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DSEWPaC SUBMISSION RESPONSES

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23 DSEWPaC Submission Responses

This section provides Arrow's response to the submission by the Commonwealth Government Department of Sustainability, Environment, Water, Population and Communities (DSEWPaC) on the EIS. Arrow's response to DSEWPaC comments is provided in Table 23-1.

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Table 23-1 DSEWPaC Submission Responses

Submission Number	Issue Number	Issue	Reference	Response
S4	59	As previously advised, more detailed information is required for a number of listed threatened species and communities. In particular, the department is concerned about the potential impacts from the proposed action on the below listed threatened species and communities and DSEWPaC requirements in respect of these species are discussed further below: • *Brigalow (Acacia harpophylla dominant and co-dominant)* • *Natural Grasslands of the Queensland Central Highlands and the northern Fitzroy Basin* • *Semi-evergreen vine thickets of the Brigalow Belt (North and South) and Nandewar Bioregions* • Fitzroy River Turtle, *Rheodytes leukops* • Koala, *Phascolarctos cinereus* (combined populations of QLD, NSW and the ACT) • Ornamental Snake, *Denisonia maculata* • King Bluegrass, *Dicanthium Queenslandicum*	Terrestrial Ecology chapter (Section 17) of the EIS Terrestrial Ecology chapter (Section 11) and Matters of National Environmental Significance (MNES) Report (Appendix J) of the SREIS	Species profiles (dossiers) of MNES species identified as potentially occurring within the Project area were compiled and are presented in the MNES report (Appendix CC) of the EIS. An update to species profiles has also been undertaken to further describe the extent of potential habitat categories within the Project area and elaborate on the potential impacts from the Project. This update has been undertaken with input from individual species habitat mapping, and is presented in the updated MNES Report (Appendix J) for the SREIS. The species profiles include specific assessments in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*. Cross references have been provided to available information and further discussion is provided to support the determination of impacts has been included in the SREIS where relevant. Species have been discounted where it can be demonstrated that they are not likely to occur on site, based on their current known range and habitat requirements, or a significant impact on the species will not occur based on complete avoidance and impact assessment against the Significant Impact Guidelines criteria.
S4	60	Please discuss potential impacts from water discharge/ release in respect of individual MNES, in	Surface Water Technical Report	Water discharge may be necessary when the preferred beneficial use options are not available or technically

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		particular the Fitzroy River Turtle. See further comments on the Fitzroy River Turtle below.	(Appendix N) and Aquatic Ecology Technical Report (Appendix O) of the EIS Aquatic Ecology Chapter (Section 10); Surface Water Technical Report (Appendix F); Aquatic Ecology Technical Report (Appendix H) and MNES Report (Appendix J) of the SREIS	feasible. Such discharges may be required under both normal operations and emergency situations to manage variations in seasonal conditions and for distribution to water users for beneficial use. Discharge to water courses will only occur within environmental flow requirements and in accordance with EA conditions and other relevant approvals The SREIS further defines the processes for all proposed water management options, and provides updated detail of proposed operations for the water treatment faculties (WTFs). While the preferred areas of interest for the WTFs have been targeted within the Project area, the final locations for WTF's and specific associated discharge points are not finalised at the SREIS stage. In lieu of locations for site specific impact studies (that will be undertaken for EA applications), the SREIS has assessed the proposed discharge options against the potential receiving environment associated with the areas of interest for the WTF's. This investigation includes an assessment of the assimilative capacity of the likely downstream receiving environments of the potential WTFs localities, and provides an update on the impact assessment of the potential downstream receiving environment. This study and the parallel impact assessment undertaken in the Supplementary Aquatic Technical Report (Appendix H) of the SREIS are based on the same discharge scenarios, which do not identify any unmitigated significant impacts to the downstream receiving environment or to the Fitzroy River turtle.

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				As part of the EIS (Aquatic Ecology Technical Report Appendix O), the Fitzroy River turtle (*Rheodytes leukops*) was identified as a possible occurrence in the Fitzroy River tributaries, such as the Isaac River. (The Fitzroy River turtle is listed as 'vulnerable' both in Queensland and nationally under the NC Act and EPBC Act respectively). The museum records for the turtle, and updated potential habitat mapping for this species undertaken for the SREIS (Appendix J), indicate that core habitat for the species occurs downstream of the Project area where the required habitat such as flowing streams and permanent water bodies are present. The known distribution for this species is “only found in the Fitzroy River and its tributaries, around Rockhampton in eastern central Queensland. The species occurs within permanent freshwater riverine reaches and large, isolated permanent waterholes” (EHP, 2014) Given the habitat preferences of this species and that the Isaac River within the Project area is highly ephemeral; this species is considered highly unlikely to occur where there are any potential discharges. It should be noted that the Surface Water Technical Report (Appendix N) of the EIS also did not identify significant impacts to downstream aquatic values arising from the discharge of CSG water, and also found that other potential impacts would be localised to the site of disturbance (e.g., pipeline watercourse crossing). A full species profile for the Fitzroy River turtle, as well as an assessment of potential impacts and mitigation measures, are detailed in MNES Report (Appendix J, Section 9.4.2) of the SREIS. The species profile includes

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				specific assessments in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*. Cross references have been provided to available information and further rationale is provided to support the determination of impacts in the SREIS where relevant. The Fitzroy River turtle species profile presents a discussion of how the impact assessment and the proposed mitigation measures are consistent with the objectives and advice provided in threat abatement plans and recovery plans. It also provides an outline of the Fitzroy River turtle Management procedure that would be implemented in line with Arrow's mitigation commitment to: • Develop threatened species management procedures as and when Project activities are identified as likely to impact upon individuals [B187].
S4	61	Please note that DSEWPaC does not accept translocation of species as a mitigation measure unless it can be clearly demonstrated based on scientific evidence to be effective for an individual species. The terrestrial ecology report identifies on a number of occasions that the suitability of species for translocation or re-seeding requires further study and methods are not proven to be effective (or are considered unviable).	Terrestrial Ecology chapter (Section 17) and MNES Report (Appendix CC) of the EIS MNES Report (Appendix J) of the SREIS	The mitigation measures outlined in both the SREIS chapters and the revised MNES report (Appendix J) of the SREIS recommend translocation and/or propagation to be considered, however this would only apply to flora species that this technique is known and proven to be successful. The MNES report states: "Where EVNT species are identified in proposed development areas, consider mitigation measures such as translocation and/or propagation of flora species. Monitor progress of any translocation programs in accordance with the relevant translocation management plans [B169];" A number of relevant translocation programs have been successfully undertaken for roads and transport projects, linear infrastructure, and mine rehabilitation programs in the past, and similar programs are also currently

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				employed as a successful mitigation method for impacts to flora species on CSG projects in Queensland (e.g. *Macrozamia sp.*). Any impact mitigation or offset management method will be qualified for relevance and applicability. If successful rehabilitation or translocation of a species is deemed not suitably viable, then alternate mitigation will be employed where relevant.
S4	62	Mitigation measures that are to be relied upon to reduce the level of significance of impact must use commitment language (e.g. 'must' or 'will') rather than preference language (e.g. 'may' or 'should'). For example, 'avoiding listed threatened communities where possible' or 'trenching in the dry season where possible' are not certain and measurable mitigation measures. While DSEWPaC understands that there are practical limitations to some mitigation measures, it must be understood that measures without commitment language cannot be relied upon to reduce the level of impact on MNES.	Aquatic Ecology chapter (Section 16) and Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Mitigation commitments in the EIS have been refined in the cases where further definition of the Project Description and revised impact assessment has allowed for a further refinement of mitigation and management strategies. As the Project progresses and is further developed, commitment language can be adopted where there are no practical limitations.
S4	63	The EIS states that management of cumulative impacts will be assisted by a collaborate approach between the proponents of interacting projects, particularly in regards to ecological research and effective habitat offsetting. The terrestrial ecology report also notes that species at risk of cumulative impact, such as the Ornamental Snake, Koala and Brigalow Scaly-foot, would be suited to a targeted monitoring effort conducted in cooperation with the proponents of overlapping projects. Please provide more detail about this collaborative approach,	MNES Report (Appendix J) of the SREIS	The MNES Report (Appendix CC, Section 10.2) of the EIS states that: "Impacts to those TECs and threatened flora and fauna species identified in Section 7 can best be managed at the individual project scale, at the site location level". The above is important to note as it is identified as the best practice to manage these impacts. However there is a broad general discussion on the potential usefulness of a collaborative approach in future in the following discussion:

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		including work undertaken to date and plans for implementation of such an approach (if any). See comments provided on 20 February 2013 for more guidance on offset requirements for the SREIS.		Broader recommendations can be also made in respect to the regional scale management of cumulative impacts across Projects at a collaborative level. These could include: • Research into species ecology and effective impact mitigation techniques to be sponsored collaboratively by proponents of the projects contributing to potential impact; • Ensuring all interacting projects identified as potentially contributing to a significant cumulative impact are made aware of this potential and their responsibilities towards management of these impacts are identified; and • A collaborative approach between project proponents for the purpose of effective ecological offsetting (e.g. joint funding for management of a specific habitat offset for a species or ecological community that is heavily impacted by a number of projects). Arrow is currently in the of process developing co-development agreements with other operators in the Project area. As co-development agreements evolve opportunities for collaborative work will be explored. More detail of any collaborative work to be undertaken to monitor impacts may potentially come to light at a later stage in the Project.
S4	64	Species Likelihood As previously advised, for each species identified in the ERT report it must be identified whether suitable habitat exists onsite. It is insufficient to state that a species has not previously been recorded (this could	Environmentally Sensitive Areas chapter (Section 18) of the EIS MNES Report	A number of criteria are used to assess the likelihood of occurrence of a species within the project area, including the habitat requirements of the species, the known current distribution and range of a species, and qualified recent records. Section 7 of the MNES report (Appendix J) in the

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		be because of lack of survey effort, or because the species is cryptic) or the project area is outside the species known range when the ERT report has indicated that the project area is within the species range. Habitat mapping/modelling that will be produced for the SREIS should be used to support these statements so that there is certainty about the presence/absence of MNES onsite. DSEWPaC reiterates that should the project be approved, it is likely that zero disturbance limits will apply to species where an impact is determined unlikely and no quantification of disturbance is provided."	(Appendix J) of the SREIS	SREIS outlines these criteria and assesses species identified as known for the region to produce an assessment of 'Likelihood of Occurrence' in the project site. Categories in the likelihood of occurrence assessment include: • Very Low – the Project area is outside the species normal range, habitat does not exist; • Low – database searches indicate the species could potentially occur in the Project area, however previous records are likely to be historic or invalid, the Project area is outside the species known normal range, habitat is not likely to exist or the species is considered locally extinct; • Moderate – habitat exists for the species; however it is either marginal or not particularly abundant. The species is known from the wider region and could potentially occur; • High – the species is known to occur in the local area and critical habitat exists in the Project area; and • Recorded – the species was recorded in the Project area as part of the field surveys In addition to the above, 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. This has been undertaken with input from individual species potential habitat mapping compiled and presented in the updated MNES Report (Appendix J) for the SREIS. Potential habitat mapping developed for the SREIS

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				includes several potential habitat categories including: • Core Habitat Known; • Core Habitat Possible • General Habitat; and • Absence suspected. The habitat categories are constructed for each species profile from individual mapping rules specific to each species based on their habitat requirements and known distribution and ecological requirements, which is presented in Appendix B of the MNES report (Appendix J) of the SREIS.
S4	65	Quantification of impact: It is difficult to assess the significance and acceptability of impacts on MNES without an understanding of the extent of these impacts. The terrestrial ecology report identifies incorrect identification of habitat as a key threat to a number of MNES. Therefore, a scientifically robust method for identifying habitat and quantifying impacts to MNES is crucial to the assessment process. It is likely that DSEWPaC will require any habitat mapping model and associated disturbance calculation method to be independently peer-reviewed prior to accepting the methodology as reliable and scientifically robust. DSEWPaC expects habitat mapping to be provided for all MNES identified in the ERT report (or otherwise found to potentially occur onsite). DSEWPaC also notes that habitat must be defined. See comments provided on 8 February 2013 for more	Terrestrial Ecology chapter (Section 17) and of the EIS MNES Report (Appendix J) and Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS	Species profiles have been updated to expand the description of the extent of potential habitat categories for each species, and elaborate on the potential impacts from the Project. A rigorous methodology employed for potential habitat mapping has been developed by Arrow to produce a robust mapping product. Potential habitat mapping has included the use of LiDAR analysis to refine the mapping based on identification of specific habitat requirements for many species. This process is outlined in Section 8 of the MNES report (Appendix J) of the SREIS. Third party review of the methodology confirms the reliability of the product. A conceptual field development plan has been used to quantify a likely scenario for maximum potential impact to mapped potential species habitat, and generate an estimated maximum potential impact for each species. These impact estimations are detailed in the Bowen Gas Project Environmental Offsets Strategic Management Plan

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		guidance on this requirement.		(Appendix P) of the SREIS. Each individual species profile (outlined in Section 9 and 10) includes specific assessments in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.* The species profiles also provide a discussion of how impact assessment and the proposed mitigation measures are consistent with the objectives in relevant conservation advice, threat abatement plans and recovery plans. Cross references have been provided where information already exists and further explanation of the rationale to support the determination of impacts has been included in the SREIS where relevant
S4	66	<u>Maps:</u> Please provide maps that clearly identify areas of suitable habitat for each EPBC listed threatened species, including in respect of conceptual locations of proposed infrastructure (if possible).	Terrestrial Ecology chapter (Section 17) and Terrestrial Ecology Technical Report (Appendix P) of the EIS MNES Report (Appendix J) of the SREIS	Species profiles have been updated to expand the description of the extent of potential habitat categories for each species and elaborate on the potential impacts from the Project. A rigorous methodology employed for habitat mapping has been developed by Arrow to produce a robust mapping product. Potential habitat mapping has included the use of LiDAR analysis to refine mapping based on identification of specific habitat requirements for many species. This process is outlined in Section 8 of the MNES report (Appendix J) of the SREIS. Third party review of the methodology confirms the reliability of the product. Maps are provided for each EPBC Act listed species potentially occurring within the project development area and habitat categories are displayed as per the mapping habitat criteria provided with each individual species

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				profiles. Potential habitat mapping developed for the SREIS includes several potential habitat categories including: • Core Habitat Known; • Core Habitat Possible • General Habitat; and • Absence suspected. The habitat categories are constructed for each species profile from individual mapping rules specific to each species based on their habitat requirements and known ecology, as presented in Appendix B of the MNES report (Appendix J) of the SREIS.
S4	67	Where suitable habitat is present onsite for a migratory species listed in table 4.3, please also depict this on a map (e.g. farm dams and wetlands).	Terrestrial Ecology chapter (Section 17) and Environmentally Sensitive Areas chapter (Section 18) of the EIS Aquatic Ecology Chapter (Section 10); Aquatic Ecology Technical Report (Appendix H) and MNES Report (Appendix J) of the SREIS.	Maps have been developed for each EVNT conservation significant species potentially occurring within the project development area, and habitat is displayed as per the potential habitat categories criteria refined for each species. It should be recognised that migratory species potentially present in the study area are generalist species that utilise a very broad range of habitat types that extends beyond farm dams and wetlands. Migratory species may use a range of habitats including, but not limited to dams, lakes, ponds, creeks, billabongs, rivers, small waterways, open grasslands, cropping fields, and various other types of man-made water sources that are highly abundant within the study area, and as such it is not possible to isolate and identify all particular habitat types of potential importance to each migratory species in question across the 8,000 km^2 project area. It is however recognised that important habitat to

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				migratory species in the form of ecologically important water bodies are likely to exist on site and an update to the assessment of wetland's has been undertaken in the Supplementary Aquatic Ecology Assessment (Chapter 10 and Appendix H) of the SREIS including a revised assessment of impacts on wetlands within the Project area. The Aquatic Ecology Chapter (Section 10.5.2 of) in the SREIS presents results of the revised review of publically available data sets and GIS mapping layers associated with wetlands, including: a) Queensland Wetland Mapping version 3; b) Ramsar Convention on Wetlands; c) Directory of Important Wetlands in Australia; d) Map of referable wetlands; e) DERM (now EHP) report on Aquatic Conservation Assessments (ACA), using AquaBAMM, for the non-riverine and riverine wetlands of the Great Barrier Reef catchment (Rollason and Howell, 2012); and f) Wetland info. The review of the above sources identified 109 riverine and 423 non-riverine wetlands incorporating a range of wetland types (described below), varying in ecological value. These wetlands incorporate riverine systems such as the Isaac River and non-riverine wetlands (lacustrine and palustrine wetlands) which range from modified dams to vegetated swamps. The analysis of wetland mapping identified that of the above listed wetlands, 66 riverine and 191 non-riverine wetlands occur within the Project gas drainage areas which are the focus areas for field development. Of these wetlands identified within gas drainage areas, 14

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				riverine and 29 non-riverine wetlands are identified of high or very high ecological value under EHP's AquaBAMM classification. Given the above, an assessment and description of the identified wetlands within the Project area and gas drainage areas is outlined in the Aquatic Ecology Chapter of the SREIS (Section 10.5). The potential impacts on these wetlands was assessed in the Aquatic Ecology Chapter (Section 10.6.1) of the SREIS and mitigation measures from the EIS reviewed (Section 10.7). The results of the impact assessment identified no residual significant impacts on wetlands and associated aquatic values following the application of current mitigation commitments in the EIS including the implementation of buffers (from construction), and ground-truthing pre-clearance surveys. These mitigation commitments include: • Buffer zones will be adopted for Project activities (with the exception of required creek crossings), in different areas of constraint, as defined by the project's constraints mapping (outlined in Section 7 and detailed in Constraints Mapping (Appendix BB of the EIS) [B196]; and • Conduct pre-construction / pre-clearance surveys to identify any additional areas that need to be avoided. Include as a minimum: — vegetation mapping at a scale suitable for site-specific planning — identification of core habitats for EVNT species — identification of site-specific sensitive areas (e.g.

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				ESAs) that require avoidance or buffers [B132]. The wetlands identified in the above mentioned assessment have also been incorporated into an update of the project area constraints mapping, the draft version of which is defined in the Constraints Mapping (Appendix BB) of the EIS. On the basis that migratory species are vagrant visitors, the mitigation measures for all species relating to impacts on natural water bodies will afford protection to migratory species temporarily utilising that resource.
S4	68	Pre-clearance surveys: More detail is required around pre-clearance surveys and how they will inform avoidance, mitigation and management measures at a project scale and for individual MNES. Please clarify if pre-clearance surveys/ground truthing will be undertaken over the whole project area or just areas of proposed disturbance. DSEWPaC expects pre-clearance surveys to be undertaken for each relevant MNES in accordance with DSEWPaC survey guidelines in all areas that will be impacted by project activities, regardless of the level of constraint in an area.	MNES Report (Appendix J) of the SREIS	Pre-clearance surveys will be undertaken in areas of proposed disturbance in areas identified by constraints mapping as having potential impact to MNES. The SREIS provides detail on the field management protocols to be employed for ecological pre-clearance surveys, and the mechanism and methodology whereby constraints mapping will trigger the requirement for pre-clearance surveys and other avoidance or mitigation protocols as outlined by the: • Fauna Survey Guideline (99-H-GDL-0061); and • Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); These documents are Provided in Appendix B of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS. The process for undertaking these surveys is also outlined in the Terrestrial Ecology chapter (Section 11) of the EIS.

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S4	69	Listed ecological communities: There are no known examples of successful rehabilitation for Natural Grasslands of the Queensland Central Highlands and the Northern Fitzroy Basin. Therefore, the likely outcome is the permanent loss of any habitat being cleared. This should be acknowledged in the assessment of impacts, and rehabilitation or re-seeding cannot be used as a mitigation measure to reduce impacts to this community.	Terrestrial Ecology chapter (Section 17) of the EIS	Noted. Any impact mitigation or offset management method will be qualified for relevance and applicability. If successful rehabilitation or translocation of a species is not suitably viable, then alternate mitigation, such as offsetting will be explored.
S4	70	Listed ecological communities: Some listed threatened communities, such as Semi-evergreen Vine Thicket, are highly susceptible to edge effects and have a limited potential to recover from disturbance. These factors should be considered when assessing impacts and effectiveness of mitigation measures for listed threatened communities.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Profiles have been updated in the MNES Report (Appendix J) of the SREIS, to include mapping and expand the description of the extent (in hectares) for each TEC within the Project area. The MNES profiles for each TEC detail the potential impacts from the project as assessed against the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*, and impact mitigation measures are presented, including a number of commitments regarding mitigation of edge effects such as: • 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

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				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 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].
S4	71	Listed ecological communities: There is no understanding of the extent of impact, or how large patches and corridors that are important to listed threatened communities (and threatened species) will be accounted for. Please discuss how important and large patches of listed threatened communities (e.g. patches of Brigalow over 200 ha) will be avoided and managed.	Terrestrial Ecology chapter (Section 17) of the EIS	Habitat corridors important to listed threatened communities (and threatened species) are mapped and incorporated into in the ecological layer of the Project constraints mapping (Appendix BB of) the EIS. Detail on how impacts to large patches of vegetation communities will be avoided, mitigated or managed are provided in the vegetation management mitigation commitments in the Terrestrial Ecology chapter (Section 17) and the MNES Report (Appendix CC) in the EIS. Relevant commitments for edge effects made in the EIS and MNES 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

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				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 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]. The above management commitments equally apply to potential edge effects impacts for large or small patches of vegetation.
S4	72	<u>Listed ecological communities:</u> Weed management is central to mitigating impacts to listed threatened communities (e.g. the acceleration of exotic grass species invasion is a significant threat to Semi-evergreen Vine Thicket). Therefore, the Minister must have certainty around the effectiveness of weed mitigation and management measures.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	The potential impacts to TEC's and other protected matters identified in the MNES report (Appendix J) of the SREIS include habitat loss and fragmentation edge effects from weed incursion. Weed management commitments made in the EIS and MNES 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

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				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 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.
S4	73	Fitzroy River Turtle Please provide a detailed assessment of impacts to the Fitzroy River Turtle from crossing the Mackenzie and Isaac Rivers (noting that the Mackenzie River in the southern section of the project area is known habitat for the Fitzroy River Turtle). Please note that 'minimising creek crossings' does not represent a measurable mitigation measure and cannot be relied upon to reduce impact. DSEWPaC requires information around location of waterway crossings, type of waterway crossing (e.g. HDD, open trenching), and detailed mitigation and management for each waterway crossing option. We note that the proponent will undertake surveys for the Fitzroy River Turtle in locations where infrastructure will cross large permanent streams. Please provide detail around how surveys will inform avoidance and mitigation and management measures for the Fitzroy River Turtle.	Surface Water Technical Report (Appendix N); Aquatic Ecology Technical Report (Appendix O) and Draft EM Plan (Appendix Z, Section Z.4.4.5) of the EIS	As part of the EIS (Aquatic Ecology Technical Report Appendix O), the Fitzroy River turtle (Rheodytes leukops) was identified as a possible occurrence in the Fitzroy River tributaries, such as the Isaac River. (The Fitzroy River turtle is listed as 'vulnerable' both in Queensland and nationally under the NC Act and EPBC Act respectively). The known distribution for this species is "only found in the Fitzroy River and its tributaries, around Rockhampton in eastern central Queensland. The species occurs within permanent freshwater riverine reaches and large, isolated permanent waterholes" (EHP, 2014). The museum Records for the turtle, and refined potential habitat mapping for this species undertaken for the MNES Report (Appendix J) of the SREIS, indicate that "core known habitat" for the species occurs downstream of the Project area, where the required habitat such as flowing streams and permanent water bodies are present. Potential habitat mapping for the species undertaken shows "core habitat possible" and "potential general

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		DSEWPaC requires surveys for the Fitzroy River Turtle, and water quality sampling, to be undertaken upstream and downstream of proposed discharge points. DSEWPaC also requires a cumulative impact assessment specifically addressing impacts to the Fitzroy River Turtle. Please provide detail around how surface water monitoring will inform mitigation and management measures for the Fitzroy River Turtle (e.g. if surface water quality thresholds exceeded, or impacts likely to result to Fitzroy River Turtle). This should be detailed in the Fitzroy River Turtle Management plan. Please provide an outline of the Fitzroy River Turtle Management Plan in the SREIS. Please discuss how the proposed action will contribute to protecting the Fitzroy River Turtle (e.g. reducing predation, protecting turtle nests).		habitat" to potentially be present along an area of the McKenzie river within the Project area Given the habitat preferences of this species and that the Isaac River within the Project area is highly ephemeral; this species is considered a highly unlikely occurrence within Isaac River where potential crossing impacts may occur. The Surface Water Technical Report (Appendix F) of the SREIS and the parallel impact assessment undertaken for the in the Aquatic Technical Report (Appendix H) of the SREIS do not identify any unmitigated significant impact's to the potential receiving environment or to the Fitzroy River turtle. It should be noted that the Surface Water Technical Report (Appendix N) of the EIS did not identify significant impacts to downstream aquatic values, and also found that other potential impacts would be localised to the site of disturbance (e.g., pipeline watercourse crossing). A full species profile for the Fitzroy River turtle, as well as an assessment of potential impacts and mitigation measures, are detailed in the MNES Report (Appendix J, Section 9.4.2) of the SREIS. The species profile includes specific assessments in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*. Cross references have been provided where information already exists and further explanation of the rationale to support the determination of impacts has been included in the SREIS where relevant. The Fitzroy River Turtle species profile also provide an outline of the Fitzroy River Turtle Management Plan that

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				would be implemented in line with Arrow's mitigation commitment to: • Develop threatened species management procedures as and when Project activities are identified as likely to impact upon individuals [B187] A conceptual sample development footprint has been developed to estimate well densities in different drainage areas within the Project area. Specific location of waterway crossings are not yet known at this time, and will be addressed in EA amendments / applications as project infrastructure is developed and located under the Project Framework approach. Mitigation commitments to avoid, reduce and manage potential impacts at waterway crossings are outlined in the impact assessment undertaken in the Surface Water Technical Report (Appendix N) of the EIS and the Impact Assessment undertaken for the Supplementary Surface Water Technical Report (Appendix F) of the SREIS. Relevant potential impact from waterway crossing impacts assessed that are relevant to any specific MNES are also discussed in the MNES Report (Appendix J) of the SREIS.
S4	74	<u>Koala</u> Please note that a number of guidance documents for the Koala are likely to be released in the next few months. For example, guidance will be provided about assessing habitat and determining if vegetation within an area meets the criteria for habitat critical to the survival of the Koala. These guidance documents must be considered and adopted in the assessment of impacts to the Koala in the SREIS. It should be noted that suitable koala habitat, and	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Relevant guidance documents for the koala have been referred to in the impact assessment and development of mitigation commitments for this species. The most relevant and current documents and recovery plan for the koala will be used to devise the most appropriate field management protocols for assessing habitat and determining if vegetation within an area meets the criteria for habitat critical to the survival of the koala. Potential habitat mapping for the koala has been undertaken to further refine the understanding of potential

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		potential critical habitat, can exist in highly modified, agricultural-grazing landscape.		presence of this species, which is utilised in the species profile and impact assessment for the koala. To refine potential habitat mapping for the koala, LiDAR data has also been utilised to improve accuracy based on a spatial analysis of specific tree densities and other known habitat requirements of the koala. This process is detailed in Section 8 of the MNES report (Appendix J) of the SREIS. Site specific assessments for the presence and potential impact to koalas will be undertaken where relevant as part of the field management protocols as detailed in the following commitments and guidelines: • Identify key koala trees and visually inspect prior to clearing to ensure that they are free of koalas. If koalas are located, the tree should be retained until the animals have moved on, typically overnight [B190]; • Conduct pre-clearance surveys to identify any additional areas that need to be avoided. Include as a minimum: — Vegetation mapping at a scale suitable for site-specific planning; — Identification of core habitats for EVNT species; and — Identification of site-specific sensitive areas (e.g. ESAs) that require avoidance or buffers) [B132];and • Consider targeted monitoring effort conducted in co-operation with the proponents of overlapping Projects. Particularly suited species to such monitoring include ornamental snake (*Denisonia maculata*), koala (*Phascolarctos cinereus*) and brigalow scaly-foot

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				(*Paradelma orientalis*) [B165].
S4	75	Koala There is insufficient evidence to clearly demonstrate that Koala population density is low within the project area, and that habitat critical to the survival of the species is not present. DSEWPaC is of the view that critical habitat exists within the project area and that the proposed action will have a significant impact on the Koala.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Updated potential habitat mapping for the koala has been undertaken in the SREIS to further refine the understanding of potential presence of the koala on the project site. To refine potential habitat mapping for the koala, LiDAR data has also been utilised to improve accuracy based on a spatial analysis of specific tree densities and other known habitat requirements of the koala. This process is detailed in Section 8 of the MNES report (Appendix J) of the SREIS. This information is utilised in the species profile and impact assessment for the koala. An impact assessment has been undertaken in the SREIS based on species habitat mapping and a conceptual development footprint to generate a likely impact scenario on any critical habitat. as well as an assessment of potential impacts and mitigation measures, as detailed in Appendix J, MNES Report of the SREIS. The species profile for koala includes specific assessments in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.
S4	76	Koala Unless the SREIS can clearly justify otherwise, taking into consideration relevant policy guidance, offsets must be proposed in accordance with DSEWPaC's offsets policy.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Management measures such as biodiversity offsets, or pest species control where it is a relevant threatening process, will be applied duly to any impacted MNES, following the process of habitat identification, management under the hierarchy of avoidance, mitigation and offsetting, and impact assessment and identification of any relevant residual impacts.

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S4	77	<u>Koala</u> Koalas are more likely to feed where food trees have reliable access to soil moisture. Koala habitat trees are also known to be dependent on groundwater. Please provide an assessment of surface and groundwater impacts to Koala habitat (such as from drawdown to the Condamine alluvium).	Terrestrial Ecology chapter (Section 17) and Draft EM Plan (Appendix Z, Section Z.4.4.5) of the EIS MNES Report (Appendix J) of the SREIS	The MNES report details a species profile for the koala outlining the species ecology, key threatening processes, known distribution in the area, potential habitat mapping (including LiDAR analysis), and an assessment of potential impacts from the Project as assessed against the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999.* The preference of specific tree species by koala for foraging or refuge is very localised and site specific. Tree species preference varies in different regions and sub-regions, and localities, according to a suite of variables, including soil moisture, site geology, soil chemistry, surface hydrology, vegetation community health, local koala population health and fecundity, as well as the local fire regime and other threatening processes. Potential habitat mapping, and determination of any koala presence (and utilisation of preferred tree species) from the pre-clearance surveys are required investigation of likely drawdown impacts, (or any other type of impacts) could be ascertained. A determining potential impacts from drawdown to general known koala tree habitat at the broad scale level in the SREIS, without known final locations of infrastructure, or the site specific information on local koala occurrence (as described above) it is not considered practical, Site specific assessments for the presence and potential impact to koalas will be undertaken where relevant as part of the field management protocols as detailed in the following commitments and guidelines: • Identify key koala trees and visually inspect prior to clearing to ensure that they are free of koalas. If koalas

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				are located, the tree should be retained until the animals have moved on, typically overnight [B190]; The SREIS provides detail on the field management protocols to be employed for ecological pre-clearance surveys, and the mechanism and methodology whereby constraints mapping will trigger the requirement for pre-clearance surveys and other avoidance or mitigation protocols as outlined by the: • Fauna Survey Guideline (99-H-GDL-0061); and • Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); These documents are Provided in Appendix B of the supplementary Terrestrial Ecology Technical Report (Appendix I) of the SREIS. The process for undertaking these surveys is outlined in the Terrestrial Ecology Chapter (Section 11) of the EIS. In addition if site scouting and pre-clearance field surveys identify potential impacts on individuals of the species, Arrow commit to: • Develop threatened species management procedures as and when Project activities are identified as likely to impact upon individuals [B187].
S4	78	<u>Koala</u> Fire management must be undertaken with consideration for the ecology of koala habitat so that any change in the flora species composition and structure of vegetation communities is minimal.	Draft EM Plan (Appendix Z) of the EIS.	The requirements for the development of relevant fire management planning for site specific project conditions are outlined in the draft EM Plan (Appendix Z) of the EIS.

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S4	79	Koala Quantification of impact to Koala habitat, and associated habitat mapping, must be provided.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	All MNES species profiles have been updated to expand the description of the extent of potential habitat categories within the Project area for each species and elaborate on the potential impacts from the project against the Significant Impact Guidelines 1.1 - *Environment Protection and Biodiversity Conservation Act 1999*. This has been undertaken with input from individual species habitat mapping compiled and presented in the updated MNES Report (Appendix J) of the SREIS. To refine potential habitat mapping for the koala, LiDAR data has been utilised to improve accuracy based on a spatial analysis of specific tree densities and other known habitat requirements of the koala. This process is detailed in Section 8 of the MNES report (Appendix J) of the SREIS. This information is utilised in the species profile and impact assessment for the koala.
S4	80	Koala Please discuss how the proposed action will contribute to protecting the Koala, e.g. managing current threats such as feral dogs.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Mitigation measures such as pest species control will be duly applied for management of MNES species, where there is a relevant threatening process or impact from the project development. This would include feral dog control, where the Project is furthering this threatening process to a significant population of an MNES species.
S4	81	King Bluegrass The terrestrial ecology report identifies that King Bluegrass may be particularly susceptible to impacts associated with applying saline coal seam water for dust suppression. This should be discussed in more detail, including proposed mitigation and management measures to specifically address this impact. DSEWPAC notes that there is an extremely high	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Susceptibility of this species to application of saline water is discussed in the Terrestrial Ecology chapter (Section 17) of the EIS. Dust suppression will be undertaken in accordance with relevant approvals. This potential impact has been assessed and specific mitigation / management measures outlined for this species in the SREIS, as outlined in the MNES report

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		potential for cumulative impact to this species. Where there is a high or extremely high potential for cumulative impact this must be discussed in detail for each species.		(Appendix J) of the SREIS. Use of non-saline water in specific areas of potential impact would be one method of mitigation to apply where required. Mitigation commitments detailed in the in the EIS to meet this objective include: • Dust suppression will be undertaken in accordance with relevant approvals and in accordance with relevant approvals, including management of MNES [B313]; and • Ensure that the quality of CSG water used for dust suppression meets the prescribed limits [B352].
S4	82	<u>Omphalea celata</u> The Omphalea Celata has been recorded just to the east of the project site. However, there is no discussion in the terrestrial ecology report about whether suitable habitat exists on site. A more detailed assessment of impacts on this species is required.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	The determination of likelihood of presence undertaken in both the Terrestrial Ecology Technical Report (Appendix P) and the MNES Report (Appendix CC) of the EIS has been updated in the MNES report (Appendix J) of the SREIS, based on a set of robust criteria applied to all species within the Project area. This species was considered to have a low likelihood of presence in the EIS but following consideration of the records for this species it has been updated to have a moderate likelihood of presence within the Project Area. *Omphalea celata* is known from three sites in central east Queensland. Locations include Hazlewood Gorge, near Eungella; Gloucester Island, near Bowen; and Cooper Creek in the Homevale Station area, north-west of Nebo (TSSC, 2008h). Records for this species occur within 200 m of the Project NE corner of the Project tenement within appropriate habitat in Homevale National Park. Given the specific habitat preferences of this species for semi evergreen vine thicket along water courses it is

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				considered highly unlikely that this species will occur outside the National Park, within Project area. Given that no work will be undertaken within the National Park which is a Category A "no go" constraint area within the Project Area, and that the rest of the Project area does not support integral habitat for this species, no habitat mapping has been undertaken for this species
S4	83	Finger Panic Grass The terrestrial ecology report identifies that Finger Panic Grass may be particularly susceptible to impacts associated with applying saline coal seam water for dust suppression. This should be discussed in more detail, including proposed mitigation and management measures to specifically address this impact.	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Susceptibility of this species to application of saline water is noted from the terrestrial ecology technical report Appendix P) of the EIS. This potential impact will be assessed and specific mitigation / management measures outlined for this species in the SREIS. Use of non-saline water in specific areas of potential impact would be one method of mitigation to apply where required. Mitigation commitments detailed in the in the EIS to meet this objective include: • Dust suppression will be undertaken in accordance with relevant approvals and in accordance with relevant approvals, including management of MNES [B313]; and • Ensure that the quality of CSG water used for dust suppression meets the prescribed limits [B352].
S4	84	Migratory species DSEWPaC requires more certainty around impacts to migratory species, in particular whether important habitat exists onsite and how much habitat will be impacted. The assessment documentation must demonstrate that there will not be a significant or unacceptable impact on migratory species. It cannot	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report (Appendix J) of the SREIS	Maps have been developed for each MNES species potentially occurring within the project development area and habitat is displayed as per the potential habitat categories criteria refined in the species profiles. It should be recognised that migratory species potentially present in the study area are generalist species that utilise a very broad range of habitat types.

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		be assumed that important habitat does not exist onsite, supporting evidence must be provided (e.g. it is insufficient to state that "whilst the project area may feature habitat with the characteristics identified [as important habitat], there are no records of wetlands in the region supporting such a high density of Latham's snipe"). Detailed aerial imagery may assist with this assessment.		Migratory species may use a range of habitats including, but not limited to dams, lakes, ponds, creeks, billabongs, rivers, small waterways, open grasslands, cropping fields, and various types of man made water sources that are highly abundant within the study area. As such it is not possible to isolate and identify all particular habitat types of potential importance to each species in question. It is recognised that important habitat to migratory species may exist on site and an update to the assessment of wetlands on site has been undertaken in the SREIS (Chapter 10 and Appendix H) including a revised assessment of impacts on wetlands within the Project area. The Aquatic Ecology chapter (Section 10.5.2) of the SREIS, presents results of the revised review of publically available data sets and GIS mapping layers associated with wetlands, including: a) Queensland Wetland Mapping Version 3; b) Ramsar Convention on Wetlands; c) Directory of Important Wetlands in Australia; d) Map of referable wetlands; e) DERM (now EHP) report on Aquatic Conservation Assessments (ACA), using AquaBAMM, for the non-riverine and riverine wetlands of the Great Barrier Reef catchment (Rollason and Howell, 2012); and f) Wetland info. The review of the above sources initially identified 109 riverine and 423 non-riverine wetlands incorporating a range of wetland types (described below), varying in ecological value. These wetlands incorporate riverine systems such as the Isaac River and non-riverine wetlands (lacustrine and palustrine wetlands) which range from modified dams to vegetated swamps.

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				The analysis of wetland mapping identified that of the above listed wetlands, 66 riverine and 191 non-riverine wetlands occur within the Project gas drainage areas which are the focus areas for field development). Of these wetlands identified within gas drainage areas, 14 riverine and 29 non-riverine wetlands are identified of high or very high ecological value under EHP's AquaBAMM classification, Given the above, an assessment of the identified wetlands within the Project area and gas drainage areas is outlined in the Aquatic Ecology chapter (Section 10.5) of the SREIS. The potential impacts on these wetlands was assessed in the SREIS (Section 10.6.1) and mitigation measures from the EIS reviewed (Section 10.7). The results of the impact assessment identified no residual significant impacts on wetlands and associated aquatic values following the application of current mitigation commitments such as the use of buffers (from construction) and ground-truthing surveys. On the basis that migratory species are vagrant visitors, the mitigation measures for all species relating to impacts on natural water bodies will afford protection to migratory species temporarily utilising that resource. The wetlands identified in the above assessment have also been incorporated into the project area constraints mapping.
S4	85	Migratory species Please provide a more detailed assessment of impacts on the White-bellied Sea Eagle, including habitat mapping and quantification of potential habitat	Terrestrial Ecology chapter (Section 17) of the EIS MNES Report	Further detail has been provided on the potential habitat for this species within the updated MNES species profiles, including potential habitat mapping and relevant impact analysis.

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		onsite and maximum impact. DSEWPaC has concerns around potential impacts to important habitat such as breeding habitat.	(Appendix J) of the SREIS	Species profiles have been updated to expand the description of the extent of potential habitat categories within the Project area for each species and elaborate on the potential impacts from the Project against the Significant Impact Guidelines 1.1 - *Environment Protection and Biodiversity Conservation Act 1999*.
S4	86	Migratory species The SREIS must clearly demonstrate, with supporting evidence, that there will be no significant surface water or groundwater impacts to Lake Elphinstone. This must include identification of ground and surface water connections, and a detailed discussion of all potential impacts (including discharge, water crossings etc.). While the EIS identifies a number of potential impacts these are not discussed in detail and relevant technical supporting information is not provided.	Groundwater Chapter (Section 7) and Groundwater Technical report (Appendix E) of the SREIS	An investigation and analysis of potential impacts and relevant management or mitigation measures for Lake Elphinstone has been provided in the Supplementary Groundwater Technical Report (Appendix E) and Groundwater Chapter (Section 7) of the SREIS
S4	87	Cumulative Impacts Figure 31-1 (projects relevant to the study area) in Section 31 (Cumulative Impacts) identifies a number of projects within the study area. However, many of these projects have not been discussed in the cumulative impact assessment for terrestrial or aquatic MNES. DSEWPaC requires an assessment of cumulative impacts from all projects in the area on MNES. DSEWPaC notes that some of these projects are currently undergoing assessment under the EPBC Act and will contribute to downstream impacts on the Fitzroy River Turtle and clearing of habitat for terrestrial MNES such as Brigalow and Ornamental Snake).	MNES Report (Appendix J) of the SREIS	A revised assessment of cumulative impacts within each species profile has been undertaken following an update of all species profiles to expand the description of potential habitat categories within the Project area for each species, and elaborate on the potential impacts from the Project against the Significant Impact Guidelines 1.1 - *Environment Protection and Biodiversity Conservation Act 1999.*

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		Please quantify cumulative impacts to listed threatened species using publically available data for other projects (DSEWPaC notes that this has been done to some extent for ecological communities and RE's). In particular a cumulative assessment from the Bowen Gas project and Bowen Pipeline project, including quantification of impacts, must be provided. This is particularly important for species that have been identified at risk of cumulative impact.		
S4	88	<u>Watercourse disposal</u> Please note that all impacts to MNES, including those associated with water disposal, must be assessed during the assessment phase so that the Minister can make an informed decision on whether or not to approve the taking of the proposed action. The EIS states that "disposal to watercourses will be considered in future EA applications. A site specific impact assessment will be undertaken to determine the relevant parameters for discharge to the receiving environment. This assessment would be provided to the EHP as part of an EA amendment application which would be subject to public exhibition." DSEWPaC requires an assessment of impacts to MNES from watercourse disposal in the SREIS and prior to a decision on whether or not to approve the action.	Surface Water Technical Report (Appendix N) of the EIS. Surface Water Chapter (Section 8); Surface water Technical Report (Appendix F) and MNES Report (Appendix J) of the SREIS.	Water discharge may be necessary when the preferred beneficial use options are not available or technically feasible. Such discharges may be required under both normal operations and emergency situations to manage variations in seasonal conditions and for distribution to water users for beneficial use. Discharge to water courses will only occur within environmental flow requirements and in accordance with EA conditions and other relevant approvals The Surface Water Technical Report (Appendix N) in the EIS did not identify significant impacts arising from the emergency discharge of CSG water as it will be in accordance with the water quality parameters conditioned in the project EA. The SREIS further defines the processes for the remaining water management options, and provides updated details of infrastructure and operations proposed for water treatment facilities (WTF's). While the preferred locality of WTF's is targeted, the final locations for WTF's and any associated discharge points are not identified at the SREIS stage. In lieu of locations for site specific impact studies (to be

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				undertaken for EA applications), the SREIS assesses the proposed discharge option against the waterway/s currently known for the target locality of WTF's. This investigation includes an assessment of the assimilative capacity of the likely receiving environments of the WTF's target locality, from current studies against the defined water quality parameters, flow rate and volume that will be detailed in the updated WTF description in the SREIS. This provides an impact assessment of the potential downstream receiving environment.
S4	89	Brine treatment and disposal DSEWPaC requires the action to be clearly defined in respect of brine treatment and disposal. DSEWPaC notes that some brine disposal options are intended to be part of a separate referral and approval process. This should be discussed further with DSEWPaC.	Project Description Chapter (Section 3); Coal Seam Gas Water and Salt Management Strategy (Appendix D) and MNES Report (Appendix J) of the SREIS	Brine disposal options outlined in the EIS have been assessed and refined as the engineering and design of the project progresses. Arrow has evaluated all potential Brine disposal options in a systematic and transparent multi-criteria assessment (MCA) process, which is presented in the Arrow CSG Water and Salt Management Strategy (Appendix D) of this SREIS. The re-assessment of the proposed brine disposal options outlined above have been updated and provided in the Project Description chapter (Section 3) of the SREIS. No new brine disposal options are introduced in the SREIS, and previous options that would have been subject to a separate referral such as ocean outfall have been eliminated. The base case for brine management for the Project consists of disposal to a regulated Waste facility (RWF), where the brine produced as part of the CSG water treatment process would be piped to brine dams, located near each of the three proposed WTFs. Crystallisation would take place via conventional solar evaporation. Once the brine has evaporated to a solid product, it would be

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				transported to the RWF. It should be noted that disposal of the waste salt concentrate to landfill is not expected to commence until approximately 30 years after commencement of water production when Arrow will encourage a licensed third party to develop a RWF in the vicinity of the Projects WTF's. To ensure a robust yet conservative road impact assessment, it has been assumed that waste salt concentrate would be transported to Townsville for disposal at an RWF.
S4	90	<u>Rehabilitation</u> DSEWPaC requires clarification around rehabilitation commitments. DSEWPaC currently understands that rehabilitation will be undertaken until landscape stabilisation is complete. Please discuss what constitutes landscape stabilisation, and outline commitments and objectives in respect of rehabilitation. If the landscape will not be rehabilitated to the same vegetation type, structure and complexity as existed prior to project disturbance, then the impact to MNES is likely to be a permanent impact.	Decommissioning and Rehabilitation chapter (Section 29) and Draft EM Plan (Appendix Z) of the EIS MNES Report (Appendix J) of the SREIS	Where an impact to MNES has been identified, rehabilitation will be targeted to pre-disturbance values. Specific objectives with respect to landscape rehabilitation are outlined in the EIS including, completion criteria, revegetation species, monitoring and maintenance requirements (Decommissioning and Rehabilitation-Section 29). This includes the objectives to revegetate disturbance areas with specific consideration of the pre-disturbance ecosystem requirements. Species being particularly suitable for rehabilitation of the disturbance areas are provided within the Terrestrial Ecology Technical Report (Appendix P) of the EIS. Plant selection for areas to be rehabilitated to pre-existing conditions will focus on those species that will successfully establish on the available growth medium, bind the soil and will result in a variety of structure and food / habitat resources. Native species will be established through direct seeding or planting of tube stock / nursery-raised stock from local propagules. Seed will be collected or sourced locally where possible to ensure it is adapted to environmental conditions in the area.”

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				Further to this Preliminary success criteria (or completion criteria) for the rehabilitation of the CSG production areas and associated infrastructure have been provided in the Draft EM Plan (Appendix Z) of the EIS. The completion criteria are performance objectives or standards against which rehabilitation success in achieving a sustainable system for the proposed post-facility life land use is demonstrated. The EIS states these standards will be developed by: "The further development of each criterion will be based on results of research, monitoring of progressive rehabilitation areas and risk assessments. The success criteria will be reviewed every three to five years with stakeholder participation to ensure the criteria remain realistic and achievable. Rehabilitation shall be considered successful when the following conditions have been met: • The site can be managed for its designated land-use (e.g. consistent with surrounding undisturbed land); • Evidence that the agreed rehabilitation criteria have been met; • No greater management input is required for site than that of surrounding areas consistent with designated land use; and • Written agreement has been attained by the land owner / holder and the administering authority."
S4	91	DSEWPaC expects habitat mapping (and quantification of impact) to be provided for all species (flora and fauna) and ecological communities for which dossiers are provided. DSEWPaC will advise if	MNES Report (Appendix J) of the SREIS	An update to the Likelihood of Occurrence analysis for MNES has been undertaken and is provided in Section 7 of the MNES report (Appendix J) of the SREIS. Where a species likelihood of occurrence has been elevated,

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		dossiers are required for any additional MNES after batch 3 is provided, which will include an updated section of species potential occurrence assessment.		potential habitat mapping has been undertaken and incorporated into the species profiles in Section 9, and impact assessment and mitigation measures in Section 10, of the MNES report (Appendix J) of the SREIS.
S4	92	More information is required around impacts to individual MNES as a result of watercourse crossings or diversions, including discussion of any potential upstream or downstream impacts to MNES.	Surface Water Technical Report (Appendix F); Aquatic Technical Report (Appendix H) and MNES Report (Appendix J) of the SREIS	Potential impacts are assessed and discussed against MNES in individual species profiles. Further discussion of potential impacts from waterway crossing's on relevant MNES such as the Fitzroy River turtle are discussed in Section 9 and 10 of the MNES report (Appendix J) and the Aquatic Technical Report (Appendix H) of the SREIS.
S4	93	Quantification of the predicted cumulative impact on MNES identified in species dossiers is required where possible. Please note that for already approved CSG projects disturbance limits in Commonwealth approval conditions should be used. Where a species is highly susceptible to cumulative impacts a detailed discussion on the level of impact and its significance and acceptability is required.	MNES Report (Appendix J) of the SREIS	Potential cumulative impacts are assessed and discussed against MNES in the species profiles Section 9 and 10 of the MNES report. Further elaboration on species that are more susceptible to cumulative impact are identified and discussed. Disturbance limits for species that are particularly relevant to any cumulative impacts analysis are those incurred by the project itself. Relevant cumulative disturbance limits can only be quantified and incorporated into an assessment following the issue of relevant disturbance limits for the Project. The MNES Report (Appendix CC, Section 10.2) of the EIS states that: "Impacts to those TECs and threatened flora and fauna species identified in Section 7 can best be managed at the individual project scale, at the site location level". The above is important to note as it is identified as the best practice to manage these impacts. However there is

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				a broad general discussion on the potential usefulness of a collaborative approach in future, as follows: Broader recommendations can be also made in respect to the regional scale management of cumulative impacts across Projects at a collaborative level. These could include: • Research into species ecology and effective impact mitigation techniques to be sponsored collaboratively by proponents of the projects contributing to potential impact; • Ensuring all interacting projects identified as potentially contributing to a significant cumulative impact are made aware of this potential and their responsibilities towards management of these impacts are identified; and • A collaborative approach between project proponents for the purpose of effective ecological offsetting (e.g. joint funding for management of a specific habitat offset for a species or ecological community that is heavily impacted by a number of projects).” Arrow has developed and is developing many co-development agreements with other operators in the Project area. As co-development agreements evolve opportunities for collaborative work may be explored. More detail of any collaborative work to be undertaken to monitor impacts may potentially come to light at a later stage in the Project.
S4	94	Habitat mapping and disturbance limits will need to include a definition of ‘habitat’. DSEWPaC is of the view that ‘habitat’ includes all potential habitat (unless	Terrestrial Ecology chapter (Section 17) and of the EIS	Species profiles have been updated to expand the description of the extent of potential habitat categories for each species and the potential impacts from the Project.

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		an exception can be justified for individual species) and must not be restricted to core or essential habitat only. As a minimum DSEWPaC would expect 'habitat' to include core, critical, essential and general habitat (as an example refer to the Queensland Biodiversity Assessment and Mapping Methodology). DSEWPaC can provide recommended definitions of habitat.	MNES Report (Appendix J) of the SREIS	A rigorous methodology employed for habitat mapping has been developed by Arrow in consultation with a number of groups with experience in this area to produce a reliable mapping product. Maps are provided for each EPBC Act listed species potentially occurring within the project development area and habitat categories are displayed as per the mapping habitat criteria provided with each individual species profiles. Potential habitat mapping developed for the SREIS includes several potential habitat categories including: • Core Habitat Known; • Core Habitat Possible • General Habitat; and • Absence suspected. These categories are constructed for each species profile from individual mapping rules specific to each species based on their habitat requirements and known ecology, as presented in Appendix B of the MNES report (Appendix J) in the SREIS.
S4	95	The majority of mitigation measures do not use commitment language (e.g. 'must') but instead use preferential language. As previously advised these mitigation measures cannot be fully relied upon to reduce impacts on MNES. The assessment of impacts on individual MNES must include a worst-case scenario (e.g. in the event that MNES cannot be avoided using the constraints approach) and assess the significance of this worst-case scenario. Any residual significant impacts will be required to be	MNES Report (Appendix J) of the SREIS	Mitigation commitments in the EIS have been refined in the cases where further definition of the Project Description and revised impact assessment have allowed for a further refinement of proposed mitigation and management strategies. As the Project progresses and becomes further refined, commitment language can be adopted where there are no practical limitations. The assessment of potential impacts to MNES has been quantified against an estimated potential 'worst case' or maximum disturbance calculation for the Project.

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		offset in accordance with the EPBC Act Environmental Offsets Policy and Offset Assessment Guide. The significance of residual impacts will need to be discussed in the context of each species and its distribution over the project area and region. For example, if an important large remnant patch of Brigalow is removed or fragmented this is likely to represent a significant impact to the Brigalow community. Similarly, if the robust population of King Bluegrass identified in the project area is removed or fragmented, this is also likely to represent a significant impact to this species. Please note that during the ongoing assessment of the EIS, it is possible that DSEWPaC may arrive at a different conclusion to the proponent on what constitutes a significant residual impact and requires offsetting.		This has been developed by overlaying a conceptual maximum disturbance footprint with the potential habitat mapping for MNES. The disturbance calculations and maximum disturbance residual impacts are detailed in the Offsets Strategic Management Plan (Appendix O) of the SREIS, and also outlined for each species profile in the MNES report (Appendix J) of the SREIS.
S4	96	Weed management is very important in ensuring that impacts on MNES, as a result of project activities, are not significant or unacceptable. Therefore the EIS must clearly demonstrate that weed management will be effective.	MNES Report (Appendix J) of the SREIS	The potential impacts to TEC's and other protected matters identified in the SREIS MNES report (Appendix J) include habitat loss and fragmentation edge effects from weed incursion. Weed management commitments made in the EIS and MNES 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

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				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 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.
S4	97	Please note that DSEWPaC does not generally accept translocation of species as a mitigation measure unless it is scientifically proven (with evidence provided) to be successful for a particular species.	MNES Report (Appendix J) of the SREIS	Noted. The mitigation measures outlined in both the SREIS chapters and the revised MNES report (Appendix J) of the SREIS recommend translocation and/or propagation to be considered, however this would only apply to flora species that this technique is known and proven to be successful. The MNES report states: “Where EVNT species are identified in proposed development areas, consider mitigation measures such as translocation and/or propagation of flora species. Monitor progress of any translocation programs in accordance with the relevant translocation management plans [B169];” A number of relevant translocation programs have been successfully undertaken for roads and transport projects, linear infrastructure, and mine rehabilitation programs in the past, and similar programs are also currently employed as a successful mitigation method for impacts to

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				flora species on CSG projects in Queensland (e.g. *Macrozamia sp.*). Any impact mitigation or offset management method will be qualified for relevance and applicability. If successful rehabilitation or translocation of a species is deemed not suitably viable, then alternate mitigation will be employed where relevant.
S4	98	Fire management should be discussed in respect of individual MNES where they are susceptible to fire (e.g. increased wildfire risk or change to fire regimes across the project area).	MNES Report (Appendix J) of the SREIS	Species susceptible to fire are discussed where relevant as part of the 'Key Threatening Processes' within the species profiles (Section 9) of the MNES Report (Appendix J) of the SREIS, whereby potential impacts are specifically assessed for MNES in accordance with the criteria set out in the *Significant Impact Guidelines 1.1 - Environment Protection and Biodiversity Conservation Act 1999*.
S4	99	Statements such as 'there is a lack of populations within the project development area' or 'the species is uncommon' should be supported by scientific evidence.	MNES Report (Appendix J) of the SREIS	A number of criteria are used to assess the likelihood of occurrence of a species within the project area, including the habitat requirements of the species, the known current distribution and range of a species and qualified recent records. Section 7 of the MNES report (Appendix J) in the SREIS outlines these criteria and assesses species identified as known for the region against these criteria to produce an assessment of 'Likelihood of Occurrence' in the project site. Categories in the likelihood of occurrence assessment include: • Very Low – the Project area is outside the species normal range, habitat does not exist; • Low – database searches indicate the species could potentially occur in the Project area, however previous records are likely to be historic or invalid, the Project

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				area is outside the species known normal range, habitat is not likely to exist or the species is considered locally extinct; • Moderate – habitat exists for the species; however it is either marginal or not particularly abundant. The species is known from the wider region and could potentially occur; • High – the species is known to occur in the local area and critical habitat exists in the Project area; and • Recorded – the species was recorded in the Project area as part of the field surveys. In addition to the above, an update to species profiles has been undertaken to expand the description of the extent of potential habitat within the Project area for each species (provided in hectares) to elaborate on the potential impacts from the Project. This has been undertaken with input from individual species potential habitat mapping compiled and presented in the updated MNES Report (Appendix J) for the SREIS.
S4	100	DSEWPaC expects the results of all pre-clearance surveys to be made publically available to improve knowledge about the environment in and around the project area.	Terrestrial Ecology Chapter (Section 11) of the EIS. Terrestrial Ecology Technical Report (Appendix I) and MNES Report (Appendix J) of the SREIS	Noted. A process for public availability of pre-clearance survey results will be undertaken in accordance with SEWPaC's expectations and regulatory requirements. Pre-clearance surveys will be undertaken in areas of proposed disturbance and in areas identified by constraints mapping as having potential impact to MNES. The SREIS provides detail on the field management protocols to be employed for ecological pre-clearance surveys, and the mechanism and methodology whereby constraints mapping will trigger the requirement for pre-

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				clearance surveys and other avoidance or mitigation protocols as outlined by the: • Fauna Survey Guideline (99-H-GDL-0061); and • Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); These documents are Provided in Appendix B of the supplementary Terrestrial Ecology Technical Report (Appendix I) of the SREIS. The process for undertaking these surveys is also outlined in the Terrestrial Ecology Chapter (Section 11) of the EIS.
S4	101	It is useful to discuss how the proposed action will benefit MNES species, for e.g. how the project will improve recovery actions for MNES. This will assist the Minister and the public to understand the beneficial impacts associated with the proposed action.	MNES Report (Appendix J) of the SREIS	Net positive benefits will be considered during the post EIS offset management planning. Opportunities will be explored during the offset program at a localised property level and where any research proposals form part of a species offset strategy. Typical net positive impacts associated with offset programs include habitat rehabilitation, establishment of corridor connectivity, contribution to research, and extension or contributions to the National Heritage estate.
4	02	onsider any facilitated impacts on MNES from salt/brine disposal (e.g. disposal which may results in additional, downstream or offsite impacts to MNES).	Coal Seam Gas Water and Salt Management Strategy (Appendix D) and Road Impact Assessment (Appendix K) of the SREIS	Brine and salt disposal options outlined in the EIS have been assessed and refined in the Project Description Chapter (Section 3.5.5) of the SREIS as the engineering and design of the Project has progressed. Arrow has evaluated all potential Brine disposal options in a systematic and transparent multi-criteria assessment (MCA) process, which is presented in the Arrow CSG Water and Salt Management Strategy (Appendix D) of this SREIS. No new brine disposal options are introduced in the

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				SREIS, and previous options that would have been subject to a separate referral such as ocean outfall have been eliminated. The base case for brine management for the Project consists of disposal to a regulated Waste facility (RWF), where the brine produced as part of the CSG water treatment process would be piped to brine dams, located near each of the three proposed WTFs. Crystallisation would take place via conventional solar evaporation. Once the brine has evaporated to a solid product, it would be transported to the RWF. It should be noted that disposal of the waste salt concentrate to landfill is not expected to commence until approximately 30 years after commencement of water production. For the purpose of downstream Impact analysis the maximum expected vehicle movements (and associated vehicle emissions), the EIS and SREIS Transport Assessments both assumed transport to and disposal of waste salt concentrate at Townsville, as a worst case scenario. It is noted within the assessments though 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 to accept brine (as a salt concentrate) produced in its operations and as such reduce vehicle movements.
S4	103	Please provide more detail, including maps, around water crossings and diversions as a result of project activities (including in the context of MNES).	Surface Water Technical Report (Appendix N) of the EIS Surface Water	A conceptual sample development footprint has been developed to estimate well densities in different drainage areas within the Project area. Specific location of waterway crossings are not yet known at this time, and will be addressed in EA applications as project infrastructure

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			Technical Report (Appendix F) and MNES Report (Appendix J) of the SREIS	is developed and located under the Project Framework approach. Mitigation commitments to avoid reduce and manage potential impacts at water way crossings are outlined in the impact assessment undertaken in the EIS Surface Water Technical Report (Appendix N) of the EIS and the Impact Assessment undertaken for the Supplementary Surface Water Technical Report (Appendix F) of the SREIS. Relevant potential impact from waterway crossing impacts assessed that are relevant to any specific MNES are also discussed in the MNES Report (Appendix J) of the SREIS.
S4	104	Where a species is identified on the ERT reporting tool, the 'Notes on Habitat, Distribution and Presence' must state whether suitable habitat exists on site. It is difficult to have confidence that a species has a low likelihood of occurrence when no information about habitat onsite is provided, particularly when targeted or large scale surveying has not been undertaken.	MNES Report (Appendix J) of the SREIS	A number of criteria are used to assess the likelihood of occurrence of a species within the project area, including the habitat requirements of the species, the known current distribution and range of a species and qualified recent records. Section 7 of the MNES report (Appendix J) in the SREIS outlines these criteria and assesses species identified as known for the region against these criteria to produce an assessment of "Likelihood of Occurrence' in the project site. Categories in the likelihood of occurrence assessment include: • Very Low – the Project area is outside the species normal range, habitat does not exist; • Low – database searches indicate the species could potentially occur in the Project area, however previous records are likely to be historic or invalid, the Project area is outside the species known normal range, habitat is not likely to exist or the species is considered locally extinct; • Moderate – habitat exists for the species; however it is

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				either marginal or not particularly abundant. The species is known from the wider region and could potentially occur; • High – the species is known to occur in the local area and critical habitat exists in the Project area; and Recorded – the species was recorded in the Project area as part of the field surveys In addition to the above, an update to species profiles has been undertaken to expand the description of the extent of potential habitat within the Project area for each species (provided in hectares) to elaborate on the potential impacts from the Project. The updated species profiles are included in Section 9 of the MNES report (Appendix J) of the SREIS.
S4	105	Please explain why habitat for the Red Goshawk is marginal, or provide an appropriate cross-reference to specific information that supports this statement. Similarly, the statement for the Spectacled Flying-fox that 'the project area is outside the range of the Spectacled Flying-fox' should be justified, as the ERT report has indicated that the range of this species extends over the project area. Please also explain why only two known records suggest that the Spectacled Flying Fox is not a regular inhabitant in the area (this could be because of a lack of survey effort for example). Similar statements for other species (e.g. Eungella Day Frog) should also be explained.	MNES Report (Appendix J) of the SREIS	The MNES report (Appendix J) of the SREIS has been updated to include a revised likelihood of occurrence analysis (Section 7) and a revised species profile (Section 9) for the red goshawk (*Erythrotriorchris radiatus*) including an impact assessment and mitigation measures (Section 10), The MNES report (Appendix J) of the SREIS has been updated to include a revised likelihood of occurrence analysis (Section 7). The report includes an expanded rationale explaining why spectacled flying fox (*Pteropus conspicillatus*) and Eungella day frog (*Taudactylus eungellensis*) both have a low likelihood of occurrence, which is based on their known range being outside of the project area and lack of any suitable habitat.
S4	106	Please explain why the Yakka Skink has a low likelihood of occurrence when it is known to occur in	MNES Report (Appendix J) of the	The MNES report (Appendix J) of the SREIS has been updated to include a revised likelihood of occurrence

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		the Brigalow Ecological community, which is extensive in the project area, and it is also known to co-occur with the Brigalow Scaly-foot (which has been assessed as having a high likelihood of occurrence). Targeted surveying was not undertaken for the species, and a lack of records does not justify a low likelihood of occurrence unless further justification can be provided. Similarly, the Collared Delma is also known to occur in Brigalow and therefore further justification for its 'very low' likelihood of occurrence should be provided.	SREIS	analysis (Section 7) and a revised species profile (Section 9) for the yakka skink (*Egernia rugosa*) including an impact assessment and mitigation measures (Section 10). The revised likelihood of occurrence analysis indicates that no records of the yakka skink occur within or close proximity to the northern gas field. Two records occur in proximity to the southern gas field at 3 km and 16 km to the west of the boundary. It is considered that marginal habitat may exist in the southern gas field. A revised species profile, potential habitat mapping and impact assessment for the species has been included in the MNES report. The revised likelihood of occurrence analysis indicates that the Project area is situated north of the known distribution of the collared delma. The Blackdown Tablelands National Park is the most proximate area in which this species is known to occur (15 km south east of the southern gas field). Habitat suitable to the collared delma is considered absent from the southern gas field. The northern gas field is considered outside the species distribution. Given this, the collared delma is not likely to be present and as such it has a low likelihood of occurrence within the Project area.
S4	107	Please explain why the Dunmall's Snake has a very low likelihood of occurrence when Brigalow is a known habitat for this species, and any suitable remnant vegetation within the range of the species is considered important habitat. The ERT report indicates that the project area is within the species range, therefore justification for the statement 'the project area is outside the species known range'	MNES Report (Appendix J) of the SREIS	The MNES report (Appendix J) of the SREIS has been updated to include a revised likely hood of occurrence analysis (Section 7). The expanded rationale explains why Dunmall's snake (*Furina dunmalli*) is of a low likely hood of occurrence based on its known range. The known distribution of the Dunmall's snake occurs outside the Project area with the closest central Queensland record occurring within the Expedition Range National Park

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		should be provided. Dunmall's Snake is a very rare and secretive species, therefore lack of records or non-detection during field surveys (particularly when they are not targeted surveys) can not be relied upon.		(approximately 160 km south).
S4	108	DSEWPaC notes that the proponent will identify key koala trees, and visually inspect prior to clearing to ensure that they are free of koalas. If koalas are located, the tree should be retained until the animals have moved on, typically overnight [B190]. Please note that the lack of commitment language ('should') means that this mitigation measure cannot be relied upon to reduce impacts. DSEWPaC recommends making this a mandatory requirement, e.g. 'If koalas are located, the tree will be retained until the animals have moved on, typically overnight'.	MNES Report (Appendix J) and Commitments Update (Appendix O) of the SREIS	Noted. This commitment has been updated to reflect the recommended wording. An update to Project commitments is provided in the Commitments Update (Appendix O) of the SREIS
S4	109	As previously discussed, should the project be approved it is likely DSEWPaC will only authorise disturbance for species where acceptable disturbance limits are provided. Zero disturbance will be permitted for all other listed threatened species, unless an appropriate and defined process for dealing with an unpredicted impact on a listed threatened species is followed. We acknowledge that this process will be detailed in the SREIS.	Terrestrial Ecology Technical Report (Appendix I, Appendix B) and Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS	Noted. Maximum estimated disturbance calculations for MNES are provided in the Bowen Gas Project Environmental Offsets Strategic Management Plan (Appendix P of the SREIS) for MNES identified as having a likelihood of occurrence of moderate and above. Arrow have developed pre-clearance survey protocols that will identify occurrence of ground truthed values and assess their potential impacts. The SREIS provides detail on the field management protocols to be employed for ecological pre-clearance surveys, and the mechanism and methodology whereby constraints mapping will trigger the requirement for pre-clearance surveys and other avoidance or mitigation protocols as outlined by the: • Fauna Survey Guideline (99-H-GDL-0061); and

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				• Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); These documents are provided in Appendix B of the supplementary Terrestrial Ecology Technical Report (Appendix I) of the SREIS. The process for undertaking these surveys is also outlined in the Terrestrial Ecology Chapter (Section 11) of the EIS.
S4	110	Please ensure that a cumulative impact assessment is provided for each species dossier. The cumulative impact assessment should summarise relevant aspects of Appendix P (e.g. 'the cumulative impact is assessed to be low/high because…') and also include a quantitative estimate of cumulative impacts where possible.	Terrestrial Ecology Technical Report (Appendix P) of the EIS MNES Report (Appendix J) of the SREIS	The MNES report (Appendix J) of the SREIS has been updated to include a specific discussion of cumulative impacts to relevant species within individual species profiles and (Section 9) and impact assessment and mitigation measures (Section 10), where an analysis of potential cumulative impacts is applicable.
S4	111	Please note that offsets under the EPBC Act must comply with the Environment Protection and Biodiversity Conservation Act Environmental Offsets Policy and Offset Assessment Guide (e.g. at least a 90% direct offset where the offset is tailored specifically to the attribute of the matter that is impacted).	Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS	The Project must satisfy the environmental offsets policy requirements of the Queensland and Australian governments, as it triggered assessment under both jurisdictions. The Bowen Gas Project Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS describes the legislative framework for the delivery of offsets for the project in accordance with legislative requirements. Arrow will work with any changes to offset policies as required, and where appropriate by transitional arrangements. In particular, the Queensland government has identified opportunities to improve its current policy and is looking to address this through policy change.

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S4	112	DSEWPaC acknowledges that advanced offsets will be considered, and is supportive of this approach.	Terrestrial Ecology chapter (Section 17) and Draft Environmental Offsets Strategy (Appendix DD) of the EIS. Environmental Offsets Strategic Management Plan (Appendix P) and MNES Report (Appendix J) of the SREIS	Noted. A staged approach to the provision of offsets that accounts for actual losses is an appropriate method of managing unavoidable losses and to incentivise avoidance to protect the identified environmental values. The following stages for the provision of offsets include: Assess - determine the estimated area of disturbance using conceptual field development plans and detailed GIS analysis of mapped biodiversity values; Demonstrate - avoidance of biodiversity values through review of estimated disturbance areas against the actual disturbance which will be undertaken; and Acquit - provision of offsets. As part of the staged approach, estimated impacts are reconciled against actual impacts and the balance accrued against the values actually offset. The staged approach is outlined further within the Bowen Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS.
S4	113	Please note that the Terms of Reference require the assessment documentation to include an offset strategy. Information around offsets that is required in the SREIS includes, but is not limited to: 1. the species for which offsets are being provided, and detail of the species impacted and the extent of impact; 2. area in hectares of required land to offset proposed impact; 3. management measures proposed to be undertaken in offset areas; and 4. timing for securing offset areas.	Draft Environmental Offsets Strategy (Appendix DD) of the EIS. MNES Report (Appendix J) and Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS	An offsets strategy was presented in the Draft Environmental Offsets Strategy (Appendix DD) of the EIS, which outlined the process for the development of biodiversity offsets for the Project. Subsequent to this, a significantly more detailed offsets report has been developed to meet the objectives of the ToR, as outlined in the Bowen Gas Project Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS. This plan incorporates estimated maximum potential impact calculations for environmental values including potential impacts to MNES, EVNT and State-Significant Biodiversity Values for the life of the Project.

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				The Environmental Offsets Strategic Management Plan also describes planned measures to avoid and minimise impacts, the expected extent of disturbance to terrestrial environmental values, and evidence that there are opportunities to offset the estimated losses of remnant vegetation, species and habitat. The plan also outlines Arrow's preferred approach for providing environmental offsets in a staged approach in accordance with the Project's framework approach of impact assessment. The approach that accounts for actual losses is an appropriate method of managing unavoidable losses and to incentivise avoidance to protect the identified environmental values. The following stages for the provision of offsets include: Assess - determine the estimated area of disturbance using conceptual field development plans and detailed GIS analysis of mapped biodiversity values; Demonstrate - avoidance of biodiversity values through review of estimated disturbance areas against the actual disturbance which will be undertaken; and Acquit - provision of offsets. As part of the staged approach, estimated impacts are reconciled against actual impacts and the balance accrued against the values actually offset. The staged approach is outlined further within the Bowen Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS.
S4	114	It is DSEWPaC's preference for offsets to be determined prior to any project approval. Therefore, we recommend providing the following information in the SREIS where possible:	Draft Environmental Offsets Strategy (Appendix DD) of the EIS.	The Bowen Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS sets out Arrow's environmental offsets obligations for the Project. Potential impacts to MNES, EVNT and State-Significant

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		g) the location and size, in hectares, of any offset site(s); h) maps clearly showing for each offset site: i. the relevant ecological features; ii. the landscape context; and iii. the cadastre boundary. i) the current tenure arrangements (including zoning and ownership) of any proposed offset sites; j) confirmed records of presence (or otherwise) of relevant protected matter(s) on the offset site(s); k) detailed information regarding the presence and quality of habitat for relevant protected matter(s) on the offset site. The quality of habitat should be assessed in a manner consistent with the approach outlined in the document titled How to use the offset assessment guide available at: http://www.environment.gov.au/epbc/publications/environmental-offsets-policy.html; l) information and justification regarding how the offsets package will deliver a conservation outcome that will maintain or improve the viability of the protected matter(s) consistent with the EPBC Act environmental offsets policy; including: i. management actions that will be undertaken that improve or maintain the quality of the proposed offset site(s) for the relevant protected matter(s). Management actions must be clearly described, planned and resourced as to justify any proposed improvements in quality for the protected matter(s) over time; ii. the time over which management actions will	MNES Report (Appendix J) and Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS	Biodiversity Values are outlined within the report and the total expected maximum impact for the life of the Project is identified for these values. Arrow has developed the staged approach for the provision of offsets to account for actual losses, in line with the timing of the project, and the framework approach of impact assessment outlined in the ToR for the EIS. This stage approach is also designed to incentivise avoidance to protect the identified environmental values. The following stages for the provision of offsets include: Assess - determine the estimated area of disturbance using conceptual field development plans and detailed GIS analysis of mapped biodiversity values; Demonstrate - avoidance of biodiversity values through review of estimated disturbance areas against the actual disturbance which will be undertaken; and Acquit - provision of offsets. As part of the staged approach, estimated impacts are reconciled against actual impacts and the balance accrued against the values actually offset. In accordance with the Environmental Offsets Strategic Management Plan, a future site specific offset plan will be developed outlining the proposed methodologies, management measures, locations, and legal mechanisms for the provision of offsets for the Project under the relevant legislation,

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		deliver any proposed improvement or maintenance of habitat quality for the relevant protected matter(s); and iii. the risk of damage, degradation or destruction to any proposed offset site(s) in the absence of any formal protection and/or management over a foreseeable time period (20 years). m) the legal mechanism(s) that are proposed to protect offset site(s) into the future and avert any risk of damage, degradation or destruction; n) how the proposed offsets package is additional to what is already required, as determined by law or planning regulations, agreed to under other schemes or programs or required under an existing duty-of-care; o) The overall cost of the proposed offsets package.		