section 3.3.3 and a review is warranted. Each approved LNG project to date has provided the Government with written assurances that they will continue to supply gas to the domestic market. DEWS seek similar commitments from Arrow Energy.		period of 2030. Australia's gas resources are sufficient to sustain both a domestic and export industry (Project Need chapter (Section 3.2.3) of the EIS). Arrow will continue to honour its domestic gas agreements.
S10	150	Arrow states (footnote 18, page 51) that the Bowen Gas Project is expected to supply approximately 35 per cent of requirements for the LNG plant. The EIS processes for the entire end-to-end project (i.e. the up, mid and downstream activities) have been separated and progressed independently. Therefore, while the Bowen Gas Project is not directly exporting gas, its role in supplying around a third of the gas required by the proposed LNG plant means it is a fundamental component for the export of LNG. Consistent with Arrow's earlier comments (3.2.3.3 of the EIS Main Report, Volume 1, 3 - Project Need), should export not proceed, then development of the Bowen Basin would progress but on a smaller scale, at a slower rate, and with a reduced level of investment and economic output. DEWS considers this may not be consistent with Arrow Energy's role as the State's agent in developing gas resources. The production of gas at the optimum rate will ensure the best outcome for the state, as the resource owner, and the market in terms of gas availability for both export and domestic customers.	Project Need chapter (Section 3) of the EIS.	The EIS case presented was for the Project to provide 35% of the gas required for two LNG trains (4 mtpa). The SREIS reference case now proposes the Project provides 100% of one LNG train (4 mtpa).
S13	279	The EIS states that 6,625 wells will be developed over 40 years. Wells will be designed for a 15 – 20 year life.	Project Description	Since the publication of the EIS, the proposed number of well's has been reduced to approximately 4,000 wells, and

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		Current development plans comprise a number of well types that are under review and it is possible that a number of different well types will eventually be installed. QPWS is not able to fully assess and give approval for the installation of wells on QPWS managed areas if the style and type of wells that will be used are not yet certain. Arrow to provide certainty around what type of well type will be used within impacted ESA's (Arthur's Bluff State Forest) before final approval for the project is granted.	chapter (Section 3.3) of the SREIS.	the well types proposed have been revised. The development plan for use as the SREIS reference case involves drilling and completion of two base case well types: • Multi Branch Laterals (MBLs): multi branched horizontal wells (deviated well) drilled in-seam to intersect a vertical producer (production well);and • Multi-seam hydraulically stimulated: vertical, cased and cemented wells, which are perforated and fracture-stimulated to provide formation access (as presented in the EIS).
S13	280	The EIS states that prior to drilling, temporary drilling sites will be prepared. Preparation will involve construction of temporary pits to hold the fluids used for drilling. On ESA's the proponent should consider the use of tanks for storage of fluid for drilling on well pads. If this is not considered possible, please provide justification in supplementary information to the EIS why this not considered possible.	Project Description chapter (Section 3) of the SREIS.	The SREIS reference case currently proposes the use of pitless drilling, therefore; drilling throughout the Project area will utilise storage tanks for drilling fluids.
S13	282	In section 4.3.3.1 the EIS states that in the Bowen Basin, SIS wells are often used in a Chevron pattern where two SIS wells are drilled to intersect a vertical production well. This method increases the productivity of the well. The Arrow reference case design is a horizontal, SIS, dual lateral in a Chevron configuration (i.e. one vertical well and two horizontal production laterals intersecting the vertical one). This requires that three holes are drilled, from three separate surface locations, to provide one "dual lateral producer". On a nominal 800 m grid pattern, an indicative density of one producer well per 65 to 130 ha is typically expected. During the drilling phase, each well pad will occupy an area of	Project Description chapter (Section 3.3) of the SREIS.	Since the publication of the EIS, the well types proposed have been revised and the development plan for use as the SREIS reference case involves drilling and completion of two base case well types: • MBLs: multi branched horizontal wells (deviated well) drilled in-seam to intersect a vertical producer (production well);and • Multi-seam hydraulically stimulated: vertical, cased and cemented wells, which are perforated and fracture-stimulated to provide formation access (as presented in the EIS). It is noted that EA conditions at the time of the EIS are

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		8,100 m^2 (90 m x 90 m) such that for an SIS dual lateral producer, the required collective well pad area (for the three separate pads) will be 24,300 m^2. Under current Environmental Authority (EA) conditions for CSG Limited Petroleum Activities that are conducted on Category C ESAs (e.g. State forest) well pad size is limited to 1 ha for single wells and 1.5 ha for multi-directional wells. The area of impact that this EIS is contemplating for SIS chevron wells is far greater than this, at just under 3 ha and would therefore not be in accordance with standard EA conditions. QPWS recommends that SIS, dual lateral in a Chevron configuration wells are not to be constructed on Category C ESA. In the supplementary EIS, the proponent needs to acknowledge the restriction within ESA's of the maximum allowable well pad footprint size of 1.5ha for multi-directional wells and propose the use of well designs in those area accordingly. Information is also needed on how far apart well heads will be spaced on the chevron.		stated to be 1.5 ha for multi-directional well pads. Details on the revised well pad sizes are proposed for the SREIS base case are presented in the updated Project Description chapter (Section 3.3) of the SREIS. Each well pad for the MBL development scenario will typically be a multi-well pad (i.e. more than one well per pad). A well pad will typically consist of both lateral wells and vertical production conduits and will be mirrored by an additional well pad (with the same number of wells) approximately 400 m apart. For the whole of the Project area the distribution of each well pad configuration is anticipated to be as follows: • 4 wells (2 vertical + 2 lateral) = 130 m x 175 m; • 8 wells (4 production + 4 lateral) = 130 m x 235 m; and • 12 wells (6 production + 6 lateral) = 130 m x 295 m. Conditioning of well pad size limits will be in line with regulatory requirements current at the EA application stage of the Project. Additionally Arrow will utilise Project constraints mapping to guide the locations for well sites
S13	283	The EIS states that gas and water will be transported via separate flow line and trunk lines from wells to the compression and treatment facilities. The gas and water gathering lines are constructed of high-density polyethylene pipe. The minimum depth of burial will be 0.75m, the final depth of burial will be agreed with the landowner to minimise disruption to other land uses and risk of damage to the infrastructure. On Category C ESA (State Forest) gathering systems need to be constructed and buried at a sufficient depth such that it will allow		Arrow acknowledges the burial depths prescribed by the *Forestry Act 1995* in Category C ESAs and will consult with QPWS prior to placement of flow and trunk lines in Category C ESAs.

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		the safe conduct over the underground infrastructure of the range of activities permissible under the Forestry Act 1959 including but not limited to the felling, snigging, forwarding, storage, loading and/or haulage of forest products (as defined under the Forestry Act 1959) including log timber and quarry material; the unloading or loading of plant, equipment or other items including beehives or stock; the construction and/or maintenance of roads and/or tracks; and the conduct of fire maintenance, protection and/or control activities. In the supplementary information to the EIS the proponent needs to acknowledge the information provided above, and consult with QPWS in regards to the placement of flow and trunk lines.		
S13	284	The distribution of power from the production facilities to each individual wellhead via individual overhead and/or underground powerlines will be investigated to determine if there are practical, economic and environmentally acceptable alternative solutions to the use of local generation for each wellhead. QPWS have concerns about the installation of overhead powerlines on any QPWS managed lands due to the increased fire risk, clearing required for the installation and maintenance of the infrastructure and impacts on visual amenity. The installation of overhead powerlines has the potential to significantly increase the clearing required in areas of State forest. On Category C ESA, due to fire risk QPWS request that any powerlines on the State Forest be run underground. Overhead powerlines also affect the harvesting of native timber. The proponent should be required to run any proposed powerlines across State forest areas underground. Although if going through rough terrain, it might not be possible to go underground, there needs to be flexibility to pick the proposal	Project Description chapter (Section 3.6) of the SREIS.	The SREIS reference case is now based on underground powerlines being installed from the compression facility to each individual wellhead, rather than overhead powerlines, where feasible. Further to this, the SREIS reference case for supply of power is the supply of bulk electricity at 132 kV with the preferred option being to connect to existing transmission and / or distribution infrastructure in the Queensland electricity grid. Arrow will work with the Network Service Providers (NSP) to establish suitable 132 kV connections at local substations in the vicinity of the major facilities to be developed in the Project area. The electricity infrastructure connecting the main Arrow substations to the NSP substation will most likely be owned and operated by the NSP. This electricity transmission infrastructure providing the connection to the Queensland electricity grid will be subject to separate environmental approvals processes by the transmission NSP. The power to the main substations will be transmitted via

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		that gives the least impact. Also preference should be given to routing powerline corridors along existing cleared alignments (e.g. access tracks) to minimise disturbance.		double circuit overhead lines from the grid and will include a fibre optic ground wire for protection and communication systems. The electricity distribution to FCFs will be through 66 kV overhead powerlines and distribution to wellheads will be at 11 kV through overhead lines and where required underground power cables, and preferably in the same easement as the gas and water gathering lines. The final alignment of transmission lines will be informed by environmental constraints, and landholder considerations. The type, spacing and height of towers/poles will be determined and optimised during the detailed design, to reduce the number of towers/poles and achieve the required safety clearances to the ground, roads, structures and vegetation. Farming practices and equipment (e.g., irrigators) will also be considered in the detailed design. See the SREIS Project Description chapter (Section 3.6.4.1) for further details. An advantage that Arrow will achieve from making connection with the Queensland electricity network and running distribution lines to its wells, is that this option will eliminate the need to have a gas-fed generator at each wellhead. There will also be fewer well site maintenance visits (and associated impacts) as the need to maintain the generators will not be required. Above ground power distribution to the wells will be assessed during detailed design, however it will not be implemented when it conflicts with current farming practices and equipment used (e.g., irrigators).
S13	285	The EIS states that medium pressure infield pipelines will be constructed of a lightweight strong plastic composite; glass		Arrow acknowledges the burial depths prescribed by the *Forestry Act 1995* in Category C ESA and will consult with

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		reinforced epoxy (GRE) or steel lined. They will have a minimum burial depth of 1 m. The final depth of burial will be agreed with the landowner to minimise disruption to other land uses and risk of damage to the infrastructure. On Category C ESA (State Forest) gathering systems need to be constructed and buried at a sufficient depth such that it will allow the safe conduct over the underground infrastructure of the range of activities permissible under the Forestry Act including but not limited to the felling, snigging, forwarding, storage, loading and/or haulage of forest products (as defined under the Forestry Act) including log timber and quarry material; the unloading or loading of plant, equipment or other items including beehives or stock; the construction and/or maintenance of roads and/or tracks; and the conduct of fire maintenance, protection and/or control activities. In the supplementary information to the EIS the proponent needs to acknowledge the information provided above, and consult with QPWS in regards to the placement of medium pressure infield pipelines.		QPWS prior to placement of flow and trunk lines in Category C ESAs.
S14	292	The development plan does not include the effects the demands of the proposed infrastructure developments will have on regional supplies of extractive materials, such as sand, gravel and rock. Also the suitability of regionally-sourced extractive materials for use in the proposed infrastructure developments and alternative sources of this material are not discussed. Development plans must include information relating to availability and suitability of extractive, materials such as sand, gravel and rock. Also, the anticipated impact on other users of extractive materials and alternative sources of supply within the region should be provided.	Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K) of the SREIS	The Project construction activities will require crushed rock, gravel, sand and soil for construction of production facilities and accommodation camps. Materials will be purchased from commercial quarries and/or borrow pits developed on Arrow land in line with relevant legislation and regulations. Some quarry material is expected to be transported directly to site from suppliers and the potential impacts of this have been assessed in a revised Transport impact study (Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K) of the SREIS). A study into the availability of existing quarries will be

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				undertaken during the FEED phase (i.e., detailed planning) of the Project.
S14	293	The effects of proposed developments may have on extractive resources, including those contained within Key Resource Areas, and any mitigating factors are not discussed. The development plan should discuss measures to be taken to ensure that proposed infrastructure does not impact or alienate known sources of extractive materials or Key Resource Areas. In situations where impaction or sterilisation of known extractive resources is unavoidable, the commercial value of those resources also needs to be discussed.	Roads and Transport chapter (Section 12) and Road Impact Assessment (Appendix K) of the SREIS	Materials will be purchased from commercial quarries and/or borrow pits developed on Arrow land in line with all relevant legislation and regulations. Some quarry material is expected to be transported directly to site from suppliers and the potential impacts of this have been assessed in a revised Roads and Transport chapter (Section 12) and Road Impact Assessment (Appendix K) of the SREIS. A study into the availability of existing quarries will be undertaken during the FEED phase (i.e., detailed planning) of the Project.
S23	439	The full impacts of the delivery of power and water infrastructure to the sites has not been investigated at sufficient detail at all to provide a high level of confidence in the investment model and impacts on local environmental or social conditions.	Project Description chapter (Section 3.6) of the SREIS.	Potable water reticulation will be supplied from on-site water tanks, collecting rainwater runoff from the selected roofs. Additional water can be imported via tanker if required. Further details in relation to power supply for the Project can be found in the Project Description chapter (Section 3.6) of the SREIS.
S23	451	The future sourcing of long-term quarry resources has not been adequately addressed in the EIS especially knowing the total loss of the road infrastructure is assured at times in the project life.	Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K) of the SREIS,	Materials will be purchased from commercial quarries and / or borrow pits developed on Arrow land in line with all relevant legislation and regulations. Some quarry material is expected to be transported directly to site from suppliers and the potential impacts of this have been assessed in a revised transport impact study (Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K) of the SREIS). A study into the availability of existing quarries will be

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				undertaken during the FEED phase (i.e. detailed planning) of the Project.
S23	452	Where does the cumulative total of material come from that will rebuild the essential roads infrastructure when it is damaged by natural events of the project life?		It would need to be determined if Arrow would be the responsible entity for such repairs in the first instance. If any roads would be required to be repaired, materials will be purchased from commercial quarries and / or borrow pits will be developed on Arrow land. A study into the availability of existing quarries will be undertaken during the FEED (i.e. detailed planning) of the project.
S23	484	Exact locations of wells are not provided or known; will well locations be determined by geology, land use or waterways? Will the drilling of wells take into account environmental significance of the area as well as the landholder's property?	Environmental Framework chapter (Section 7.4.2) of the EIS. Project Description chapter (Sections 3.2 and 3.3) of the SREIS.	The Project Description chapter (Sections 3.2 and 3.3) of the SREIS includes an update to the Project development plan and discussion around the layout of wells. Gas field planning commences with the analysis of exploration and pilot well data to enhance Arrow's knowledge of the CSG reservoirs and their potential yield. Geologists and reservoir engineers highlight the most prospective reserves which are passed onto the field development planning and concept engineers who prepare a conceptual gas field layout. The well density and infrastructure required to transport and process the gas and CSG water is conceptualised and optimised. Technical feasibility of the resource recovery are the primary considerations at this stage in the development process. Field development engineers use a series of environmental constraints maps to determine the feasibility of constructing the conceptual gas field layout having regard to the environmental, social and cultural constraints. The conceptual layout is refined to produce a preliminary

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				design to facilitate landowner and stakeholder consultation, and field surveys of the potential sites and routes. Key considerations in this phase are technical feasibility (including constructability) and cost. Cost encompasses capital and operating costs, and the cost of mitigation including rehabilitation, which is primarily informed by the constraints and associated environmental management controls. Ecological and cultural heritage clearance surveys, along with geotechnical investigations inform any further refinement of the conceptual gas field layout, particularly the location and arrangement of production facilities and routes for gas and water gathering lines.
S23	488	What designs for the wells are being considered for the project and what will this mean for the area / drawing capability / contamination?	Project Description chapter (Section 3.3) of the SREIS.	Layout of wells and well type has been refined since publication of the EIS. Further details are presented in the updated Project Description chapter (Section 3.3) of the SREIS.
S23	490	Will facilities be an appropriate distance from existing open water bodies to prevent unwanted species attraction?	Constraints Mapping report (Appendix BB) of the EIS.	Facilities will be located according to constraints mapping in consideration of biodiversity and waterway constraints, including exclusion buffers for waterways in accordance with legislative requirements.
S23	537	What is the internal and external communications strategy for; Disaster management communications Stakeholder communication Local government communications	Community Consultation chapter (Section 5.3, Table 5-1) and Consultation	The Community Consultation chapter (Section 5) and Consultation Report (Appendix F) of the EIS outline the communication strategy for both stakeholders and local government (for a full list of stakeholders, refer to the Community Consultation chapter (Section 5.3, Table 5-1) of the EIS).

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			Report (Appendix F) of the EIS.	Disaster management planning and communications can only be outlined and developed at the pre-construction detailed design phase of the Project.
S23	538	What is the strategy for ICT infrastructure supply and maintenance? NBN and general day to day communications (e.g. phone towers) Communication strategy for emergencies in remote locations	Project Description chapter (Section 3.8.5) of the SREIS	The ICT strategy for infrastructure such as phone towers is outlined in the updated Project Description chapter (Section 3.8.5) of the SREIS. Emergency communication planning can only be outlined and developed at the pre-construction detailed design phase of the Project when infrastructure locations have been determined.
S26	576	The EIS refers to QR National. Please note that QR National has changed its name to Aurizon from 1 December 2012. This change should be reflected in the supplementary EIS documentation.		Noted. This has been amended throughout the SREIS.
S26	583	Rail lines for coal movement to the ports have been identified as a large user of electricity in the Project area. Measures to ensure that multiple users of the region's power supply are not adversely impacted by the additional pressure of the Arrow Bowen Gas Project development and operations, should be detailed in the EIS (Table 24-11) to demonstrate its consideration of existing users and management of existing energy supply.	Project Description chapter (Section 3.6) of the SREIS.	Further details in relation to power supply for the Project can be found in the Project Description chapter (Section 3.6) of the SREIS. The Network Service Provider will be responsible for the delivery of power to both the Project and other users in the area
S28	587	Specific areas of concern which are not addressed in the EIS are: • Development of significant infrastructure near the pipeline such as processing equipment, lay down areas, accommodation camps. EIM requests that the EIS includes specific management processes to ensure that any activity to be carried out within 500m of the pipeline is assessed, to ensure any potential risks it poses to the pipeline are managed.		Arrow will undergo required State and local planning approval for construction components of the Project and all existing infrastructure will be taken into account as part of this process. Arrow will undertake the selection of locations for production facilities, gathering lines and wells on the basis of many criteria including environmental and engineering constraints. Construction Management Plans will be in place prior to any construction activities to ensure any potential risks are identified and managed.

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S28	588	Specific areas of concern which are not addressed in the EIS are: • Drilling, blasting or vibration activities EIM requests that the EIS includes specific management processes to ensure that any activity to be carried out within 500m of the pipeline is assessed, to ensure any potential risks it poses to the pipeline are managed.	Project Description chapter (Section 4.6.2) and Draft EM Plan (Appendix Z, Section Z.4.10) of the EIS.	Construction Management Plans will be in place prior to any construction activities to ensure any potential risks are identified and managed. Arrow will undertake the selection of locations for production facilities, gathering lines and wells on the basis of many criteria including environmental and engineering constraints. Blasting is not anticipated during construction of the Project, but it was considered in the noise and vibration assessment should the need arise. During the construction of the facilities, drilling is likely to produce the highest levels of vibration of the equipment to be used. Using a conservative assessment, human annoyance and building damage are not expected to occur at distances greater than 70 m from the sites. Drilling activities are anticipated at distances greater than 70 m of any sensitive receptor, therefore no negative impacts are predicted from vibration. Drilling activities are covered extensively in the Project Description chapter (Section 4.6.3) of the EIS. Blasting and vibration are covered in the Draft EM Plan (Appendix Z.4.10) of the EIS.
S28	589	Specific areas of concern which are not addressed in the EIS are: • Other intrusive works being conducted on the easements or near the easements. EIM requests that the EIS includes specific management processes to ensure that any activity to be carried out within 500m of the pipeline is assessed, to ensure any potential risks it poses to the pipeline are managed.		Arrow will undergo required State and local planning approval for construction components of the Project and all existing infrastructure will be taken into account as part of this process. Arrow will undertake the selection of locations for production facilities, gathering lines and wells on the basis of many criteria including environmental and engineering constraints.

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				Construction Management Plans will be in place prior to any construction activities to ensure any potential risks are identified and managed. This will include the measures such as dial before you dig and the necessary notifications.
S29	592	Any redesign of Ergon Energy infrastructure required as a result of the proposal must take into consideration servicing and maintenance access requirements for Ergon Energy personnel and equipment. Where fencing prohibits access to and along infrastructure, gates must be supplied and installed at the proponent's expense.		Noted. Servicing and maintenance access requirements for Ergon Energy personnel and equipment will be taken into account if redesign of any Ergon Energy infrastructure is required.
S29	593	Proposed infrastructure registered over any part of an existing Ergon Energy easement must be subject to the conditions of our existing easement.		Arrow will undergo required State and local planning approval for construction components of the Project and all existing infrastructure will be taken into account as part of this process. Arrow will undertake the selection of locations for production facilities, gathering lines and wells on the basis of many criteria including environmental and engineering constraints. Construction Management Plans will be in place prior to any construction activities to ensure any potential risks are identified and managed. This will include the measures such as dial before you dig and the necessary notifications.
S31	607	Construction and infrastructure: QCC has concerns over the lack of certainty over the location of infrastructure, in particular the effect that: • The location of the well heads; • The location of compression facilities;	Project Description chapter (Section 3.2) of the SREIS.	The Project overlays a number of mining tenements, including Exploration Permits for Coal (EPC) and Mining Leases (ML) in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies to ensure the value of the underlying gas (for Arrow) and coal (for the relevant coal company). With regards to QCC,

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		• The techniques and methods of utilizing the infrastructure; and • Location of gathering lines, may have on mining operations and the potential sterilization of coal resources, and the increased risk factors for current and future coal mining activities.		Arrow has met and will continue to meet with QCC on a regular basis to allow each party to discuss their proposed plans to ensure cooperative co-development. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure.
S33	618	Vale as an affected party and stakeholder consultation: Several of Vale's proposed operations have not been considered within the study. Many of the concerns outlined in Section 4 are around lack of information as to location of infrastructure and associated activities of the project.		The Project overlays a number of mining tenements, including EPC and ML in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies to ensure the value of the underlying gas (for Arrow) and coal (for the relevant coal company). With regards to Vale, Arrow has met and will continue to meet with Vale on an ongoing basis to allow each party to discuss their proposed plans to ensure cooperative co-development.
S33	622	The EIS provides no proposed locations of above ground gas facilities and therefore Vale cannot adequately assess the opportunities or risks associated with these, should they occur within the future plans for mining operations in the area.	Project Description chapter (Section 3.2) of the SREIS.	The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure. Specifically, with regards to Vale, Arrow has met and will continue to meet with Vale on an ongoing basis to allow

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				each party to discuss their proposed plans to ensure cooperative co-development.
S33	625	As a significant number of Vale's tenements are overlain by Arrow's petroleum tenements, Vale requires a schedule of Application for PLs, to assess the potential interruption to Vale's Development activities.	Project Description chapter (Section 3.2) of the SREIS.	In Queensland, there currently is no legislative requirement for CSG tenure holders to provide to coal companies that hold overlapping tenure, a schedule for future Petroleum Lease Applications (PLA). Conversely, there is no current legislation requirement on coal companies to provide CSG companies that hold overlapping tenure, a schedule for its own Mining Lease Applications (MLA). Notwithstanding this, the Project overlays a number of Vale's tenements, including EPC and ML in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure the value of the underlying gas (for Arrow) and coal (for the relevant coal company). Accordingly, Arrow meets with Vale on an ongoing basis to discuss overlapping matters. In accordance with the Framework Approach and the 'Maximising Utilisation of Queensland's Coal and Coal Seam Gas Resources – A New Approach to Overlapping Tenure in Queensland', also known as the Overlapping Tenure 'White Paper', recently developed in consultation with the Queensland coal and CSG industries and relevant regulatory bodies, the most up to date detailed information regarding overlapping PLAs and infrastructure locations are currently discussed at the regularly held Vale / Arrow meetings. Conversely, as Vale's own development plans are created, Vale is encouraged to provide this information to Arrow at these meetings rather than by a schedule, to allow Arrow to assess the potential interruption to Arrow's Project activities.

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				Accordingly, the request for a formal schedule of future PLAs is redundant as: • The regular meetings between Vale and Arrow provides the avenue for the exchange of the most up to date schedule of each other's proposed activities; • As specific locations of Project infrastructure is not available for the revised project description, the timing and sequencing of PLAs / EA applications cannot be quantified accurately at this stage; and • Arrow's preferred procedure is to provide quantifiable detailed information regarding infrastructure locations when the PLA is made, rather than provide a future schedule that is subject to change. In summary, it is the responsibility of both Vale and Arrow to reach an agreement for each individual tenure overlap between them regarding the exploitation of their respective resources. Arrow will continue to liaise with Vale directly with respect to the "schedule" of its PLAs as the Project progresses. Arrow is always proactively consulting with all tenement holders which are overlayed by the Project tenements.
S33	626	Vale would like an indication of proposed material extraction points to assess potential impact to our activities in the project area.	Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K)	Materials will be purchased from commercial quarries and / or borrow pits will be developed on Arrow land. Some quarry material is expected to be transported directly to site from suppliers and the potential impacts of this have been assessed in a revised Roads Impact Assessment (Roads and Transport chapter (Section 12) and Road and Transport Technical Report (Appendix K) of the SREIS,). A study into the availability of existing quarries will be

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			of the SREIS,	undertaken during the FEED (i.e. detailed planning) of the Project. With regards to Vale specifically, Arrow has met and will continue to meet with Vale on an ongoing basis to allow each party to discuss their proposed plans to ensure cooperative co-development.
S33	629	Vale notes that this proposal would require a significant amount of small infrastructure to be located across the study area. Vale requires the location of these power generation units so that a thorough assessment of the impact to Vale owned land or tenure can be undertaken.	Project Description chapter (Section 3.2) of the SREIS.	The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure. Management commitments for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and groundtruthing methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations. With regards to Vale specifically, Arrow has met and will continue to meet with Vale on an ongoing basis to allow each party to discuss their proposed plans to ensure cooperative co-development.
S33	641	Vale requires a schedule of development to allow comparison of the project's development with development of Vale's exploration activities and expansion projects.	Land Use and Tenure chapter (Section	The Project Description chapter (Section 3.2) of the SREIS outlines the revised development plan and sequencing for the Project. Arrow will be in a position to more accurately determine

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			19.4.3) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	the schedule of PL applications upon the completion of the EIS / SREIS process, at the FEED detailed design stage. Any potential technical impacts that are specific to Vale's interests will be addressed within the co-development agreement with Vale, if these tenements are going to be potentially impacted. "The interaction of overlapping CSG production and coal mining needs to be managed with a 'co-development agreement', founded on the basis of mutual cooperation and coordination of the respective parties' activities, and providing the means to agree, monitor and communicate appropriate mechanisms to manage safety, commercial, operational and environmental matters." In Queensland, there currently is no legislative requirement for CSG tenure holders to provide to coal companies that hold overlapping tenure, a schedule for future PLA. Conversely, there is no current legislation requirement on coal companies to provide CSG companies that hold overlapping tenure, a schedule for its own MLA. Notwithstanding this, the Project overlays a number of Vale's tenements, including EPC and ML in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure the value of the underlying gas (for Arrow) and coal (for the relevant coal company). Accordingly, Arrow meets with Vale on a regular basis to discuss overlapping matters. In accordance with the Framework Approach and the "Maximising Utilisation of Queensland's Coal and Coal Seam Gas Resources – A New Approach to Overlapping Tenure in Queensland", also known as the Overlapping

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				Tenure "White Paper", recently developed in consultation with the Queensland coal and CSG industries and relevant regulatory bodies, the most up to date detailed information regarding overlapping PLAs and infrastructure locations are currently discussed at the regularly held Vale / Arrow meetings. Conversely, as Vale's own development plans are created, Vale is encouraged to provide this information to Arrow at these meetings rather than by a schedule, to allow Arrow to assess the potential interruption to Arrow's Project activities. Accordingly, the request for a formal schedule of future PLAs is redundant as: The regular meetings between Vale and Arrow provides the avenue for the exchange of the most up to date schedule of each other's proposed activities; • As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PLAs / EA applications cannot be quantified accurately at this stage; and • Arrow's preferred procedure is to provide quantifiable detailed information regarding infrastructure locations when the PLA is made, rather than provide a future schedule that is subject to change. In summary, it is the responsibility of both Vale and Arrow to reach an agreement for each individual tenure overlap between them regarding the exploitation of their respective resources. Arrow will continue to liaise with Vale directly with respect to the "schedule" of its PLAs as the Project progresses. Arrow is always proactively consulting with all tenement

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				holders which are overlayed by the Project tenements.
S33	643	Vale requires notification of the proposed location of project infrastructure with enough notice to allow assessment of impact to Vale owned land and tenure.	Project Description chapter (Section 3.2) of the SREIS.	The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure. In Queensland, there currently is no legislative requirement for CSG tenure holders to provide to coal companies that hold overlapping tenure, a schedule for future PLA. Conversely, there is no current legislation requirement on coal companies to provide CSG companies that hold overlapping tenure, a schedule for its own MLA. Notwithstanding this, the Project overlays a number of Vale's tenements, including EPC and ML in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure the value of the underlying gas (for Arrow) and coal (for the relevant coal company). Accordingly, Arrow meets with Vale on a regular basis to discuss overlapping matters. In accordance with the Framework Approach and the “Maximising Utilisation of Queensland’s Coal and Coal Seam Gas Resources – A New Approach to Overlapping Tenure in Queensland”, also known as the Overlapping Tenure “White Paper”, recently developed in consultation with the Queensland coal and CSG industries and relevant regulatory bodies, the most up to date detailed information regarding overlapping PLAs and infrastructure locations

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				are currently discussed at the regularly held Vale / Arrow meetings. Conversely, as Vale's own development plans are created, Vale is encouraged to provide this information to Arrow at these meetings rather than by a schedule, to allow Arrow to assess the potential interruption to Arrow's Project activities. Accordingly, the request for a formal schedule of future PLAs is redundant as: • The regular meetings between Vale and Arrow provides the avenue for the exchange of the most up to date schedule of each other's proposed activities; • As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PLAs / EA applications cannot be quantified accurately at this stage; and • Arrow's preferred procedure is to provide quantifiable detailed information regarding infrastructure locations when the PLA is made, rather than provide a future schedule that is subject to change. In summary, it is the responsibility of both Vale and Arrow to reach an agreement for each individual tenure overlap between them regarding the exploitation of their respective resources. Arrow will continue to liaise with Vale directly with respect to the "schedule" of its PLAs as the Project progresses. Arrow is always proactively consulting with all tenement holders which are overlayed by the Project tenements.
S35	656	We share and support the comments and concerns raised by Mackay Conservation Group, particularly the concern over the validity of the EIS due to the inadequacy of information provided on	Environmental Framework chapter	The Framework Approach was developed for the impact assessment of the Project, as per the Terms of Reference (ToR) requirements. The Framework Approach is used in

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		the location of gas wells and associated infrastructure	(Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management commitments for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations.
S35	657	The EIS does not meet the basic requirements of the Precautionary Principle and does not provide the government or public with the necessary information to comment upon and assess the project impacts without such information (location).	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of

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				the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations.
S35	660	Description of the project and planning at the bottom of page 11, first column: 'development planning is iterative and will be ongoing through the life of the Project as gas reserves mature and actual production is realised.' We struggle to understand how gas reserves 'mature'. If there is a maturation process, we believe that this would have occurred along time ago in geological timeframes, not human based approval process timeframes. For the proponent to describe how the gas reserves 'mature' and what is truly meant by this statement, given our comments above.		The maturation process referred to for the Project, is referring to the ongoing exploration of the Project Area (8,000 km^2), and the term maturation hence reflects the ongoing appraisal and increasing certainty of the volume of gas reserves available throughout the Project area for future gas production.
S35	662	It is unclear if the 800m by 800m grid (or maybe larger) would have a gas well on each corner of the grid square, which would actually make four (4) wells per 64-65 hectares and not just the one (1) well described. Provide clear information if the grid pattern will have up to four wells on 64-65 hectares?	Project Description chapter (Section 3.3) of the SREIS.	Layout of wells and well type has been refined since publication of the EIS. Further details are presented in the updated Project Description chapter (Section 3.3) of the SREIS. Also see Figure 3-4 for a visual representation of the SREIS reference case well layout.
S36	678	Justification for the project:	Project Need chapter	ToR requirement: "The justification for the project should be described, with particular reference to the economic

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		In our view this is not made. We believe there may be a case for short term use of gas to supplement variability of renewables but this is a project for the export of fossil fuel that has nothing to do with domestic need.	(Section 3) and Project Description chapter (Section 4.1) of the EIS.	and social benefits and costs to the community and other industries arising from the Project, including employment and spin-off business development that the Project may provide. The status of the Project should be discussed in a regional, state and national context". The above requirement has been satisfied in the Project Need chapter (Section 3) of the EIS. The Project has been designed to assist in meeting the growing demand for gas supply for both domestic and global markets – Project Description chapter (Section 4.1) of the EIS.
S37	680	The proponent states that "…at this stage, it is not possible to establish the specific detail on the location of all infrastructure or its design or layout." FBA submits that the proponent should be required to have the full details of the project finalised before an EIS is released for public comment. This will allow for all potential impacts (particularly those that are geographical, e.g. corridor fragmentation) to be accurately assessed within the environmental impact assessment process. The proponent needs to describe the full detail of the proposed project in a revised EIS, and the re-submit this document for consideration under the public comment process.	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and groundtruthing methodologies. Site specific EM Plans will be prepared for the associated

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				EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	690	Location information has not been fully and properly addressed. This is of concern because the EIS does not meet the basic requirements of the Precautionary Principle. The real difficulty lies in the absence of any ongoing environmental assessment of approved CSG projects under either state or federal regulation. Once a CSG project is approved, the approval is enduring and the explorer is not required to undergo further environmental evaluation, even if new scientific data emerges. And a CSG assessment can't be suspended on the basis of inadequate environmental data.	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and groundtruthing methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	691	We would expect that the location of unconventional gas wells and supporting infrastructure should be provided in order for this EIS to be valid.	Environmental Framework chapter	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the

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		Refer to ToR section 3.1.2 Local context.	(Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and groundtruthing methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	692	Obviously the location of proposed unconventional gas wells and supporting infrastructure does need to be provided so that EIS assessment can be properly undertaken. Arrow Energy needs to do what all other mining companies do and first conduct its exploration investigations to identify gas resources which are economically viable then proceed to the EIS process to see if such locations are also socially and environmentally acceptable and development licenses can be issued. Otherwise the public has no opportunity for access to information on which to comment. We see in this EIS application just an open-ended process for Arrow Energy with:	EIS Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan

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		• The location and final number of gas wells – unknown; • Baseline studies to record methane emissions prior to exploration – not conducted; • How many times the wells will be mined i.e. through later return-fraccing (can be up to twenty times) – unknown; • Where gathering lines and access roads and other supporting infrastructure will be located – unknown; • Impacts on water supplies – unknown etc. How can the public comment on environmental and social impacts if we have no locations for the wells and number of wells expected per affected property? How can DERM and other relevant government agencies properly assess impacts? The EIS process is clearly set by precedent. First do the exploration and identify areas to be mined. Then when sufficient information has been gathered apply for the EIS. To have a legitimate assessment process the EIS should be re-submitted after the exploration work is completed and Arrow Energy can show where it will be going and the extent of its impacts. This is what the coal and minerals mining companies must do. Why should the unconventional gas mining companies be different?		and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management commitmentes for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	693	Arrow Energy appears to be trying to circumvent the EIS process. For example the Integrated Planning Act states: "1.2.1 Purpose of Act The purpose of this Act is to seek to achieve ecological sustainability by — (a) Coordinating and integrating planning at the local, regional and State levels; and (b) Managing the process by which development occurs; and	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2)	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure.

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		(c) Managing the effects of development on the environment (including managing the use of premises)." How can (a) coordinating and integrating planning at all government levels and (b) managing the process by which development occurs and (c) managing the effects of development on the environment, if the location of the development (i.e. wells and supporting infrastructure) and other impacts is not known nor presented in the EIS?	of the SREIS.	The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and groundtruthing methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	694	Mackay Conservation Group put in a submission on the draft ToR requesting that the location of the gas wells and supporting infrastructure be made a part of the EIS. Capricorn Conservation Council also made this request. This has not happened. We have seen no good reason why this essential part of an EIS has not been addressed. It makes the whole Arrow Energy EIS process lack credibility.	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2)	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project

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			of the SREIS.	infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management commitments for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	695	The public has no information on the location of the wells and supporting infrastructure. Thus it is not fully aware of the nature of the project and it is severely restricted in preparing a properly informed submission. This negates the validity of this EIS.	Environmental Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS.	The Framework Approach was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Management commitments for potentially impacted

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				environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
S38	697	What is not discussed is how competitive gas from this project will be in competition with the glut of shale gas from the United States over the short to medium term. Also there is the cautionary tale for unconventional gas development in Queensland from the U.S. experience with shale gas.		Noted.
S38	698	A recently published report reviewing production data of over 60,000 shale gas and oil wells observes that U.S. shale gas has been on a plateau since December 2011, and that 80 percent of shale gas production comes from five plays, several of which are in decline. Further, according to a recent report by the Oil and Gas Journal, and industry publication, it is confirmed that the recovery efficiencies of shale plays are truly dismal. It is stated: "The recovery efficiency for the five major [shale gas] plays averages 6.5% and ranges from 4.7% to 10%...this contrasts significantly with recovery efficiencies of 75-80% for conventional gas fields." This means a highly competitive market for Arrow Energy's gas production from this project. Lower prices will mean far less revenue for the Queensland government. There is also the high degree of risk for investors as described below. From this perspective this gas is better off left in the ground.	Project Need chapter (Section 3.5) of the EIS.	Noted. There are significant economic benefits to the region and the State which will be generated by the Project, as presented in the Project Need chapter (Section 3.5) of the EIS.

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S38	699	Industry relies heavily on fewer business hurdles to affect their drilling programs. Margins are simply too thin in shales and the well performance too poor to justify investment in wells with added regulatory and environmental costs. This suggests that the present mining industry's increased pressure on the Queensland government to decrease regulatory and environmental costs as unconventional gas resources decline will continue, to the detriment of communities and the environment.		Noted.
S53	1313	Where is drilling mud stored and managed and what is its toxicity. Are any reports relative to this commercial in confidence?	Project Description chapter (Section 4.6.2) of the EIS.	Drilling muds are typically contained in specially constructed above ground tanks or excavated pits on site during the drilling process. Drilling muds are composed of drilling fluid and the crushed rock particles generated during the drilling process. The drilling fluids employed by Arrow comprise generally non-toxic and inert substances that are broadly utilised throughout the petroleum and gas industry in Australia. In accordance with the EA conditions, neither oil nor synthetic based fluids are used in the drilling process.
S53	1325	Can the gas transfer infrastructure locations relative to landholders residents and communities be more specific, what are the regulations for proximity to the above.	Project Description chapter (Section 3.2) of the SREIS.	The updated Project Description chapter (Section 3) of the SREIS presents indicative locations of Project infrastructure. The revised Project Description chapter (Section 3.2) of the SREIS details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a description, and likely general locality of major infrastructure. Mitigation measures for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies.

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				Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations.

21.3 Climate, Air Quality and Greenhouse Gas

Table 21-3 Climate, Air Quality and Greenhouse Gas Submission Responses

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S17	352	The proponent has not provided adequate information in relation to the site location or density of proposed wells for any assessment human health to be undertaken. The QPHS recommends that the proponent provides Health Impact Assessment based on air quality. This assessment should include worst case scenarios. This should include but not be limited to the locations of sensitive receivers in relation to: • The closest extraction well and the highest density of extraction wells surrounding sensitive receivers. • Emissions from evaporation ponds. • A cumulative air assessment of air emissions from other industries.	Air Quality chapter (Section 9), Air Quality Technical Report (Appendix H) and Draft Environmental Management Plan (Appendix Z, Section Z.4.1.3) of the EIS Air Quality Technical Report (Appendix B, Section 5.2) of the SREIS	The air quality impact assessment presented in the Air Quality chapter (Section 9) and Air Quality Technical Report (Appendix H) of the EIS was completed in line with QLD Air Environmental Protection Policy, which is designed to protect human health. The assessment was conducted at regional and local scales. The Air Quality Technical Report (Appendix B) of the SREIS incorporated all the latest changes to Arrow's field development plan and conceptual design for the Project, including updated conceptual locations of the Project infrastructure. In the EIS, estimated emissions from permanent gas-fired power generation for the whole Project was assessed. However, in the SREIS, the preferred power supply option for the Project is based on connection to electricity network. As such, electrical power supply will significantly reduce emissions of local air pollutants from the Project and the number of Project related air emission sources. However, SREIS considered a worst-case scenario, assuming that connection to the electricity network is not achieved on time and the Project is temporary powered locally by gas-fired engines. The EIS and SREIS assessments were completed based on a number of conservative assumptions and for a number of worst-case scenarios (see Air Quality Technical Report (Appendix B) of the SREIS) at local and regional scales,

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				including cumulative impacts of air emissions from the Project and existing and future industry (based on the available information). Please note that in the SREIS cumulative assessment, emissions from 68 current and future approved projects were assessed and ground level concentrations were predicted for 286 sensitive receptors in the area. The EIS localised impact assessment determined the minimum separation distances (buffer distances) between Project sources of air pollution and any proximate sensitive receptors to achieve compliance with the NO_2 health-based objective. These distances were reassessed in the SREIS based on new engineering and infrastructure information; however, it is acknowledged that upon finalising locations and completion of the detailed design of specific facilities, further modelling will be undertaken by Arrow. It is important to note that the Draft Environmental Management Plan (Appendix Z, Section Z.4.1.3) of the EIS states: "The primary mitigation measure to avoid impacts to air quality will be the exploration of opportunities to maximise the distance of Project development sites from the nearest sensitive receptors. Large separation distances are made possible due to the typically low population density within the Project area. Once locations are finalised, equipment selection and design during detailed engineering will include consideration of air quality objectives." Arrow has a CSG water management strategy which is informed by the EHP Coal Seam Gas Water Management Policy. Arrow will seek to beneficially use or dispose of CSG water in proximity to the point of treatment through one or more of the processes described further in the Project Description chapter (Section 3.4 and 3.5) of the SREIS.

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				The evaporation of volatile compounds from the surface of evaporation dams is expected to be negligible. However, further consideration of potential VOC emissions from the evaporation of brine once the detailed design has been finalised at the Environmental Approvals stage will be undertaken.
S18	366	Airborne particulate matter, as well as gas, fumes and odours should not cause distress to the local inhabitants. It is recommended that landholders in the immediate vicinity of the Project be advised of any by-product, which is likely to affect their health.	Air Quality chapter (Section 9 and 9.6.2) and Air Quality Technical Report (Appendix H) of the EIS Air Quality Technical Report (Appendix B, Section 5.2) of the SREIS	A comprehensive air quality impact assessment is reported in –the Air Quality chapter (Section 9) and Air Quality Technical Report (Appendix H) of the EIS, and Air Quality Technical Report (Appendix B) of the SREIS. The assessment describes the air pollutants which will be released by the Project, including NO_2, VOCs, CO, SO_2, particulate matter and odour, and includes predictive modelling or qualitative assessment of their dispersion. The modelling shows that at the regional scale there will be no exceedences of the standards set for the protection of human health as a result of air pollution from the Project. The localised impact assessment determined the minimum separation distances (buffer distances) between Project sources of air pollution and any proximate sensitive receptors. These distances have been reassessed in the SREIS based on new engineering and infrastructure information (Air Quality Technical Report (Appendix B, Section 5.2) of the SREIS), however it is acknowledged that upon finalising locations and completion of the detailed design of specific facilities, further modelling will be undertaken by Arrow. The assessment also indicates that the only significant odorant, which may be related to the Project, is hydrogen sulphide emissions from gas flaring and fugitive emissions. However, if present, hydrogen sulphide would be in trace amounts and won't create a nuisance issue.

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				In the Air Quality chapter (Section 9.6.2) of the EIS, Arrow has committed to the implementation of a quantifiable monitoring and measuring program during operational activities. This would provide information as to whether health based pollutant standards are being exceeded as a result of Project activities. Public notification of monitoring will be in accordance with legislative guidelines.
S18	367	It is recommended that a detailed and quantifiable air monitoring and measuring program is developed and implemented during operational activities.	Air Quality chapter (Section 9.6.2) of the EIS Commitments Summary (Appendix D) of the EIS	Arrow has committed to the implementation of a quantifiable monitoring and measuring program during operational activities [B030] (Commitments Summary (Appendix D) of the EIS).
S23	412	<u>Not meaningfully addressed in EIS:</u> The project proposes low grade infrastructure immunity levels subject to inundation and natural disaster loss at very low thresholds with little consideration to having to renew infrastructure connections in adverse weather conditions and the re-supply of large volumes of raw infrastructure materials and the movement and sourcing of these components in landscapes of scarcity; i.e. road making materials.	Climate chapter (Section 8) of the EIS Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C, Section 7) of the SREIS	Arrow considers climate change adaptation in planning and design, construction, operation and decommissioning phases of the Project. This includes developing preventative and responsive measures for extreme climatic events and designing and constructing production facilities in accordance with current Australian standards to withstand extreme occurrences of these events, as described in the IPCC, Special Report of the Intergovernmental Panel on Climate Change (IPCC). Managing the Risks of Extreme Events and Disasters to Advance Climate Change Adaptation (IPCC 2012, Cambridge University Press). Arrow operates a Crisis and Emergency Management System which includes a Corporate level Emergency Management Standard and Crisis and Emergency Management System Description. As a major asset, operations in the Bowen Basin are subject to the Bowen Basin Emergency Management

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				Plan, which includes emergency management actions for the management of risks from bush fires and flooding. Arrow is committed to the following actions to mitigate the effects of extreme weather events on the Project: • Design to address increased intensities of storm events; • Incorporate seasonal and weather forecasts for planning Project activities; • Consider future climate change effects in emergency response planning; and • Repair damaged infrastructure based on higher standards to withstand local climate extremes with contingency for climate change, where possible. Risk management measures that will be adopted in the development of the Project are described in the Greenhouse Gas Technical Report (Appendix I, Section 7.7.3) of the EIS. Furthermore, Arrow is committed to taking a cooperative approach with government, industry and other sectors to address adaptation to climate change.
S23	413	The EIS does not describe the extent of the particulate and gas contamination levels beyond the petroleum tenement lease above the existing pre-development background levels measured at the property boundary as the proposed operations cumulative effect will affect the health and wellbeing amenity of surrounding rural residents and is unsustainable without long term adverse effects on health and agricultural production.	Air Quality chapter (Sections 9.5.2 and 9.5.3) of the EIS Air Quality Technical Report (Appendix B, Section 5.2) of the SREIS	In the EIS, atmospheric dispersion modelling was used to predict pollutant concentrations in the region and local area. Contour plots of the regional dispersion of these pollutants are shown in the Air Quality chapter (Section 9.5.2) of the EIS and localised impacts are assessed in Section 9.5.3. In the air quality assessment, all modelled concentrations were added to the best available conservative estimates of background pollution at the property boundary which were either taken from the nearest available representative monitoring site or modelled. The modelling shows that at a regional scale there will be no exceedences of the standards set for the protection of human

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				health as a result of air pollution from the Project. The localised impact assessment determined the minimum separation distance (buffer distance) between Project sources of air pollution and any proximate sensitive receptors to achieve compliance with the NO_2 health-based objective. The buffer distances have been reassessed in the SREIS based on new engineering and infrastructure information (Air Quality Technical Report (Appendix B, Section 5.2) of the SREIS), however it is acknowledged that upon finalising locations and completion of the detailed design of specifc facilities, further modelling will be undertaken by Arrow.
S23	414	The reduction in emissions shall be focused on industry best practice by ensuring all the operational components of the project are mapped and quantified. The EIS should clearly propose up front a draft particulate mitigation strategy to prevent biodiversity and agricultural production losses.	Air Quality chapter (Section 9.6) of the EIS	It is not anticipated that particulates will be a major source of air pollution from the Project and the air quality modelling shows that their concentrations will be below the corresponding EPP (Air) objectives. However, the Air Quality chapter (Section 9.6) of the EIS provides generic mitigation strategies for pollutant emissions including dust which will be incorporated into the environmental management plan for the Project.
S23	424	The EIS should clearly detail the cumulative effect of Greenhouse gas production of the FIFO and DIDO operational methodology of workforce residency for the project and propose local offset programs to deliver carbon neutral transport for the project.	Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS	An update to greenhouse gas emissions is provided in the Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS and quantifies the cumulative effect of Greenhouse Gas production from the FIFO and DIDO of staff. These are included as additional Scope 3 emissions in the SREIS. Arrow is committed to exploring options for offsetting greenhouse gas emissions, which could be offset by investing in third party projects such as forestry that reduce emissions below a demonstrated baseline.
S25	571	Chapters 10 and 20 of Arrow Energy's SREIS do not adequately	Climate	The location of the end use is irrelevant when considering the

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		address requirements of the Sustainable Planning Act (2009) with regard to greenhouse gas emissions. The EIS and SREIS assessments are incomplete and fail to address sustainable ecological development requirements of the Queensland Government's Sustainable Planning Act (2009) (The Act) and permit comprehensive environmental assessment under the EPBC Act. The Act requires holistic consideration of climate change impacts of greenhouse gas emissions associated with the development and operation of production wells, transportation of coal seam gas production to end users and the combustion of gas and/or LNG. No detail is provided in the SREIS to establish proportions of production intended for domestic end use as gas vis-d-vis the proportions intended for export as LNG. Without end use information being provided no holistic assessment of ecological sustainability of the project is possible and no assurance that the purposes of The Act relating to climate change abatement can be achieved is provided.	chapter (Section 8) and Greenhouse Gas Emissions chapter (Section 10) of the EIS	impact of the Project on global climate. Project emissions, including Scope 3, are negligible in the context of global emissions. The transition to gas fired power generation is a recognised transitional step in reducing national and international GHG emissions. The Project is, therefore, consistent with the principles of sustainable development.
S25	572	The Chapter 20 Table 20.4 requires revision to include greenhouse gas emission information associated with ocean transportation and end use of LNG exports for electricity generation purposes to ensure that purposes of The Act are not compromised for reasons listed below: 1. Ecological sustainability is a balance that integrates protection of ecological processes, economic development, and maintenance of the cultural, economic, physical and social well-being of people and communities; 2. Queensland's Sustainable Planning Act (2009) requires consideration of ecological sustainability at local, regional, State and National levels including the global climate change implications;	Climate chapter (Section 8) and Greenhouse Gas Emissions chapter (Section 10) of the EIS	The location of the end use is irrelevant when considering the impact of the Project on global climate. Project emissions, including Scope 3, are negligible in the context of global emissions. The transition to gas fired power generation is a recognised transitional step in reducing national and international GHG emissions. The Project is, therefore, consistent with the principles of sustainable development.

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		3. Matters described in the SREIS do not include the holistic consideration of ecological sustainability requirements set out in item 1, and it presently fails in its purpose to protect ecological processes.		
S33	623	0.0007% of global emissions is a poor comparison. The actual amount of emission when considering the context in Australia is quite significant. Vale requires further information on the cumulative impact to the region.	Executive Summary chapter (Section 6.3), Greenhouse Gas chapter (Section 10.4.2.1) and Cumulative Impacts chapter (Section 31.4.2) of the EIS	Actual statement reads: "The Project's predicted carbon dioxide equivalent (CO_2-e) emissions are 0.007% of global emissions (based on a 2009) baseline for the worst-case operational year (2046)". Refer to the Executive Summary (Section 6.3) of the EIS. This was summarised from the Greenhouse Gas chapter (Section 10.4.2.1) of the EIS which states: "The aggregate Scope 1 and Scope 2 emissions from the Project associated with the worst-case year (2046) appear to be insignificant and represent approximately 0.007% of the global 2009 fossil fuel consumption emissions". Project emissions as a percentage of global, Australian and Queensland totals are shown in the Executive Summary (Section 6.3, Table 9) of the EIS. The cumulative impact from greenhouse gas emissions is addressed in the Cumulative Impacts chapter (Section 31.4.2) of the EIS.
S36	672	Scope 1 emissions - Fugitive emissions should include a realistic assessment based on current science and on findings in other gas fields such as Tara in Australia and large gas fields in the USA. Refer to http://www.bloomberg.com/news/2013-04-09/shale-gas-isn-t-a-low-emissions-fuel-yet.html	Greenhouse Gas Technical Report (Appendix I, Sections A.3.2 and A.3.3) of the EIS Greenhouse Gas Technical	The methodology adopted for the assessment of fugitive emissions from the Project is described in Sections A.3.2 and A.3.3 of the Greenhouse Gas Technical Report (Appendix I) of the EIS. For facility level production and processing the method uses the American Petroleum Institute of Greenhouse Gas Methodologies for the Oil and Gas Industry default emission factor modified to represent the Project site. For gas transmission the National Greenhouse Accounts Factors (2011) were used. These remain the best available assessment methods for assessing GHG emissions from

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			Report (Appendix C, Section 8) of the SREIS	Australian CSG at this time. It should also be noted that conclusions which are drawn from the assessment of emissions from the extraction of shale gas cannot be applied to Australian CSG where the underlying strata and extraction techniques can be very different to US shale. Fugitive emissions have been reassessed in the SREIS based on new engineering and infrastructure information and the best available assessment methods (Greenhouse Gas Technical Report (Appendix C, Section 8) of the SREIS). An advanced approach was used in the assessment based on the updated global warming potential (GWP) values for methane and nitrous oxide. The updated GWP values were published in the IPCC in the Physical Science Basis (Cambridge, UK: Cambridge University Press, 2007). The NGER (Measurement) Amendment Determination 2013 (Explanatory Statement) outlines the intention to adopt these values from 2017 onwards. These values have been used to adjust the emissions factors used in calculations.
S36	673	Greenhouse Gas emissions - Scope 1 emissions: Andrew Steer of the World Resources Institute (WRI) writing in Bloomberg. http://www.bloomberg.com/news/2013-04-09/shale-gas-isn-t-a-low-emissions-fuelyet.html "Methane leaks are estimated to be around two to three precent of total production – though there is troubling uncertainty around the total. The biggest source of emissions is from new wells. Starting up a new gas well is like popping a Champagne bottle: it releases gas under pressure quickly and with force. Emissions can also leak out through the production process, if proper safeguards are not in place. The EIS process should be one of assessing risk factors so that a balanced view can be prepared to enable decisions to be reached	Greenhouse Gas Technical Report (Appendix I, Sections A.3.2 and A.3.3) of the EIS Greenhouse Gas Technical Report (Appendix C, Section 8) of the SREIS	The methodology adopted for the assessment of fugitive emissions from the Project is described in Section A.3.2 and A.3.3 of the Greenhouse Gas Technical Report (Appendix I) of the EIS. For facility level production and processing the method uses the American Petroleum Institute of Greenhouse Gas Methodologies for the Oil and Gas Industry default emission factor modified to represent the Project site. The National Greenhouse and Energy Reporting (NGER) methods often refer to methods published by the American Petroleum Institute which provide more conservative estimates than the NGER determination. For gas transmission the National Greenhouse Accounts Factors (2011) were used. These remain the best available assessment methods at this time.

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		in the interests of the entire community. Risks are related to (1) Can technology be improved to stop the 'Champagne cork?' (2) Can technology reduce persistent losses? (3) What will be the proponents monitoring strategy? Clearly this should be financed by the proponent in the initial agreement to avoid the vicissitudes of successive government in reducing funding. Risk (1) should be demonstrated with a pilot study before the EIS is accepted and there should be a research and implementation program for (2) and (3).		Fugitive emissions have been reassessed in the SREIS based on new engineering and infrastructure information and the best available assessment methods (Greenhouse Gas Technical Report (Appendix C, Section 8) of the SREIS). An advanced approach was used in the assessment based on the updated GWP values for methane and nitrous oxide. The updated GWP values were published in the IPCC in the Physical Science Basis (Cambridge, UK: Cambridge University Press, 2007). The NGER (Measurement) Amendment Determination 2013 (Explanatory Statement) outlines the intention to adopt these values from 2017 onwards. These values have been used to adjust the emissions factors used in calculations.
S36	674	<u>Greenhouse Gas emissions - Scope 1 emissions:</u> In the words of Steer "Some companies and environmental groups, including major players like Shell and the Environmental Defence Fund, are working together to create best practices. By demonstrating that cost-effective technologies are available and will get more methane to its destination, other companies will hopefully decide to follow". It is of concern to Doctors for the Environment Australia that approvals for CSG mining are being given before these problems are solved. This leads one to ask what is Arrow doing and what is the degree of risk if these strategies are not successful?	Greenhouse Gas Technical Report (Appendix I, Section7 and Table 6-1) of the EIS Greenhouse Gas Technical Report (Appendix C) of the SREIS	The Project is subject to international, national, state and corporate greenhouse gas policies with abatement objectives and performance standards (Greenhouse Gas Technical Report (Appendix C, Section 2) of the SREIS). Arrow is committed to complying with all mandatory international, national and state objectives and remains committed to the mitigation measures described in the Greenhouse Gas Technical Report (Appendix I, Table 6-1) of the EIS and the climate change adaptation commitments described in Section 7 of the same report. The best available assessment methods at the time were used to assess the impacts from Project greenhouse gas emissions. The impacts have been reassessed in the SREIS based on new engineering and infrastructure information (Greenhouse Gas Technical Report (Appendix C) of the SREIS). Arrow monitors and manages well head emissions in accordance with the Code of Practice for Coal Seam Gas Well

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				Head Emissions Detection and Reporting (COP). The requirements of well head monitoring are detailed in a formal Leak Management Plan. Arrow has conducted a risk assessment to identify the risks posed by leaks from well sites and has implemented appropriate actions to reduce these risks to as low as reasonably practicable as required under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) (see the Greenhouse Gas Technical Report (Appendix C, Section 8.2.4) of the SREIS). Detected leaks are repaired as soon as practical in line with the requirements of Arrow's Leak Management Plan.
S36	675	Greenhouse Gas emissions - Scope 1 emissions: How are the fugitive emissions listed in table 10.4 derived, and are the figures listed based on 3%? Steer says "According to the most recent estimate from EPA, more than 6 million metric tons of fugitive methane leaked from U.S. natural gas systems in 2011. In terms of climate impacts, that's equivalent to 432 million metric tons of CO_2 per year over a 20 year time horizon." So that the public can understand the Arrow proposal it is appropriate that we have the metric tons CO_2 that will be leaked per annum if all the wells are commissioned. This should be based on both best and worst case scenarios.	Greenhouse Gas Emissions chapter (Section 10, Table 10.4) and Greenhouse Gas Technical Report (Appendix I, Table A.3-11) of the EIS Greenhouse Gas Technical Report (Appendix C) of the SREIS	The emissions presented in Table 10.4 of the Greenhouse Gas chapter (Section 10) of the EIS were estimated using the methodology described in Section A.3.2 of the Greenhouse Gas Technical Report (Appendix I) of the EIS. The method uses the American Petroleum Institute of Greenhouse Gas Methodologies for the Oil and Gas Industry default emission factor modified to represent the Project site. For gas gathering / distribution from wells to facilities the National Greenhouse Accounts Factors (2011) were used. Table A.3-11 of the Greenhouse Gas Technical Report (Appendix I) of the EIS shows the estimated CH_4 emissions associated with facility level fugitives from production and processing in t CO_2-e (metric tonnes of equivalent carbon dioxide) for each year of the Project, which is consistent with the ToR. "Equivalent Carbon dioxide" or "CO_2-e" is a term for describing different greenhouse gases in a common unit. For any quantity and type of greenhouse gas, CO_2-e signifies the amount of CO_2 which would have the equivalent global warming impact. The greenhouse gas emissions from the Project have been

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				reassessed in the SREIS based on new engineering and infrastructure information (Greenhouse Gas Technical Report (Appendix C) of the SREIS). Arrow monitors and manages well head emissions in accordance with the COP. The requirements of well head monitoring are detailed in a formal Leak Management Plan. Arrow has conducted a risk assessment to identify the risks posed by leaks from well sites and has implemented appropriate actions to reduce these risks to as low as reasonably practicable as required under the P&G Act (see the Greenhouse Gas Technical Report (Appendix C, Section 8.2.4) of the SREIS). Detected leaks are repaired as soon as practical in line with the requirements of Arrow's Leak Management Plan.
S36	676	Scope 3 emissions - These should now be included in the EIS for the following reasons. (1) Combustion of the mined gas at any site in the world has health impacts on Queensland and Australia as evidenced by the data on the frequency and severity of extreme weather events. Therefore this information becomes part of the health impact assessment. (2) It also becomes part of the economic assessment of the project, EIS being an independent assessment of the positive and negative impacts on the Australian community as a whole.	Greenhouse Gas Emissions chapter (Section 10.3) of the EIS Greenhouse Gas Technical Report (Appendix C) of the SREIS	The largest scource of Scope 3 emissions, end combustion of gas has been assessed as per the ToR in the Greenhouse Gas Emissions chapter (Section 10.3) of the EIS. The Scope 3 emissions from the Project have been reassessed in the SREIS based on new engineering and infrastructure information (Greenhouse Gas Technical Report (Appendix C) of the SREIS). Additionally Scope 3 emissions from DIDO and FIFO travels were assessed in the SREIS. Furthermore, in order to be conservative in estimating the Scope 3 emissions from third party infrastructure, the Scope 1 and Scope 2 emissions associated with the worst-case emissions scenario for the Arrow LNG Plant were used. This worst-case scenario is defined as the use of four LNG trains sourcing power from the national grid exclusively. These estimates were then scaled according to the currently expected fraction of gas supplied by the Project. It should be noted that Scope 3 emissions associated with the

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				Project are negligible in the context of global emissions
S36	677	Greenhouse Gas emissions - Scope 3 emissions: In 8.5.4 - The expected impacts of climate change on the project are summarised. The Scope 3 emissions of the project are listed per annum and for the life of the project as about 420 Mt CO_2-e. Thereafter these should be considered in other Sections e.g. 23, where they are presently omitted from economic risks and in health impact assessment risks.	Greenhouse Gas Technical Report (Appendix C) of the SREIS	The Scope 3 emissions from the Project have been reassessed in the SREIS based on new engineering and infrastructure information (Greenhouse Gas Technical Report (Appendix C) of the SREIS). Additionally Scope 3 emissions from DIDO and FIFO travels were assessed in the SREIS. Furthermore, in order to be conservative in estimating the Scope 3 emissions from third party infrastructure, the Scope 1 and Scope 2 emissions associated with the worst-case emissions scenario for the Arrow LNG Plant were used. This worst-case scenario is defined as the use of four LNG trains sourcing power from the national grid exclusively. These estimates were then scaled according to the currently expected fraction of gas supplied by the Project It should be noted that Scope 3 emissions associated with the Project are negligible in the context of global emissions. Similarly, It should be noted that Scope 3 emissions are non-Project emissions, as defined in the Greenhouse Gas Emissions chapter (Section 10.3) of the EIS. As such consideration of potential Scope 3 emissions impacts on economic and health risks are not within the area of influence of the Project or scope of the EIS assessment.
S38	696	It is incumbent on Arrow Energy to prove that its greenhouse gas emissions across the full life cycle of the unconventional gas it proposes to mine are actually less than those of coal. This will mean baseline monitoring of pre-mining methane gas levels across all of its exploration and mined sites, as well as monitoring for the life of the wells and following closure.	Greenhouse Gas Emissions chapter (Section 10) of the EIS Greenhouse Gas Technical Report (Appendix C,	The EIS has assessed greenhouse gas emissions in accordance with the Project ToR in the Greenhouse Gas Emissions chapter (Section 10) of the EIS. The greenhouse gas emissions from the Project have been reassessed in the SREIS based on new engineering and infrastructure information (Greenhouse Gas Technical Report (Appendix C, Section 7) of the SREIS). Arrow is committed to the ongoing assessment of Project's

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			Section 7) of the SREIS	emissions, energy consumption and production through schemes which include: • National Greenhouse Emissions Reporting System; and • Energy Efficiency Opportunities (as amended). Arrow monitors and manages well head emissions in accordance with the COP. The requirements of well head monitoring are detailed in a formal Leak Management Plan. Arrow has conducted a risk assessment to identify the risks posed by leaks from well sites and has implemented appropriate actions to reduce these risks to as low as reasonably practicable as required under the P&G Act (see the Greenhouse Gas Technical Report (Appendix C, Section 8.2.4) of the SREIS). Detected leaks are repaired as soon as practical in line with the requirements of Arrow's Leak Management Plan.
S38	700	The contention that unconventional gas is a transition fuel to renewable is now in doubt, as leakage from unconventional gas wells is now acknowledged to be higher than the industry has previously estimated. Possibly up to eight per cent rather than the industry estimate of 0.12 per cent. This means that in many cases greenhouse gas emissions may be as high as those from coal when the full life cycle of these fossil fuels is taken into account. Unconventional gas may be of little use as a transition fuel to renewable energy sources to lower greenhouse gas emissions when its full cycle emissions are considered. Arrow Energy will be adding to rather than causing a decrease in global greenhouse warming as claimed in the EIS. This means they will be contributing to the demise of the Great Barrier Reef through increase ocean temperatures caused by the anthropogenic contributions to global warming.	Greenhouse Gas Emissions chapter (Section 10) of the EIS Greenhouse Gas Technical Report (Appendix C) of the SREIS	Arrow monitors and manages well head emissions in accordance with the COP. The requirements of well head monitoring are detailed in a formal Leak Management Plan. Arrow has conducted a risk assessment to identify the risks posed by leaks from well sites and has implemented appropriate actions to reduce these risks to as low as reasonably practicable as required under the P&G Act (see the Greenhouse Gas Technical Report (Appendix C, Section 8.2.4) of the SREIS). Detected leaks are repaired as soon as practical in line with the requirements of Arrow's Leak Management Plan.

Section 21 Submission Responses

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S53	1320	CSG produce water management: How extensive are the baseline studies to these specific areas and do they include air quality monitoring prior to any CSG activity to draw a comparison.	Draft Environmental Management Plan (Appendix Z) of the EIS	Representative baseline pollutant levels will be determined prior to ongoing monitoring as per the mitigation and monitoring outlined in the Draft Environmental Management Plan (Appendix Z) of the EIS.

21.4 Groundwater

Table 21-4 Groundwater Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S10	151	In the 3rd paragraph 4th sentence reference is made to "…a depth below…." without describing that depth or the depth of alluvium in the area.	Groundwater chapter (Section 14.4.2.1) of the EIS	The description of Quaternary alluvial aquifers in Section 14.4.2.1 of the Groundwater chapter (Section 14) of the EIS incorporates findings from a report prepared by JBT Consulting in 2010, which includes discussion on the depth of the alluvium, and the saturated thickness of the alluvium. The JBT Consulting report documents the groundwater impact assessment for the Grosvenor Coal Project EIS, which is located to the north of Moranbah, and within Arrow's Moranbah Gas Project. The JBT Consulting (2010) report provides results of a ground penetrating radar (GPR) investigation along the Isaac River which runs through the central portion of the proposed Grosvenor underground mine location. Findings of the GPR survey indicated that the sand thickness within the stream bed of the reach of the Isaac River investigated ranged from approximately 1.5 to 3.0 meters (m). A clay layer was identified beneath the sand horizon, and was interpreted to potentially impede downward drainage of water stored in the Quaternary alluvium. Test pits were excavated within the Isaac River channel to facilitate the completion of the GPR survey, and most of the test pits were reported to be dry, or only damp in the base layer (JBT Consulting, 2010). The results of the GPR survey were compared with information from exploration drilling data collected from within the Grosvenor mining lease. The drilling data also

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				supported the observation that in most locations, the basal sands of the Isaac River are dry, and groundwater is located adjacent to the Isaac River in older formations (e.g. Tertiary sediments) at depths greater than the depth of the basal sands (i.e. deeper than 3 m). Groundwater within the alluvium associated with the Isaac River occurs in discontinuous lenses and typically in the basal sands. The information presented in the EIS conceptualises the relationship between the thickness of the alluvium and the depth to the watertable. The relative depths as can be used to understand the likelihood of surface water and groundwater interaction without presenting detail on the actual depths.
S10	152	In the 3rd paragraph 1st sentence reference is made to the confining units having "…very low vertical hydraulic conductivity" in their current state. No reference is made to their vertical hydraulic conductivity post hydraulic stimulation. Recent investigations in Western Australia have shown that hydraulic stimulation of shale seams has resulted in strata disturbance up to 1,000 m distant from the point of disturbance, both horizontally and vertically.	Groundwater chapter (Section 14.4.2.6) of the EIS	Fractures caused by hydraulic stimulation propagate in a direction perpendicular to the least principal stress. In the Bowen Basin, the least principal stress is vertical, consistent with the compressive stress state. Hence, fractures in this Basin will propagate in a horizontal plane. In addition, the target formations for hydraulic stimulation in the Bowen Basin are coal seams which are of much lower density and strength than surrounding competent rock such as sandstone and shale that form the inter-burden and confining layers. Because of the relative weakness of the coal and shallow depth (compared with typical shale gas targets, such as in WA) relatively low pressures are required to generate fractures in this material, and fractures are typically bounded by weaker contact planes between the coal seam and other rock types, thereby reducing the risk of out of zone fracturing. To better understand the behaviour of hydraulic stimulation in the coals of the Bowen Basin, microseismic mapping

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				was undertaken for Arrow by Pinnacle Services in November and December 2012 during the hydraulic fracture stimulation of vertical coal seam gas wells located near Moranbah in the Bowen Basin. The objectives of the fracture microseismic mapping included measuring the fracture geometry, determining the relative degree of induced fracture complexity, and monitoring the project in real time for out-of-zone fracture height growth. The average fracture extent from the well for stages that injected water was approximately 65 m horizontally, although greater extents are possible. Most fractures were contained within their target interval, and the maximum vertical extent measured was 32 m. Hence, vertical hydraulic conductivity in the overlying and underlying formations is not likely to be affected by the hydraulic stimulation. Finally, it is noted that Western Australian shale formations are unlikely to be directly comparable to formations in the Bowen Basin, and the behaviour of shale gas or tight gas formations when hydraulically stimulated is related to basin lithology and structure, which will differ from the Bowen Basin.
S10	153	In the 3rd paragraph 2nd sentence reference is made to the "entire Blackwater Group" being confined from above by the Rewan Formation when this is not so, as Figure 14.3 shows.	Groundwater chapter (Section 14.4.2.1) of the EIS Groundwater chapter (Section 7) and Groundwater Technical	As presented in Groundwater Technical Report (Appendix E) and Groundwater chapter (Section 7) of the SREIS, the Rewan Formation is present across the majority of the study area, however is noted to be absent in the following general areas: • Western parts of ATP742, ATP1103 and ATP1031; • Most of ATP749 and ATP759; • Northern parts of ATP1031; and

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			Report (Appendix E) of the SREIS	• Small parts of part of ATP1025 to the north and north west. Figure 14-3 in the EIS correctly reflects that the Rewan Formation is absent in some areas of the Project area. The groundwater model developed for the EIS takes into consideration the extent of the Rewan Formation and, therefore the areas where this formation is absent have been represented in the geological model used to construct the groundwater model.
S10	154	In the 1st paragraph 2nd last sentence recharge estimated for the GAB are described as being 0.5 to 28.2 mm/a. The average figure of 2 mm/a has been settled upon by leading GAB hydrogeologists. This low figure is supported by the text in Sections 14.8.2.4 to 14.8.2.6 and should be adopted in the modelling of impacts.	Groundwater chapter (Section 14.4.4) of the EIS	The range of recharge rates considered in the EIS (0.5 to 28.2 mm/a) are rates established by Cook et al (2006) for the Great Artesian Basin (GAB). This is an appropriate reference. The range of recharge rates applied in the regional numerical model are dependent on geology specific to the Bowen Basin and ranged from 0.2 mm/a to 13 mm/a which is predominately within the range of Cook et al (2006). Higher rates are applied in the model for river drainages and lower rates at outcrops of Triassic and Permian geology. The model is well calibrated based on the adopted values, and this confirms that they are appropriate. The values are consistent with the qualitative descriptions in the Groundwater chapter (Sections 14.8.2.4 to 14.8.2.6) of the EIS.
S10	155	Table 14.8 and Figure 14.7 show significant zones (40% of the Project area) have not been assessed for groundwater quality, although suppositions have been made.	Groundwater chapter (Section 14.5.1.4) of the EIS	Collation and assessment of additional groundwater quality information has been undertaken since the release of the EIS. The Groundwater Technical Report (Appendix E, Section 5.4) of the SREIS presents the results of this assessment, including water quality information that supports the

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				inferences made regarding groundwater quality in areas of limited data presented in the EIS. Based on the additional desktop sources incorporated into the SREIS assessment of groundwater quality, there is sufficient spatial distribution to provide a regional overview of water quality across the geological formations present within the study area, as demonstrated in Ausenco-Norwest (2013a) and Worley Parsons (2012). The regional understanding of groundwater quality within aquifers across the study area will be continually improved and updated as additional information becomes available from groundwater monitoring events and baseline assessments required to be completed by Arrow. As presented in Commitment B245 of the SREIS Arrow will establish baseline groundwater quality data within the Project area that will enable future comparison, including during and after completion of project activities.
S10	156	In the last paragraph reference is made to the unknown connection between the Quaternary/ Tertiary aquifers and the underlying Triassic/ Permian strata aquifers.	Groundwater chapter (Section 14.5.2.1) of the EIS	While the EIS acknowledged that limited data is available in relation to the interactions of groundwater between the shallow groundwater system and underlying aquifers, certain assumptions were made in the EIS to account for this uncertainty. Numerical groundwater modelling completed as part of the EIS predicted the groundwater level response in aquifers within the model domain as a result of coal seam gas extraction from the target coal seams. The model takes into consideration the extent of the confining layers above the target coal seams, therefore the areas where these formations are absent have been represented in the geological model used to construct the groundwater model. However, as a conservative measure, an assessment of

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				areas where the Rewan Formation is absent has been conducted in the SREIS. The results of this assessment are presented in the Groundwater Technical Report (Appendix E) and Groundwater chapter (Section 7) of the SREIS. Sliwa (2011) reviewed the solid geology mapping with respect to the distribution of Triassic rocks. The review provided a revised extent of the Rewan Formation, and showed that overall the Rewan Formation extent is more extensive than in the earlier conceptualisation of the model region geology. The implication of this from a modelling perspective is that in these areas groundwater drawdown in overlying formations such as the shallow alluvium is likely to be overstated rather than understated, therefore providing for a conservative impact assessment. Further studies will be completed to improve the understanding of the level of connectivity between these groundwater systems, presented in Commitment B245. This commitment explains that Arrow will define and undertake a program of aquifer testing in dedicated groundwater monitoring wells to reduce areas of uncertainty, aim to quantify aquifer properties, areas of potential interconnection and groundwater velocities. The findings of these investigative programs will provide the basis for on-going conceptual model refinement.
S10	157	In the 2nd paragraph 1st sentence connectivity between the streams and the alluvium is described as being "moderate to high". This together with the reference in Section 14.4.2.1 third paragraph 4th sentence which indicated the base-flow to the Isaac River is not significant indicates that water is transferring to underlying aquifers, at least in some reaches along the Isaac and other streams where the Rewan formation is not present.	Groundwater chapter (Section 14.5.2.3) of the EIS	As described in the Groundwater chapter (Section 14.5.2.3) of the EIS, watercourses within the study area may be gaining (watercourse receives groundwater discharge), losing (surface water loss to groundwater) or a combination of both. There is seasonal variation in where this occurs. Many watercourses are ephemeral (do not flow year round), and the interaction between groundwater and

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				surface water will depend on the relationship between groundwater elevation and stream bed depth. During peak stream flow events it is unlikely that groundwater will discharge to watercourses as the surface water level is typically above groundwater elevation, therefore surface water will migrate to groundwater (SKM, 2009a). The majority of the watercourses in the Project area are understood to be losing watercourses, as supported by the findings of the JBT Consulting (2010) study (as presented in the Groundwater chapter (Section 14.4.2.1) of the EIS). In this investigation the results of a ground penetrating radar (GPR) survey conducted in the Isaac River were compared with information from exploration drilling data collected from within the Grosvenor mining lease. The Grosvenor Coal Project is located to the north of Moranbah, within Arrow's Moranbah Gas Project. The drilling data also supported the observation that in most locations, the basal sands of the Isaac River investigated are dry, indicative of a losing system where the surface water body is disconnected from underlying aquifers. This interpretation is also supported by the SKM (2009a) study. The Groundwater chapter (Section 14.5.2.3) of the EIS explains that for the perennial reaches of the watercourses located to the east of the project area, along with eastern side of the Isaac-Connors catchment, where the systems receive higher average rainfall, surface water flow provides enhanced recharge to the shallow groundwater systems in these downstream (eastern) reaches. Following high rainfall events and periods of enhanced recharge, groundwater baseflow is likely along some stream reaches and in some areas, occurs year-round (SKM, 2009a).

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				Therefore, these sections in the EIS are characterising the surface water and groundwater interactions in two different regions within the study area.
S10	158	In the sections under "Area between Phillips Ck and Sawmill Ck" and "Glenden Area" which occupy significant parts of the Project area, reference is made to how these areas "remain unmapped" and "chemistry data are too limited to provide a reliable description". There are many stock bored to NW, W and SW of Glenden as shown in Figure 14-16a which should be investigated.	Groundwater chapter (Section 14.5.3.1) of the EIS	A number of bores recorded in the Department of Natural Resources and Mines Groundwater Database (NRM GWDB) are located across the study area, typically however, they do not have water quality data associated with their record, or the records were considered unreliable due to incomplete well construction records. Where this was the case, the water quality records were not used to characterise groundwater quality nor included in the assessment presented in the EIS. Available water quality information sourced from NRM, as well as from Arrow, has been collated in a study completed since the release of the EIS. This study is described in the Groundwater Technical Report (Appendix E, Section 5.4) of the SREIS and represents the most current collation and assessment of available groundwater quality information across the Project area. In addition, Worley Parsons (2012) completed a study that collated basin-wide groundwater quality data and provided additional information to supplement data specific to the Project area, which has also been used to inform the SREIS. Based on the additional desktop sources incorporated into the SREIS assessment of groundwater quality, there is sufficient spatial distribution to provide a regional overview of water quality across the geological formations present within the study area. The regional understanding of groundwater quality within aquifers across the study area will be continually improved

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				and updated as additional information becomes available from baseline monitoring events and baseline assessments required to be completed by Arrow. As presented in Commitment B245, Arrow will establish baseline groundwater quality data within significant aquifers in the Project area to enable future comparison, including during and after completion of project activities.
S10	159	In the last paragraph reference is made to the "limited area of influence" which may be true where the Rewan formation exists depending on the level of hydraulic stimulation which can cause disturbance for significant distances from the point of disturbance, both horizontally and vertically.	Groundwater chapter (Section 14.7.2.2) of the EIS	With respect to the areas where the Rewan Formation exists, an assessment has been conducted in the SREIS. Sliwa (2011) reviewed the distribution of Triassic rocks and provided a revised extent of the Rewan Formation, and showed that overall the Rewan Formation extent is more extensive than in the earlier conceptualisation of the model region geology. To better understand the behaviour of hydraulic stimulation in the coals of the Bowen Basin, microseismic mapping was undertaken for Arrow by Pinnacle Services in November and December 2012 during the hydraulic fracture stimulation of vertical coal seam gas wells located near Moranbah in the Bowen Basin. The average fracture extent from the well stages that injected water was approximately 65 m horizontally. Vertical growth of fractures in almost all cases was within +/- 10 m of the target level, with a small percentage between 10 and 20 m. The maximum vertical extent measured was 32 m. Hence, vertical hydraulic conductivity in overlying and underlying formations is not likely to be affected by the hydraulic stimulation. The assertion that hydraulic stimulation can cause disturbance for significant distances from the location of the stimulation event both horizontally and vertically not

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				supported by the findings of this assessment. The extent of vertical and horizontal fractures resulting from hydraulic stimulation events is limited. As described in the Groundwater and Geology Technical Report (Appendix L, Appendix G) in the EIS, Arrow conducts a comprehensive risk assessment prior to every hydraulic fracturing event. The risk assessment considers site specific conditions, including (but not limited to) hydraulic properties (porosity, permeability, hydraulic conductivity, faulting and fracture propensity) of the coal seams, interburden and overburden units, location and characteristics of naturally occurring faults, seismic history of the region and proximity of underlying and overlying aquifers.
S10	160	In the 1st paragraph 2nd last sentence the pressure disturbances are described as being mostly contained by low permeability and the Rewan formation. The disturbances would only have the opportunity of being somewhat contained where the Rewan formation exists	Groundwater chapter (Section 14.7.3.2) of the EIS	The section referred to presents a qualitative evaluation. However, impacts were quantitatively predicted by the groundwater model. The numerical groundwater modelling completed as part of the EIS predicted the groundwater level response in aquifers within the model domain as a result of coal seam gas extraction from the target coal seams. The model takes into consideration the extent of the confining layers above the target coal seams, therefore the areas where these formations are absent have been represented in the geological model used to construct the groundwater model. However, as a conservative measure, an assessment of areas where the Rewan Formation is absent has been conducted for the SREIS. The results of this assessment are presented in the Groundwater Technical Report (Appendix E) and Groundwater chapter (Section 7) of the SREIS. Sliwa (2011) reviewed the solid geology mapping

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				with respect to the distribution of Triassic rocks. The review provided a revised extent of the Rewan Formation, and showed that overall the Rewan Formation extent is more extensive than in the earlier conceptualisation of the model region geology. The implication of this from a modelling perspective is that in these areas groundwater drawdown in overlying formations such as the shallow alluvium is likely to be overstated rather than understated, therefore providing for a conservative impact assessment.
S10	161	The 1st sentence refers to the drawdown being limited in magnitude and extent, however should any hydraulic stimulation occur close to the edge of the Rewan formation or any area where the Rewan formation is not present then the drawdown within the shallow aquifers could be significant thereby impacting downstream users' water security.	Groundwater chapter (Section 14.7.3.3.1) of the EIS	When conducting hydraulic stimulation, the target formation is the coal seams within the Late Permian strata. These targets are at depth and significantly disconnected from surface processes as a result of layered heterogeneity (Freeze and Cherry, 1979) and also due to the presence of physical confining layers, such as the Triassic Rewan Formation. Confining units or shallow formation sub-crop are not the intended subject of hydraulic stimulation. In coal seam gas developments, the target coal seams for hydraulic stimulation in the Bowen Basin are of much lower strength than surrounding competent formations such as sandstone and shale that form the confining layers. Because of the relative weakness of the coal, lower pressures are required to generate fractures, and this reduces risks of out of zone fracturing. This is supported by the work conducted by Pinnacle (2013) and discussed in the Groundwater Technical Report (Appendix E, Section 9) of the SREIS. As required under the current Guideline on Application Requirements for Petroleum Activities (EHP, 2013a), an assessment of the location of other aquifers, including

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				shallow aquifers, is carried out. Where identified, these are considered as part of the assessment and a review of geological aspects including the vertical separation and location of aquifers is made. Since completion of the EIS, further review and assessment of areas where the Rewan Formation is absent has been conducted for the SREIS. The results of this assessment are discussed in the Groundwater Technical Report (Appendix E, Section 5) of the SREIS. The review provided a revised extent of the Rewan Formation, and showed that overall the Rewan Formation extent is more extensive than in the earlier conceptualisation of the model region geology. In addition, it is considered that in general, areas where the Rewan Formation does not exist are not only much more limited than previously understood (Sliwa, 2011), but will also correlate with areas where the coal seams are expected to be un-prospective, due to shallow depths. In these areas hydraulic stimulation is unlikely to be conducted because of the absence of gas or where gas is present shalower weathered coals having higher permeability and not requiring stimulation.
S10	162	The 1st sentence refers to the induced groundwater pressure gradients and flows being towards the coal seams. Initially however following any hydraulic stimulation there would be potential for groundwater movement to occur vertically upwards which could impact the overlying strata aquifers due to the high pressures within the coal seams, particularly where the Rewan formation does not exist. Additionally there could be potential for downward movement to the Back Creek Group which is at a lower pressure than the	Groundwater chapter (Section 14.7.5.2) of the EIS	The potential for groundwater movement to occur vertically upwards and impact the overlying strata aquifers, or downward to the Back Creek Group, due to high pressures within the coal seams is unlikely due to the following: • The equilibrium condition is that groundwater pressures in the Blackwater Group will be similar to groundwater pressures in overlying and underlying formations. Hence, there should be no significant vertical hydraulic gradient between the formations that would drive flow.

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		aquifers within the overlying target Blackwater Group. Although sometimes described as having poor quality groundwater there are a significant number of bores located in the Back Creek Group. Tight controls need to be stipulated on any hydraulic stimulating that is to occur.		• The hydraulic stimulation process results in brief transient pressures that do not remain in the target formation. Hence, these do not create a long term, large pressure differential. • Confining units are not subject to hydraulic stimulation. In coal seam gas developments, the target formations for hydraulic stimulation in the Bowen Basin are coal seams which are of much lower strength than surrounding competent formations such as sandstone and shale that form the confining layers. Because of the relative weakness of the coal, much lower fracturing pressures are required, and this reduces risks of out of zone fracturing. • The review of information in Sliwa (2011) provided a revised extent of the Rewan Formation, and showed that overall the Rewan Formation extent is more extensive than in the earlier conceptualisation of the model region geology. For the above reasons, there is unlikely to be a water quality impact to either the Rewan Formation or Back Creek Group aquifers associated with the hydraulic stimulation of the Blackwater Group target formation.
S10	163	In the 2nd paragraph, 2nd sentence reference is made to impacts to the groundwater system being reversible. Section 14.7.5.1 refers to recovery taking thousands of years.	Groundwater chapter (Section 14.8.4.2) of the EIS	Over time, groundwater systems can reach equilibrium, as described in the Groundwater chapter (Section 14.7.5.1) of the EIS. Groundwater systems recover through natural recharge processes over time. The timeframe for recovery is dependent on the recharge mechanisms associated with each aquifer, i.e., deeper confined aquifers will generally have slower recharge rates compared with shallow, unconfined aquifers which can be recharged through direct

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				surface infiltration.
S10	164	Mitigation measures do not include monitoring. Monitoring only enables an assessment of the effectiveness of true mitigation measures as correctly described in the 1 51 paragraph of Section 14.9.	Groundwater chapter (Section 14.8.5, Table 14-17) of the EIS	Noted. The EIS acknowledges that monitoring forms part of the overall mitigation framework for groundwater, and that monitoring is conducted to ensure the effectiveness of mitigation measures. Monitoring programs are conducted to provide an early warning system to identify where groundwater protection objectives may be approaching trigger values and where additional controls may be required. The monitoring program defined for groundwater does not replace the active mitigation measures identified in EIS, associated with fulfilment of make good obligations as a measure for managing the impacts of groundwater drawdown resulting from coal seam gas extraction. The EIS also detailed Arrow's mitigation measures associated with potential impacts on groundwater resources from dams, including appropriate dam construction, design and monitoring requirements (Commitment B255) and the installation of groundwater monitoring bores as a leak detection measure (Commitment B256).
S10	166	No information regarding potential implications to take of water for the project may affect water access and water security of other water users in the area.	Groundwater chapter (Section 14) and Surface Water chapter (Section 15) of the EIS	The Groundwater chapter (Section 14.5.4) of the EIS identifies the other known groundwater users in the Project area and surrounds. The overall sensitivity rankings applied to the groundwater systems consider the use of the groundwater in each system to support consumptive and productive uses. The Groundwater chapter (Section 14.7) of the EIS identifies the potential impacts of the Project on groundwater values, with a summary provided in Table 14-18. These sections identify the potential for project activities to impact on groundwater supplies to third-party

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				users. Further assessment of the potential impact to existing users is presented in the Groundwater Technical Report (Appendix E, Section 8) of the SREIS. Under the *Water Act 2000* (Qld) (Water Act) Arrow will be required to implement make good measures where third-party bores are found to be impaired by coal seam gas activities, through the completion of a bore assessment. It is acknowledged that impacts are likely to persist over time, as predicted by groundwater models. The make good measures to be put in place accounts for this, in that the obligation persists, and therefore the make good measures should continue to be effective over the longer term. This ensures a secure supply of water over the term of impaired capacity in the third-party bore. The make good measures to be will be negotiated between Arrow and the bore owner depending on the specific situation and may include: • Modifying the pumping infrastructure of the bore. • Modifying or deepening the bore. • Installing a new bore into the same aquifer. • Installing a new bore into another aquifer. • Supplying an alternative source of water. • Monetary compensation (considerate of the use of the bore). Arrow does not intend to take, divert, or store significant volumes of surface water as part of the project activities, however small volumes of surface water may be taken to support well drilling or dust suppression in some parts of the field.

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S10	167	In Figure 7.1 the Storage Inflow for the transient mass balance needs to be corrected in accordance with the issue specified above for Section 14.4.4	Groundwater Model Technical Report (Appendix M) of the EIS	The range of recharge rates considered in the EIS (0.5 to 28.2 mm/a) are rates established by Cook et al (2006) for the Great Artesian Basin (GAB). This is an appropriate reference. The range of recharge rates applied in the regional numerical model are dependent on geology specific to the Bowen Basin and ranged from 0.2 mm/a to 13 mm/a which is predominately within the range of Cook et al (2006). Higher rates are applied in the model for river drainages and lower rates at outcrops of Triassic and Permian geology. The model is well calibrated based on the adopted values, and this confirms that they are appropriate. The values are consistent with the qualitative descriptions in the Groundwater chapter (Sections 14.8.2.4 to 14.8.2.6) of the EIS.
S14	294	In general adequate details are not presented in the monitoring program in relation to the number of bores and bore locations. It appears that the locations of some monitoring wells will be finalised after the CSG production layout is finalised. Further clarification is needed. The following specific proposals are supported: • Structured database to host groundwater data • Arrangements for monitoring reporting • The objectives of the groundwater monitoring network	Groundwater chapter (Section 14.9.5) of the EIS	Groundwater monitoring networks will be designed in consideration of the eventual production well field layout, once confirmed, as well as the location of landholder water bores or springs that may be impacted by the action. However, the general layout of associated monitoring networks are likely to be similar to existing installations and the location and management of the associated monitoring network will be subject to an approved UWIR. Chapter 3 (Project Description) of the SREIS presents the refined field development plan for the Project which outlines the drainage areas to be developed across the Project area, and when they are expected to be brought into production. Under the *Water Act 2000* (Qld) (Water Act), Arrow is required to prepare Underground Water Impact Reports (UWIR) for operations within their tenures. In these UWIRs, a water monitoring strategy is required where material

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				impacts on groundwater are expected, based on model drawdown predictions, water production volumes, geological conditions and the location of sensitive receptors. Where a water monitoring strategy is prepared, it contains detailed information on the location of the monitoring bore network, target aquifers and bore construction requirements, frequency of monitoring events, and the parameter suites included in the monitoring events. UWIRs prepared by Arrow are available on their website. The UWIRs prepared by Arrow, including the water monitoring strategy, are required to be released for public consultation. Comments submitted are summarised and addressed as appropriate before being provided to EHP. Each UWIR is submitted to EHP for approval.
S14	295	No reference has been made to any specific groundwater management instruments such as Water Resource Plans and Resource Operation Plans made under the Water Act 2000.	Groundwater chapter (Section 14.9.5.2) of the EIS Groundwater chapter (Section 7) of the SREIS)	The Groundwater chapter (Section 14.2) of the EIS acknowledges the relevance of the water resource plans for the Great Artesian Basin, Fitzroy and Burdekin Basins to the groundwater legislative framework. The Groundwater chapter (Section 7) of the SREIS contains an updated legislative section relative to groundwater.
S14	296	"The monitoring program may use nested standpipes". Problems have been encountered previously with the installation of more than one standpipe in a single hole.	Groundwater chapter (Section 14.9.5.3) of the EIS	Arrow does not install nested standpipes with multiple standpipes in a single hole. All monitoring bores will be constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia (NUDLC, 2012), the minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins in Queensland (NRM, 2013a) (Commitment B250), or the Code of Practice for Constructing and Abandoning Coal Seam Gas Wells in Queensland (NRM, 2013), which also has provision for

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				monitoring and observation bores.
S14	297	The following points are made in relation to the statements provided in this section: • It appears that the locations of some monitoring wells will be finalised after the CSG production layout is finalised. • Monitoring will be conducted in compliance with relevant standards but no details of these standards have been provided. • Whilst the seepage monitoring strategy is satisfactory it is unclear if the proposed site impact monitoring extends to monitoring of groundwater as well. • Regular monitoring of groundwater levels, EC, pH, TDS, major cations and anions will be undertaken, but no comments on specific target contaminants have been provided.	Groundwater chapter (Section 14.9.5.4) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Section 14.9.5.4 (Groundwater chapter) of the EIS relates to groundwater monitoring related to potential impacts to groundwater values from surface infrastructure (e.g., seepage from dams). Therefore, the location of bores that make up these groundwater monitoring networks cannot be identified until the location of surface infrastructure is finalised. As part of an Environmental Authority or an amendment application, Arrow will be required to identify the location of surface infrastructure, and accordingly, additional information on the location of the site impact groundwater monitoring network, the parameters to be monitored and the appropriate frequency and method of monitoring. Table 14-20 outlines the initial site impact monitoring strategy, but it is noted that this strategy will be further refined as the location of project infrastructure is finalised, as detailed in Commitment B256, which states that the number of monitoring bores and their location will take into account site-specific hydrogeology, preferential pathways, and potential receptors of impacts. Therefore the list of parameters included in Table 14-20 reflects the initial monitoring strategy which is likely to be revised as the project progresses and site-specific conditions are identified. It is acknowledged in Section 14.9.5.2 of the EIS that Arrow is required to meet the requirements of certain standards as part of their groundwater monitoring program, including the AS/NZ 5667.11 (1998), Water Quality Sampling – Guidance on Sampling of Groundwater. In conjunction with the site impact groundwater monitoring

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				network associated with seepage from surface infrastructure, Arrow will design a regional groundwater monitoring network. The regional groundwater monitoring network will monitor the effects of coal seam gas extraction on groundwater systems. This information is contained in Section 14.9.5.3 of the EIS. Since the release of the EIS, additional information on the regional monitoring strategy is presented in the Supplementary Groundwater Assessment (Appendix E, Section 9.3.4) of the SREIS.
S14	298	The aquifer to be monitored is the Blackwater Group at Target CSG depths. Monitoring in the formations above and below the target CSG formations is also required.	Groundwater chapter (Table 14-20) of the EIS	Table 14-20 in the EIS, and commitment B245 reflect that Arrow will implement a groundwater monitoring program that includes a representative suite of bores in the shallow, intermediate, coal seams and deep aquifers.
S14	299	The following points are made in relation to the statements provided in this section: • Installation of dam liners is supported as good practice • The statement "Hydraulic stimulation is found to have a low potential impact of causing increased interconnection and blending groundwater within the Permian aquitards above and below the coal seams" has not been supported with any factual data/information. • The statement "Arrow will however undertake groundwater monitoring before and after hydraulic stimulation" is supported, however no details of proposed monitoring have been provided.	Groundwater chapter (Section 14.10.1 and Table 14-16) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	The target formations for hydraulic stimulation in the Bowen Basin are coal seams which are of much lower strength than surrounding competent rock such as sandstone and shale that form the inter-burden and confining layers. Because of the relative weakness of the coal, relatively low pressures are required to generate fractures in this material, and fractures are typically bounded by weaker contact planes between the coal seam and other rock types, thereby reducing the risk of out of zone fracturing. To better understand the behaviour of hydraulic stimulation in the coals of the Bowen Basin, microseismic mapping was undertaken for Arrow by Pinnacle Services in November and December 2012 during the hydraulic fracture stimulation of vertical coal seam gas wells located near Moranbah in the Bowen Basin. The objectives of the fracture microseismic mapping included measuring the fracture geometry, determining the relative degree of

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				induced fracture complexity, and monitoring the project in real time for out-of-zone fracture height growth. The average fracture extent from well stages that injected water was approximately 65 m horizontally. Vertical growth of fractures in almost all cases was within +/- 10 m of the target level, with a small percentage between 10 and 20 m. The maximum vertical extent measured was 32 m. Hence, this evaluation demonstrated that vertical hydraulic conductivity of the overlying and underlying formations is not likely to be affected by the hydraulic stimulation. The Supplementary Groundwater Assessment (Appendix E, Section 9) presents an outline of the mitigation and monitoring measures that will be adopted for hydraulic stimulation, which includes a requirement for an assessment of each hydraulic stimulation campaign as part of the application for an Environmental Authority under the EP Act (1994) and consistent with Commitments B646 and B644. Arrow is committed to the development of impact and monitoring programs for each hydraulic stimulation campaign carried out in relation to the Project as required by relevant current legislation, consistent with Commitment B644.
S14	300	"Table 14-19 provides an assessment of groundwater impacts resulting from certain activities. For the water quality impacts/deterioration resulting from well installation, hydraulic stimulation and sub-surface activities the statement that "Incomplete or incorrect monitoring well installation results in interconnection of aquifers and consequent cross contamination" is made, however no details of procedures to ensure that the fraccing bores are correctly designed and operated has been provided.	Groundwater chapter (Table 14-19) of the EIS Supplementary Groundwater Assessment (Appendix E, Section 9.3.8) of	All coal seam gas production wells will be designed and installed in accordance with the code of practice for constructing and abandoning coal seam gas wells in Queensland (NRM, 2013a) consistent with Commitment B249. Where Arrow proposes a hydraulic stimulation event, an environmental authority (EA) must be granted by EHP under the *Environmental Protection 1994* (Qld) Act (EP Act) prior to commencement. A range of information must

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			the SREIS	be provided by Arrow to EHP as part of the EA application in relation to hydraulic stimulation. The required information is outlined in the Guideline on Application Requirements for Petroleum Activities (EHP, 2013a). These requirements are summarised in the Supplementary Groundwater Assessment (Appendix E, Section 9.3.8) of the SREIS, with the main requirement set out in the current Guideline on Application Requirements for Petroleum Activities including a risk assessment. Arrow is already completing these risk assessments for current operations where hydraulic stimulation activities are conducted. In these areas EA conditions issued from EHP are in place to control potential impacts related to hydraulic stimulation events. Arrow will design all hydraulic stimulation wells and events in accordance with relevant requirements of the EP Act and P&G Act, consistent with Commitment B646.
S14	301	It is unclear if the Queensland Water Commission/Office of Groundwater Impact Assessment are involved at this stage and who will be the governing authority responsible for long term management.	Groundwater chapter (Section 14.10.4) of the EIS	In areas of concentrated petroleum development, the impacts on groundwater caused by extraction activities conducted by individual proponents can overlap. The Queensland government may declare these areas to be Cumulative Management Areas (CMAs). A CMA was declared for the Surat Basin and the southern area of the Bowen Basin on 18 March 2011. The Surat CMA includes ATP 1025, which is the southern-most tenement within the Bowen Gas Project area. The remainder of the Bowen Gas Project area does not fall within a CMA. However, while a CMA has not been declared across the majority of the Bowen Gas Project area, Arrow is required under the *Water Act 2000* (Qld) (Water Act) to prepare Underground Water Impact Reports (UWIR) for operations within their tenures.

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				The UWIRs prepared by Arrow are required to be released for public consultation. Comments submitted are summarised and addressed as appropriate before being provided to EHP. Each UWIR is submitted to EHP for approval. EHP may engage the Office of Groundwater Impact Assessment (OGIA) to provide advice on the adequacy of the UWIRs. The role of the OGIA includes a requirement to monitor the development of the petroleum and gas industry in relation to the potential impacts of water extraction. The OGIA will identify the need to declare any additional CMAs within Queensland.
S21	388	The EIS suggests that groundwater impacts will be minimal due to the Arrow BGP and that a monitoring network will be installed to validate and improve model predictions. This is commended however the EIS notes that the cumulative impacts likely to result from the development of Arrow's fields at the same time as other major projects such as Santos GLNG and Curtis LNG projects as well as mines were not able to be determined.	Groundwater chapter (Section 14), Surface Water chapter (Section 15) and Cumulative Impacts chapter (Section 31) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	The assessment of potential cumulative impacts on groundwater values presented in the Cumulative Impacts chapter (Section 31) of the EIS considered a number of contributing future developments. The Gladstone Liquefied Natural Gas (GLNG) and Queensland Curtis LNG (QCLNG) projects were not included in this assessment because the gas fields for these projects are located within the Surat Basin, and therefore do not have a spatial overlap with the Bowen Gas Project area. A lack of suitable data in the public domain limited a full assessment of potential cumulative impacts resulting from the operation of the Bowen Gas Project in conjunction with the existing mining industry. The Supplementary Groundwater Assessment (Appendix E, Section 8.3) of the SREIS presents an updated assessment of cumulative impacts associated with groundwater. While suitable available data from existing mines remains limited, a qualitative discussion on the significance of potential cumulative impacts is presented.

Section 21 Submission Responses

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S23	404	Not meaningfully addressed in EIS: Any comprehensive master planning of the region dealing with all aspects of the proposal (including resilient infrastructure) and the associated impacts of irreversible change in the locality from de watering and lack of meaningful science on the potential impacts.	Groundwater chapter (Section 14) of the EIS Commitments Update (Appendix O) of the SREIS	Noted. Results of all specialist studies conducted to assess potential project impacts in the Project area are presented in the EIS. Arrow has made a number of commitments which seek to protect environmental and socioeconomic values identified within the Project area. A number of these commitments are expected to become conditions of approval. A full list of these commitments is provided in the Commitments Update (Appendix O) of the SREIS. Detailed information on the mitigation measures to reduce impacts will be provided in statutory information requirements provided in accordance with the EHP Guideline 'Application requirements for petroleum activities' (EHP, 2013a) to accompany environmental authority (EA) or EA amendment application(s).
S23	422	The assessment should seriously address the process of securing and allocating significant additional water resources to the locality that does not compromise the existing rural industry uses. To avoid an integrated strategy which does not clearly contain long term flooding or drought modelling is unacceptable to Isaac Regional Council and will destroy the local economy which is highly reliant on the unique ground water sources to sustain operations. The proposal is now located within the amalgamated Local Government Area of Isaac Regional Council and the presentation of the project in a light of isolation does not reflect the guiding intent of the integration process of the local industries and communities. The EIS report should accurately and unequivocally address and identify sources of ensuring that sufficient water is available of ordinary operations of the proposed gas field operations under drought conditions and the forecast changing climate conditions of	Groundwater chapter (Section 14), Surface Water chapter (Section 15), and Groundwater Model Technical Report (Appendix M)of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	While Arrow is authorised under the Petroleum and Gas (Production and Safety) Act 2004 and Petroleum Act 1923 to take or interfere with groundwater in the process of exploration for, and production of coal seam gas, the *Water Act 2000* (Qld) (Water Act) requires Arrow to manage any impacts caused as a result of these activities on groundwater values. These requirements include a responsibility to make good any impairment of private bore groundwater supplies. Based on the modelling presented in the Groundwater Model Technical Report (Appendix M) of the EIS and the supplementary groundwater assessment presented in the Supplementary Groundwater Assessment (Appendix E) of the SREIS, as well as Arrow's baseline assessments completed to date, there are a very limited number of existing bores that will potentially experience groundwater

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		a drying Central Queensland Region.		drawdown greater than the bore trigger threshold. For instance, there are only two registered bores that are registered as screening the shallow groundwater system (i.e alluvium) that coincide with areas of groundwater drawdown greater than 2 m. Climatic variation and/or climate change will affect the water table in the shallow groundwater system. As expected, a reduction in rainfall due to a drought will reduce recharge to these shallow aquifers and therefore the water table will drop. The magnitude of this drop will largely be a function of the climate (rainfall versus evapotranspiration) and non-coal seam gas extraction. Modelling completed for the EIS shows that drawdown in the shallow groundwater system as a function of coal seam gas extraction is limited. The lowering of groundwater levels as a result of natural drought conditions is likely to be greater than the predicted drawdown as a result of coal seam gas extraction activities. In the event that the third-party bore is found to have impaired capacity due to coal seam gas extraction activities, Arrow is required to implement make good measures to account for this. This ensures a secure supply of water over the term of impaired capacity in the third-party bore. Arrow is required by law to fulfil these obligations. The make good measures to be implemented will be negotiated between Arrow and the bore owner depending on the specific situation and may include: • Modifying the pumping infrastructure of the bore. • Modifying or deepening the bore. • Installing a new bore into the same aquifer.

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				• Installing a new bore into another aquifer. • Supplying an alternative source of water. • Monetary compensation (considerate of the use of the bore). In times of drought, deeper groundwater systems are less likely to be affected, as they are recharged by different mechanisms over significantly longer time scales independent of decadal drought/flood climatic events. In comparison, shallow systems are commonly directly recharged by surface infiltration. Therefore, if a shallow third-party bore is found to be impaired by coal seam gas activities, the make good options available include accessing another aquifer that is less likely to be drought affected, provided it can supply groundwater of a suitable quality for the intended use.
S23	423	The EIS should specifically establish a detailed analysis of managing and protecting aquifers in the area. The present document does not reflect the on-going sustainable management of this finite water resource. Dewatering of the gas well operations will impact significantly on the local hydrology near and around the site for a considerable intergenerational time period. Limited information is available on the interaction between the perched riparian water sources and the long term at depth aquifers. Given the extensive de-watering to occur, more reliable analysis needs to be undertaken on the effects this will have on the surface and perched water tables before final comments can be provided in this specific area. This area of concern is one of Council's highest priorities as it has the potential to ruin intergenerational sustainable agriculture in the region within the project life of 40 years.	Groundwater chapter (Section 14) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Where groundwater is perched it will be hydraulically disconnected from the underlying aquifers and therefore will not be influenced by drawdown in underlying aquifers. The groundwater impact assessment prepared for the EIS presents a robust framework for the protection of groundwater values potentially impacted by the project. The framework incorporates legislative requirements of the *Environmental Protection Act 1994* (Qld) (EP Act), Environmental Protection (Water) Policy 2009 (EPP Water) and the *Water Act 2000* (Qld) (Water Act). The results of the groundwater impact assessment presented in the EIS show that following the implementation of mitigation measures the residual impacts to groundwater resources are low to very low. This includes potential impacts to shallow groundwater resources.

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				The Project will require a site-specific environmental authority under the EP Act. The preparation of an EIS is the preliminary assessment process for identifying potential impacts and mitigation measures for resource activities. While Arrow is authorised under the *Petroleum and Gas (Production and Safety) Act 2004* (P&G Act) and *Petroleum Act 1923* to take or interfere with groundwater in the process of exploration for, and production of coal seam gas, the Water Act requires Arrow to manage any impacts caused as a result of these activities on groundwater values. These underground water obligations include a responsibility to undertake baseline assessments (to identify the presence of existing groundwater bores), prepare (and comply with) underground water impact reports (including predictions of areas in each aquifer when drawdown impacts are likely to occur), undertake groundwater modelling (to verify groundwater modelling), and make good any impairment of private bore groundwater supplies. These make good obligations are required under the Water Act for both impaired groundwater supply and quality as a result of coal seam gas activities. The Water Act defines bore trigger threshold values for consolidated aquifers (5 metres (m)) and unconsolidated aquifers (2 m). The Water Act also defines trigger threshold for springs (0.2 m). Bore trigger threshold values are used to determine the point at which investigation is required to determine whether monitoring or intervention may be required to maintain groundwater supply or groundwater quality in line with current uses. The threshold values do not represent drawdown values that impact on the sustainable use of an aquifer, and instead provide an early

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				warning system that triggers investigation by responsible tenure holders. While the EIS acknowledged that limited data is available in relation to the interactions of groundwater between the shallow groundwater system and underlying aquifers, certain assumptions were made in the EIS to account for this uncertainty. Numerical groundwater modelling completed as part of the EIS predicted the groundwater level response in aquifers within the model domain as a result of coal seam gas extraction from the target coal seams. In some instances, limited data sets were available during the preparation of the regional groundwater model. In these cases, the groundwater model adopted the more conservative values to ensure that the impacts predicted by the model presented the worst-case, and therefore did not under-represent the potential impacts to groundwater values. As an example, the predicted groundwater drawdowns presented in the EIS that form the basis of the impact assessment for the shallow groundwater system are based on the predicted drawdown for the groundwater model Layer 3, which is actually more representative of the underlying Triassic or 'intermediate' groundwater system. This was done because effectively no drawdown was predicted in Layer 1 of the groundwater model, therefore to provide a worst-case scenario of potential areas of impact to the watertable aquifers, predicted drawdown from Layer 3 was adopted. As such, the review of the impact assessment presented in Supplementary Groundwater Assessment (Appendix E,

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				Section 8) of the SREIS for the shallow groundwater system uses a more widespread groundwater drawdown profile to identify potential impacts on existing groundwater users and potentially groundwater dependent ecosystems in the overlying alluvial, sedimentary and basaltic aquifers.
S23	464	Socio-economic and cumulative: Will there be verification of cement integrity through available public data of all oilfield wells within a certain radius of the well to be fractured? (as per Alberta, Canada regulations)	Project Description chapter (Section 4) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	When conducting hydraulic stimulation, the target formation is the coal seams within the Late Permian strata. The coal seams targeted during hydraulic stimulation events in the Bowen Basin are of much lower strength than surrounding competent formations such as sandstone and shale that form the confining layers. Because of the relative weakness of the coal, lower pressures are required to generate fractures, and this reduces risks of out of zone fracturing. This is supported by the work conducted by Pinnacle (2013) and discussed in the Supplementary Groundwater Assessment (Appendix E, Section 9) of the SREIS. As required under the current Guideline on Application Requirements for Petroleum Activities (EHP, 2013a), an assessment of the location of other features in the vicinity of the stimulation event, including other coal seam gas wells or third-party boresis carried out. Where present, these are considered as part of the assessment and a review of geological aspects including the vertical and horizontal separation and location of aquifers is made. Following the installation of all coal seam gas production wells, Arrow will conduct periodic integrity checks to ensure the integrity of well construction (Commitment B285). These integrity checks will be conducted on all wells, regardless of whether it is in the vicinity of a hydraulically fractured well or not.

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S23	487	Natural Resource and Stock Route Impacts: Contamination of water supplies, aquifer. What measures will be taken to minimise the risk of contamination and what processes will occur if contamination occurs or removal of overly substantial amounts of water occurs?	Contaminated Land chapter (Section 11), Groundwater chapter (Section 14) and Waste Management chapter (Section 28) of the EIS	The Waste Management chapter (Section 28) of the EIS contains commitments in relation to protection of groundwater values from contamination. In addition, mitigation measures have been developed to reduce the risk of groundwater contamination which include siting of surface infrastructure (i.e. dams and storage of other potential contaminating material) that takes into consideration the local environment to minimise risk to the environment, construction of infrastructure in accordance with relevant guidelines, standards and legislative controls, implementation of bunding and lining to prevent release of potential spills or leaks to the environment, adherence to quality control and assurance procedures and monitoring of groundwater levels and quality to identify potential impact and the need for further mitigation measures where required. These measures are consistent with Commitments B178, B255, B256, B353 and B398. The Contaminated Land chapter (Section 11) of the EIS contains commitments in relation to management of any existing contaminated land and/or groundwater in the Project area. Disturbance of these areas without appropriate planning and investigation can result in contamination of surrounding areas. Under the *Environmental Protection Act 1994* (Qld) (EP Act), Arrow is legally required to remediate any contamination caused by project activities. Remediation goals include identifying proposed future land uses and will be determined as part of a Remediation Action Plan (RAP) which would be developed should land contamination occur. A validation sampling program will be conducted to confirm the site has been successfully remediated

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				according to the objectives identified in the RAP. Just as Arrow is required to make good on impaired groundwater supply due to coal seam gas water activities, they are also obligated under the *Water Act 2000* (Qld) (Water Act) to make good if the water quality is impaired as a result of coal seam gas activities.
S23	505	Natural Resource and Stock Route Impacts: Effects of the release of groundwater into the general environment?	Groundwater chapter (Section 14) of the EIS Project Description (Section 3), the Surface Water chapter (Section 8), Hydrology and Geomorphology chapter (Section 9), Aquatic ecology chapter (Section 10), and Coal Seam Gas and Salt Management Strategy (Appendix D) of the SREIS	The potential impact of leaks and spills of groundwater to the receiving environment at the surface is identified in the Groundwater chapter (Section 14.7.2.1) of the EIS. Where groundwater is stored in dams, mitigation measures have been developed to reduce the potential for release of stored water to the environment. This includes commitments to design and construct new dams in accordance with the most recent version of the Manual for Assessing Consequence Categories and Hydraulic Performance of Structures (EHP, 2013b), and construction of dams in accordance with DERM requirements (Commitment B255). In addition, the potential for release of groundwater to the general environment through the drilling and construction of production wells is managed through the commitment to install production wells in accordance with the Code of Practice for Constructing and Abandoning CSG wells in Queensland (NRM, 2013a) (Commitment B249). All monitoring bores will be constructed in accordance with the Minimum Construction Requirements for Water Bores in Australia (NUDLC, 2012) or the minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins of Queensland or the Code of Practice for Constructing and Abandoning CSG wells in Queensland (NRM, 2013a) (Commitment B250). These require

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				management of groundwater at the surface to ensure that it is contained and prevented from migrating uncontrolled away from the well head. Since the release of the EIS, the second edition of the code of practice was released in November 2013 (NRM, 2013a). Arrow is committed to meeting the requirements in the revised code of practice, as detailed in commitment B249. Similarly, the third edition of the Minimum Construction Requirements for Water Bores in Australia was released in February 2012 (NUDLC, 2012). Arrow is committed to meeting the requirements in this revised document, as detailed in commitment B250. Once the production bore or monitoring well is constructed, application of Arrow's well integrity program ensures that no leaks of groundwater are occurring at the surface at the wellhead or from connections to the gathering lines. Once the groundwater reaches the surface, it is then managed as coal seam gas water. Arrow's Coal Seam Gas and Salt Management Strategy is presented in Appendix D of the SREIS, and the management options carried forward are discussed in Project Description (Section 3) of the SREIS. Detailed assessments of discharge of coal seam gas water to watercourses are contained in the Surface Water chapter (Section 8), Hydrology and Geomorphology chapter (Section 9) and Aquatic ecology chapter (Section 10) of the SREIS.
S23	560	How will Arrow Energy's manage water supply (including bore, springs, aquifers, dams) in the event of water contamination scenario over the longer term?	Groundwater chapter (Section 14) of the EIS	Two processes have the potential to impact groundwater supply; contamination of groundwater resources and a reduction in groundwater level. With regards to the potential for contamination, the potential indirect impact on groundwater quality as a result

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				of coal seam gas extraction causing induced flow and changes in groundwater quality is identified in the Groundwater Chapter (Section 14, Table 14-18) of the EIS. The magnitude of that potential impact is identified in the EIS and the SREIS as very low, given that when coal seam gas and water are extracted from the target coal seams, a pressure gradient will be generated such that groundwater in overlying and underlying aquifers will migrate towards the lower pressure target coal seams in the Blackwater Group at various rates determined by aquifer and aquitard parameters. The pressure gradients are not conducive to movement of poorer quality groundwater in the Blackwater Group into surrounding aquifers with generally better water quality. In addition, the Rewan Formation behaves as an aquitard, and overlies the Blackwater Group in most locations, limiting the movement of groundwater into the overlying intermediate and shallow groundwater systems. Similarly the interburden between the target coal seams consists of low permeability shale, mudstone and siltstone, which also restricts the migration of groundwater. The significance of potential impacts to groundwater quality presented in the EIS is based on this process. The potential for groundwater quality to be impacted by the use of drilling muds etc. is manageable through the implementation of standard controls associated with appropriate drilling techniques and surface storage of chemicals and fuels (e.g., Commitments B168, B178, B249 and B250). The potential for groundwater to be contaminated through surface storage of chemicals and storage of liquids in dams is managed through commitments relating to siting of surface infrastructure (i.e. dams and storage of other potential contaminating

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				material) that takes into consideration the local environment to minimise risk to the environment, construction of infrastructure in accordance with relevant guidelines, standards and legislative controls, implementation of bunding and lining to prevent release of potential spills or leaks to the environment, adherence to quality control and assurance procedures and monitoring of groundwater levels and quality to identify potential impact and the need for further mitigation measures where required. These measures are consistent with Commitments B178, B255, B353, B256 and B398. In the event that Arrow's coal seam gas activities do cause alteration of groundwater quality and the inability of that groundwater to support an existing use at a third-party bore, or an ecological community present at a spring or groundwater-dependent ecosystem, Arrow is obligated under the *Water Act 2000* (Qld) (Water Act) to implement make good measures. Where an existing groundwater bore is potentially impacted by the exercise of underground water rights associated with petroleum activities, Arrow must enter into a Make Good Agreement with the bore owner, which includes definition of make good measures should impact actually occur. These measure outline how Arrow will ensure the bore owner has access to a reasonable quantity and quality of water. Just as Arrow is required to make good on impaired groundwater supply due to coal seam gas water activities, they are also obligated under the Water Act to make good if the water quality is impaired as a result of coal seam gas activities.
S23	561	How will water sources be monitored for sustainability?	Groundwater	The *Water Act 2000* (Qld) (Water Act) defines bore trigger

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			chapter (Section 14) of the EIS	threshold values for consolidated aquifers (5 metres (m)) and unconsolidated aquifers (2 m). The Water Act also defines trigger threshold for springs (0.2 m). Bore trigger threshold values are used to determine the point at which investigation is required to determine whether monitoring or intervention may be required to maintain groundwater supply or groundwater quality in line with current uses. The threshold values do not represent drawdown values that impact on the sustainable use of an aquifer, and instead provide an early warning system that triggers investigation by responsible tenure holders. The Underground Water Impact Reports (UWIR) prepared by Arrow identify areas of aquifers where drawdown in excess of the bore trigger thresholds (2 m for an unconsolidated aquifer and 5 m for a consolidated aquifer) within the next three years (this area is identified as the Immediately Affected Area (IAA)) may occur as a result of coal seam gas extraction. Arrow must establish make good agreements with bore owners within these areas. Drawdowns of 2 m for unconsolidated aquifers and 5 m for consolidated aquifers may have no effect on the capacity of the bore. Bore-specific characteristics drive the requirement for individual bores with the potential to be impacted to be investigated as part of a bore assessment. In the event that the third-party bore is found to have impaired capacity due to coal seam gas extraction activities, Arrow is required to implement make good measures to account for this. This ensures a secure supply of water over the term of impaired capacity in the third-party bore. Arrow is required by law to fulfil these obligations.

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				The make good measures to be implemented will be negotiated between Arrow and the bore owner depending on the specific situation and may include: • Modifying the pumping infrastructure of the bore. • Modifying or deepening the bore. • Installing a new bore into the same aquifer. • Installing a new bore into another aquifer. • Supplying an alternative source of water. • Monetary compensation (considerate of the use of the bore). In addition, the Water Act defines the requirement for a Water Monitoring Strategy (WMS) that will provide for the collection and assessment of suitable groundwater level and quality data on a regional scale whereby groundwater baseline conditions will be established and the potential for on-going impacts to groundwater as a result of extraction of groundwater associated with petroleum activities is routinely assessed. Arrow is committed to the establishment of a regional monitoring network and routine assessment of the data against baseline conditions, as presented in Commitments B242 and B245.
S32	612	Although some elements of the TOR have been addressed, the EIS in its current form describes the area that may be influenced by land subsidence due to coal seam depressurisation as the entire project area. Section 4.2.2 of the TOR requires that the EIS identifies potential impacts to existing infrastructure. SunWater considers water pipelines as existing infrastructure as it belongs to the same class as provided for in the section 4.2.2 of the TOR.	Geology chapter (Section 13.5) of the EIS Groundwater chapter (Section 7), Hydrology and Geomorphology chapter (Section	The EIS identified two forms of potential subsidence. One form is related to localised differential settlement associated with ground disturbance activities such as underground gathering line installations and the potential for the surface to subside post-installation if backfilling works are not conducted appropriately. The other form of potential subsidence is caused by coal seam gas extraction and depressurisation of the target coal seams.

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			9), Supplementary Groundwater Assessment (Appendix E) and Supplementary Hydrology Assessment (Appendix G) of the SREIS	Arrow acknowledges that existing infrastructure within the Project area must be protected from impacts resulting from project activities. In the event that existing infrastructure is impacted during the construction of a pipeline, for example, Arrow will repair or replace the existing infrastructure as required (Commitment B594). Localised subsidence caused by installation of underground gathering lines will be managed through a series of commitments to ensure that disturbed areas are reinstated to preconstruction levels (Commitment B233) and monitored to determine the status of signposting subsidence (Commitment B536). Once Arrow's underground infrastructure is no longer required, the infrastructure will be filled with an inert substance to prevent subsidence (where applicable) (Commitment B604). Land subsidence due to coal seam depressurisation is acknowledged in the Geology chapter (Section 13.5) of the EIS as a potential impact associated with the project. Section 13.5.3 describes the mechanisms of land subsidence as a function of coal seam gas extraction. The EIS explains that the risk to infrastructure associated with potential regional scale subsidence across a basin is lower than for localised subsidence related to ground disturbance works. This is primarily because subsidence at a local scale is more likely to result in a differential in the rate of subsidence than ground movement at a regional scale due to groundwater extraction. At the time of the EIS, the discussion on subsidence referred to literature available for similar sites in the Powder River Basin, Wyoming USA and in the San Juan Basin of

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				Colorado and New Mexico. No local examples were available. As part of the SREIS, a desktop assessment of additional information available since the EIS has been undertaken and included in the Groundwater chapter (Section 7) and Hydrology and Geomorphology chapter (Section 9) of the SREIS. The desktop study presents the results of a baseline surface deformation study conducted by Altamira on behalf of Arrow over the Moranbah Gas Project area. The information has been used to expand on the description provided in the EIS that subsidence as a result of coal seam gas extraction is unlikely to occur in the region. The results of the baseline monitoring show that ground movement across the Moranbah Gas Project is within the range of natural ground movement associated with shrink and swell properties of soil. The Groundwater chapter (Section 7) and Hydrology and Geomorphology chapter (Section 9) of the SREIS provide updates on the data being collected to assist with understanding the potential for subsidence associated with project activities. The supplementary groundwater assessment (Appendix E) of the SREIS concludes that the magnitude of impact resulting from coal seam depressurisation that may cause physical effects due to subsidence is very low. In addition, the supplementary hydrology assessment (Appendix G) of the SREIS concludes that the impacts of subsidence on the surface water environments respectively is negligible. If available, Arrow will review information available from the Office of Water Science (a group within Department of the Environment) in relation to subsidence to inform its

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				understanding of potential impacts.
S32	616	Water: SunWater's pipeline infrastructure in the Bowen Gas Project production area includes high pressure water lines which will not withstand any differential subsidence. Several pipelines are designed to transport bulk water via gravity, so any subsidence could impact on the capacity of the line to transport water and SunWater's ability to supply water to industrial, urban and agricultural customers in the project area.	Geology chapter (Section 13.5) and Groundwater chapter (Section 14) of the EIS	Land subsidence due to coal seam depressurisation is acknowledged in the Geology chapter (Section 13.5) of the EIS as a potential impact associated with the project. EIS Section 13.5.3 describes the mechanisms of land subsidence as a function of coal seam gas extraction. The EIS explains that the risk to infrastructure associated with potential regional scale subsidence across a basin is lower than for localised subsidence related to ground disturbance works. This is primarily because subsidence at a local scale is more likely to result in a differential in the rate of subsidence than ground movement at a regional scale due to groundwater extraction. The results of the baseline monitoring also show that ground movement across the Moranbah Gas Project is within the range of natural ground movement associated with shrink and swell properties of soil. Arrow acknowledges that existing infrastructure within the Project area must be protected from impacts resulting from project activities. Localised subsidence caused by installation of underground gathering lines will be managed through a series of commitments to ensure that disturbed areas are reinstated to preconstruction levels (Commitment B233) and monitored to determine the status of signposting subsidence (Commitment B536). Once Arrow's underground infrastructure is no longer required, the infrastructure will be filled with an inert substance to prevent subsidence (where applicable) (Commitment B604).
S33	630	Vale is unsure what impact the fraccing chemicals will have on	Geology chapter	Hydraulic fracture stimulation is not expected to impact on

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		coal quality. Table 3-1 and 3-2 of Appendix G (Hydraulic Simulation Risk Assessment) show some fraccing compounds containing sulphur (e.g. sodium sulphate, sodium sulphide and sodium thiosulphate) and phosphorous (tetrakish phosphonium sulphate).	(Section 13) and Groundwater and Geology Technical Report (Appendix L) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Vale coal operations, and compounds are not expected to migrate to Vale target coals. Hydraulic fracture stimulation is undertaken to stimulate wells in coal targets that are located at depth, typically 350 m to 750 m below surface, and only within Arrow's tenure. Accordingly, Vale's tenements will not be impacted because these wells are at distance from Vale operations. In addition, the extent of fracturing due to well stimulation is limited. Microseismic mapping was undertaken for Arrow by Pinnacle Services in November and December 2012 during the hydraulic fracture stimulation of vertical coal seam gas wells located near Moranbah in the Bowen Basin. The objectives of the fracture microseismic mapping included measuring the fracture geometry (height, length, width, and azimuth), determining the relative degree of induced fracture complexity, and monitoring the project in real time for out-of-zone fracture height growth. The average fracture extent from well stages that injected water was approximately 65 m horizontally. Hydraulic fracturing activities are customised for each well to ensure that out of zone fracturing does not occur. The Groundwater and Geology Technical Report (Appendix L, Appendix G) of the EIS contained a hydraulic stimulation risk assessment. Included in this document was a mass balance of the fluid mixture, indicating that in most cases, less than 6 megalitres (ML) of hydraulic stimulation fluids are required in each well. The mass balance presented in the Groundwater and Geology Technical Report (Appendix L, Appendix G) of the EIS concluded that the 18% to 32% of hydraulic stimulation fluids remaining in the formation, or not accounted for in the

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				volume of flow back material, would be subject to other sub-surface mass loss mechanisms including: • Natural biodegradation. • Enhanced biodegradation (through the use of acetic acid or enzymes injected in to the well during the stimulation process). • Entrapment and sorption on the coal. Following hydraulic stimulation, pumping is commenced in the production well, causing depressurisation of the coal seams. This captures the remaining hydraulic stimulation fluids, preventing migration of chemicals away from the zone of hydraulic stimulation. The risk assessment concluded that the maximum travel distance of hydraulic stimulation fluids within the target coal seams is within the capture radius of the well during pumping. Based on this information, chemicals used by Arrow in hydraulic stimulation activities are not expected to migrate significantly from the location of hydraulic stimulation. Where Arrow proposes a hydraulic stimulation event, an environmental authority (EA) must be granted by EHP under the *Environmental Protection 1994* (Qld) Act (EP Act) prior to commencement. A range of information must be provided by Arrow to EHP as part of the EA application in relation to hydraulic stimulation. The required information is outlined in the Guideline on Application Requirements for Petroleum Activities (EHP, 2013a). These requirements are summarised in the Supplementary Groundwater Assessment (Appendix E, Section 9.3.8) of the SREIS, with the main requirement set out in the current Guideline on Application Requirements for Petroleum Activities including a risk assessment and monitoring program. Arrow is

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				already completing these risk assessments for current operations where hydraulic stimulation activities are conducted. In these areas EA conditions issued from EHP are in place to control potential impacts related to hydraulic stimulation events. Arrow will design all hydraulic stimulation wells and events in accordance with relevant requirements of the EP Act and P&G Act, consistent with Commitment B646.
S33	631	It is likely that Fraccing will affect the geotechnical behaviour of both the coal, roof and floor, and therefore may contribute to mining issues. E.g., for a board and pillar operation, will fraccing reduce the potential pillar strength? What will happen to the strength of the roof and the track ability of the floor? What impacts from a geotechnical perspective will this have to future longwall mining?	Geology chapter (Section 13) of the EIS	Hydraulic fracture stimulation is not expected to impact on Vale coal operations. ACARP (2007) report that production scale hydraulic fracture stimulations do not adversely impact on the future safe and efficient coal mining, and in most cases offer benefits due to the reduction in gas related delays. Hydraulic fracture stimulation is undertaken to stimulate wells in coal targets that are located at depth, typically 350 m to 750 m below surface, and only within Arrow's tenure. Accordingly, Vale's tenements will not be impacted because these wells are at distance from Vale operations. In addition, the extent of fracturing due to well stimulation is limited. Microseismic mapping was undertaken for Arrow by Pinnacle Services in November and December 2012 during the hydraulic fracture stimulation of vertical coal seam gas wells located near Moranbah in the Bowen Basin. The objectives of the fracture microseismic mapping included measuring the fracture geometry (height, length, width, and azimuth), determining the relative degree of induced fracture complexity, and monitoring the project in real time for out-of-zone fracture height growth. The average fracture extent from well stages half-length for stages that injected water was approximately 65 m horizontally.

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S33	632	Will the draw-down of the water table/aquifer coupled with the increase in permeability in the coal seams increase the rate of oxidation of the exposed coal?	Geology chapter (Section 13) and Groundwater and Geology Technical Report (Appendix L, Section 8) of the EIS.	It is unlikely that any material impact to coal formations due to oxidation will occur. Impacts caused by groundwater drawdown have been assessed by numerical groundwater modelling. This modelling predicts the drawdown due to coal seam gas activities, and the impacts are discussed in the Groundwater and Geology Technical Report (Appendix L, Section 8) of the EIS. The modelling indicates that only a very small extent of drawdown will occur in the shallow groundwater system, based on the extent of 2 m drawdown impacts presented (refer Figures 8-2 and 8-3 of the abovementioned report). In addition, these identified impacts are very conservative, because the results adopted for the assessment of shallow groundwater system drawdown are based on Layer 3 of the groundwater model (mainly the Clematis Sandstone) rather than Layer 1 of the groundwater model (mainly surficial alluvial material). As a result, the data used to represent the drawdown in the shallow system (and therefore the associated assessment of impacts) is actually based on the drawdown associated with a deeper groundwater system, where greater drawdown would be expected. In addition the modelling was based on a total groundwater take of 274 GL over the project life, and this has since been reduced to 153 GL.
S33	633	Vale suggests that Arrow should have a plan in place to map all wells (including failed wells) to ensure that no future mining hazards are created, this should include the survey of all lateral components of the wells.	Geology chapter (Section 13) and Land Use and Tenure chapter (Section 19.4.3)	The EIS reflects Arrow's commitment to install production wells in accordance with the Code of Practice for Constructing and Abandoning CSG wells in Queensland (NRM, 2013a) (Commitment B249). All monitoring bores will be constructed in accordance with the Minimum Construction Requirements for Water

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			of the EIS	Bores in Australia (NUDLC, 2012), the Code of Practice for Constructing and Abandoning CSG wells in Queensland (NRM, 2013a) or the minimum standards for the construction and reconditioning of water bores that intersect the sediments of artesian basins in Queensland (Commitment B250). Since the release of the EIS, the second edition of the code of practice was released in November 2013 (NRM, 2013a). Arrow is committed to meeting the requirements in the revised code of practice, as detailed in commitment B249. Similarly, the third edition of the Minimum Construction Requirements for Water Bores in Australia was released in February 2012 (NUDLC, 2012)Arrow is committed to meeting the requirements in this revised document, as detailed in commitment B250. During operation, Arrow will conduct periodic well integrity checks to ensure the integrity of well construction as per commitment B285. In areas of overlapping tenure, the location of Arrow infrastructure will be discussed with other proponents as part of a co-development agreement. Details of a co-development agreement are described in the Land Use and Tenure chapter (Section 19.4.3) of the EIS. The co-development agreement will be generated in consultation with the relevant proponent and will include safety and hazard management considerations.
S33	634	Rehabilitation of wells (i.e. correct grouting) will need to be monitored to ensure that no future mining hazards are created.	Geology chapter (Section 13) and Decommissioning and	The EIS reflects Arrow's commitment to install and abandon all production wells in accordance with the Code of Practice for Constructing and Abandoning CSG wells in Queensland (NRM, 2013a) (Commitment B249). Since the

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			Rehabilitation chapter (Section 29.6.3.1) of the EIS	release of the EIS, the second edition of the code of practice was released in November 2013 (NRM, 2013a). Arrow is committed to meeting the requirements in the revised code of practice, as detailed in Commitment B249. Section 6.9 of the code outlines the decommissioning requirements for coal seam gas wells, and also makes reference to the relevant legislative requirements. As detailed in the revised code, and in Decommissioning and Rehabilitation chapter (Section 29.6.3.1) of the EIS, groundwater aquifers are generally isolated by plugging the well with cement slurry. The mandatory decommissioning requirements rely on appropriate cementing techniques, which are detailed in section 6.3 of the code. Specific decommissioning requirements will differ depending on the well type (whether an exploration and appraisal bore hole, a monitoring bore or a production well) and the stratigraphic profile intersected (e.g., depths to the coal seam gas production zone and water production rates). Mandatory pressure testing and cementing requirements ensure that the migration pathways are prevented and key stratigraphic zones are isolated. Through the correct decommissioning of these bores, and liaison between Arrow and proponents with overlapping tenure via a co-development agreement, potential risks to surrounding mining operations will be managed appropriately. Part of the decommissioning process for wells will also include sign-posting to ensure that they can be located at the surface. This will allow appropriate management of activities associated with overlapping tenure that may come into contact with the decommissioned well (e.g. contact

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				with steel casing).
S33	636	Where are the low-salinity areas? Vale requires an indication of potential impact to potable, stock and irrigation suitable groundwater to assess whether land owned by Vale will be affected.	Groundwater chapter (Section 14.5.3.1) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	The distribution of groundwater salinity zones are presented in the Groundwater chapter (Section 14, Figure 14-7) of the EIS. This map is based on desktop information. Additional groundwater quality data included in the SREIS is presented in Supplementary Groundwater Assessment (Appendix E, Section 5.4) of the SREIS. The potential indirect impact on groundwater quality as a result of coal seam gas extraction causing induced flow and changes in groundwater quality is identified in the Groundwater chapter (Section 14, Table 14-18) of the EIS. The magnitude of that potential impact is identified in the EIS as very low, given that when coal seam gas and water are extracted from the target coal seams, a pressure gradient will be generated such that groundwater in overlying and underlying aquifers will migrate towards the target coal seams in the Blackwater Group at various rates. The pressure gradients are not conducive to movement of poorer quality groundwater in the Blackwater Group into surrounding aquifers with generally better water quality. In addition, the Rewan Formation behaves as an aquitard, and overlies the Blackwater Group in most locations, limiting the movement of groundwater into the overlying intermediate and shallow groundwater systems. Similarly the interburden between the target coal seams consists of low permeability shale, mudstone and siltstone, which also restricts the migration of groundwater. The significance of potential impacts to groundwater quality presented in the EIS is based on this process. Potential impacts to groundwater quality as a result of surface infrastructure, e.g., leaks and spills from fuel

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				storage containers or subsurface infrastructure such as underground gathering lines or drilling activities are identified in the Groundwater chapter (Section 14, Table 14-18) of the EIS. Mitigation measures associated with the management of these potential impacts are centred on the design, construction and maintenance of chemical storage containers in accordance with relevant standards (e.g., Commitment B178). Arrow must also meet minimum drilling, construction and monitoring requirements to ensure that impacts on groundwater quality from drilling activities are managed appropriately. (e.g., Commitments B249 and B250) Just as Arrow is required to make good on impaired groundwater supply due to coal seam gas water activities, they are also obligated under the Water Act to make good if the water quality is impaired as a result of coal seam gas activities.
S33	637	Vale requires indication of the amount of seismicity expected and the effect on underground coal mining operations.	Geology chapter (Section 13) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Historical natural seismic activity within the Project Area is discussed in the Geology chapter (Section 13.4.7) of the EIS. The majority of the Project area falls within a Modified Mercalli Intensity (MMI) III zone of expected earthquake intensities. This MMI ranking is approximately equivalent to a 3.0 to 3.9 magnitude earthquake on the Richter magnitude scale. Additional information on historical seismic events in the vicinity of the Project area is presented in the Supplementary Groundwater Assessment (Appendix E, Section 5.7) of the SREIS. As described in the Geology chapter (Section 13.5.1) of the EIS, induced seismicity refers to typically low magnitude seismic activity (earthquakes and tremors) caused by

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				human activities that alter stresses on the earth's crust. This section of the EIS also describes the magnitude of seismic events induced by hydraulic stimulation. The EIS concluded that induced seismicity as a result of hydraulic stimulation is considered to result in minor seismic events, which are likely to be less than the historically recorded magnitudes or those generated by mining activities. Microseismic mapping was conducted by Arrow in 2012 during hydraulic stimulation activities approximately 60 km north of Moranbah. The results of the microseismic mapping exercise indicated that the moment magnitude of microseismic events ranged up to -3.91 Mw. The microseismic events were imaged up to approximately 250 m away from the hydraulically stimulated well, but these events are small and can only be detected by sensitive seismological instruments. Based on the magnitude of induced seismicity from hydraulic stimulation activities, and that the events are localised to the area of stimulation, potential follow-on impacts to coal mining operations are not expected to occur. Further discussion of natural and induced seismicity is provided in in the Supplementary Groundwater Assessment (Appendix E, Section 5.7) of the SREIS. Through liaison between Arrow and proponents with overlapping tenure via a co-development agreement, potential risks to surrounding mining operations will be managed appropriately. This agreement will consider all safety and hazard management controls required.

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S33	638	This could be localised safety risk. Vale requires indication of the amount of seismicity expected and the effect on underground coal mining operations.	Geology chapter (Section 13) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Historical natural seismic activity within the Project Area is discussed in the Geology chapter (Section 13.4.7) of the EIS. The majority of the Project area falls within a Modified Mercalli Intensity (MMI) III zone of expected earthquake intensities. This MMI ranking is approximately equivalent to a 3.0 to 3.9 magnitude earthquake on the Richter magnitude scale. Additional information on historical seismic events in the vicinity of the Project area is presented in the Supplementary Groundwater Assessment (Appendix E, Section 5.7) of the SREIS. As described in the Geology chapter (Section 13.5.1) of the EIS, induced seismicity refers to typically low magnitude seismic activity (earthquakes and tremors) caused by human activities that alter stresses on the earth's crust. This section of the EIS also describes the magnitude of seismic events induced by hydraulic stimulation. The EIS concluded that induced seismicity as a result of hydraulic stimulation is considered to result in minor seismic events, which are likely to be less than the historically recorded magnitudes or those generated by mining activities. Microseismic mapping was conducted by Arrow in 2012 during hydraulic stimulation activities approximately 60 km north of Moranbah. The results of the microseismic mapping exercise indicated that the moment magnitude of microseismic events ranged up to -3.91 Mw. The microseismic events were imaged up to approximately 250 m away from the hydraulically stimulated well, but these events are small and can only be detected by sensitive seismological instruments. Based on the magnitude of induced seismicity from

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				hydraulic stimulation activities, and that the events are localised to the area of stimulation, potential follow-on impacts to coal mining operations are not expected to occur. Further discussion of natural and induced seismicity is provided in the Supplementary Groundwater Assessment (Appendix E, Section 5.7) of the SREIS. Through liaison between Arrow and proponents with overlapping tenure via a co-development agreement, potential risks to surrounding mining operations will be managed appropriately. This agreement will consider all safety and hazard management controls required.
S33	639	Vale requires information including maps indicating the location and expected extent of subsidence.	Groundwater chapter (Section 7), and Hydrology and Geomorphology chapter (Section 9) of the SREIS	The EIS identified two forms of potential subsidence. One form is related to localised differential settlement associated with ground disturbance activities such as underground gathering line installations and the potential for the surface to subside post-installation if backfilling works are not conducted appropriately. The other form of potential subsidence is caused by coal seam gas extraction and depressurisation of the target coal seams. At the time of the EIS, the discussion on this form of potential subsidence referred to literature available for similar sites in the Powder River Basin, Wyoming USA and in the San Juan Basin of Colorado and New Mexico. No local examples were available. As part of the SREIS, a desktop assessment of additional information available since the EIS has been undertaken and included in the Groundwater chapter (Section 7), and Hydrology and Geomorphology chapter (Section 9) of the SREIS. The desktop study presents the results of a baseline

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				surface deformation study conducted by Altamira on behalf of Arrow over the Moranbah Gas Project area. The information has been used to expand on the description provided in the EIS that subsidence as a result of coal seam gas extraction is unlikely to occur in the region. The results of the baseline monitoring show that ground movement across the Moranbah Gas Project is within the range of natural ground movement associated with shrink and swell properties of soil. It is therefore expected that subsidence across the remainder of the Bowen Gas Project during coal seam gas extraction over the life of the project will also be within the range of natural ground movement, including natural erosion rates. Through liaison between Arrow and proponents with overlapping tenure via a co-development agreement, potential risks to surrounding mining operations will be managed appropriately.
S33	651	What alternatives are proposed to be used? Vale requires material safety data sheets of all chemicals used on its land and tenure.	Groundwater and Geology Technical Report (Appendix L) of the EIS	Since the release of the EIS, Arrow have refined the field development plan and the production well designs. The production well designs identified to maximise gas production include: • Multi-branch lateral wells. • Multi-seam hydraulically stimulated vertical wells. The SREIS also assumes that up to 25% of all wells would require hydraulic stimulation. Therefore, not all production wells will require hydraulic stimulation, if any at all. The Groundwater and Geology Technical Report (Appendix L) presented in the EIS contained information on the range of chemicals utilised in hydraulic stimulation activities. This list also provided the Chemical Abstract Service (CAS) numbers.

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				Through liaison between Arrow and proponents with overlapping tenure via a co-development agreement, potential risks to surrounding mining operations will be managed appropriately.
S37	681	The proponent states that "A review of publicly available mine data within the Project area yielding insufficient information on the 40 mines (i.e. geometrics, schedules and dewatering rates) to enable the accurate modelling of their cumulative groundwater impacts… Consequently, cumulative impacts of this coal mining were not able to be included in the proposed numerical groundwater model of the Project."	Cumulative Impacts chapter (Section 31) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS	Noted. The assessment of potential cumulative impacts on groundwater values presented in the Cumulative Impacts chapter (Section 31) of the EIS considered a number of contributing future developments. A lack of suitable data in the public domain limited a full quantitative assessment of potential cumulative impacts resulting from the operation of the Bowen Gas Project in conjunction with the existing mining industry. The Supplementary Groundwater Assessment (Appendix E, Section 8.3) of the SREIS presents an updated assessment of cumulative impacts associated with groundwater. While suitable available data from existing mines remains limited, a qualitative discussion on the significance of potential cumulative impacts is presented.
S37	682	The proponent stated that "Induced groundwater pressure gradients and flows will be towards the coal seams. The induced pressure gradients will be sustained for long periods of time, such that the risk of groundwater seeping away from the CSG production zone of influence is interpreted as being negligible." The proponent has assessed the relative risk of groundwater seeping away from the production zone (and presumably contaminating other groundwater aquifers), however there is no description of what actions the proponent would take if an impact was detected (i.e. mitigation measures).	Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS Supplementary Groundwater Assessment (Appendix E) of	The potential indirect impact on groundwater quality as a result of coal seam gas extraction causing induced flow and changes in groundwater quality is identified in the Groundwater Chapter (Section 14, Table 14-18) of the EIS. The magnitude of that potential impact is identified in the EIS and SREIS as very low, given that when coal seam gas and water are extracted from the target coal seams, a pressure gradient will be generated such that groundwater in overlying and underlying aquifers will migrate towards the target coal seams in the Blackwater Group at various rates. The pressure gradients are not conducive to movement of poorer quality groundwater in the Blackwater Group into surrounding aquifers with generally better water

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			the SREIS	quality. In addition, the Rewan Formation behaves as an aquitard, and overlies the Blackwater Group in most locations, limiting the movement of groundwater into the overlying intermediate and shallow groundwater systems. Similarly the interburden between the target coal seams consists of low permeability shale, mudstone and siltstone, which also restricts the migration of groundwater. The significance of potential impacts to groundwater quality presented in the EIS and SREIS is based on this process. However, in the event that Arrow's coal seam gas activities cause a decline in water level at a bore and which, because of the decline in water level, the bore can no longer provide a reasonable quality of water. Arrow is obligated under the Water Act 2000 (Qld) (Water Act) to implement make good measures. Just as Arrow is required to make good on impaired groundwater supply due to coal seam gas water activities, they are also obligated under the Water Act to make good if the water quality is impaired as a result of coal seam gas activities. Under the *Environmental Protection Act 1994* (Qld) (EP Act), Arrow is legally required to remediate any contamination caused by project activities. Mechanisms for groundwater contamination have been identified and assessed in the Groundwater and Geology Technical Report (Appendix L) of the EIS and the Supplementary Groundwater Assessment (Appendix E) of the SREIS, and appropriate mitigation, management and monitoring measures proposed, which result in an assessment of the residual impact significance being low to very low.
S37	683	On page 90, the proponent states that "as aquifer depressurisation is an intrinsic part of the CSG extraction process, groundwater	Groundwater chapter (Section	The recovery of hydrogeological systems following coal seam gas extraction relates to geological time frames i.e.,

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		level impacts cannot be avoided. However, because impacts to the groundwater system are reversible these impacts may be acceptable"; however, on page 87, the proponent states that "...upon complete depressurisation, groundwater within the coal seams will virtually never recover to pre-CSG conditions." These statements seem contradictory.	14) of the EIS	thousands of years, hundreds of thousands of years, or longer. Over these time periods, groundwater systems can reach equilibrium, as described in the Groundwater chapter (Section 14.7.5.1) of the EIS. Groundwater systems inherently recover through natural recharge processes over time. The timeframe for recovery is dependent on the recharge mechanisms associated with each aquifer, i.e., deeper confined aquifers will generally have slower recharge rates compared with shallow, unconfined aquifers which can be recharged through direct surface infiltration. Groundwater drawdown resulting from coal seam gas extraction can be reversed over geological time due primarily to natural recharge mechanisms.
S37	684	This table considers the risks and mitigation measures to groundwater resources, including aquifer contamination, inter-aquifer impacts, etc. While mitigation measures have been proposed, there are no details about what actions/ rehabilitation measures the proponent would take if an impact is detected.	Groundwater chapter (Section 14, Table 14-17) of the EIS	In the event that Arrow's coal seam gas activities do cause a decline in water level at a bore and which, because of the decline in water level, the bore can no longer provide a reasonable quality of water, or where it results in impact to an ecological community present at a spring or groundwater-dependent ecosystem, Arrow is obligated under the *Water Act 2000* (Qld) (Water Act) to implement make good measures. Just as Arrow is required to make good on impaired groundwater supply due to coal seam gas water activities, they are also obligated under the Water Act to make good if the water quality is impaired as a result of coal seam gas activities.
S37	688	The proponent states that "After CSG operations are completed, the groundwater system will re-adjust over a long period." FBA submits that this statement is misleading, particularly in light of other statements made in the EIS, such that groundwater will never recover to pre-CSG extraction levels, being effectively "mined" through the CSG extraction process.	Groundwater chapter (Section 14) of the EIS	The recovery of hydrogeological systems following coal seam gas extraction relates to geological time frames i.e., thousands of years, hundreds of thousands of years, or longer. Over these time periods, groundwater systems can reach equilibrium, as described in Groundwater chapter (Section 14.7.5.1) of the EIS. Groundwater systems

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				inherently recover through natural recharge processes over time. The timeframe for recovery is dependent on the recharge mechanisms associated with each aquifer, i.e., deeper confined aquifers will generally have slower recharge rates compared with shallow, unconfined aquifers which can be recharged through direct surface infiltration. Groundwater drawdown resulting from coal seam gas extraction can be reversed over geological time due primarily to natural recharge mechanisms.
S38	705	Health: How will impacts on surface water irrigation and groundwater withdrawal impacts by CSG and other forms of mining impacts be resolved?	Cumulative Impacts chapter (Section 31) and CSG Water and Salt Management Strategy (Appendix AA) of the EIS Supplementary Groundwater Assessment (Appendix E) of of the SREIS	Arrow does not intend to take, divert, or store significant volumes of surface water as part of the project activities, however small volumes of surface water may be taken to support well drilling or dust suppression in some parts of the field. Current irrigation practices in the Project area are not expected to be impacted. While Arrow is authorised under the Petroleum and Gas (Production and Safety) Act 2004 (P&G Act) and Petroleum Act 1923 to take or interfere with groundwater in the process of exploration for, and production of coal seam gas, the *Water Act 2000* (Qld) (Water Act) requires Arrow to manage any impacts caused as a result of these activities on groundwater values. These underground water obligations include a responsibility to undertake baseline assessments (to identify the presence of existing groundwater bores), prepare (and comply with) underground water impact reports (including predictions of areas in each aquifer when drawdown impacts are likely to occur), undertake groundwater monitoring (to verify groundwater modelling), and make good any impairment of private bore groundwater supplies. These make good obligations are required under the Water Act for both

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				impaired groundwater supply and quality as a result of coal seam gas activities. A cumulative impact assessment was presented in the Cumulative Impacts chapter (Section 31) of the EIS, and this considered impacts on groundwater values from other projects in the area. The Supplementary Groundwater Assessment (Appendix E, Section 8.3) of the SREIS presents an updated assessment of cumulative impacts associated with groundwater.
S38	708	Health: Because the complex nature of groundwater connectivity is not fully understood, no definitive evaluation of the impact of CSG mining upon groundwater aquifers currently exists. The project is therefore high risk.	Groundwater chapter (Section 14) and CSG Water and Salt Management Strategy (Appendix AA) of the EIS	Commitment B260 acknowledges that the collection of monitoring data will be used to update and calibrate the regional numerical model over time. This forms a key aspect of the adaptive management framework and the information will be used to reduce uncertainty in drawdown predictions and provide information for improving monitoring, management and mitigation measures. It is standard practice for groundwater models to be calibrated to the available data, and then over time, to be 'validated' as new data becomes available. This allows for the model to be recalibrated if necessary, therefore improving predictions. Hence, the approach is considered adaptive. In some instances, limited data sets were available during the preparation of the regional groundwater model. In these cases, the groundwater model adopted the more conservative values to ensure that the impacts predicted by the model presented the worst-case, and therefore did not under-represent the potential impacts to groundwater values. Under the *Water Act 2000* (Qld) (Water Act), Arrow is required to use these conservative groundwater drawdown

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				predictions to define Immediately Affected Areas (IAA) and Long-Term Affected Areas (LAA) within their Underground Water Impact Reports (UWIRs). Arrow has already prepared UWIRs for their operations in the Moranbah Gas Project area (petroleum leases (PL) 191, 196, 223 and 224, and for some of their Authority to Prospect (ATP) areas within the Bowen Gas Project Area (ATP 1103 and ATP 1031). Arrow's use of these conservative groundwater drawdown predictions to define those areas within the model domain with the potential to be impacted within three years enables higher risk areas to be identified and the management measures to be prioritised. In addition, the model predictions have undergone uncertainty analysis, and therefore represent the most conservative potential drawdown within an aquifer. These up-front model predictions will be updated based on regular and ongoing model calibrations that will take account of observed responses in monitoring bores during coal seam gas water extraction. The UWIR(s) will be republished every three years and will present any revisions to the number and location of bores likely to be impacted.
S38	709	Health: The Independent Expert Scientific Committee is preparing bio-regional assessments for all areas where CSG development is planned. These assessments seek to evaluate the ecology, hydrology and geology of the areas and determine the potential risks of CSG mining to water resources. But without completed research modelling on groundwater impacts, surface area disturbance, and soil fertility, how good can		The current bio-regional assessment program proposed by the Independent Expert Scientific Committee (IESC) does not include the Bowen Basin. Therefore, there is currently no mechanism for Arrow to contribute to a bio-regional assessment relevant to the Bowen Gas Project area, nor apply any information provided by the IESC as part of this process.

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		these assessments be?		
S53	1314	CSG drilling and extraction process: The activity of drilling and fraccing could in some instances allow increased hydrological connectivity between gas and upper aquifers and surface rivers (as suggested in the methane gas pockets that bubble at the surface of the Condamine River in QLD, and of various complaints from land holders that their bore water reservoirs have been contaminated by methane gas due to CSG activities in close proximity). How will Arrow energy ensure such an incident will not occur in this area given the high frequency of surrounding blasting practices in surrounding mines could contribute to this phenomenon.	Supplementary Groundwater Assessment (Appendix E) of the SREIS	The potential for hydraulic stimulation activities to result in fracturing of formations above or below the target coal seams are considered low, as described in the Supplementary Groundwater Assessment (Appendix E, Section 8) of the SREIS. The method of hydraulic stimulation and the prevailing geological conditions in the Bowen Basin Project area limits the fracture zone to the stimulation impact zone. There is anecdotal evidence that migration of gas to the surface can be a naturally occurring process that has occurred within the Surat Basin prior to the commencement of coal seam gas production activities. It is identified however, that coal seam gas extraction activities can cause pressure reductions allowing gas desorption and migration to the surface. The cause of the presence of gas in the Condamine River has not been determined. Based on the information obtained by the LNG (liquefied natural gas) enforcement unit (NRM, 2012b), the cause of bubbles in the Condamine River was unlikely to be due to coal seam gas activities. Origin Energy has advised NRM that the gas present may be naturally-occurring coal seam methane rising through the underlying geology in the area. Further investigations into the cause of gas in the Condamine River are continuing. Part 1 of the summary technical report of the Condamine River gas seep investigation (NRM, 2012b) also concluded no apparent safety risk in the immediate area of the seeps, and no apparent evidence of environmental harm that can be attributed to the present gas seeps. The depth to the

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				target coal seams in the Surat Basin and the Bowen Basin are similar, both ranging from approximately 150 m to 800 m. Arrow will extract coal seam gas water from the target coal seams in the Blackwater Group to reduce reservoir pressure in the coal seams to release gas. Gas flow is proportional to the groundwater depression around a production well, the gas content of the coal and the coal permeability. Proximity of groundwater bores to production wells will determine the extent to which the bore might be exposed to the groundwater depression and therefore exposed to the potential for fugitive gas flows. In addition, the groundwater depression around a production well will promote gas flow to the production well drawing it away from the peripheries of the cone of depression. Only wells within the Blackwater Group are potentially exposed to this risk. This risk is managed through bore integrity requirements, which are designed to limit the potential for gas migration. Arrow has committed to undertake periodic integrity checks to ensure well construction (Commitment B285). Such a system will include components addressing well construction, assessment of the effectiveness of well completion, and post construction monitoring and response to identified issues of well integrity. This risk is also managed through operation of the production wells which aims to achieve only a sufficient reduction in reservoir pressure to promote gas flow. Blasting activities associated with coal mining will not contribute to regional gas migration. Blasting events will not contribute to regional

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				depressurisation of the target coal seams. Blasting operations in open cut mines are limited to time and place, and any gas emissions from a blasting event will dissipate into the atmosphere. Blasting operations in underground mines could release gas emissions; however, these are also isolated events that are strictly controlled for safety reasons.
S53	1315	CSG drilling and extraction process: What distance of separation threshold is in place to frack from aquifers.	Hydrology and Geomorphology chapter (Section 9) of the SREIS	When conducting hydraulic stimulation, the target formation is the coal seams within the Late Permian strata. The targets are at depth and significantly disconnected from surface processes as a result of layered heterogeneity (Freeze and Cherry, 1979) and also due to the presence of physical confining layers, such as the Triassic Rewan Formation. In coal seam gas developments, the target coal seams for hydraulic stimulation in the Bowen Basin are of much lower strength than surrounding competent formations such as sandstone and shale that form the confining layers. Because of the relative weakness of the coal, lower pressures are required to generate fractures, and this reduces risks of out of zone fracturing. This is supported by the work conducted by Pinnacle (2013) and discussed in the Hydrology and Geomorphology chapter (Section 9) of the SREIS. As required under the current Guideline on Application Requirements for Petroleum Activities (EHP, 2013a), an assessment of the location of other aquifers, including shallow aquifers, will be carried out. Where present, these are considered as part of the assessment and a review of geological aspects including the vertical separation and location of aquifers is made.

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S53	1316	CSG drilling and extraction process: How often will fraccing activities be required, what chemicals, volumes of chemicals are injected and what volumes are recovered from a single well and how are they disposed of and managed.	Groundwater and Geology Technical Report (Appendix L) of the EIS Project Description chapter (Section 3) of the SREIS	The frequency of hydraulic stimulation is dependent on the site specific conditions, as described in the Project Description chapter (Section 3) of the SREIS. Arrow assumes that up to 25% of all production wells installed as part of the Bowen Gas Project will require hydraulic stimulation. This percentage could be lower, depending on geological conditions. The Groundwater and Geology Technical Report (Appendix L) of the EIS contained a hydraulic stimulation risk assessment. Included in this document was a list of chemicals used in hydraulic stimulation. This risk assessment document also contained a mass balance of the fluid mixture, indicating that in most cases, less than 6 megalitres (ML) of hydraulic stimulation fluids are required in each well. A significant volume of the hydraulic stimulation fluids are returned to the surface as flow back material. The flow back material will be managed in accordance with legislative requirements and the Arrow Waste Management Procedure (Commitment B384). The key aspect of Arrow's Waste Management Procedure that relate to the management of hydraulic stimulation chemicals includes a commitment (Commitment B398) to contain all waste drilling fluids resulting from drilling activities in dams or storage tanks lined as appropriate prior to re-use, recycling, treatment or disposal. Waste will only be disposed of in appropriate, approved disposal sites using approved methods and contractors. Waste tracking records will be maintained, in line with legal requirements (Commitment B395). The mass balance presented in the Groundwater and

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				Geology Technical Report (Appendix L) of the EIS concluded that the 18% to 32% of hydraulic stimulation fluids remaining in the formation, or not accounted for in the volume of flow back material, would be subject to other sub-surface mass loss mechanisms including: • Natural biodegradation. • Enhanced biodegradation (through the use of acetic acid or enzymes injected in to the well). • Entrapment and sorption on the coal. Following hydraulic stimulation, pumping is commenced in the production well, causing depressurisation of the coal seams. This captures the remaining hydraulic stimulation fluids, preventing migration of chemicals away from the zone of hydraulic stimulation. The risk assessment concluded that the maximum travel distance of hydraulic stimulation fluids within the target coal seams is within the capture radius of the well during pumping. The hydraulic simulation fluids are returned to the surface as flow back material and will be managed in accordance with legislative requirements and the Arrow Waste Management Procedure (Commitment B384). The key aspect of Arrow's Waste Management Procedure that relate to the management of hydraulic stimulation chemicals includes a commitment (Commitment B398) to contain all waste drilling fluids resulting from drilling activities in dams or storage tanks lined as appropriate prior to re-use, recycling, treatment or disposal. Waste will only be disposed of in appropriate, approved disposal sites using approved methods and contractors. Waste tracking records will be maintained, in line with legal requirements (Commitment B395).

21.5 Surface Water

Table 21-5 Surface Water Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S14	287	The introduction explains that the methodology for assessing potential impacts of the development of the proposed Project on surface water resources as being carried out in the context of environmental values, as defined by the Environmental Protection (Water) Policy 2009. Section 15.2 does not include any reference to an assessment of features within the project area being completed in the context of Water Act 2000. The definition of a watercourse is fundamental to the department's management of water resources under the Water Act 2000. Section 5 of the Water Act 2000 provides a definition of a watercourse and Section 3 of the Water Regulation 2002 provides further clarification to identification of watercourses. Requests for a watercourse determination (as defined under the Water Act 2000) should be made where: 1. the proponent considers activities to be outside the scope of the Guideline - Activities in a watercourse, lake or spring associated with a resource activity or mining operations, or 2. to determine whether or not surface water features within the project area are considered watercourses Requests should be made to the nearest office of Department of Natural Resources, Water Services.	Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water Technical Report (Appendix F) of the SREIS	Currently it is expected that all identified Project activities will occur in the proximity of defined watercourses. As the Project develops further, and potential locations for infrastructure are assessed on a site-specific basis, there may be a need to define surface water features that could potentially be impacted by development. In this instance, clarification would be sought by submitting a request for watercourse determination to the Department of Natural Resources and Mines (Water Services).
S14	288	A watercourse determination for surface water features within the project area can be requested from the department and must be; • lodged by an owner of the land, or • an acknowledged representative of the owner, or	Surface Water chapter (Section 15)	Currently, it is expected that all identified Project activities will occur in the proximity of defined watercourses. As the Project develops further, and potential locations for infrastructure are assessed on a site-specific basis, there

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		• if not made by the owner or owners representative, accompanied by the owners consent And must be made; • in writing • include the location and feature for which the determination is to be made; and • state the reason for the watercourse determination Watercourse determinations for activities within a watercourse lake or spring would only be required where the activity is outside the scope of the DNRM Guideline – Activities in a watercourse, lake or spring associated with a resource activity or mining operations (the Guideline).The Water Regulation 2002 permits activities including the destruction of native vegetation, excavation and placement of fill in a watercourse, lake or spring to be carried out without the need for a riverine protection permit provided they are in accordance with the Guideline. The Guideline may be used by the holder of an environmental authority under the Environmental Protection Act 1994, the holder of a mineral development licence or mining lease under the Mineral Resources Act 1989 and contractors, sub-contractors or other agents engaged by an authority holder.	of the EIS Surface Water Technical Report (Appendix F) of the SREIS	may be a need to define surface water features that could potentially be impacted by development. In this instance, clarification would be sought by submitting a request for watercourse determination to the Department of Natural Resources and Mines (Water Services).
S14	289	The description of the requirements of the Water Resource (Fitzroy Basin) Plan 2011 (Fitzroy WRP) and Water Resource (Burdekin Basin) Plan 2007 (Burdekin WRP) includes the following wording: "These plans set requirements for the taking of or interfering with overflow flow – therefore such activities need an operational works approval under Schedule 3, Table 4 of the Sustainable Planning Regulation 2009". The term 'overflow flow' is not correct. The appropriate term in this	Surface Water chapter (Section 15) of the EIS Surface Water chapter	Noted. Any reference to overland flow in the SREIS incorporates changes similar to those recommended. We recognise that the reference to "overflow flow" in the EIS was a typographic error, and should have been "over**land** flow". Arrow have checked that references to overland flow in SREIS use correct spelling / terminology. Wording has been revised for the SREIS to make the

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		case would be overland flow – defined as water flowing over land other than in a watercourse. This paragraph also does not differentiate between Water Resource Plan areas and the requirements of each for the take of overland flow within those plan areas. The paragraph also does not differentiate between the interference and take of overland flow water. The interference of overland flow is regulated under Section 20 (6A) of the Water Act 2000. The take of overland flow water is regulated by the WRP Plan's relevant to the project area. Within the Burdekin WRP area the construction of works for taking overland flow with a capacity less than 250 megalitres or through an environmental authority are able to be constructed provided that they are in accordance with the DNRM – "Code for self assessable development for taking overland flow water using limited capacity works" or "Code for self-assessable development for taking overland flow water to satisfy the requirements of an environmental authority or a development permit for carrying out an environmentally relevant activity". Within the Fitzroy WRP area construction of overland flow works with a capacity less than 50ML or through an environmental authority are able to be constructed in accordance with the above self-assessable codes. Delete the struck-through text and insert underlined text: "The Water Act 2000 (Water Act) provides a framework to deliver sustainable water planning, allocation management and supply processes to ensure the improved security of water resources. <u>The interference with overland flow and the take or interference with surface water is regulated under the Water Act 2000.</u> The Project is located within the areas covered by the Water Resource (Fitzroy Basin) Plan (2011) and the Water Resource (Burdekin Basin) Plan (2007), which sit under the Water Act. ~~These plans~~ <u>The Water Resource Plans</u> provide limitations on taking overland flow water. ~~therefore such activities need an operational works approval under~~	(Section 8); Hydrology and Geomorphology chapter (Section 9); Surface Water Technical Report (Appendix F); Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	distinction between WRP areas and the requirements of each for take and interference (diversion or impoundment) of overland flows clearer.

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		~~Schedule 3, Table 4 of the Sustainable Planning Regulation 2009".~~ Within the Water Resource (Burdekin Basin) Plan (2007) or Water Resource (Fitzroy Basin) Plan (2011) area, works constructed of a volume no greater than is required to satisfy an Environmental Authority issued under the Environmental Protection Act 1994 can be constructed in accordance with a DNRM – "Code for self-assessable development for taking overland flow water to satisfy the requirements of an environmental authority or a development permit for carrying out an environmentally relevant activity". For other purposes in the Water Resource (Burdekin Basin) Plan (2007) area overland flow works with a capacity of not more than 250ML can be constructed in accordance with the DNRM – ' Code for self-assessable development for taking overland flow water using limited capacity works". Where the project is within the Water Resource (Fitzroy Basin) Plan (2011) area overland flow works for other purposes with a capacity of not more than 50ML can be constructed in accordance with the "Code for self-assessable development for taking overland flow water using limited capacity works". For other purposes overland flow works in excess of the above capacities would be considered assessable works requiring approval under Schedule 3, Table 4 of the Sustainable Planning Regulation 2009."		
S14	290	Table 2.1 does not include authorisations such as a Water Licence or Water Permit under the Water Act 2000 for aspects of the project that involve the take or interference with water from surface water or groundwater. Add two additional rows to Table 2.1 to address authorisations required under the Water Act 2000: • Row 1, Column 1: Water Act 2000 Water Licence • Row 1, Column 2: Department of Natural Resources and Mines (DNRM)	Surface Water chapter (Section 15) of the EIS Surface Water chapter (Section 8); Hydrology	The recommended changes regarding withdrawal of, and interference with, surface water and groundwater have been considered for the SREIS; however, it is noted that any further detail regarding take or interference with groundwater is included in the Groundwater Technical Report (Appendix E) of the SREIS and is not appropriate for inclusion in the Surface Water Technical Report (Appendix F) of the SREIS.

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		• Row 1, Colum 3: A Water Licence may be required to: — - Take or interfere with water from a watercourse; or — - Take or interfere with artesian or sub-artesian water. • Row 2, Column 1: Water Act 2000 Water Permit • Row 2, Column 2: Department of Natural Resources and Mines (DNRM) • Row 2, Column 3: A Water Permit may be required for: — - the temporary take of surface water — - the temporary take of groundwater	and Geomorphology chapter (Section 9); Surface Water Technical Report (Appendix F); Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	
S14	291	The last dot point of Management Measures includes that construction of watercourse crossings can be done in accordance with the DERM Guideline – "Activities in a watercourse, lake or spring carried out by an entity". This Guideline does not apply as the proponents of the Project are not an entity under the Water Regulation 2002. The "Guideline – Activities in a watercourse, lake or spring associated with a resource activity or mining operations" can be used by either the holder of an EA under the Environmental Protection Act 1994, the holder of an mineral development lease under the Mineral Resources Act 1989, contractors, subcontractors or other agents engaged by an authority holder. The proponent to note that the information contained in the report by URS – Appendix N Surface Water Technical Report concerning DNRM Guidelines is incorrect. The dot point should instead refer to the "Guideline – Activities in a watercourse, lake or spring associated	Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); Hydrology and Geomorphology chapter (Section 9);	Noted. Any reference to the Guideline "Activities in a watercourse, lake or spring carried out by an entity" has been updated to "Guideline - activities in a watercourse, lake or spring associated with a resource activity or mining operations" in the SREIS. The latter guideline document was last updated by NRM in July 2012, to include "activities associated with a resource activity" rather than the previous reference to "mining operations".

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		with a resource activity or mining operations	Surface Water Technical Report (Appendix F); Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	
S23	409	Not meaningfully addressed in EIS: The project as proposed does not provide any fundamental security for the investment decision and avoids the intergenerational sustainability risk assessment of the project in the locality on water resources	Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water Technical Report (Appendix F, Sections 7 to 9) of the SREIS	The impact assessment methodology and mitigation strategy for the EIS were developed in consultation with both the State and federal governments and met the Terms of Reference for large scale resource development Projects. These methods have been carried over to the revised SREIS assessments (see the Surface Water Technical Report (Appendix F, Section 9) and summarised in the Surface Water chapter (Section 8) of the SREIS).
S23	438	In the event of prolonged flooding in the region, the EIS does not	Surface	Flood assessments over such a vast Project area are not

Section 21 Submission Responses

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		adequately address how Arrow Energy is going to manage the issue of prolonged submersion of the floodplain and many of the gas well production sites.	Water chapter (Section 15) of the EIS Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	feasible. The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS provides an assessment of the potential for flood inundation from 1% AEP events and overland flows of sub-catchments that have been tentatively identified as areas for two WTFs and holding dams. Options for managing identified risks are also outlined in the Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS.
S23	544	What is Arrow Energy strategy to proactively manage dispersive soils and salinity issues including resulting runoff into water supply catchment areas?	Soils chapter (Section 12) and Surface Water chapter (Section 15) of the EIS Surface Water Technical Report (Appendix F) of the SREIS	Soil impact assessment and ongoing management and mitigation strategies are outlined in the EIS; these are also referred to in the revised SREIS impact assessment, details of which are contained in the Surface Water Technical Report (Appendix F) of the SREIS.
S31	608	Gas transfer infrastructure: Further we raise concerns about the potential contamination of water reserves where the operations are not carried out safely and the effects that this will have on overlapping tenure holders and their projects.	Land Use and Tenure chapter (Section 19) of the EIS	These concerns are noted and it is implicit in Arrow's operations that all activities are undertaken safely. A range of mitigation measures applicable to managing potential impacts associated with gas transfer infrastructure were detailed in the Draft EM Plan (Appendix Z, Section 4.7.3 (Table 21; including (but not limited to) of the EIS conditions such as location of infrastructure; design of any

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				watercourse crossings; consideration of flood inundation levels, and erosion and sediment management controls)).
S37	685	This table considers the risks and mitigation measures to surface water. While mitigation measures have been proposed, there are no details about what actions/ rehabilitation measures the proponent would take if an impact is detected. FBA submits that the proponent must describe actions/ rehabilitation measures that would be undertaken if impacts to surface waters are detected.	Surface Water chapter (Section 15) and draft Environmental Management Plan (Appendix Z) of the EIS Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F) of the SREIS	Actions to be undertaken if impacts to surface water are detected will be outlined in monitoring and management plans for the Project.
S37	686	The proponent states that the emergency release of water from dams (including brine dams) may be required to avoid overtopping and possible dam failure, and that "by controlling the timing and manner in which release occurs, the downstream effects are likely to be minimal due to the dilution effect attributable to the high flow rates in the receiving waters during the wetter months." FBA submits that the proponent provides the following additional	Aquatic Ecology chapter (Section 16) of the EIS Surface Water Technical	An updated impact assessment of potential discharge and relevant mitigation measures is included in the Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS.

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		details: What water quality parameters and levels will be monitored? How will cumulative impacts of multiple operations that release contaminated water (including CSG and coal mining operations) be assessed and environmental impacts avoided? How did the proponent determine that the "downstream effects are likely to be minimal"? FBA submits that the proponent provides a response to the questions at left.	Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS.	
S38	701	<u>Health:</u> MCG does not support discharge of polluted saline water into waterways because it is denser than fresh waters and sinks to the bottom, adversely affecting aquatic life.	Surface Water chapter (Section 15) and Aquatic Ecology chapter (Section 16) of the EIS Surface Water Technical Report (Appendix F) of the SREIS	A revised impact assessment for release of CSG water to the receiving environment is provided in the Surface Water Technical Report (Appendix F) of the SREIS.
S38	702	<u>Health:</u> Water column measurements of water quality provide no information useful in assessing the ecological impacts of such waste discharges, especially where they are repeated over time and wastes are not biodegradable and are taken up the food chain where they can bio-accumulate. Site specific studies in ecological impacts need to be	Aquatic Ecology chapter (Section 16) and Surface Water	Water column measurements are a well-established and commonly used indicator of potential impacts on aquatic ecology. Water quality objectives and trigger values (such as those outlined in the EPP (Water), 2009 and ANZECC Guidelines for Fresh and Marine Water Quality, 2000 – see the Surface Water Technical Report (Appendix N, Section

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		done to measure impacts.	Technical Report (Appendix N) of the EIS Surface Water Technical Report (Appendix F) of the SREIS	7.1) of the EIS) have been developed in order to protect environmental values such as aquatic ecosystems (Surface Water Technical Report, Appendix N, Section 4) of the EIS. Where available, water quality objectives developed specifically for the Fitzroy Basin have been applied for this Project. In the absence of region-specific water quality objectives, ANZECC 2000 water quality trigger values for the protection of 95% of species were used.
S53	1317	<u>CSG drilling and extraction process:</u> How extensive are the baseline studies in surrounding river systems and landholder bores to provide accurate ambient water quality to reflect natural mineral qualities prior to CSG activity, and to show if bubbling methane gas in rivers is a natural phenomenon as the CSG industry and Qld government advocate.	Surface Water Technical Report (Appendix F) of the SREIS	A detailed desktop assessment of water quality condition on a sub-catchment basis has been completed within the Project area using water quality data collected by nearby operational coal mines (see the Surface Water Technical Report (Appendix F) of the SREIS). The water quality assessments include consideration of water quality relationships to stream flow using data from two NRM stream gauges on Isaac River, at Goonyella and Deverill. The Surface Water Technical Report (Appendix F) of the SREIS also provides a desktop assessment of the baseline surface water condition, geomorphic character and aquatic ecology of two reaches of the Isaac River main channel where two Water Treatment Facilities (WTFs) are tentatively proposed to be located. It is expected that further field assessment of these components will be undertaken as part of the EA approval process.

21.6 CSG Water Management

Table 21-6 CSG Water Management Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	1	Regional services: Confirmation and validation of the options for the disposal of CSG water and brine that have no beneficial use. The EIS should provide more information on how the various disposal methods and strategies for CSG water and brine should be tested and evaluated as safe prior to the final approval for the Project's EIS. Strategies for the management of CSG water should be 'proven' and based on sound science with the aim to ensuring that natural resources (e.g. land and water) are either as good or in better condition than before CSG activities commenced.	CSG Water and Salt Management Strategy (Appendix D, Section 5.3.2) of the SREIS	As outlined in Section 5.3.2 of the CSG Water and Salt Management Strategy (Appendix D) of the SREIS, disposal of CSG water and brine / salt may be necessary when beneficial use options are not economically and technically feasible, or in the case of residual volumes (those volumes of CSG water that cannot be feasibly managed through beneficial use due to operational, technical, environmental or economic constraints). To ensure that the most sustainable portfolio of CSG water and brine/salt management options is implemented, Arrow evaluates all potential options in a systematic and transparent MCA process (refer to the CSG Water and Salt Management Strategy (Appendix D) of this SREIS for further detail). It should be noted that Arrow has environmental authorities for and experience with CSG water discharges. The disposal of brine in licensed landfills is a well-established disposal method that is managed in accordance with hazardous waste procedures and guidelines issued by the Queensland government.
S10	165	No reference is made to treating all associated water to a level fit for an identified purpose. Describe the extent to which water will be treated for a range of identified water supply purposes.	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	The SREIS contains an updated and revised version of the CSG Water and Salt Management Strategy (Appendix D). As discussed in the updated Project Description, where viable, water treated using reverse osmosis technology coupled with suitable pre-treatment will be distributed to existing/new users. As indicated in Section 5.3 of the CSG Water and Salt Management Strategy (Appendix D) of the SREIS, the management options apply to both treated and

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				untreated CSG water and the water quality requirements of this water will be determined by the end user and the defined limits/conditions of the relevant approval.
S17	351	Queensland Public Health System (QPHS) notes the information provided by the proponent on the potential impacts, management and possible beneficial uses of associated water. QPHS also notes that water for gas field worker camps, including potable water, may be supplied from treated associated water. Whilst information on the potential environmental impacts is provided in the EIS, the potential human health impacts have not been assessed. Along with the potential impacts of salt, QPHS is concerned about the potential human health impacts from other contaminants (e.g. heavy metals (lead, cadmium)) in the associated water. Although water treatment systems, such as reverse osmosis, may reduce the concentration of contaminants, the direct and indirect human health risk of exposure to contaminants has not been assessed. Examples include the consumption of treated associated water by workers and the potential for irrigated associated water to contaminate soils used for food crops, bioaccumulate in food crops and animals and impact on human health indirectly. QPHS also notes the proponent's analysis of the beneficial use options and the selection of potential short-term and long-term management strategies (i.e. evaporation ponds and tree crop irrigation respectively). However, QPHS is unable to comment as the EIS does not provide adequate information on the potential human health impacts of these strategies." It is recommended that that the proponent assesses the potential human health impacts of the beneficial uses of associated water proposed for the project. The scope of the assessment should include the potential for direct and indirect human exposure to	CSG Water and Salt Management Strategy (Appendix D, Section 5.3.1) of the SREIS	As outlined in the CSG Water and Salt Management Strategy (Appendix D, Section 5.3.1) of the SREIS, the water quality specifications to enable supply of CSG water for potable, irrigation or stock water uses will be prescribed in the relevant regulatory approval.

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		contaminants in treated and untreated associated water. An appropriate methodology for undertaking this assessment is the enHealth Council's publication ""Environmental Health Risk Assessment: Guidelines for assessing the human health risks from environmental hazards"" available at http://enhealth.nphp.qov.au/council/pubs/pdf/envhazards.pdf.		
S23	489	Natural Resource and Stock Route Impacts: What processes will be in place to stop contamination from water treatment facilities or transfer stations?	CSG Water and Salt Management Strategy (Appendix D, Section 4.4) and the Surface Water Technical Report (Appendix F) of the SREIS	As indicated in the CSG Water and Salt management Strategy (Appendix D, Section 4.4) and the Surface Water Technical Report (Appendix F) of the SREIS, risks from CSG water contamination are mitigated by constructing and maintaining key water infrastructure (e.g. storage dams) in accordance with current standards and guidelines.
S23	510	Natural Resource and Stock Route Impacts: Are there going to be any measures in place to minimise environmental degradation from utilising 'saline coal seam water' as a dust suppressant?	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	As outlined in the CSG Water and Salt Management Strategy (Appendix D, Section 5.2.1) of the SREIS, CSG water will meet relevant approvals before being used for construction and processing requirements.
S23	549	How will Arrow Energy guarantee no downstream degradation due to water contamination from controlled discharges or urbanised uses from the project?	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	Site-specific assessments of the water quality at the confirmed locations of potential CSG discharge points will be considered as part of the EA application process. Discharge of treated or untreated CSG water is considered appropriate only where disposal to receiving waterways will not significantly impact the environmental values of the aquatic environment, in line with legislative requirements. The discharge rates, timing, frequency and duration of

Submission Number	Issue Number	Submission / Issue	Reference	Response
				CSG water releases that will be considered as part of the EA process will address a number of variables including stream flows, stream water quality and CSG water quality. Under these circumstances, CSG water discharges would have insignificant impacts on the receiving environment. Monitoring frequencies for specific facilities, events and environmental aspects of the Project will be established and detailed further during the EA approval process.
S33	635	This plan is not in the EIS. Vale wishes to know where Arrow intends to dispose of CSG water and salt, should it affect Vale owned land and tenure. Will it be available for review?	CSG Water and Salt Management Strategy (Appendix D); Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	The final discharge locations for any potential CSG water release have not yet been determined for the SREIS. CSG water discharge locations will be confirmed during the EA application process. However, preferred localities for potential discharges of CSG water have been considered as part of the Surface Water Technical report (Appendix F) and the Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS.
S37	679	This project will generate large quantities of 'CSG water'. The treatment of this water and/or disposal of by-products (e.g. brine) are expected to be a significant management responsibility for the proponent, and has the potential to cause serious environmental impacts if not managed correctly. FBA submits that the proponent needs to provide full details about the scale and management of the CSG water, including the	CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical	The SREIS contains an updated and revised version of the CSG Water and Salt Management Strategy (Appendix D) of the SREIS, outlining water disposal options and associated mitigation measures. The options for management of both CSG water and brine have been considered in accordance with EHP's Coal Seam Gas Water Management Policy (2012). Any disposal

Submission Number	Issue Number	Submission / Issue	Reference	Response
		amount of water expected to be extracted and management options for that water (including amount of brine expected to be generated if evaporation is the only option employed).	Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G)	of CSG water and brine will be regulated by relevant EA conditions.
S38	704	Health: Three Olympic swimming pools = .003125 gigaliters per well of groundwater per year x 7,000 wells = 21.875 Gigaliters for Arrow Energy's Bowen project per year. That represents a substantial increase in the amount of groundwater pumped and waste salt and other wastes that will have to be safely disposed of or re-cycled. How will it be managed? It cannot be landfilled.	CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G)	As indicated in the CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS, all Project activities will be undertaken in accordance with current legislation and guidelines, and any CSG water released into the receiving environment will be in compliance with the relevant approvals.
S38	707	Health: CSG groundwater mining depletes a well quickly e.g. within a year or two. A farmer would want a "beneficial water" supply for much longer than that to make the investment in an irrigation project. Has Arrow Energy made contracts to supply this water to demonstrate there is a demand for it?	CSG Water and Salt Management Strategy (Appendix D, Section 4,5,4) of the SREIS	Given the need for water for crop production and stock drinking water is high in the dry environment of the Bowen basin, Arrow expects that the demand for CSG water will be high. Arrow will continue to engage with stakeholders to gauge demand and future potential water supply opportunities.
S40	747	In the same Arrow has been unable to provide within the EIS an		Ocean outfall was presented as an option only in the EIS

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S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	791 835 879 923 967 1011 1055 1099 1143 1187 1231 1275	environment impact assessment in support of an ocean outfall disposal. The EIS has not referenced and technical report to indicate that disposal of brine by an ocean outfall is commercially feasible. In the same Arrow has not provided any evidence that the potential environmental impacts of any ocean outfall would be deemed acceptable by the regulatory authority. Further the EIS does not indicate the possible route option's for an outfall.		and had this been progressed further, additional and extensive assessment would have been conducted under a separate approval process. Since publication of the EIS, ocean outfall is no longer being considered by Arrow as a disposal option for the Project.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	748 792 836 880 924 968 1012 1056 1100 1144 1188 1232 1276	It is also relevant that Arrow's CSG Water and Salt Management strategy cannot with any specificity identify a facility approved by the regulator within the Project area capable of accepting the volume of salt to be produced by the Project to land fill or which is capable of ensuring containment to avoid leaching to surface or groundwater.	Project Description chapter (Section 3) and CSG Water and Salt Management Strategy (Appendix D) of the SREIS	The SREIS contains an updated Project Description (Chapter 3), which confirms that the base case for brine management for the Project consists of disposal to a RWF. For the purpose of assessing the impact of this brine management option on the environment, transport to and disposal of this waste salt concentrate at the RWF in Townsville has been assumed. It should be noted that Arrow is looking to encourage other suitably licensed landfill sites to be developed locally in response to the demand created by the CSG industry and to be available to accept brine (as a salt concentrate) produced in its operations and as such reduce vehicle movements.
S40	749	[The Landholder] notes Arrow's EIS does not meet the ToR requirements under reference or accordingly if it does neither	Project Description	The SREIS contains an updated Project Description (Chapter 3), which confirms that the base case for brine

Submission Number	Issue Number	Submission / Issue	Reference	Response
S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	793 837 881 925 969 1013 1057 1101 1145 1189 1233 1277	requirement has been adequately or sufficiently described for a Project of the scale proposed by Arrow so as to have a demonstrated Arrow has in place a brine system that can adequately treat or dispose of a significant waste stream in an environmentally acceptable manner.	chapter (Section 3) and CSG Water and Salt Management Strategy (Appendix D) of the SREIS	management for the Project consists of disposal to a RWF. Brine produced as part of the CSG water treatment process will be piped to brine dams, located near each of the proposed WTFs. Crystallisation will take place via conventional solar evaporation. Once the brine has evaporated to a solid product, it will be transported to the RWF. For the purpose of assessing the impact of this brine management option on the environment, transport to and disposal of this waste salt concentrate at the RWF in Townsville has been assumed. It should be noted that Arrow is looking to encourage other suitably licensed landfill sites to be developed locally in response to the demand created by the CSG industry and to be available to accept brine (as a salt concentrate) produced in its operations and as such reduce vehicle movements.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	750 794 838 882 926 970 1014 1058 1102 1146 1190 1234 1278	It is apparent from the EIS documentation that Arrow has not completed sufficient investigations to conclude whether it has the capacity to cater for all estimated brine production over the Project life of 40 years.	Project Description chapter (Section 3) and CSG Water and Salt Management Strategy (Appendix D) of the SREIS	The SREIS contains an updated Project Description (Chapter 3), which confirms that the base case for brine management for the Project consists of disposal to a RWF. Brine produced as part of the CSG water treatment process will be piped to brine dams, located near each of the proposed WTFs. Crystallisation will take place via conventional solar evaporation. Once the brine has evaporated to a solid product, it will be transported to the RWF. For the purpose of assessing the impact of this brine management option on the environment, transport to and disposal of this waste salt concentrate at the RWF in Townsville has been assumed. It should be noted that Arrow is looking to encourage other suitably licensed landfill sites to be developed locally in response to the demand created by the CSG industry and

Submission Number	Issue Number	Submission / Issue	Reference	Response
				to be available to accept brine (as a salt concentrate) produced in its operations and as such reduce vehicle movements.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	751 795 839 883 927 971 1015 1059 1103 1147 1191 1235 1279	It is apparent from the EIS documentation that Arrow is proposing to adopt the lowest hierarchy of brine management for an unspecified period of time, that being the use of lined containment ponds, and then following the requisite period for the brine to crystallise and dispose of the crystallised salt residue to landfill.	CSG Water and Salt Management Strategy (Appendix D, Section 5.3.3) of the SREIS	Noted. Arrow has evaluated the options available for management of brine in accordance with the EHP's 2012 Coal Seam Gas Water Management Policy. The selection process for beneficial use or disposal management options involved consideration of multiple criteria such as economic, schedule, operability, size of demand, reliability, social impact and environmental impact/ compliance. The analysis determined that the base case brine management option for the Project was disposal to a RWF. Brine produced as part of the CSG water treatment process will be piped to brine dams, located near each of the proposed WTFs. Crystallisation will take place via conventional solar evaporation. Once the brine has evaporated to a solid product, it will be transported to the RWF. For the purpose of assessing the impact of this brine management option on the environment, transport to and disposal of this waste salt concentrate at the RWF in Townsville has been assumed. It should be noted that Arrow is looking to encourage other suitably licensed landfill sites to be developed locally in response to the demand created by the CSG industry and to be available to accept brine (as a salt concentrate) produced in its operations and as such reduce vehicle movements.
S40 S41 S42	752 796 840	<u>CSG Water Management:</u> The EIS is generally silent as to extent of fraccing and the management of this activity as a whole.	Project Description chapter (Section 3) and CSG	It is expected that phase 1 of the Project will only utilise multi-branch lateral (MBL) wells, with hydraulically stimulated wells not expected to be required until phase 2, if required at all.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	884 928 972 1016 1060 1104 1148 1192 1236 1280		Water and Salt Management Strategy (Appendix D) of the SREIS	
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	753 797 841 885 929 973 1017 1061 1105 1149 1193 1237 1281	<u>CSG Water Management:</u> As pastoral areas (cattle grazing) covers 90.2 per cent of the project area (approximately 722,306 ha) the potential for chemical contamination risk is of concern and understated in the EIS.	CSG Water and Salt Management Strategy (Appendix D, Section 4.4.1) of the SREIS	As indicated in the revised CSG Water and Salt Management Strategy (Appendix D, Section 4.4.1) of the SREIS, all water and brine storage dams will be hazard categorised and constructed, operated and decommissioned in accordance with EHP (2013a) Guideline Manual for Assessing Consequence Categories and Hydraulic Performance of Structures and the relevant EA.
S40 S41 S42	754 798 842	<u>CSG Water Management:</u> The EIS under reference does not address the management or the impacts of on land management in terms of CSG water containment in the context of risk to cattle certification which is	CSG Water and Salt Management Strategy	As indicated in the revised CSG Water and Salt Management Strategy (Appendix D, Section 4.4.1) of the SREIS, all water and brine storage dams will be hazard categorised and constructed, operated and

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S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	886 930 974 1018 1062 1106 1150 1194 1238 1282	surprising given 90.2% of the project are consists of cattle grazing.	(Appendix D, Section 4.4.1) of the SREIS	decommissioned in accordance with EHP (2013a) Guideline Manual for Assessing Consequence Categories and Hydraulic Performance of Structures and the relevant EA.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	755 799 843 887 931 975 1019 1063 1107 1151 1195 1239 1283	CSG Water Management: Arrow has not addressed within the EIS or within its CSG Water Management Plan, the magnitude of any afflux, and its impacts on land contamination and cattle and the flood plain assets relevant to landholders which is of particular over sight and concern given 90.2% of the land tenure in the Project is classified as grazing. On this basis, [the landholder] requires further subsequent modelling so that a design solution can be developed that will avoid significant exacerbation of afflux or flooding event.	Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS includes flood modelling for a 1 in a 100 year event for areas being considered as potential sites for CGPFs and WTFs, including CSG water and brine dams. The results indicate that large areas of the sites being considered remain flood free during such a rain event. Further modelling will be undertaken at the detailed design stage to ascertain the flood risks for confirmed infrastructure locations. All dams are designed, built, operated and decommissioned according to EHP (2013a) Guideline Manual for Assessing Consequence Categories and Hydraulic Performance of Structures and the relevant EA.
S40 S41 S42	756 800 844	CSG Water Management: The Project will impact on a number of cattle (and grain producing) businesses including [the landholder].	Surface Water chapter (Section 8), Hydrology and	Likely potential impacts are outlined in the EIS and the SREIS and the mitigation measures for impacts are detailed and committed to by Arrow.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	888 932 976 1020 1064 1108 1152 1196 1240 1284		Geomorphology chapter (Section 9) and the Commitments Update (Appendix O) of the SREIS	
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	757 801 845 889 933 977 1021 1065 1109 1153 1197 1241 1285	CSG Water Management: Landholders each of whom presently have to deal with a range of natural flood events which are only going to be further exasperated by poorly managed development options, including multiple CSG water storages in close proximity to each other (and further exasperated by the cumulative impost of other coal mines/infrastructure development in the area).	Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS includes flood modelling for a 1 in a 100 year event for areas being considered as potential sites for CGPFs and WTFs, including CSG water and brine dams. The results indicate that large areas of the sites being considered remain flood free during such a rain event. Further modelling will be undertaken at the detailed design stage to ascertain the flood risks for confirmed infrastructure locations. All dams are designed, built, operated and decommissioned according to EHP guidelines and relevant approvals. In addition, CSG water discharges will only take place in accordance with relevant approvals.
S40 S41 S42	758 802 846	CSG Water Management: As evidenced by cumulative risk ranking provided by Arrow, the significance of flooding is severely underestimated by reference to the Project Hazard and Risk Assessment as flooding not ranked	Hydrology and Geomorphology Technical Report	The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS includes flood modelling for a 1 in a 100 year event for areas being considered as potential sites for CGPFs and WTFs, including CSG water and brine

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	890 934 978 1022 1066 1110 1154 1198 1242 1286	even high.	(Appendix G) of the SREIS	dams. The results indicate that large areas of the sites being considered remain flood free during such a rain event. Further modelling will be undertaken at the detailed design stage to ascertain the flood risks for confirmed infrastructure locations. All dams are designed, built, operated and decommissioned according to current EHP guidelines and relevant approvals.
S53	1309	I am concerned the industry is not adequately regulated when it comes to mitigating the associated risks of CSG activities from the drilling and extraction process through to CSG product water management specifically medium and long term accumulative impacts of potentially 4000 wells across a large land mass encompassing the Fitzroy River Basin.	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	Arrow has prepared a CSG Water and Salt Management Strategy (Appendix D) of the SREIS to address CSG water management and the Project will be conditioned by relevant federal and state legislation to minimise potential environmental impacts. All other activities related to drilling and gas extraction will be undertaken in accordance with relevant guidelines and approvals.
S53	1310	The Fitzroy River Basin is an already fragile and stressed river system as a consequence of surrounding mine water discharges and historical activities, additional activities such as the Bowen Gas Project proposal add further stress and risk of pollution to land and rivers and consequently the drinking and water supplies for farming, livestock and human consumption.	Surface Water Technical Report (Appendix F, Section 8) of the SREIS	As outlined in the Surface Water Technical Report (Appendix F, Section 8) of the SREIS, discharges of CSG water will be undertaken in accordance with relevant approvals.
S53	1318	<u>CSG produce water management:</u> What volume dams are required for CSG produce water on a single tenure, how many are required at any one time, what ratio of chemicals are they likely to contain.	CSG Water and Salt Management Strategy (Appendix D, Section 4.2) of	As outlined in the CSG Water and Salt Management Strategy (Appendix D, Section 4.2) of the SREIS, water production profiles and assumptions for well counts are obtained from reservoir engineering based on current and proposed field development plans. Dynamic reservoir modelling and the development of low, mid and high case

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			the SREIS	production scenarios for both gas and water are developed from this information. The resulting water balance models and the water forecasting process are maintained by the Arrow Water Operations Team and used for short, medium and long term planning of water management and supply infrastructure, including water supply and end use. The model simulates expected dam storage capacity based on forecast production rates, climatic data and anticipated water usage rates. The following items are incorporated into the model: • Forecast water production; • Dam storage capacity, surface area and current levels; • Rainfall and evaporation based on dam surface area and local historical meteorologic conditions; • Evaporation factors comprised of surface area and salinity factors; • Beneficial use off-takes and disposal; and • Treatment capacity, including allowances for plant availability and recovery.
S53	1319	<u>CSG produce water management:</u> Can the chemicals contained in the CSG produce water evaporate, and will this pose a health risk to CSG employees, landholders, nearby communities or animals and livestock.		CSG water contains dissolved salts and metals which cannot evaporate and therefore do not pose a health risk to humans or animals. Other volatile organic chemicals that may be present in raw CSG water are present in trace quantities and are greatly diluted when vaporised; therefore they do not pose a health risk to humans, animals or the environment.
S53	1321	<u>CSG produce water management:</u> What are the threshold volume metrics of CSG produce water	Surface Water Technical	As outlined in the Surface Water Technical Report (Appendix F, Section 8) of the SREIS, discharges of CSG

Submission Number	Issue Number	Submission / Issue	Reference	Response
		when it is discharged into a watercourse treated or untreated. Is this an application based event or will the proponent self regulate quantities and contaminant ratios. Is this peer reviewed.	Report (Appendix F, Section 8) of the SREIS	water will be undertaken in accordance with relevant approvals. This process is legislated by the EA and Water Supply (Safety & Reliability) Act.
S53	1322	CSG produce water management: The proponent identifies certain aspects of CSG activities have high risk of irreversible significant environmental damage, please detail these aspects and impacts. Are these impacts peer reviewed.	Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	The Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS have assessed in detail the baseline condition of potential receiving environments to CSG water discharges, and the likely impacts that these discharges may have to the environment. Further site specific assessments of CSG water discharges will be undertaken during the EA application stage when localities for discharges are confirmed. The studies have shown that CSG water discharges can be effectively managed so as to cause no significant impact to the receiving environment.
S53	1324	CSG produce water management: Using CSG produce water as a dust suppressant is not an industry best practice as potential exists for unregulated run off into water course.	CSG Water and Salt Management Strategy (Appendix D, Section 5.2.1) of the SREIS	Dust suppression will be undertaken in accordance with relevant approvals, including management of MNES

Table 21-7 Water (Supply / Potable / Recycled / Waste) Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S17	354	The proponent has not indicated how potable water for the gas fields, construction camps will be supplied. Information has not	Waste Management	Arrow intends to be independent of the public water infrastructure for construction purposes to the maximum

Submission Number	Issue Number	Submission / Issue	Reference	Response
		been provided on the detail of the water treatment and management systems and the regulatory requirements relevant to this proposal. The proponent needs to determine whether they will be regarded as a drinking water service provider as regulated by the *Water Supply (Safety and Reliability) Act 2008* and the *Public Health Act 2005*. If the proponent is not a drinking water service provider, then the proponent needs to develop a management system that will be used to ensure that all potable water consumed on site complies with the Australian Drinking Water Guideline 2004 (ADWG). This should include how potable water will be sourced, transported, stored, reticulated and the water quality monitored. Identification of also how potable water will be protected from potential cross contamination from other water sources and waste streams on site needs to be highlighted. The proponent should consult with the Department of Energy and Water Supply to make this determination.	chapter (Section 16) and Surface Water chapter (Section 8) of the SREIS	practicable extent. Construction water is required for a number of uses, e.g. dust suppression. Water is to be piped overland in lieu of trucking wherever practical to reduce vehicular traffic. Water supply will be from the following sources: • Facilities owned by Arrow (both existing and future); • Both untreated and treated water will be considered and assessed for their suitability beforehand; • Exploration and / or appraisal dams; • Watercourses, bores and farm dams, where approvals are in place to extract; and • Potable water will be trucked to site where required. Drinking water used on the project area will be of quality that is in accordance with the Australian Drinking Water Guideline 2004.
S18	360	The supply of drinking water on site should be carried out in accordance with the requirements of the Australian Drinking Water Guideline 2004.	Waste Management chapter (Section 16) and Surface Water chapter (Section 8) of the SREIS	Drinking water supply will be in accordance with the Australian Drinking Water Guideline 2004 or other relevant current guidelines.
S18	361	For the safe use of recycled water, Queensland Health recommends that any recycled water activities comply with the Australian Guidelines for Water Recycling: Managing Health and Environmental Risks (2006) (Phase 1) and (Phase 2).	Waste Management chapter (Section 16) and Surface Water chapter (Section 8) of the SREIS	Recycled water activities will comply with the Water Supply (Safety & Reliability) Act and the Australian Guidelines for Water Recycling.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S18	362	Waste water from the project should not pollute any ground water or local streams, which are used for drinking, agricultural, pastoral or recreational purposes.	CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology (Appendix G) of the SREIS	The revised CSG Water and Salt Management Strategy (Appendix O), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology (Appendix G) of the SREIS outline a number of management and mitigation measures to minimise the potential to pollute any groundwater or surface water body. These measures are in line with current Australian legislation, guidelines and standards. Any discharges of waste water will be subject to relevant approvals.
S18	363	Waste water from the project should not be diverted to or pollute any ground water or creeks, streams or rivers, which are used for drinking, agricultural, pastoral or recreational purposes.	CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology (Appendix G) of the SREIS	The revised CSG Water and Salt Management Strategy (Appendix O), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology (Appendix G) of the SREIS outline a number of management and mitigation measures to minimise the potential to pollute any groundwater or surface water body. These measures are in line with current Australian legislation, guidelines and standards. Any discharges of waste water will be subject to relevant approvals.
S18	364	The disposal of liquid wastes or contouring of the ground should not allow ponding of liquids which are likely to provide a breeding site for mosquitoes.	Commitments Update (Appendix O) of	A mosquito management plan would be developed if they become a nuisance on site.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
		A mosquito management plan may be desirable should a nuisance exist on site.	the SREIS	
S18	365	The disposal of waste water should be via the sewerage system or in conformity to the South Australian Reclaimed Water Guidelines (Treated Effluent).	Waste Management chapter (Section 16) of the SREIS	Options for disposal will be in accordance with relevant legislation and guidelines.
S23	440	The EIS assessment must seriously assess the process of securing and allocating significant additional water resources to the operational locality of the project in a manner that does not compromise the existing rural industry uses and climate variability across the landscape.	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	Arrow intends to be independent of the public water infrastructure for construction purposes to the maximum practicable extent. Construction water is required for a number of uses, e.g. dust suppression. Water is to be piped overland in lieu of trucking wherever practical to reduce vehicular traffic. Water supply will be from the following sources: • Facilities owned by Arrow (both existing and future). Both untreated and treated water will be considered and assessed for their suitability beforehand; • Exploration and / or appraisal dams; • Watercourses, bores and farm dams, where approvals are in place to extract; and • Potable water will be trucked to site where required. Drinking water used on the Project area will be of quality that is in accordance with the Australian Drinking Water Guideline 2004.
S23	467	Socio-economic and cumulative: How will it be determined what water source will be used and will this be assessed with advice from local government?	CSG Water and Salt Management Strategy	Arrow intends to be independent of the public water infrastructure for construction purposes to the maximum practicable extent. Construction water is required for a number of uses, e.g.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
			(Appendix D) of the SREIS	dust suppression. Water is to be piped overland in lieu of trucking wherever practical to reduce vehicular traffic. Water supply will be from the following sources: • Facilities owned by Arrow (both existing and future). Both untreated and treated water will be considered and assessed for their suitability beforehand; • Exploration and / or appraisal dams; • Watercourses, bores and farm dams, where approvals are in place to extract; and • Potable water will be trucked to site where required. Drinking water used on the project area will be of quality that is in accordance with the Australian Drinking Water Guideline 2004.
S23	524	What is Arrow Energy strategy to manage water supply (including bores, springs, aquifers, dams) within the region in the event of a 1-100 year drought OR water contamination scenario over the longer term.	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	Arrow intends to be independent of the public water infrastructure for construction purposes to the maximum practicable extent. Construction water is required for a number of uses, e.g. dust suppression. Water is to be piped overland in lieu of trucking wherever practical to reduce vehicular traffic. Water supply will be from the following sources: • Facilities owned by Arrow (both existing and future). Both untreated and treated water will be considered and assessed for their suitability beforehand; • Exploration and / or appraisal dams; • Watercourses, bores and farm dams, where approvals are in place to extract; and • Potable water will be trucked to site where required.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
				Drinking water used on the project area will be of quality that is in accordance with the Australian Drinking Water Guideline 2004.
S23	534	Where is the water source for tracking processes identified and how will it be monitored for sustainability?	CSG Water and Salt Management Strategy (Appendix D) and Surface Water Technical Report (Appendix F) of the SREIS	Arrow intends to be independent of the public water infrastructure for construction purposes to the maximum practicable extent. Construction water is required for a number of uses, e.g. dust suppression. Water is to be piped overland in lieu of trucking wherever practical to reduce vehicular traffic. Water supply will be from the following sources: • Facilities owned by Arrow (both existing and future). Both untreated and treated water will be considered and assessed for their suitability beforehand; • Exploration and / or appraisal dams; • Watercourses, bores and farm dams, where approvals are in place to extract; and • Potable water will be trucked to site where required. Drinking water used on the project area will be of quality that is in accordance with the Australian Drinking Water Guideline 2004.
S23	546	How will Arrow Energy supply potable water and sewerage services including disposal of waste to temporary transient accommodation including during flood and drought periods?	Waste Management chapter (Section 16.4) and CSG Water and Salt Management Strategy (Appendix D) of the SREIS	The revised CSG Water and Salt Management Strategy (Appendix D) presented in the SREIS describes the regulatory framework under which Arrow must operate to supply drinking water. As indicated in the Waste Management chapter (Section 16.4) of the SREIS, sewage will be collected and transported offsite to a municipal treatment facility or treated onsite.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	563	How will Arrow Energy supply potable water and sewerage services including disposal of waste to temporary camps during flooding?	Surface Water Technical Report (Appendix F) of the SREIS	Prior to the siting and construction of Project facilities, including accommodation facilities, flood modelling will be undertaken at the detailed design phase to ensure that the likelihood of flooding is extremely small.
S32	611	As a water service provider, SunWater understands the regulatory framework surrounding impacts on water quality and quantity to be well developed. SunWater expects that through the proper application of the provisions of the Water Act 2000 (Qld), the Environmental Protection Act 1994 (Old), delegated legislation, policy and water quality guidelines, that reliability of water supplies, applicable environmental values and water quality should be protected.	Surface Water Technical Report (Appendix F) of the SREIS	Arrow is in agreement.
S32	614	SunWater would like to highlight our concerns regarding the future ability to deliver water through our pipeline network have not been adequately addressed and potential mitigation measures have not been outlined in the EIS		Potential impacts to the SunWater network, are not anticipated as a result of the Project, however ongoing liaison with SunWater as a stakeholder will be conducted.

Section 21 Submission Responses

Table 21-8 Waterway Works Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	7	Forestry and fisheries: This section describes the use of existing and new access tracks and roads for all Project-related vehicle movements. Bridges are preferred for major crossings, and culvert crossings are recommended for other minor crossings. Note: The construction of new, or the upgrading of existing stream crossings may impact fisheries resources. (FQ) The EIS should confirm the presence and location of waterways across the Project Area by using the GIS layer Queensland Waterways for Waterway Barrier Works http://dds.information.qld.gov.au/DDS/ Appendix III of the Fish Habitat Management Operational Policy Waterway Barrier Works Development Approvals May 2012 FHMOP008 http://www.daff.qld.gov.au/documents/Fisheries_Habitats/FHMOP008-May-2012-V2.pdf, provides examples of structures that are not considered to be waterway barriers. The Project should consider bridge designs in terms of this definition so as to avoid the necessity to seek a Development Approval for these works. The design of culvert or bed-level crossings should be undertaken in accordance with s9.1.3 of Fish Habitat Management Operational Policy Waterway Barrier Works Development Approvals May 2012 FHMOP008. In many instances, culvert and bed-level crossings can be constructed in accordance with Self Assessable Codes: • WWBW01: Minor waterway barrier works, Part 3: Culvert crossings, January 2013 http://www.daff.qld.gov.au/documents/Fisheries_Habitats/culvert-code-jan-2013-final.pdf	Project Description chapter (Section 3) of the SREIS	All construction within waterways will be undertaken in accordance with the relevant legislative requirements, guidelines and recommendations.

Submission Number	Issue Number	Submission / Issue	Reference	Response
		• WWBW01: Minor waterway barrier works, Part 4: Bed-level crossings, January 2013 http://www.daff.qld.gov.au/documents/Fisheries_Habitats/bed-level-code-jan-2013-final.pdf Note: The Project is encouraged to consider its culvert and bed-level crossing designs in terms of the Self Assessable Codes, so as to avoid the necessity to seek approval for these works."		
S1	8	Fisheries Queensland: The consideration of the potential impacts to fisheries resources from the design and construction of waterway crossings, diversions, culverts, or other waterway barrier works, disturbance to marine plants or works within a declared Fish Habitat Area. Note that waterway barriers have the capacity to impact upon fish movement and waterway habitats with ramifications to the fisheries resources of the region. The Project should commit that: • any waterway diversions, culvert or bed level crossings, rock armouring, or all and any other works within a waterway as defined under the Fisheries Act 1994 for both permanent and temporary works, or works resulting in the disturbance of marine plants or within a declared Fish Habitat Area, adequately provide for fish passage, and provide equal or enhanced habitat values and habitat complexity; and • will not, either directly or indirectly, increase water velocities within waterways to a level that would prevent fish movement through the Project site or associated infrastructure. The Project should obtain development approval for operational works that is the building or raising of waterway barrier works, disturbance of marine plants or works within a declared Fish Habitat Area under the Fisheries Act 1994 including any and all waterway	Surface Water chapter (Section 8) and Aquatic Ecology chapter (Section 10) of the SREIS	All works within riparian areas and waterways will be undertaken in accordance with all relevant legislation and guidelines.

Submission Number	Issue Number	Submission / Issue	Reference	Response
		diversions, culvert or bed level crossings, rock armouring, or all and any other works within a waterway as defined under the Fisheries Act 1994 for both permanent and temporary works, or works resulting in the disturbance of marine plants or within a declared Fish Habitat Area for both permanent and temporary works, unless those works can be undertaken under a relevant Self-Assessable Code.		
S1	9	Fisheries Queensland: Linking mitigation measures for the design considerations of fish passages to the relevant DAFF operational policy. The mitigation measures listed under the heading 'Alteration of Flows and Flow Paths' in this table should include details outlining the design consideration for fish passage, with respect to Fish Habitat Management Operational Policy Waterway Barrier Works Development Approvals May 2012 FHMOP008 and the Self Assessable Codes as provided in the comments concerning s4.3.8 as outlined above.	Surface Water chapter (Section 8) and Aquatic Ecology chapter (Section 10) of the SREIS	All works within riparian areas and waterways will be undertaken in accordance with all relevant legislation and guidelines.

21.7 Terrestrial Ecology

Table 21-9 Terrestrial Ecology Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	6	Forestry and fisheries: DAFF notes that construction will require the clearing of remnant and regrowth vegetation on freehold land. The EIS provides no information on whether commercial quantities of privately-owned forest products will be interfered with, and if so, how the Project will facilitate a timber salvage operation before any Project related work commences. (DF) The Project should identify if commercial quantities of privately-owned (freehold land) forest products (i.e. log, pole, fencing timbers, etc.) will be interfered with (i.e. cleared, destroyed, etc.) and if so how the Project will facilitate a timber salvage operation for the local timber industry before any Project work commences.	Project Description chapter (Section 3) of the SREIS	It is not anticipated that commercially viable quantities of timber will be removed sufficient to be considered a resource to be investigated. Any clearance of timber will be incremental over the life of the Project and in relatively small amounts. The incremental Project development sequence planned over the life the Project is outlined in the Project Description chapter (Section 3) of the SREIS.
S1	10	Fisheries Queensland: Possible application of the *Plant Protection Act 1989* There is the possibility that machinery contaminated with plant pests (e.g. insects) or disease (e.g. fungi) could move to, or from, sensitive zones. General biosecurity awareness of plant risks amongst the Project's workforce can reduce the risk of introducing pests of concern into Project area and subsequently, the region. This section should ensure that the EIS details the compliance strategy for the requirements of the *Plant Protection Act 1989* and associated regulations.	Terrestrial Ecology chapter (Section 17) of the EIS	The Draft Environmental Management Plan (EM Plan) (Appendix Z) of the EIS commits to developing a site specific weed management plan and pest management plan (PMP) in accordance with all relevant legislation and guidelines and recommended procedures. This will include inspection of vehicles, and training and awareness programs for staff targeting all relevant personnel that will support the effective delivery of pest management activities. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. As an example, where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected

Submission Number	Issue Number	Submission / Issue	Reference	Response
				soils to adjacent areas [B172].
S1	11	Biosecurity Queensland: Herbicides such as flupropanate used to control invasive grasses like tussock, Parramatta, Giant rats tail, Chilean needle and African lovegrass, have long withholding periods and obligations to move livestock to clean feed prior to slaughter. The Project should consult with adjacent and regional landholders on uses of herbicides to ensure that appropriate risk management actions can be implemented.	Terrestrial Ecology chapter (Section 17) of the EIS	Arrow is dedicated to the adoption of integrated management practices which incorporate a combination of land and habitat rehabilitation, pasture improvement, herbicide use and grazing management to minimise habitat degradation. Arrow has committed to working closely with the landholder to ensure that agreed management measures are implemented.
S1	14	Biosecurity Queensland: The last comment under the heading 'Impacts to agricultural land uses' provides a summary of measures to avoid, mitigate and manage the spread of weeds. These measures do not include inspection of vehicles or training of staff in weed hygiene. This section should include the inspection of vehicles and equipment following clean down and training of staff in weed hygiene in the summary of avoidance, mitigation and management measures.	Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS	The Draft Environmental Management Plan (Appendix Z) of the EIS commits to developing a site specific weed management plan and PMP in accordance with all relevant legislation and guidelines and recommended procedures. This will include inspection of vehicles, and training and awareness programs for staff targeting all relevant personnel that will support the effective delivery of pest management activities.

Section 21 Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S13	277	The project area overlaps with ESA's: • Homevale National Park • Arthur's Bluff State Forest In the Project Description section the EIS states that Arrow will actively protect the terrestrial ecological values of the areas in which it operates through: Avoidance of Category A ESAs; Manage impacts to Category A, B and C ESAs through implementation of management buffers; Demarcate ESA buffers and educate workers in regard to necessary site access protocols and requirements; and Development and implementation of a weed and pest management plan. In Section 7 Environmental framework (7-4) discusses No go areas: The only activities to be undertaken in these areas will be low impact petroleum activities. 'Low impact petroleum activities' have been defined as: 'limited petroleum activities' which do not result in clearing of native vegetation, cause disruption to soil profiles through earthworks or excavation or result in significant disturbance to land (e.g. soil surveys, topographic surveys, cadastral surveys and traversing land by car or foot via existing access tracks or routes or in such a way that does not result in permanent damage to vegetation). Can Arrow also confirm that it will minimise impacts on any Category C ESA in supplementary information to the EIS?	Terrestrial Ecology chapter (Section 17) of the EIS	The Terrestrial Ecology chapter (Section 17) of the EIS details the measures proposed for environmental protection of high-value environmental areas. The chapter stipulates that for category C ESAs, including Arthur's Bluff State Forest and gazetted nature reserves, disturbance will be avoided where possible. Updated constraints mapping is provided in the SREIS including updated mapping of potential habitat for EVNT species and ESA areas for the Project. In addition, analysis of LiDAR data has been undertaken to increase confidence in habitat mapping factors such as REs (MNES Report (Appendix J) of the SREIS). The SREIS also outlines the activities allowable in the different constraint areas, and outlines field management protocols and survey methodology to undertake detailed confirmation of on-ground environmental values.

Section 21 Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S13	278	Specific issues relating to Homevale NP - Section 27 of the *Nature Conservation Act 1992* prohibits the grant of mining and petroleum interests in relation to national parks and conservation parks (with exceptions to provide the capacity to approve pipelines to provide community supply). The *Petroleum and Gas (Production and Safety) Act 2004* is subject to s27 of the NCA (see section 6A of the P&G Act) and petroleum leases are not valid over national parks. Petroleum activities are therefore not permitted on Homevale National Park. Arrow to confirm that it will avoid works on Homevale NP.	Terrestrial Ecology chapter (Section 17) of the EIS	The Terrestrial Ecology chapter (Section 17) of the EIS details the measures proposed for environmental protection of high-value environmental areas. The chapter stipulates that disturbance within Homevale National Park will be avoided. Updated constraints mapping is provided in the SREIS including updated mapping of potential habitat for EVNT species and ESA areas for the Project. In addition, analysis of LiDAR data has been undertaken to increase confidence in habitat mapping factors such as REs. The SREIS also outlines the activities allowable in the different constraint areas, and outlines field management protocols and survey methodology to undertake detailed confirmation of on-ground environmental values.
S23	416	Petroleum operation needs to satisfactorily address the ingress of invasive weed species within the lease area and implement active third party independent agricultural industry auditable management strategies to prevent further expansions of existing infestations into the surrounding rural landscape especially those along the transport route access to the site and those interface areas with water courses that can rapidly spread invasive weed species to downstream properties and the broader interregional catchments.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	Arrow is committed to managing the introduction or spread of weeds as a result of its operations. As part of Arrow's environmental management obligations, a site specific weed management and PMP will be developed in accordance with all relevant legislation and guidelines and recommended procedures. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. As an example, where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas and washdown solids will be treated or disposed of in a registered landfill [B172]. Additionally, liaison with landholders will contribute to weed management planning and monitoring.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	492	Natural Resource and Stock Route Impacts: What will happen in regards to residual impact assessment if the sensitivity of ecological values does change and the magnitude of the impact assessment does/doesn't?"	Terrestrial Ecology chapter (Section 17) of the EIS	Arrow will monitor changes in the sensitivity of ecological values through ongoing dialogue with the relevant regulatory agencies. Should the sensitivity of ecological values change, the residual impact would increase or decrease accordingly. Planning of infrastructure will take into account alterations to the residual impact assessment and location and design of infrastructure will be amended accordingly if required. In addition, the implementation of field management protocols will allow for confirmation of ecological constraints not identified through the desktop assessment and the subsequent implementation of appropriate mitigation measures.
S23	493	Natural Resource and Stock Route Impacts: Avoidance of sensitive habitat altogether should not be classed as not requiring any mitigation measures.	Terrestrial Ecology chapter (Section 17) of the EIS	The avoidance of sensitive habitat is a key approach to be employed to ensure impacts are minimised, and avoidance is at the top of the impact management hierarchy. If avoidance cannot be employed then mitigation measures are next in the hierarchy of impact management In all cases, the implementation of field management protocols and ground truthing will allow for confirmation of ecological constraints not identified through the desktop assessment and the subsequent implementation of appropriate mitigation measures.
S23	494	Natural Resource and Stock Route Impacts: EPBC threatened ecological communities (flora) not expected to be in the area - what happens to these communities if they are present within the project area? Rehabilitation? Consideration?"	Terrestrial Ecology chapter (Section 17) of the EIS	EPBC TECs have been ground-truthed and mapped within the Detailed Mapping Area. The TECs within other portions of the Project area have been mapped using EHP's regional ecosystems, and as such have not been fully confirmed. Pre-construction and pre-clearance surveys will be undertaken prior to development and clearing to confirm

Submission Number	Issue Number	Submission / Issue	Reference	Response
				vegetation communities present. Impact management will be undertaken through avoidance, mitigation, rehabilitation or offsetting as per the hierarchy of mitigation measures outlined in the EIS.
S23	495	Natural Resource and Stock Route Impacts: What will happen to high risk biodiversity outside of the project development area during activities?	Terrestrial Ecology chapter (Section 17) of the EIS	No areas of "high risk biodiversity" are known within or adjacent to the Project area. Impacts to conservation significant ecological values within the Project area are anticipated and as such, mitigation measures are outlined in the EIS, together with a cumulative impacts assessment for any potential downstream impacts. Impact mitigation will be undertaken through avoidance, management, rehabilitation or offsetting as per the hierarchy of impact measures outlined in the Terrestrial Ecology chapter (Section 17) of the EIS.
S23	496	Natural Resource and Stock Route Impacts: What will be done to minimise weed infestation during the 40 years of activity?"	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	Arrow is committed to managing the introduction or spread of weeds as a result of its operations. As part of Arrow's environmental management obligations, a site specific weed management plan and PMP will be developed in accordance with all relevant legislation and guidelines and recommended procedures. This will include inspection of vehicles, and training and awareness programs for staff targeting all relevant personnel that will support the effective delivery of pest management activities. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. As an example, where washdown facilities are built, the design will ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent

Submission Number	Issue Number	Submission / Issue	Reference	Response
				areas [B172]. Other strategies will include: • Undertaking partial rehabilitation of gathering lines and other linear infrastructure to reduce edge effects (including weed invasion) and maintain movement rates [B156]; • Undertaking rehabilitation of available areas consistent with pre-clearing habitats, to increase the rate of recovery [B157]; and • Undertaking weed monitoring and targeted weed control measures within sensitive EVNT habitats (particularly threatened communities such as Brigalow and native grasslands) [B158]. Additionally, liaison with landholders will contribute to weed management planning and monitoring.
S23	497	Natural Resource and Stock Route Impacts: If a private property within the project area is infested with weeds brought in by a company vehicle, will it be classed as the company's responsibility or the landholders for control and eradication of the pests?"	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	As part of Arrow's environmental management commitments, a site specific weed management plan and PMP will be developed in accordance with all relevant legislation and guidelines and recommended procedures. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. As an example, where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds to adjacent areas [B172]. Additionally, liaison with landholders will contribute to weed management planning and monitoring.
S23	498	Natural Resource and Stock Route Impacts: What will happen to declared pest species such as lantana if the report in the EIS classes them as ideal residential locations for organisms such as the fairy wren and brown bandicoot? Will the	Terrestrial Ecology Technical Report	The Terrestrial Ecology Technical Report (Appendix P) of the EIS notes that "*The relatively dense undergrowth formed by this weed provides refuge for ground dwelling species such as northern brown bandicoots (Isoodon*

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		company not do the appropriate control measures of the declared pest because they believe it is a good habitat for other organisms?	(Appendix P) of the EIS	*macrourus) as well as smaller bird species such as white-browed scrubwren (Sericornis frontalis) and variegated fairy-wren (Malurus lamberti).*" This is not an endorsement for the retention of the weed for biodiversity purposes. It is an observation and part of the description of the riparian zone habitat in the Project area. The prevention of the spread of Lantana from Arrow's activities, especially into areas in which it is not yet established, is a priority for Arrow. As part of Arrow's environmental management obligations, a site specific weed management plan and PMP will be developed in accordance with all relevant legislation and guidelines and recommended procedures. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. As an example, the appropriate design of washdown facilities will ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas [B172].
S23	499	Natural Resource and Stock Route Impacts: Why are transient species excluded from studies within the report? This does not meet Australia's international obligations	Matters of National Environmental Significance (Appendix CC) of the EIS	Migratory species are assessed in detail within the EIS as per the requirements of the ToR and SEWPaC.
S23	500	Natural Resource and Stock Route Impacts: If vegetation clearing occurs within the project area thus removing habitat for organisms to live with the organisms that are forced to	Terrestrial Ecology chapter	Fauna dispersion and fauna mortality are implicit in the assessment of the direct removal of vegetation. One of the mitigation strategies is to allow for the dispersion of fauna

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		move to new habitat areas be classed as 'transient' and not be counted in studies?	(Section 17) of the EIS	during the staged clearing of vegetation.
S23	501	Natural Resource and Stock Route Impacts: Will activities be changed due to rare or uncommon habitat class (as they will result in higher individual mortality and higher habitat loss)?"	Terrestrial Ecology chapter (Section 17) of the EIS	The Environmental Framework chapter (Section 7) of the EIS details the approach to identifying constraints to CSG development in the Project area, having regard to the sensitivity of identified environmental values. The level of constraint will determine the type of activity that can take place within the mapped constraint area. Activities are restricted within higher constraint classes based on the conservation significance of habitat or vegetation present, such as potential habitat for protected species. Pre-construction and pre-clearance surveys will be undertaken prior to development and clearing. These surveys will confirm the vegetation community or habitat present and impact mitigation will be undertaken through avoidance, mitigation, rehabilitation or offsetting as per the mitigation measures outlined in the EIS.
S23	502	Natural Resource and Stock Route Impacts: Potential damage to organism and habitat corridors - what will be done to mitigate/offset?	Terrestrial Ecology chapter (Section 17), Draft Environmental Management Plan (Appendix Z) and Environmental Offset	The EIS details the measures to be employed to mitigate the impacts to organisms and habitat corridors. These measures include avoidance where possible, minimisation of impacts and mitigation where avoidance or minimisation is not possible. The use of offsets is an example of mitigation in lieu of avoidance. For the Project, an Environmental Offset Management Strategy (Appendix P) has been developed for the SREIS, utilising both the Queensland Biodiversity Offsets Policy, and the EPBC Act Environmental Offsets Policy 2012 as guidance.

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			Management Strategy (Appendix Q) of the EIS	
S23	503	Natural Resource and Stock Route Impacts: Natural Resource and Stock Route Impacts: Increased lighting is now a positive impact? - creating food for organisms? (p.153 Terrestrial Report). The EIS fails to acknowledge the advance of pest species on the back of this food source stimulation	Terrestrial Ecology Technical Report (Appendix P) of the EIS	As reported in the Terrestrial Ecology Technical Report (Appendix P) of the EIS, "*The impacts of extended periods of lighting are not detrimental to all species and some; particularly insectivorous predators are likely to be favoured*". This is primarily referring to insectivorous bats and birds such as kookaburras which prey on insects attracted to the lights. It is acknowledged that feral pests such as the cane toad will also congregate around light sources to take advantage of insects attracted to the lights. The cane toad is already established throughout the Project development area and apart from a potential increase in numbers; lighting will not promote an advance of this species into areas where it currently does not exist. It is unlikely that any other feral insectivorous species will be favoured by the increase in lighting as a result of the Project. Other pest animals such as feral dogs, cats and European red foxes may be attracted by the presence of food scraps and putrescible waste if this aspect is not properly managed. However, lighting will not significantly cause an increase in their numbers or range. Arrow will develop a PMP that provides strategies to minimise opportunities for the spread or proliferation of pest species. This will include species-specific management protocols for pest fauna such as those mentioned above, and will take into account issues such as artificial light sources.

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	504	Natural Resource and Stock Route Impacts: Project will increase surface water availability for organisms?	Environmental Management Plan (Appendix Z) of the EIS	The EIS notes that surface water can be a limiting resource within the Brigalow Belt North Bioregion and that increases in surface water bodies due to Project-related dams may increase exotic pest species abundance. There may also be likely benefits for native fauna from the provision of additional water in the Project development area. Management will primarily aim to reduce the number of water bodies, especially in association with individual wells. Rather, water should be gathered in large structures, preferably within existing cleared areas where exotic species are most likely to already occur. Where it is not feasible to collect water in larger containments, access to smaller water bodies can be restricted by the inclusion of fauna exclusion protocols such as fauna exclusion fencing, fauna exclusion covers and plastic barrier buffers. In addition, individual dams associated with individual wells would be temporary features, partially rehabilitated when the well is completed and brought into production following its initial installation. Regular monitoring of each well should be undertaken to ensure that no water is allowed to leak and collect around well heads. Even small quantities of ponding water may be suitable for species such as the European red fox and can be used by cane toads for breeding. A PMP will be developed that includes strategies for managing availability of water for feral animals.
S23	506	Natural Resource and Stock Route Impacts: Surface dams around gas wells are a potential water source for pests and native wildlife; what will be done in regards? Fencing? Control actions?	Environmental Management Plan (Appendix Z)	The EIS notes that surface water can be a limiting resource within the Brigalow Belt North Bioregion and that increases in surface water bodies due to Project-related dams may increase exotic pest species abundance. There may also be likely benefits for native fauna from the provision of

Submission Number	Issue Number	Submission / Issue	Reference	Response
			of the EIS	additional water in the Project development area. Management will primarily aim to reduce the number of water bodies, especially in association with individual wells. Rather, water should be gathered in large structures, preferably within existing cleared areas where exotic species are most likely to already occur. Where it is not feasible to collect water in larger containments, access to smaller water bodies can be restricted by the inclusion of fauna exclusion protocols such as fauna exclusion fencing, fauna exclusion covers and plastic barrier buffers. In addition, individual dams associated with individual wells would be temporary features, partially rehabilitated when the well is completed and brought into production following its initial installation. Regular monitoring of each well should be undertaken to ensure that no water is allowed to leak and collect around well heads. Even small quantities of ponding water may be suitable for species such as the European red fox and can be used by cane toads for breeding. A PMP will be developed that includes strategies for managing availability of water for feral animals.
S23	507	<u>Natural Resource and Stock Route Impacts:</u> Waste dumps can be a potential food source for pest species and have the potential to result in disease spread within pest species; what will be done to manage this?	Terrestrial Ecology Technical Report (Appendix P) of the EIS	Putrescible wastes such as food scraps can attract pest species as well as increase their abundance if the food resource is stable. All food scraps should therefore be appropriately disposed in large skips or bins that prevent animal access, particularly around camps and construction areas. These storage devices should be regularly emptied through existing council disposal facilities. No food scraps or general waste should be buried, or disposed in open trenches/waste dumps.

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S23	508	Natural Resource and Stock Route Impacts: Pg. 157 (Terrestrial Ecology) - appropriate impact of pests? Is it correct? The table appears too minimal from a Council pest management perspective.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	This impact assessment is correct. As part of Arrow's environmental management commitments, a site specific weed management plan and PMP will be developed in accordance with all relevant legislation and guidelines and recommended procedures. The PMP will be developed to mitigate and manage the potential spread of pest flora and fauna species [B152]. This will include inspection of vehicles, and training and awareness programs for staff targeting all relevant personnel that will support the effective delivery of pest management activities. Additionally, liaison with landholders will contribute to weed management planning and monitoring.
S23	509	Natural Resource and Stock Route Impacts: Will turkey nest dams be adequately fenced to minimise mortality of terrestrial species?	Surface Water chapter (Section 15) of the EIS	All dams will be adequately designed to correct standards to minimise fauna mortality. This will involve the use of appropriate fencing as per Arrow's Standard Specification for Fencing (99-C-SP-0010). In addition the Fauna Management Guideline (99-H-GDL-0060) should be followed where relevant.
S23	540	How will the impact from site discharges affect the GBR (Great Barrier Reef) via the Isaac and Fitzroy River catchments be mitigated?	Environmentally Sensitive Areas chapter (Section 18) of the EIS	As noted in the MNES report (Appendix CC) of the EIS and the EPBC referral, no discharge impacts from the Project are relevant to the extent of downstream impacts to the GBR. Project impacts on the hydrology, morphology or functions of the river systems and marine areas downstream of the Project area are not expected. This is investigated in the EIS. Water quality management strategies to be implemented to mitigate downstream effects of any discharges are outlined in the relevant sections of the EIS and include:

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				• Site facilities will avoid wetlands and watercourses that are highly susceptible to erosion; • Development areas will avoid permanent pools, chains of ponds, and alluvial islands, where practicable; • Watercourse crossings will be minimised; • Site-specific management plans will be developed for permanent and semi-permanent watercourse crossings; • Buffers will be established around environmentally sensitive areas and watercourses; and • Surface water quality discharge objectives will be adhered to. Commitments relating to the mitigation of surface water impacts are presented in the Surface Water Chapter (Section 8) of the SREIS.
S23	550	How will declared weed/pest control be actively undertaken (site/access) and at what intervals?	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry - Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP will include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and

Submission Number	Issue Number	Submission / Issue	Reference	Response
				does not transfer weed seeds, spores or infected soils to adjacent areas. When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.
S37	687	The proponent states that they will "undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats…". FBA submits that this should be undertake in all habitats, particularly since disturbance by this project will provide increased opportunities for weed and feral animal encroachment across large areas.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	All legislative requirements guidelines and local council requirements will be met with regard to the development of a weed management plan and ongoing monitoring. Additionally liaise with landholders requirements in this respect will also contribute to weed management planning and monitoring.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S37	689	This section addresses the cumulative impacts on terrestrial ecology, however the cumulative impacts of corridor and habitat fragmentation are not described, nor are impacts on threatened species and ecological communities (only offsets are discussed in any detail) on landscape/ catchment scale. FBA submits that the proponent must describe cumulative impacts on corridor and habitat fragmentation, and on threatened species and ecological communities.	Cumulative Impacts chapter (Section 17) of the SREIS	Habitat fragmentation is a potential direct impact within the Project area from vegetation removal. The Project activities will not impact on these values outside of the Project area. The SREIS provides an updated chapter providing further discussion of cumulative impacts
S38	711	Biodiversity: Most of Arrow Energy's CSG tenures are in the Isaac River catchment already covered with coal exploration permits. Little information is available on how wetland biodiversity will be impacted by this project (Table 1). So how can impacts on significant wetlands by this project be assessed?	Aquatic Ecology chapter (Section 10) of the SREIS	The SREIS provides an updated Aquatic Ecology chapter (Section 10) which outlines an updated impact assessment against relevant values associated with significant wetlands.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	774 818 862 906 950 994 1038 1082 1126 1170 1214 1258 1302	Weeds: The EMP must address all the environmental values likely to be affected ; any potential adverse or beneficial impacts on those values; and the proposed environmental protection commitments for best practice environmental management	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry - Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP will include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to

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				adjacent areas and washdown solids will be treated or disposed of in a registered landfill. When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	775 819 863 907 951 995 1039 1083 1127 1171 1215 1259 1303	<u>Weeds:</u> The EMP must also include a rehabilitation program for the proposed disturbed land and must volunteer a proposed amount of financial assurance for the rehabilitation program. A CSG water management plan is required as part of the EMP.	Project Description chapter (Section 4.8.8) and Draft Environmental Management Plan (Appendix Z.5) of the EIS.	For details regarding rehabilitation please refer to the Draft Environmental Management Plan (Appendix Z, Section Z.5) of the EIS. Arrow will calculate the financial assurance required for the Project during EA applications and/or amendments. The financial assurance will be provided to EHP and reviewed throughout the life of the Project. An updated CSG Water and Salt Management Strategy is provided as part of the SREIS (Appendix D).
S40 S41	776 820	<u>Weeds:</u> The submitter's position is that one of the significant land	Terrestrial Ecology	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry -

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S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	864 908 952 996 1040 1084 1128 1172 1216 1260 1304	management risks posed by the Project involves weed infestation.	chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP should include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be to designed ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas and washdown solids will be treated or disposed of in a registered landfill. When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.

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S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	777 821 865 909 953 997 1041 1085 1129 1173 1217 1261 1305	<u>Weeds:</u> Multiple contractors assessing the land whose composition and standards of work / work culture will vary significantly over the life of the project providing an absence of continuity of performance given the works are dependent on a contractor work force; but administered under a single generic Environmental Authority covering a gas field comprising over 6,000 wells and associated infrastructure over 8,000 square kilometres.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry - Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP should include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds [B172]. When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.

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S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	778 822 866 910 954 998 1042 1086 1130 1174 1218 1262 1306	<u>Weeds:</u> The Project risk is further heightened by the fact that the 6,000 wells and associated structures siting is presently unknown as such the EIS does not address the scale and nature of the project sufficiently.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry - Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP should include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and does not transfer weed seeds, spores or infected soils to adjacent areas [B172]. When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.

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S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	779 823 867 911 955 999 1043 1087 1131 1175 1219 1263 1307	Weeds: In the same the EIS does not address impacts on aerial application for weed control (or regrowth control) by landholders arising from the positioning of CSG developments may affect local aerial application operations, depending on the particular site.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	The impact of site infrastructure on aerial activities will be in accordance with state planning policy SPP 1/02. Site specific impacts to aerial weed spraying would not be expected for CSG infrastructure.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	780 824 868 912 956 1000 1044 1088 1132 1176 1220 1264 1308	Weeds: The EIS is deficient in terms of its potential environmental impacts and economic impact by not addressing weed impacts of CSG infrastructure in terms of operational impacts of weed application of landholder given 90.2% of the tenure area is defined as cattle grazing which will have resultant environmental impact in terms of accuracy and application of weed control regimes.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Management Plan (Appendix Z) of the EIS	A declared weed management plan and PMP will be developed in accordance with the Petroleum Industry - Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Arrow will undertake species-specific management for identified key weed species at risk of spread through Project activities; will increase weed control in areas particularly sensitive to invasion and will undertake weed monitoring and targeted weed control measures within sensitive EVNT habitats. The PMP should include, at a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. Where washdown facilities are constructed they will be designed to ensure that runoff is contained on site and

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				does not transfer weed seeds to adjacent areas [B172], When sourcing maintenance materials, Arrow will ensure that such materials as bedding sand, topsoil, straw bales and sand bags are brought to site only after it is ascertained that the materials are not contaminated with weeds and plant or animal pathogens. A weed hygiene declaration form will be requested from the supplier where there is a possible risk of contamination in products. Arrow will ensure that all relevant personnel are made aware of the location and extent of weed infestations in the vicinity of the work and the risks involved in moving from one site or property to another.

21.8 Roads and Transport

Table 21-10 Roads and Transport Submission Responses

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S7	120	The increase of traffic along the Suttor Developmental Road during the life of this project has the potential to increase road crash incidents. As this area is serviced primarily by Auxiliary Fire Services and the closest full time urban QFRS station is Mackay, delay times may occur. QFRS currently has sufficient resources to attend road crash on public roads in the areas. Arrow Bowen Gas will need to develop and implement traffic management plans to deal with the increase in traffic along these roads.	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	Arrow will engage with all relevant stakeholders during development of the Road-use Management Plan (RMP). This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised.
S7	121	Road accident crashes in general impact on the response capabilities and resources of QFRS, this coupled with the intersections of public roads and private roads and road accident crashes that may occur on Arrow Bowen Gas leased land may have a delay in QFRS response times. Arrow Bowen Gas EIS traffic management plans should deal with these delays.	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	Arrow will engage with all relevant stakeholders during development of the RMP. This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised.
S7	124	Advise any diversions, restrictions on road infrastructure that may impact on the delivery of ambulance operations from ambulance stations through road network locations within the project area; this should outline alternatives to road transport for delivery of equipment.	Roads and Transport chapter (Section 21) of the EIS	Arrow will engage with all relevant stakeholders during development of the RMP. This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised.
S16	303	To be addressed: Preparation of an updated Road Impact Assessment (RIA) in	Road Impact Assessment (Appendix R)	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by

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		accordance with the TMR Guidelines for Assessment of Road Impacts of Development 2006 (GARID);	of the EIS Road Impact Assessment (Appendix K) of the SREIS	documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies.
S16	304	To be addressed: The updated RIA should be based on the proponent's latest traffic generation information and agreed assumptions about background traffic and include: • a more comprehensive road safety assessment; • a pavement impact assessment; • details of access location to the extent these are known or can be estimated; • a more comprehensive traffic operations assessment for link and intersection performance; • better details of anticipated over-mass and over-dimension vehicle movements; • more comprehensive assessment of cumulative impacts including all five Arrow LNG projects; and • identification of appropriate mitigation measures (both infrastructure and road use management based) or likely types	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon the work previously undertaken as part of the Road Impact Assessment (Appendix R) of the EIS. • An expanded historic crash assessment is included for all Department of Transport and Main Roads (TMR) roads within and in proximity to the Project development area. In addition, case study assessments are included to confirm that the application of the planned management measures will result in appropriate safety outcomes. • A comprehensive pavement assessment is included for all State-controlled roads within the Road Impact Assessment (Appendix K) of the SREIS Study Area. This assessment considers the potential impact of Project traffic on the level of maintenance activity required and the pavement service life for in excess of 1,000 assessment segments.

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		and locations for required measures even if they are subject to change as a result of more detailed project planning.		• Case study assessments consider the suitability of the planned management strategies including those relevant to access works. These works are for notional access locations as the location of Project infrastructure has not been finalised at this stage. • A comprehensive link level of service assessment is included for all State-controlled roads within the Road Impact Assessment (Appendix K) of the SREIS Study Area. This assessment includes consideration of the impact that peak traffic demands will have on the level of service afforded by the road network. Furthermore, case study assessments consider the suitability of the planned management strategy including those relevant to the operation of intersections. • Arrow will engage with all relevant stakeholders during development of the RMP post-EIS approval including with regards to the consideration of over-mass and over-size movements. This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised. • The Road Impact Assessment (Appendix K) of the SREIS includes consideration of the cumulative impact generated by other planned projects which have the potential to influence future traffic demands. The link level of service reflects the influence that traffic growth potentially associated with the cumulative impact of various other projects will have on the level of service afforded by the road network. • The Road Impact Assessment (Appendix K) of the SREIS presents planned management strategies and applies the formulated strategies to case study

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				locations to identify the access route works potentially required at these case study locations.
S16	305	To be addressed: Clarification of likely tonnages required for pipeline construction and whether these are likely to trigger the Notifiable road use provisions of the Petroleum and Gas (Production and Safety) Act 2004;	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	Arrow will engage with all relevant stakeholders during development of the RMP. This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised.
S16	306	To be addressed: Inclusion and assessment of impacts and required mitigation on all existing and proposed rail lines in the project area, including level crossing safety and performance;	Land Use and Tenure chapter (Section 19.4.5.2), Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	This item is outside the scope of the Road Impact Assessment (Appendix K) of the SREIS but would ultimately be addressed when undertaking fitness-for-use assessments post EIS approval as part of preparing RMPs, Road Impact Assessments and Infrastructure Agreements. ToR s4.3.2 requirement for potential rail impacts: *The assessment of impacts on the rail network itself, or on environmental values affected by changes in rail traffic (due to dust, noise and vibration), will also consider the following matters:* • *impacts at interface points with other private and public transport pathways such as roadway level crossings or occupational crossings (that is, those crossings that form part of private access pathways to and from residential or business sites)* • *impacts on passenger transport and services* • *requirements for any approvals needed for rail crossings by roads or other infrastructure.* The first point is most relevant to this issue and this point is

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				addressed by the following: Potential Impacts "Project infrastructure will not directly impact on the operation of any rail infrastructure. Where the gas gathering or trunkline network is required to cross under a rail line, the crossing will be either bored or directionally drilled, thereby avoiding direct impacts. ...Minor service interruptions/disturbances may occur if construction is required in proximity to any rail lines, so as to satisfy likely recommended safety protocols (e.g. trains reducing speed near the construction zone). Impacts on rail infrastructure and services resulting from the ongoing operation of the Project are not expected." Refer to the Land Use and Tenure chapter (Section 19.4.5.2) of the EIS.
S16	307	To be addressed: Inclusion of a summary of freight data for the project in accordance with TMR's template (attached).	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The scope for the Road Impact Assessment (Appendix K) of the SREIS does not include allowance to convert to this format as it was not included in the Surat Gas Project SREIS Road Impact Assessment. Arrow believes that the data presented in the Project's Road Impact Assessment (Appendix K) of the SREIS will be suitable to inform TMR's assessments of the Project's impacts. The Road Impact Assessment will be further updated upon completion of detailed design, and at that time the freight data will be updated and provided in TMR's template.
S16	308	The proponent should also be aware of their obligations under section 515 of the Petroleum and Gas (Production and Safety) Act 2004 to notify TMR of haulage associated with construction of a pipeline, where this haulage is in excess of 50 000 tonnes per year on State	Roads and Transport chapter (Section 21)	Noted.

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		controlled roads (SCRs). Under this Act, TMR is able to issue road use directions regarding the use of SCRs to protect road safety and condition. If an adequate assessment of the impacts of this haulage, including identification of appropriate mitigation measures, has not already been undertaken as part of the EIS process, TiviR will require it as part of a road use direction. Inadequate information could potentially delay approval of pipeline construction haulage and the commencement of project construction and related approvals such as access works onto SCRs and pipeline crossings of road and rail corridors.	and Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	
S16	309	Incorrect reference to QR National. QR National is now trading as Aurizon Ltd.	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	Noted. This has been amended throughout the SREIS.
S16	310	Some transport tasks involved with the Bowen Gas project may constitute Notifiable road uses and be subject to road use directions under the Petroleum and Gas (Production and Safety) Act 2004 where the construction of a pipeline is concerned. The proponent is advised that the Bowen Gas Project would be recognised under Petroleum and Gas (Production and Safety) Act 2004, therefore the transport activities associated with the construction of a pipeline above threshold rates defined for state controlled roads and local roads is Notifiable road use and may be subject to a road use direction. The proponent is also liable to pay compensation for any cost, damage or loss incurred by TMR in relation to the Notifiable road use.	Roads and Transport chapter (Section 21) of the EIS	Noted.

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		The proponent is further advised to consult with Planning Management Branch of the Department of Transport and Main Roads (TMR) in regard to this matter.		
S16	311	It is noted that mitigation strategies for dealing with potential impacts to the rail environment are not yet proposed due to the strategic level of the EIS. The proponent states in s21.11 that "during the detailed Project planning phase, consultation will be undertaken with TMR, Councils and Queensland Rail to identify works at specific locations". Where the Bowen Gas Project impacts on non-Queensland Rail corridors, all relevant railway managers must be consulted. The proponent is advised that under the Transport Infrastructure Act 1994, interfering with a railway, which encompasses activities that include the development in a railway environment, multiple rail corridors are likely to be subject to such interference and hence multiple railway managers, including Aurizon Ltd will need to be consulted. The proponent is further advised that proposed new railways, such as the GVK-Hancock railway, may be under construction or possibly in operation prior to the commencement of construction activities associated with the Bowen Gas Project. On this basis the proponent is directed to consult with proponents of the GVK-Hancock railway project for further advice.	Roads and Transport chapter (Section 21) of the EIS	Noted
S16	312	It is unclear from the information provided in s4.7 and accompanying map, Fig 4-19, that all rail corridors (existing and proposed) have been included in the assessment of level crossing risk analysis. Figure 4-19 is incomplete. It does not refer to the Northern Missing Link component of the Newlands System, which was completed in 2011. Further this map should also include to the GVK-Hancock rail corridor	Road Impact Assessment (Appendix R) and Draft Environmental Management	The Road Impact Assessment (Appendix K) of the SREIS includes an updated Figure 5-10 summarising supplied rail infrastructure data. The Road Impact Assessment does not include detailed consideration of specific impacts on rail crossings but this will ultimately be addressed when undertaking fitness-for-use assessments post EIS approval as part of preparing RMPs, Road Impact Assessments and

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		which intersects with the north-west regions of the project area in close proximity to the Newlands System. The proponent is requested to include in the SREIS, maps that identify all rail corridors, existing and proposed, that traverse the project area. Further, while it is noted that the proponent has indicated that the final location for key project infrastructure has not yet been finalised, the proponent is requested to ensure that all level crossings in the project vicinity that are expected to experience increased road traffic levels arising from project related transport tasks are appropriately assessed. Level crossings to be assessed would include those that have been identified as part of new railways and railway upgrades in the vicinity of the project that would be in place prior to commencement of construction activities for the Bowen Gas Project. The proponent is advised that it may be necessary to consult with the project proponents and railway managers associated with the development of new rail infrastructure in the vicinity of the Bowen Gas Project.	Plan (Appendix Z, Section Z.4.15) of the EIS Road Impact Assessment (Appendix K, Figure 5-10) of the SREIS	Infrastructure Agreements. A number of specific mitigation commitments to undertake the relevant assessments are outlined in the Draft Environmental Management Plan (Appendix Z, Section Z.4.15) of the EIS, including: • "A RUMP will be prepared to manage and mitigate the risks and impacts of any transport related issues. The RUMP will evolve as detailed design and operation details are finalised, however an outline of the components that the RUMP should include are as follows [B570]: — A strategy to safely manage road usage by construction vehicles; — Interaction of Project vehicles with school bus routes; — Interaction between stock and freight routes; — Detail safe driver behaviour and fatigue management protocols; — Consideration of specific requirements for over dimensional vehicles; — Interaction between Project traffic and at grade road / rail crossings; — Dust mitigation strategy; — Detail road maintenance and/or road upgrade requirements; — Liaise with relevant stakeholders; — Define community engagement strategies; and — Suitability of existing road infrastructure." • "Assess and identify works required to manage the increased traffic volumes and road safety issues

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				associated with the Project in road use management plans prepared and regularly reviewed in consultation with the relevant council TMR [B571]" • "Assess and identify the need to upgrade unsealed roads or widen sealed roads where Project activities and traffic will create road safety issues. Such works will be done in consultation with the relevant council (if a local government road) or TMR (if a state road) [B572]" • "Undertake threshold assessments to determine whether upgrading of rail crossings is warranted [B573]"
S16	313	The proponent has not adequately addressed the Terms of Reference regarding the provision of details concerning transport tasks associated with the project. The descriptions provided are limited to the number of heavy vehicle trips required for each type of construction activity such as well, field compression facilities, central gas processing facilities, integrated production facilities and construction camps. The proponent is requested to provide in the SREIS, for each mode of transport and each phase of the project, the expected volumes and weights of materials, products, hazardous goods or wastes, the likely number and timing of trips, all types of vehicles to be used and the routes. This would include for each freight task: • tonnage/volume • proposed transport methodologies (modes); • estimates of number of discrete trips required for each task; and • origins and destinations and proposed transport routes The proponent is requested to provide the relevant information in	Road Impact Assessment (Appendix K) of the SREIS	• The Road Impact Assessment (Appendix K) of the SREIS models the latest Project description including revised material requirements and the latest logistics strategy. • The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all utilised roads during each year of the Project life to address this item.

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		electronic form in the spread sheet provided and printed in the SREIS.		
S16	314	Reference to the State Controlled Road (SCR) Collinsville Elphinstone Road is not correct. The section which is referenced as unsealed from the Bowen Developmental Road is not correct. The Collinsville Elphinstone Road was re gazetted several years ago and the new alignment is fully sealed from the intersection of the Bowen Developmental Road. The unsealed former alignment of this road is now maintained by Isaac Regional Council. In the SREIS, amend assessment to include correct reference to the SCR for this road. Assessment then needs to be undertaken on the correct State Controlled Road link.	Road Impact Assessment (Appendix R) of the EIS	This has been updated in the Road Impact Assessment (Appendix K) of the SREIS: • The Road Impact Assessment (Appendix R) of the EIS reference to Newlands Access Road has been updated to Collinsville-Elphinstone Road. • The unsealed section of what was previously referred to as Collinsville-Elphinstone Road, is now referred to as 'former Collinsville-Elphinstone Road' and is noted as a Council road.
S16	315	Given the proximity of the site to the Bowen Developmental Road and townships of Collinsville and Bowen it is not unreasonable for the assessment to include an assessment of project impacts on the Bowen Developmental Road. In the SREIS, include an updated Road Impact Assessment (RIA) that includes the Bowen Development Road.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS addresses this item by providing annualised Project traffic forecast for all roads utilised by Project traffic within the Study Area for each year of the Project life. The Bowen Developmental Road is included within the extents of the Road Impact Assessment (Appendix K) of the SREIS Study Area.
S16	316	Table 6.2 TMR does not agree with the sensitivity analysis of the Suttor Developmental Road, Collinsville-Elphinstone Road. Nor has any analysis been undertaken on the Bowen Developmental Road. The EIS assumes any materials and equipment arriving from the port of Townsville would travel via Mackay. TMR does not agree with this assumption and questions why they wouldn't use Bowen Developmental Road, particularly to access the northern extremities of this project site. In the SREIS, include an updated RIA that includes the Bowen	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	• The sensitivity of Suttor Developmental Road and Collinsville-Elphinstone Road have remained classified as Regional Connecting Roads given their regional significance. • The Bowen Developmental Road is included within the extents of the Study Area. • The Road Impact Assessment (Appendix K) of the SREIS resolves this item by modelling the latest project description including revised material and equipment

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		Development Road as a potential supply route.		requirements. The revised project description now assumes that all materials and equipment arrives at the port of Mackay.
S16	317	The traffic volumes shown in Table 7.1 are not completely representative of the links shown. Traffic volumes between Nebo and Mackay are not 16,700 vpd for the entire link. There is only a relatively short section of this link with volumes of this order. In the updated assessment included in the SREIS, volumes on this link need to be broken up into sections to better represent existing network conditions.	Road Impact Assessment (Appendix K, Figure 5-3) of the SREIS	The Road Impact Assessment (Appendix K, Figure 5-3) of the SREIS shows the AADT volumes for TMR's road segments which provides a better representation of the road network and the traffic volumes along each road.
S16	318	Comment that TMR advised that it was acceptable to adopt background growth of 3%. Growth rates for each road will need to be agreed with each individual TMR region (Mackay/Whitsunday and Central Queensland) and incorporated in the updated RIA.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS considers historical traffic growth rates (shown on Figure 5-4) recorded on key roads within the study area to resolve this item. The historic traffic growth on each road has been used as a predictor of likely future traffic growth that would occur on that road in the absence of the Project.
S16	319	Estimated Traffic volume for 2045 for Capricorn Highway is less than 2011 volume. Revise the estimated traffic for 2045, in line agreed growth rates.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS considers historical traffic growth rates (shown on Figure 5-4) recorded on key roads within the study area to resolve this item. The historic traffic growth on each road has been used as a predictor of likely future traffic growth that would occur on that road in the absence of the Project.
S16	320	The predicted traffic volumes for 2045 in Table 7.3 appear to be based on linear growth and not cumulative. All future traffic predictions should be based on 2011 or 2012 traffic data with agreement with individual TMR regions on growth rates to be adopted for the future. Growth rates adopted will be compound and not linear and this should be reflected in the updated RIA.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life. Future traffic growth predictions are based on historical traffic growth rates (shown in Figure 5-4 of the Road Impact Assessment (Appendix K) of the SREIS) to estimate the future traffic volumes for the case study assessments.

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S16	321	Assumptions of the fly-in/fly-out component of construction and operational workforce seem very high (80% for construction and 50% operational). Lower fly-in/fly-out arrangements will significantly add to the impact on the SCR. A sensitivity analysis is required also, based on lower (more realistic) percentages of fly in fly out workers.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description, which reflects impacts associated with the latest planning in relation to FIFO and DIDO projections.
S16	322	The Magnitude Criteria that has been used is not one that is referenced in any TMR documents including the GARID. To state that increases in AADT of 30-60% is a low magnitude impact is not acceptable to TMR. The Guidelines for Assessment of Road Impacts Of Developments (GARID) indicates that an increase greater than 5% is significant. This magnitude criterion is misleading and should be removed from the Traffic Impact Assessment.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS details TMR roads where Project traffic demands exceed 5% of existing traffic demands (in accordance with GARID). The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies.

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S16	323	Table 9.2 is subjective and should be removed from the analysis. It is best that factual information (percentage increase in AADT and ESAs) be provided so that assessments can be made of impacts on a factual basis. Remove assessment criteria from analysis.	Road Impact Assessment (Appendix R, Table 9.2) of the EIS Road Impact Assessment (Appendix K) of the SREIS	Table 9.2 of the Road Impact Assessment (Appendix R) in the EIS related to an environmental values assessment of the impacts of the Project. The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the SREIS Road Impact Assessment (Appendix K) provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management In addition, the Road Impact Assessment (Appendix K) of the SREIS also presents case study assessments of potential facility locations which confirm the effectiveness of planned management strategies and compares them against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID). The Road Impact Assessment (Appendix K) of the SREIS includes figures which demonstrate the likely increases in AADT (Figure 8.3 and Figure 8.4) as well as potential reductions in pavement service life (Figure 12.4) and maintenance cost increases (Figure 12.2) on TMR roads.

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S16	324	Table 9.3 expresses the increase in AADT as a percentage of 2045 AADT. Construction and operational traffic impacts will be greater in the early stages of the project. To compare with 2045 volumes reduces the % increase and consequently reduces the potential significance of the impacts. The percentage increase on the Peak Downs Highway between Mackay and Nebo is based on an traffic volume which is not reflective of this entire link TMR does not agree with the significance ratings provided in Table 9.4, particularly impacts on the Suttor Developmental Road (low) and Collinsville- Elphinstone (moderate), given the percentage increases are expressed as a percentage of 2045 volumes. No assessment of the Bowen Developmental Road has been undertaken. Comparisons should be made with estimated traffic volumes during the various stages of construction phase at regular increments. Some interim comparisons should be made, such as at 5, 10 15 20 year intervals not just 2045. Alternatively, assessment should be undertaken at the completion of construction and commencement of operation of each production area. Therefore the assumptions about potential impacts will need to be re-assessed in the updated RIA, to determine the significance of impacts on the SCR.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecasts for all impacted roads during each year of the Project life. Through this process, the maximum impact on each road link has been identified which shows that for the majority of links the construction period is the most significant. Figure 8-4 identifies the maximum Project AADT on any link in any year, while Figure 8-5 identifies the year of that peak impact. Percentage increases are presented for the maximum Project AADT on Figure 12-1 which is based on TMR's road segments which provide a more representative view of the road network.

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S16	325	Given the comments previously about traffic volumes and growth rates, the assertion that impacts from the project traffic are generally negligible on the efficiency, safety and amenity of the road network can not be substantiated until further analysis is undertaken. Review of traffic impacts is required in a format and to a higher standard agreed with TMR regions.	Road Impact Assessment (Appendix R, Section 9.2.1) of the EIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life. The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the EIS Road Impact Assessment (Appendix R) by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies.
S16	326	Table 9.5 once again has expressed percentage increase in AADT in terms of a 2045 volume. This is not appropriate or reflective of the actual impacts. Comparisons should be made with estimated traffic volumes during the various stages of construction phase at regular increments. Some interim comparisons should be made, such as at 5, 10 15 20 year intervals not just 2045. Alternatively, at the completion of construction and commencement of operation of each production area. The assumption, therefore, about potential impacts relating to road network performance will need to be re assessed and the analysis of additional roads will need to be undertaken, not just those included as	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS has addressed and resolved this item by providing annualised Project traffic forecasts on all impacted roads during each year of the Project life. In addition the Road Impact Assessment (Appendix K) of the SREIS Figure 12-1 details TMR roads where the peak Project traffic demands on each link exceed 5% of existing traffic demands.

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		"yes" in Table 9.5.		
S16	327	There is no basis provided for the assertion that no intersection assessments are required. Intersection assessments will be required specifically in terms of the warrants established in Part 13 of TMR's Road Planning and Design Manual. These must be included in the updated RIA.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS presents planned management strategies and applies the formulated strategies to case study locations to identify the intersection works potentially required. This intersection analysis at the notional case study locations is based on current traffic engineering best practice and includes use of TMR's warrants in the RPDM. Appendix E of the Road Impact Assessment (Appendix K) of the SREIS documents the detailed Road Standard Assessments undertaken for the case study locations.
S16	328	This section will need to be re-assessed taking into consideration previous comments about traffic data, growth rates and so on. Conclusions will need to be revised in the updated RIA and included in the project's SREIS.	Road Impact Assessment (Appendix R, Section 11.2) of the EIS	Noted
S16	329	This section will need to be re-assessed taking into consideration previous comments about traffic data, growth rates and so on. Conclusions will need to be revised in the updated RIA.	Road Impact Assessment (Appendix R, Section 12) of the EIS	Noted
S16	330	There is no adequate assessment on the potential implications of driver fatigue from construction and operational work force Re- assessment of the fatigue issues associated with construction and operational work force commuting to and from airports and regional centres needs to be undertaken, as part of the updated RIA.	Road Impact Assessment (Appendix R, Section 10.2) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will evolve as detailed design and operation details are finalised. The RMP will include consideration of driver fatigue management.

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S16	331	No reference is made specifically to the location of accommodation camps and access to and from the State-controlled road network for them. Appendix A makes reference to the construction of the camps but no detail is provided on the operation and how the impacts will be assessed during the operation, particularly in regards to access to the SCR. Definition and assessment of the construction and operation of construction camps in relation to access to the SCR is required.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS presents case study assessments of potential facility locations (including accommodation villages) to confirm the effectiveness of the planned management strategies and compares them against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID). It should be noted the case study assessments will be undertaken based on representative facility locations as the actual locations are currently unknown.
S16	332	There has been no draft assessment undertaken of the impacts of the project on pavements (reduction in pavement life) and increase in maintenance as per the requirements of the GARID. A Pavement Impact Assessment in accordance with the GARID needs to be undertaken in included in the updated RIA included in the SREIS.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS includes a comprehensive pavement assessment for all State-controlled roads within the SREIS Road Impact Assessment Study Area. This assessment considers the potential impact of Project traffic on the level of maintenance activity required and the pavement service life for in excess of 1,000 assessment segments.
S16	333	There has been no assessment undertaken on potential impact of project and project generated traffic on structures An assessment on the impact on structures of project generated traffic needs to be undertaken and detailed in the updated RIA.		A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.
S16	334	The rationale for projecting 2011 traffic back to 2001 and then forward to 2045 isn't clear. In the SREIS, explain why it is necessary to project existing traffic back rather than simply projecting 2011 traffic forward at the agreed growth rates.	Road Impact Assessment (Appendix K, Figure 5-4) of the SREIS	The Road Impact Assessment (Appendix K, Figure 5-4) of the SREIS resolves this item by instead considering historical traffic growth rates to estimate future traffic volumes for case study assessments. The projection of future traffic volumes are based on 2012 volumes.

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S16	335	It would be of assistance if this table also include project over-mass / over-dimension (OM/OD) vehicle movements. In the SREIS, include figures on anticipated OM/OD vehicle movements.		This item is outside the scope of the Road Impact Assessment and is best addressed during the preparation of RMP. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.
S16	336	This section and table only discuss typical traffic generation rates and traffic in the peak year (2045). The last paragraph of this section indicates traffic generation was aggregated per phase and per year. In the SREIS, present traffic generation figures by phase and year to enable TMR to determine project impacts and any required mitigation, specifically including construction peaks, not just the peak demand year of 2045.	Road Impact Assessment (Appendix K, Section 7 and Figure 8-5) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life. This includes traffic demands generated by each key facility during each Project phase as documented in the Road Impact Assessment (Appendix K, Section 7) of the SREIS. Figure 8-5 shows the year of peak impact for each link. Through this process, the maximum impact on each road link has been identified which shows that for the majority of links the construction period is the most significant.
S16	337	As has previously been advised, TMR does not consider the "Significance Assessment" methodology to be appropriate for the assessment of project-related traffic impacts on the safety, efficiency and condition of the State controlled road network. Furthermore, the magnitude of impact presented in table 21-5 is inconsistent with TMR's Guidelines for Assessment of Road impacts of Development 2006 (GARID), which regards a 5% increase in traffic as significant. The SREIS for the project must include a Road Impact Assessment prepared in accordance with the GARID.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact

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				Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies. In addition the Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS details TMR roads where Project traffic demands exceed 5% of existing traffic demands in accordance with GARID.
S16	338	The EIS fails to justify the classification of impacts presented in table 21-7 in a way that is consistent with the GARID and acceptable to TMR. TMR does not accept this table as a reasonable assessment of project impacts. Remove the sensitivity assessment methodology and include an RIA prepared in accordance with the GARID.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS presents case study assessments of potential facility locations to confirm the effectiveness of the planned management strategies and compares them against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID). In addition the Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS details TMR roads where Project traffic demands exceed 5% of existing traffic demands in accordance with GARID.
S16	339	As previously advised, TMR does not accept the significance and magnitude assessment methodology is appropriate for the identification and assessment of transport impacts. The EIS does not meet the requirements of section 4.3.2 of the Terms of Reference in that an assessment of transport impacts has not been carried out in accordance with all relevant requirements of the GARID. The SREIS for the project must include a Road Impact Assessment, prepared in accordance with the GARID.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS presents case study assessments of potential facility locations to confirm the effectiveness of the planned management strategies and compares them against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID). In addition the Road Impact Assessment (Appendix K, Figure 12.1) of the SREIS details TMR roads where Project traffic demands exceed 5% of existing traffic demands.
S16	340	Paragraph 1 mentions the treatment and storage of water and brine. It is not clear if there is any significant transport task associated with	Road Impact Assessment	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including traffic

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		the treatment, storage and disposal of water and brine. "Clarify if any transport tasks are associated with the treatment, storage and disposal of water, brine and irrigation water, and if so, estimate potential traffic, likely impacts and any appropriate mitigation strategies. These estimates can be finalised before the commencement of project-related construction traffic."	(Appendix K) of the SREIS	demands associated with the treatment and storage of water and brine during each phase of development under a treatment and transport scenario confirmed by Arrow.
S16	341	The assessment of likely project-related road safety impacts is wholly inadequate. The document simply states current crash rates, with no assessment of the increased road safety risk associated with project traffic or identification of appropriate mitigation measures. The updated RIA included in the SREIS must include a comprehensive road safety assessment of increased risk and appropriate mitigation measures.	Roads and Transport chapter (Section 21.10) and the Road Impact Assessment (Appendix R, Section 4.11) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will include consideration of road safety aspects.
S16	342	As previously advised, TMR does not accept the significance and magnitude assessment methodology is appropriate for the identification and assessment of transport impacts. The EIS does not meet the requirements of section 4.3.2 of the Terms of Reference in that an assessment of transport impacts has not been carried out in accordance with all relevant requirements of the GARID. The SREIS for the project must include a more comprehensive Road Impact Assessment prepared in accordance with the GARID.	Road Impact Assessment (Appendix R, Sections 5 and 6) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact

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				Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies.
S16	343	This section and tables only discuss typical traffic generation rates and traffic in the peak year (2045). The Main Traffic and Transport Report indicated traffic generation was aggregated per phase and per year. In the SREIS, present traffic generation figures by phase and year to enable TMR to determine project impacts and any required mitigation prior to the peak demand year of 2045.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life. This will include traffic demands generated by each key facility during each Project phase. Figure 12-1 in the Road Impact Assessment (Appendix K) of the SREIS shows those roads for which the peak Project traffic demands in any year are greater than existing traffic demands. Through this process, the maximum impact on each road link has been identified which shows that for the majority of links the construction period is the most significant.
S16	345	Tables in this chapter to include subtotals and totals of all vehicle movements associated with each project element. Annual traffic generation and project two-way traffic data should also be presented for each year and not simply the peak generating year. In the SREIS, present traffic generation figures by phase and year to enable TMR to determine project impacts and any required mitigation prior to the peak demand year of 2045.	Road Impact Assessment (Appendix R, Section 8) of the EIS	The Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life.
S16	346	Refer previous comments regarding significance assessment methodology. The SREIS for the project must include a comprehensive Road Impact Assessment prepared in accordance with the GARID.	Road Impact Assessment (Appendix R, Section 9) of the EIS Road Impact	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both

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			Assessment (Appendix K) of the SREIS	assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The Road Impact Assessment (Appendix K) of the SREIS will present case study assessments of potential facility locations to confirm the effectiveness of the planned management strategies and compare them against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID). Figure 12-1 in the Road Impact Assessment (Appendix K) of the SREIS shows those roads for which the peak Project traffic demands in any year are greater than existing traffic demands.
S16	347	The stated percentage increases on many roads exceed the 5% threshold stated in the GARID, in some cases by a very significant margin. Potential impacts have not been adequately assessed and the stated assessment of Sensitivity, Magnitude and Significance of Impacts in Table 9-4 is inconsistent with the GARID and not accepted by TMR. The SREIS for the project must include a Road Impact Assessment prepared in accordance with the GARID. Continued use of the sensitivity assessment methodology is not supported by TMR.	Road Impact Assessment (Appendix R, Section 9 and Tables 9-3 and 9-4) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix R, Table 9.4) of the EIS related to an environmental values assessment of the impacts of the Project. The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides road

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				authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management.
S16	349	The conclusions contain a number of assertions about project impacts that are based on the use of significance assessment methodology. This methodology is not consistent with the GARID and the report's conclusions are not accepted by TMR. The SREIS for the project must include a Road Impact Assessment prepared in accordance with the GARID. This assessment must include assessment of road safety, estimated access arrangements to project sites, assessment of the impacts of project traffic on pavements and structures, details of over-mass and over-dimension vehicle movements and assessment of intersection performance.	Road Impact Assessment (Appendix R, Section 13) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides road authorities greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management.
S16	350	Description of construction materials, equipment and wastes. Updated RIAs should include assessment of transport of materials, equipment and wastes to and from project sites from their origins and destinations (port of import, quarry, manufacturer etc.).	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including likely revised origins and destinations of construction materials, equipment and wastes etc.
S19	373	The proponent should give consideration to involving the Queensland Police Service in the development of a Traffic Management Plan (TMP) for the construction phase.	Roads and Transport chapter (Section 21.10) of the	Arrow will engage with all relevant stakeholders during development of the RMP. This item is best addressed as part of this process following EIS approval.

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S19	374	The proponent should give consideration to the use of bus transport for FIFO and DIDO workers to reduce the impact of vehicular movements of its workforce.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including revised FIFO and DIDO projections. Bus transport will be utilised for workforce movement to and from CGPFs during the construction, decommissioning and rehabilitation phases.
S19	375	An increase in demand for QPS wide load escorts during the construction phase will need to be managed.	Roads and Transport chapter (Section 21.8) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Arrow will engage with QPS particularly with regards to escort arrangement protocols.
S19	376	The provision of the number of oversized deliveries to the QPS once final design for the project is completed would assist the QPS in planning for capacity and resourcing. It is suggested the proponent advance dialogue with the QPS regarding permit approvals for over dimensional vehicles.	Roads and Transport chapter (Section 21.8) of the EIS	Arrow will engage with all relevant stakeholders during development of the RMP. This item is best addressed as part of this process following EIS approval once detailed Project planning is finalised. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will consider the movement of oversized loads once detailed design and operations are finalised.
S23	407	Not meaningfully addressed in EIS: No infrastructure use analysis and mapping has been provided that clearly details the modelling of effects on the local area road network	Road Impact Assessment (Appendix K)	• The impact of Project traffic on the environment and agriculture is outside the scope of the Road Impact Assessment.

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		and the impacts on the productivity agricultural industry using the lower standard roads at the point of operations and the entire transport corridor. There is a clear absence on any cumulative analysis of the transport use impacts along the existing transport corridors which already exhibits detrimental environmental and unacceptable agricultural impacts.	of the SREIS	• The Road Impact Assessment (Appendix K) of the SREIS considers the cumulative impact generated by other planned projects which have the potential to influence future traffic demands. The link level of service reflects the influence that traffic growth potentially associated with the cumulative impact of various other projects will have on the level of service afforded by the road network.
S23	421	The EIS should address the process of the adverse road transport impacts from the project construction, operation and supply chain management over the project time line including adverse weather conditions during operations in a sound and stable manner. There will be a significant impact the development will bring to the service levels of road and transport infrastructure locally. The level of infrastructure integrity and resilience is presently substantially below the level to provide any security to the proposed operation in adverse weather conditions which in turn compromises the investment integrity and the project resilience to meet production targets. Furthermore the infrastructure proposed will be totally lost periodically and the EIS fails to address the rapid reinstatement of infrastructure in sub optimal conditions in a remote location which has a serious deficiency in infrastructure natural raw materials (road making materials).	Roads and Transport chapter (Section 21) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will consider management of traffic to minimise impacts following adverse weather events.
S23	425	The EIS should identify the alternatives and implement modified fuel transport arrangements for the hydrocarbon fuels to be used in the project. Cumulative impacts of fuel transport and storage are not being adequately managed on a regional basis. The treatment of the project strategy in isolation on this element delivers a substantial weakness to the long term resilient operation of the project during challenging weather conditions flawing the investment strategy.	Preliminary Hazard and Risk chapter (Section 27) of the EIS	This item is outside the scope of the Road Impact Assessment and is best addressed during detailed planning undertaken post-EIS approval.
S23	426	The EIS should clearly identify any transport reallocation on rural roads on or adjacent to the project sites. The existing EIS project	Road Impact Assessment	The Road Impact Assessment (Appendix K) of the SREIS addresses this item by providing annualised Project traffic

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		traffic assessment clearly promotes the non-state road network (Local Roads) as the preferred transport corridor for all the supplies to the sited. Cumulative impacts from alternative travel to work journey paths needs to be considered five the maintenance hierarchy and suitability of additional use capacity of the surrounding rural roads infrastructure.	(Appendix K) of the SREIS	forecasts on all impacted roads during each year of the Project life however alternative routes will not be assessed as this is best undertaken during detailed design. It is noted that the modelling assumes preferential use of State-controlled roads where possible, rather than lower order roads.
S23	441	The following points represent significant concerns in the Infrastructure area of the project: • Levels of road flood immunity for the arterial and local roads • Provide a detailed road hierarchy maintenance program for affected infrastructure across the development area. • The overall design of the temporary accommodation camp localities to be discussed with Council prior to finalising the plan of development (water, sewerage and road). • Due to the intensity of the development Council seeks full grade separation in all instances of pipeline and existing transport conflicts.	Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	This item is outside the scope of the Road Impact Assessment. Flood immunity would however be considered when ultimately undertaking fitness-for-use assessments to inform the preparation of RMPs. The management strategies approach provides a high level of certainty in relation to the likely form of any access works for accommodation camps. Details in relation to grade separation of pipelines and roads is outside the scope of the Road Impact Assessment.
S23	448	<u>Strategic Planning:</u> All proposed access roads should be adequately secured and managed in consultation with land owners and provide appropriate access for existing agriculture uses and ensure that the cattle can still use the land on either side and access water.	Roads and Transport chapter (Section 21) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will consider management of traffic to minimise impacts following adverse weather events.
S23	475	<u>Socio-economic and cumulative:</u> Which airports will be used during construction and operation? And how will these impact the condition of essential connecting transport corridors?	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including revised FIFO and DIDO projections and identifies associated demands along transport corridors.

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S23	513	Natural Resource and Stock Route Impacts: The EIS fails to clearly identify which access roads will occur - State, local government, private, stock routes and company roads?	Roads and Transport chapter (Section 21.5) of the EIS	The identification of the specific roads that will ultimately be selected to service the Project is outside the Road Impact Assessment. This item would ultimately be addressed when undertaking fitness-for-use assessments post EIS approval. The road register in the RMP will identify all routes agreed to be fit-for-use.
S23	514	Natural Resource and Stock Route Impacts: Compensation to local government and landholders for road use?	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies the ultimate likely requirement for Arrow to enter into Infrastructure Agreements with road authorities in relation to various impacts. The Infrastructure Agreements will establish the mechanism by which road authorities are "compensated" for impacts including for example any significant increased maintenance requirements.
S23	515	Natural Resource and Stock Route Impacts: Who decides where access roads will be constructed - will Arrow give private land holders input? Will they allow private landholders to use the roads?	Roads and Transport chapter (Section 21) of the EIS	This item is outside the scope of the Road Impact Assessment and will be addressed in the detailed design and planning stage of the Project. The relevant landholder(s) will be engaged as required at this time.
S23	525	What is the Arrow Energy strategy for goods/freight delivery to site including disaster management of fuel and dangerous goods?	Road Impact Assessment (Appendix K, Section 7) of the SREIS	As noted in the Road Impact Assessment (Appendix K, Section 7) of the SREIS, it is anticipated that the majority of delivery types will be co-ordinated from a marshalling yard location in Mackay with materials transport from this location to each Project site. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will include consideration of the transportation of

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				hazardous and dangerous goods including fuel.
S23	543	How will Arrow Energy manage and maintain road infrastructure within the region serving this project? Including scenarios of potential cumulative changes to workforce structure as a remerging mining sector growth.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS details the management strategies planned to be utilised to manage, and where appropriate, mitigate any significant Project impacts to road infrastructure. The Road Impact Assessment (Appendix K) of the SREIS includes consideration of the cumulative impact generated by other planned projects which have the potential to influence future traffic demands. The link level of service reflects the influence that traffic growth potentially associated with the cumulative impact of various other projects will have on the level of service afforded by the road network. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.
S23	555	Will the existing configuration of the roads be able to accommodate the demand? Please provide a proposed road hierarchy plan for upgrading road infrastructure to meet proposed demand standards.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS details the management strategies planned to be utilised to accommodate Project traffic demands. Identification of specific works will however not occur until preparation of Infrastructure Agreements post EIS approval. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.

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S24	565	Firstly, the provision of industrial land and services that support the expanding resources sector is not addressed in either the Landuse and Tenure chapter or the Land use and Tenure Technical Report of the EIS. Notably the EIS addresses most of the areas of Council's interests listed above in detail but with limited certainty on significant details, such as the sourcing and transport movements of workers as well as the transportation of materials and equipment from Mackay. For example, if greater than 0% of the construction workforce and/or greater than 10% of the operational workforce are sourced from the local and regional area, creating a disparity in the assumptions of the primary workforce scenario, the effect of the Project on housing, traffic and community services in the region may no longer be accurately described as 'negligible'. As the sourcing and transportation movements of the construction and operational workforce for the Project is further developed, the social and traffic impacts should be reassessed. Council supports the monitoring of the number of workers moving into the local and regional area and the formulation of a housing strategy for implementation and monitoring within the evolving Social Impact Management Plan (SIMP).	Roads and Transport chapter (Section 21.10) and Social Impact Assessment (Section 24.3.5) of the EIS Road Impact Assessment (Appendix K) of the SREIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Similarly, "the SIMP is a live document, which can be updated and adjusted as the environment and Project change and impacts become apparent. As a result, the SIMP will be used to manage residual impacts into the future." Refer to the Social Impact Assessment chapter (Section 24.3.5) of the EIS. The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including revised workforce projections if appropriate. Consideration of land tenure is outside the scope of the Road Impact Assessment.
S24	566	Additionally, the EIS states the assumption that 50% of the materials and equipment for the Project will be transported from Mackay, including any materials and equipment from the port at Townsville would travel via Mackay. Yet, the EIS also states that the Project's traffic impacts, as well as cumulative impacts relative to 2045 future background traffic, are 'negligible' on most sections of road, including the Peak Downs Highway from Mackay to Nebo. Council suggests the review of the Project's likely impacts on regional infrastructure, especially in regard to increased road transport.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS models the latest project description including revised material requirements and logistics strategy. Further, the Road Impact Assessment (Appendix K) of the SREIS provides annualised Project traffic forecast for all impacted roads during each year of the Project life to address this item.
S26	575	Further, it is recommended that supplementary assessment of the impacts to the existing rail network as part of the EIS is warranted.		This item is outside the scope of the Road Impact Assessment as it relates to non-road based transport

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		Impact assessment and mitigation measures associated with the rail infrastructure has not received the same, detailed level of analysis afforded to agricultural, mining and other land uses and associated development. It is also suggested that any assessment of the upstream impacts to the existing rail network as a result of this project should be included in the EIS.		impacts.
S33	624	Further information is required so that Vale can determine which roads are expected to experience peak traffic flows. Specifically, what volume of traffic is expected through the construction phase?	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS addresses this item by providing annualised Project traffic forecasts on all impacted roads during each year of the Project life.
S39	712	The economic impacts on other road users from delays caused by Wide Loads, which is highly significant, e.g. Peak Downs Highway [PDH] currently 11,000 vehicles per day,[Eton Range] 20% Heavy Vehicles, with estimated growth rate 5% p.a. are adding on average of one hour per trip to allow for wide and over-dimensional loads. Coupled with the cumulative impacts by Arrow Pipeline Project, ongoing Bowen Basin developments and Galilee Basin developments, wide load movements are forecast to nearly double by 2016. These delay costs are enormous, currently up to 11,000 hours per day for drivers plus commercial vehicle costs, Eton Range has approx. 900 coaches traversing per month, these loaded coaches also have frequent stops for wide loads, also leaving early to allow for delays, this is a major social impact also. These huge costs apply to the non mining sector, cattle, grain, local and state government employees, health, education, rail and service industries. Wide loads are causing industries to be non competitive locally and internationally, if the decision from a review is 10 metre plus wide loads are acceptable, then massive road infrastructure improvements are needed urgently and funding made available for these.	Roads and Transport chapter (Section 21.10) and Road Impact Assessment (Appendix R) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will consider management of traffic to minimise impacts following adverse weather events. Arrow will engage with relevant stakeholders in relation to over-dimension and over-mass vehicle movements during development of the RMP. This item is best addressed during detailed planning undertaken post EIS approval.

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		Ref: State Coroner Michael Barnes inquest into wide load escort fatalities, 15.03.13 and recommendations. Attachment [A] Economic costs must be calculated from serious road crash injuries and fatalities, noting a minimum of 10, up to 14 serious injuries per fatality. Qld Fatality cost $2.7M [QPS] Serious head injury up to $8M [33900 Collaboration] Serious spinal injury up to $6.5M [33900 Collaboration] "		
S39	713	Considering the economic impacts from cumulative impacts above, one would expect road safety issues from cumulative impacts from multiple developments in the Bowen and Galilee Basin. The delays described above, cause severe fatigue issues on a road that already has double the state average of fatigue related crashes as a causal factor, Ref: DTMR Crash overview 2007-2012 [see attached doc, page four Isaac] [G] With reference to 31.1.3 Assessment method: There is no specific mention of road and transport, the RIA must have all the economic costs clearly transparent to other road users and industries and be shown with economic impacts. Consultation with RAAG and TMR using the RAAG Rest Area and Stopping Places Master Plan, which recognises locations for rest areas, and contribution to this project as mitigation for fatigued drivers Ref: RASP Master plan attached {H]	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements.
S39	714	The expected life of this project,[40 years] including pipeline, combined with the long life projects in the Galilee Basin will have a large long term cumulative effect on an already stressed Peak Downs Highway, and associated arterial roads, Fitzroy and Suttor Development roads, causing high risk to residents of Mackay travelling to the hinterland, all residents in the Bowen Basin travelling	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements.

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		for social or work needs, tourism traffic being encouraged with the Qld Tourism Drive Strategy, and Mining trail tourism promoted by Mackay and Isaac Regional Councils. We recommend a new RIA report be compiled using transport and logistics experts for example: ARRB, TMR, NHVR, QTLC.SCOTI		
S39	715	No mention of Heavy Vehicle Fatigue Management legislation, how organisations and drivers can comply with this and "Chain of Responsibility" with the cumulative impacts of the Arrow Bowen Gas Project, Arrow Pipeline Project, Bowen Basin expansion and the massive impacts from the Galilee Basin developments Recognition of Heavy Vehicle fatigue legislation, COR, and how Arrow Energy, and contractors will comply.	Cumulative Impacts chapter (Section 31.1) and Road Impact Assessment (Appendix R, Section 10.2) of the EIS	A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues, including safe driver behaviour and fatigue management protocols.
S39	716	It is well recognised in the mining industry, the greatest danger and risk of injury or fatality is in the uncontrolled environment being travel time on the road travelling to or from site or between sites. Based on this, and all of the above a cumulative assessment is strongly recommended	Cumulative Impacts chapter (Section 31.3) of the EIS	The SREIS Road Impact Assessment identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will also be prepared to manage and mitigate the risks and impacts of any transport related issues, including safe driver behaviour and fatigue management protocols.
S39	717	It should be clearly stated the roster/fatigue guidelines for this project will work under, and enforcement of these guidelines with contractors and service companies. An example is road pilots, commonly work up to 24 hours returning to base for the next trip, as they do not get reimbursed for the return trip, often paid mileage only outbound. This also applies to parcel delivery, light vehicles used in the freight industry, fatigued drivers are high risk to other road users.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues, including safe

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		Coroner Barnes inquest also shows how easily delays can cause fatigue with QPS escorts also. Solution: legislation, or at least, Arrow Energy require road pilots and all freight delivery drivers to comply with HV Fatigue regulations.		driver behaviour and fatigue management protocols.
S39	718	Projects Relevant to the Study Area Several Galilee Basin projects have been approved, several have current EIS These enormous projects will have large cumulative impacts on Bowen Basin Road Infrastructure. An example: Fuel for the Bowen Basin travelling through Walkerston, along the Peak Downs Highway was over 1.25Billion litres per annum in 2012, with expected growth [and capacity in Mackay] with Galilee Basin on stream by 2016 to be in excess of 2 Billion litres p.a. A significant amount will travel via the Fitzroy and Suttor Development roads. The high traffic growth increase on the PDH will be high risk cargo, with high risk of significant environmental damage in the event of a major incident Major rail projects construction generate a huge amount of road traffic, this was most noticeable on the Bowen Development Road during construction of the “Missing Link”, many associated problems caused by “illegal” dangerous access points by contractors for delivery of goods, water trucks, crane access. TMR had considerable problems policing these dangerous access points. <u>Cumulative impact assessment must include:</u> Projects relevant to the study area must include Galilee Basin projects, and the associated rail projects. The cumulative impact assessment must take on board the	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. The management strategies will identify typical requirements for access to all common facilities associated with the Project. The identification of the specific roads that will ultimately be selected to service the Project is outside the scope of the Road Impact Assessment but this item would ultimately be addressed when undertaking fitness-for-use assessments post EIS approval. The road register in the RMP will identify all routes agreed to be fit-for-use. The Road Impact Assessment (Appendix K) of the SREIS includes consideration of the cumulative impact generated by other planned projects which have the potential to influence future traffic demands. The link level of service reflects the influence that traffic growth potentially associated with the cumulative impact of various other projects will have on the level of service afforded by the road network.

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		AusRAP/RACQ star rating of the Peak Downs Highway, Being 1/2/3 star.		
S39	719	Potential Non-Project Impacts No mention in the list of projects, of major rail line projects associated with the Galilee Basin, particularly new lines to Dudgeon Point Port of 180Million tonnes p.a., and rail upgrades to Hay Point from 60-160 M.T. PA These rail projects will have major impacts on road infrastructure, particularly large earthworks for overpasses and underpasses, also pipeline infrastructure for Arrow Pipeline project. The cumulative impacts of the projects listed, must be expanded to include Galilee Basin impacts on the Bowen Basin, and appropriate assessment undertaken	Cumulative Impacts chapter (Section 31.6.2) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS includes consideration of the cumulative impact generated by other planned projects which have the potential to influence future traffic demands. The link level of service reflects the influence that traffic growth potentially associated with the cumulative impact of various other projects will have on the level of service afforded by the road network.
S39	720	“Potential impacts of the project are anticipated to be minor” This statement is a gross misleading understatement. Considering the current massive impacts on road users listed above with delays from wide loads, and the cumulative impact with thousands of loads of pipes and massive movements of drill trucks and crews for this project, often on narrow rural back roads, severely impacted by any rain with no recognition of this is erroneous. A separate unbiased report by an independent body such as ARRB needs to be undertaken including economic, road safety and social impacts	Cumulative Impacts chapter (Section 31) of the EIS Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS	The Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS details TMR roads where it is likely that Project traffic demands will exceed the typical GARID threshold of "significant" impact. The Road Impact Assessment (Appendix K) of the SREIS identifies that there will be significant impacts associated with Project traffic but that these impacts can be effectively managed through the application of the planned management strategies.
S39	721	"Cumulative impacts for communities are inherently difficult to identify or assess because they are based on assumptions of assessments made by other projects which may be difficult or impossible to ascertain” This statement is erroneous in that information is not available or incorrect, e.g.	Cumulative Impacts chapter (Section 31.4.10.3) of the EIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. The management strategies will identify that for low volume and low standard roads Arrow will enter into a "make good" agreement with road

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		Ref 23.6.1 to 23.8 in economic impacts no mention is made on impacts on other road users No mention serious risk of damage to rural roads by drill trucks, delivery of pipes, and subsequent mitigation costs and economic costs to landholders, agricultural interests with their operations if roads are closed from poor management or just unexpected weather events. A recent example: in June/July 2012 drill trucks destroyed roads west of Belyando crossing, by driving on them after recent rain, significant cost to reinstate, cattle trucks could not traverse these roads for months after. A separate unbiased report must be produced with input from Rural Councils, livestock haulage, grain haulage, ARRB or similar as to the economic impacts to rural industry from use of these roads, this will include for example where pipelines are being placed across roads, causing delays to all motorists. The RUMP must consider impacts on the users of rural roads, the likely very high costs of mitigation if Arrow Energy contractors use the roads after rain, how those impacted will be reimbursed.	Road Impact Assessment (Appendix K) of the SREIS	authorities to address impacts.
S39	722	Health and Emergency Services Increased likelihood of traffic accidents and road safety issues along Peak Downs Highway. This statement, while recognising impacts on all road users, is not recognising with the high number of drill trucks, pipe delivery trucks on narrow rural access roads, and arterial development roads, a significantly higher risk of road crash trauma will apply to these roads, recognition must be made of huge costs to the community of road crash injuries, up to $8Million for a serious head injury. No recognition in this statement who will pay for the extra emergency staff to service the extra workload imposed?	Cumulative Impacts chapter (Section 31.5) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements.

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		We suggest an extra section needs to be added into, Roads and Transport. This section to recognise significant impacts on other road users due to cumulative effects of Bowen and Galilee Basin coal and rail projects plus Arrow CSG projects." In addition to the RIA RAAG has produced a Decade of Action plan for the Peak Downs Highway, this can be used as a starting point for a full report that must be produced recognising the full risk to the community on the Peak Downs Highway, Arterial Development roads and rural feeder roads that will be extensively impacted by traffic generated by this project, all emergency services must be involved in the report. Attach [E] As an example, Nebo relies heavily on an already overstretched SES volunteers to attend and manage road crashes, how will Arrow Energy help staff this volunteer group, with increased workload as already recognised."		
S39	723	The last paragraph of this section has no merit, this statement is not recognising the reality nearly all projects planned in the Galilee Basin, and associated rail projects are advancing at a rapid rate, with all these projects having very high cumulative impact in 2015/6 on the Bowen Basin There is ample evidence of all these projects coinciding in 2015/6 with serious cumulative impacts. The Cumulative Impacts section needs to be rewritten taking into account economic, road safety and social costs caused by impacts to other road users, the mitigation costs of repairs to rural roads must be recognised due to the cumulative effects of Arrow Bowen Pipeline and Arrow Bowen Gas Project	Cumulative Impacts chapter (Section 31.6) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS does not include specific detailed consideration of the impacts associated with the cumulative impact of specific projects but will instead detail likely growth rate ranges. More refined consideration has been undertaken for each of the case study locations. The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements.
S39	727	Several Heavy Vehicle Rest Areas shown do not exist, they are either HV Stopping places, TMR Scaly pads, or Road train breakdown pads.	Roads and Transport	An updated figure has been prepared and presented in the Road Impact Assessment (Appendix K) of the SREIS. The

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		TMR Scaly pads are not suitable for rest, immediately adjacent to highway headlights and road noise. Road train break down pads are workplaces, and not suitable for rest due to headlights, road noise and truck engines. One HV rest area at Nebo is not shown. Several HV Stopping places shown do not exist on the Fitzroy development road, removed during road works in 2011 Motorist rest areas are inaccurate in positioning. Note: No motorist rest or HV areas Bowen Development Road, one only motorist rest area Gregory Development Road Note: No HV Rest areas Fitzroy or Suttor Development Roads. For compliance with Heavy Vehicle Fatigue Management legislation, where do HV stop for proper rest? Statistics for crash causal factors in the Bowen Basin show the Peak Downs Highway is double the state average, the Fitzroy is triple the state average, Arrow Energy staff will be at high risk from other motorists driving fatigued on these roads. 1. A site inspection was also undertaken to confirm the condition of existing road infrastructure 9. The potential cumulative impacts were evaluated, taking into account of other major projects in the area" • An accurate figure [map] needs to be created, which RAAG can assist with. Attachment [H] • The EIS needs to show how compliance will take place with Heavy Vehicle Fatigue legislation and Chain of Responsibility, taking into account drastic lack of HV Rest Areas. • The EIS needs to address travel management plans including rest breaks, taking into account drastic lack of Motorist rest areas, special note the Fitzroy Development Road	chapter (Section 21) and Figure 21-5) and Road Impact Assessment (Appendix R, Section 10.2) of the EIS Road Impact Assessment (Appendix K, Figure 5-6 and 5-11) of the SREIS	Road Impact Assessment (Appendix K) of the SREIS summarises the latest publicly available road condition data including crash rates (Figure 5-6) and motorist stopping areas (Figure 5-11). A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues, including safe driver behaviour and fatigue management protocols.

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		• We suggest consultation and reinspection take place to enable an accurate map be created and included in the EIS • We suggest this evaluation did not take into account cumulative impacts as close as 2015/6."		
S39	728	This report does not take into account current problems, delays, road safety issues caused by wide and over-dimensional loads. Example, if the Peak Downs Highway is suitable for current use, why then are TMR spending $millions on design, geo surveys for planning study for re-alignment of the Eton Range. AusRAP rated 1 star Attachment [D] The recent AusRAP study paints a very poor picture of the Peak Downs Highway The 33900 Decade of Action Plan shows numerous shortcomings of the Peak Downs Highway Attachment [E] Table 23 does not show current serious shortcomings of these roads, and worse with anticipated traffic growth It is very easy to generalise the Peak Downs Highway, percentage of HV is much higher from Nebo to Moranbah with no passing lanes, Mackay to Nebo, very high traffic volumes at change of shifts, the anticipated growth on Clermont to Moranbah section could double in two years with Galilee Basin Developments New tables need to be drawn with much more accurate picture of growth volumes of AADT, thus giving a more accurate road safety risk picture.	Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements.
S39	729	2011 AADT traffic volumes used as a base, and only using committed development projects grossly underestimates cumulative HV traffic growth that will be generated from cumulative Galilee Basin, CSG, Bowen Basin expansion developments likely to be approved and commence in 2013/4 on the Peak Downs Highway	Roads and Transport chapter (Section 21, Table 21-9)	The Road Impact Assessment (Appendix K) of the SREIS does not include specific detailed consideration of the impacts associated with the cumulative impact of specific Projects but will instead detail likely growth rate ranges. More refined consideration has been undertaken for each

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		An independent RIA be commenced taking into account all expected development approvals.	of the EIS Road Impact Assessment (Appendix K) of the SREIS	of the case study locations.
S39	730	"With the addition of cumulative development traffic all roads would continue to operate at LOS A, which indicates that free flow conditions will occur". Most drivers on the Peak Downs Highway would strongly contest this statement, the road does not have free flow conditions now. Most companies add one hour to travel time Mackay-Moranbah of say four years ago, mostly due to wide/over-dimensional loads, or just slow moving road trains hauling coal or gravel, the Red Hill is notorious for road trains travelling west to be down to 40kms per hour or less for several kilometres. No passing lanes for 160 kilometres Nebo to Clermont, with over 20% HV AADT Doubles or Type 2 road trains may be free flowing, but at what speed? Attachment [C,D]"Recognition must be made of the shortcomings of the Peak Downs Highway, to be compounded by cumulative impacts	Road Impact Assessment (Appendix R, Section 4.3.1, Section 9.1 and Section 12.2) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.
S39	731	No mention of vehicle standards required from manufacturers of light vehicles, which can have significantly different outcomes in the event of crash All light vehicles including 4wd's be ANCAP 5 star rated, this includes all contractors	Health and Safety chapter (Section 30, Table 30-2) of the EIS	Arrow currently ensure that all Project-related light vehicles (including 4WD) will be ANCAP 5 star rated.
S39	732	No mention of Daytime Running Lights [DRL's] or as commonly done in Australia, auto low beam when engine running, this will improve safety at all times but significantly so on dirt roads. All vehicles, including trucks have auto low beam lights on when	Health and Safety chapter (Section 30,	Arrow's Journey Management and Driver Safety Procedure (99-H-PR-0043) stipulates that all personnel must ensure that head lights are on at all times while driving.

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		engine running from new.	Table 30-2) of the EIS	
S39	733	Many 4wd vehicles are not supplied with tyres that are suitable for gravel/dirt roads in the Bowen Basin. Suggest an appropriate specialist, specify appropriate tyres to be supplied from new with any light vehicle to be used on gravel/dirt roads	Health and Safety chapter (Section 30, Table 30-2) of the EIS	All Project 4WD vehicles will be equipped with tyres appropriate to gravel / dirt. Where hire vehicles are used (such as for contractors), Arrow will ensure that these are mine-spec.
S39	734	If, employees or contractors will be using light vehicles for towing trailers, lighting platforms etc. particularly on gravel roads, high risk attached this activity for the driver and other road users. Employees and contractors towing trailers must complete a nationally accredited towing course.	Health and Safety chapter (Section 30, Table 30-2) of the EIS	Where employees and contractors are required to tow trailers, they will complete a nationally accredited towing course, if required.
S39	735	" All identified cumulative impacts remained negligible, except for the impact on the Suttor Development Road between Elphinstone and Red Hill Road which remained low" The statement "all of the roads assessed would operate at LOS A [free flow conditions] with predicted 2045 background traffic flows". As mentioned in several sections above, the cumulative economic impacts on other road users, by being delayed by thousands of "wide and over-dimensional loads" for freight of pipes, and oversize drilling equipment cannot be ignored and down played. The Peak Downs Highway has double the state average fatigue related crashes, the Suttor Development Road has triple the state average of fatigue related crashes, delays will only compound this problem, extenuated by lack of passing lanes, near zero HV stopping places for wide loads to pass. The Peak Downs Highway is not currently free flow, is getting worse by the week, thousands of motorists are adding 33% to travel times to	Environmental Framework chapter (Section 7.3) of the EIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.

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		allow for wide loads, will be much worse the next three years with forecast wide load movements, this is a serious economic cost to thousands of motorists daily. The risk to other Heavy Vehicle traffic from the cumulative effects of multiple projects must be recognised and mitigation of these managed.." "A report must be generated showing the true cost to the community and economy from wide load delays, included, must be impacts adding to fatigued drivers, and the cost of fatigue related crashes on Bowen Basin arterial roads. The cumulative impacts on road safety must be seriously addressed, the increased economic and social impacts from road crashes is immense. Delays such as the recent wide load truck tray that “fell off” blocking the Peak Downs highway for over 8 hours, the recent collision with a wide load and cattle truck, again blocking the highway are cumulative impacts causing economic cost, ref 6.16 Economics. An independent report must be generated."		
S39	736	“Limit project traffic on school bus routes….” We ask the question, why are the 900 coaches carrying miners per month on the Peak Downs Highway not recognised, they also pull over to pick up and drop off, e.g. At Eton, numerous coaches stop each day, with no designated, safe, signed Bus Stop, Is this discrimination….. These coaches will be carrying Arrow Energy staff, no recognition of traffic management for coaches, they will also be delayed by wide loads. RAAG has received written concerns from mine coach drivers being forced off the road in unsafe places by wide load escorts, is this acceptable?	Impact Assessment Method chapter (Section 6.14) and Roads and Transport chapter (Section 21.8, Table 21-4, 21.9 and 21.10)	Project-related coach movements are included as ‘Bus Trips’ in the traffic generation estimation (refer to the Road Impact Assessment (Appendix K, Section 7) of the SREIS). Consequently, coach trips related to this Project are included in the roads and transport impact assessment, and impact management and mitigation measures. The Road Impact Assessment (Appendix K) of the SREIS considers the significance of Project impacts which includes proportionate impacts on State-controlled roads. These calculations include traffic associated with all vehicle classes and users including the bus services identified. A RMP will be prepared in accordance with TMR’s

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		Questions need to be asked regarding fatigue management of coach drivers, RAAG is aware of several very near misses, including a coach driver that went to sleep at the top of the Eton Range, saved only by a passenger who shook him awake." We ask if the safety of all travellers on coaches be considered, especially considering the AusRAP assessment of the Peak Downs highway. Are the coach stopping places safe, for pedestrians, and other traffic, are coach stops adequately signed and lighted, must be noted a high percentage of mine coaches pick up and drop off at night, many employees are female Have adequate risk assessments been completed for employees travelling by coach. What fatigue management guidelines are coach drivers to work to?	of the EIS Road Impact Assessment (Appendix K, Section 7) of the SREIS	guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	759 803 847 891 935 979 1023 1067 1111 1155 1199 1243 1287	<u>Transport and Road use:</u> Arrow has not adequately recognised or addressed the impact of heavy traffic haulage over the Project Road Network, disrupting the landholder'scattle grazing operations. This is especially the case when it is considered that 90.2% of the Project area is classified as being grazing land.	Road Impact Assessment (Appendix R, Section 6.1), Roads and Transport chapter (Section 21.9.1 and 21.11) and Draft Environmental Management Plan (Appendix Z, Section	Arrow recognises the impact of Project-related traffic on adjacent land uses (such as cattle grazing) as 'amenity'. Refer to the Road Impact Assessment (Appendix R, Section 6.1) of the EIS. The sensitivity of road network amenity before and after the implementation of impact management measures is discussed in the Roads and Transport chapter (Section 21.9.1 and 21.11 respectively) of the EIS. Further, Arrow commits to "routinely monitor integrity and amenity on Project-related roads [B588]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS. The Road Impact Assessment (Appendix K) of the SREIS addresses this item by providing annualised Project traffic forecasts on all impacted roads during each year of the Project life. In addition the Road Impact Assessment

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			Z.4.15.of the EIS Road Impact Assessment (Appendix K) of the SREIS	(Appendix K, Figure 12-1) of the SREIS details TMR roads where Project traffic demands exceed 5% of existing traffic demands. During the preparation of future RMPs, consideration will be given to all roads and intersections where Project traffic demands trigger the 5% threshold.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	760 804 848 892 936 980 1024 1068 1112 1156 1200 1244 1288	Transport and Road use: The Project will generate increased numbers of heavy haulage traffic on the local and State Controlled Road Network. It is questionable for example if the Peak Downs Highway will have sufficient capacity to cater for the Project generated traffic given many sections of the Technical Report under reference relevantly concludes on Page 9 the Highway is '*generally in poor-good condition with unsealed shoulders and visible patching and rutting on the road surface*'.	Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Further, Arrow commits to "routinely monitor integrity and amenity on Project-related roads [B588]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.
S40 S41 S42 S43 S44 S45 S46 S47	761 805 849 893 937 981 1025 1069	<u>Transport and Road use:</u> A number of local roads, e.g. Annandale Road are currently near capacity with vehicular traffic from current Arrow Energy exploration employees, Queensland Rail employees and mine vehicles from nearby camps.	Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS	The Road Impact Assessment (Appendix K) of the SREIS addresses this item by providing annualised Project traffic forecasts on all impacted roads during each year of the Project life. In addition the Road Impact Assessment (Appendix K, Figure 12-1) of the SREIS details TMR roads where the peak Project traffic demands on each link exceed 5% of existing traffic demands. The Road Impact Assessment (Appendix K) of the SREIS

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S48 S49 S50 S51 S52	1113 1157 1201 1245 1289		Road Impact Assessment (Appendix K) of the SREIS	identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Further, Arrow commits to: "Routinely monitor integrity and amenity on Project-related roads [B588]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	762 806 850 894 938 982 1026 1070 1114 1158 1202 1246 1290	<u>Transport and Road use:</u> A number of local roads are dirt and due to dust have poor visibility when traffic is encountered.	Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS identifies best practice management strategies to manage and where appropriate mitigate any significant impacts associated with Project traffic in line with relevant legislative requirements. The management strategies identify that for low volume and low standard roads Arrow will enter into a "make good" agreement with road authorities to address impacts. These agreements will assist to maintain roads in good condition. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Further, Arrow commits to "maintain the integrity of private roads and tracks and minimise dust generation, where

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				appropriate, in consultation with relevant landowners and council [B581]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	763 807 851 895 939 983 1027 1071 1115 1159 1203 1247 1291	<u>Transport and Road use:</u> Currently it is necessary for residents to pull over into drains to allow trucks to pass. The width of some local roads, e.g. Annandale/Daunia Road is not safe and residents using the road are suffering vehicular damage due to passing heavy vehicles. Incidents of damage to resident's vehicles will increase should the Project be approved. This is hazardous to the safety of all road users.	Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS Road Impact Assessment (Appendix K) of the SREIS	Assessment of specific impacts on particular roads as identified is outside the scope of the Road Impact Assessment (Appendix K) of the SREIS. Seal width will be considered when ultimately undertaking fitness for use assessments to ensure that roads utilised by Project traffic are to a suitable standard. Existing seal widths for State-controlled roads are shown on Figure 5-7 of the Road Impact Assessment (Appendix K) of the SREIS. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Further, Arrow has committed to "assess and identify the need to upgrade unsealed roads or widen sealed roads where Project activities and traffic will create road safety issues. Such works will be done in consultation with the relevant council (if a local government road) or TMR (if a state road) [B572]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.
S40 S41 S42 S43	764 808 852 896	<u>Transport and Road use:</u> Many local roads have cattle grids in place along the roads, which are not capable of sustaining consistent usage of heavy haulage trucking.	Draft Environmental Management Plan	Assessment of specific impacts on particular roads as identified is outside the scope of the Road Impact Assessment (Appendix K) of the SREIS. Seal width will be considered when ultimately undertaking fitness for use assessments to ensure that roads utilised by Project traffic

Submission Number	Issue Number	Submission / Issue	Reference	Response
S44 S45 S46 S47 S48 S49 S50 S51 S52	940 984 1028 1072 1116 1160 1204 1248 1292		(Appendix Z, Section Z.4.15.3) of the EIS Road Impact Assessment (Appendix K) of the SREIS	are to a suitable standard. Existing seal widths for State-controlled roads are shown on Figure 5-7 of the Road Impact Assessment (Appendix K) of the SREIS. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. Further, Arrow has committed to "assess and identify the need to upgrade unsealed roads or widen sealed roads where Project activities and traffic will create road safety issues. Such works will be done in consultation with the relevant council (if a local government road) or TMR (if a state road) [B572]." Refer to the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51	765 809 853 897 941 985 1029 1073 1117 1161 1205 1249	Transport and Road use: Road Networks do not have capacity to accommodate additional traffic generated by the Proposed Development. The scale and design of the proposed development is not compatible with the surrounding road network.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides greater certainty that the impact of the Project can be effectively

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S52	1293			managed through the application of typical approval conditions and the implementation of the planned management strategies.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	766 810 854 898 942 986 1030 1074 1118 1162 1206 1250 1294	<u>Transport and Road use:</u> The Projects generated truck movements would endanger residents, be detrimental to their livelihood and wellbeing, would devalue their properties and would not be suitable for existing infrastructure.	Roads and Transport chapter (Section 21.10) and Road Impact Assessment (Appendix R) of the EIS	A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues. The RMP will evolve as detailed design and operation details are finalised.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50	767 811 855 899 943 987 1031 1075 1119 1163 1207	<u>Transport and Road use:</u> In addition, there is a proportionately high increased and unacceptable risk of collision between cattle and truck movements which has not been accounted for in the transport impacts.	Roads and Transport chapter (Section 21.10) and Road Impact Assessment (Appendix R) of the EIS	A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues. The RMP will evolve as detailed design and operation details are finalised. Identification of all unfenced roads is outside the scope of the Road Impact Assessment. Road fencing and presence of cattle along roads (stock routes) will be considered when ultimately undertaking fitness for use assessments to ensure that roads utilised by Project traffic are appropriate.

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S51 S52	1251 1295			
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	768 812 856 900 944 988 1032 1076 1120 1164 1208 1252 1296	<u>Transport and Road use:</u> Further, the proposed development does not consider and adequately address both primary and secondary students' use of the local roads.	Road Impact Assessment (Appendix K, Figure 5-13) of the SREIS	The presence of school bus routes is shown in the Road Impact Assessment (Appendix K, Figure 5-13) of the SREIS and will be considered when ultimately undertaking fitness-for-use assessments to ensure that roads utilised by Project traffic are appropriate.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50	769 813 857 901 945 989 1033 1077 1121 1165 1209	<u>Transport and Road use:</u> The EIS further does not adequately detail mitigation measures of the stock route network in terms of stock interactions with heavy vehicle use.	Road Impact Assessment (Appendix K, Figure 5-14) of the SREIS	The presence of stock routes is shown Road Impact Assessment (Appendix K, Figure 5-14) of the SREIS and will be considered when ultimately undertaking fitness for use assessments to ensure that roads utilised by Project traffic are appropriate. A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S51 S52	1253 1297			
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	770 814 858 902 946 990 1034 1078 1122 1166 1210 1254 1298	<u>Transport and Road use:</u> Traffic movements do not take into account restrictions on vehicle movements during the wet season.	Road Impact Assessment (Appendix R, Section 10.2) of the EIS	A RMP will be prepared in accordance with TMR's guidelines to manage and mitigate the risks and impacts of any transport related issues. The RMP will be based on detailed fitness-for-use assessments undertaken post-EIS approval. The RMP will evolve as detailed design and operation details are finalised. The RMP will consider management of traffic to minimise impacts following adverse weather events.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50	771 815 860 903 947 991 1035 1079 1123 1167 1211	<u>Transport and Road use:</u> Arrow's proposed RUMP to manage and mitigate the above risk is so qualified as to be almost meaningless, relevantly at page 69 the reader is provided with the following assurances by Arrow: "It is recognised that at this strategic level, specific mitigation works cannot be identified. During the detailed Project planning phase, consultation will be undertaken with Councils, TMR and Queensland rail to identify works at specific locations.	Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.	It is not understood how the following commitment can be interpreted as meaningless: "during the detailed Project planning phase, consultation will be undertaken with Councils, TMR and Queensland rail to identify works at specific locations". This consultation will be undertaken and is an important part of the mitigation process. In addition to the RMP, Arrow has made numerous transport and road use impact management commitments, as outlined in the Draft Environmental Management Plan (Appendix Z, Section Z.4.15.3) of the EIS.

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S51 S52	1255 1299			
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	772 816 861 904 948 992 1036 1080 1124 1168 1212 1256 1300	Transport and Road use: Arrow has not provided sufficient evidence within the EIS to demonstrate to any reasonable person the feasibility of the proposed mitigation strategies necessary to support its conclusions at Page 63 of the Technical report under reference: The implementation of management and mitigation effectively reduces the significance of the projects impacts from a range of negligible to low to just negligible.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K) of the SREIS	The Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the EIS Road Impact Assessment (Appendix R) by documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies. The inclusion of both approaches within the Road Impact Assessment (Appendix K) of the SREIS provides greater certainty that the impact of the Project can be effectively managed through the application of typical approval conditions and the implementation of the planned management strategies. The inclusion of case study assessments of potential facility locations in the Road Impact Assessment (Appendix K) of the SREIS confirms the effectiveness of the planned management strategies when compared against typical outcomes achieved utilising a traditional traffic engineering approach (i.e. GARID).
S40 S41 S42 S43 S44 S45	773 817 862 905 949 993	Transport and Road use: To be clear, whilst Arrow may have prescribed certain specific mitigations as the location of infrastructure cannot be identified at this stage of the Project planning. Accordingly, Arrow cannot reasonably sustain its significance ranking of post impact management and mitigation as being negligible.	Road Impact Assessment (Appendix R) of the EIS Road Impact Assessment (Appendix K)	The Road Impact Assessment (Appendix K) of the SREIS considers a representative Project scenario for the purposes of identifying any residual impacts so significant that they preclude approval of the Project. Further, the Road Impact Assessment (Appendix K) of the SREIS expands upon work previously undertaken for the Road Impact Assessment (Appendix R) of the EIS by

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S46 S47 S48 S49 S50 S51 S52	1037 1081 1125 1169 1213 1257 1301		of the SREIS	documenting both a traditional traffic engineering assessment (in accordance with principles of the GARID) and an updated environmental values assessment. Both assessments undertaken to support the Road Impact Assessment (Appendix K) of the SREIS seek to determine the significance of the residual road impacts post application of typical approval conditions and implementation of the planned management strategies.

21.9 Noise and Vibration

Table 21-11 Noise and Vibration Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S17	353	The EIS has not assessed ; • Against the requirements of neither the Environmental Protection (Noise) Policy 2008, specifically the health and well-being criteria identified for sleep disturbance for residential/sensitive receivers (including accommodation/workers camps). • The QPHS acknowledges the assessment of frequencies within Appendix S (Appendix C). This assessment however does not appear to assess all the impacts of low frequency noise generated by the project, in particular the noise crated by compressors. The proponent should undertake further assessments in relation to; • A maximum sound pressure level (LA 1, adj, 1 hr) impact within habitable dwellings, ensuring sleep is not disturbed. • An assessment of all low frequency sources must be assessed. • A Noise management I monitoring strategy that includes proactive as well as reactive management strategies; NOTE: Preventative management strategies are to be implemented prior to the criteria being exceeded, rather than waiting for the criteria to be exceeded. Noise attenuation at sensitive receptors (e.g. noise attenuation at residences) has not been discussed as a mitigation measure and an effective complaints management system is considered essential in managing noise issues."	Noise and Vibration Technical Report (Appendix S, Table 5-20) and Noise and Vibration chapter (Sections 22.4.1 and 22.5.4) of the EIS	<u>Sleep disturbance:</u> The environmental values in the EPP(Noise) relating to the criteria for sleep disturbance were reproduced in the Noise and Vibration Technical Report (Appendix S Table 3.1) of the EIS. The nominated Project noise limits presented in the Noise and Vibration Technical Report (Appendix S, Section 6.1) of the EIS were based on the noise limits given in the PGA Noise Guideline (see Noise and Vibration Technical Report (Appendix S section 4.2.1) of the EIS) which are designed to comply with the objectives of the EPP(Noise). Compliance with the nominated project operational noise criteria would also achieve compliance with the environmental values. This is summarised in a statement in the Operational Noise Impact Assessment presented in the Nosie and Vibration Technical Report (Appendix S Section 7.1) of the EIS which states that “In all instances, noise will comply with the objective environmental values” The Project criteria for maximum sound pressure level at night is provided in the Noise and Vibration Technical Report (Appendix S, Table 6.2) of the EIS as 55 dB(A) max$L_{P,A,,15\ minutes}$ for short, medium and long-term noise sources. An assessment of maximum noise levels at sensitive receptors cannot be undertaken because the locations of

Submission Number	Issue Number	Submission / Issue	Reference	Response
				Project noise sources relative to receptors are not yet known. As stated in the Draft Environmental Management Plan (Appendix Z, Section Z.4.10.3) of the EIS “the noise levels from the final design will be modelled to confirm that compliance with the Project criteria is still predicted [B367].” This modelling will include prediction of the max$L_{P,A}$, noise levels and design of noise mitigation to ensure compliance with the Project criteria. Low frequency noise: In accordance with the Ecoaccess Draft Guideline Assessment of Low Frequency Noise, an assessment of low frequency noise emissions from facilities has been made. Refer to the Noise and Vibration Technical Report (Appendix S, Table 5-20) of the EIS. "Predictions of low-frequency noise indicate that noise levels would be within the nominated internal noise criterion of 20 dB(A)." Refer to the Noise and Vibration chapter (Section 22.5.4) of the EIS. The EIS further states "Infrasound assessment could not be completed in this assessment as source noise data in the 1 hertz (Hz) to 100 Hz range is not available to undertake further investigation. Further low frequency noise (LFN) assessment may be required during the detailed design stage of the Project. An operational LFN criterion of 20 dB(A) (internal) has been adopted for this assessment." Refer to the Noise and Vibration chapter (Section 22.4.1) of the EIS. Noise management / monitoring strategies: The noise monitoring and management measures that will be implemented have been described in the Draft Environmental Management Plan(Appendix Z, Section

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				Z.4.10.3 and Table 26) of the EIS “Inspection and Monitoring” An effective complaints management system will be implemented in accordance with Table 26 “Performance criteria”
S18	368	It is recommended that a noise and vibration monitoring program is set out in an Environmental Management Plan during the construction and operational phases of the project.	Draft Environmental Management Plan (Appendix Z, Section Z.4.10.3 of the EIS	Noted. The management hierarchy is in line with avoidance, mitigation and management. Site selection will be based on noise modelling and follow the noise management hierarchy. The Draft Environmental Management Plan (Appendix Z, Section Z.4.10.3) of the EIS states: • “The noise levels from the final design will be modelled to confirm that compliance with the Project criteria is still predicted [B367]. • Where noise reduction devices are deemed necessary, ensure devices (such as mufflers, low-noise fans and possibly enclosures) are fitted and work correctly [B370]. • Site-specific detailed noise modelling of production facilities and the application of acoustic treatments where the modelled noise from facilities exceeds the established noise criteria at one or more sensitive receptors [B377]. • Implement monitoring and inspection of avoidance, mitigation and management measures to ensure the residual impacts continue to be negligible throughout the lifetime of the Project [B382]. • If directed by the administering authority in response to a valid noise complaint, undertake noise monitoring in accordance with the EPA (2000) Noise Measurement

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				Manual [B383]".
S23	435	There is no noise and vibration footprint analysis and mapping that clearly details the modelling of the effects on the local areas across the project footprint. The EIS is inconclusive on exact locations and does not address cumulative impacts and assumes standards background thresholds.	Noise and Vibration chapter (Section 22.6.2) and Cumulative Impacts chapter (Section 31.4.11) of the EIS. Noise and Vibration Technical Report (Appendix L, Section 2, Figure 2-1)	The SREIS includes a map of potential noise sensitive receptors in the Noise and Vibration Technical Report (Appendix L, Section 2, Figure 2-1), which will be included in the noise constraints criteria, where relevant, as per below. As stated in the Noise and Vibration chapter (Section 22.6.2) of the EIS, "Arrow will undertake the selection of locations for production facilities and wells on the basis of many criteria including environmental and engineering constraints, and the setback distances for noise described in Section 22.5 of this report will be one of them [B365]. This is consistent with the EPP (Noise) management hierarchy whereby avoidance must be considered first". Cumulative Impacts for Noise and Vibration are addressed in the Cumulative Impacts chapter (Section 31.4.11) of the EIS.

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S23	536	What is the strategy for nuisance (dust/noise/vibration) that is below regulated levels for surrounding residents including the transient accommodation sites?	Noise and Vibration Technical Report (Appendix L, Section 2, Figure 2-1) of the SREIS Noise and Vibration chapter (Section 22.6.2) and Cumulative Impacts chapter (Section 31.4.11) of the EIS.	The Noise and Vibration Technical Report (Appendix L, Section 2, Figure 2-1) of the SREIS includes a map of potential noise sensitive receptors, which will be included in the noise constraints criteria, where relevant, as per below. As stated in the Noise and Vibration chapter (Section 22.6.2) of the EIS, "Arrow will undertake the selection of locations for production facilities and wells on the basis of many criteria including environmental and engineering constraints, and the setback distances for noise described in Section 22.5 of this report will be one of them [B365]. This is consistent with the EPP (Noise) management hierarchy whereby avoidance must be considered first". Cumulative Impacts for Noise and Vibration are addressed in the Cumulative Impacts chapter (Section 31.4.11) of the EIS.

21.10 Social

Table 21-12 Social Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S2	18	There are no Social Commitments included in this summary to mitigate identified impacts. Submitter recommended that: Include commitments within the summary and the SIMP action plans to mitigate identified project social impacts.	Social Technical Report (Appendix U, Sections 6 and 6.9.3) of the EIS Commitments Update (Appendix O) and Social Impact Management Plan (SIMP) (Appendix N) of the SREIS	Mitigation measures for potential social impacts are presented in the Social Technical Report (Appendix U, Section 6 with a summary in Section 6.9.3) of the EIS. The Commitments Update (Appendix O) of the SREIS clearly represents the social environment commitments that are included in the SIMP (Appendix N) of the SREIS.
S2	19	Consultation and agreement Submitter recommended that: Proponent to engage and reach agreement on outstanding issues discussed in this submission with Social Impact Assessment Unit at the Office of the Coordinator General during submission response phase.	Social Technical Report (Appendix U) of the EIS SIMP (Appendix N) of the SREIS	Noted. Arrow welcomes the opportunity to further engage with the Social Impact Assessment Unit from the Department of State Development and Infrastructure Planning to discuss the issues raised in their submission.
S2	20	SIMP Action Plans Submitter recommended that: Align SIMP Action Plans to the same	SIMP (Appendix N)	Arrow intends to develop the Project SIMP Action Plans to reflect a similar format as those for the Arrow LNG and

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		or similar format as Arrow LNG /Arrow Surat Gas Field Projects.	of the SREIS	Arrow Surat Gas Field Projects.
S2	21	Housing and Accommodation: Action plan states the following Monitor through HR the number of workers moving into local area and regional area and formulate a housing strategy for implementation and monitoring within the evolving SIMP as required. Some reference to Housing Strategy but more detail required to ensure identified impacts are being mitigated. Submitter recommended that: Overall Project Housing Plan to be provided prior to approval of the project and discussed with the Social Impact Assessment Unit. Key issue which should be covered off in the plan include: • Type of housing provision to be provide • Volume of housing to be provide • Timeframes for bringing on line housing provision and the length of time each type will be utilised • Locations for housing • Clarify who which be located in each type of housing • Should incorporate strategies for the following: • Early works • All levels of workforce including proponent employees, and all levels of contractors for both non-resident (FIFO, BIBO and DIDO) construction and operational workforce during construction phase of project. • Affordable Housing Within the Action there needs to clear understanding of the mitigation strategies to be undertaken by Arrow and the associated commitments and that these have been agreed with Council and	Social Technical Report (Appendix U) of the EIS Project Description chapter (Section 3.9) and SIMP (Appendix N) of the SREIS	An updated workforce accommodation strategy is provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. It is not expected that there will be a significant influx of workers and population growth in the construction phase and Arrow is making provision for the accommodation of construction workers in worker accommodation villages. The impacts of the Project on housing availability and affordability will be monitored during the construction phase to assess the need for investment in housing in the towns within the Project area during the operational phase, particularly in light of the effects of the current downturn in the coal industry on the housing market in the Project area.

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		other relevant stakeholders.		
S2	22	Worker housing provision Submitter recommended that: There is an existing opportunity for the proponent to utilise existing commercial camp facility and should be an option as part of the overall housing plan for the project	Social Technical Report (Appendix U) of the EIS Project Description chapter (Section 3.9) and SIMP (Appendix N) of the SREIS	An updated workforce accommodation strategy and workforce profile is provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. This strategy indicates that the 'pioneer' workforce required to establish accommodation villages will be housed in existing accommodation camps in the area until sufficient units at the accommodation camp sites are established.
S2	23	Housing market in the region covered by project Not a typical housing market and very volatile changes in rental and sales prices – proponent needs to be very clear about housing options to be adopted within their housing plan and the level each of these will be utilised	Social Technical Report (Appendix U, Section 6.4) of the EIS Project Description chapter (Section 3.9) and SIMP (Appendix N) of the SREIS	Housing and accommodation associated with the Project is discussed in the Social Technical Report (Appendix U, Section 6.4) of the EIS. Arrow recognises that the housing market is highly volatile, and that changes to the market will alter the Project's potential impacts on the same. Further, the Project workforce impact on housing and accommodation is an ongoing assessment. Refer to the Social Technical Report (Appendix U, Section 6.4.1) of the EIS. "Arrow will monitor, through HR, the number of workers moving into the local and regional area and will formulate a housing strategy for implementation and monitoring within the evolving SIMP […] as required" (refer to the Social Technical Report (Appendix U, Section 6.4.3) of the EIS). Section 2 of the SIMP (Appendix N) outlines Action Plans for housing and accommodation. An updated workforce accommodation strategy is provided

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				as part of the updated Project Description chapter (Section 3.9) of the SREIS.
S2	24	Affordable Housing Impacts and vulnerable groups – aged-single parents- young people low income families- people with a disability. Arrow state they will explore opportunities to invest in Isaac Housing Trust and Central Highlands Regional Council to help alleviate housing stress. Limited supply of Affordable Housing and proponent must be clear about how they will mitigate and impacts in particular ensuring that there is no reduction in supply and limit speculative practices associated with this project and housing market. Proponent should explore links with Isaac Affordable Housing Trust, Belyando Estate 2000 lots and State Government in relation UDA's in Blackwater and Moranbah in relation to Mitigation strategies for Affordable Housing Provision. If vacancy Rate above 3% and access to rental market is used in Moranbah/Dysart this will maintain high rents and associated mitigation strategies need to be included for development of affordable housing options to offset this impact. Commitment to invest needs to be discussed and agreed with appropriate councils and commitment included in SIMP Action Plans and commitment summary.	Social Technical Report (Appendix U) of the EIS	See response to Issue No. 23. In addition, Arrow has made a commitment to consider investment in the Isaac Affordable Housing Trust should monitoring indicate that the Project is having an adverse effect on the affordability of housing in the Project area towns. Given the unpredictability of the market and the number of market participants (such as Economic Development Queensland, the Isaac Affordable Housing Trust, and BMA) Arrow considers its proposed approach to be prudent and optimal in terms of avoiding further distortion of the housing market.
S2	25	Overlap between construction and operational workforce begins 2017 – see page135 in excess of 2000 construction and operational workers – what is housing strategy. Housing provision needs to clearly be stated in the housing plan during construction and operational overlap phase (during construction) and for 2 years of operational phase following completion of construction. What housing strategies will be adopted for workforce, detail key dates and timeframes for camps, locations,	Social Technical Report (Appendix U) of the EIS Project Description chapter	An updated workforce accommodation strategy and workforce profile has been provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. Impacts upon housing and accommodation in the Project area are assessed in the Social Technical Report (Appendix U, Section 6.4) of the EIS. That assessment concluded that there was not likely to be any direct increase in demand for housing, and noted that

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		size of camps, impacts on housing market how much stock will be used in towns impacted by project, duration of housing stock out of the market and appropriate mitigation strategies for dealing with these as an offset.	(Section 3.9) of the SREIS	while Arrow had a preference for operational staff to be resident in the region there was likely to be minimal demand from operational workers to relocate to the region. The Project characteristic of facilities and infrastructure (and hence construction workforce) being dispersed across a large area, compared to the more localised development of a mining project, supports this assessment. The revised project description indicates a decrease in the Project's operational workforce numbers which, combined with the rise in housing affordability, confirms that there will be no change to the impacts assessed in the Social Technical Report (Appendix U) of the EIS.
S2	26	Housing for key workers Potential impact on attraction and retention of key workers depending on size of residential workforce in each town as part of operational staff- what is the size of the operational workforce??	Project Description chapter (Section 4.7.8) of the EIS Project Description chapter (Section 3.9) of the SREIS	The size of the workforce as described in the EIS is detailed below: "The forecasted operations workforce is expected to reach its peak of approximately 597 personnel in 2034" (refer to the Project Description chapter (Section 4.7.8) of the EIS). An updated workforce accommodation strategy is provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. This indicates that the operational workforce has been halved from approximately 600 to 300, due to a combination of well automation and the use of multi-pad wells.
S2	27	Increase in regional and property prices from speculative activity Impact understated by proponent given historical evidence of continued speculative activity and high housing costs even during current downturn in mining. Submitter recommended that: It is considered that this impact should be rated as medium and likely to occur and therefore requires	Social Technical Report (Appendix M) and Social Impact Management Plan	The Social Technical Report (Appendix M, Section 4.2.2) of the SREIS indicates the extent to which housing costs have reduced in towns within the Project area over the last 12-18 months. Speculative activity cannot be attributed solely to Arrow as the EIS clearly states that workers will be accommodated in temporary workforce accommodation facilities (TWAFs). Arrow has committed to participating in housing forums, actively monitoring demand factors

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		mitigation strategies that should be included in the SIMP Action Plans and commitment summary	(Appendix N) of the SREIS	associated with its workforce, and to examine opportunities to invest in the Isaac Affordable Housing Trust in conjunction with the IRC. Monitoring actions will be incorporated in to the SIMP (Appendix N) of the SREIS as it is developed further.
S2	28	Proponent states "accommodation for project workers will be TWAF's with some housing within the community on a case by case basis." Submitter recommended that: Proponent needs to clarify what the level of impact will be (likely number of properties), what locations, over what timeframe would properties be used, housing options that are being considered.	Social Technical Report (Appendix U) of the EIS Project Description chapter (Section 3.9) of the SREIS	An updated workforce accommodation strategy is provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. See response to Issue No. 25.
S2	29	Proponent has stated that TWAF's will be sited to reduce pressure on Community Services and Infrastructure. Explanation required by proponent how they intend to meet this commitment and what discussion, negotiation and agreement has been reached in the communities affected?	Social Technical Report (Appendix U) of the EIS Project Description chapter (Section 3.9) of the SREIS	An updated workforce accommodation strategy has been provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. This indicates that the Project will establish two TWAFs of approximately 1,200 beds each, 40 km north and 40 km south-east of Moranbah. There will be full consultation with the Isaac Regional Council (IRC) in regard to development approval and minimising the impact on surrounding property owners and the nearest towns. No discussions in this regard have occurred to date as they would be premature at this stage.
S2	30	Workforce Management – local job opportunities operational workforce Low target of 10% for local employment. Given current downturn in coal mining there is an opportunity to seek to increase local employment figures. This needs to be reflected in Mitigation and	Social Technical Report (Appendix U) of the EIS	An updated workforce accommodation strategy and workforce profile is provided as part of the updated Project Description chapter (Section 3.9) of the SREIS. While the local unemployment rate has been rising, it is still considered low in comparison to the State level. The

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		management strategies to explain how this will be achieved if employment conditions remain as per current situation. Two other scenarios are discussed 100% and 50% local and regional operational workforce page 13 Social Technical Report. Skills Qld have stated that it may be acceptable that 70% of construction and 40% of operational workforce are non-resident workers (FIFO, BIBO, DIDO) because of workforce demand. This is considerably higher than what is proposed by the proponent. This needs to be explained by the proponent in the context of the employment and workforce situation at commencement and during construction and operational phases of the project to understand overall approach to recruitment locally,	Project Description chapter (Section 3.9) of the SREIS	downturn in the coal industry has more likely been most significant amongst the contract miners who are residing in accommodation camps, and not residing permanently in the local area. Also, construction skills required for gas facility construction are not likely to be widespread among the mining workforce. It should also be noted that the figure of 10% is not a target, but a conservative estimate of likely outcome. Arrow's first preference would be to source employment locally and the numbers of locally sourced employees will not be restricted by accommodation camp capacity. Arrow intends to continually review and update the estimate.
S2	31	Opportunities for women in the workforce and indigenous community and people with a disability. Submitter recommended that: Employment training and skills development strategies for underrepresented groups to be part of Workforce management action plan and commitments.	SIMP (Appendix N, Sections 2.2, 2.3 and 2.4) and Commitments Update (Appendix O) of the SREIS.	Arrow has committed to increasing the training and skill development opportunities for the local population, as detailed in the SIMP (Appendix N, Section 2) of the SREIS and the Commitments Update (Appendix O, Commitment Numbers B618, B619 and B620) of the SREIS. *Arrow is an Equal Opportunity Employer and its policies and facilities will not impose any restrictions on the employment of women or people with a disability.* Arrow has the following initiatives relating to Indigenous participation: • "Aboriginal and Torres Strait Islander Reconciliation Action Plan [...] - identifies strategies relating to Indigenous employment and enterprise opportunities; • Reconciliation Action Plan." Refer to the SIMP (Appendix N, Sections 2.2, 2.3 and 2.4) of the SREIS. Further, Indigenous groups are included in non-culturally specific action plans for employment and skills opportunities, as outlined in the SIMP (Appendix N,

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				Section 2) of the SREIS.
S2	32	Loss of skilled staff from local business and difficulty for local business to recruit and retain staff. Submitter recommended that: Proponent needs to detail strategies/initiatives to be implemented in towns to up skill residents for the loss of skilled staff from local business to the project. Strategies to assist in recruiting and retaining staff in local industries – subsidised housing program should be considered in conjunction with appropriate Council	SIMP (Appendix N, Section 2.4) and Commitments Update (Appendix O) of the SREIS.	Arrow has committed to reducing its impact on local businesses as a result of increased competition for labour as detailed in the SIMP (Appendix N, Section 2.4) of the SREIS. It will do this in conjunction with local Councils, business groups and State Government agencies with responsibilities for training at an appropriate time in the Project cycle (see the Commitments Update (Appendix O, Commitment Number B621) of the SREIS).
S2	33	Workforce Training and Development Contractor obligations Clarify the position regarding Arrows requirement for all Contractors to have a Workforce Management Plan for existing and expanded workforce in relation to training development and employment opportunities for local and regional and Nationwide workers	SIMP (Appendix N, Section 2) and Commitments Update (Appendix O) of the SREIS.	Arrow has committed to increasing the training and skill development opportunities for the local population, as detailed in the SIMP (Appendix N, Section 2) of the SREIS. These opportunities will be developed and monitored through a training program and workforce program. Arrow has committed to ensuring that our contractors provide similar opportunities. Arrow also participates in industry-wide initiatives to up-skill the labour force to pursue opportunities for work in the gas industry sector. Project-specific strategies and initiatives will be coordinated with industry-wide initiatives (see the Commitments Update (Appendix O, Commitment Numbers B617, B619 and B620) of the SREIS).
S2	34	Training and employment opportunities for School leavers and TAFE. Submitter recommended that: Proponent to detail and targets for training, development, apprenticeship and employment opportunities for school leavers/TAFE and Uni students as part of workforce mitigation strategies include these in commitment summary and SIMP Action Plan with timeframes and expected outcomes.	SIMP (Appendix N, Table 1-9 and Section 2.3) of the SREIS.	Arrow's initiatives for social management include "Various vocational and specialist training programs; traineeships; graduate development program; school based training programs" (refer to the SIMP (Appendix N, Table 1-9) of the SREIS). The SIMP (Appendix N: Section 2.3) of the SREIS further discusses increased training and skill development opportunities for the local population. The nomination of

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				specific input targets, outcomes and timeframes is not possible, nor appropriate, at this point in time.
S2	35	Increase training and skill development opportunities for local population. 1. Implement Training and skills development programs to identify workers within the region. 2. Implement apprenticeships, scholarships, vocational training, support for work readiness programs and pre trade training. Clarify the timeframes for commencing these initiatives, provide details of current and future programs being considered programs, provide targets and include this information within the SIA and SIMP Action plan.	SIMP (Appendix N, Section 2.3) of the SREIS.	Arrow has committed to implementing training and skill development opportunities for residents in the locality of the Project. As the status of current education and training initiatives in the region are likely to change, further planning for programs associated with this opportunity will occur during the SIMP development process, when there is a higher level of certainty surrounding the relevant program parameters (see the SIMP (Appendix N, Section 2.3) of the SREIS).
S2	36	Impacts on Health Services. Rapid growth in patient numbers and overall workload in the region particularly affecting Moranbah and Central Highlands health services SEE PAGE 172 6.8.2 Current strategies included in the Action Plan do not recognise the need to mitigate direct impacts identified in SIA – Increase potential disease outbreaks – increase demand on medical centres and hospitals – increase demand on emergency services. Submitter recommended that: Proponent to consult, liaise and agree mitigation strategies with Regional Q Health as to service delivery impacts of the project. Mitigation strategies to be included in the Action Plan and commitments summary	SIMP (Appendix N, Section 2.2) of the SREIS	Arrow has committed to implementing a range of management measures to mitigate the Project's impact on health services, which may include the provision of an on-site health service for the workforce located in TWAFs. Arrow will engage with Regional Queensland Health regarding service delivery impacts of the Project. Further management measures are discussed in the SIMP (Appendix N, Section 2.2) of the SREIS.
S2	37	Service delivery impacts associated with Project related activities. Current strategies included in Action Plan relates to the workforce and there also needs to be a focus on the project impacts on the community services currently available with agreed and appropriate mitigation strategies. Needs to be a commitment to consult, negotiate and agree with	SIMP (Appendix N, Section 2.2) of the SREIS	Arrow has committed to implementing a range of management measures to mitigate the Project's impact on community services. Arrow will engage with central and regional officers of the Department of Community Safety, Queensland Health and the Queensland Police Service regarding service delivery impacts of the Project. Further management measures are discussed in the SIMP

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		Emergency Services mitigation and management strategies in relation to a range of service delivery issue impacted by the project. Including - volume of work associated with traffic movements, emergency procedures, health and safety, increased anti-social behaviour , health issues/ outbreaks These strategies need to be part of SIA/SIMP Action Plan and proponents commitment summary		(Appendix N, Section 2.2) of the SREIS.
S2	38	Community Infrastructure and Services Action Plan: Development of an Emergency Management Plan Proponent needs to clarify issue that will be considered as part of this plan, who will be key stakeholders who will be engaged and the timing when this process will commence. These details need to be provided in the SIA/SIMP Action Plan and Commitment Summary.	SIMP (Appendix N, Section 2.2) of the SREIS	Arrow has committed to developing an emergency management plan, as stated in the SIMP (Appendix N, Section 2.2) of the SREIS. The emergency management plan will be complimented by relevant plans (e.g. Road-use Management Plans (RMPs), Community Safety Plans) to manage potential project impacts on community emergency management capacity. Arrow will engage with central and regional officers of the Department of Community Safety regarding service delivery impacts of the Project.
S2	39	Community Infrastructure and Services Action Plan: Arrow will consider provision of a medivac service to respond to various emergency situations in consortium with other proponents.	SIMP (Appendix N, Section 2.2) of the SREIS	Arrow has committed to emergency management planning in consultation with Queensland Government agencies (see SIMP (Appendix N, Section 2.2) of the SREIS). As a medivac service is not an initiative that Arrow can support unilaterally, Arrow cannot commit to the provision of a service at this point in time.
S2	40	Where are Indigenous issues picked up in Action Plans and commitments? Employment and Training opportunities – Indigenous groups underrepresented Local participation	SIMP (Appendix N, Sections 2.2, 2.3 and 2.4) of the SREIS.	Arrow has the following initiatives relating to Indigenous participation: • "Aboriginal and Torres Strait Islander Reconciliation Action Plan [...] - identifies strategies relating to Indigenous employment and enterprise opportunities;

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		Skills development		• Reconciliation Action Plan." Refer to the SREIS SIMP (Appendix N, Sections 2.2, 2.3 and 2.4).
S2	41	Local Industry Participation Identified impact in SIA as follows: Increased opportunities for businesses in the project area to gain contracts in the CSG supply chain has been rated as low and unlikely.	Social Technical Report (Appendix U, Section 6.5.5) of the EIS	Arrow's approach to local business development is outlined in the Social Technical Report (Appendix U, Section 6.5.5) of the EIS. Arrow has committed to develop an Australian Industry Participation Plan (AIPP) that is consistent with State and Commonwealth industry participation frameworks, and has committed to adopting the Queensland Resources and Energy Sector Code of Practice for Local Content (see Commitments Update (Appendix O, Commitment Number B624) of the SREIS).
S2	42	Consultation and negotiation with landholders Consultation and negotiation with landholders. Has this process begun yet – clarify – commitment in EIS to start 6-12 months out from production drilling- What about process for construction prior to operational drilling. Action contradicts this stating proponent will communicate with landholders at least 3 months before activities take place.	Social Technical Report (Appendix U) of the EIS	For all exploration and development activities, Arrow is legally bound to comply with the *Queensland Land Access Code* (November 2010), which establishes best practice guidelines for communication with owners and occupiers of private land. Arrow is committed to cooperative relationships with landholders and has developed a set of 12 Land Access Rules to ensure compliance with the Code.
S2	43	SIMP Action Plans and consultation and agreement with key stakeholders – local government, government agencies etc. What level of consultation and agreement has been undertaken with key stakeholders to support Action Plans. This is required prior to approval of project and must be reflected in revised SIMP and Action Plans. Housing Plan - Traffic Management Plan – Social and Community Infrastructure	Community Consultation chapter (Section 5.3, Table 5–1) of the EIS	Arrow is committed to development of an effective SIMP that incorporates due regard to the views of stakeholders in the SIMP development process. The consultation undertaken prior to the development of the management measures discussed in the EIS is detailed in the Community Consultation chapter (Section 5.3, Table 5–1) of the EIS. Further SIMP development will involve close consultation with relevant regional stakeholders.

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S2	44	Clarify what is being considered by proponent in relation to overseas workers and what steps have been taken in this regard to date with Commonwealth or State Governments.	Social Technical Report (Appendix U, Section 6.2.3.2) of the EIS	The Social Technical Report (Appendix U, Section 6.2.3.2) of the EIS addresses workforce sourcing scenarios. Detailed planning is yet to occur, and should overseas workers be required to provide necessary skills, Arrow will comply with all relevant State and Commonwealth procedures.
S2	46	Changes to Regional Liveability: EIS states that there has been some discussion between Arrow and MDSS for a collaborative approach to planning and delivering family, community and individual support services in the project area. Submitter recommended that: Proponent to agree way forward on key support services with MDSS and other regional stakeholders and include appropriate mitigation strategies and intended outcomes within SIMP action plan and commitment summary	Social Technical Report (Appendix U) of the EIS	Arrow is committed to development of an effective SIMP that incorporates due regard to the views of stakeholders in the SIMP development and implementation process.
S2	47	Impacts on Safety Provision: Increased crime, antisocial behaviour, drug related activity and community related safety issues, resulting on impacts on Service delivery for QPS Community resilience based on past experience is not consider a mitigation strategy. Submitter recommended that: Proponent to consult, negotiate and reach agreement with QPS and Council on appropriate strategies to mitigate impacts on service delivery and community issues associated with increased crime, antisocial behaviour and drug related activity.	SIMP (Appendix N, Section 2.2) and Project Description chapter (Section 3.9) of the SREIS	Arrow is committed to minimising the potential for contributing to an increase in drug-related anti-social and criminal behaviour in the region. As detailed in the SIMP (Appendix N, Section 2.2) of the EIS, Arrow's Code of Conduct includes zero tolerance for drug and alcohol. Beyond this, as described in the Project Description chapter (Section 3.9) of the SREIS, accommodation camps will be located outside of established towns, which reduces the potential for Arrow workforces to contribute to anti-social behaviour in local communities. Arrow will continue ongoing consultation with all stakeholders including QPS on relevant issues raised.
S2	48	Community Values and Lifestyle: Consultation with Councils on social, community or recreational services which are impacted by the project	SIMP (Appendix N) of the EIS	Arrow is committed to an effective SIMP that incorporates due regard to the views of stakeholders in the SIMP development and implementation process.

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		Action plan needs to identify impacts have been identified and provide direction on the mitigation strategies agreed to or being discussed with Councils to alleviate these impacts. Have these discussion begun if so what has been the outcomes achieved		
S2	49	Mitigation / Enhancement: Social Investment Plan - Brighter Futures Project Clarify what “expand opportunities available for the region under the Brighter Futures Program” Explain rationale, target areas, outcomes to be achieved, funding commitment for the program Clarity required on level of commitment to Social Investment with identified outcomes.	Social Technical Report (Appendix U) of the EIS	Arrow implements the Brighter Futures Program to provide support to local communities in which it operates. Should this Project proceed, Arrow will engage with the communities in the Project area to develop further the objectives and funding parameters associated with the roll out of this program. It is not appropriate to provide detail at this stage as authentic community participation requires further consultation and engagement. Details on the Brighter Future program are available on the Arrow website, including information on criteria for funding, funds expended, processes for applying for funding and how often funding will be available for applications. All community organisations in the Project area footprint are able to apply for Brighter Futures funding. Information will also be provided on projects that receive funding or in kind support to offset or mitigate direct Project impacts.
S2	50	Encourage employees and contractors to integrate and become involved in local community (volunteer work, participation in clubs and local organisations). Submitter recommended that: Proponent to provide details of the strategies to be adopted to achieve this outcome and mitigate these impacts on the community. These details need to be included in the SIA/SIMP and Commitments.	SIMP (Appendix N, Section 2.2) of the SREIS	Where appropriate, Arrow will encourage employees and contractors to integrate and become involved in local community sporting and recreational activities, as committed to in the SIMP (Appendix N, Section 2.2) of the SREIS.
S2	51	Impact on Governance: Potential for community backlash in relation to TWAFS as this is	Social Technical	The site selection of TWAF facilities depends on the ability to meet multiple criteria. Arrow has committed to consult

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		counter to Councils objectives of encouraging growth and sustainability in the region. Approvals for TWAF'S may require proponents to demonstrate how the project will contribute to the growth of the community. This issue needs to be actioned within the SIMP and appropriate strategies identified and agreed with Council. These should be included in the SIMP Action plan and summary commitments. It is not sufficient to refer to the development of a Community Engagement Plan and associated discussions. What strategies are being considered to alleviate community and councils concerns? This needs to clarify in revised Action Plan.	Report (Appendix U) of the EIS Project Description chapter (Section 3.9) of the SREIS.	closely with the IRC in site selection to ensure that local concerns are given appropriate weight in the decision. As this task depends on further detailed field planning, and the desired level of consultation has not yet occurred, it is premature to provide detailed strategies. Arrow's updated accommodation strategy is provided in the Project Description chapter (Section 3.9) of the SREIS.
S2	52	Community Engagement Plan What mechanism will be used to engage local community In monitoring SIMP progress and outcomes. Regional Community Consultative Committee??	Social chapter (Section 24.8.6) of the EIS SIMP (Appendix N, Section 2.2) of the SREIS.	Arrow has committed to the "development of a Community Engagement Plan that includes the provision of opportunities to discuss community concerns, e.g. Arrow website, regional community information centres, 1800 free call number, etc." Refer to the Social chapter (Section 24.8.6) of the EIS. Arrow will engage with a regional community consultative committee (RCCC) and other planning and consultation mechanisms being established across the Bowen Basin and CSG industry leadership groups. Refer to the SIMP (Appendix N; Section 2.2) of the SREIS.
S2	53	Cumulative Impacts - Project Impact Summary: Relationship between peak workforce of 1800 and 4 proposed TWAF'S with capacity for 1200 workers Proponent has said that all construction workers will be in TWAFS clarify this statement given gap in peak workforce numbers and TWAF accommodation being provided across the project during construction phase. This need to be clarified and incorporated within the Housing Plan to describe how NRW workers will be housed when	Social Technical Report (Appendix M, Section 3.4) of the SREIS	A revised Accommodation Strategy has been developed and is presented in the Social Technical Report (Appendix M, Section 3.4) of the SREIS. The revised project description indicates that the two TWAFs will be sized to accommodate the peak construction workforce of 2,450 workers in 2018. Each TWAF is planned to accommodate 1,225 persons, and are of a modular construction allowing them to be expanded rapidly should it be required by

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		on shift.		workforce numbers, and after the peak construction period has passed the TWAF capacities will be subsequently reduced.
S2	54	Early and ongoing engagement with key stakeholders, including Councils, regarding the Social investment Plan and other community support strategies This needs to be demonstrated as part of the process for developing SIMP and Action plans to ensure that strategies impacting on the community are agreed and supported prior to project approval.	SIMP (Appendix N) of the SREIS	Arrow is committed to an effective SIMP that incorporates due regard to the views of stakeholders in the SIMP development and implementation process.
S2	55	Proponent has stated that the Monitoring Plan, Dispute Resolution procedure and Reporting mechanisms will be developed during stage 2 of the SIMP development process. This needs to be in place prior to project approval	SIMP (Appendix N) of the SREIS	Arrow is committed to an effective SIMP that incorporates due regard to the views of stakeholders in the SIMP development and implementation process. This includes stakeholder views on monitoring, reporting and dispute resolution.
S2	56	Stakeholder groups need to include Dept of Community Safety and specifically locally QAS, QFRS – Skills Queensland for workforce related issues – Department of State Development Infrastructure and Planning – in relation to Urban Development Areas.	SIMP (Appendix N) of the SREIS	Arrow has updated the list of stakeholders to include those proposed (see SIMP (Appendix N, Section 2.2) of the SREIS).
S7	122	The majority of the construction workforce will be accommodated in temporary accommodation camps to be constructed as required. Any increase in populations may result in an increase in QFRS responses to structural fires and emergency incidents. However, due to the fluctuation in workforce numbers any increase in responses is anticipated to be minor. The accommodation camps will have an Emergency Management Plan to deal with any risks and hazard situations that may be encountered, and along with the construction personnel being provided with training on dealing with any emergency incident along with QFRS response capabilities, any situation will be able to be effectively managed.	Social chapter (Section 15.2.5) of the SREIS	A revised Accommodation Strategy has been presented in the Social chapter (Section 15.2.5) of the SREIS and Arrow will consult will QFRS regarding the development of the Emergency Management Plan.

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		Information should be provided to QFRS on these camps/villages. The QFRS will be required to be involved in the approval process as a referral agency under the Sustainable Planning Act 2009 and Sustainable Planning Regulations 2009, Schedule 7.		
S7	126	Social: Identify the impact on the surrounding community health and services infrastructure, should the project result in a significant increase in population.	Social Technical Report (Appendix U, Section 6.8) of the EIS Social Technical Report (Appendix M, Section 4.2.1) and SIMP (Appendix N, Section 2.2) of the SREIS	The Social Technical Report (Appendix M, Section 4.2.1) of the SREIS includes updated baseline population projections and expected changes due to the Project. These projections, together with workforce numbers associated with the revised project description, indicate that it is not expected that there will be a significant increase in population. Actual population change due to the Project will be monitored through the SIMP, as discussed in the Social Technical Report (Appendix U, Section 6.8) of the EIS. Mitigation and management in regards to these impacts are detailed within the SIMP (Appendix N, Section 2.2) of the SREIS.
S7	127	Social: Identify possible landing sites for both the rescue helicopter service and fixed wing aircraft services if required. This should include landing zones, flight paths, lighting and wind sock.	Social chapter (Section 24) of the EIS	Airports and airstrips are presented in the Social chapter (Section 24.4.2.1) of the EIS. The development of Emergency Management Plans will assess the requirement for identification and need for upgrade of aviation access.
S7	128	Social: With a Fly In/Fly Out, Drive In/Drive Out, Bus In/Bus Out workforce can you outline your fatigue management policy both in relation to on roster shifts and pre/post shift.	Roads and Transport chapter (Section 21.10) of the EIS	A RMP will be prepared to manage and mitigate the risks and impacts of any transport related issues. This will include, but not be limited to, safe driver behaviour and fatigue management protocols.

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S7	129	Social: Will the accommodation camp be a wet or dry camp?	Social Technical Report (Appendix M, Section 3.4) of the SREIS	The Project is yet to go through detailed design, when decisions on matters, such as the consumption of alcohol in camps, are likely to be finalised.
S7	130	Social: Consult with QAS in relation to provision of a paramedic service on the site. This paramedic will work closely with your health team to ensure loss time is reduced where possible. The QAS provides paramedical services including but not limited to: - Emergency patient care; - Health and welfare checks; - Certification in First-Aid and Low Voltage Rescue; - Drug and Alcohol testing; and - Supply of a mine site approved vehicle.	SIMP (Appendix N, Section 2.3) of the SREIS	A Workforce Health Management Plan will be prepared to assist with reducing Project employees use of local health services and improve the workforces health (refer to the SIMP (Appendix N, Section 2.3) of the SREIS). Arrow will consult with QAS in relation to provision of a paramedic service on the site.
S7	131	Social: Identify management strategies to address the consequences of limited accommodation availability and affordability, the impact for local residents including emergency service personnel in securing suitable accommodation at reasonable costs.	Social Technical Report (Appendix M, Section 3.4) of the SREIS	A revised Accommodation Strategy has been developed and is presented in the Social Technical Report (Appendix M, Section 3.4) of the SREIS.
S7	132	Social: Identify viable housing initiatives and commitments that the project can assist the local community, low income earners and critical workers with residential housing availability and affordability factors, should the project result in a significant increase in the construction workforce.	Social Technical Report (Appendix M, Section 3.4) of the SREIS	A revised Accommodation Strategy has been developed and is presented in the Social Technical Report (Appendix M, Section 3.4) of the SREIS.
S7	133	Preliminary hazard and risks:	Social chapter	Arrow will consult with QAS in relation to the provision of

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		Consult with the Queensland Chemical Hazards and Emergency Management and the Medical Director, QAS in relation to treatment plans for injured workers due to methane gas extraction or chemical processes used on site.	(Section 24) of the EIS	medical services to injured workers on site.
S7	138	Preliminary hazard and risks: Provide QAS with the access and evacuation maps for accommodation camps or villages.	Social chapter (Section 24) and Preliminary Hazard and Risk chapter (Section 27) of the EIS	Access and evacuation maps for accommodation camps will be provided to the QAS when developed.
S7	139	Ensure that construction camps and buildings comply with the current building standards where applicable and that temporary housing and shipping containers are securely fastened to any relevant standards in the event of strong winds or cyclonic wind events (Cyclone George 2007).	Project Description chapter (Section 3.9) of the SREIS	All construction camps and buildings will comply with current building standards and any temporary housing or storage containers are fastened securely.
S7	140	Construction camps need to be prepared in the event of isolation from flooding and plan to carry sufficient foodstuffs and supplies to sustain the workers in the event of prolonged isolation. This should not place any additional demand on Local Disaster Management Groups.	Social Technical Report (Appendix M, Section 3.4) of the SREIS	A revised Accommodation Strategy has been developed and is presented in the Social Technical Report (Appendix M, Section 3.4) of the SREIS. Camp management plans will make provision for environmental events.
S7	141	Employees should be encouraged to join the local emergency services, i.e. SES or Rural fire brigades to support the community in which they reside.	Social chapter (Section 24) of the EIS	Arrow will ensure that the Project workforce is kept advised of opportunities for participation in local emergency services.
S7	142	Plans should be identified and prepared to evacuate the workforce from the site/s in the event of a localised disaster situation.	Health and Safety chapter (Section 30)	An Emergency Response Plan will be developed, which will contain an evacuation procedure.

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			of the EIS	
S9	146	Skills and Employment within the Department of Education, Training and Employment (DETE) suggest that as the project evolves Arrow Energy develop and articulate strategies for sourcing labour from other regions as part of the ongoing reporting for this project. While the SIMP contains local recruitment and training, and industry development strategies across all the regions directly impacted some of these strategies could also be used in other areas of Queensland. Submitter recommended that: The SIMP could be strengthened by the inclusion of strategies for the under-employed, unemployed and women.	Social Technical Report (Appendix U, Section 2.3.2) of the EIS	The Social Technical Report, (Appendix U, Section 2.3.2) of the EIS details Workforce Sourcing Scenarios. Arrow will cooperate with State Government supported agencies (such as Energy Skills Queensland) to ensure that industry relevant training is available to potential employees in other Queensland areas. Arrow is an equal opportunity employer and has developed a range of programs to increase our employment and retention of Indigenous Australians. These include an Indigenous Recruitment and Retention Plan, employment and training, Indigenous scholarships and collaborative workforce planning with Traditional Owner groups. The SIMP (Appendix N, Section 2.3) of the SREIS details action plans addressing EEO issues.
S9	147	Workforce profile: A summary of the estimated construction and operations workforce numbers and occupations are provided with appropriate skills breakdowns.	Project Description chapter (Section 3.9) of the SREIS	An update of the construction and operations workforce numbers along with occupations / roles and skills is provided in the updated Project Description chapter (Section 3.9) of the SREIS.
S12	276	Housing and Accommodation: The EIS acknowledges the ongoing housing pressures in the Bowen Basin region stemming from cumulative impacts of resource projects. This project is likely to contribute to these cumulative impacts. The SIMP has identified several strategies for managing and mitigating housing impacts. The department notes and supports these strategies; particularly the commitment to explore opportunities to contribute to the Isaac Affordable Housing Trust. Given the scale of resource activity occurring in the region however, the department recommends that the strategies for addressing housing impacts on	Social Technical Report (Appendix U, Section 6.4) of the EIS SIMP (Appendix N) of the SREIS	The SIMP has been updated where necessary as part of the SREIS process. Arrow will work cooperatively with the Department of Housing and Public Works and the IRC to ensure that its management of, and response to, housing impacts is appropriate and commensurate with the level of impact attributable to the Project. The Social Technical Report (Appendix U, Section 6.4) of the EIS addresses Housing and Accommodation impacts. It indicates that accommodating workers in TWAFs will

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		low income households in the region should be bolstered. Submitter recommended that: The department recommends that the SIMP include further detail on strategies to help manage the impact of rising housing costs on low income households, including: • exploring opportunities to work with councils, not for profit housing providers and the state government to deliver housing assistance and support programs for families in the region who are struggling to find rental accommodation or who are suffering rental stress; • if, over time, monitoring shows continued rising housing stress in the region, a commitment to work with key stakeholders to re-evaluate contributions towards and affordable rental housing initiatives aimed at families on low to moderate incomes. The Department of Housing and Public Works notes the proponent's commitment to formulate a housing strategy to address issues relating to workers moving to the local area. The department would welcome the opportunity to work with the proponent in developing this strategy.		assist in managing negative impacts on the affordability of housing in local communities. In the longer-term, it can be expected that the housing market will adapt to moderate any decrease in affordability due to short-term elevated demand. Arrow has committed (see Social Technical Report (Appendix U, Section 6.4.3) of the EIS) to participating with State and Local Government, Industry and other project proponents in developing a better understanding of cumulative housing demand, and to examine opportunities to invest in the Isaac Affordable Housing Trust in consultation with the IRC should its operations contribute to housing stress in the region.
S17	355	The proponent identifies that a mix of temporary and permanent worker camps will be used for each component of the project. It is also noted that some of these camps will be in the near vicinity of construction and operational activities, however the camps have not been identified as a sensitive receptor to the emissions (e.g. air, noise) from plant and equipment. Worker camps are similar in a nature to a residential receptor and construction and operation emissions can impact on the health and well-being of workers as for the general public. The proponent should include worker camps as a sensitive receptor (particular attention to accommodation facilities provided at the LNG Plant facility) in the assessment of emissions from the construction and operational phases of the project and, where relevant,	Health and Safety chapter (Section 30) of the EIS	While workforce accommodation facilities are not automatically classified as residential dwellings, they are considered to be a sensitive receptor. The proposed facilities are not yet in existence, and there is capability to site and design them to suitably mitigate or avoid any potential impact from air and noise emissions.

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		appropriate mitigation strategies are identified to minimise potential impacts.		
S17	359	QPHS has reviewed the draft SIMP and has the following comments and has identified numerous aspects that need to be addressed. These include: • QPHS has concerns that the draft SIMP does not include the monitoring of the local cost of living. The impact of resource development can result in rises in the cost of living which will impact most on those on low or fixed incomes and negatively impact on community health. • QPHS notes that the SIMP does not include proactive strategies to enhance the health and wellbeing of employees. Healthier workers are more likely to be productive, have fewer days absent and lower workers compensation costs (reference WorkSafe Victoria 2010, Healthy Workplace Kit. Your Guide to Implementing Health and Wellbeing Programs at Work, WorkSafe Victoria, Melbourne. http://www.workhealth. vic.gov.au/workplace programs/healthy-workplace-kit) • QPHS is concerned that while community consultation and engagement will continue throughout the life of the GSPP, the draft SIMP does not include a KPI to monitor community satisfaction with the project and the implementation of the SIMP. Submitter recommended that: QPHS believes that the SIMP needs the following aspects to be addressed: • The proponent should include a KPI to monitor local cost of living measures over time. • The proponent should include opportunities to promote employee health and wellbeing in the SIMP. The proponent should implement workplace wellness initiatives as part of the SIMP. • The proponent should include a KPI on community satisfaction	Arrow HSE Policy (Appendix E) of the EIS Social Technical Report (Appendix M, Section 4.2.2) and SIMP (Appendix N, Section 2.3) of the SREIS.	**Cost of living:** Arrow recognises that the cost of housing is the primary cost of living concern in the communities proximal to the Project. Arrow has committed to a range of mitigation measures to negate and reduce our impact on housing demand in these communities. Arrow will also document the in-migration of its workforce to the region and adapt its housing strategy as necessary, depending on local housing conditions and the level of in-migration. In addition, the changes to housing affordability in the Project area have been discussed in the Social Technical Report (Appendix M, Section 4.2.2) of the SREIS. **Workforce health and wellbeing:** Arrow has committed to promoting healthy lifestyles in our employees, as discussed in SIMP (Section 2.3) of the SREIS. Arrow will also develop a workforce health management plan to assist with reducing Project employees use of local health services and improve the workforce's health. Additionally, the Arrow HSE Policy (Appendix E) of the EIS includes an implementation measure of 'Effectively managing personnel 'fitness for duty'' which will include 'workplace wellness initiatives. Community sentiment of Arrow's social performance will be continually monitored through Arrow's participation in regional community consultative committee (RCCC) forums.

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		with SIMP implementation.		
S19	377	The QPS requests that consultation occurs with the Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and Queensland Police Service in relation to the assessment of potential impacts and risk. This should be extended to include consultation regarding the development of emergency and risk management plans.	Preliminary Hazard and Risk) chapter (Section 27.6.7) of the EIS	As the Project progresses, Arrow will continue to communicate with Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and Queensland Police Service in relation to the assessment of potential impacts and risk. "Arrow has established regional emergency response plans across their operations [B480]. The objectives of the plans are to [B513]: • Detail the logistical support processes for emergency response and recovery, covering staff, shut down, containment, communications and emergency systems; • Detail the liaison processes with all agencies, including emergency services" Refer to Preliminary Hazard and Risk chapter (Section 27.6.7) of the EIS.
S19	378	In addition to the Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and QPS, consultation in relation to the development of these plans should take place with Local and District Disaster Management Groups. This would ensure that the emergency /risk management plans for the project do not conflict with and/or place unnecessary burdens on existing disaster management arrangements. The proponent should consider a behaviour management plan to ensure standards of behaviour of employees living and socialising within the local environs are maintained.	Social chapter (Section 24.8.5) of the EIS	As the Project progresses, Arrow will continue to communicate with Local and District Disaster Management Groups in the development of emergency and risk management plans. In relation to workforce behaviour management, "Arrow will consider a range of measures to maintain and enhance community values and lifestyles through continued community liaison and consideration of the following: • Develop a Code of Conduct that: — develops and provides workers with an induction and welcome kit which includes a statement of community expectations for new arrivals. Where FIFO workers come from overseas, ensure they are provided with an adequate Australian cultural awareness briefing

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				and information on how to undertake day to day activities, for example banking or shopping; — ensures that all direct employees and contractors adhere to the Code of Conduct and that disciplinary procedures for inappropriate behaviour of employees will be documented; Code of Conduct will include a zero tolerance for drugs and alcohol and random drug testing will be conducted on all personnel[...]" Refer to the Social chapter (Section 24.8.5) of the EIS.
S19	379	The proponent should consider a behavioural code as part of an individual's employment contract to highlight and emphasise community concerns held around temporary camps.	Social chapter (Section 24.8.5) of the EIS	Arrow will ensure that "all direct employees and contractors adhere to the Code of Conduct and that disciplinary procedures for inappropriate behaviour of employees will be documented; Code of Conduct will include a zero tolerance for drugs and alcohol and random drug testing will be conducted on all personnel" (refer to the Social chapter (Section 24.8.5) of the EIS.
S20	385	Skills Queensland supports the commitments the proponent has detailed to address workforce needs and would seek: • further consultation on skills and labour requirements as contractors are appointed and the number of facilities and wells are determined; and • continued relationships with ESQ, CSQ and Manufacturing Skills Queensland to identify gaps in occupational areas and strategies to ensure Queenslanders are provided with employment opportunities.	Community Consultation chapter (Section 5) and Social chapter (Section 24.8.5) of the EIS	Arrow will maintain consultation with Skills Queensland and other relevant stakeholders as more detailed workforce/contractor information is determined.
S21	386	According to Table 5 "Indicative Field Development Timing for Reference case", ATP 1025 within the Central Highlands Regional Council is to be developed in 2033-2037 (Development Area 19) and 2048-2052 (Development Area 20). This is a considerable time into the future and beyond Council's planning horizon.	Community Consultation Report (Appendix A) of the SREIS	Arrow will continue consultation with Central Highlands Regional Council (CHRC) regarding plans and programs for ATP 1025 as the Project progresses. Engagement is a high priority for Arrow and it will continue to be implemented throughout the Project development

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		Submitter recommended that: Arrow Energy continues to inform Central Highlands Regional Council of its plans and programs for ATP1 025, particularly if activities are to be brought forward, delayed or other significant project variations.		process as outlined in the Community Consultation Report (Appendix A) of the SREIS.
S21	387	The timing of the project may lead to impacts on the town of Blackwater in relation to the siting of temporary and permanent workforce accommodation to deliver that portion of the project within CHRC. Submitter recommended that: Arrow Energy maintains contact with Central Highlands Regional Council and monitor the population size and composition across the region to assess potential impacts on Blackwater and possibly other towns in close proximity in the region.	General Comment	Arrow will continue communication with CHRC regarding population size across the region as the Project progresses.
S21	389	The utilisation of CHRC Community Plan 2022 is acknowledged and the preparation of a SIMP is commended. Submitter recommended that: Arrow Energy to engage with CHRC to develop suitable monitoring systems to inform their mitigation strategies. Arrow is encouraged to continue to develop its mitigation strategies utilising best practice social impact assessment techniques. Annual meetings with the CHRC Community Development Unit (at a minimum) can assist Arrow Energy with on-going and up-to-date community feedback on local issues and opportunities to inform Social, Economic and Environmental mitigation strategies for Blackwater community and the Central Highlands Region.	Social chapter (Section 24.8.5) of the EIS	Arrow will continue to engage with CHRC regarding social mitigation and management strategies, and will utilise the assistance offered by the CHRC Community Development Unit. "The SIMP is a live document, which can be updated and adjusted as the environment and Project change and impacts become apparent. As a result, the SIMP will be used to manage residual impacts into the future" (refer to the Social chapter (Section 24.8.5) of the EIS).
S21	390	Regional Community Consultative Committee CHRC will nominate a Councillor or staff member to participate on the Regional Community Consultative Committee. Issues and opportunities can be discussed at this level: • Transport		Noted

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		• Health • Housing • Accommodation • Training • Employment • Small business and supply chain • Environmental This provides the opportunity to aggregate topics to a regional level that cannot be successfully addressed at a more local level.		
S21	392	Increased training and skill development opportunities for the local population Submitter recommended that: Explore the opportunity to utilise education and training facilities in the Central Highlands to support the upgrade of innovation in the education sector in regional/rural Queensland. Emerald has well-established tertiary education facilities with CQ University campus, Australian Agricultural College and Queensland TAFE College. For example the Agricultural College can support rural landholders with farming and grazing programs and training to up-skill for employability for the gas sector, thereby providing additional income streams for land holders. These institutions are really to be utilised as soon as possible, which provides a training advantage to the industry and the opportunity to support state of the art teaching facilities in the future. Comments: Expanding the Brighter Futures Program and the Social Investment Plan is positive for local communities Positive initiative for Arrow Energy to employ Land Liaison Officers and Community Officers for ongoing discussions for landholder and	Social chapter (Section 24.8.4) of the EIS	Arrow will investigate opportunities to utilise facilities in the Central Highlands for education, training and skills development. The Social chapter (Section 24.8.4) of the EIS presents positive and medium level impacts on the study area with regards to skills development and training.

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		residents' concerns.		
S21	393	Continue to increase the cultural diversity of FTE population in the region Submitter recommended that: Perhaps there is an opportunity to link with CHRC Community Development Unit to support cultural diversity programs for the broader community to ensure community perceptions are informed	SIMP (Appendix N, Section 2.2) of the SREIS.	Arrow proposes to participate in a RCCC if applicable to the region, with membership extended to key stakeholders. Refer to the SIMP (Appendix N, Section 2.2) of the SREIS. Arrow will include the CHRC Community Development Unit as a stakeholder in the RCCC.
S21	394	Consider establishing a School Based Apprenticeship and Training (SAT) Program for Year 11 & 12 similar to Moranbah in other project areas in the Bowen Basin. Submitter recommended that: SAT Program support for Blackwater State High School would be positive.	SIMP (Appendix N, Section 2.3) of the SREIS	Arrow has an established School Based Apprenticeship and Training program in Moranbah, and will consider establishing a School Based Apprenticeship and Training (SAT) program similar to that run in Moranbah in other projects areas within the Bowen Basin (refer to the SIMP (Appendix N, Section 2.3) of the SREIS).
S21	395	Continue to use Industry Capability Network (ICN) database for potential suppliers in the area. Submitter recommended that: Explore the opportunity to support Blackwater SME's (supply chain and other retail) to improve their economic viability and increase employment options (other than gas and mining) to enhance liveability. Promote ICN to local businesses, registration requirements and business planning to enable businesses to meet ICN standards.	Social chapter (Section 24) of the EIS	Arrow will continue to use the ICN, and will encourage use of the ICN to businesses in Blackwater due to its proximity to the Project.
S21	396	Consult with Council for their views on which social, community or recreational infrastructure in the IRC or CHRC is being directly impacted by the project and to what extent. Liaise with the relevant body to coordinate efforts across all proponents and identify opportunities that may potentially ease or mitigate impacts. Submitter recommended that: As highlighted above can be achieved through regular meetings with CHRC	Social chapter (Section 24.5.7) of the EIS	Arrow will continue to consult with IRC and CHRC with regards to social and community values that may be impacted by the Project. Arrow has established a community consultation program that will be ongoing. Phase 1 and 2 were undertaken as part of the EIS and post-EIS process. "Once Phase 3 consultation is complete, and if a final investment decision to proceed is made by the joint venture

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				partners, Arrow will develop and maintain community relationships and liaison during the construction, operation and decommissioning stages of the Project. This will be achieved through a comprehensive and ongoing communications and engagement plan, which addresses community expectations" (refer to the Social chapter (Section 24.5.7) of the EIS).
S21	397	Encourage employees and contractors to integrate and become involved in local community (e.g. volunteer work, participation in clubs and organisation). Submitter recommended that: CHRC welcome this initiative and support employee's assistance with gaining volunteer blue cards registration	Social chapter (Section 24) of the EIS	Noted
S21	398	Develop and promote workers with an induction and welcome kit which includes a statement of community expectations for new arrivals. Where FIFO workers come from overseas, ensure they are provided with an adequate Australian cultural awareness briefing and information on how to undertake day to day activities, for example banking or shopping. Submitter recommended that: A positive initiative and CHRC can assist with direction to promotional packs and welcome packs to support and promote the tourism activities in the region to interstate and overseas. The volume of this promotion material requirements may be beyond Council's budget so an opportunity to support this activity and invest could be discussed further.	Social chapter (Section 24) of the EIS	Noted. Arrow will communicate with the CHRC regarding promotional and welcome packs to support and promote the region to overseas workers and visitors.
S21	399	Arrow will consider provision of a medivac service to respond to various Project related emergency situations in consortium with other proponents.	Social chapter (Section 24) of the EIS	As the Project progresses, Arrow will continue to communicate with Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and Queensland Police Service in relation to the assessment of potential impacts and risk and

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				the provision of emergency services.
S21	400	**Proposed Workforce Profile** 100% of the construction workforce is likely to be non-residential based on Arrow's market experience in Queensland Reference to 12 hour shifts on a 20 days on, 7-days off roster for construction. Submitter recommended that: CHRC would encourage the opportunity for the company to consider supporting those workers who prefer to live in Blackwater or local communities, especially those with small families. This will support population growth in surrounding smaller communities. CHRC would encourage consideration of operational roster to encourage people to live locally and contribute to volunteer programs. There may be a need to also consider the social impacts on source communities as part of ongoing social investment programs.	Social Technical Report (Appendix M, Section 3) of the SREIS	A revised Accommodation Strategy has been developed and is presented in the Social Technical Report (Appendix M, Section 3) of the SREIS. Arrow has a preference to recruit locally.
S21	401	**Existing Social Management Commitments and Activities** Indigenous Participation Submitter recommended that: CHRC view as positive the intent to broaden this employment participation to community programs with schools and healthy lifestyle programs	Social chapter (Section 24) of the EIS	Noted
S23	405	The proposal is completely devoid of any meaningful local social mapping in the inception and design of the project and acts in isolation	Social Technical Report (Appendix U, Section 4) of the EIS	The Social Technical Report (Appendix U, Section 4) of the EIS presents a comprehensive social baseline description for communities within the study area. It is not a requirement of the ToR, nor is it warranted, to undertake more detailed household surveys to further characterise the potentially impacted communities.
S23	406	Not meaningfully addressed in EIS: The local impact of the proposal is unable to be attained due to the	Social chapter (Section 24),	The potential impact of the Project is described in the Social chapter (Section 24), the Economics chapter

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		absence of any socio-economic impact analysis and connection with the resident population present either rural or urban.	Economics chapter (Section 25) and Social Technical Report (Appendix U) of the EIS SIMP (Appendix N) of the SREIS	(Section 25) and the Social Technical Report (Appendix U) of the EIS and the Social Impact Management Pan (Appendix N) of the SREIS. This fully describes the impacts on communities. Impacts on individual landholders are described in general, but specific details are subject to confidential land access agreements that comply with the *State Government Land Access Code* (November 2010).
S23	408	Not meaningfully addressed in EIS: The assessment of the project has avoided any meaningful assessment of liveability and hides behind the FIFO model and clearly underestimates and denies the connection to place that will occur with the regional locality where in excess of 3 generations of workers will actively engage with the project from commencement to rehabilitation closure.	Social Technical Report (Appendix U, Sections 5.2.1 and 6) of the EIS	The Project has adopted a FIFO model of operation to both secure the workforce required and to minimise impacts on the liveability of local communities. There will be a Code of Conduct that applies to the workforce to ensure that the use of FIFO does not compromise community liveability. The Project has a preference to source operational staff from nearby communities. The Social Technical Report, (Appendix U, Section 5.2.1) of the EIS details the preferred hierarchy of communities. FIFO workers would not be disadvantaged should they wish to transfer to a residential model of employment as Project implementation proceeds. The Social Technical Report (Appendix U, Section 6) of the EIS includes material that contributes to a meaningful assessment of the potential Project impacts on components of community liveability.
S23	419	The EIS should address the process of the social impacts from the change in operational work method of operating transitional work forces and not housing workers locally. The social impacts of isolated workers and fragmented caring arrangements for families is unsustainable over the project time line.	Social Technical Report (Appendix U, Sections 6.7.6	The Social Technical Report (Appendix U, Section 6.7.6) of the EIS details a range of mitigation measures aimed at mitigating any potential social impact on communities stemming from the use of a FIFO workforce model. The Social Technical Report (Appendix U, Section 6.8.6) of the

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			and 6.8.6) of the EIS	EIS acknowledges employee well-being as an issue, and proposes measures to address this aspect of employee management.
S23	420	The EIS SIMP should be developed up front of the project and include information and responses on the impact anticipated from proposal and cumulative effects as this is fundamental to a long-term sustainable regional population to underpin a locally resident skilled workforce for the existing agricultural industries.	SIMP (Appendix N, Section 2.2 and 2.6.5) of the SREIS	Arrow proposes to participate in a RCCC if applicable to the region, with membership extended to key stakeholders from State and local government, community and business organisations, service providers, industry peak bodies and other resource companies, in order to effectively and proactively plan for and respond to challenges resulting from cumulative impacts of the Project. The RCCC would provide oversight of implementation of the social impact mitigation/enhancement and management strategies outlined within the final SIMP. Following consultation on the draft SIMP, Arrow would define the ToR and its resourcing commitments for the RCCC, and propose any alternative models to its structure as agreed upon through consultation. Options may include linkages with other planning and consultation mechanisms being established across the Bowen Basin and CSG industry leadership groups.
S23	428	The proposed workforce employment suggestion of regional and local employment options is intrinsically undermined by the 100% FIFO model. This contradiction clearly undermines the integrity of the EIS and limits the future opportunities for sustainable regional employment over many generations attached to this project. This model of exporting economic development undermines the local regional economy and weakens the opportunity for a sustainable and resilient Isaac Regional Council.	Social Technical Report (Appendix U) of the EIS SIMP (Appendix N) of the SREIS.	The EIS does not propose a 100% FIFO workforce model. A number of mitigation measures are proposed in the SIMP (Appendix N) of the SREIS for potential impacts from the prosed FIFO / DIDO / local workforce balance.
S23	429	The EIS Social Impact Assessment proposes to discourage locally based regional employment opportunities. Why has the EIS not considered regionally grown workforces to diversify and develop	Social Technical Report	The EIS does not propose discouragement of locally based regional employment opportunities.

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		employment resilience and integration with local skilled training solutions? This in turn would develop and enhance locally based skilled contracting workforces to minimise breakdown repair delays. The EIS fails to address this local opportunity to develop a highly skilled intergenerational workforce to sustain the investment over the project life.	(Appendix U) of the EIS SIMP (Appendix N) of the SREIS	"Arrow's preference is to source staff from the local region. However, "due to existing low unemployment rates and the high demand for workers by development projects across central Queensland, Arrow has estimated that the majority of the construction workforce will be sourced from outside the area" (refer to the SIMP (Appendix N, Section 2.3) of the SREIS). Arrow is a strong supporter of local content for employment and has a number of programs running to this end, including a local content management program based in Moranbah.
S23	430	It is of fundamental concern to Council and the wider community that realistic integrated employment and skills development solutions have not been presented or developed as part of the Proposed Project EIS or social impact assessment. This in turn would substantially enhance the positive management of fatigue in the operational workforce for the project.	Social Technical Report (Appendix U, Section 6.5.5) and Health and Safety chapter (Section 30.4.2) of the EIS	The Social Technical Report (Appendix U, Section 6.5.5) of the EIS presents information on proposed Workforce Development Strategies, including for locally-based persons and for Aboriginal and Torres Strait Islander people. The management of fatigue in the workforce is addressed in Health and Safety chapter (Section 30.4.2) of the EIS and in the SIMP (Appendix N, Section 2.3) of the SREIS.
S23	432	The EIS should deliver a SIMP for the proposed temporary construction camps as these facilities will have lasting negative effect on the local community from the outset of the project and promote decline in regional populations.	Social Technical Report (Appendix U, Sections 5.3 and 6) of the EIS Social Technical	The Social Technical Report (Appendix M) of the SREIS comprehensively describes the circumstances surrounding the establishment of TWAFs, estimating the size and general location of each facility. Criteria to be used for selecting the final location of each facility are also described. This information, combined with information on the likely staging of TWAF construction and operations directly influence the subsequent impact assessment (see Social Technical Report (Appendix U, Section 6) of the

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			Report (Appendix M) of the SREIS	EIS). There is no evidence that use of TWAFs has promoted 'decline in regional populations'.
S23	433	The EIS presented for consideration does not reflect sufficient detail surrounding social norms of the 457 visa international recruitment solution where Equal employment opportunities exist for Women in management positions, Safety of Women (perception), Capacity to deliver appropriate cultural requirements in an isolated location.	Social Technical Report (Appendix U, Section 5.2) of the EIS SIMP (Appendix N, Section 2.3) of the SREIS.	"Arrow has a workforce Code of Conduct which applies to all employees and will apply to the Bowen Gas Project. Key aspects of the Code of Conduct that relate to this social impact assessment are: • Equal Employment Opportunity (EEO);" (Refer to the Social Technical Report (Appendix U, Section 5.2) of the EIS). Since 2011, Arrow has made it mandatory for all employees to undertake cultural awareness training. Refer to the SIMP (Appendix N, Section 2.3) of the SREIS.
S23	434	Council recognises development of social impact strategies have not been completed and this is a fundamental flaw in the EIS, significantly compromising positive outcomes. Will they be recognised and monitored by Department of Environment and Heritage's office over the life of the project, will they focus on developing intergenerational partnerships and a regionalised methodology?	SIMP (Appendix N, Section 2) of the SREIS	Action Plans (see the SIMP (Appendix N, Section 2 of the SREIS) provide indicative mitigation and enhancement measures to manage potential social impacts. The ToR requires the development of a draft SIMP to be a process that is informed by a program of engagement with key stakeholders, which includes the IRC and CHRC. Further development of the SIMP will provide opportunities to assess the potential for regional partnerships and to refine implementation methodologies.
S23	436	The location of a considerable workforce population out of established urban centre exposes the project resilience to substantial risks associated with medical, ambulance services and the business services associated with the population density referenced.	Social chapter (Section 24.8.6) of the EIS	Arrow notes that the location of TWAFs during construction outside of regional centres and proximal to worksites is necessitated to reduce the risks associated with driver fatigue. Recognising the concerns around workforce health in accommodation camps, Arrow will "Develop a Workforce Health Management Plan that reduces Project employee use of local health services and improve the workforces health through:

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				• developing an employee wellbeing program that monitors the mental and physical health of employees and contractors. • employee and contractor inductions to include the clinical service capability framework of local health services; • provide Queensland Health and other health service representatives with expected workforce numbers in a timely manner; • consideration of workforce health issues in health, safety and environment (HSE) planning; • consider linking with existing men's health service providers and programs in the region; • consideration of provision of an on-site health service for the workforce in TWAFs of a certain size and liaison with emergency services and Queensland Health in the planning of this facility; • health promotion through information and educational tools on the issue of healthy eating; • promote alternative education and alcohol-free recreational activities for NRW outside working hours; and • consideration of medical contractors openly communicating with community health service providers, diagnostic services and allied health services." Refer to the Social chapter (Section 24.8.6) of the EIS.
S23	437	Under the present proposed state transitions to new legislation, what is the obligation to fulfil SIMP obligations by the proponent. This is not	SIMP (Appendix N)	Although there has been a transition from legislative SIMPs, Arrow has committed to the implementation of the

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		referenced in the EIS documentation at any point.	of the SREIS	SIMP in compliance with the ToR for the Project.
S23	442	Strategic Planning: At the point of proposal the workforce is 100% FIFO-DIDO. Is there an opportunity to change this in the future? What is the likelihood of change and normalisation and integration of the long-term workforce in the region to build skills resilience and economic security?	Social Technical Report (Appendix U, Section 6.5.5) of the EIS SIMP (Appendix N, Section 1.2.7) of the SREIS	The EIS considered a worst-case scenario at the time of writing. As a result of labour market conditions, the scenario assumed a 100% FIFO-DIDO workforce based on extremely low unemployment in the Project area. Arrow's hierarchy of preferred employment and contractor candidates is as follows: • Local (Moranbah, Blackwater, Dysart, Glenden, Middlemount); • Regional (Nebo, Emerald, Clermont, Mackay, Rockhampton); • State/Interstate Other regions of Queensland and Australia); and • Overseas. Refer to SIMP (Appendix N, Section 1.2.7) of the SREIS. The Social Technical Report (Appendix U, Section 6.5.5) of the EIS presents information on proposed Workforce Development Strategies, including for locally-based persons and for Aboriginal and Torres Strait Islander people. Arrow is a strong supporter of local content for employment and has a number of programs running to this end, including a local content management program based in Moranbah.
S23	443	Strategic Planning: With FIFO and DIDO some families will move to the Isaac region to be closer. Will the accommodation model allow for families to visit and will it be family friendly?	Social chapter (Section 24) of the EIS	It is not anticipated that family visitation is a part of a TWAF design criteria. For workers who will move to the region Arrow provides onboarding support to workers and thier families.
S23	444	Strategic Planning: What is the strategy to ensure the Isaac region has the capacity to	SIMP (Appendix N,	The strategy to manage social impacts in the Isaac region is addressed in the SIMP (Appendix N Section 2.6) of the

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		accommodate additional social impacts?	Section 2.6) of the SREIS	SREIS. Arrow is committed to participating in a RCCC that would oversee the implementation of the SIMP, including the adoption of community-acceptable impact mitigation strategies, as well as strategies aimed at capturing opportunities for the enhancement of community capacity.
S23	445	Strategic Planning: What will be the links between the accommodation and closest community over the project life?	SIMP (Appendix N, Section 2.2) of the SREIS	Most construction workers will be accommodated in TWAFs and will work days on / days off rosters, returning to their normal place of residence during days off. As the TWAFs will be self-contained and often located in remote sites, there will be limited opportunity for interaction between many workers and the general community. A smaller number of construction workers and operations staff who move to the area will however bring economic benefits to the community. Arrow will "Encourage employees and contractors to integrate and become involved in local community sporting and recreational activities" (refer to the SIMP (Appendix N, Section 2.2) of the SREIS).
S23	446	Strategic Planning: More detail on the structure of the workforce required to have meaningful comment in the social impact area. The present EIS is substantially devoid of detail as no backgrounding baseline data is provided.	Project Description chapter (Section 3.9) of the SREIS	Further detail on the structure of the workforce is provided in the Project Description chapter (Section 3.9) of the SREIS.
S23	447	Strategic Planning: More detail required on the scope of the permanent transient Master Plan for the project accommodation and the specific locations of services	SIMP (Appendix N) of the SREIS	As the Project progresses and workforce and infrastructure details are further defined, Arrow will update the SIMP with details on the scope of the permanent transient Master Plan.
S23	449	Strategic Planning: What are the proposed integration models with the existing local	Social Technical Report,	"Arrow is committed to working with other industries, government, and service providers to plan and share information relating to preferred growth patterns and

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		community in areas such as services and shops etc.?	(Appendix U, Section 6.3.3 and 6.4.3) of the EIS SIMP (Appendix N, Section 2.4) of the SREIS	managing potential impacts associated with any population growth or decline resulting from Project activities" (refer to the Social Technical Report (Appendix U, Section 6.3.3) of the EIS). "The Project will consider the appropriate siting of TWAFs to avoid pressure on community services and infrastructure" (refer to the Social Technical Report (Appendix U, Section 6.4.3) of the EIS and the SIMP (Appendix N, Section 2.4) of the SREIS).
S23	450	Strategic Planning: Is there the opportunity to develop more remote natural area tourism associated with the upgraded access provided to the project sites across the region?	Road Impact Assessment (Appendix R) and Roads and Transport chapter (Section 21) of the EIS	The development of strategies for nature tourism in the more remote areas, leveraging off the better access provided through Project-upgraded infrastructure, is the responsibility of the state and local governments working with the tourism business sector. Arrow will manage its impacts on roads in accordance with an RMP negotiated with the IRC.
S23	453	Strategic Planning: The report does not acknowledge that there will be a cumulative effect of the project development and will increase shortages in housing supply and decrease housing affordability in the long term.	Social Technical Report, (Appendix U, Sections 6.4 and 6.4.3) of the EIS Social Technical Report (Appendix M, Section 4.2.2) of the SREIS	The Social Technical Report (Appendix U, Section 6.4) of the EIS addresses Housing and Accommodation impacts. It indicates that accommodating workers in TWAFs will assist in managing negative impacts on the affordability of housing in local communities. In the longer-term, it can be expected that the housing market will adapt to moderate any decrease in affordability due to short-term elevated demand. Arrow has committed (see Social Technical Report (Appendix U, Section 6.4.3) of the EIS) to participating with State and Local Government, Industry and other project proponents in developing a better understanding of cumulative housing demand, and to examine opportunities to invest in the Isaac Affordable Housing Trust in

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				consultation with the IRC should its operations contribute to housing stress in the region. The Social Technical Report (Appendix M, Section 4.2.2) of the SREIS provides an update on housing costs and affordability in Project area communities.
S23	454	Socio-economic and cumulative: No comprehensive social mapping appears to have been conducted as part of the Project EIS	Social Technical Report (Appendix U, Section 4) of the EIS	The Social Technical Report (Appendix U, Section 4) of the EIS presents a comprehensive social baseline description for communities within the study area. It is not a requirement of the ToR, nor is it warranted, to undertake more detailed household surveys to further characterise the potentially impacted communities.
S23	455	Socio-economic and cumulative: Without Social Mapping it is near impossible to determine the true impacts on local and rural roads which differ greatly to main arterial highways and connection roads. A local and rural road may only be classified for maintenance (grading) once every two years. An additional few cars per week could potentially double the traffic experienced on that road, theoretically doubling its rate of decline and increasing its maintenance requirements. This is a significant additional cost incurred by Council to which they will not receive additional funding to effectively manage. Will Arrow Energy take proactive steps with IRC representatives to ensure 'at-risk' roads are identified ahead of time to proactively manage complaints and damage and develop more adequate maintenance programs?	Road Impact Assessment (Appendix R, Section 10) and Roads and Transport chapter (Section 21) of the EIS	The impact of the Project on local roads has been assessed comprehensively in the Road and Transport Technical Report (Appendix R, Section 10) and Roads and Transport chapter (Section 21) of the EIS and describes the components of a RMP to be developed in consultation with relevant stakeholders including the IRC. Concerns in regard to the need to ensure that 'at-risk' roads are identified early would be addressed in the development of the RMP.
S23	456	Socio-economic and cumulative: How will mitigation efforts be determined for each community of interest? • How will efforts be fair and consistent but tailored as necessary? • How will impacts and outcomes be measured cumulatively across	Cumulative Impacts chapter (Section 31) of the EIS SIMP	The strategy to manage social impacts in the Isaac region is addressed in the SIMP (Appendix N, Section 2.6) of the SREIS, which commits Arrow to participating in a RCCC that would oversight the implementation of the SIMP including the adoption of community-acceptable impact mitigation strategies, as well as strategies aimed at

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		the Bowen Basin?	(Appendix N, Section 2.6) of the SREIS	capturing opportunities for the enhancement of community capacity. Through Arrow's participation in the RCCC the need to contextualise the SIMP to the needs of the communities of interest will be addressed and fairness ensured. The Cumulative Impacts chapter (Section 31) of the EIS commits Arrow to developing and incorporating inspection and monitoring programs into the Project's environmental management plan, in accordance with relevant State and Commonwealth approval conditions.
S23	457	Socio-economic and cumulative: What is the trigger for engaging with landowners and communities? Will the company wait for complaints or proactively seek to minimise impacts. For example, Rio Tinto Clermont mine hosts an Offsite Impacts Group (OIG) and proactively communicates with "Near Neighbours" to attempt to anticipate complaints or issues. How does Arrow Energy propose to independently validate land owner and community engagement?	Community Consultation chapter (Sections 5.2 and 5.7) of the EIS Community Consultation Report (Appendix A, Sections 2 and 3) of the SREIS	As stated in the Community Consultation chapter (Section 5.2) of the EIS, Arrow's Communication Program seeks to "Provide accurate, relevant and up-to-date information to stakeholders and the broader community". The Community Consultation Report (Appendix A, Sections 2 and 3) of the SREIS details the consultation undertaken during 2013 as part of the public exhibition and supplementary report preparation process. Further, Arrow has and "will continue to have community relations officers based in Moranbah to represent the company and the Project. This will provide a conduit for information flow to the community and enable community stakeholders to raise any issues or opportunities". Refer to the Community Consultation chapter (Section 5.7) of the EIS. Arrow has also committed to participation in an RCCC to ensure that active communication and information sharing anticipates emerging issues with the aim of avoiding adverse impacts.
S23	458	Socio-economic and cumulative:	Project Description	Arrow's hierarchy of preferred employment and contractor

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		Where will the 693 construction workforce be sourced? - Where will the accommodation camps be located? - Will there be one or several camps operational at one time? - Will Council be notified of these plans including changes, and accurate up to- date occupancy figures? - How will policies around length of commute and fatigue management be developed and will these be communicated with local government?	chapter (Section 4), Social chapter (Section 24) and Social Technical Report (Appendix U, Section 3.4) of the EIS	candidates is as follows: • Local (Moranbah, Blackwater, Dysart, Glenden, Middlemount); • Regional (Nebo, Emerald, Clermont, Mackay, Rockhampton); • State/Interstate Other regions of Queensland and Australia); and • Overseas. The Social Technical Report (Appendix M, Section 3.4) of the SREIS indicates that for accommodation camps "It is currently envisaged that purpose-built accommodation will be constructed as follows: • Two main villages located near CGPF1 and CGPF2, designed and built as permanent accommodation solutions. • In addition, and in an effort to minimise staff travelling time, several smaller temporary villages (currently estimated to be another four) are expected to be required when the facilities associated with the drainage areas furthest away from the CGPFs are under construction." "Small mobile camps to house drilling staff may also be required in a location central to the drilling activities." To limit fatigue, Arrow would like to achieve a maximum commute time of approximately 30 minutes to the work fronts. Arrow will notify council of the proposed location of camps, in compliance with relevant local planning provisions and will submit occupancy of accommodation facilities to the Government Statistician, as part of their annual non-

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				resident workforce survey.
S23	459	Socio-economic and cumulative: It was noted that emergency services will be notified of remote camps; as even small numbers of workers will contribute to the cumulative impact (which is currently significant) on regional emergency services, what is the contingency plan if services are unavailable?	Preliminary Hazard and Risk chapter (Section 27) of the EIS SIMP (Appendix N, Section 2.2) of the SREIS	Arrow is committed to providing a safe and healthy workplace, and the Health Safety and Environment chapter (Section 30) of the EIS has described the outline of the Health Safety and Environmental System operated by Arrow. Implementation of this system, and compliance with the legislation and regulatory requirements of the State and Commonwealth governments, require that Arrow plan for contingencies. The details of these plans will not be known until operational planning to define the size and location of TWAFs is completed. In addition, Arrow has committed to the following in regards to emergency services: • In accordance with Project requirements, an emergency management plan will be developed that will cover joint emergency response planning in collaboration with emergency service providers; and • Arrow will consider provision of a medivac service to respond to various Project-related emergency situations in consortium with other proponents. Refer to the SIMP (Appendix N, Section 2.2) of the SREIS.
S23	460	Socio-economic and cumulative: Will Arrow Energy also notify the Office of Economic and Statistical Research (OESR) of camp numbers and locations to ensure these are captured as part of the annual Bowen Basin Population Report	Social chapter (Section 24) of the EIS	Provision of the information on the location and size of camps will be provided to the Government Statistician upon request, as part of Arrow's implementation of the SIMP. Arrow works closely with Government regulatory agencies and has dedicated staff to ensure that effective communication with the agencies is undertaken continually.
S23	461	Socio-economic and cumulative: Similarly, will Arrow Energy take a leadership role in the roll out of CENSUS research. i.e.: ensuring their employees at remote sites are	Social chapter (Section 24) of the EIS	Arrow will support the dissemination of information on the ABS 5-yearly Census at the time through its staff information and communication processes.

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		given CENSUS forms, reminded and educated on how to properly fill them in, collect them and ensure they are given back to the government for collation?		
S23	462	Socio-economic and cumulative: How will agreements be made with the various affected local government areas? How will the Councils be communicated with? Must be fair and equitable, not just loudest voice or largest population.	Social chapter (Section 24) and Community Consultation chapter (Section 5) of the EIS	Arrow recognises local governments are key regional stakeholders, and all Arrow engagement with councils will be fair and equitable. This will be undertaken in line with Arrow's Engagement Program. However, Arrow is available to engage on important issues with local government stakeholders on an as-needed basis, regardless of the formal engagement program.
S23	463	Socio-economic and cumulative: What is the communications process in regards to spillage which may affect local landowners? If there are statutory requirements to report, this does not necessarily ensure the appropriate stakeholders will be notified.	Social chapter (Section 24) and Draft Environmental Management Plan (Appendix Z, Section Z.4.2.3) of the EIS	For all exploration and development activities, Arrow is legally bound to comply with the Queensland *Land Access Code* (November 2010) which establishes best practice guidelines for engaging with owners and occupiers of private land. Arrow is committed to cooperative relationships with landholders and has developed a set of 12 Land Access Rules to ensure compliance with the Code. The Code commits Arrow to 'Be responsible for all authorised activities and actions undertaken' by its 'employees and contractors', and to 'Rectify, without undue delay, any damage caused by the authorised activities' (refer to the Social chapter (Section 24) of the EIS). Furthermore, the draft Environmental Management Plan (Appendix Z, Section Z.4.2.3) of the EIS indicates that Arrow will "Develop and implement emergency response and spill response procedures to minimise any impacts that could occur as a result of releases of hazardous materials or any loss of containment of storage equipment [B084];"
S23	465	Socio-economic and cumulative:	Groundwater chapter	"If a landholder bore is ‘at risk’ of potential impacts and impaired capacity, or observes an impaired capacity in a

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		Will there be landholder notification when active water wells are within a certain radius of the proposed fracturing operations? (as per Alberta, Canada regulations)	(Section 14.10.2) of the EIS	bore due to Arrow's operations, then Arrow will undertake a bore assessment" - refer to Groundwater chapter (Section 14.10.2) of the EIS. Furthermore, the *Land Access Code* commits Arrow to 'Advise the landholder of the holder's intentions relating to authorised activities well in advance of them being undertaken'. This would capture the provision of advice on all activities occurring on the landholder's property, including the location of the activity.
S23	466	Socio-economic and cumulative: How will the fraccing and drilling processes be communicated to the public, local government or other stakeholders in a way that is easily accessible and in easy to understand terms?	Project Description chapter (Section 4) and Community Consultation chapter (Section 5.7) of the EIS	Fraccing and drilling processes will be communicated to stakeholders through Arrow's engagement program, including information sessions, displays, public notices, specific-issue briefings, one-on-one meetings and responses to email, telephone and written enquiries. Further, "Arrow will continue to have community relations officers based in Moranbah to represent the company and the Project" (refer to the Community Consultation chapter (Section 5.7) of the EIS).
S23	468	Socio-economic and cumulative: How will local procurement policies and processes be developed to target services or goods that can be sourced locally and regionally?	Economics Technical Report (Appendix T) and Economics chapter (Section 23) of the EIS SIMP (Appendix N, Section 2.4)	The potential for local procurement is dealt with in Economics Technical Report (Appendix T), and Economics chapter (Section 23) of the EIS. The Economics chapter (Section 23.7) of the EIS indicates that a social protection objective of the Project is to "Provide opportunities for local business to secure supply contracts for the Project." The Economics chapter (Section 23, Table 23-1) provides a comprehensive summary of the measures that will be used to work with local businesses who desire to participate in the Project's supply chain. The SIMP (Appendix N, Section 2.4) of the SREIS also includes an Action Plan to address Local Content that

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			of the SREIS	includes a commitment to adhere to the Queensland Resources and Energy Sector Code of Practice for Local Content and to implement the Project's AIPP (Australian Industry Participation Plan).
S23	471	Socio-economic and cumulative: Many of the mitigation efforts are identified as to "examine, develop or investigate" options. When will concrete social impact mitigation measures be developed and will they be done so in conjunction with local government and regional social or economic agencies?	SIMP (Appendix N) of the SREIS	Arrow is committed to working with local government and regional social and economic agencies. As economic conditions change, it is not advisable to develop 'concrete social impact mitigation measures' too far in advance of project commencement as they may need to be re-worked due to altered conditions at the time of project commencement. This uncertainty will be managed by maintaining engagement with the local government and key local stakeholders.
S23	472	Socio-economic and cumulative: It is common for SIMPs to address the "low hanging fruit" by putting in place programs that are easiest to address, or contribute funding to social infrastructure which has an ongoing impact through maintenance costs to local communities. How will measures be developed in conjunction with relevant government and stakeholders to ensure that the SIMP will actually mitigate relevant impacts of the project and complement other activities or programs in the region (to avoid duplication or unintended conflict with other programs)?	SIMP (Appendix N, Sections 2.2 and 2.6.5) of the SREIS	As indicated in the SIMP (Appendix N, Sections 2.2 and 2.6.5) of the SREIS it is Arrow's intention to support and participate in a RCCC. These forums, which are in place in the Surat Basin, are generally seen as an effective means of consulting with stakeholders to ensure that priority impact management measures are developed and implemented in a coordinated manner with existing or other proposed programs.
S23	473	Socio-economic and cumulative: When state requirements around SIAs or SIMPs undergo amendments, what will the company's commitment be to ensure that best practice in socioeconomic impact mitigation is achieved (not necessarily only what is legislative requirement)?	Social Technical Report (Appendix U) of the EIS Social Technical Report	Arrow is committed to managing the impacts attributable to the development of the Project in collaboration with stakeholders, irrespective of particular requirements of the State Government SIMP guidelines. Arrow's engagement with stakeholders in the further development of the draft SIMP will be guided by the recommendations of any revised SIMP guidelines that may be published. Further, Arrow's Social Technical Report (Appendix U) of

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			(Appendix M) and SIMP (Appendix N) of the SREIS	the EIS and Social Technical Report (Appendix M) and SIMP (Appendix N) of the SREIS have been developed in accordance with the Project ToR. Future changes to legislative requirements will not change the Project requirements that were set out in the 2012 ToR.
S23	474	Socio-economic and cumulative: Despite the fact that the SIA claims negative impacts will be "insignificant" it does not downplay the positive impacts, which would presumably be "insignificant" as well.	Social Technical Report (Appendix U) of the EIS	The Social Technical Report (Appendix U) of the EIS evaluates each impact attributable to the Project in accordance with its significance derived through the risk-assessment approach, evaluating the likelihood and consequence for each in a structured manner. The assessment of a negative impact as being 'insignificant' does not imply that the impact has been 'downgraded'.
S23	476	Socio-economic and cumulative: What will be the company's housing policy for workers living regionally? Many times internal policies through housing subsidies, allowances etc. can have a significant impact on the real estate market. What will be the commitment to ensure these and other internal policies reflect best practice?	SIMP (Appendix N, Section 2.1) of the SREIS	The approach to managing impacts on the housing sector in local communities is outlaid in the SIMP (Appendix N, Section 2.1) of the SREIS which is the Housing and Accommodation Action Plan. Temporary camps will be established which will act to mitigate demand, and subsequent rent inflation, in local markets. Arrow will also examine the option of contributing to the Isaac Affordable Housing Trust, and will participate actively in forums with State and Local Governments and the community to ensure that it remains abreast of any emerging issues in the housing area that may be either wholly or partially attributable to the development of the Project.
S23	477	Socio-economic and cumulative: It is identified that the company be implementing skills training programs, however, there must be alignment with housing strategy etc. If they are expecting more locals to be employed, how will impacts be reassessed on an ongoing basis to respond to changes in the workforce?	SIMP (Appendix N, Section 2.6) of the SREIS	Arrow recognises that workforces and employment markets are dynamic, continually changing in response to economic stimuli. It is for this reason that the SIMP acknowledges the requirement for impact management measures to be flexible and adaptable to meet local circumstances. The SIMP (Appendix N, Section 2.6) of the SREIS indicates that a monitoring plan will be established during further

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				development of the SIMP, and that impact management performance will be reported to the relevant regulatory authority as required.
S23	478	Socio-economic and cumulative: Training programs for skills directly related to the project may only be treating the symptoms of the impacts. A diversified skill base is necessary to retain population and ensure community capacity after the life of the project. For example, the Clermont Preferred Futures program in partnership with Rio Tinto implemented the Agricultural Department at Clermont State High School.	Social chapter (Section 24) of the EIS	Training programs linked to skills required by the Project directly address the creation of opportunity for local workers to secure work on the project if they so desire. It is expected that these opportunities will be long-term and will form part of any local diversified economic base. It is acknowledged that upgraded skills in other sectors (such as agriculture) may be a requirement for future diversified development. Entities responsible for skills development in these sectors will be eligible to approach the Arrow Brighter Futures Program with appropriately developed requests for funding support.
S23	479	Socio-economic and cumulative: How will impacts be addressed in the case of significant changes due to market forces, legislation or otherwise? For example, in the case of early decommissioning of the project.	Social chapter (Section 24) of the EIS	It is accepted that markets are dynamic and change continually in response to economic stimuli, and that for this reason impact management needs to be flexible and adaptable to meet local circumstances. Arrow has committed to monitoring the impacts of the project and to participating in regional consultative committees to ensure that local community concerns are given prime consideration when developing or modifying impact management measures. Closure and decommissioning planning will also incorporate input from RCCCs.
S23	480	Socio-economic and cumulative: The Social Investment Plan identifies "integration of employees"- How will this be done and why would it be expected that non-resident workers will be involved in community activities if there are already working long rosters?	SIMP (Appendix N) of the SREIS	The particular measures to encourage the engagement of employees with nearby communities will be considered in consultation with stakeholders during the further development of the SIMP. While some non-resident workers may not choose to engage with the local community, there are examples where non-resident workers avail themselves of the opportunity to engage in

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				sporting and other social activities.
S23	481	Socio-economic and cumulative: It is identified the company will look to participate in community events such as alcohol free social events or Men's Sheds. What will this achieve, directly related to project impacts? Will employees other than community relations staff or management actually attend? How will a culture of community or social responsibility be created when the workforce may be constantly changing? If these types of events are not participated in, how will it be measured whether the outcomes were achieved and what efforts will be made to address this?	Social chapter (Section 24) of the EIS SIMP (Appendix N) of the SREIS	Company supported participation in community events is a measure aimed at fostering a higher level of interaction between non-resident workers and those resident in local communities. Through a higher level of engagement, it could be expected that potential social barriers would be lessened, and local spend by employees may potentially be increased. The fostering of mutual understanding between non-resident workers and the local community is an important factor in avoiding potential social tension. This is an adaptive measure where the contribution to harmonious community relations will be monitored continually.
S23	482	Socio-economic and cumulative: It is identified the "residual impacts" will be mostly positive, as negative impacts will be mitigated through the SIMP, however it is not clear what the specific criteria of the SIMP actually are yet.	SIMP (Appendix N, Sections 2.1 to 2.5) of the SREIS	Action Plans in the SIMP (Appendix N, Sections 2.1 to 2.5) of the SREIS provide indicative mitigation and enhancement measures to manage potential social impacts. The ToR requires the development of a draft SIMP, and the EIS acknowledges that further development of the SIMP is based on a program of engagement with key stakeholders. Further development of the SIMP will provide opportunities to assess the potential for regional partnerships and to refine implementation methodologies.
S23	483	Socio-economic and cumulative: The Sustainable Resource Communities Policy is referenced, but it is no longer current- how will the company commit to best practice even when policy is not always relevant?	SIMP (Appendix N) of the SREIS	While Arrow is guided by current Government policies, it is not constrained to limit its guidance to those policies. Arrow maintains constant appraisal of leading practice policies and approaches to sustainable development at an international level, and is committed to leadership and the implementation of best practice in this regard. Accordingly, the SIMP will be an adaptive plan (refer to the SIMP (Appendix N) of the SREIS), which will be reassessed at regular intervals. Where policies become superseded, the

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				SIMP will adapt to satisfy requirements of new policies, procedures, legislation, etc.
S23	521	How will Arrow Energy address extreme development change in the immediate region?	Social Technical Report (Appendix U, Section 4.7.3) of the EIS.	The social impact assessment was undertaken based on population projections developed by the Government Statistician that indicated population and associated development is expected to continue to increase. This adequately satisfies the ToR for the Project. However, Arrow recognises that markets are dynamic and change continually in response to economic stimuli, and that for this reason impact management needs to be flexible and adaptable to meet local circumstances. Arrow has committed to monitoring the impacts of the project and to participating in regional consultative committees to ensure that local community concerns are given prime consideration when developing or modifying impact management measures.
S23	522	How does Arrow Energy ensure that local procurement remains a priority for the company regardless of Legislative requirements and changes over time?	Project Description chapter (Section 4.3.12), Economics Technical Report (Appendix T), and Economics chapter (Section 23) of the EIS	Regardless of legislative requirements, Arrow prefers to recruit its workforce from the local Project region wherever possible. Refer to the Project Description chapter (Section 4.3.12) of the EIS. Arrow is also committed to procure locally where possible, and has undertaken to assist the development of local business capacity to participate in the Project's supply chain. Arrow has developed a AIPP (Australian Industry Participation Plan) which is compliant with the *Queensland Resources and Energy Sector Code of Practice for Local Content* The potential for local procurement is dealt with in Economics Technical Report (Appendix T), and Economics chapter (Section 23) of the EIS. The Economics chapter (Section 23.7) of the EIS indicates that a social protection

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				objective of the Project is to 'Provide opportunities for local business to secure supply contracts for the Project.' The Economics chapter (Section 23, Table 23-1) of the EIS provides a comprehensive summary of the measures that will be utilised to work with local businesses who desire to participate in the Project's supply chain.
S23	526	If there is a transition from legislative SIMP's, what is the obligation of the company to fulfil commitments?	SIMP (Appendix N, Section 2.1 to 2.6) of the SREIS	Action plans in the SIMP (Appendix N, Section 2.1 to 2.5) of the SREIS provide indicative mitigation and enhancement measures to manage potential social impacts. The ToR requires the development of a draft SIMP, and Appendix N of the SREIS acknowledges that further development of the SIMP is based on a program of engagement with key stakeholders. Further development of the SIMP will provide opportunities to assess the potential for regional partnerships and to refine implementation methodologies. While Arrow is guided by current Government policies, it is not constrained to limit its guidance to those policies. Arrow maintains constant appraisal of leading practice policies and approaches to sustainable development at an international level, and is committed to leadership and the implementation of best practice in this regard. Accordingly, the SIMP will be an adaptive plan (refer to the SIMP (Appendix N, Section 2.6) of the SREIS) which will be reassessed at regular intervals. Where policies become superseded, the SIMP will adapt to satisfy requirements of new policies, procedures, legislation, etc.
S23	527	How does the creation of new remote transient accommodation footprints align with the aspirations of regional planning scheme?	Project Description chapter (Section 3) of	The nature of the development of coal seam gas resources over an extensive geographic area necessitates the development of TWAFs to both manage potential accommodation impacts on local communities, and to allow

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			the SREIS	for construction efficiency and the minimisation of local road impacts through avoiding unnecessary road trips between accommodation centres and work sites.
S23	528	Who do you define as the Arrow Energy community of interest for any community development fund programs?	Project Description chapter (Section 4) and Community Consultation chapter (Section 5) of the EIS Project Description chapter (Section 3) of the SREIS	Arrow plans to continue its ongoing engagement activities with local government, other project proponents, community organisations and other relevant stakeholders to better understand the social, community and recreational impacts within the Project area. Details on the Brighter Future program are available on the Arrow website, including information on criteria for funding, funds expended, processes for applying for funding and how often funding will be available for applications. All communitiy organisations in the footprint are able to apply for Brighter Futures funding. Information will also be provided on projects that receive funding or in kind support to offset or mitigate direct Project impacts.
S23	535	What are the implications of social isolation of the workforce and what is the mitigation strategies proposed?	Social Technical Report (Appendix M) and SIMP (Appendix N, Section 2.3) of the SREIS	The potential risks associated with individuals who are accommodated remotely are considered in the Social Technical Report (Appendix M) and the SIMP (Appendix N, Section 2.3) of the SREIS. In this regard, Arrow has committed to the following: • Provision of welfare and recreation facilities. • Provision of a counselling service (including drug and alcohol services*). • Implementation of a range of Arrow Energy policies including the OHS Policy, Drug, Alcohol and Contraband Policy, Duty to Stop Work Policy and Fit for Duty Policy.

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				• Enforcement of smoking regulations on site. • Restrictions on working hours to reduce worker fatigue. • Provision of nutritionally balanced food to all personnel living within construction camps in line with guidance issued by Queensland Health. *At all times Arrow's Drug, Alcohol and Contraband and Fit For Duty Policies will apply to the workforce whilst on Arrow sites and whilst engaged in Arrow work.
S23	541	Why is the opportunity not being given for DIDO/BIBO/FIFO from within the local region?	SIMP (Appendix N, Section 1.2) of the SREIS	Arrow's hierarchy of preferred employment and contractor candidates is as follows: • Local (Moranbah, Blackwater, Dysart, Glenden, Middlemount); • Regional (Nebo, Emerald, Clermont, Mackay, Rockhampton); • State/Interstate (Other regions of Queensland and Australia); and • Overseas. Refer to the SIMP (Appendix N, Section 1.2) of the SREIS. However, "due to existing low unemployment rates and the high demand for workers by development projects across central Queensland, Arrow has estimated that the majority of the construction workforce will be sourced from outside the area".
S23	542	Why is the option to FIFO from the Clermont airport not available or tabled for consideration in the EIS?	Social chapter (Section 24) of the EIS	Clermont airport (YCMT) is not a consideration. It does not provide adequate facilities to accommodate relevant flights.
S23	547	What is the workforce recreation strategy?	SIMP (Appendix N, Section 2.3)	Arrow will implement policies and programs to maintain the wellbeing of personnel (refer to the SIMP (Appendix N, Section 2.3) of the SREIS).

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			of the SREIS	
S23	551	What is the criteria/framework that constitutes the trigger for compensation and mitigation of off-site impacts of the proposal? How will this be independently monitored? Who is the independent authority for administration and reporting purposes?	Social chapter (Section 24) of the EIS	Social impacts almost invariably occur off-site and within local communities. The impacts are assessed and addressed through the development and implementation of the SIMP. The management of these impacts is considered by the Coordinator-General who makes recommendations in the Coordinator-General's Report, including for the auditing and reporting on the SIMP. Arrow will engage with local communities and stakeholders in the further development and implementation of the SIMP, including measures to monitor and report on the performance of impact management.
S23	553	What is State/Federal/Proponent expectations of economic, social, community development for the life of the project?	Economics chapter (Section 23.5) of the EIS SIMP (Appendix N) of the SREIS	Arrow, as the proponent, expects the Project to promote local socio-economic development that has been documented in the EIS, particularly in the Social and the Economic Technical Reports. Arrow has identified potential opportunities for local development, and is committed to working with local, State and Commonwealth Governments to ensure that local opportunities are captured to the extent possible. Expectations for social and community development over the life of the Project are outlined in the SIMP (Appendix N) of the SREIS. Projected economic development associated with the Project is outlined in Economics Impact Assessment chapter (Section 23.5) of the EIS.
S23	554	What is the mitigation strategy for housing market in the Isaac Region if population exceeds OESR high range projections?	SIMP (Appendix N, Section 2.1) of the SREIS	Arrow's approach to the management of housing impacts is presented in the SIMP (Appendix N, Section 2.1) of the SREIS. As shown in the SIMP, the state of the coal mining sector has the most significant influence on the housing

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				market, and Arrow has committed to monitoring the influence of its project on the market, and to working in concert with local and state agencies to understand and manage impacts.
S23	557	How will human services be provided to support the population and what will the State and Federal commitment be for services locally at a normal service interface?	SIMP (Appendix N, Section 2.2) of the SREIS	The provision of human services to support the residents of local communities in the Project area is, in general, the responsibility of local, State and Commonwealth Governments. Arrow takes responsibility for managing the impact of its Project through implementation of the SIMP (Appendix N, Section 2.2) of the SREIS, and is not able to provide commitments on behalf of any level of government.
S24	568	While the EIS recognises Mackay's role as a regional centre, it suggests that potential impacts of the proposed project will be minimal on the Mackay region, particularly in regard to impacts on regional infrastructure and community services. These potential impacts on the Mackay region should be reviewed.	Social Technical Report (Appendix U) and Indigenous Cultural Heritage Technical Report (Appendix W) of the EIS SIMP (Appendix N) of the SREIS	The potential impact of the Project is described in the Social Technical Report (Appendix M) and Indigenous Cultural Heritage Technical Report (Appendix W) of the EIS, and the SIMP (Appendix N) of the SREIS. These reports fully describe the impacts on communities, based on the provision of TWAFs to accommodate the construction and operations workforce. Furthermore, impacts will be managed and monitored through the development and implementation of a SIMP and participation in a RCCC. Impacts on regional infrastructure, particularly roads, will be managed through the development of RMPs with the responsible agencies. For these reasons, Arrow does not consider it warranted to undertake any further review of impacts on the Mackay Region.
S24	569	Due to the significant scale and extent of the proposed expansion of gas operations in the Bowen Basin, Mackay Regional Council would have an interest in reviewing future plans and strategies referred to in the EIS which relate to social and traffic impacts in the Mackay region, such as the Traffic Management Plan, Road Use	Community Consultation chapter (Section 5.2)	Engagement is a high priority for Arrow and it will continue to be implemented throughout the project development process as is outlined in the Community Consultation chapter (Section 5.2) of the EIS.

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		Management Plan, and the annual review of the SIMP.	of the EIS	Arrow will engage with relevant stakeholders with regards to Project impact management plans where they are relevant to their interests.
S26	574	Due to the extent of Aurizon's Central Queensland Coal Network and the number of potential interfaces with the Bowen Gas Project, Aurizon should be listed as a relevant stakeholder within the EIS due to the potential effects the project may have in regard to the rail network and the need for Arrow Energy to seek appropriate agreements for its gas transmission pipelines to cross the rail corridor. It is recommended that detailed discussions with Aurizon regarding potential interface issues relating to rail / gas pipeline construction, operations and adjoining landownership matters should be initiated.	Community Consultation chapter (Section 5.2) of the EIS	Engagement is a high priority for Arrow and it will continue to be implemented throughout the project development process as is outlined in the Community Consultation chapter (Section 5.2) of the EIS. Arrow will include Aurizon as a relevant stakeholder. As the Project progresses, Arrow will consult with Aurizon regarding potential interface issues relating to rail / gas pipeline construction, operations and adjoining land ownership matters.
S26	582	The Project area is identified as dominated by grazing and agricultural activity with other land uses including urban communities; coal mines; mining, petroleum and exploratory lease and permits; and conservation, tourism and recreational areas. It has been noted that rail infrastructure although present and planned throughout the Project area, has not been identified as an important land use. It is assumed that Arrow, through failure to recognise the rail networks throughout the Project area as an important land use, has not considered Aurizon to be a landowner requiring consultation in the development process. It is recommended that the EIS be amended to recognise rail infrastructure as an important land use and to reflect this in consideration of rail network operators as relevant landowners.	Community Consultation chapter (Section 5.2) of the EIS	Engagement is a high priority for Arrow and it will continue to be implemented throughout the Project development process as is outlined in the Community Consultation (Section 5.2) of the EIS. Arrow will include Aurizon as a relevant stakeholder. As the Project progresses, Arrow will consult with Aurizon.
S27	586	BMA believes it would be beneficial to preserve the opportunity to review and comment on future detailed field development plans proposed by Arrow to maximise the opportunity for effective coordination of activities. Specifically, BMA requests that the Department's project conditioning requires Arrow to: - Undertake mandatory pre-design notification and consultation with	General Comment	Arrow will continue to engage with BMA regarding Project development and timing, under Arrow's co-development plan.

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		BMA during the planning and assessment of field development plans for any possible operational, infrastructure or water management interaction which may occur adjacent to or overlapping BMA's tenures, owned land, operations or infrastructure.		
S29	590	Connection requirements: As the project is refined and energy needs are identified, the proponent should negotiate electricity supply arrangements (if required) by applying in writing to Ergon Energy, or by contacting Ergon Energy on 13 10 46. Should the development require permanent electrical distribution infrastructure for its ongoing operations (e.g. Switching stations, pad mounted transformers for valve stations, scraper stations, control centres or test points), early contact with Ergon Energy (i.e. prior to detailed design) can ensure any requirements are accounted for in a timely and efficient manner.	Project Description chapter (Section 4.3.5.1) of the EIS	"Arrow will work with the network service providers to establish, subject to availability and location, suitable 132 kV or 66 kV connections at new zone or local substations on Arrow's petroleum leases (PLs) in the vicinity of the major facilities to be developed" (refer to the Project Description chapter (Section 4.3.5.1) of the EIS).
S29	591	Encroachment and points of intersection: When available, detailed design plans should be provided to Ergon Energy illustrating the relationship between the proposed coal seam gas and ancillary infrastructure and the exact location of Ergon Energy poles and wires, identifying each point of encroachment or conflict. The proponent will be required to identify where (if anywhere) the relocation or replacement of poles is required.	Land Use and Tenure chapter (Section 19.4.5.4) of the EIS Commitments Update (Appendix O) of the SREIS	"During detailed design, Arrow will also liaise with Ergon Energy and Powerlink to ensure the final alignment surrounding power related infrastructure avoids any existing works. Safety aspects surrounding this element of the Project (e.g. setbacks) required under the *Electricity Safety Act 2002* will be administered by the EM Plan and Health Safety and Environment (HSE) Plan developed for the Project" (refer to Land Use and Tenure chapter (Section 19.4.5.4) of the EIS). Arrow will select locations for Project infrastructure with full consideration of and allowance for the minimum buffer zones indicated by the quantitative risk assessment and in consultation with authorities responsible for existing infrastructure provision [B476] (see the Commitments Update (Appendix O) of the SREIS).
S30	595	It is noted that the EIS, in section 19.3.3.6 and Appendix Q, Section	Land Use and	"During detailed design, Arrow will also liaise with Ergon

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		5, states that “Arrow will liaise with Ergon Energy and Powerlink” in regard to “power related infrastructure”. These statements should be amended to reflect the requirement for Arrow to consult with Powerlink where Arrows works are planned on or in the vicinity of Powerlink easements, sites or corridors using the processes described below.	Tenure chapter (Section 19.4.5.4) of the EIS Commitments Update (Appendix O) of the SREIS	Energy and Powerlink to ensure the final alignment surrounding power related infrastructure avoids any existing works. Safety aspects surrounding this element of the Project (e.g. setbacks) required under the *Electricity Safety Act 2002* will be administered by the EM Plan and Health Safety and Environment (HSE) Plan developed for the Project" (refer to Land Use and Tenure chapter (Section 19.4.5.4) of the EIS. Arrow will select locations for Project infrastructure with full consideration of and allowance for the minimum buffer zones indicated by the quantitative risk assessment and in consultation with authorities responsible for existing infrastructure provision [B476] (see the Commitments Update (Appendix O) of the SREIS).
S30	596	Powerlink will need to receive detailed engineering drawings for assessment and consent (or otherwise) of any works that are planned on or in the vicinity of Powerlink easements, sites and corridors. Powerlink will typically respond to such enquiries in 4 to 6 weeks from receipt of the full details in relation to such works, and will require that certain conditions be met as applicable to the proposed works.	Project Description chapter (Section 4) of the EIS	Arrow will engage with Powerlink Queensland in advance of any works that are planned in the vicinity of Powerlink easements.
S31	605	QCC maintains excellent relationships and a targeted approach with all of its stakeholders. QCC is concerned that lack of detail in stakeholder engagement strategies and poor relationships with affected stakeholders in the future could have an adverse impact on other mining companies relationships with stakeholders including landholders, native title and cultural heritage parties, the general public, media and the State and Federal Government.	Community Consultation Report (Appendix A) and Community Consultation chapter (Section 4) of the SREIS	Consultation is a high priority for Arrow and it will continue to be implemented throughout the Project development process as is outlined in the Community Consultation Report (Appendix A) of the SREIS. Further, Arrow has committed to "continue to have community relations officers based in Moranbah to represent the company and the Project. This will provide a conduit for information flow to the community and enable community stakeholders to raise any issues or opportunities."

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				Refer to Community Consultation chapter (Section 4) of the SREIS.
S31	606	QCC have just completed a comprehensive community engagement exercise in key towns in the heart of the Central Highlands region of the Bowen Basin, including Emerald and Blackwater. The results of our engagement lead us to believe that proponents need to be paying greater attention to rural communities and the potential impacts of their projects upon people, not just upon infrastructure and economies.	Community Consultation chapter (Section 4) of the SREIS	Arrow has and will continue to engage rural communities during implementation of the stakeholder communication strategies. Refer to Community Consultation chapter (Section 4) of the SREIS, which outline Arrow's approach to community engagement.
S31	609	QCC have attended the Arrow community consultation presentations and have met with Arrow to discuss the location of the proposed Arrow Bowen Gas Project and the Arrow Bowen Gas Pipeline. Arrow have confirmed that they will remove the Bowen Gas Pipeline off certain QCC tenements including, EPCs 1710, 1232 and 1805 and would provide written confirmation to that effect. QCC have provided a draft statutory declaration for execution to that effect, however Arrow have failed to respond to date.	Land Use and Tenure chapter (Section 19) of the EIS Community Consultation chapter (Section 4) of the SREIS	Arrow will continue communications with QCC regarding development on QCC tenements and will continue broader co-development discussions across all overlapping tenures between QCC and Arrow. The Bowen Gas Pipeline does not form a component of the Bowen Gas Project or this EIS.
S33	617	To achieve an outcome that is in the best interests of all stakeholders, including Arrow, Vale and the State of Queensland, Vale considers that consultation between the proponent and Vale should be made to minimise the potential sterilisation of coal resources and prevent the interruption of project schedules to both parties. Vale is ready and willing to work proactively with all stakeholders to achieve this outcome.	Project Description chapter (Section 4), Geology chapter (Sections 13.4.6 and 13.5) and Groundwater and Geology Technical	Under Arrow's co-development plan and overlapping tenure strategy, Arrow has and will continue to be in regular consultation with Vale during various stages of the Project to ensure minimisation of the potential sterilisation of coal resources. Arrow's approach to resource stewardship is provided in the Project Description chapter (Section 4), Geology chapter (Sections 13.4.6 and 13.5) and Groundwater and Geology Technical Report (Appendix L, Section 6.4) of the EIS. Consultation is a high priority for Arrow and it will continue to be implemented throughout the Project development

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			Report (Appendix L, Section 6.4) of the EIS Community Consultation Report (Appendix A) of the SREIS	process as is outlined in the Community Consultation Report (Appendix A) of the SREIS.
S33	642	Vale submission 2a; ToR 4.2.2.1 Arrow has referenced the potential impact on EPC holders, however at a very high level. They state that they will consult with EPC holders with regard to the placement of infrastructure and the timing of development to minimise the impact and sterilisation of coal resources. Vale stresses the importance of this engagement.	Project Description chapter (Section 4), Geology chapter (Sections 13.4.6 and 13.5) and Groundwater and Geology Technical Report (Appendix L, Section 6.4) of the EIS Community Consultation Report (Appendix A) of the SREIS	As the Project progresses, Arrow will consult EPC holders and other relevant stakeholders with regard to placement of infrastructure and timing of development, under Arrow's co-development plan. Arrow's approach to resource stewardship is provided in Project Description chapter (Section 4), Geology chapter (Sections 13.4.6 and 13.5) and Groundwater and Geology Technical Report (Appendix L, Section 6.4) of the EIS. Consultation is a high priority for Arrow and it will continue to be implemented throughout the Project development process as is outlined in the Community Consultation Report (Appendix A) of the SREIS. Arrow will continue to consult Vale during Project development.
S33	648	Parties have discussed the Bowen gas pipeline project and its	Community	As the Project progresses, Arrow will continue consultation

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		location but limited discussion on the gas project and it's interaction with Vale sites. Vale looks forward to continuing dialogue with Arrow on this matter.	Consultation Report (Appendix A) of the SREIS	with Vale with regard to the Project's interaction with Vale sites, under Arrow's co-development plan and overlapping tenure strategy. Consultation is a high priority for Arrow and it will continue to be implemented throughout the Project development process as is outlined in the Community Consultation Report (Appendix A) of the SREIS.
S53	1312	II refer to a report conducted by Dr Mariann Lloyd-Smith on CSG activity, a senior adviser from the National Toxics Network. I am deeply disturbed by this report and note this information has not been made transparent to the general public, and is clearly of public interest. This report is short and raises some serious concerns that relate to this proposal. An audible presentation can be found at the following link. http://www.youtube.com/watch?v=gz2mq5GYnR0 I would recommend the following information be presented to surrounding communities and landholders to ensure transparency of these concerns and allow the proponent to address them accordingly.	Community Consultation Report (Appendix A) of the SREIS	Arrow notes the concerns expressed by the submitter. Arrow also notes that the role of the Queensland Gasfields Commission pursuant to the Gasfields Commission Act 2013 include: • Reviewing legislation and regulation; • Obtaining and publishing factual information; • Identifying and advising on coexistence issues; • Facilitating better relationships and resolving issues; • Promoting scientific research to address knowledge gaps; and • Making recommendations to government and industry. For the purpose of managing and improving sustainable co-existence between landholders, regional communities and the onshore gas industry in Queensland.

21.11 Waste Management

Table 21-13 Waste Management Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	511	Natural Resource and Stock Route Impacts: What's the resilience planning for waste management and dump facilities	Waste Management chapter (Section 16.2) of the SREIS	Where reuse and recycling are not feasible, residual waste generated by the Project will be disposed to appropriately licensed waste disposal facilities developed and operated by third parties. A Waste Management Plan will be designed to avoid or minimise the potential environmental impacts associated with waste generation from the Project. Typically landfills operate on a commercial basis where fees are applied per tonne of waste accepted for disposal. This contributes toward the cost of disposal i.e. engineering, development, operation and maintenance over the life of the facility. Arrow has identified Stuart Landfill in Townsville as a waste disposal facility licensed to receive up to 200,000 tonnes of regulated waste or a combination of regulated waste and general waste per year. Potentially, this site would be suitable to receive the residual regulated and general waste streams from the Project, subject to further discussions with Townsville City Council. There are waste disposal facilities located closer to the Project area licensed to receive up to 50,000 tonnes of regulated waste, which may be preferable subject to their ability to accept the types and quantities of waste generated from the Project. Arrow will enter into negotiations with the relevant operators to identify that adequate facilities are available for Project waste. Arrow see potential for a third party landfill operator to take

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				advantage of a commercial opportunity to develop and operate a suitable engineered landfill on tenure or nearby to the Arrow Water Treatment Facilities to accept residual waste, potentially including regulated waste streams from the Project.
S23	548	What is the long-term recycling strategy including economic models proposed for wastes generated from the project?	Waste Management chapter (Section 16, Table 16-2) of the SREIS Waste Management chapter (Section 16, Table 16-3) of the SREIS	The waste strategy for the Project is outlined in the Waste Management chapter (Section 16) of the SREIS. Table 16-2 identifies the waste streams expected to be generated and their respective management measure. Where possible materials will be reused or recycled with residual waste sent to a licensed waste processing or disposal facility. A Waste Management Plan will be developed to avoid or minimise the potential environmental impacts associated with waste generation from the Project.
S38	703	Health: The CSG industry has proposed “beneficial use” of its produced water following treatment via reverse osmosis. Strict quality controls have to be used with reverse osmosis to ensure the treatment works effectively. It is also an expensive process so there will be the temptation to cut corners. The real question is how does this industry propose to dispose of the enormous amounts of salt and other toxics that will be filtered out using reverse osmosis?	Waste Management chapter (Section 16.2) of the SREIS	Arrow has assessed the feasibility of beneficial use of salt generated from the Project in accordance with the hierarchy for the management of brine and salt set out by the EHP CSG Water Management Policy (2012) and Arrow's Corporate CSG Water and Salt Management Strategy (2013). Due to the relatively low volumes of coal seam gas water and therefore salt produced by the Project, beneficial use is currently deemed not to be economically viable and has been ruled out of the Project design at this time. In accordance with the EHP CSG Water Management Policy (2012), having assessed that beneficial use is not viable; Arrow will dispose of waste salt concentrate from the reverse osmosis process to a suitably licensed landfill. Monitoring of the WTF operation and effectiveness will be

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				undertaken in accordance with the EHP CSG Water Management Policy 2012 and Arrow Management procedures and plans. Arrow has identified Stuart Landfill in Townsville as a waste disposal facility licensed to receive up to 200,000 tonnes of regulated waste or a combination of regulated waste and general waste per year. There are waste disposal facilities located closer to the Project area licensed to receive up to 50,000 tonnes of regulated waste, which may be preferable subject to their ability to accept the types and quantities of waste generated from the Project. Arrow will enter into negotiations with the relevant operators to identify that adequate facilities are available to take the Project's waste. Disposal of the waste salt concentrate to landfill is not expected to commence until approximately 30 years after commencing water production. Arrow expect a third party landfill operator will take advantage of the commercial opportunity to develop and operate a suitable regulated waste facility local to the Arrow Water Treatment Facilities.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49	745 789 833 877 921 965 1009 1053 1097 1141	Arrow is unable to direct landholders to any specific study conducted by Arrow (and provide the results and findings of such in any detail in the EIS) to support Arrow's proposition that a commercially viable beneficial reuse option for its waste product (Salt Recovery) presently exists or will become available at the scale of the Project proposed.	Project Description chapter (Section 3.5.6) and Waste Management chapter ((Section 16.2) of the SREIS)	Arrow has assessed the feasibility of beneficial use of salt generated from the Project in accordance with the EHP CSG Water Management Policy (2012) and Arrow's Corporate CSG Water and Salt Management Strategy (2013) hierarchy for the management of brine and salt. Due to the relatively low volumes of coal seam gas water and therefore salt produced by the Project, beneficial use is currently deemed not to be economically viable and has been ruled out of the Project design at this time. In accordance with the EHP CSG Water Management Policy (2012), having assessed that beneficial use is not viable; Arrow will dispose of waste salt concentrate from the

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S50 S51 S52	1185 1229 1273			reverse osmosis process to a suitably licensed landfill. Stuart Landfill in Townsville City Council is licensed to receive up to 200,000 tonnes per year of regulated waste or a combination of regulated waste and general waste. It is noted that there are several other landfills located in closer proximity to the Project area, which would be preferable to transporting the waste to Townsville, subject to their suitability to accept the types and quantities of waste generated from the Project. Disposal of the waste salt concentrate to landfill is not expected to commence until approximately 30 years after commencing water production. Arrow expect a third party landfill operator will take advantage of the commercial opportunity to develop and operate a suitable regulated waste facility local to the Arrow Water Treatment Facilities.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	46 790 834 878 922 966 1010 1054 1098 1142 1186 1230 1274	At page 18/24 of the Technical Report under reference Arrow states there are no known suitable target formations within Arrows Operational Areas capable of disposal of brine by injection. Accordingly Arrow's Project cannot sustain brine injection as a base case disposal method so Arrow's inclusion of brine injection as part of the hierarchy of brine management is not sustainable and in fact misleading.	Project Description chapter (Section 3.5.5.2) of the SREIS	Disposal of brine via injection is only an option if a suitable formation can be identified. This option was considered as part of the EIS assessment; however since then, no such suitable formation has been identified in the Project development area and therefore injection as a disposal option has been ruled out for the Project going forward.

21.12 Land Use and Tenure

Table 21-14 Land Use and Tenure Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	2	Regional services: Omission of: • the existing economic value and contribution that agriculture makes within the region affected by Project related activities; and • the potential impacts the Project could have to agricultural productivity across the region as a result of Project related activities (as detailed in s19.4.1, p19-24). This section should provide detail on: • the existing economic value and contribution that agriculture makes within the region affected by Project related activities; and • the potential impacts to agricultural activities and include the proposed mitigation measures in Box 16 on p43.	Executive Summary (Section 6.16) of the EIS	Potential Impacts and mitigations related to agricultural land uses are addressed in the Land Use and Tenure chapter (Section 19.6.5) of the EIS and supplemented in the Land Use and Tenure chapter (Section 13) of the SREIS. This assessment has been undertaken in accordance with the Terms of Reference (ToR) for the Project and CSG industry.
S1	12	Animal industries / regional services / biosecurity Queensland: The grazing industry is concerned that vital stock routes may be compromised by limiting access. The routes are vital pathways particularly during times of drought for producers to move cattle and obtain feed. The EIS should confirm the current status of Stock Route Network infrastructure (e.g. watering points, bores, windmills and holding yards etc.) located within the Project area and where impacted upon by the Project, maintain at a useable standard or provide substitute facilities. The Project should not restrict the access of stock to this infrastructure, nor should it impede the movement of stock in and through the Project area when utilising the route network.	Land Use and Tenure Technical Report (Appendix Q, Section 5.3.3) of the EIS Land Use and Tenure chapter (Section 19) of the EIS	The Project will comply with legislative requirements under the *Land Protection (Pest and Stock Route Management) Act 2002* (LP Act), where relevant. This includes Department of Natural Resource Management (NRM) requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more detailed information regarding major infrastructure locations will be presented at the environmental authority (EA) application stage of the

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			Land Use and Tenure chapter (Section 13) of the SREIS	approvals process or in the plan of operations as per S288 of the EP Act. At this point in time, Stock Route Network infrastructure such as watering points, bores, windmills and holding yards etc. will be defined and where interference cannot be avoided, suitable mitigation measures will be implemented.
S1	13	<u>Regional services:</u> As detailed in this section, and across other sections of the EIS (e.g. s31.4.9.1, p31-25 & Table 31-5, p31-29), the adverse impacts, including cumulative regional impacts, to agricultural land use activities across the Project and adjacent areas have the potential to be significant and enduring. The Project should commit in the EIS to supporting agriculture growth and to minimise adverse impacts to affected agriculture land (e.g. to current land condition etc.), both within and outside the Project area, during and post completion of Project activities. The EIS should detail how the Project will maintain and improve sectoral coexistence with agriculture land use activities and landholders, so that Project related activities benefit both parties. The EIS should commit to and provide further detail on the scope (and membership) of the proposed strategic forum and collaborative cumulative impact management strategy for the significant impacts that will result from this and other regionally located Projects. Note: The Proponent should draw on its experience from its developments in the Surat Basin to ensure that errors made in the Surat development are not repeated in the Project area, particularly in regard to the potential loss and/or productivity of 82,628ha of strategic cropping land.	Land Use and Tenure chapter (Section 19) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	Potential impacts on agricultural enterprise and land characteristics include disturbance of the soil profile, disruption to machinery operations, impediments to farm workability, increased or new management overheads (including integration with farm plans), and loss of amenity, as detailed within the Land Use and Tenure chapter (Section 19.4.1) of the EIS and Land Use and Tenure chapter (Section 13) of the SREIS. Impacts resulting from the Project are unlike other land use impacts where the proposed activity may permanently displace the existing land use. On agricultural land, the effect of the Project is to establish an additional land use which co-exists with existing uses. The land use impact will be determined by the individual characteristics of the land and the current or proposed agricultural use. The main impact to agricultural activities is expected to occur during construction. Some agricultural activities may be temporarily restricted where construction activities are required for Project facilities. Of particular relevance to agricultural activities is the construction of the low pressure gas and water gathering systems where trenching/ploughing of pipelines will create linear disturbance to the subject land. Agricultural activities will be able to recommence upon rehabilitation of construction areas and continue for the life of the gas and water

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				gathering systems without impediment, with the exception of well head sites and facility locations. Temporary access restrictions may also apply during the course of construction and rehabilitation works. Impacts to agricultural land uses will vary depending on the contextual and operational characteristics of individual farming pursuits. Arrow will work with landowners to integrate development activities (and infrastructure) with farming operations recognising and understanding the particular farming practices and property specific development plans. Arrow will consult landowners on the location of infrastructure and construction methods to reduce overall impacts to the farming operation including capital and operating costs, and productivity. It is Arrow's philosophy that through appropriate consultation with landholders and the broader community together with CSG development planning, intensively farmed land and CSG developments can coexist without causing permanent alienation of, or diminished productivity from intensively farmed land. Siting of wells in consultation with landholders in locations that minimise impacts on productive areas and provide the best opportunity for rehabilitation, as well as locating of production facilities in less productive land are key strategies for reducing the potential for permanent alienation of intensively farmed land. Arrow intends to adopt a similar approach to mitigation in the Bowen Basin to that proposed for the Surat Basin CSG fields, as detailed within the Surat EIS. Primary and secondary mitigation is to be achieved through the implementation of 12 performance-based objectives that

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				provide an opportunity for Arrow to work with the landowner to develop appropriate methods for the development and placement of the Project, having regard to the property-specific values and operational characteristics of each agricultural land use. Lessons learned throughout the design, construction and operation of the Surat Gas Project will be applied to the Project.
S1	14	Biosecurity Queensland: The last comment under the heading 'Impacts to agricultural land uses' provides a summary of measures to avoid, mitigate and manage the spread of weeds. These measures do not include inspection of vehicles or training of staff in weed hygiene. This section should include the inspection of vehicles and equipment following clean down and training of staff in weed hygiene in the summary of avoidance, mitigation and management measures.	Draft EM Plan (Appendix Z) of the EIS	The draft Environmental Management Plan (Appendix Z, Section A.4.4.5, Table 16) of the EIS commits to the development of a declared weed and pest management plan in accordance with the *Petroleum Industry – Pest Spread Minimisation Advisory Guide* (Biosecurity Queensland, 2008). The weed and pest management plan include, as a minimum, training, inspection and wash down procedures for vehicles, management of pest spread, management of pest infestations and monitoring effectiveness of control measures. In addition, Arrow has implemented a Weed and Pathogen Management Procedure (99-H-PR-0030) introducing environmental standards to ensure compliance with Arrow's regulatory obligations and meet community stakeholder expectations for the control and management of the introduction and/or spread of weeds and pathogens.
S23	403	Not meaningfully addressed in EIS: Detailed land use analysis of the sites and surrounding land uses which form the keys to the sustained wellbeing of the local economy now and beyond the petroleum use.	Land Use and Tenure chapter (Section 19) of the EIS	Land use impacts are identified and addressed in detail in Appendix Q of the EIS in the context of a rigorous and robust Impact Assessment process and updated to reflect any changes to the Project and land use characteristics in the SREIS. The methodology for these assessments has been developed in accordance with the ToR for the Project.

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S23	516	Natural Resource and Stock Route Impacts: Will Arrow consult with relevant stakeholders where their service roads intersect landholders/ State road systems and stock routes?	Land Use and Tenure chapter (Section 19.6.5) of the EIS. Land Use and Tenure chapter (Section 13) of the SREIS	Where state controlled roads or local roads (including stock routes) are required to be crossed or intersected by the construction of Project infrastructure, all works will be carried out in consultation with the relevant stakeholders so as to minimise disturbance to the operation of the road and/or stock route.
S23	517	Natural Resource and Stock Route Impacts: Where Arrow activities conflict with stock routes/road reserves; what provision has been made to negotiate suitable alternative easements - with who will Arrow consult/negotiate agreements?	Land Use and Tenure chapter (Sections 19.6.5 and 19.8) of the EIS. Land Use and Tenure chapter (Section 13) of the SREIS	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. Where state controlled roads or local roads (including stock routes) are required to be crossed or intersected by the construction of Project infrastructure, all works will be carried out in consultation with the relevant stakeholders so as to minimise disturbance to the operation of the road and/or stock route.
S23	518	Natural Resource and Stock Route Impacts: Is land use compensation indexed? For permanently impacted Strategic Cropping Land? (Presently $4,750/ha) will this be indexed over the project life?	Land Use and Tenure chapter (Section 19.4.1) of the EIS.	Project activities with the potential to cause adverse impacts to agricultural activities during the construction, operations and decommissioning phases of the Project are detailed within the Land Use and Tenure chapter (Section 19.4.1) of the EIS. Arrow will provide compensation (mitigation value) for

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			Land Use and Tenure chapter (Section 13) of the SREIS	impacts to Strategic Cropping Land resulting from Project activities in accordance with the *Strategic Cropping Land Act 2011* and *Strategic Cropping Land Regulation 2011*.
S23	519	Natural Resource and Stock Route Impacts: Stock-routes - no provision for informing stock route administration of worksites when development works are going to be carried out and rehabilitation completed.	Land Use and Tenure Technical Report (Appendix Q, Section 5.3.3) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to ensuring adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the temporary realignment. The mitigation measures will ensure the ongoing connectivity of the Stock Route Network and will involve liaison with the Stock Route Network management unit in NRM to ensure construction activities don't materially impede the stock route network at a time that would affect movement of stock. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more detailed information regarding major

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				infrastructure locations will be presented at the EA application stage of the approvals process. At this point in time, potential impacts and interference with Stock Route Network will be identified and where interference cannot be avoided, suitable mitigation measures will be implemented. These mitigation measures will be reached in accordance with relevant stakeholders including Isaac Regional Council.
S23	520	Natural Resource and Stock Route Impacts: No provision for local stock route inspectors to inspect works being carried out and after works are completed in their area of responsibility?		Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed. Through this consultation process, requirements such as the need for local stock route inspectors to inspect works being carried out and/or completed can be appropriately scheduled and facilitated. In accordance with the 'Framework Approach' developed for impact assessment of the Project as per the requirements of the ToR, more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. At this point in time, potential impacts and interference with Stock Route Network will be identified and where interference cannot be avoided, suitable mitigation measures will be implemented. These mitigation measures will be reached in accordance with relevant stakeholders including Isaac Regional Council.
S23	545	How do Arrow Energy propose to manage the stock routes to ensure existing business can continue operations without adding undue frustration for stock movement.	Land Use and Tenure chapter	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures

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			(Section 19.8) of the EIS. Land Use and Tenure chapter (Section 13) of the SREIS	during construction activities and ensuring the safety of stock and people utilising the temporary realignment. The mitigation measures will ensure the ongoing connectivity of the Stock Route Network and will involve liaison with the Stock Route Network management unit in NRM to ensure construction activities don't materially impede the stock route network at a time that would affect movement of stock. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. At this point in time, potential impacts and interference with Stock Route Network will be identified and where interference cannot be avoided, suitable mitigation measures will be implemented. These mitigation measures will be reached in accordance with relevant stakeholders including Isaac Regional Council.

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S24	565	Firstly, the provision of industrial land and services that support the expanding resources sector is not addressed in either the Landuse and Tenure chapter or the Land use and Tenure Technical Report of the EIS. Notably the EIS addresses most of the areas of Council's interests listed above in detail but with limited certainty on significant details, such as the sourcing and transport movements of workers as well as the transportation of materials and equipment from Mackay. For example, if greater than 0% of the construction workforce and/or greater than 10% of the operational workforce are sourced from the local and regional area, creating a disparity in the assumptions of the primary workforce scenario, the effect of the Project on housing, traffic and community services in the region may no longer be accurately described as 'negligible'. As the sourcing and transportation movements of the construction and operational workforce for the Project is further developed, the social and traffic impacts should be reassessed. Council supports the monitoring of the number of workers moving into the local and regional area and the formulation of a housing strategy for implementation and monitoring within the evolving Social Impact Management Plan (SIMP).	Social chapter (Section 24) and Social Impact Management Plan (Appendix V) of the EIS Social Impact Assessment chapter (Section 15), Social Impact Assessment (Appendix M) and Social Impact Management Plan (Appendix N) of the SREIS Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS	Indirect impacts of the Project may result in the need for industrial land and services to support the CSG industry within the region. Such land uses will be subject to regulation by the applicable planning schemes and associated legislative controls to manage the potential impacts of these non-Project related land uses. The potential social impacts and associated mitigation measures of the Project are discussed in the Social chapter (Section 24) and Social Impact Management Plan (Appendix V) of the EIS and Social Impact Assessment chapter (Section 15), Social Impact Assessment (Appendix M) and Social Impact Management Plan (Appendix N) of the SREIS. The potential road and transport impacts and associated mitigation measures of the Project are discussed in the Roads and Transport chapter (Section 21) and Road Impact Assessment (Appendix R) of the EIS and Roads and Transport chapter (Section 12) and Road Impact Assessment (Appendix K) of the SREIS.

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			Roads and Transport chapter (Section 12) and Road Impact Assessment (Appendix K) of the SREIS	
S26	577	The EIS references the planned BHP Billiton Group (BHP) - Goonyella to Abbot Point Rail Project. However, it does not consider the existing Goonyella to Abbot Point Railway currently operated by Aurizon although it is located almost parallel to the planned BHP project. It can be assumed that similar impacts would arise from the Arrow Bowen Gas Project, impacting the operation of Aurizon's network. It is recommended that the text be updated to reflect the existing rail network and that Figure 19-6 is amended to reflect both planned and existing network.	Land Use and Tenure chapter (Section 13) of the SREIS.	Arrow acknowledges Aurizon's rail corridors and associated operations in and around the proposed Project. The Project will likely intersect with Aurizon's infrastructure and as with all utility and infrastructure crossings, Arrow will work collaboratively with the affected party to ensure there is no disruption to operations and that all statutory obligations are complied with. The existing Land Use and Tenure Technical Report (Appendix Q) of the EIS details the potential impacts of the Project on the Goonyella to Abbot Point Railway currently operated by Aurizon. It is acknowledged that Figure 5-1a mistakenly indicates that the existing railway line is a proposed alignment. Arrow apologises for any confusion this has caused.
S26	578	No discussion of need to secure appropriate below rail crossing approval from Aurizon/DTMR. It is recommended that additional detail is included reflecting the need to secure required rail corridor crossing approval for transmission pipeline/s.	Land Use and Tenure Technical Report (Appendix Q, Section 5.2.3) of the EIS	Arrow will work collaboratively with affected parties where Arrow proposes to cross/intersect with other activities (including rail corridors) to ensure there is no disruption to operations and that all statutory obligations are complied with. Arrow notes that Aurizon currently adopts a fee-based wayleave process to coordinate crossings of the type proposed by Arrow, principally the installation of pipelines underground.

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				The design of any required rail crossings will be finalised during the detailed design phase of the Project. If crossings are required, Arrow will liaise with the relevant stakeholders regarding the design of the crossing and obtain the necessary consents, approvals and appropriate standards during the detailed design phase of the Project.
S26	579	Last item in Table 19-4 recognises that the consequence of 'impact on existing transport infrastructure' as low. However, given the operational and economic importance of rail infrastructure, it is recommended that the consequence will be high. It is suggested that the text be amended to reflect this higher category.	Land Use and Tenure chapter (Section 13, Table 13-3) of the SREIS	Arrow acknowledges the importance of Aurizon's activities in the Bowen Basin, particularly in conveying valuable commodities to port. Arrow does not propose to impact Aurizon's operations and it is envisaged that the number of crossings will be minimal. Arrow notes that Aurizon currently adopts a fee-based way leave process to coordinate crossings of the type proposed by Arrow, principally the installation of pipelines underground. Table 13-3 of the Land Use and Tenure chapter (Section 13) of the SREIS has been updated to nominate the consequence of 'impact on existing transport infrastructure' as high.
S29	592	Encroachment and points of intersection: Any redesign of Ergon Energy infrastructure required as a result of the proposal must take into consideration servicing and maintenance access requirements for Ergon Energy personnel and equipment. Where fencing prohibits access to and along infrastructure, gates must be supplied and installed at the proponent's expense		Servicing and maintenance access requirements for Ergon Energy personnel and equipment will be taken into account where redesign of any Ergon Energy infrastructure is required. All works that may interfere with any element of the electricity network which are proposed to occur will be carried out in accordance with the legislative requirements of the *Electrical Safety Act 2002*.
S29	593	Encroachment and points of intersection: Proposed infrastructure registered over any part of an existing Ergon Energy easement must be subject to the conditions of our existing easement.		Arrow will liaise directly with all impacted easement holders and/or third party utility providers to ensure that any terms of existing easements and services crossings designs requirements are appropriately planned for during the

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				design, approval, construction and operational phases of the Project. Arrow will undertake a site selection process for all Project infrastructure, including production facilities and wells. The site selection process will consider all environmental, tenure and engineering constraints, including existing easements and third party infrastructure. Construction Management Plans will also be developed and implemented prior to any construction activities to ensure any potential risks are managed.
S30	595	It is noted that the EIS, in section 19.3.3.6 and Appendix Q, Section 5, states that “Arrow will liaise with Ergon Energy and Powerlink” in regard to “power related infrastructure”. These statements should be amended to reflect the requirement for Arrow to consult with Powerlink where Arrows works are planned on or in the vicinity of Powerlink easements, sites or corridors using the processes described below.	Land Use and Tenure Technical Report (Appendix Q, Section 5.2.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	As detailed within Land Use and Tenure Technical report (Appendix Q, Section 5.2.3) of the EIS, all Project-related works will be undertaken in accordance with the applicable legislative requirements, including the *Electrical Safety Act 2002*. Details regarding the relevant legalisation and Project approvals were addressed within the Project Approvals chapter (Section 2) of the EIS. The design of any required utility crossings will be finalised during the detailed design phase of the Project. If crossings are required, Arrow will liaise with the relevant stakeholders, including Powerlink, regarding the design of the crossings and obtain the necessary consents and approvals in accordance with the relevant legislation and appropriate standards. This includes any requirement to consult with Powerlink where the Project incorporates works on or in the vicinity of Powerlink easements, sites or corridors.
S31	597	EPC 1232 'Suttor Creek East' Longwall underground mining activities utilising the whole of the tenement area has been planned for a 50 year period targeting two	Land Use and Tenure chapter (Section	It is acknowledged that EPC 1232 (Suttor Creek East) is overlayed by the Project area. Steel casing used in Arrow’s gas production wells will not

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		coal seams within the Rangal measures spanning the breadth of the tenement. Health and safety risks resulting from proposed Bowen Gas Project activities will pose significant safety risks, in particular to any longwall operations were steel casing may have been used for gas exploration and production. As such, proposed mining activities will be incompatible with the current Bowen Gas Project to the extent that it is located within the tenement area and pose significant risks to QCC as an affected party.	19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	be placed in mineable coal seams. Underground coal mines must be degassed to safe levels prior to coal mining, and overlapping coal tenement holders will benefit from Arrow's gas production activity from the target and non-target coal mining seams. In addition, the surface to in-seam wells can also be used during longwall mining to remove goaf gas. In the event that drill-string is lost in a mineable coal seam, Arrow will adhere to the relevant regulations. More broadly, in accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Queensland Coal Corporation (QCC), to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are

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				prescribed by the relevant resource legislation and include: • Where CSG tenements overlay non-coal/oil shale tenements granted under the P&G Act and *Mineral Resources Act 1989* (MR Act); • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S31	598	EPC 1730 'Norwich Park East' Presence of a gas project over the MLAs and MDLAs will pose a significant threat of sterilization to the extensive coal resources within the MLAs and MDLA and pose a significant risk to the QCC Group as an affected party.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that EPC 1730 (Norwich Park East) is overlayed by the Project area. Arrow holds the firm belief that coordinated development of coal and petroleum resources is both technically and commercially feasible, with several well established precedents in the Bowen Basin. Arrow has the capability, appropriate methodologies and experience to allow for collection of gas before, during or after underground mining. Extraction of CSG resources below open cut mining pits or spoil areas has also been shown to be practicable provided that cooperative planning occurs. More broadly, in accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage

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				of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance QCC, to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.

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S31	599	EPC 1243 and EPC 1805 'Coxendea n' Substantial economically viable coal resources are deemed to be subject to potential sterilisation by the presence of the Bowen Gas Project over any or all of the tenement area.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that EPC 1243 and EPC 1805 (Coxendean) is overlayed by the Project area. Arrow holds the firm belief that coordinated development of coal and petroleum resources is both technically and commercially feasible, with several well established precedents in the Bowen Basin. Arrow has the capability, appropriate methodologies and experience to allow for collection of gas before, during or after underground mining. Extraction of CSG resources below open cut mining pits or spoil areas has also been shown to be practicable provided cooperative planning occurs. More broadly, in accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Queensland Coal Corporation (QCC), to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing

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				overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S31	600	EPC 1710 'Limestone Hill Project' The Bowen Gas Project proposes to overlap with this tenement and as such, a significant proportion of potentially viable coal resources extractable via open cut methods may be sterilised by the Bowen Gas Project.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that EPC 1710 (Limestone Hill Project) is overlayed by the Project area. Arrow holds the firm belief that coordinated development of coal and petroleum resources is both technically and commercially feasible, with several well established precedents in the Bowen Basin. Arrow has the capability, appropriate methodologies and experience to allow for collection of gas before, during or after underground mining. Extraction of CSG resources below open cut mining pits or spoil areas has also been shown to be practicable provided cooperative planning occurs. More broadly, in accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage

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				of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance QCC, to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.

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S31	601	QCC Group holds a wide portfolio of quality coal assets. As a tenement holder currently focused on mining operations, this incompatibility with CSG developments is likely to have an adverse effect on our operations and will also have an adverse effect on the QCC Group's ability to carry out its exploration activities, conduct safe and efficient mining and potentially sterilising coal resources. In particular the use of steel casing for gas wells causes significant risk to longwall mining operations	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that a number of QCC tenements are overlayed by the Project area. Arrow has an established model for a Co-Development Agreement, which is based on the principles in the Overlapping Tenures "White Paper". It is a commercially based agreement that allows for consideration of matters such as safety, communication and meetings, dispute resolution, gas custody and sales, and future consents to applications for Mining or Petroleum Leases (the principles in the Overlapping Tenures "White Paper" are expected to become legislation by mid-2014). Arrow holds the firm belief that coordinated development of coal and petroleum resources is both technically and commercially feasible, with several well established precedents in the Bowen Basin. Arrow has the capability, appropriate methodologies and experience to allow for collection of gas before, during or after underground mining. Extraction of CSG resources below open cut mining pits or spoil areas has also been shown to be practicable provided cooperative planning occurs. Steel casing used in Arrow's gas production wells will not be placed in mineable coal seams. Underground coal mines must be degassed to safe levels prior to coal mining, and overlapping coal tenement holders will benefit from Arrow's gas production activity from the target and non-target coal mining seams. In addition, the surface to in-seam wells can also be used during longwall mining to remove goaf gas. In the event that drill-string is lost in a mineable coal seam, Arrow will adhere to the relevant regulations. More broadly, Arrow acknowledges and agrees that it will

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				need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance QCC, to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the

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				P&G Act which overlay tenements (applied for or granted) under the Geothermal Energy Act 2010 or Greenhouse Gas Storage Act 2009. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S31	602	By sterilising coal reserves there will be a consequential reduction in coal parties employment and royalties across the EIS area that are not set off by the employment opportunities and royalties provided by Arrow. QCC questions whether this would result in the Arrow Bowen Gas Project being in the public interest.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that a number of QCC tenements are overlayed by the Project area. In Arrow's view, the interests of the State will be best served by allowing the parties to co-develop their respective gas and coal interests in the overlap area. Arrow has an established model for co-operation with coal mining proponents which provides a safe, co-operative and flexible arrangement to allow for co-ordinated recovery of gas and coal resources. The model includes a Co-Development Agreement, which is based on the principles in the Overlapping Tenures "White Paper". It is a commercially based agreement that allows for consideration of matters such as safety, communication and meetings, dispute resolution, gas custody and sales, and future consents to applications for Mining or Petroleum Leases (the principles in the Overlapping Tenures "White Paper" are expected to become legislation by mid-2014). More broadly, Arrow acknowledges and agrees that it will need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act.

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				The interaction of overlapping CSG production and coal mining needs to be managed with a 'co-development agreement', founded on the basis of mutual cooperation and coordination of the respective parties' activities, and providing the means to agree, monitor and communicate appropriate mechanisms to manage safety, commercial, operational and environmental matters. To minimise the impacts on resource activities, major infrastructure has been designed to avoid lands subject to existing mineral development lease tenements and minor Project infrastructure is placed in consultation with tenement holders to minimise impact. This ensures that existing mineral resource operations, which are well progressed through the planning and approval process are protected. Where Project infrastructure is located in areas of overlapping tenure with coal mining projects, the design and placement of infrastructure and CSG wells, including the rate of production, will be flexible enough to accommodate coal mining activities. CSG production wells will typically be decommissioned ahead of coal mining activities commencing as part of the normal well abandonment processes. Arrow has demonstrated experience in working with mining companies to ensure that the value of the underlying gas and coal resources are maximised. Arrow has successfully worked with open cut mining projects, demonstrating its ability to install surface and sub-surface infrastructure in a manner that avoids impacts to mining operations. Similarly with underground mining, Arrow has demonstrated experience ensuring well and other project infrastructure

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				placement does not impact on the safe and efficient extraction of underground resources. Arrow's commitment to cooperation and dialogue allows for negotiations surrounding infrastructure placement which will maximise gas yields and lower costs for the subject mining proponent, whilst still allowing safe access the resource reserves. Deep surface to inseam degassing of coal delivers benefits to mining including improved health and safety outcomes as well as avoiding carbon liabilities. The coal and gas sectors have worked together on similar projects to ensure commercial certainty and viable co-existence. As a result, the Project offers a number of potential advantages to overlapping coal mining operations. These include: • Extensive experience in the development and management of CSG extraction processes; • Reducing coal mine development costs and improved safety by providing significant gas drainage ahead of coal mining; • Leveraging gas infrastructure and relationships to supply gas to higher value markets; • Reducing greenhouse gas liabilities for coal mining companies by: — Optimising gas production across a large acreage; and — Maximising the recovery of CSG from all coal seams within a mining lease area. The Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the

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				relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S31	603	Further Arrow has not considered exploration holders in the location of their Bowen Gas Project and suggests that the onus will be on exploration holders to negotiate with Arrow in relation to proposed mining activities. This demonstrates an unwillingness by Arrow to work co-operatively with overlapping tenure holders to determine a safe passage over land where significant coal reserves may be sterilised.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that a number of QCC tenements are overlayed by the Project area. Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. Arrow has numerous examples of co-operative mechanisms in place with coal mining and coal exploration proponents throughout the Bowen and Surat Basins. Arrow acknowledges and agrees that it will need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act.

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				The interaction of overlapping CSG production and coal mining needs to be managed with a 'co-development agreement', founded on the basis of mutual cooperation and coordination of the respective parties' activities, and providing the means to agree, monitor and communicate appropriate mechanisms to manage safety, commercial, operational and environmental matters. To minimise the impacts on resource activities, major infrastructure has been designed to avoid lands subject to existing mineral development lease tenements and minor Project infrastructure is placed in consultation with tenement holders to minimise impact. This ensures that existing mineral resource operations, which are well progressed through the planning and approval process are protected. Where Project infrastructure is located in areas of overlapping tenure with coal mining projects, the design and placement of infrastructure and CSG wells, including the rate of production, will be flexible enough to accommodate coal mining activities. CSG production wells will typically be decommissioned ahead of coal mining activities commencing as part of the normal well abandonment processes. Arrow has demonstrated experience in working with mining companies to ensure that the value of the underlying gas and coal resources are maximised. Arrow has successfully worked with open cut mining projects, demonstrating its ability to install surface and sub-surface infrastructure in a manner that avoids impacts to mining operations. Similarly with underground mining, Arrow has demonstrated experience ensuring well and other project infrastructure

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				placement does not impact on the safe and efficient extraction of underground resources. Arrow's commitment to cooperation and dialogue allows for negotiations surrounding infrastructure placement which will maximise gas yields and lower costs for the subject mining proponent, whilst still allowing safe access the resource reserves. Deep surface to inseam degassing of coal delivers benefits to mining including improved health and safety outcomes as well as avoiding carbon liabilities. The coal and gas sectors have worked together on similar projects to ensure commercial certainty and viable co-existence. As a result, the Project offers a number of potential advantages to overlapping coal mining operations. These include: • Extensive experience in the development and management of CSG extraction processes; • Reducing coal mine development costs and improved safety by providing significant pre-drainage ahead of coal mining; • Leveraging gas infrastructure and relationships to supply gas to higher value markets; • Reducing greenhouse gas liabilities for coal mining companies by: — Optimising gas production across a large acreage; and — Maximising the recovery of CSG from all coal seams within a mining lease area. The Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the

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				relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S31	604	We hope that Arrow will continue to notify and work with all tenure holders as they lodge petroleum leases over their existing Authority to Prospect licences. We note the most recent Petroleum Lease Application (Saraji South) only considered granted mining leases to have legitimate interests.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	It is acknowledged that a number of QCC tenements are overlayed by the Project area. Arrow has numerous examples of co-operative mechanisms in place with coal mining and coal exploration proponents throughout the Bowen and Surat Basins. Arrow acknowledges and agrees that it will need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process.

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				A number of mining tenements overlay the Project area, including exploratory (EPCs) and production types (MLs) in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance QCC, to ensure that the value of the underlying gas and coal resources are maximised. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with QCC directly with respect to the 'rolling out' of PL applications as the Project progresses. In addition, the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.

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S31	608	Gas transfer infrastructure: Further we raise concerns about the potential contamination of water reserves where the operations are not carried out safely and the effects that this will have on overlapping tenure holders and their projects.	Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8), Surface Water Technical Report (Appendix F) of the SREIS	The potential impacts to surface and underground water resources and their associated mitigation measures for the Project are discussed in the Surface Water chapter (Section 15), Groundwater chapter (Section 14), Surface Water Technical Report (Appendix N) and Groundwater Technical Report (Appendix L) of the EIS and the Groundwater chapter (Section 7), Surface Water chapter (Section 8), Groundwater Technical Report (Appendix E) and Surface Water Technical Report (Appendix F) of the SREIS.
S31	610	We note that the absolute location of the various components of the Bowen Gas Project and Arrow Bowen Gas Pipeline have not been provided with sufficient detail and accordingly it is not possible for QCC to accurately ascertain the exact effect of the Bowen Gas Project on its tenements, however based on the information provided, QCC anticipates that the Bowen Gas Project may sterilize a significant amount of coal reserves within the tenements held by the QCC Group and may contribute toward significant health and safety risks where proposed mining activities are planned to occur.	Land Use and Tenure chapter (Section 19.4.3) of the EIS	Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. Arrow has numerous examples of co-operative mechanisms in place with coal mining and coal exploration proponents throughout the Bowen and Surat Basins. Arrow acknowledges and agrees that it will need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of

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				coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act. The interaction of overlapping CSG production and coal mining needs to be managed with a 'co-development agreement', founded on the basis of mutual cooperation and coordination of the respective parties' activities, and providing the means to agree, monitor and communicate appropriate mechanisms to manage safety, commercial, operational and environmental matters. To minimise the impacts on resource activities, major infrastructure has been designed to avoid lands subject to existing mineral development lease tenements and minor Project infrastructure is placed in consultation with tenement holders to minimise impact. This ensures that existing mineral resource operations, which are well progressed through the planning and approval process are protected. Where Project infrastructure is located in areas of overlapping tenure with coal mining projects, the design and placement of infrastructure and CSG wells, including the rate of production, will be flexible enough to accommodate coal mining activities. CSG production wells will typically be decommissioned ahead of coal mining activities commencing as part of the normal well abandonment processes. Arrow has demonstrated experience in working with mining companies to ensure that the value of the underlying gas and coal resources are maximised. Arrow has successfully worked with open cut mining projects, demonstrating its ability to install surface and sub-surface infrastructure in a

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				manner that avoids impacts to mining operations. Similarly with underground mining, Arrow has demonstrated experience ensuring well and other project infrastructure placement does not impact on the safe and efficient extraction of underground resources. Arrow's commitment to cooperation and dialogue allows for negotiations surrounding infrastructure placement which will maximise gas yields and lower costs for the subject mining proponent, whilst still allowing safe access the resource reserves.
S33	619	Overlapping tenements, future proposed operations: The project area overlaps a significant number of Vale's tenements (EPC and MLs) in the Bowen Basin (Appendix 1). Vale notes that as part of the project approval process, the approval of the EIS, as with acquisition, formation of Co-development Agreements and Co-ordination Arrangements, will be required.	Land Use and Tenure chapter (Section 19.4.3) of the EIS	Arrow acknowledges and agrees that it will need to establish agreements with third party overlapping tenure holders to minimise impacts of the Project on the mining of coal resources within the fields for the timeframe of the Project. These provisions need to be in accordance with the provisions of the P&G Act. Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. Arrow has numerous examples of co-operative mechanisms in place with coal mining and coal exploration proponents throughout the Bowen and Surat Basins.
S33	620	Vale notes that an application for a PL over an existing coal ML (i.e. producing tenement) or vice versa, may only be granted if the applicant has negotiated a coordination arrangement with the existing production tenement holder. The Minister may refuse the production tenement application in cases where the parties have had reasonable attempts to reach an arrangement but the existing production tenement holder does not consider that an arrangement can be	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project	In Arrow's view, the State's interests will be best served by allowing the parties to co-develop their respective gas and coal interests in the overlap area. Arrow has an established model for co-operation with coal mining proponents which provides for co-ordinated recovery of gas and coal resources. The model includes a Co-Development Agreement, which is based on the principles in the

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		made. It is noted that Arrow will not be required to consult or reach agreement on the Co-development Arrangements for EPC's and or MDL's however agreement must be reached (or a preference decision sought from the Minister) for MLA's and ML's.	Approvals chapter (Section 2) of the SREIS	Overlapping Tenures "White Paper". It is a commercially based agreement that allows for consideration of matters such as safety, communication and meetings, dispute resolution, gas custody and sales, and future consents to applications for Mining or Petroleum Leases (the principles in the Overlapping Tenures "White Paper" are expected to become legislation by mid 2014). It is acknowledged that a number of Vale's tenements are overlayed by the Project area. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of Vale's tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure that the value of the underlying gas and coal resources are maximised. Arrow will continue to liaise with Vale directly with respect to the 'rolling out' of PL applications as the Project progresses. It is worth noting that the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and

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				• Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S33	621	Vale considers that overlapping tenements and tenure issues and impacts and the above information has not been adequately addressed in the EIS, and consultation has not occurred in relation to the overlap of Vale's tenements. Vale considers that consultation with tenement and tenure holders should be outlined or addressed in a supplementary EIS, for the benefit of other reviewers of the EIS that may be requiring clarity on this process.	Land Use and Tenure chapter (Section 19.4.3) of the EIS	In Arrow's view, the interests of the State will be best served by allowing parties to co-develop their respective gas and coal interests where tenements overlap. Arrow has an established model for co-operation with coal mining proponents which provides for co-ordinated recovery of gas and coal resources. The model includes a Co-Development Agreement, which is based on the principles in the Overlapping Tenures "White Paper". It is a commercially based agreement that allows for consideration of matters such as safety, communication and meetings, dispute resolution, gas custody and sales, and future consents to applications for Mining or Petroleum Leases (the principles in the Overlapping Tenures "White Paper" are expected to become legislation by mid 2014). It is acknowledged that a number of Vale's tenements are overlayed by the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. Arrow holds the firm belief that coordinated development of coal and petroleum resources is both technically and

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				commercially feasible, with several well established precedents in the Bowen Basin. Arrow has the capability, appropriate methodologies and experience to allow for collection of gas before, during or after underground mining. Extraction of CSG resources below open cut mining pits or spoil areas has also been shown to be practicable provided cooperative planning occurs.
S33	627	Vale wishes to reference the importance of Arrow and Vale establishing an agreement whereby the two parties can coexist such that Coal resources are not sterilised.	Land Use and Tenure chapter (Section 19.4.3) of the EIS	It is acknowledged that a number of Vale's tenements overlay the Project area. A number of Vale's tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure that the value of the underlying gas and coal resources are maximised. Arrow will continue to liaise with Vale directly with respect to the 'rolling out' of PL applications as the Project progresses.
S33	640	No indication of the overlap with EPC tenure has been provided. It would be useful to have this discussed and presented in a map format to allow Vale to assess the potential impact of the project on our exploration activities.	Land Use and Tenure chapter (Section 19) of the EIS	Existing land ownership and tenure within the Project area is depicted in –the Land use and Tenure chapter (Section 19, Figure 19-1) of the EIS. Figure 19-1 satisfies the ToR requirement: s3.3.1 Describe and illustrate any existing mining tenements, petroleum, geothermal and greenhouse gas tenures and licences overlying and adjacent to the Project site, and any proposed applications required for this Project. Arrow has an existing relationship with Vale and can provide the relevant data in future. Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view

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				to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources.
S33	641	Vale requires a schedule of development to allow comparison of the project's development with development of Vale's exploration activities and expansion projects.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	Arrow has an existing relationship with Vale and can provide the relevant data in future. Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. It is acknowledged that a number of Vale's tenements overlay the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of Vale's tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure that the value of the underlying gas and coal resources are maximised. It is also acknowledged that Vale has requested that Arrow provide a schedule of applications for PLs, to assess the potential interruption to Vale's Development activities, however at this point in time a schedule of PL applications is not ready for issue to third parties. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals

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				process. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with Vale directly with respect to the 'rolling out' of PL applications as the Project progresses. It is worth noting that the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S33	642	<u>Vale submission 2a; ToR 4.2.2.1</u> Arrow has referenced the potential impact on EPC holders, however at a very high level. They state that they will consult with EPC holders with regard to the placement of infrastructure and the timing of development to minimise the impact and sterilisation of coal resources. Vale stresses the importance of this engagement.	Land Use and Tenure chapter (Section 19.4.3) of the EIS	Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. It is acknowledged that a number of Vale's tenements are

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			Project Approvals chapter (Section 2) of the SREIS	overlayed by the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of Vale's tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the northern Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies, in this instance Vale, to ensure that the value of the underlying gas and coal resources are maximised. It is also acknowledged that Vale has requested that Arrow provide a schedule of applications for PLs, to assess the potential interruption to Vale's Development activities, however at this point in time a schedule of PL applications is not ready for issue to third parties. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. As specific locations of Project infrastructure is not available for the revised project description for the SREIS, the timing and sequencing of PL/EA applications cannot be quantified accurately at this stage. However, Arrow will continue to liaise with Vale directly with respect to the 'rolling out' of PL applications as the Project progresses. It is worth noting that the Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include:

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				• Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S34	653	WCPL requires clarification of the following matter in the EIS: • The EIS does not make clear that the petroleum lease (PL) cannot be granted under the P&G Act unless a coordination arrangement has been agreed between existing mining lease holders and the applicant for the petroleum lease	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	Arrow is aware that an existing ML holder has veto rights over a PL applicant. Arrow's business philosophy in regard to all overlapping tenure holders is to discuss and develop co-operative mechanisms with a view to establishing positive and constructive relationships that allow for the coordinated development of both coal and gas resources. It is acknowledged that a number of tenements granted under the MR Act are overlayed by the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies to ensure that

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				the value of the underlying gas and coal resources are maximised. The Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S34	654	The P&G Act and the MR Act set out a process for overlapping coal seam gas tenements and coal mining tenements. Chapter 19 of the EIS deals with land use and tenure issues. It does not clearly state anywhere in that chapter that a petroleum lease cannot be granted over a pre-existing mining lease without agreement from the mining lease holder. Further, a pre-existing mining lease holder is not required to agree to an arrangement with a petroleum lease applicant, if the arrangement is not commercially and technically feasible for the mining lease holder. WCPF requires this be noted in Chapter 19.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	Arrow is aware that an existing ML holder has veto rights over a PL applicant. In Arrow's view the interests of the State will be best served by allowing the parties to co-develop their respective gas and coal interests in the overlap area via an agreement. Such an agreement normally encompasses legislative requirements including a Coordination Arrangement aimed at guaranteeing safety, and management of hazards identified in a Principal Hazard Management Plan. Arrow strongly believes that coal mining and CSG development are compatible activities and that with appropriate co-operation on the part

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				of respective parties can be mutually beneficial and achieve the best outcome for the parties and the State. More broadly, it is acknowledged that a number of tenements granted under the MR Act are overlayed by the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies to ensure that the value of the underlying gas and coal resources are maximised. The Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include: • Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project

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				tenements.
S34	655	In relation to WCPL operations, WCPL submits that the on-going security of operations at the Curragh Mine of which ML80012, ML1878, ML80086 and MLA80171 form crucial parts, should not be jeopardized. A PL application should only be granted if WCPL agrees on terms with Arrow that: a) are commercially and technically feasible for Wesfarmers (particularly from a safety and operational perspective); and b) ensure that the on-going coal mining operation at the Curragh Mine is not jeopardized or compromised.	Land Use and Tenure chapter (Section 19.4.3) of the EIS Project Approvals chapter (Section 2) of the SREIS	Arrow is aware that an existing ML holder has veto rights over a PL applicant. In Arrow's view the interests of the State will be best served by allowing the parties to co-develop their respective gas and coal interests in the overlap area via an agreement. Such an agreement normally encompasses legislative requirements including a Coordination Arrangement aimed at guaranteeing safety, and management of hazards identified in a Principal Hazard Management Plan. Arrow strongly believes that coal mining and CSG development are compatible activities and that with appropriate co-operation on the part of respective parties can be mutually beneficial and achieve the best outcome for the parties and the State. It is acknowledged that a number of tenements granted under the MR Act are overlayed by the Project area. In accordance with the 'Framework Approach' developed in consultation with regulatory bodies, more detailed information regarding major infrastructure locations will be presented at the PL/EA application stage of the approvals process. A number of mining tenements overlay the Project area, including exploratory (EPCs), and production types (MLs), in the Bowen Basin. As stated in the EIS, Arrow is committed to working with mining companies to ensure that the value of the underlying gas and coal resources are maximised. The Queensland Regulatory Framework provides for three different approaches to managing overlaying resource tenements. These approaches are prescribed by the relevant resource legislation and include:

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				• Where CSG tenements overly non-coal/oil shale tenements granted under the P&G Act and MR Act; • Where CSG (petroleum) tenements overlays with coal/oil shale (mining) tenements; and • Where tenements (applied for or granted) under the P&G Act which overlay tenements (applied for or granted) under the *Geothermal Energy Act 2010* or *Greenhouse Gas Storage Act 2009*. In these instances, it is the responsibility of the tenement holders to reach an agreement regarding the exploitation of their respective resources. Arrow is proactively consulting with all tenement holders which are overlayed by Project tenements.
S38	706	<u>Health:</u> CSG affects the land by reducing its agricultural productivity (because of surface area disturbance and subsidence, effects on soil profile, fertility and rooting depths, soil salinity, changes to soil pH, and impacts on highly productive groundwater)"	N/A	Noted.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49	737 781 825 869 913 957 1001 1045 1089 1133	The EIS does not give sufficient weight to the importance of the stock Route Network (SRN) The Chief Executive should adhere to the principle of preservation of stock route in terms of access as part of the Project unless the loss is deemed unavoidable in which case the landholder must be properly and adequately compensated as a result. In the premises, should the loss of SRN be unavoidable, the Project plan must be relevantly conditioned such that affected stock routes are not to be closed until a suitable realignment of the stock route has been approved by DNRM to minimise delays and disruption to stock route use and the business operations of users of stock routes. [The Landholder's] livelihood (cattle grazing operations) will be	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use	The importance of the Stock Route Network is discussed in the Land Use and Tenure chapter (Section 19.3.3.3) and Land Use and Tenure Technical Report (Appendix Q) of the EIS and Land Use and Tenure chapter (Section 13) of the SREIS. Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under

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S50 S51 S52	1177 1221 1265	detrimentally impacted and must not be disregarded in considering the merits of the Project.	and Tenure chapter (Section 13) of the SREIS	the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed. This satisfies the ToR requirement for description of environmental values s4.2.1.8 *"The location and owner / custodians of all existing tenures, reserves, roads and road reserves, railways, rail level crossings to be used and rail reserves, power lines, stock routes and the like, covering the project area should be shown on maps of a suitable scale. Indicate locations of proposed gas and water pipelines, power lines and any other easements."*
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50	738 782 826 870 914 958 1002 1046 1090 1134 1178	The EIS does not provide sufficient detail as to whether alternatives were considered to avoid the loss of SRN.	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure	The importance of the Stock Route Network is discussed in the Land Use and Tenure chapter (Section 19.3.3.3) and Land Use and Tenure Technical Report (Appendix Q) of the EIS and Land Use and Tenure chapter (Section 13) of the SREIS. Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the temporary realignment. The mitigation measures will ensure the ongoing connectivity of the Stock Route Network and will involve liaison with the Stock Route Network management

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S51 S52	1222 1266		chapter (Section 13) of the SREIS	unit in NRM to ensure construction activities don't materially impede the stock route network at a time that would affect movement of stock. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	739 783 827 871 915 959 1003 1047 1091 1135 1179 1223 1267	The EIS does not address nor does it consider the significance of a loss of the SRN (whether on a long term or temporary basis) as to impacts on the business of landholders (Kirk) who use the stock routes (or may in the future) including:	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	740 784 828 872 916 960 1004 1048 1092 1136 1180 1224 1268	Cultural and historical values associated with SRN activities such as sites of stock route facilities; family and personal connections to certain stock routes for both indigenous and non-indigenous peoples; and intrinsic cultural values associated with the simple existence of the stock route network and its linkage to exploration and settlement.	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS Indigenous Cultural Heritage chapter (Section 25) and Indigenous Cultural Heritage Technical Report (Appendix W) of the EIS Non-Indigenous	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed. Potential impacts of the Project on all identified areas of indigenous cultural heritage and non-Indigenous cultural heritage was provided within Indigenous Cultural Heritage chapter (Section 25) and Non-Indigenous Cultural Heritage chapter (Section 26) of the EIS.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
			Cultural Heritage chapter (Section 26) and Non-Indigenous Cultural Heritage Technical Report (Appendix X) of the EIS	
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	741 785 829 873 917 961 1005 1049 1093 1137 1181 1225 1269	Economic values associated with providing employment to drovers and providing more economical alternatives for moving stock. The increased costs as a result of having to relocate stock routes including increased management costs to Kirk. Environmental values associated with the benefits to the environment from walking stock routes as opposed to trucking or transporting by rail (e.g. reduced emissions). The Chief Executive should adhere to the principle of preservation of stock route in terms of access as part of the Project unless the loss is deemed unavoidable in which case the landholder must be properly and adequately compensated as a result. In the premises, should the loss of SRN be unavoidable, the Project plan must be relevantly conditioned such that affected stock routes are not to be closed until a suitable realignment of the stock route has been approved by DNRM to minimise delays and disruption to stock route use and the business operations of users of stock routes. [The Landholder's] livelihood (cattle grazing operations) will be detrimentally impacted and must not be disregarded in considering the merits of the Project.	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	742 786 830 874 918 962 1006 1050 1094 1138 1182 1226 1270	Social values associated with employment opportunities in the droving and pastoral industries as well as local governments.	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to facilitating adequate mitigation measures during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed.
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	743 787 831 875 919 963 1007 1051 1095 1139 1183 1227 1271	Arrow has not established that it has taken the necessary steps to establish the present use of the SRN and accordingly in the absence of such cannot reasonably have assessed the potential impacts in the same.	Land Use and Tenure Technical Report (Appendix Q) of the EIS	Arrow sourced stock route data directly from the Queensland Government, which is represented on Figures 5-1a, 5-1b and 5-1c of the Land Use and Tenure Technical Report (Appendix Q) of the EIS. The EIS satisfies the description of environmental values component of the ToR stock route requirements s4.2.1.8 *"The location and owner / custodians of all existing tenures, reserves, roads and road reserves, railways, rail level crossings to be used and rail reserves, power lines, stock routes and the like, covering the project area should be shown on maps of a suitable scale. Indicate locations of proposed gas and water pipelines, power lines and any other easements."*

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S40 S41 S42 S43 S44 S45 S46 S47 S48 S49 S50 S51 S52	744 788 832 876 920 964 1008 1052 1096 1140 1184 1228 1272	As pastoral areas (cattle grazing) covers a 90.2 per cent of the project area (approximately 722,306 ha) it is with respect difficult to see how Arrow can sustain a significance of residual risk for transport impacts on stock routes as being of negligible to low in the absence of any analysis of the SRN usage and how that usage will be impacted by the Project.	Land Use and Tenure chapter (Section 19) and Land Use and Tenure Technical Report (Appendix Q) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS Roads and Transport chapter (Section 21) of the EIS	Prior to construction, a Road-use Management Plan will be prepared to manage and mitigate the risks and impacts of any transport related issues. The Road-use Management Plan will evolve as detailed design and operation details are finalised, and will include interaction between stock and freight routes. Where the Stock Route Network is identified as potentially being temporarily impacted during construction, Arrow is committed to ensuring adequate mitigation measures are proposed during construction activities and ensuring the safety of stock and people utilising the Stock Route Network. The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. Arrow will consult with all stakeholders involved in the administration and use of the Stock Route Network, such as the Stock Route Management Unit of NRM, to ensure any potential impacts of the Project impacts on the Stock Route Network are appropriately managed.

21.13 Soils and Land Suitability

Table 21-15 Acid Sulphate Soils Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	562	What is Arrow Energy's strategy to proactively manage acid sulphate soils and salinity issues including resulting runoff into water supplies?	Soils and Land Suitability chapter (Section 12) of the EIS	The Queensland State Planning Policy 2/02 - Planning and Managing Development Involving Acid Sulphate Soils (DIP, 2002) sets out the State's interests concerning development involving acid sulphate soils in low-lying coastal areas. The policy applies only to certain types of development assessments, located in a strict list of local government areas as outlined in Annex 1 of the policy. In addition the surface elevation of the Project area is well above 5 m AHD and inconsistent with the presence of low-land acid sulphate soils. Inland acid sulphate soils generally occur in poorly drained inland swamps above 5 m AHD. These areas are not anticipated to be disturbed during any proposed developments within the Project area Commit to addressing the issue of potential increases in secondary salinity within the Draft EMP, together with additional soil related issues. E.g.: • Surface stabilisation and revegetation of areas mapped as saline soils as soon as possible following disturbance • Achieve stable permanent landform through reinstatement activities confirmed through visual monitoring event at the end of the first wet season after completion of reinstatement works • Maintain soil nutrient condition and structural integrity confirmed through annual visual monitoring event and recording of active erosion conditions,

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Submission Number	Issue Number	Submission / Issue	Reference	Response
				presence/absence of surface scouring and presence/absence of vegetative cover • Visual monitoring for any signs of salinity (e.g. saline outbreaks, vegetation and waterlogging).

21.14 Contaminated Land

Table 21-16 Contaminated Land Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	564	What appropriate procedures and measures will be put in place for the notification, mitigation, investigation, remediation, and validation of the contaminated land? Who will be notified? Who will investigate? Who will validate remediation?	Contaminated Land chapter (Section 11.6.1 and Figure 11–1), Contaminated Land Technical Report (Appendix J, Section 1.4) and Draft Environmental Management Plan (Appendix Z, Section Z.4.3.2) of the EIS	Notification: Land can be contaminated through a range of historical, current or proposed land uses and activities. As such, a schedule of 38 Notifiable Activities is detailed within the EP Act (1994). Regardless of the cause of the contamination, there is a requirement that "if the owner or occupier of land becomes aware a Notifiable Activity is being carried out on the land, or if the land has been, or is being contaminated…the owner or occupier must notify the administering authority" (EHP, 2012). In the unlikely event that land is contaminated by incidents arising from CSG activities, under the Environmental Protection Act (EP Act) and Environmental Authorities (EAs), Arrow are under legislative obligations to notify landholders/occupiers of the land and the regulating authority. In addition, some Arrow Project activities are considered Notifiable Activities in their own right and land parcels may be required to be listed on the EMR". Mitigation: "The application of avoidance, mitigation and management actions for specified Project development activities is presented in the Contaminated Land chapter (Section 11, Figure 11-1) of the EIS. This is further discussed in the Draft Environmental Management Plan (Appendix Z, Section Z.4.3.2) of the EIS.

Submission Number	Issue Number	Submission / Issue	Reference	Response
				Investigation: If it is identified that the site is likely to have become contaminated, a site specific contaminated land assessment and management plan will be developed for each site. The assessments will be developed and conducted in accordance with the Guideline for Contaminated Land Professionals (EHP, 2012) and National Environmental Protection (Assessment of Site Contamination) Measure (ASC NEPM) (National Environmental Protection Council, 2013). Arrow will "conduct site investigations on relevant land parcels to assess for presence of contamination to allow for appropriate siting decisions to be made [B087]" - refer to the Contaminated Land chapter (Section 11.6.1) of the EIS. Remediation and validation: Arrow will be required to remediate and validate contamination arising from CSG Activities. For existing contamination Arrow has committed to "manage contaminated soil or groundwater that cannot be avoided through physical investigation; manage quantification of the type, severity and extent of contamination; and remediate or manage in accordance with the ASC NEPM (NEPC, 2013) and the Guideline for Contaminated Land Professionals (EHP, 2012) - refer to the Contaminated Land chapter (Section 11.6.1) of the EIS.

21.15 Visual Assessment

Table 21-17 Visual Assessment Submission Responses

Submission Number	Issue Number	Issue	Reference	Response
S33	645	Vale notes that most new mines in the Project area are likely to be underground. The visual impact of these mines will be much less than the considered open cut mines.		Noted. Underground mines still require a significant amount of surface infrastructure, which will result in visual impacts. This not only includes major infrastructure such as accommodation facilities, Mine Infrastructure Areas, dams and roads, but also bores and associated surface infrastructure required over the underground mine footprint to enable extraction of incidental mine gas.
S33	646	Will there be a flare on each well? If so, this will mean hundreds/thousands of wells, so they will need to be placed appropriately.	Landscape and Visual Amenity chapter (Section 20.7.2.3) of the EIS.	Each well requires a temporary flare during construction (drilling) and also during well workovers (i.e. maintenance) which has been estimated to occur every two years for each well. Flares are assessed in the Landscape and Visual Amenity chapter (Section 20.7.2.3) of the EIS.
S33	647	Vale notes this project has been cancelled and therefore should not be considered as part of this process: Connors River Dam and sunwater pipeline	Cumulative Impacts chapter (Section 31.3.1 and 31.3.2) of the EIS	The Cumulative Impacts chapter (Section 31.3.1) of the EIS explains: "Since the list of projects for consideration in this cumulative assessment was developed, a number of projects have been delayed (with revised timescales unavailable) or suspended; however these projects were considered to the extent of information publicly available in the development of this cumulative impact assessment." The Cumulative Impacts chapter (Section 31.3.2) of the EIS further states that "the Connors River Dam and Pipeline project EIS has been withdrawn and therefore the impact assessment data is no longer available. Where

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Submission Number	Issue Number	Issue	Reference	Response
				information can be used from the IAS' published for these projects, this will be done however this will be in a qualitative style (as the information required for a quantitative assessment will be documented in the EIS)."

21.16 Economics

Table 21-18 Economics Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	15	The 5th dot point of this section refers to “decline in the prominence of the Catchment Area’s agricultural industry in value add contributions”. This section should provide further explanation as to the meaning of ‘value-add contributions’ when used in this context.	Economics Technical Report (Appendix T) of the EIS.	A glossary of terms is presented upfront in the Economics Technical Report (Appendix T) of the EIS. “Measurement of the contribution to the economy of each individual producer, industry or sector based on the net activity at each stage of production. Gross value added (GVA) only measures the additional value added at each stage of production, and as such is considered a true measure of economic activity”.
S2	57	Proponent must bring forward key strategies and commitments contained in the Economic Assessment to the SIMP/Action Plans and commitment summary where appropriate. This should be discussed with Social Impact Assessment Unit Office of the Coordinator General.	SIA chapter (Section 15), SIA (Appendix M) and SIMP (Appendix N) of the SREIS.	The SREIS provides an update on the Social chapter (Section 15), SIA technical report (Appendix M) and SIMP (Appendix N) and outlines the relevant staging for implementing key commitments and strategies
S7	125	The Queensland Ambulance Service (QAS) may be required to fund and expand radio networks in the area. The QAS would request support to piggy back communication technology on planned towers or investigate assisting QAS to install appropriate technology in the area.		Arrow will consult with QAS regarding piggy back of communication technology post detailed design and prior to construction of the towers.
S10	149	The Bowen Gas EIS relies on analysis conducted for Arrow's LNG Plant regarding impacts of the project on the domestic market. This analysis was completed in July 2011 and is out-dated. For example, any scenario analysis post July 2012 should use the six trains currently under construction as a base case and ramp gas		ACIL Tasman (2011) assessed the likely potential impacts to the domestic gas market from the two further LNG trains associated with the Arrow LNG plant, as part of the state government approved Arrow LNG Plant EIS. The study concludes the development of the CSG gas resource to supply the first two trains of the arrow LNG Plant may

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		expected to be available for domestic customers during construction and commissioning of the projects has not materialised. The three Gas Market Reviews completed for the Government during the period 2010 to 2012 show increasing concern from the domestic customers regarding access to gas in the short to medium term. A key finding of the 2012 Gas Market Review is that the construction of a further two LNG trains (beyond the six currently under construction) prior to 2020, makes reserve levels available for domestic market contracting highly sensitive to, and dependent upon, planned or above planned reserved conversion and development rates. Given the significant gas market changes that have occurred in recent years, updated analysis of the impact of the Bowen Gas Project on the domestic market should be considered. A current analysis would assist Government and industry to understand the cumulative impact of export projects on gas supply and production.		increase pressure on eastern Australian gas consumption and prices. Further information on this analysis can be found In the Arrow LNG Plant EIS Economics Assessment (Chapter 27), the Economics Impact Assessment (Appendix 22) and the Implications for Domestic Gas Market Report (Appendix 22) The Cost benefit analysis undertaken for the Economic Impact Assessment chapter (Section 23) and technical report (Appendix T) of the EIS concludes that higher domestic gas prices are a potential impact of the Project. However the benefits generated by the Project outweigh the costs and are economically desirable for Queensland.
S21	391	Increase in regional rental and property prices from speculative activity. There may be opportunities to invest in the Central Highlands Housing Corporation.		Arrow will engage with CHRC regarding investigation of opportunities around the Central Highlands Housing Corporation.
S23	539	What will be the economic effect on existing local businesses including local agricultural producers?	Economics Impact Assessment chapter (Sections 23.5.4, 23.6.1, 23.6.8 and 23.8) of the EIS	The Project has the potential for both beneficial (Economic Impact Assessment chapter (Section 23.5.4) of the EIS) and adverse (Economic Impact Assessment chapter (Section 23.6.1) of the EIS) impacts to local business. Specific impacts on agricultural production are outlined in – the Economic Impact Assessment chapter (Section 23.6.2) of the EIS. Mitigation measures for these potential impacts are detailed in –the Economic Impact Assessment chapter (Section 23.8) of the EIS.
S24	567	Mackay Regional Council recognises that a majority of the proposed		Noted.

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		Project's impacts will be experienced in the Isaac Regional Council and Central Highlands Regional Council localities. Nevertheless, Mackay is the regional centre providing much of the engineering, manufacturing and services industries for the resource sector as well as community services and facilities which serve the wider region. In this respect, Council welcomes the potential economic benefits of the proposed Project on the region of Mackay as well as the wider Mackay, Isaac and Whitsunday region.		
S26	580	The Bowen Catchment Area, comprising the Isaac, Mackay and Central Highlands local government areas, is the study area for assessment of the economic impacts of the Project. This area is identified in the EIS as an area largely viewed as a mining region and this is recognised as an important driver for a tightening property market and decline in the growth of the agricultural industry. Rail network operators are directly impacted by changes in the resource industry as this drives the need and provision of rail infrastructure in these regions. The EIS should consider the impact of the growth in mining and resource projects in the region on the surrounding rail network which services the area.		Indirect impacts of the growth of mining projects on surrounding rail networks are not a requirement of the Project ToR.
S26	581	Impacts on future coal mining development have been identified where coal mining activity on the same tenements might be delayed due to extraction of gas. Although this should not cause any permanent economic losses, the delay is likely to impact Aurizon haulage if coal mining is slowed. This will have residual impacts on the enterprise through interfering with annual haulage rates. The mitigation measures and residual impacts of this delay in coal mining have not been identified in Table 23-1. It is recommended that this section is amended to reflect this and to include details of how the proponent will manage such matters with the rail network operators within the region.		Indirect impacts of the growth of mining projects on surrounding rail networks are not a requirement of the Project ToR. This is not considered a likely impact and is not assessed.
S33	649	Vale submission 2a on the draft Terms of Reference	Landuse and	Existing land ownership and tenure within the Project area

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		Arrow reference the impact on ML and MDL however does not reference the impact on EPCs. Vale's submission on the draft TOR sought Arrow to consider impact on EPCs.	Tenure chapter (Section 19, Figure 19-1) of the EIS.	is depicted in the Land Use and Tenure chapter (Section 19, Figure 19-1) of the EIS. In addition, with regards to Vale specifically, Arrow has met and will continue to meet with Vale on a regular basis to allow each party to discuss their proposed plans to ensure cooperative co-development across all forms of tenure. Figure 19-1 satisfies the ToR requirement: s3.3.1 *Describe and illustrate any existing mining tenements, petroleum, geothermal and greenhouse gas tenures and licences overlying and adjacent to the project site, and any proposed applications required for this project.*
S33	650	Vale submission on the draft Terms of Reference 4.12.2 The ToR specifically states that Arrow's EIS must "Outline a strategy committing to the development of a local industry participation plan (LIPP)" This has not been completed in the EIS	Economics Technical Report (Appendix T, Section 6.2) of the EIS.	In June 2012, the Department of State Development, Infrastructure and Planning initiated discussions with the Queensland Resource Council to investigate the development of a voluntary code of conduct for local content in private sector projects that would replace the requirement to develop a Local Industry Participation Plan (LIPP). Based on this initiative, Arrow requested that the Coordinator General remove the LIPP requirement on the Arrow LNG Project and accept that Arrow would comply through the development of an Australian Industry Participation Plan (AIPP). On the 4 December 2012 the Coordinator General's office confirmed that: "The proponent should submit a copy of their full Australian Industry Participation Plan (AIPP) (refer to AusIndustry – http://www.ausindustry.gov.au/programs/import-export/epbs/Pages/EPBS-AustralianIndustryParticipationPlan.aspx) with the final SIMP across all Arrow Energy EIS projects." The Economics Technical Report (Appendix T, Section 6.2)

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				of the EIS outlines a number of local skills development strategies for the project.
S39	724	No reference to economic impacts caused by drill truck fleets traversing narrow rural roads for the estimated 6500 wells, these drill trucks and associated equipment have the potential to seriously disrupt travel of agricultural, and service industries using these rural feeder roads. The delays caused by wide and over-dimensional loads are already causing serious economic cost on the Peak Downs Highway; these costs due to delays will be even more widespread with large numbers of Arrow Energy drill, pipeline heavy vehicles, equipment and contractors on narrow rural roads. The potential for serious economic costs and hardship is high if movement of trucks and equipment is not very carefully managed after rain. No mention of mitigation costs for damage to rural roads. No mention of much higher risk to road safety with this equipment on narrow rural feeder roads.	Roads and Transport chapter (Section 21.10) of the EIS Roads and Transport chapter (Section 12) and Roads Impact Assessment (Appendix K) of the SREIS.	The EIS stated that a Road-use Management Plan (RMP) would be prepared (see Roads and Transport chapter (Section 21.10) of the EIS) as detailed design and operations details are finalised. The RMP will present management and mitigation measures for all transported related issues, including impacts to rural roads.
S39	725	As above, highly likely to cause economic loss to Agricultural industry if rural roads are damaged, with subsequent risks also to road safety, again at very high costs.	Roads and Transport chapter (Section 21.10) of the EIS Roads and Transport chapter (Section 12) and Road	The EIS stated that a Road-use Management Plan (RMP) would be prepared (see Roads and Transport chapter (Section 21.10) of the EIS) as detailed design and operations details are finalised. The RMP will present management and mitigation measures for all transported related issues, including impacts to rural roads.

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			Impact Assessment (Appendix K) of the SREIS.	
S39	726	Risks of damage to rural roads and mitigation measures only mentions councils, severe economic hardship will also be imposed on Agricultural industry if roads damaged and unable to be repaired for months, this must be clearly recognised as high risk, and high residual risk. When road conditions are poor, road safety risks compound especially with night driving, this must be recognised as an economic cost. Rewrite the section recognising the true risks and mitigation measures using costs from the RIA	Roads and Transport chapter (Section 21.10) of the EIS Roads and Transport chapter (Section 12) and Road Impact Assessment (Appendix K) of the SREIS.	The EIS stated that a RMP would be prepared (see Roads and Transport chapter (Section 21.10) of the EIS) as detailed design and operations details are finalised. The RMP will present management and mitigation measures for all transported related issues, including impacts to rural roads.
S53	1311	I acknowledge the royalties from this project would be a welcomed economic benefit directly and indirectly, however it is my opinion that short term economic benefit does not justify the high risk of environmental harm to land and rivers particularly when the greatest beneficiary is a foreign interest.		Noted.

21.17 Health and Safety

Table 21-19 Health and Safety Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S7	143	The project managers should establish links with the Local Disaster Management Groups across the construction area and operations areas. Support should be offered if available to the Disaster Management system - local government and communities in the event of the impact of a disaster situation.		Arrow will continue to engage with emergency services and the local disaster management groups as field development progresses and the locations of infrastructure are better understood. Arrow has committed to maintaining an emergency management plan that will cover joint emergency response planning in collaboration with emergency response providers. The plan will be prepared in consultation with relevant Queensland government authorities and emergency services organisations and maintained for the Project in collaboration with emergency service providers. Arrow will develop emergency response plans in consultation with emergency services organisations that include a list of required equipment, training and other resources, and foreseeable emergency and crisis situations.
S8	145	Monitoring of ongoing school community physical and mental health: While detailed consideration has been given to employee health and wellbeing with the proposed introduction of various programs there is limited assessment of the ongoing health and wellbeing of the wider community, outside of the recognition that health services may be impacted and that a grievance management initiative will be implemented. We request that the proponent address monitoring of the school community's physical and mental health through funding appropriate programs that are made available to the community as a whole.		The Education Department is responsible to ensure that physical and mental health issues do not adversely affect the operations of schools in Queensland, and ensures that health is a part of the curriculum and that school counsellors are provided as necessary. The availability of more diverse employment and training options as a result of the Project is expected to improve community confidence in the long-term economic future of the region, thereby indirectly benefiting overall mental health status.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
				Arrow invests in community initiatives through the Brighter Futures program which supports local, not-for-profit community groups and organisations undertaking projects and initiatives that make a sustainable contribution to Arrow's areas of operation throughout Queensland. The program places significant importance on the inclusion of projects and initiatives that help build community capacity. The program centres on three focus areas which are linked to Arrow's vision; health and safety, education and environment. Arrow currently supports a range of initiatives in the Bowen Basin region that are focussed on education and wellbeing: Arrow funds the education and business streams of the Moranbah State High School M-STEP program. The education stream allows students to gain hands on experience through running an after school and vacation childcare services in the region whilst completing a Certificate III in Education Support. Business students complete a Certificate III in Business whilst running a stationary store at the High School. The Moranbah District Support Service has received funding from Arrow to research and develop a feasibility plan for a Men's Shed initiative in Moranbah. Arrow regularly attends the regional meetings that are focussed on community health and wellbeing. These include the Moranbah Interagency Meeting and the bi-monthly meeting between proponents and Queensland Police. Organisations supporting the school community will be eligible to seek support from the 'Brighter Futures Program' for initiatives that target physical and mental health should

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				that be their priority.
S17	356	The EIS made reference (pg. 30-12) that the Pest Management Plan "might" include control measures to prevent the increase of biting insect species. The proponent however has not committed to developing this plan to protect human health from disease vectors. For guidance the proponent can refer to The Queensland Health document 'Guidelines to minimise mosquito and biting midge problems in new development areas' (http://www.health.qld.gov.au/phs/Documents/cdu/14804dmp.htm) for assistance. The proponent must commit to the development of a comprehensive plan referencing The QPHS document 'Guidelines to minimise mosquito and biting midge problems in new development areas' (http://www.health.qld.gov.au/phs/Documents/cdu/14804dmp.htm) mosquitoes given the number of itinerant workers/visitors who will be on site for varying periods of time.		The Pest Management Plan will address mosquitos and biting midges. It will reference the QPHS document 'Guidleine to minimise mosquito and midge problems in new development areas'.
S17	357	QPHS notes that the proponent has committed to an on-site medical facility (pg. 30-12). It is important that this facility is appropriately staffed and available to the workforce 24 hours a day, 7 days a week. DoH believes that the Health and Safety component of the needs to provide further details relating to the following aspects: • The impacts the project will have on the regional health services. In particular concerns relating to the increased in risk of road trauma. • The identified potential impact of industrial activities is the increased need for emergency first response. • An increase in the population within the area may result in an increase in demand for a cross section of health services QPHS recommends that the proponent: • Assesses the impact the project will have on regional health	Social Impact Assessment (SIA) (Appendix U, Section 6.8) of the EIS.	The Social Impact Assessment (Appendix U, Section 6.8) of the EIS presents the potential impacts on health and emergency services and also presents the proposed mitigation for these impacts. Arrow will consider the Health (Drug and Poisons) Regulation 1996 and any relevant approvals pertaining to the Project.

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		services and describe any necessary management strategies, including further with the appropriate regional Hospital and Health Service district. • That the proponent ensures appropriate approvals are obtained as specified by the Health (Drugs and Poisons) Regulation 1996. For further information relating to these requirements please refer to; http://www.health.qld.gov.au/ph/Documents/ehu/com-paraapproval.pdf		
S18	369	Landholders close to the site should be advised that the establishment of the mine may prevent their obtaining permits to conduct strychnine or sodium fluoroacetate (1080) baiting for dingoes. Queensland Health's current policy restricts baiting with these poisons to more than 5 kilometres from neighbouring industries, such as coal mines.		Landholders will be reminded of the Queensland Health policy pertaining to the baiting of dingoes, as appropriate.
S18	370	All camp kitchens must be designed, approved and constructed in accordance with the requirements of the Food Act 2006. The camp kitchens must be approved and licensed by the relevant Local Government prior to use.		All camp kitchens will be designed, approved and constructed in accordance with the requirements of the Food Act 2006 or other relevant current regulations.
S18	371	The number of employees involved in the construction and future operation of the project may impact on the existing health services provided by the Mackay Hospital and Health Service. Matters such as housing, medical services and community health issues are of concern.	Social Impact Management Plan (SIMP) (Appendix V, Section 1.1.4) of the EIS. Project Description chapter (Section 3.9) and SIA (Appendix M)	The construction and operations workforce has been revised for the SREIS reference case – see Project Description chapter (Section 3.9) of the SREIS. Regional health services will be consulted with when Arrow develops the Health Management Plan for the Project. Impacts and mitigation to health and emergency services were presented in the SIMP (Appendix V, Section 1.1.4) of the EIS. A revised assessment on housing is presented in the SIMP (Appendix M) of the SREIS.

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			of the SREIS.	
S23	411	Not meaningfully addressed in EIS: The project does not substantiate any real consideration of the remote locations and the health and safety of workers and relies on the FIFO model to solve all issues related to the workforce.	SIA (Appendix U, Section 4.6.2) of the EIS.	The SIA (Appendix U, Section 4.6.2) of the EIS presents the health of non-resident workers and includes the impact of non-resident workers' health needs on residential population as well as an in-camp medical service model.
S23	523	What is the Arrow Energy / contractor strategy for the management of communicable disease outbreaks and quarantine in the locality as no permanent medical facility is proposed for the operational workforce?	Health and Safety chapter (Section 30.4.2, Table 30-2) of the EIS.	Arrow has committed to an on-site health service for the workforce in the TWAFs. Arrow will liaise with emergency services and Queensland Health during Project planning, which will include discussions on management of communicable disease outbreaks and quarantine.
S23	559	How will Arrow Energy/contractor strategy for the management of communicable disease outbreaks and quarantine in the locality?	Health and Safety chapter (Section 30.4.2, Table 30-2) of the EIS.	Arrow will liaise with emergency services and Queensland Health during Project planning, which will include discussions on management of communicable disease outbreaks and quarantine. These management strategies will be included in Arrow's HSEMS for the Project.
S29	594	Safety during construction: Ergon Energy must be contacted for safety advice prior to work commencing within close proximity of Ergon Energy infrastructure. The following legislation and code should be consulted for working in the vicinity of electricity infrastructure: • Electrical Safety Act 2002 • Electrical Safety Regulation 2002 • Code of Practice - Working near Exposed Live Parts	Preliminary Hazard and Risk chapter (Sections 27.3.1.5, 27.3.2 and 27.3.1.6) and Health and Safety	Noted. Arrow will liaise with utility providers as required to ensure that a safe distance is maintained between electrical infrastructure and Project facilities and infrastructure in accordance with applicable legislation, regulations, standards and codes of practice. Although not specifically identified in the EIS, all relevant legislation and code will be consulted for working in the

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			chapter (Section 30.2.2) of the EIS.	vicinity of electricity infrastructure.
S38	710	Human health: There is no information on air and water pollutant emissions that will be harmful to human health and the likely concentrations of those emissions at different CSG production and transportation sites.	Air Quality chapter (Section 9.5), Surface Water chapter (Sections 15.5 and 15.6) and Health and Safety chapter (Section 30.4.2, Table 30-2) of the EIS.	Air Quality emissions have been assessed against criteria that consider human health. Potential air quality emissions from the Project are discussed in the Air Quality chapter (Section 9.5) of the EIS. Results show that the environmental values for air quality in the region are not predicted to be materially impacted by emissions from the Project. Water pollutant emissions are also assessed against a range of legislative requirements and guidelines. The Surface Water chapter (Section 15.5) of the EIS identifies the potential impacts the Project may have on water quality, and outlines management and mitigation measures to reduce risk to human and environmental health. The Surface Water chapter (Section 15.6) of the EIS states "This investigation considers that the impacts associated with the development of the Project could be appropriately managed by implementing a range of mitigation measures during construction, operational and decommissioning phases of the Project." Mitigation measures for Project workforce and public risk associated with air and water quality are further outlined in the Health and Safety chapter (Section 30.4.2, Table 30-2) of the EIS.
S53	1326	Gas transfer infrastructure: Have baseline studies been conducted in relation to effects of CSG produce water holding ponds ,gas well head and compressor station		Noted The SREIS will include reference to any recent and relevant studies in this area.

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		and related infrastructure relative to human and livestock interaction of long durations. As there is significant landholder and community complaints in relation to this in the Surat Basin tenures, relating to nose bleeds, headaches, general unwellness when exposed for long durations, persistent odours.		
S53	1327	Gas transfer infrastructure: It is alleged that cattle and animals can be contaminated from over exposure to CSG produce water holding ponds, gas well heads, compressor stations and related infrastructure. Is a study available or can one be included.		Noted. The SREIS will include reference to any recent and relevant studies in this area.

21.18 Hazard and Risk

Table 21-20 Hazard and Risk Submission Responses

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S7	119	The EIS does not provide a specific assessment of the level of risk associated with landslide for the Project. It is recommended that the EIS provides a specific assessment for the level of risk associated with landslide and identify appropriate mitigation strategies for landslide hazard identified. Volume 1 – Section 27 Preliminary Hazard and Risk, s27.4 Hazard Identification and Controls, s27.4.1 Natural Hazards should be amended to reflect the assessment.	Preliminary Hazard and Risk chapter (Sections 27.4.1 and 27.6.2) of the EIS.	The Preliminary Hazard and Risk chapter (Section 27.4.1) of the EIS states: "Sites for compression facilities will be located on level ground to minimise landslide risk.[...] The principals of SPP 1/03 will be applied by the Project on a consistent basis across the Project area to minimise the potential adverse impacts of flood, bushfire and landslide. Design for credible natural events is managed by Arrow's Health, Safety and Environment Management System (HSEMS) (refer to the Preliminary Hazard and Risk chapter (Section 27.6.2) of the EIS)." See ToR 4.13 "...the EIS should consider the principles of natural hazard management in State Planning Policy 1/03 (SPP1/03), Mitigating the Adverse Impacts of Flood, Bushfire and Landslide, even if the development is exempt development under the *Sustainable Planning Act 2009*. SPP1/03 may not be applicable as a statutory instrument for exempt development, but it contains information that guides best practice for all development..."
S7	123	QFRS acknowledges EIS – Hazard Analysis and Evaluations, in particular the potential for fires or emergency incident at the on-site wells and associated facilities. QFRS is able to assist in the planning and developing both the firefighting Emergency Management Plan and Emergency Response Plan for the sites.		Arrow will consult with QFRS during the development of both the firefighting Emergency Management Plan and Emergency Response Plan.
S7	134	Formulate and provide a copy of the Integrated Risk Management Plan, which should include contact details for key stakeholders in	Preliminary Hazard and	A Project HSEMS will be developed from Arrow's HSEMS

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		case of an emergency.	Risk chapter (Section 27.6.7) of the EIS.	[B494]. The Project HSEMS is an integrated risk management plan for health, safety and environment (HSE) for the whole life of the Project, from design and construction, through to operation and decommissioning and will be updated from time to time as required [B473] & [B498]. Arrow will include the contact details for key stakeholders in the Emergency Response Plan.
S7	135	The QAS to be provided a copy of the Hazards and Risk assessment.	Preliminary Hazard and Risk chapter (Section 27.6.7) and Hazard and Risk Technical Report (Appendix Y) of the EIS.	The Hazard and Risk assessment has been provided in the Hazard and Risk Technical Report (Appendix Y) of the EIS. A summary of the hazard and risk assessment undertaken as part of the EIS is presented in the Preliminary Hazard and Risk chapter (Section 27.6).
S7	136	Notification of planned exercises, either practical or table top, for attendance and participation by QAS.		Arrow will inform QAS and other relevant stakeholders when hazard and risk practical / table top exercises are planned.
S7	137	Provide QAS with information relating to the Disaster Management System that will be used in the event of a disaster.	Preliminary Hazard and Risk chapter (Section 27.6.7) of the EIS.	"Regional response plans for the Project area will be developed and updated as operations in the area expand to include Project specific information. Arrow already has plans in place for their existing operations in Queensland. The plans are developed in consultation with emergency service organisations" (refer to the Preliminary Hazard and Risk chapter (Section 27.6.7) of the EIS). Arrow will continue to consult with emergency services and

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				the local disaster management groups as field development progresses and the locations of infrastructure are determined. QAS and other relevant stakeholders will be provided with copies of the plans once these have been finalised.
S17	358	When describing the characteristics of solid or liquid wastes produced by a process, the radiological characteristics of the waste are often overlooked. Extraction of liquids or gases from wells can be accompanied by the build-up of radioactive scales on the inside of pipes and pumping equipment, the release of radon, the release of contaminated formation water, and the generation of sludges and oily sands containing radionuclides[1]. Typically, the radionuclide with the greatest activity concentration is 22 Ra. In scales its activity concentration can range from 0.1 to 15,000 Bq.g-1 and in sludges from 0.05 to 800 Bq.g-1 Occupational exposure to NORM typically takes place as a result of: • Gamma radiation from deposits inside equipment exposing workers outside the equipment • Disturbing NORM deposits during maintenance work on equipment when taken offline. NORM in scales and sludges may also cause environmental harm and it must be disposed of in accordance with the disposal requirements of the *Radiation Safety Act 1999*. The proponent needs to be aware that the project has the potential to concentrate naturally occurring radioactive material (NORM) which may cause occupational or environmental harm. [1] ARPANSA Safety Guide for the Management of Naturally Occurring Radioactive Material (2008). The proponent should identify those parts of the process where	Waste Management chapter (Section 16) of the SREIS.	Any radioactive materials generated by the Project will be managed in accordance with relevant standards and guidelines.

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		NORM may be a hazard. The proponent should deal with the NORM hazard in accordance with the ARPANSA Safety Guide for the Management of Naturally Occurring Radioactive Material (2008). Disposal of waste containing NORM must comply with the *Radiation Safety Act 1999*.		
S19	381	In addition to the Department of Community Safety, Queensland Fire and Rescue Service, Queensland Ambulance Service and QPS, consultation in relation to the development of these plans should take place with Local and District Disaster Management Groups. This would ensure that the emergency /risk management plans for the project do not conflict with and/or place unnecessary burdens on existing disaster management arrangements.	Preliminary Hazard and Risk chapter (Section 27.6.7) of the EIS.	"Regional response plans for the Project area will be developed and updated as operations in the area expand to include Project specific information. Arrow already has plans in place for their existing operations in Queensland. The plans are developed in consultation with emergency service organisations" Arrow will continue to engage with emergency services and the local disaster management groups as field development progresses and the locations of infrastructure are determined.
S19	382	QPS requests that the proponent reference the *Disaster Management Act 2003* and any reference to a 'disaster' should be in consideration of the definition ·provided for in this Act.	Preliminary Hazard and Risk chapter (Section 27.4) and Health and Safety chapter (Section 30.6) of the EIS.	The SREIS has been updated to include reference to the *Disaster Management Act 2003*. The term 'disaster' will be used to describe such events where appropriate. The EIS currently addresses situations or events that may be termed 'disasters', but does not use the term itself to describe these. See for example the Preliminary Hazard and Risk chapter (Section 27.4) and Health and Safety chapter (Section 30.6) of the EIS.
S19	383	The QPS requests that it be identified as a key participant and stakeholder in disaster management.		Arrow recognise and will engage with QPS as a stakeholder with relation to disaster management.
S19	384	The QPS further requests that the proponent include elements within		Arrow conducts security risk assessments on its CSG

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		the Risk Assessment in relation to how the proponent will deal with trespass action, nonviolent direct action, and other protest related activities that could close operations and place police, workers and protesters in danger. The QPS invites consultation with the proponent in the development of plans.		activities. These include identifying any activity that may be subject to protest action or disruption, and developing plans to deal safely with any such action. These plans include liaison with QPS as appropriate with a focus on safely responding to any potential incident. Where required barriers or other security measures may be implemented to ensure operations can safely continue free of interference.
S23	431	The EIS does not propose any meaningful solutions to disaster management or medical services for the project and leaves the local services to take responsibility. This is unsustainable as a local service provider and volunteer base is essential to assist in times of emergency under the normalised community model. A workable solution must be found unless the project will be left exposed and lives at risk. A failure to have workable solutions for emergency responses will not be acceptable to Isaac Regional Council as it will draw down existing levels of service in the region.	Social Impact Assessment chapter (Section 24.8.6) of the EIS.	Refer to the Social Impact Assessment chapter (Section 24.8.6) of the EIS. "In accordance with Project requirements, an emergency management plan will be developed that will cover joint emergency response planning in collaboration with emergency service providers. Consider the joint provision of a medivac service for Project related emergencies in the region. Arrow will discuss with QPS the opportunities and applicability for QPS to utilise Arrow's communication networks throughout the Project area to assist the QPS' (and other emergency services) gaps in coverage. Ongoing consultation will occur with appropriate levels of QPS regarding the development and implementation of the traffic management plan including vehicle movements and coordination of efforts where possible. Arrow will continue to engage with emergency services and the local disaster management groups as field development progresses and the locations of infrastructure are determined.
S23	530	What is the mitigation strategy for disaster management (flooding and otherwise) when the workforce is unable to leave site or site is inaccessible, including infrastructure reconstruction?		Arrow considers the potential for natural disasters as part of the Project planning process, and where appropriate, will establish specific field management protocols in the event

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		• During construction • During operation • Including liquid waste disposal		the workforce is unable to leave site or the site is inaccessible.

21.19 Indigenous Cultural Heritage

Table 21-21 Indigenous Cultural Heritage Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S5	115	The final Terms of Reference (ToR) at p.46 required "adequate provision of education, training and employment for women, people with disability and Indigenous peoples." The mitigation measures proposed in the Social Impact Management Plan (SIMP) adequately deal with education, training and employment for Aboriginal and Torres Strait Islander peoples. The existence of an Aboriginal and Torres Strait Islander Action Plan and a Reconciliation Action Plan that guide the Proponent's actions across all its projects and operations does not negate the need to specify actions that will ensure the adequate provision of education, training and employment for Aboriginal and Torres Strait Islander peoples as required in the ToR. As detailed in the Department of Aboriginal and Torres Strait Islander and Multicultural Affairs' feedback on the draft ToR for this project, the department suggests that an Aboriginal and Torres Strait Islander Participation Plan be developed as one of the mitigation actions proposed. It is suggested that the Aboriginal and Torres Strait Islander Participation Plan include: Indigenous cultural awareness training. This will build understanding and knowledge of Indigenous relations and culture at the individual and business unit level. Demonstration of support for Aboriginal and Torres Strait Islander events, celebrations and awards. Local, regional and state recruitment strategies, processes and systems that are culturally sensitive to the recruitment of Aboriginal	SIMP (Appendix N) of the SREIS.	Arrow acknowledges its role in providing employment, education and training opportunities for Indigenous people. An update to the SIMP (Appendix N) of the SREIS outlines a range of measures to provide Project employment and education and training opportunities to Indigenous people and communities which have been developed since the EIS. Measures may include commitments designed to highlight Arrow's ongoing efforts including: • Implement actions within Arrow's Aboriginal and Torres Strait Islander Reconciliation Action Plan (RAP) relating to educational opportunities for indigenous students (Commitment C551). Current existing initiatives include: • The Queensland Aboriginal and Torres Strait Islander Foundation, which includes support to 69 Indigenous students entering years 11 or 12 in 2013 through bursaries that cover school-related expenses such as uniforms, IT levies, and VET expenses. • The Yalari Foundation, which provides support to three Indigenous students commencing high school in 2013 to obtain education at a boarding school suited to their education and cultural needs. • Partnering with six Queensland universities (University of Southern Queensland, Central Queensland University, James Cook University, University of Queensland, Queensland University of Technology and

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		people and Torres Strait Islander people.		Griffith University) to provide 25 scholarships to Indigenous students, including financial support, mentoring and peer support. • Encouraging Indigenous Australians to apply for Arrow's graduate program, vacation employment, traineeships and apprenticeships. Arrow has committed to prepare CHMPs or equivalent agreements in accordance with the provisions of the *Aboriginal Cultural Heritage Act 2003* (Qld) and Arrow will also enter into Land Use Agreements for the Project area to address Aboriginal involvement in the management of Aboriginal cultural heritage.

21.20 Decommissioning and Rehabilitation

Table 21-22 Decommissioning and Rehabilitation Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	16	Potentially any rehabilitated site can have undesirable contaminants in the land or in the run-off from the land that ends in animal drinking water. Under the Stock Act 1915, DAFF can quarantine land and 'things' that may cause a residue in stock. The EIS should address the risk posed to the product integrity of animals grazing on contaminated land (where mining land is to be returned to livestock production) through the development of an appropriate risk management strategy.	Contaminated Land chapter (Section 11.4.3), Preliminary Hazard and Risk chapter (Section 27.6.5), and Decommissioning and Rehabilitation chapter (Section 29.5.7) of the EIS.	The potential impacts of contaminated land on animal grazing has been included in the EIS impact assessment. "Potential impacts may include exposure of contaminated land to site workers, the public, wildlife, stock, native and cultured vegetation". Rehabilitation will only be considered successful once the following conditions have been met, Monitoring and maintenance will continue until such time. • The site can be managed for its designated landuse • Evidence that the agreed rehabilitation objectives of the rehabilitation strategy have been met. • No greater management input is required for the site than that of the surrounding areas consistent with designated landuse • Written agreement has been attained by the land owner / holder and the administering authority. If it is identified that the site is likely to have become contaminated, a site specific contaminated land assessment and management plan will be developed for each site. The assessments will be developed and conducted in accordance with the Guideline for Contaminated Land Professionals (The State of Queensland (Department of Environment and Heritage Protection) 2012) and the National Environment Protection (Assessment of Site Contamination) Measure 1999, as amended.

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				Refer to the Contaminated Land chapter (Section 11.4.3) of the EIS. Contaminated land impacts will be considered under the project's HSEMS for Risk Management. Refer to Preliminary Hazard and Risk chapter (Section 27.6.5) of the EIS.
S13	281	The EIS states that in some locations, vegetation trimming may be required. For safety reasons, drilling sites are normally up to 90 x 90m. Once the well is installed the footprint is reduced to approximately 10 x 10m, as this area is sufficient to house the wellhead and associated equipment. The larger drilling site footprint is then partially rehabilitated. Workover rigs will re-establish a temporary 90 x90 m footprint on a periodical basis (typically every 3 years) over the well's lifespan. Clarity is needed on what the 'partial rehabilitation' will involve. The mention above of workover rigs re-establishing a temporary 90 m x 90 m footprint typically every 3 years, contradicts the information below taken from 4.8.1 Production Wells (in Decommissioning and rehabilitation). 4.8.1 Production Wells (in Decommissioning and rehabilitation) states that the construction site footprint outside the 0.1ha required for operations will be rehabilitated and contoured as practicable to pre-existing conditions or to a standard agreed by the landowner. Recommendation is that Arrow provide clarification on what is meant by partial rehabilitation of well site footprint in the supplementary information to the EIS. What activities will be involved in rehabilitation and will the standard of rehabilitation have to meet QPWS satisfaction.	Decommissioning and Rehabilitation chapter (Sections 29.2 and 29.3.2) of the EIS.	Partial, or interim rehabilitation is further defined in Chapter 29.3.2 of the EIS Arrow's "Rehabilitation Procedure" established minimum standards that are mandatory for rehabilitating disturbed land following drilling activities, construction, operation and maintenance of plant and equipment at Arrow Energy Australia controlled sites.' The procedure applies to interim rehabilitation for stabilising operating project sites (i.e. production wells, power lines) as well as final closure rehabilitation to achieve the rehabilitation objectives of the land following the decommissioning of infrastructure (plugged and abandoned wells, pipelines, power line easements etc.). The intent of the procedure is to "facilitate the return of the land to a stable state, where either the former land use or another specified state agreed by the Government and landholder, can be resumed." Rehabilitation objectives include ensuring that the site is safe to humans and wildlife, non-polluting, stable and able to sustain an agreed land use". For interim rehabilitation of well sites, the minimum interim rehabilitation objectives for the non-operational area would include (1) site is safe, (2) landform is stable, (3) site is non-polluting. Revegetation of groundcover would also be initiated as part of site stabilisation through

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				respreading of topsoil and/or seeding. However, the non-operational area of the site would not necessarily be rehabilitated to the final land use as part of interim rehabilitation, depending on the use and characteristics of the site (e.g. paddock, native ecosystem, woody vegetation, etc.). This is because well sites are re-disturbed every few years for maintenance/workovers, and therefore, achievement of the final land use may be impracticable until such time that the well infrastructure is decommissioned and there is no longer an operational need to re-disturb the site. Following decommissioning of well infrastructure, final rehabilitation will be commenced as soon as practicable for the entire site, including the operational area around the wellhead.
S13	286	The EIS states that site-specific rehabilitation plans will be developed for areas where natural vegetation regeneration may be problematic. The final rehabilitation will be determined in conjunction with the landowner. In general terms of rehabilitation, we request that QPWS have the capability to set rehabilitation requirements, including replanting vegetation and site preparation. Specifically, in Category C ESAs (State Forest) QPWS request that the following be conditions of an environmental approval: The Tenement Holder must as a minimum, meet the requirements of the Environmental Authority with regards to rehabilitation; The Tenement Holder must consult the Landowner about the rehabilitation of the land and have reasonable regard to the Landowner's proposals relating to rehabilitation; The Landowners requirements must be considered in the development of the site specific performance measures and monitoring actions which are required as per the rehabilitation	Project Description chapter (Section 4.8) of the EIS.	Arrow agrees that the proposed conditions noted in the submission by QPWS are reasonable and applicable. Conditions of an Environmental Authority are expected once the EIS process is completed and Arrow have submitted the Environmental Authority application and supporting information.

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		objectives in the appropriate Rehabilitation Plan; The site specific performance measures and monitoring actions must be developed prior to works commencing within the project area; and The site specific performance measures must be made available to the Landowner upon request.		
S23	410	The project does not commit to any semblance of a framework for a long term closure plan and rehabilitation of the site given strong evidence of climate change and variability being a serious player for this region over the project life.	Decommissioning and Rehabilitation chapter (Sections 29.2, 29.7.7, and 29.7.10.2), and Draft Environmental Management Plan (Appendix Z, Section Z.5) of the EIS.	The EIS contains commitments for rehabilitation measures being undertaken as soon as practicable after a disturbance. Where practicable and appropriate, Arrow will endeavour to undertake re-vegetation and stabilisation this within 6 months for all non-active disturbed surfaces. Final rehabilitation will be commenced within 12 months following decommissioning of infrastructure on sites that are no longer required for operational activities, and monitoring will be conducted to assess progress against rehabilitation objectives until rehabilitation requirements are demonstrated to have been achieved. “The specific objectives, indicators and appropriate closure criteria will be developed during detailed closure planning”, see the Decommissioning and Rehabilitation chapter (Section 29.2) of the EIS. The Decommissioning and Rehabilitation chapter (Section 29.7.7) of the EIS, states "Revegetation activities will be planned to occur after the completion of reshaping, topsoil application.....where possible, the timing of these preparation works would be scheduled to enable immediate sowing of appropriate vegetation. This would minimise the potential for soil erosion and weed invasion..."

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				The Decommissioning and Rehabilitation chapter (Section 29.7.10.2) of the EIS states, "Monitoring outcomes will determine whether rehabilitation is underperforming and additional maintenance required. Rehabilitation methods will be modified over time as additional knowledge is gained from monitoring programs and research conducted into the different rehabilitation techniques". Rehabilitation will only be considered successful once the following conditions have been met, Monitoring and maintenance will continue until such time. The site can be managed for its designated land use Evidence that the agreed rehabilitation criteria have been met. No greater management input is required for the site than that of the surrounding areas consistent with designated land use Written agreement has been attained by the land owner / holder and the administering authority. Refer to the Draft Environmental Management Plan (Appendix Z Section Z.5) of the EIS.
S23	415	All disturbed exploration and operational well sites and rehabilitation areas shall be rapidly re-vegetated and stabilised to prevent particulate contamination and surface water pollution from the site exceeding the pre-development levels at the property boundary. Council views a maximum period of 6 months for all non-active disturbed surfaces to be left exposed prior to re-vegetation and stabilisation being implemented as a minimum standard to protect local amenity and ecological integrity of the surrounding agriculture and proposed rehabilitation areas.	Draft Environmental Management Plan (Appendix Z, Section Z.5) of the EIS.	The EIS outlines site rehabilitation will occur as soon as reasonably practicable. Site specific Erosion and Sediment Control (ESC) Plans are developed (in accordance with our EA Conditions) prior to disturbance taking place. Measures required by the specific ESC Plan are implemented during the initial disturbance phase to mitigate the effects of erosion and run-off to surrounding areas. ESC measures are maintained until the site is rehabilitated, or has a self-

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				sustaining ground cover. "Progressive Rehabilitation: where appropriate, this is undertaken after construction to stabilise the land and reduce the construction footprint for operations. The period of time between construction and the initial phase of progressive rehabilitation will be minimised to prevent degradation and loss of exposed soils. Surface structures, equipment and waste materials from the construction area will be removed prior to rehabilitation".
S23	486	Natural Resource and Stock Route Impacts. When will rehabilitation processes start? Directly after drilling or at the end of all operations? If extra work or clearing is required will rehabilitation practices remain the same?	Decommissioning and Rehabilitation chapter (Section 29) of the EIS. Draft Environmental Management Plan (Appendix Z, Section Z.5.3) of the EIS.	Following completion of drilling, the rig and pits will be removed and the well site footprint reduced to a sufficient size to accommodate the surface equipment. The construction site footprint outside this area will no longer be used and will be rehabilitated and contoured as soon as practicable to pre-existing conditions or to a standard agreed with the landowner. Rehabilitation practices will remain the same if extra work or clearing is required as described in the Decommissioning and Rehabilitation chapter (Section 29) of the EIS.
S23	512	Natural Resource and Stock Route Impacts. Rehabilitation measures? At what time and interval will this be undertaken? Will this involve replacement of sensitive habitat loss?	Decommissioning and Rehabilitation chapter (Section 29.7.7.2) of the EIS.	Rehabilitation measures will be undertaken as soon as practicable after a disturbance. "The general aim for rehabilitated areas is to return them to the pre-disturbed land use; therefore, revegetation of disturbance areas will be completed with specific consideration of the pre-disturbance ecosystem requirements...". In some instances, high risk of erosion necessitates the use of sterile cover crops in revegetation, as it provides more extensive coverage of the soil and stabilisation in a

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				shorter time. This is compliant with the Project ToR.
S23	556	Rehabilitation and landscaping must use locally indigenous plants rather than plants that may become a localised pest species.	Decommissioning and Rehabilitation chapter (Section 29.7.7.2) of the EIS.	"The general aim for rehabilitated areas is to return them to the pre-disturbed land use; therefore, revegetation of disturbance areas will be completed with specific consideration of the pre-disturbance ecosystem requirements. Seed will be sourced from local distributors where possible". In some instances, such as high risk of erosion necessitates the use of sterile cover crops in revegetation, as it provides more extensive coverage of the soil and stabilisation in a shorter time. This is compliant with the Project ToR.
S23	529	What is the closure plan including landform, decommissioning and management?	Decommissioning and Rehabilitation chapter (Section 29) of the EIS.	Decommissioning and rehabilitation for the Project is outlined in the Decommissioning and Rehabilitation chapter (Section 29) of the EIS
S23	556	Rehabilitation and landscaping must use locally indigenous plants rather than plants that may become a localised pest species.	Decommissioning and Rehabilitation chapter (Section 29.7.7.2) of the EIS.	"The general aim for rehabilitated areas is to return them to the pre-disturbed land use; therefore, revegetation of disturbance areas will be completed with specific consideration of the pre-disturbance ecosystem requirements. [...] Seed will be collected or sourced locally where possible to ensure it is adapted to environmental conditions in the area." Refer to the Decommissioning and Rehabilitation chapter (Section 29.7.7.2) of the EIS. In some instances, high risk of erosion necessitates the use of sterile cover crops in revegetation, as it provides more extensive coverage of the soil and stabilisation in a shorter time. This is compliant with the Project ToR.

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Submission Number	Issue Number	Submission / Issue	Reference	Response
S33	652	Abandoned wells have the potential to cause significant safety and production issues to subsequent underground mining operations. Vale suggests that overlapping coal tenement holders should be able to gain access to the register of abandoned wells either from DSDIP or Arrow?		Arrow will register abandoned wells with DSDIP. Arrow will liaise with Vale on important infrastructure location issues under Arrow's shared tenement Co-development planning process.

21.21 Cumulative Impacts

Table 21-23 Cumulative Impacts Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S2	45	Cumulative Impacts associated with increase in Non-Resident Workers. This impact is understated given the peak workforce figure is 2300 all be it for a specific time period. The impacted townships all have small populations and resulting impacts may require mitigation. These issue need to be reviewed and appropriate strategies included in the SIMP Action Plans.	Social chapter (Section 15), SIA (Appendix M) and SIMP (Appendix N) of the SREIS.	Arrow has revised its workforce accommodation strategy since the publication of the EIS – see the Project Description chapter (Section 3.9) of the SREIS. The Social chapter (Section 15), SIA (Appendix M) and SIMP (Appendix N) of the SREIS have incorporated these changes into the revised assessment. The revised assessment indicates that the Project in its peak workforce year of 2018 will result in an increase of approximately 6% to the number of Non-resident Workers (NRW) in the Isaac Regional Council area. These workers will all be accommodated in construction camps remote from the regional townships. Mitigation actions to address potential impacts of NRW on regional communities are included in SIMP Action Plans for Housing and Accommodation, Health and Community Wellbeing, and Workforce Management.
S16	344	Consideration of other projects must, as a minimum, include consideration of the cumulative impacts of the five related Arrow LNG projects. The updated RIA included in the SREIS must include a cumulative assessment of the traffic and transport impacts of all five Arrow LNG projects (Surat gas fields and pipeline, Bowen gas fields and pipeline and Curtis Island LNG plant).	Cumulative Impacts chapter (Section 31.3) of the EIS. Roads and Transport chapter (Section 12)	The Arrow Bowen Pipeline project was incorporated in the Cumulative Impacts chapter (Section 31.3) of the EIS as it was considered a ‘relevant project’ based on the selection criteria. Not all of the Arrow projects were included as they do not fall into the sphere of influence of the Project (spatial criteria) and therefore were not considered as ‘relevant projects’. The Summlementary Road Impact Assessment (Appendix K) of the SREIS presents a revised traffic cumulative

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Submission Number	Issue Number	Submission / Issue	Reference	Response
			and Summlementary Road Impact Assessment (Appendix K) of the SREIS.	impacts assessment for those projects for which cumulative impacts are expected to occur.
S16	348	The assessment of cumulative impacts is wholly inadequate; both in terms of scope of projects considered and continued use of the significance assessment methodology. The updated RIA included in the SREIS must include a cumulative assessment of the traffic and transport impacts of all five related Arrow LNG projects (Surat gas fields and pipeline, Bowen gas fields and pipeline and Curtis Island LNG plant) and other projects located in or directing significant traffic through the Bowen Basin, for which traffic information is available. The recently released EIS for the Springsure Creek Coal Mine Project provides an example of a reasonable cumulative assessment of the potential impacts of nearby projects.	Cumulative Impacts chapter (Section 31.3) of the EIS Roads and Transport chapter (Section 12) and Summlementary Road Impact Assessment (Appendix K) of the SREIS.	The Arrow Bowen Pipeline project was incorporated in the Cumulative Impacts chapter (Section 31.3) of the EIS as it was considered a 'relevant project' based on the selection criteria. Not all of the Arrow projects were included as they do not fall into the sphere of influence of the Project (spatial criteria) and therefore were not considered as 'relevant projects'. The Summlementary Road Impact Assessment (Appendix K) of the SREIS presents revised traffic cumulative impacts assessment for those projects for which cumulative impacts are expected to occur.
S19	372	The EIS states that the impact of this project on roads will be low / negligible. The proponent needs to identify the cumulative impact of other mining, energy and infrastructure projects in the Bowen Basin and not just those associated with the project. Significant road safety issues are being experienced due to the movement of 'wide loads' in the Bowen Basin and in the project area including insufficient passing lanes and the lack of rest areas and toilets, etc.	Cumulative Impacts chapter (Section 31.3) of the EIS. Roads and	The Summlementary Road Impact Assessment (Appendix K) of the SREIS presents a revised traffic cumulative impacts assessment which includes consideration of all projects expected to contribute to cumulative impacts on regional roads. Projects assessed are based on the Project's selection criteria – see the Cumulative Impacts chapter (Section

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Submission Number	Issue Number	Submission / Issue	Reference	Response
			Transport chapter (Section 12) and Summlementary Road Impact Assessment (Appendix K) of the SREIS.	31.3) of the EIS.
S19	380	It would be advantageous for the proponent to identify and discuss strategies they deem appropriate to mitigate the cumulative impacts their project will have on the impacted area and whether they propose to work with other project developers to overcome these impacts.		Arrow will include QPS as a relevant stakeholder. As the Project planning progresses, Arrow will continue to identify and engage with third parties regarding potential interface issues relating to cumulative impacts on regional infrastructure and services.
S21	388	The EIS suggests that groundwater impacts will be minimal due to the Arrow BGP and that a monitoring network will be installed to validate and improve model predictions. This is commended however the EIS notes that the cumulative impacts likely to result from the development of Arrow's fields at the same time as other major projects such as Santos GLNG and Curtis LNG projects as well as mines were not able to be determined. Arrow Energy, along with other major development project proponents, be encouraged to develop a regional groundwater impact model to determine the cumulative impacts of development on surface waters and groundwater.		Arrow recognise that, if considered necessary, that is the responsibility of the State Government to develop and manage regional groundwater impact models and Arrow would be happy to provide data if requested.
S23	417	The EIS needs to reflect the cumulative impacts of numerous and extensive petroleum operations proposed, planned or approved in the vicinity with a focus on the triple bottom line being economic, environmental and social outcomes. There needs to be action taken on a broad spectrum cumulative study contributed to by the	Cumulative Impacts chapter (Section 31.4) of the	The EIS included a cumulative impact assessment of proposed, planned and approved petroleum projects in the region which meet the criteria for contributing to cumulative impacts (Cumulative Impacts chapter (Section 31.4) of the EIS). The EIS also includes an assessment of cumulative

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		petroleum industry, which establishes the base line effects being experienced by the Rural and Urban Community of Isaac Regional Council.	EIS.	social and economic impacts (see Cumulative Impacts chapter (Sections 31.4.9 and 31.4.10) of the EIS respectively).
S23	418	The EIS document should address the process of disposal of additional solid and sewerage waste waters from the operation and the likely increase in the volume of this waste in the region through cumulative effects including the nitrification of the Isaac and Fitzroy catchments of the project life. It is considered the nitrification of the Isaac and Fitzroy catchments is unsustainable and will affect aquatic and terrestrial ecosystems.	Waste Management chapter (Section 16) of the SREIS.	Practical and effective waste management is a consideration through design, construction, operation, decommissioning and rehabilitation. The Project will plan for the anticipated waste volumes. Waste and sewage effluent will be managed and disposed in a way that avoids any impacts (including nitrification) on waterways. Solid waste will be disposed to suitably engineered landfill cells, with leachate collection and treatment. Treated sewage effluent will be managed typically by irrigation on designated land parcels selected to avoid discharge to drainage lines and waterways.
S23	427	The EIS clearly avoids the integrated assessment of the project impacts amongst other projects under consideration across the mineral sector. This is a considerable flaw in the assessment as it fails to draw in the opportunity for integrated success in numerous areas of shared services. This in turn compromises the proposed infrastructure investment strategy of the project and delivers standalone isolated sub optimal solutions. The EIS should connect multiple integrated solutions to regional participants to reinforce the investment decisions being made and provide greater levels of immunity and resilience to core service infrastructure.	Social chapter (Section 15), SIA (Appendix M) and SIMP (Appendix N) of the SREIS.	The SIA and SIMP have been revised since the publication of the EIS and are presented in the SIA (Appendix M) and SIMP (Appendix N) of the SREIS. These reports detail revisions to the cumulative impact assessment and how these potential impacts will be continually assessed as part of the ongoing SIMP process. Mitigation actions outlined in the SIMP for ongoing identification and management of regional level cumulative impacts include: • Participation in regional development planning and issues coordination forums for the IRC and CHRC areas (e.g. for housing, training, local business development and regional industry/local and state government coordination); and • Continued participation in the Industry Leadership Group for CSG Resource Projects.

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S23	469	No genuine attempt to address cumulative impacts-many of the statement note that project activities will contribute to cumulative impacts but that project's activities will be "insignificant" compared to other activities in region or that it is "unlikely project impact will be noticeable above current cumulative environment". The point is that even "insignificant" activities are magnified when services and infrastructure capacities are already stretched. How will genuine efforts be made to liaise with local government or organisations to mitigate cumulative impacts? i.e. Membership of MCIG	Social chapter (Section 15), SIA (Appendix M) and SIMP (Appendix N) of the SREIS.	The SIA and SIMP have been revised since the publication of the EIS and are presented in the SIA (Appendix M) and SIMP (Appendix N) of the SREIS. These reports detail revisions to the cumulative impact assessment and how these potential impacts will be continually assessed as part of the ongoing SIMP process. Arrow will “continue to provide state and local government departments responsible for educational, health and other social infrastructure with forecasts of workforce numbers and projected families to assist in their future service planning. This information will be provided in an agreed format that will allow these departments to plan for cumulative population change” see the SIMP (Appendix N, Section 2.2) of the SREIS).
S23	470	Socio-economic and cumulative: Will the government consider/measure these "insignificant" or "negligible" impacts to ensure they are addressed / mitigated at a common cumulative level? For example; managing the additional numerous "insignificant" traffic impacts on the Peak Downs Highway through increased maintenance and upgrades.	Road Impact Assessment (Appendix K) of the SREIS.	Arrow notes that this question is directed to Government. A Summlementary Road Impact Assessment is presented in Appendix K of the SREIS, and includes a traffic cumulative impact assessment and management strategies relevant for the Project.
S24	570	Council remains of the opinion that the Department of Environment and Heritage Protection should consider the cumulative impact of activities within the resources sector in the Bowen Basin on the region's infrastructure and services. The EIS does not address these cumulative impacts.	Cumulative Impacts chapter (Section 31) of the EIS.	Arrow note that the MRC will consult with EHP regarding further assessment of cumulative impacts of activities within the region. The Cumulative Impacts chapter (Section 31) of the EIS has assessed the potential for impacts from the Project to have compounding or synergistic interactions with similar impacts from other projects proposed or under development within the sphere of influence on the Project.
S26	573	The Central Queensland Integrated Rail Project (CQIRP) is a key related project which should be considered in the EIS particularly in the assessment of cumulative impacts. The CQIRP is a heavy haul	Cumulative Impacts chapter	The majority of the CQIRP is beyond the locality (sphere of influence) of the Project and only small upgrades of the existing rail network meet the criteria for inclusion in the

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		rail project that proposes to provide access for multiple mine owners from the Galilee and Bowen Basins to the ports (current and proposed) at Abbot Point.	(Section 31) of the EIS.	cumulative impact assessment. Arrow has included the Goonyella to Abbot Point Rail Project (BHP Billiton Group) as part of the cumulative impact assessment presented in the Cumulative Impacts chapter (Section 31) of the EIS. The assessment concluded that the minor upgrades to the existing line will not have a significant cumulative impact and hence does not require additional assessment.
S26	577	The EIS references the planned BHP Billiton Group (BHP) - Goonyella to Abbot Point Rail Project. However, it does not consider the existing Goonyella to Abbot Point Railway currently operated by Aurizon although it is located almost parallel to the planned BHP project. It can be assumed that similar impacts would arise from the Arrow Bowen Gas Project, impacting the operation of Aurizon's network. It is recommended that the text be updated to reflect the existing rail network and that Figure 19-6 is amended to reflect both planned and existing network.	Cumulative Impacts chapter (Section 31) of the EIS.	The Cumulative Impacts chapter (Section 31.3.1) of the EIS defined two types of projects which were reviewed for relevance for the cumulative impacts assessment. These two types were; "past and present developments" and "future developments". The projects considered for the assessment were those projects which are proposed but not currently operating (i.e. "future developments"). Approved projects that are in construction or operating (i.e. "past and present developments) are assumed to be captured through establishment of both the Project's environmental framework approach and/or the Project environmental value baselines and the impact assessments carried out in the EIS chapter (and technical reports).
S26	584	The EIS identifies a number of projects (Projects Relevant to the Study Area) which have been included in the cumulative impact assessment for the study area including various resource projects and infrastructure projects. Aurizon network exists throughout the Arrow Bowen Gas Project area with possible overlapping of project construction periods. It is recommended that this section is amended to include Aurizon rail infrastructure projects, in particular CQIRP, in the cumulative impact assessment.	Cumulative Impacts chapter (Section 31) of the EIS.	The Cumulative Impacts chapter (Section 31.3.1) of the EIS defined two types of projects which were reviewed for relevance for the cumulative impacts assessment. These two types were; "past and present developments" and "future developments". The projects considered for the assessment were those projects which are proposed but not currently operating (i.e. "future developments"). Approved projects that are in construction or operating (i.e. "past and present

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				developments) are assumed to be captured through establishment of both the Project's environmental framework approach and/or the Project environmental value baselines and the impact assessments carried out in the EIS chapter (and technical reports). The majority of the CQIRP is beyond the locality (sphere of influence) of the Project and only small upgrades of the existing rail network meet the criteria for inclusion in the cumulative impact assessment. Arrow has included the Goonyella to Abbot Point Rail Project (BHP Billiton Group) as part of the cumulative impact assessment presented in the Cumulative Impacts chapter (Section 31) of the EIS. The assessment concluded that the minor upgrades to the existing line will not have a significant cumulative impact and do not require additional assessment.
S32	615	SunWater is also concerned with Arrow's comments regarding the cumulative impacts associated with subsidence. Transparency in a project approval process is vital where damage or disruption to SunWater's water delivery obligations may occur due to a specific CSG activity or multiple CSG proponents. The consequence of approval assessment documents containing inadequate high level detail on potential impacts should not lead to SunWater being financially responsible for mitigating impacts or corrective actions to infrastructure resulting from the CSG industry.	Consultation Report (Appendix F) of the EIS. Community Consultation chapter (Section 4) of the SREIS,	Arrow will continue to engage with stakeholders throughout the Project development process and the Community Consultation chapter has been updated since the publication of the EIS – see the Community Consultation chapter (Section 4) of the SREIS. Arrow recognises SunWater as a relevant stakeholder. As the Project progresses, Arrow will engage with SunWater to discuss the potential for impacts to infrastructure and any mitigation measures where appropriate.
S33	644	Vale notes that Isaac Plains Coal Mine (50% Vale owned) has been omitted. The EIS does not mention any underground mines. The proposed activities may affect them and their surface infrastructure	Cumulative Impacts chapter (Sections 31.3.1, 31.3.2 and	A number of underground coal mines were included in the cumulative impacts assessment for this Project - for a full list please refer to Cumulative Impacts chapter (Section 31.3.2 and Table 31-2) of the EIS. The selection criteria for determining relevant projects

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			Table 31–2) of the EIS.	included in the assessment are outlined in Cumulative Impacts chapter (Section 31.3.1) of the EIS, and includes future developments that are within the same spatial and temporal scope as the Project. Projects also had to meet criteria based on available information, to be in the assessment (of which the Isaac Plains Coal mine did not) including: • Are being assessed under Part 1 of the Chapter 3 of the *Environmental Protection Act 1994* (Qld) with the EHP being the EIS Coordinator. As a minimum an IAS is available on the EHP website. • Have been declared a 'state significant project' by the Coordinator-General under the State Development Public Works Organisation Act 1971 (Qld) and an EIS for the project is currently being completed or is complete. As a minimum an Initial Advice Statement is available on the website of the Department of State Development, Infrastructure and Planning. • Are directly associated with the development of CSG projects within the Bowen Basin or (i.e. gas fields and gas pipelines). • Will, or may, utilise resources located within the region (including materials, groundwater, road networks or workforces) that are the same as the Project. • Could potentially compound residual impacts that the Project will potentially have on environmental or social values. Developments that satisfied the above criteria and could reasonably and practically be assessed for impacts at the time of writing were included in the cumulative impact

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				assessment.
S37	681	The proponent states that "A review of publicly available mine data within the Project area yielding insufficient information on the 40 mines (i.e. geometrics, schedules and dewatering rates) to enable the accurate modelling of their cumulative groundwater impacts....Consequently, cumulative impacts of this coal mining were not able to be included in the proposed numerical groundwater model of the Project." All proponents submitting projects under the environmental impact assessment process must be able to gain access to relevant data from companies already operating in the area, in order to properly assess potential cumulative impacts. The Queensland Government is the obvious stakeholder that could manage this data as a collective and release it to proponents, ensuring anonymity of data source is maintained.		Arrow welcomes any data management initiative where data is collected, collated and released by the Queensland Government for use in a Project's cumulative impact assessment.

21.22 Framework Approach and Impact Assessment

Table 21-24 Framework Approach and Impact Assessment Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	491	Natural Resource and Stock Route Impacts: What future research will be conducted to test effectiveness of potential mitigation measures?	Draft EM Plan (Appendix Z) of the EIS.	Mitigation will be monitored as per the monitoring actions within the Draft EM Plan (Appendix Z) of the EIS.
S27	585	Whilst the EIS does provide a 'Reference Case', which forms the basis for future detailed design, it is BMA's view that the 'Reference Case' does not provide sufficient detail for BMA to undertake any reasonable assessment of possible impact to BMA's existing and future operations at this time.	Environmental Framework chapter (Section 7) of the EIS. Project Approvals chapter (Section 2), Project Description chapter (Section 3.2) and Terrestrial Ecology chapter (Section 11) of the SREIS.	The 'Framework Approach' was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding infrastructure locations will be presented at the EA application stage of the approvals process. A revised Project development sequence has been provided in the Project Description chapter (Section 3.2) of the SREIS which outlines the project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS elaborates on the specific field management protocols; site scouting and survey methodologies (refer to the Terrestrial Ecology chapter (Section 11) of the SREIS). Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations.
S35	658	CCC raised concerns in the draft Terms of Reference (ToR)	Environmental	The 'Framework Approach' was developed for the impact

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		regarding the proposed 'framework approach' and objected to this approach. In our quick review of the Final ToR, we were able to identify that it appears this approach, or one that is very similar, has been approved because the information provided in the 'Siting of petroleum activities' (in the Introduction) states that "Due to the nature of the proposal, the EIS will not be able to address the exact locations of all wells, pipelines and other associated infrastructure throughout the life of the project." It then goes on to say "Siting of CSG infrastructure is a process of progressive refinement informed by exploration, resource validation and gas field design to optimise recovery of economic reserves. It commences with the development of a reference case or conceptual layout that describes how wells, gathering systems and production facilities might be arranged to extract and process gas."	Framework chapter (Section 7) of the EIS. Project Description chapter (Section 3.2) of the SREIS	assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding infrastructure locations will be presented at the EA application stage of the approvals process. A revised project development sequence has been provided in the Project Description chapter (Section 3.2) of the SREIS which outlines the project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS elaborates on the specific field management protocols; site scouting and survey methodologies (refer to the Terrestrial Ecology chapter (Section 11) of the SREIS). Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations. Additional studies have been undertaken to inform the SREIS and provide greater detail on the existing environmental values and impacts of the Project based on updated Project Description information. These studies are outlined in the SREIS Sections 5 to 16.
S35	659	The 'concept select phase' and the development of a 'reference case', 'conceptual layout' and 'constraints analysis' are of great concern to us because it provides for the proponent to have the project assessed on a 'concept' without the true location of infrastructure being identified until the Environmental Authority stage. This assessment framework, which we note has also been provided in the ToR for the Santos GLNG gas fields project in the	Environmental Framework chapter (Section 7) of the EIS. Project Description	The 'Framework Approach' was developed for the impact assessment of the Project, as per the ToR requirements. The Framework Approach is used in this stage of the approval process. Further and more detailed information regarding infrastructure locations will be presented at the EA application stage of the approvals process. A revised Project development sequence has been

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		Bowen and Surat, does little to provide landholders, community, government or environment with the knowledge and information necessary to determine the location and extent of actual impacts. Rather, the assessment framework is set up to benefit the proponents' situation and not the environment or community or landholder or government. We do not support this framework approach as it is too high a risk for the environment (not knowing detailed locations of development and locations of impacts) and too high a risk for community and government to assess a project and its impacts on a 'concept'. Locations of infrastructure such as wells, pipes and water treatment etc. need to be fully and clearly identified and detailed at the EIS stage (not the Environmental Authority or permit stage) along with details of the specific and measurable impacts in these locations.	chapter (Section 3.2) and SREIS Sections 5 to 16.	provided in the Project Description chapter (Section 3.2) of the SREIS which outlines the Project development phasing and a description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS elaborates on the specific field management protocols; site scouting and survey methodologies (refer to the Terrestrial Ecology chapter (Section 11) of the SREIS). Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of infrastructure locations. Additional studies have been undertaken to inform the SREIS and provide greater detail on the existing environmental values and impacts of the Project based on updated project description information. These studies are outlined in the SREIS Sections 5 to 16.

21.23 Constraints

Table 21-25 Constraints Analysis Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S35	661	This section of the EIS and table 4 provide no detail or explanation of how, what and why to a) the levels of constraint, b) what the environmental measures and management controls are in real terms, and c) the justification or decision hierarchy for Yes and No to project activities. Part of the current explanation is as follows and says nothing to give the reader an understanding of the scientific validity of how these 'permissible project activities' are determined; 'The level of environmental constraint determines the types of activities permitted and the applicable environmental management measures as set out in Table 4.' We are left wondering what the methodology is to determine that only a production facility will not be developed in an area with a high level of environmental constraint, yet all other activities will be allowed to occur in high and moderate areas of environmental constraint. The environmental constraints and environmental values are not respected and it appears the project is given a higher value and priority by the proponent with all the yes's (in the table). This is unacceptable. Provide detailed and comprehensive information about the constraints analysis and table 4, including answering the following: - Level of Environmental Constraints – description of the differences between No go, High, Medium and Low. Detail of how and what determines each level, including info on any quantitative and qualitative measures.	Constraints Mapping (Appendix BB, Section 7) of the EIS	Constraints Mapping (Appendix BB) of the EIS clearly outlines the methodology for determining constraint levels and associated proposed activities within each level. For example Section BB.2.1 outlines the constraint levels applied for natural environment / ecology and surface water are based on legislatively enforced Environmentally Sensitive Area categories (Cat A, Cat B, and Cat C), and the activities that are legislated as allowable within each of the areas. It should be noted that the constraints mapping is a tool Arrow employ as the starting point for site infrastructure planning, and not the end point for management of potential impacts or protection of environmental values. Constraints mapping does not provide a comprehensive list of all activities associated with the Project and their associated development constraints; its intent is to guide Project planning and development activities, and as a result protect the integrity and the long term viability of environmental values within the Project area through avoidance and impact minimisation. Numerous mitigation management strategies and specific mitigation commitments (refer to the Commitments Register, Appendix O of the SREIS) have been developed from the EIS impact assessment studies to ensure Project construction, operation and decommissioning activities are managed to protect environmental and social values.

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		- Environmental Management Control – description of each environmental management measure ('site-specific', 'specific' and 'standard'). Detail of how and what determines each measure, including info on any quantitative and qualitative measures. - Project Activities and Yes and No answers – Details (how, what, why) of how 'yes' and 'no' answers are determined. Answer the question as to how areas of high and medium environmental constraint can be allowed to be impacted by wells, gathering systems and production systems? Areas of high to medium constraint should be a 'no' for all, if not most, project activities.		
S35	663	The use of the term 'no go areas' is completely misleading and we refer to the statement on page 7-4 (see across in Column G). We reiterate that it is totally misleading and irresponsible to use 'no go areas' as a term when there is actually an intention to implement 'low impact petroleum activities' in 'no go areas' as detailed in the statement from page 7-3. So, there is potential opportunity and intent to go into 'no go areas' such as National Parks, significant cultural heritage sites, nature refuges and towns with 'limited petroleum activities' that do not result in clearing of native vegetation, soil profile disturbance or significant land disturbance (or otherwise termed low impact petroleum activities). No go areas' to be absolutely off limits as the words describe/suggest, such that a commitment is given to no petroleum activities (including no limited or low impact petroleum activities) occurring in any 'no go areas' at all and provide a full list of committed 'no go areas' in the project area. Nature refuges, national parks, conservation parks, forest estate,	Constraints Mapping (Appendix BB) of the EIS	Low impact petroleum activities are named so because they are low impact by nature and at the time of writing the EIS, the legislative definition for such activities only include non-intrusive activities such as traversing land by car or foot, ecological surveys, and topographic surveys using existing tracks and access routes in a way that does not result in damage to vegetation. These type of activities will not require mitigation as they do not result in impacts" Nature refuges, national parks, conservation parks, forest estate, towns, high conservation value remnant and regrowth, and endangered ecosystems and essential habitat for EVNT species in state and federal legislation are included in 'no go areas' or 'high' constraint areas as outlined by the definition of in Category A, Category B, Category C and EPBC Species habitat areas in Table BB-4 Appendix A of the Constraints Mapping Report (Appendix BB) of the EIS in line with legislation at the time of submission.

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		towns, high conservation value remnant and regrowth, and endangered ecosystems and essential habitat for EVRT (endangered, vulnerable, rare and threatened) species in state and federal legislation should be included in 'no go areas'.		
S35	665	Constraints identified do not include ground water. This is unacceptable. Include ground water in the constraints methodology and mapping. Complete ground water technical field studies across the project area to provide information and mapping on ground water resources and impacts.	Groundwater Chapter Section 14); Groundwater Technical Report (Appendix M) and Constraints Mapping (Appendix BB) of the EIS Groundwater Chapter (Section 7) and Groundwater Technical Report (Appendix E) of the SREIS.	Constraints mapping incorporates layers of surface features to determine suitable areas to locate surface infrastructure and minimise impacts. Groundwater modelling of potential impacts and mitigation measures are addressed in significant detail separately in the Groundwater chapter (Section 14) and Groundwater Technical Report (Appendix M) of the EIS, and within the Groundwater Chapter (Section 7) and the supplementary Groundwater Technical Report (Appendix E) of the SREIS.
S35	666	Figures 1 to 8 (constraints maps) are provided at an unacceptable scale of 1:1,500,000 which does not allow for localised or area specific assessment and interpretation. Provide constraint mapping at a scale of 1:100,000 for regional level detail (as some GIS layers from Government are provided at this	Constraints Mapping (Appendix BB) of the EIS	Constraints mapping is presented in the EIS at a project wide scale to demonstrate project wide applicability, however the constraints mapping is compiled in a GIS platform that will be utilised by Arrow during project planning at the property level, or any required suitable scale for close interpretation of all elements comprising the

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		level) and 1:10,000 for local detail.		constraints layers.
S35	667	'Significant conservation areas' are listed to be within 'no go areas' in table BB-4 on page 10, however there is no definition provided on what a significant conservation area is. Define what a 'significant conservation area' is.	Constraints Mapping (Appendix BB) of the EIS	Significant Conservation Areas include National Heritage Estate such as National Parks, Conservation Parks, and Nature Reserves
S35	668	Table BB-1 confirms our concerns regarding intent and opportunity to conduct 'low impact petroleum activities' in 'no go areas'. For the reasons described in our comments on section 7.2 of chapter 7, 'no go areas' need to be exactly that – no go for any petroleum activities. Refer to comments on section 7.2.	Constraints Mapping (Appendix BB) of the EIS	Low impact petroleum activities are named so because they are low impact by nature and include activities like vehicular access and other non-intrusive activities allowable in sensitive areas. These activities will remain allowable in these areas, in line with all legislative requirements. Appendix A in the Constraints Mapping Report (Appendix BB) of the EIS outlines the methodology for determining constraints levels and associated proposed activities.
S35	669	All individual constraints identified for Natural Environment, Ecology and Surface Water are placed collectively on to one (a single) constraints map (figure 1). This is poor and unacceptable as each individual constraint (and environmental, water and ecology value) needs to be identified in a clear, itemised list in section BB2.1 and each individual constraint needs to be mapped individually for clear assessment and interpretation. Constraint maps to be provided for each individual constraint on a single map each. A clear itemised list of all constraints to be provided in section BB2.1.	Constraints Mapping (Appendix BB) of the EIS	Appendix A in the Constraints Mapping Report (Appendix BB) of the EIS outlines the methodology for determining constraints levels and associated proposed activities, and provides a list of all the elements and GIS layers that combine to make up the constraint layer. This combination of layers is common best practice to provide a constraints mapping tool to determine areas of activity. Constraints mapping is presented in the EIS at a project wide scale to demonstrate project wide applicability, however the constraints mapping is compiled in a GIS platform that will be utilised by Arrow during project planning at the property level, or any required suitable scale for close interpretation of all elements comprising the constraints layers. The GIS mapping layers making up the different constraints

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				categories can also be interrogated individually for interpretation when identifying key values to be ground truthed for pre-clearance surveys.
S35	670	Section BB2.1 does not identify any environmental matters of national significance under the EPBC act such as Threatened Ecological Communities (TEC's), EPBC listed species, migratory species, Ramsar Wetlands and World Heritage Areas. Include MNES in constraint information and mapping.	Constraints Mapping (Appendix BB) of the EIS	Mapped wetlands (including Ramsar Wetlands) are outlined as a 'no go' constraint area in Table BB-4 of Appendix A in the Constraints Mapping Report (Appendix BB) of the EIS. EPBC species habit is listed as a 'High' constraint area in Table BB-4 of Appendix A in the Constraints Mapping Report (Appendix BB) of the EIS. Species profiles and potential habitat mapping have been developed for all TEC's and listed EPBC species for the Project within the MNES report (Appendix J) of the SREIS. Species profiles have been updated to expand the description of the extent of potential habitat within the Project area for each species (provided in hectares) and elaborate on the potential impacts from the Project. Potential habitat mapping developed for the SREIS includes several potential habitat categories for MNES including: • Core Habitat Known; • Core Habitat Possible • General Habitat; and • Absence suspected. The habitat categories are constructed for each MNES profile from individual mapping rules specific to each MNES based on habitat requirements, known distribution and ecological requirements, which is presented in Appendix B of the MNES report (Appendix J) of the SREIS. Constraints mapping is presented in the EIS at a project

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				wide scale to demonstrate project wide applicability, however the constraints mapping is compiled in a GIS platform that will be utilised by users such as Arrow during project planning at the property level, or any required suitable scale for close interpretation of all elements comprising the constraints layers
S35	671	EPBC TEC's and species are not identified in Table BB-4. No description of how each item listed has had their constraint level determined. MNES under the EPBC Act must be included in the table. A description of how each item had their constraint level determined.	Constraints Mapping (Appendix BB) of the EIS MNES report (Appendix J) of the SREIS.	EPBC species habit is listed as a 'High' constraint area in Table BB-4 of Appendix A in the Constraints Mapping Report (Appendix BB) of the EIS Species profiles and potential habitat mapping have been developed for all TEC's and other MNES for the Project within the MNES Report (Appendix J) of the SREIS. Species profiles have been updated to expand the description of the extent of potential habitat within the Project area for each species (provided in hectares) and elaborate on the potential impacts from the Project. Potential habitat mapping developed for the SREIS includes several potential habitat categories for MNES including: • Core Habitat Known; • Core Habitat Possible • General Habitat; and • Absence suspected. The habitat categories are constructed for each MNES profile from individual mapping rules specific to each MNES based on habitat requirements, known distribution and ecological requirements, which is presented in Appendix B of the MNES report (Appendix J) of the SREIS.

21.24 EM Plan and Commitments

Table 21-26 EM Plan and Commitments Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S1	17	The role of local governments as stakeholders is not evident in the Project's Environment Management Plan. Local governments have a legislative function to ensure that declared weed and pest animals are managed in their local area and alignment with local government priorities should be evident in this and other relevant sections of the EIS. The 3rd last dot point under the heading 'Implementation Strategy for Construction and Operation', on p74, details a list of weeds that is different from species identified in Chapter 17 as present in the Project area. It is not clear how "species specific" management will be prioritised. The 1st dot point under the heading 'Implementation Strategy for Construction and Operation' on p75, it is unclear whether the Biosecurity Management Plan will address pests and diseases of plants under the Plant Protection Act 1989 (and not just legislation addressing invasive plants and animals). This EIS should commit the Project to establish partnership arrangements with stakeholders (such as local government and local landholders) to ensure that pest management strategies implemented are aligned to coordinated with local and regional priorities. This section should clarify why listings are different across the EIS and explain how "species specific" management will be prioritised. The *Plant Protection Act 1989* enables the addition (or removal) of pests of plants and diseases of plants from the Plant Protection Regulation 2002 or, creation of other specific regulations, on an as	Draft EM Plan (Appendix O) of the SREIS.	Arrow has had ongoing engagement with local government throughout the EIS process and several local councils have made submissions on the EIS. Detail on how potential impacts of weed incursion to environmental values be avoided, mitigated or managed are provided in the vegetation management mitigation commitments in the Terrestrial Ecology chapter (Section 17) in the EIS. Weed management commitments made in the EIS and the report include but are not limited to: • Undertake partial rehabilitation of gathering lines and other linear infrastructure to reduce edge effects (including weed invasion) and maintain movement rates [B156]; • Undertake weed monitoring and targeted weed control measures within sensitive habitat (particularly threatened communities such as brigalow and native grasslands) [B158]; • Develop a declared weed and pest management plan in accordance with the Petroleum Industry – Pest Spread Minimisation Advisory Guide (Biosecurity Queensland, 2008). Undertake species-specific management for identified key weed species at risk of spread through Project activities (mesquite, parthenium, African lovegrass and lippia). Increase weed control efforts in

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		needed basis. Notes: • It is suggested that the Project establish a watching brief for any developments about pests of plants or diseases of plants that may become regulated and any specific decontamination requirements that may apply to the relevant pest or disease. • In addition to plant diseases, the attached link provides a listing of significant pests of plants relevant to the plant protection legislation (http://www.daff.qld.gov.au/26_6460.htm).		areas particularly sensitive to invasion. The pest management plan should include, as a minimum, training, management of pest spread, management of pest infestations and monitoring effectiveness of control measures [B191]. Arrow currently implements an effective weed management program for its existing operational projects in the Bowen Basin.
S7	117	The EIS generally provides mitigation measures to address flood hazards, including building to achieve flood immunity for different flood events, timing of works to avoid the wet season and monitoring of flood warnings. A detailed explanation of how areas of flooding along the corridor will be managed during construction and maintenance phases should also be provided as part of the EMP. The EMP should confirm that the safety of workers on the development site will be maintained by the proposed flood mitigation measures from all floods up to and including the DFE, in accordance with SPP 1/03 Annex 4.2 The following recommendations are provided to ensure reflection of the SPP 1/03 (flood) is clearly documented in the EIS: "Appendix Z – Draft EMP, Section 4 to be amended to include detailed information for the management of the Project during the construction and maintenance phases and documentation of how the Project would establish the safety of site occupants and staff as detailed in Annex 4 of the SPP 1/03"	Draft EM Plan (Appendix Z) of the EIS Project Approvals chapter (Section 2) of the SREIS.	The SREIS Project Approvals chapter (Section 2) is an update to what was presented in the EIS and outlines relevant legislation, requiring additional attention since publication of the EIS. At this stage Arrow will review the recommendation for these requirements against its legislative obligations and assess if it is a viable mitigation before committing to updating the Draft EM Plan (Appendix Z) of the EIS.
S7	118	The EIS provides relevant mapping to identify areas of Low and Medium bushfire hazard within the Project area. The following recommendations are provided to ensure the reflection of SPP 1/03 (bushfire):	Commitments Register (Appendix D) of the EIS	Infrastructure and facilities will be designed to provide adequate access for firefighting and other emergency vehicles along with safe evacuation for people. Arrow will also develop emergency response plans and maintain an

Submission Number	Issue Number	Submission / Issue	Reference	Response
		"Appendix Z – Draft EMP, Table 28 be amended so that the emergency response plan address the requirements for the provision of sufficient water for fire fighting purposes, road access for fire-fighting/other emergency vehicles and safe evacuation emergency response plan."		emergency management plan in consultation with relevant emergency service providers (Commitment B480 – see Commitments Register (Appendix D) of the EIS). Arrow will continue to consult with emergency services and the local disaster management groups as field development progresses and the locations of infrastructure are better understood.
S23	531	How will it be guaranteed that the development of strategies named in the Arrow Energy commitments will be done in collaboration with Council, the community and other key stakeholder to deliver best practice outcomes? • Who is the authority? • Will the strategies be publicly available? • What is the timeline? • How will they be enforced? • How will the programs be validated as being successful?	Commitments Summary (Appendix D) and Draft EM Plan (Appendix Z) of the EIS.	All Commitments outlined in the EIS commitment summary are drawn from specific technical impact mitigation chapters and the Draft EM Plan (Appendix Z) of the EIS, which are assessed by the relevant State and Federal Government regulatory authorities for each technical discipline. As per the EIS approvals process, the commitments are assessed by the state regulatory agencies for adequacy and relevancy and appropriate recommendations may be outlined in the Environmental Assessment Report.
S23	558	It is impossible to assess the quality of mitigation strategies when the mitigation commitment is to develop a strategy. More information is required on all these commitments.	Commitments Summary (Appendix D) and Draft EM Plan (Appendix Z) of the EIS.	All Commitments outlined in the EIS commitment summary are drawn from specific technical impact mitigation chapters and the Draft EM Plan (Appendix Z) of the EIS, which are assessed by the relevant State and Federal Government regulatory authorities for each technical discipline. As per the EIS approvals process, the commitments are assessed by the state regulatory agencies for adequacy and relevancy and appropriate recommendations may be outlined in the Environmental Assessment Report. As per the Framework Approach to the EIS impact assessment, a number of site specific management plans will be submitted with the EA application at that stage of the

Submission Number	Issue Number	Submission / Issue	Reference	Response
				Project.
S32	613	SunWater has reviewed the draft Environmental Management Plan and could not locate mitigation strategies for potential impacts on existing and proposed infrastructure.	Geology chapter (Section 13.7) and Groundwater and Geology Technical Report (Appendix L) of the EIS.	The Geology chapter (Section 13.7) of the EIS outlines the monitoring and mitigation measures in relation to land subsidence including: • Regular monitoring of surface and subsurface elevations. • An initial baseline analysis of subsidence within the study area. • Regular monitoring of surface elevation to understand the potential level of subsidence. • Arrow and other CSG companies are currently outlining a framework to monitor the cumulative impacts associated with subsidence (coal seam and land). Arrow will undergo required State and local planning approval for construction components of the Project and all existing infrastructure will be taken into account as part of this process. Arrow will undertake the selection of locations for production facilities, gathering lines and wells on the basis of many criteria including environmental and engineering constraints. Construction Management Plans will be in place prior to any construction activities to ensure any potential risks are identified and managed. This will include the measures such as dial before you dig and the necessary notifications.

21.25 Biodiversity Offsets

Table 21-27 Biodiversity Offsets Submission Responses

Submission Number	Issue Number	Submission / Issue	Reference	Response
S23	485	Natural Resource and Stock Route Impacts: Will direct clearing of habitat be offset by rehabilitation or replanting and if so will the area for offset be chosen appropriately	Terrestrial Ecology chapter (Section 17) of the EIS Environmental Offsets Strategic Management Plan (Offsets SMP) (Appendix P) of the SREIS	A specific Offsets SMP (Appendix P) has been developed for the Project SREIS, in accordance with current offset legislation at both State and Commonwealth levels. Natural resource and stock route impacts are addressed within the Offsets SMP (Appendix P) of the SREIS. Further, the preferred strategy for providing offsets to residual impacts to all state significant biodiversity values (SSBV) and matters of national environmental significance (MNES) are outlined. The Offsets SMP (Appendix P) developed for the SREIS outlines the broad steps to be applied in identifying suitable offsets, in line with the requirements under the current policies. Further, it outlines the type of information that will be presented when final offset management plans are implemented for the Project. This information may include but not necessarily be limited to: • Details of the protected matter being impacted and the estimated extent of the likely proposed impact; • Area in hectares of required land to offset estimated impact; • Preferred methodology for delivering offset requirements; • Delivery timeframes;

Submission Number	Issue Number	Submission / Issue	Reference	Response
				• Outline of staged offsets approach; • Communities and habitat types to be secured; • Demonstration of conservation gain; • Timing of securing offset areas; • Details of how the offset areas will be legally binding (mechanisms for long term protection); and • Management and/or rehabilitation programs for the offset areas.
S23	552	What is the implementation plan for the offset strategy for all nature refuges? • Who/what determines the success for the offset? • What are the consequences for non-compliance or success?	Terrestrial Ecology chapter (Section 17) of the EIS Offsets SMP (Appendix P) of the SREIS	Nature refuges are classified as Category C environmentally sensitive areas – as such they are included in the constraints mapping and site selection methodology outlined in the Terrestrial Ecology chapter (Section 17) of the EIS. Additionally, a specific Offsets SMP (Appendix P) has been developed for the Project SREIS, as required under current offset legislation, both State and Commonwealth. Impacts to environmental values are addressed within the Offsets SMP (Appendix P) of the SREIS. The preferred strategy for providing offsets related to expected impacts to all SSBV and MNES are outlined. Parameters for offset success are outlined in the relevant offset policies and will be followed. At present, this usually involves an ecological equivalence assessment or calculation but may be subject to change with pending changes to various State Government offset policies. Penalties for non-compliance are also outlined within legislation. Management requirements are aimed at

Submission Number	Issue Number	Submission / Issue	Reference	Response
				providing the greatest chance of success.

21.26 Submissions Without Comment

Table 21-28 Submissions Without Comment

Submission Number	Issue Number	Submission / Issue	Reference	Response
S3	58	DSDIP (Strategic Policy) has reviewed the EIS. Final advice from the Office of the Coordinator-General (OCG) is still being prepared and will be forwarded as soon as available. Pending advice from the OCG, DSDIP (Strategic Policy) has no comment.		Noted
S6	116	Email correspondence confirming that no comment to be provided.		Noted
S15	302	Following a review of the EIS provided, I would like to advise we have no comments for this project, as there are no issues associated with the project related to the department.		Noted
S22	402	I would advise that, as this project has no discernible impact on the Gladstone Regional Council area and the project area falls outside of the Gladstone Regional Council area, Council will not be making a submission on the EIS.		Noted