

22

EHP SUBMISSION RESPONSES

[ENTER HERE](#) 

[BACK TO CONTENTS](#) 



SUPPLEMENTARY REPORT TO THE EIS

Section 22 Department of Environment and Heritage Protection Submission Responses

22 Department of Environment and Heritage Protection Submission Responses

This section provides Arrow's response to the submission by the Queensland Department of Environment and Heritage Protection (EHP) on the Project EIS.

Arrow's response is presented in Table 22-1.

Section 22 Department of Environment and Heritage Protection Submission Responses

Table 22-1 Response to EHP Submissions

Issue Number	Submission / Issue	Reference	Response
168	<p>Page 10 of the ES states that, “If the Project is deemed to have significantly changed from the EIS stage to the EA stage, that is, the environmental risks of the activity and/or the way the activity will be carried out have changed, then under the EP Act an application for an EA will be published and public comment invited.” It is understood that there will be substantially more details available for assessment at the EA application stage and that public notification will be required.</p> <p>The SREIS should amend this section to reflect the certainty that public notification will be required based on the additional information that will need to form part of any future EA applications.</p>	Project Approvals chapter (Section 2) of the SREIS	<p>The SREIS expands on the current detail already provided in the EIS and ToR.</p> <p>In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the ToR requirements, more information regarding infrastructure locations and Project activities will be presented at the EA application and EA amendment stages of the approvals process.</p> <p>In accordance with the ToR for the Project, the public notification requirements through each stage of the assessment process provide the opportunity for stakeholders to comment on information provided by the proponent and to be involved in the approvals application process.</p> <p>Arrow will publically notify EA applications in accordance with the current statutory obligations at the time the required approval is sought.</p>
169	<p>No illustrations have been provided of key infrastructure. There are descriptions of key elements such as gas well pads and gas processing facilities however illustrations of those key elements are not included in this section. To assist in understanding what infrastructure is planned, this section should reference where illustrations of 'reference case' infrastructure and conceptual designs are located.</p> <p>Update and augment Figure 1.1 and 1.3 for the SREIS with relevant information concerning major infrastructure.</p>	Project Description chapter (Section 3) of the SREIS.	The updated SREIS Project Description chapter (Section 3) provides schematics of key infrastructure, figures of indicative drainage area locations, well pad layouts and cross-sections, and process flow diagrams.
170	A new section should be introduced into the SREIS to describe the changes that have occurred with the EP Act since the release of the EIS to the public (e.g. the changes that have resulted from	Project Approvals chapter (Section 2) of the SREIS	A revised Project Approvals chapter (Section 2) detailing the recent changes resulting from the Greentape Reduction Act has been developed for inclusion into the SREIS.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	the commencement of the greentape reduction legislation). There are numerous parts of the EIS that should be rewritten to reflect those changes, e.g., reference to environmental management plans forming part of a future EA application. However, a description of the changes and their implications for the project would suffice.		Please refer to the Project Approvals chapter (Section 2) of the SREIS for the revised approvals applicable to the Project.
171	<p>Descriptions of the likely activities that will form the construction phase of the BGP are provided. However, no details are provided for the likely sites for the major infrastructure. The proponent has committed to providing location information for major infrastructure as part of an SREIS.</p> <p>Provide location information for major infrastructure relating to the construction phase in the SREIS. Provide site-specific details about how environmental impacts at each major construction site will be avoided / minimised / mitigated.</p>	Project Description chapter (Section 3.2) of the SREIS.	<p>The updated SREIS Project Description chapter (Section 3) presents indicative locations of Project infrastructure.</p> <p>The revised SREIS Project Description chapter (Section 3.2) details the changes to the development plan and sequencing of the Project. This outlines the Project development phasing and a description, and likely general locality of major infrastructure.</p> <p>Management and mitigation measures for potentially impacted environmental values have been detailed in the EIS. The SREIS elaborates on the specific field management protocols, site scouting and survey methodologies.</p> <p>Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.</p>
172	<p>Adequate descriptions of the likely activities that will form the operations phase of the BGP are provided. However, no details are provided for the likely sites for the major infrastructure. Where the proponent has committed to providing location information for major infrastructure as part of an SREIS, this information should be provided.</p> <p>Provide location information for major infrastructure relating to the operation phase as part of the SREIS. Provide site-specific details about how environmental impacts at each major construction site will be avoided / minimised / mitigated.</p>	Project Description chapter (Section 3.2), Terrestrial Ecology chapter (Section 11), and Appendix B of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.	<p>The updated SREIS Project Description chapter (Section 3) presents indicative locations of Project infrastructure.</p> <p>The revised SREIS Project Description chapter (Section 3.2) details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and general locality of major infrastructure.</p> <p>Management and mitigation measures for potentially impacted environmental values have been detailed in the EIS. The SREIS elaborates on the specific field management protocols, site scouting and survey methodologies to be implemented in the field</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>prior to construction.</p> <p>Pre-clearance surveys will be undertaken in areas of proposed disturbance in areas identified by constraints mapping as having potential impact to MNES.</p> <p>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:</p> <ul style="list-style-type: none"> • Fauna Survey Guideline (99-H-GDL-0061); and • Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); <p>These documents are Provided in Appendix B of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p> <p>The process for undertaking these surveys is also outlined in the Terrestrial Ecology chapter (Section 11) of the EIS.</p> <p>Site specific EM Plans will also be prepared for associated EA applications, where relevant, to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.</p>
173	<p>Descriptions of the infrastructure requirements for the BGP are provided for the current stage of project planning however the lack of specificity and location details is inadequate for the range of project approvals that may be required.</p> <p>It is expected that further impact and management details will be provided in the SREIS and subsequently in EA applications made for the project and for public comment.</p>	<p>Project Description chapter (Section 3.2), Terrestrial Ecology chapter (Section 11), and Appendix B of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p>	<p>The updated SREIS Project Description chapter (Section 3) presents indicative locations of Project infrastructure.</p> <p>The revised SREIS Project Description chapter (Section 3.2) details the changes to the development plan and sequencing of the Project. This outlines the project development phasing, and the description and likely general locality of major infrastructure.</p> <p>Management prescriptions for potentially impacted environmental values have been detailed in the EIS.</p> <p>The SREIS elaborates on the specific field management protocols,</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>site scouting and survey methodologies to be implemented in the field prior to construction.</p> <p>Pre-clearance surveys will be undertaken in areas of proposed disturbance in areas identified by constraints mapping as having potential impact to MNES.</p> <p>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:</p> <ul style="list-style-type: none"> • Fauna Survey Guideline (99-H-GDL-0061); and • Ecological Survey Guideline (99-H-GDL-00091); and • Ecological Impact Assessment Procedure (99-H-PR-0081); <p>These documents are Provided in Appendix B of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p> <p>The process for undertaking these surveys is also outlined in the Terrestrial Ecology chapter (Section 11) of the EIS.</p> <p>Site specific EM Plans will also be prepared for associated EA applications, where relevant, to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations. Further information and management details will be provided in the EA applications made for the Project and will be available for public comment, if required.</p>
174	<p>Several references are made to the Environmental Protection (Waste Management) Policy (EPP) however this document policy no longer exists since the commencement of the <i>Waste Reduction and Recycling Act 2011</i>.</p> <p>Remove reference to the EPP (Waste Management) for the</p>	<p>Waste Management chapter (Section 28) of the EIS</p>	<p>The EIS Waste Management chapter (Section 28.1.2) states: "<i>Waste Reduction and Recycling Act 2011</i> (Qld) repeals the Environmental Protection (Waste Management) Policy 2000 (Qld) and amends the EP Act and Regulation and encourages the proper use of resources by improving ways of reducing and dealing with waste, including allowing for introduction of a price signalling</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	SREIS and detail current waste management requirements.		approach, i.e. waste levy".
175	Section 28.4 (Waste Management Measures) discusses the inputs and outputs (wastes) expected during construction, operation and decommissioning under un-numbered subheadings before a table of expected waste generation and management options over the life of the project (Table 28-2 pg28-15). The paragraph prior to the table appears to be an introduction to the table however it currently sits under the sub-heading "Decommissioning and Rehabilitation". The paragraph commencing "Typical waste stream and projected quantities of waste to be generated by the Project are shown in Table 28-2" and the following Table 28-2 should be clearly identified by a numbered heading that is searchable from the table of contents in order to allow ease of access to the critical information.	Waste Management chapter (Section 16.3) of the SREIS	The table of 'Estimated Waste Generated and Proposed Management Strategies' has been referenced as Table16-2 in the Waste Management chapter (Section 16.3) of the SREIS, and will now be identified in the table of contents.
176	An estimate for the amount of (solid) salt waste expected to be produced per ML of treated water has been provided. Management options in order of preference have been described on a hypothetical basis; with the statement that commercialisation of salt products will continue to be investigated as the project progresses. It is difficult to determine the likelihood of that a commercial use for the salt waste will be forthcoming.	Project Description chapter (Sections 3 and 3.5.5.2) of the SREIS	Arrow has assessed the feasibility of beneficial use of salt generated from the Project in accordance with the hierarchy for the management of brine and salt set out by the EHP Coal Seam Gas Water Management Policy (2012) and Arrow's Corporate CSG Water and Salt Management Strategy. Due to the relatively low volumes of CSG water and therefore salt produced by the Project, beneficial use is currently deemed not to be economically viable and has been ruled out of the Project design at this time. In accordance with the EHP Coal Seam Gas Water Management Policy (2012), having assessed that beneficial use is not viable; Arrow will dispose of the residual salt concentrate to a suitably licensed landfill. This will be done in accordance with regulatory standards that provide for management and mitigation of potential environmental impacts. Disposal of the waste salt concentrate to landfill is not expected to commence until approximately 30 years after commencing water production. Arrow expect a third party landfill operator will take

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			advantage of the commercial opportunity to develop and operate a suitable regulated waste facility local to the Arrow WTFs
177 to 180	<p>Appendix AA constitutes a Coal Seam Gas Water and Salt Management Strategy, which is stated to be the overarching strategy applicable to all of the proponent's production areas within Queensland (i.e., Bowen and Surat Basins), as well as its Exploration and Appraisal activities. The EP Act requires that CSG Water Management Plans are site-specific and contain management measures specific to each projects' needs. Whilst the Coal Seam Gas Water and Salt Management Strategy contains overarching and general comments, more site-specific details will be required to form part of any future EA application. Currently, the Coal Seam Gas Water and Salt Management Strategy does not meet all of the legislative requirements for EAs relating to site-specific CSG activities as outlined in s126 of the EP Act. Additional details on the following matters should be provided as part of the SEIS:</p> <ul style="list-style-type: none"> • expected water quality changes during the undertaking of different water management activities • expected holding times for untreated and treated CSG water in the various water storage infrastructure required within the development areas • measurable criteria (management criteria) to be developed to determine the success and effectiveness of the CSG water management measures • actions to be taken if the management criteria are not met. <p>Ensure that the SEIS and all future EA applications address all of the legislative requirements relevant to the management of CSG water as described above, and that the details provided are site and project specific, and based on sampling of water quality</p>	CSG Water and Salt Management Strategy (Appendix D), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	<p>The SREIS contains a supplementary Surface Water Technical Report (Appendix F) and revised version of the CSG Water and Salt Management Strategy (Appendix D) outlining water disposal options and associated mitigation measures.</p> <p>The supplementary Surface Water Technical Report (Appendix F) of the SREIS includes the identification of two areas for potential WTFs, and also identifies reaches of the Isaac River that would be associated with the discharge of treated (or in certain instances untreated) CSG water from the potential WTF locations.</p> <p>The outcomes from characterisation of the baseline condition of the Isaac River presented in the supplementary Surface Water Technical Report (Appendix F) of the SREIS, allows Arrow to manage the possible controlled releases of treated or untreated CSG water without causing significant impacts to the receiving waterway.</p> <p>In addition, the supplementary Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS has examined the existing hydrological, hydraulic and geomorphic conditions of the potential receiving environment in order to ascertain the assimilative capacity of the Isaac River to receive possible CSG water discharges.</p> <p>CSG water discharges that may be required will be conditioned by a relevant EA, which may mean that more site-specific assessment of the water quality and stream flows at confirmed locations of potential CSG discharge points may need to be undertaken as part of the EA application process in the future. The discharge rates, timing, frequency and duration of CSG water releases that will be considered as part of the EA application process will address a number of variables including stream flows, stream water quality</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	undertaken within the Bowen Basin region.		and CSG water quality. As an overarching objective, discharge of treated or untreated CSG water is considered appropriate only where disposal to receiving waterways will not significantly impact the environmental values of the aquatic environment, in line with legislative requirement. Arrow seeks to ensure that all legislative requirements with regards to CSG water management are met.
181	<p>The Coal Seam Gas Water and Salt Management Strategy (Appendix AA) describes the need for temporary water storage dams to be located in remote areas on the basis that it would not be economically viable to connect such dams to any other gathering and treatment facilities due to the remoteness of the gas exploration activities. No details are provided as to the expected number of such dams, the holding times for water in those dams, the evaporative losses expected and the principles that have been used to estimate evaporative losses and other design criteria.</p> <p>The SEIS should contain more detailed information to demonstrate why the connection of remote water storage dams to the larger water gathering network is not feasible. Details should include estimates as to how long water is proposed to be stored in such dams, details to demonstrate the extent of evaporative losses that are likely to occur over the timeframe for the storage, and how the dam size and number of dams will be minimised.</p>	CSG Water and Salt Management Strategy (Appendix D) of the SREIS	Exploration activities are not part of the scope of the EIS. However, they are subject of Arrow's current environmental authorities and will be further considered in future EA applications that are relevant to exploration activities.
182	The EIS lacks detail on how groundwater aquifers will be isolated during well decommissioning activities. Section 29.6.3.1 states the outcomes for decommissioning CSG wells and the general strategies for achieving those outcomes, however further details should be provided to address how the outcome of achieving isolation of groundwater aquifers will be achieved.	Decommissioning and Rehabilitation chapter (Section 29) of the EIS	<p>The Decommissioning and Rehabilitation chapter (Section 29) of the EIS acknowledged the code of practice for constructing and abandoning coal seam gas wells in Queensland (DNRM, 2013a). Arrow has committed to fulfilling the requirements in this code of practice, as reflected in commitment B249.</p> <p>Since the release of the EIS, the second edition of the code of practice was released in November 2013 (DNRM, 2013a). Section 6.9 of the code outlines the decommissioning requirements</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>for coal seam gas wells, and also makes reference to the relevant legislative requirements. As detailed in the revised code of practice, and in the Decommissioning and Rehabilitation chapter (Section 29.6.3.1) of the EIS, groundwater aquifers are generally isolated by plugging the well with cement slurry. The mandatory decommissioning requirements rely on appropriate cementing techniques, which are detailed in Section 6.3 of the code.</p> <p>Specific decommissioning requirements will differ depending on the well type (whether an exploration and appraisal bore hole, a monitoring bore or a production well) and the stratigraphic profile intersected (e.g., depths to the coal seam gas production zone and water production rates). Mandatory pressure testing and cementing requirements ensure that migration pathways are prevented and key stratigraphic zones are isolated.</p> <p>Arrow is committed to meeting the requirements in the revised code of practice, as detailed in commitment B249.</p>
183	<p>Revegetation actions have been repeated in the decommissioning strategy. Section 29.6.2 subheading CSG Water Storage Dams and Clean Water Dams, the rehabilitation and decommissioning section (EIS s29) are presented as separate strategies (decommissioning s29.6 and rehabilitation s29.7). There is some repetition of rehabilitation actions included under both strategies. Rehabilitation activities are discussed under some subheadings in s29.6 (decommissioning strategy) but not others. Reference to revegetation should be removed from s29.6 to maintain clarity and consistency.</p> <p>In the SREIS, section 29.6.2 subheading CSG Water Storage Dams and Clean Water Dams should be amended to remove rehabilitation actions as shown below:</p> <p><i>...if an alternative use cannot be identified, the decommissioning and removal will include:</i></p>	Decommissioning and Rehabilitation chapter (Section 29.6.2) of the EIS	<p>Noted.</p> <p>The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<ul style="list-style-type: none"> • <i>Draining the water from the dam, and removal of any wildlife to a suitable location;</i> • <i>Sampling and analytical testing of the sediment within the dam, and appropriate treatment or disposal of the sediment based on the analytical results;</i> • <i>Removal of the liner, leak detection system including any piezometers and disposal at a suitable approved location; <u>and</u></i> • <i>Backfilling of the dam and reshaping to a landform similar to that of the surrounding undisturbed areas;</i> • <i>If required topsoiling and/or amelioration the disturbed area; and</i> • <i>Revegetating with species that are commensurate with the surrounding vegetation and previous land use.</i> 		
184	<p>Section 29.6.3.1 Production Wells should be amended to remove rehabilitation actions as shown below: <i>...The general strategy for decommissioning of an exhausted well site includes:</i></p> <ul style="list-style-type: none"> • <i>Re-clearing of vegetation and removal of imported gravel in the vicinity of the well head;</i> • <i>Removing the well head and associated infrastructure;</i> • <i>Plugging the well with cement slurry;</i> • <i>Cutting the upper pipe casing to a minimum depth of 1.5 m below the surface;</i> • <i>Backfilling the hole with material suitable for revegetation;</i> • <i>Recreating the original ground surface levels while allowing for any subsidence;</i> • <i>Re-establishing drainage lines with appropriate surface erosion controls in place;</i> 	Decommissioning and Rehabilitation chapter (Section 29.6.3.1) of the EIS.	Noted. The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<ul style="list-style-type: none"> • Re-establishing vegetation species commensurate with the surrounding land use, by ripping / scarifying soil, re-spreading of topsoil, application of soil ameliorants / fertilizers and seeding operations; • Placing an identification marker over the top of the well; • Removing any waste products from the site; • Registering the abandoned well site with the Department of Sustainability, Development, Infrastructure and Planning (Petroleum & Gas Inspectorate);and • Monitoring of rehabilitation for plant recruitment / germination / growth, erosion and weeds until criteria are met and relinquishment can be achieved; • Maintaining a complete and accurate record of the abandonment procedure; and • Removal from the rehabilitation register once successful rehabilitation has been demonstrated through compliance with the rehabilitation criteria. 		
185	<p>Section 29.6.4.2 Pipelines subheading Rehabilitation should be amended to remove revegetation actions as shown below:</p> <p><u>Rehabilitation Reshaping</u></p> <p><i>After removal of all infrastructure developed for the pipeline, the disturbance area will be reshaped and trimmed to make a landform that is consistent with the surrounding topography and ripped to reduce compaction. Embankments in the area will be graded to a maximum of 10 degrees. The regrading will be done in a way that enables the free drainage of surface runoff from the site. Surface water management structures (contour banks and drains) will also be constructed to minimise the risk of erosion from water leaving the landform. Topsoil will be spread over the disturbance area, lightly tilled to provide a seed bed prior to</i></p>	Decommissioning and Rehabilitation chapter (Section 29.6.4.2) of the EIS	<p>Noted.</p> <p>The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	revegetation.		
186	<p>Unnecessary disposal of uncontaminated material during decommissioning of access tracks and roads. Sections 29.6.4.1 Roads and Tracks and 29.6.5 subheading Light Vehicle Tracks requires the scalping and removal of soil to 0.3m below the surface during decommissioning activities on access roads and tracks, car parks and hardstand areas. If this material is not contaminated, scalping is unnecessary and will require additional follow on actions including reshaping and disposal of scalped material. Uncontaminated soil in access roads and tracks, car parks and hardstand areas should be ripped to loosen compaction rather than removed and disposed.</p> <p>In the SREIS, sections 29.6.4.1 Roads and Tracks and 29.6.5 subheading Light Vehicle Tracks should be amended to remove the automatic requirement for uncontaminated material to be scalped as shown below:</p> <p>Access roads and tracks that are not required by landowners, car parks and hardstand areas (e.g. workshop, administration areas, etc.) <u>that do not contain contaminated or unsuitable material (e.g. gravel) will be ripped to loosen compaction. will be scalped to approximately 0.3 m below the surface to remove stabilised and compacted material. The inert waste will be recycled or disposed of in a suitable location (i.e. a quarry or an approved landfill off-site as appropriate).</u></p>	Decommissioning and Rehabilitation chapter (Section 29.6.4.1) of the EIS	<p>Noted.</p> <p>The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.</p>
187	<p>Incorrect count of rehabilitation domains. In Section 29.6.5 Domain 4: Other Lands, the reference to the other domains is an incorrect count and creates confusion.</p> <p>In the SREIS, Section 29.6.5 Domain 4: Other Lands should be amended to correct the number of other rehabilitation domains as shown below:</p>	Decommissioning and Rehabilitation chapter (Section 29.6.4.1) of the EIS	<p>Noted.</p> <p>The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	The other lands domain consists of all land within the Arrow CSG production acreage that is not captured in the other eight <u>three</u> domains.		
188	Repeat of rehabilitation action. Section 29.7.5 subheading Topsoil stripping and handling repeats actions from the first dot point in the last dot point and should be removed to reduce confusion. In the SREIS, section 29.7.5 subheading Topsoil stripping and handling should be amended to remove the last dot point as it is a repeat of the first dot point.	Decommissioning and Rehabilitation chapter (Section 29.7.4) of the EIS	Noted. The EIS has been published and the Decommissioning and Rehabilitation chapter (Section 29) of the EIS will not be reproduced in Part A of this SREIS.
189	In assessing the cumulative impact of the BGP, the EIS only considers residual impacts on the basis that all other impacts would be of a temporary nature and/or mitigated effectively. The EIS includes an assessment of other state significant projects, projects that are directly associated with other CSG projects in the Bowen Basin, and other projects that may utilise the same resources located within the region (e.g. groundwater). The assessment was undertaken for those projects that have publicly available information about the respective expected environmental impacts. Provide details to describe how additional monitoring data obtained for the BGP and any other projects will be used to inform and continuously update the assessment of the project's cumulative impacts. For instance, as baseline bore water quality data is obtained, the assessment of cumulative impacts to groundwater should be refined. This additional information should form part of the EA applications to follow the completion of the EIS process.		Arrow will implement continuous monitoring programs in line with the EA requirements, and the monitoring requirements of the relevant UWIR for the region. Arrow recognise that, if considered necessary, that it is the responsibility of the State Government to develop and manage regional groundwater impact models and Arrow would be happy to provide data if requested.
190	Wetlands and likely impacts on wetlands have not been adequately addressed in the EIS. Section 4.5.1.1 of the Terms of Reference states that a description should be given of the surface	Environmentally Sensitive Areas chapter (Sections 18.4.2 and	The Aquatic Ecology chapter (Section 10.5.2) and the supplementary Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS present an updated desktop assessment

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>watercourses, overland flow, and palustrine and lacustrine wetlands. Also, that an assessment is required of existing water quality in surface waters and wetlands likely to be affected by the project.</p> <p>The SREIS should be revised and updated to include site specific information on wetlands. EHP can provide information on wetlands. The SREIS should discuss potential impacts and their management.</p>	<p>18.4.3), Aquatic Ecology Technical Report (Appendix O, Section 4.2.2), and Constraints Mapping Report (Appendix BB) of the EIS</p> <p>Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Sections 4.2 and 5.1) of the SREIS.</p>	<p>of wetlands within the Project area including:</p> <ul style="list-style-type: none"> • Palustrine and lacustrine wetlands within the Project area; • Conservation significant wetlands including those listed under the Ramsar Convention or the Directory of Important Wetlands in Australia; • Referable wetlands including mapped great barrier reef (GBR) protection areas and wetlands of high ecological significance; and • Wetlands mapped as supporting very high or high ecological values as per the aquatic conservation assessments (ACAs) for the Fitzroy and Burdekin catchments <p>Wetlands within the Project area are mapped within the Aquatic Ecology chapter (Section 10, Figure 10-2) and the supplementary Aquatic Ecology Technical Report (Appendix H, Figure 4-1) of the SREIS. These figures also depict wetlands in relation to Arrow's gas drainage areas.</p> <p>Given the size of the Project area and number of wetlands, site specific surveys of wetlands are not a practical undertaking during the SREIS. However, site specific field surveys will be undertaken as part of preclearance surveys. Palustrine and lacustrine wetlands of high or very high ecological value have also included within Arrow's risk based constraints mapping with constraints buffers allocated to these areas in accordance with the relevant legislative requirements.</p>
191	This section does not identify State Planning Policy 4/11 Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments	Project Approvals chapter (Section 2) of the SREIS	An assessment of the Project, as it stands for the SREIS, against the outcomes of SPP4/11 is included in the Project Approvals chapter (Section 2) of the SREIS.
192	EIS section 3.2 Desktop Study page 11 - The methodology used in the Aquatic Ecology Technical Report does not adequately address palustrine or lacustrine wetlands and does not use	Aquatic Ecology Technical Report (Appendix O, Section	The Aquatic Ecology chapter (Section 10) and supplementary Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS presents an updated description of wetlands within the

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>appropriate methods to identify those within the project area. The desktop study is not sufficient to address the requirements of the Terms of Reference in regards to wetlands.</p> <p>The SREIS should expand on the desktop study in relation to wetlands impacts and management.</p>	<p>4.2.2) of the EIS Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Sections 4.2 and 5.1) of the SREIS.</p>	<p>Project area including:</p> <ul style="list-style-type: none"> • Palustrine and lacustrine wetlands within the Project area; • Conservation significant wetlands including those listed under the Ramsar Convention or the Directory of Important Wetlands in Australia; • Referable wetlands including mapped GBR protection areas and wetlands of high ecological significance; and • Wetlands mapped as supporting very high or high ecological values as per the ACAs for the Fitzroy and Burdekin catchments. <p>The updated Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS meets the Terms of Reference requirements through the following inclusions:</p> <ul style="list-style-type: none"> • Detailed desktop assessment of wetlands within Project area; • Mapped location of wetlands within the Project area in relation to Project development phases (see Aquatic Ecology chapter (Section 10, Figure 10-2) of the SREIS); • Assessment of potential impacts on wetlands; and • Provision of management measures to reduce the potential for impacts on wetlands such as inclusion within Arrow's risk based framework and associated constraints mapping (see the Aquatic Ecology chapter (Section 10.7.2) of the SREIS).
193	<p>While EPBC listed wetlands and HES wetlands should be a focus however the terms of reference requests consideration of all wetlands that may be impacted by the project.</p> <p>It is acknowledged that the project area is large and it is not practical at this stage of the process to have a detailed site survey of each wetland. The SREIS should however describe the</p>	<p>Aquatic Ecology Technical Report (Appendix O, Section 4.2.2) of the EIS</p> <p>Aquatic Ecology</p>	<p>The Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS presents an updated description of wetlands within Project, including:</p> <ul style="list-style-type: none"> • Palustrine and lacustrine wetlands within the Project area; • Conservation significant wetlands including those listed under the Ramsar Convention or the Directory of Important Wetlands

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>wetlands located in the project area and use available sources to identify wetlands of high ecological significance. A desktop study can assist and the following publically available data sets enable a basic desktop study to be completed (see the EHP web site in the first instance).</p> <ul style="list-style-type: none"> • Queensland Wetland Mapping v3 • Map of referable wetlands • Wetlandinfo – a comprehensive source of information and mapping. <p>For example, these records show that there are 442 lacustrine and palustrine wetlands identified by the Queensland Wetland Mapping v3 within the project area. Of these 38 are identified as being wetland protection areas for the purpose of State Planning Policy 4/11 Protecting Wetlands of High Ecological Significance in Great Barrier Reef Catchments. These 38 wetlands have been identified by AquaBAMM (previous version) as being of high or very high ecological significance."</p>	<p>chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Sections 4.2 and 5.1) of the SREIS.</p>	<p>in Australia;</p> <ul style="list-style-type: none"> • Referable wetlands including mapped GBR protection areas and wetlands of high ecological significance; and • Wetlands mapped as supporting very high or high ecological values as per the ACAs for the Fitzroy and Burdekin catchments. <p>Wetlands identified in the desktop review were then mapped and assessed against Arrow's development phases (see the Aquatic Ecology chapter (Section 10, Figure 10-2) of the SREIS).</p> <p>Mitigation measures for these wetlands are identified in the Aquatic Ecology chapter (Section 10.7.2) of the SREIS, including management measures to reduce the potential for impacts on wetlands such as inclusion within Arrow's risk based framework and associated constraints mapping (Appendix BB of the EIS)</p>
194	<p>The EIS states 'No wetlands were listed as significant under the EPBC Act or were identified in aquatic conservation assessments. This statement is not correct as AquaBAMM v3.1 is based on the Qld wetland mapping the same number of lacustrine and palustrine wetlands occur within the project area. There are 14 wetlands scored very high; 38 wetlands scored high; 292 scored medium; 2 scored low and 96 scored very low.</p> <p>The SREIS should correct this statement and appropriate consideration should be given to wetlands as required by the Terms of Reference. This will include an adequate study to identify existing wetlands and potential impacts from the project. Wetlands identified as being of high ecological significance should be incorporated in the constraints mapping or evidence should be</p>	<p>Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Sections 4.2 and 5.1) of the SREIS.</p>	<p>The Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS presents an updated description of wetlands within Project, including:</p> <ul style="list-style-type: none"> • Palustrine and lacustrine wetlands within the Project area; • Conservation significant wetlands including those listed under the Ramsar Convention or the Directory of Important Wetlands in Australia; • Referable wetlands including mapped GBR protection areas and wetlands of high ecological significance; and • Wetlands mapped as supporting very high or high ecological values as per the ACAs for the Fitzroy and Burdekin catchments

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	provided that the wetlands are not of high ecological significance.		<p>The updated Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4.2) of the SREIS meets the Terms of Reference requirements through the following inclusions:</p> <ul style="list-style-type: none"> • Detailed desktop assessment of wetlands within the Project area; • Mapped location of wetlands within the Project area in relation to Project development phases (see Aquatic Ecology chapter (Section 10, Figure 10-2) of the SREIS); • Assessment of potential impacts on wetlands; and • Provision of management measures to reduce the potential for impacts on wetlands such as inclusion within Arrow's risk based framework and associated constraints mapping (see the Aquatic Ecology chapter (Section 10.7.2) of the SREIS).
195	<p>No section of the EIS adequately address the identification or assessment of potential project impacts on (GDE). GDE may be of a range of typologies including riverine, lacustrine and palustrine. Given the significant potential for groundwater impacts from the project it is important that a detailed understanding of GDE is developed before the EIS process can be finalised.</p> <p>While the project area is large, the identification of GDEs is desirable at the EIS stage. For EA applications, the 'Walking the landscape - A whole-of-system framework for understanding and mapping environmental processes and values'. method is recommended for surveying the GDE affected by this project. It is available at http://wetlandinfo.derm.qld.gov.au/wetlands/index.html</p>	<p>Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS</p> <p>Groundwater chapter (Section 7) and Groundwater Technical Report (Appendix E) of the SREIS</p>	<p>Groundwater dependent ecosystems are discussed and an assessment of the relevance of potential impacts on GDEs is presented in the Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS.</p> <p>In addition, further work has been undertaken in the SREIS (see the Groundwater chapter (Section 7) and the Groundwater Technical Report (Appendix E)) to assess likelihood of any potential impacts to GDEs within a 50 km buffer of the Project area.</p>
196	<p><u>Offsets:</u></p> <p>Accuracy of the existing regional ecosystem mapping. The proponent states that 224 or 35% of the 632 floristic survey sites</p>	Terrestrial Ecology Technical Report (Appendix I, Section	Updated habitat mapping for EVNT species has been undertaken for the Project area, including analysis of LiDAR Data to increase confidence in habitat mapping factors (including REs). Further

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>established within the Project area, correspond with mapped REs in the certified data. It is not clear in the EIS what the implications are for the project.</p> <p>The SREIS should commit to providing revised regional ecosystem mapping for impact areas and the required evidence as outlined in the Queensland Herbarium Regional Ecosystem Assessment Kit methodology. Site specific information will be required by the time of the EA application.</p>	s4.1.1.2 and 4.1.1.3) of the SREIS	<p>information on updated habitat mapping is provided in Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p> <p>The SREIS outlines the field management protocols and survey methodology to undertake detailed RE mapping confirmation. Further information outlining field development planning and preclearance surveys and refinement of vegetation mapping is provided in the Terrestrial Ecology Technical Report (Appendix I, Section 4.1.1.2 and 4.1.1.3) of the SREIS.</p> <p>Vegetation mapping will be undertaken as per Arrow's Ecological Survey Guideline (99-H-GDL-0091)</p>
197	<p>The proponent states that the remnant vegetation totals 306,371 ha (40% of the Project area), however, the summary of the ecosystems significant to impact assessment provided in Table 17-5 only accounts for 33,083ha. This shows a major discrepancy of areas for all endangered and of concern regional ecosystems.</p> <p>The SREIS should provide accurate figures for each remnant area of each regional ecosystem for impact areas and the evidence that supports the description of these regional ecosystems. This is for the purpose of guiding infrastructure location, decisions on rehabilitation and mitigation as well as determining offsets required. Site specific information will be required by the time of the EA application.</p>	Terrestrial Ecology Report (Appendix I) of the SREIS.	<p>The total of 306,371 ha represents all REs mapped by EHP within the Project area.</p> <p>Table 17-5 equates to 32,071 ha (not 33,083 ha) which represents the total area of conservation significant REs (i.e. 'endangered' and 'of concern' REs).</p> <p>The calculations detailing REs in the Project area from the EHP RE mapping are correct. These calculations are represented in the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p> <p>Further to this a calculation of potential impacts to all REs within each drainage area for the Project, based on the updated SREIS Project Description is presented in the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p> <p>Further ground truthing and vegetation of RE's will be undertaken in accordance with Arrow's Ecological Survey Guideline (99-H-GDL-0091), as outlined in Appendix C of the Terrestrial Ecology Technical Report (Appendix I) of the SREIS.</p>
198	<p>Summary of EVNT Flora Likelihood of Occurrence in Project Area - The vulnerable plant <i>Gratophyllum illicifolium</i> is known from EHP databases to occur in the project area.</p> <p>It is recommended that the proponent add <i>Gratophyllum</i></p>	Terrestrial Ecology Technical Report (Appendix I, Section 4.1.3) of the SREIS	This species is endemic to central coastal Queensland from the Mackay area with a disjunct population at Miriam Vale, The EPBC Act Species Profiles and Threats (SPRAT) database notes that it grows in tall to very tall mixed notophyll forest. This is a coastal

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<i>illicifolium</i> to the known to occur list.		rainforest community and does not exist within the project area. The most current confirmed records of the species have been obtained from the Queensland Herbarium (2 April 2014) and in discussions with the Herbarium staff to ascertain the correct range of distribution for this species. These records confirm that all specimens are located in coastal and sub-coastal rainforest and vine thicket communities that are found to the east of the Project area. No records of this species are within or are in proximity to the Project Development area, with the closest record over 50 km away to the north east of ATP749 where suitable rainforest community habitat exists in a more suitable less dry microclimate. The Terrestrial Ecology Technical Report (Appendix P, Table 11) of the EIS notes the presence of <i>Graptophyllum illicifolium</i> as Unlikely. As tall to very tall mixed notophyll forest is not present in the Project development area, the likelihood of occurrence for this species has been retained as Very Low.
199	The Near Threatened black-chinned honeyeater is known from EHP databases to occur in the project area. It is recommended that the proponent add black-chinned honeyeater to the known to occur list.	Terrestrial Ecology Technical Report (Appendix P, Tables 15 and 18) of the EIS Terrestrial Ecology Report (Appendix I, Table 4.2) of the SREIS	The black-chinned honeyeater was included in the Terrestrial Ecology Technical Report (Appendix P, Table 15) of the EIS, with a likelihood of occurrence of 'possible'. In contrast, Table 18 of the same report states it is 'known to occur' within the Project development area. Given that records for the black-chinned honeyeater exist from the Project development area, the likelihood of occurrence table for fauna has been upgraded to reflect the known presence of black chinned honeyeater. Refer to the Terrestrial Ecology Report (Appendix I, Table 4-2) of the SREIS for the updated likelihood of occurrence of this species.
200	There are gaps in the flora and fauna survey effort in key high biodiversity value areas within the project area. These gaps occur in the far north and middle eastern areas as shown in figures 17-1	Terrestrial Ecology Technical Report (Appendix I) of the	Ecological studies undertaken as part of the EIS have characterised the ecological values of the Project area. Further detailed studies will be undertaken at site-specific locations

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>and 17-2. The survey requirements of these areas should be addressed.</p> <p>It is recommended that before approvals are progressed the proponent undertake flora and fauna surveys in accordance with EHP guidelines in the northern and eastern extremities of the project area.</p>	SREIS.	<p>following the finalisation of infrastructure locations.</p> <p>The SREIS outlines the specific field management protocols, site scouting and survey methodologies to be undertaken in association with EA applications, following finalisation of major infrastructure locations, in accordance with the framework approach for impact assessment.</p>
201	<p>The proponent has made the commitment to not impact on Homevale National Park and to minimise impacts to EPBC threatened ecological communities, category B ESAs, category C ESAs, stock routes and significant bioregional wildlife corridors, essential habitat, core habitat, timber tenures and of concern regional ecosystems. For effective assessment of environmental impacts the impacts to State Significant Biodiversity Values need to be quantified in a more exact manner. It is not clear if or when this will occur.</p> <p>In the SREIS, to the extent possible, an estimate should be made of the minimum and likely area of each State Significant Biodiversity Value that is likely to be impacted should be detailed especially that within the high and moderate constraint areas. This will enable an assessment of whether mitigation and offsets proposed are adequate. Proposed site selection and management methods to ensure the area of disturbance during construction and operation of the project should be provided.</p>	Draft Environmental Offset Strategic Management Plan (Appendix P) of the SREIS	<p>Approximate maximum disturbance calculations have been undertaken based on a conceptual sample of the field development footprint and extrapolated across all Phases of the Project in areas of projected similar well densities, to establish a conservative maximum disturbance development footprint.</p> <p>These calculations outline estimated disturbance to State Significant Biodiversity Values (SSBVs) that may be potentially impacted and are outlined in the Environmental Offset Management Strategy (Appendix P) of the SREIS.</p> <p>SSBVs are among a range of biodiversity values that may be potentially impacted by the Project. As part of the overall impact mitigation approach, staged biodiversity offsetting will be implemented.</p> <p>As part of the site specific Environmental Offset Operational Management Plan to be developed, Arrow will track the actual losses of biodiversity values and review the offset obligations against the estimated area of disturbance. This staged process will also be used to demonstrate Arrow's avoidance of biodiversity values on an annual basis.</p> <p>In addition, field development planning has advanced since preparation of the EIS, with the overall Project development area now being separated into 33 smaller drainage areas. The application of the drainage area approach has allowed for a refined analysis of potential impacts which will enable a more focused approach to management and mitigation of impacts.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>To assist in mitigating impacts, pre-clearance surveys, coupled with refined vegetation mapping at an appropriate scale, will be undertaken prior to development to quantify the presence of EVNT species and habitats. Following further field survey and revised mapping, possible habitat may be revised to “habitat known” or can be revised to areas in which the absence of EVNT habitat is known.</p> <p>The methodology for undertaking these surveys is outlined in the Terrestrial Ecology Chapter (Section 11) of the EIS, and will be implemented through Arrow’s Ecological Impact Assessment Procedure (99-H-PR-0081), Fauna Survey Guideline (99-H-GDL-0061) and Ecological Survey Guideline (99-H-GDL-00091).</p>
202 to 207	<p>This strategy is inadequate for the purposes of the Environmental Impact assessment process. There is no detail of the areas of State Significant Biodiversity Values that are to be impacted. There is no attempt to quantify the availability of the offset areas within the Northern Brigalow Belt to offset any impacts. It is recommended that the proponent address the inadequacy of the current draft environmental offset strategy by addressing the following:</p> <ul style="list-style-type: none"> • Demonstrate how the Queensland Biodiversity Offsets Policy (QBOP) has been applied to the development; and • Provide an Offset Strategy which addresses: <ul style="list-style-type: none"> — How the activity has avoided or minimised impacts on values subject to a specific-issue offset policy; — The State significant biodiversity values which are required to be offset and the extent of impact on each value (this information should be supported by spatial mapping); — The offset delivery mechanism (land based offset or offset payment). <ul style="list-style-type: none"> - Where offsets will be provided via a land based 	Offsets SMP (Appendix P, Sections 7, 8, 9 and 10) of the SREIS	<p>The Offsets Strategy (Appendix Q) presented in the EIS has been further developed into a specific Offsets SMP (Appendix P) for the Project SREIS, in accordance with current offset legislation at both State and Commonwealth levels.</p> <p>The Offsets SMP (Appendix P) of the SREIS includes the following information:</p> <ul style="list-style-type: none"> • SSBV likely to be impacted; • MNES likely to be impacted; • Quantification of predicted impacts to SSBV and MNES; and • Availability of potential offset areas within the region. <p>The SREIS Offsets SMP (Appendix P) demonstrates how the QBOP and EPBC Act offset policies have been addressed, including how the Project has avoided and minimised impacts to State and Commonwealth environmental values.</p> <p>Further, it outlines preferred methodology for delivering offset requirements including the delivery mechanism, delivery timeframes.</p> <p>Early discussions with the Department of the Environment have</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>offset, information should be included detailing whether the values can be offset within the landscape; and</p> <ul style="list-style-type: none"> - Where an offset payment is proposed, the values to which the offset payment relates. <ul style="list-style-type: none"> — Details of when offsets will be provided, that is, prior to the issuing of the environmental authority or staged over the life of the project. Where it is proposed to stage the provision of offsets, identify what those stages are and the anticipated timeframes; — Where land based offsets are proposed, provide a pre-impacts assessment of ecological equivalence of the impact area. Assessment of ecological equivalence should use the Ecological Equivalence Methodology published by DERM; — Provision of any other relevant information as per the policy. — An offset strategy should be submitted as part of the SEIS or EA application documents or submitted Environmental Management Plan. 		<p>indicated in-principle support for a staged approach to the provision of offsets that provides phase one offsets up front with a rolling offset requirement for the remainder of the Project.</p> <p>The Offsets SMP (Appendix P) developed for the SREIS also outlines the type of information that will be presented when final offset management plans are developed for the Project. The information that is to be detailed in final offset management plans may include, but not necessarily be limited to:</p> <ul style="list-style-type: none"> • Details of the protected matter being impacted and the estimated extent of the likely proposed impact; • Area in hectares of required land to offset estimated impact; • Preferred methodology for delivering offset requirements; • Delivery timeframes; • Outline of staged offsets approach; • Communities and habitat types to be secured; • Demonstration of conservation gain; • Timing of securing offset areas; • Details of how the offset areas will be legally binding (mechanisms for long term protection); and • Management and/or rehabilitation programs for the offset areas.
208	<p>The Strategy indicates that the proponent's preference for offset security is to add to the protected area estate. This is not the preferred approach in the Queensland Biodiversity Offset Policy.</p>	<p>Offsets SMP (Appendix P, Sections 8, 9 and 10) of the</p>	<p>A specific Offsets SMP (Appendix P) has been developed for the Project SREIS, as required under current offset legislation and policy, both State and Commonwealth.</p> <p>The preferred offset delivery mechanisms are outlined in the updated Offsets SMP (Appendix P) of the SREIS. Delivery of offsets will seek to provide strategic biodiversity outcomes for SSBV and MNES. This approach is in line with the QGEOP and EPBC Act offset policy.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
209	This section is an overview of Queensland's bioregions and does not address the State Significant Biodiversity Values that exist within the Project area.	Offsets SMP (Appendix P, Sections 7, 8, 9 and 10) of the SREIS	A specific Offsets SMP (Appendix P) has been developed for the Project SREIS, in accordance with current offset legislation and policies, both State and Commonwealth. Identification of and impacts to SSBVs are specifically addressed within the Project Offsets SMP (Appendix P). The preferred strategy for providing offsets related to expected impacts to all SSBV and MNES are outlined.
210	<p>The information quality has not been adequately described in the Constraints Analyses and Environmental Framework (section 3 and following). Mention is made of background field studies, but no details have been provided as to how this information has been obtained e.g. the methodologies used, the sampling intensity, timing and any assumptions and limitations used when incorporating the results of such sampling into the development of the Environmental Framework.</p> <p>Provide a table as part of an SEIS to show where information has been incorporated into the Environmental Framework, and how the quality of that data is maintained and adequately described.</p> <p>The ToR requires that "where detailed information about the location of infrastructure cannot be provided, the EIS must deliver a statement of the potential foreseeable maximum impact on all terrestrial ecology environmental values resulting from foreseeable project activities after effective mitigation measures have been applied.</p>	<p>Impact Assessment Methodology Chapter (Section 6) of the EIS</p> <p>Environmental Framework chapter (Section 7) of the EIS</p> <p>EIS Study Impact Assessment Chapters (Chapters 8 to 28) of the EIS</p> <p>Technical Reports (Appendices H to EE) of the EIS</p> <p>Supplementary impact Assessment (Chapters (Sections 5 to 16) of the SREIS</p> <p>Supplementary Technical Reports (Appendices A to M) of the SREIS</p>	<p>Reference to information quality in the EIS is provided in the Cross Reference with the Final Terms of Reference (Appendix B) of the EIS, whereby ToR Section 4: "Environmental Values and Management of Impacts", outlines the following requirements:</p> <p>"Information quality: information given under each element should also state the sources of the information, how recent the information is, how any background studies were undertaken (including intensity of field work sampling), how the reliability of the information was tested, and what uncertainties (if any) there are in the information."</p> <p>Specific methodology for each "element" or study discipline including; study timing, survey effort, assumptions and discussion around the information quality and/or any limitations, is provided within each individual study of the EIS (Chapters 8 to 28), and the supplementary impact assessments for the SREIS (Chapters 5 to 16), as well as the detailed methodologies and reference lists for each study discipline provided in the supporting Technical Reports (Appendices H to EE) of the EIS and the Supplementary Technical Reports of the SREIS (Appendices A to M).</p> <p>These study methodologies are too numerous and diverse to outline or summarise within the Environmental Framework chapter (Section 7), however it is implicit in the framework approach, which relies on the input of all the studies for impact assessment and mitigation commitments, that the numerous methodologies are</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>incorporated and ensure adequate quality of information for all impact assessments supporting the framework approach.</p> <p>In addition, the References chapter (Section 33) of the EIS, and References chapter (Section 17) of the SREIS contains a comprehensive list of all the reference material and data sources, to address the information quality used for the entire EIS.</p> <p>A maximum disturbance calculation of terrestrial ecological values has been undertaken and is provided in the Bowen Gas Project Environmental Offsets Strategic Management Plan (Appendix P) of the SREIS.</p>
211	<p>Information quality is not adequately addressed. Statements are made about what environmental values will be avoided to the maximum extent possible, but no statements are made about the potential foreseeable (maximum or other estimate) impact area for terrestrial environmental values.</p> <p>The SREIS should address this issue.</p>	Bowen Gas Project Environmental Offset Strategic Management Plan (Appendix P) of the SREIS	<p>A conceptual maximum disturbance calculation has been undertaken based on a sample field development footprint which has been applied across all phases the Project Area of similar well densities, to establish a conservative development footprint.</p> <p>These calculations outline estimated maximum potential disturbance to State Significant Biodiversity Values and Matters of National Environmental Significance, and are outlined in the Bowen Gas Project Environmental Offset Management Strategy (Appendix P) of the SREIS.</p>
212	<p>Section 8.4 of the EIS states that “as project site is located in central QLD, extreme coastal weather events such as flooding will not be discussed”. This statement should be removed as flooding does occur in central QLD and it is conflicting as the report later discusses the possibility of more frequent flooding events in section 8.4.2. Also there is no discussion of extremes of climate with relation to water management at the project site.</p> <p>The SEIS should consider the effect of flooding on the project. Amend the CSG Water and Salt Management Strategy, or include as part of project-specific CSG water management plan a discussion of specific examples of how water will be managed</p>	Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	<p>The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS presents the findings of a flood investigation in the vicinity of the proposed WTF localities. The extent of flooding associated with peak flows was assessed using numerical hydrology and hydraulic models. Sensitivity analysis was undertaken to estimate the potential impact of climate change on flooding in the area.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	during any extreme climate events. Discuss the limiting factors that will need to be considered when designing and implementing the overall water management plan for the development sites.		
213	<p>The SREIS should include further details on climate change adaptation in this section as it relates to project planning and the need for adaptive management. Ensure that adequate discussion is included in the CSG Water Management Strategy.</p> <p>Although Sections 8.5.1 to 8.5.4 discuss the role of climate change on the design of the project, insufficient information has been provided regarding the planning for climate change in the short and long terms to determine how these changes will be managed. It is not clear what adaptation strategies will be implemented to account for those impacts. Limited discussion has been provided for the following example matters:</p> <ul style="list-style-type: none"> • How extreme climate events may impact on the project and local environment 	<p>Climate chapter (Sections 8.5.1 to 8.5.4) of the EIS</p> <p>Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS</p>	<p>Climate change adaptation is considered in planning and design, construction, operation and decommissioning phases of the Project. This includes:</p> <ul style="list-style-type: none"> • Developing preventative and responsive measures for bushfire management and flooding; and • Designing and constructing production facilities in accordance with current Australian standards for climatic factors including wind, bushfires and floods. <p>Arrow is committed to taking a cooperative approach with government, industry and other sectors to address adaptation to climate change.</p> <p>The SREIS provides an update to the Climate chapter (Section 8) of the EIS to address any relevant potential impacts and mitigation related to extreme weather events such as those described above. This can be found in the Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS.</p>
214	<ul style="list-style-type: none"> • Given that floods and cyclones increase in frequency as a result of climate change, it is not clear what measures will be taken to minimise impacts to the project and local environment as a result of those extreme weather events 	<p>Climate chapter (Sections 8.5.1 to 8.5.4) of the EIS</p> <p>Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS</p>	<p>Climate change adaptation is considered in planning and design, construction, operation and decommissioning phases of the Project. This includes:</p> <ul style="list-style-type: none"> • Developing preventative and responsive measures for bushfire management and flooding; and • Designing and constructing production facilities in accordance with current Australian standards for climatic factors including wind, bushfires and floods. Arrow is committed to taking a cooperative approach with government, industry and other sectors to address adaptation to climate change. <p>The SREIS provides an update to the Climate chapter (Section 8)</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			of the EIS to address any relevant potential impacts and mitigation related to extreme weather events such as those described above. This can be found in the Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS.
215	Commitments to undertake a cooperative approach with government, industry and other sectors to address adaptation to climate change are not made or are unclear	Climate chapter (Sections 8.5.1 to 8.5.4) of the EIS Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS	Climate change adaptation is considered in planning and design, construction, operation and decommissioning phases of the Project. This includes: <ul style="list-style-type: none"> Developing preventative and responsive measures for bushfire management and flooding; and Designing and constructing production facilities in accordance with current Australian standards for climatic factors including wind, bushfires and floods. Arrow is committed to taking a cooperative approach with government, industry and other sectors to address adaptation to climate change. The SREIS provides an update to the Climate chapter (Section 8) of the EIS to address any relevant potential impacts and mitigation related to extreme weather events such as those described above. This can be found in the Greenhouse Gas chapter (Section 6) and Greenhouse Gas Technical Report (Appendix C) of the SREIS.
216	Whilst commitments are made to monitor success of rehabilitation, erosion and sediment control, commitments are limited when it comes to audits and monitoring success in meeting impact objectives across the project area. The ToR requires the proponent to set out an auditing and monitoring program to determine success in meeting nominated environmental protection objectives. To meet this requirement the proponent should provide details in the SREIS to demonstrate how the success in achieving the objectives will be monitored, audited and managed.	Decommissioning and Rehabilitation chapter (Sections 29.7.9 and 29.7.10) and Environmental Management Plan (Appendix Z, Sections A.2 and Z.5.5) of the EIS	Rehabilitation completion criteria, rehabilitation monitoring and maintenance measures are presented in the Decommissioning and Rehabilitation chapter (Section 29) of the EIS. Also, Arrow's commitment to establishing preliminary success criteria (or completion criteria) for the rehabilitation of the CSG production areas and associated infrastructure are provided in the Draft EM Plan (Appendix Z) of the EIS. The completion criteria are performance objectives against which rehabilitation success will be measured. The Draft EM Plan (Appendix Z) of the EIS details the monitoring, auditing and reporting commitments. Compliance with this

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			management plan will be assessed during periodic HSEMS audits. This includes internal inspections, reviews and audits to be undertaken as both scheduled and unscheduled activities. Regular audits will be conducted for aspects of operations and maintenance activities in conjunction with site environmental improvement plans and review meetings. In addition, spot audits will be undertaken during ad hoc site visits. External audits will be undertaken when required to evaluate compliance with EA conditions and Arrow's HSEMS.
217	Mitigation measures for potentially adverse impacts on stock route operations have not been proposed in the EIS however it is stated in the Environmental Management Plan that project related activities in the vicinity of existing stock routes will be managed in accordance with the <i>Land Protection (Pest and Stock Route Management) Act 2002</i> Provide more details in the SREIS on the types of measures that will be adopted in line with the Land Protection (Stock Route Management) Act 2002.	Land Use and Tenure Technical Report (Appendix Q, Section 5.3.3) of the EIS Land Use and Tenure chapter (Section 13) of the SREIS	The Project will comply with legislative requirements under the LP Act, where relevant. This includes NRM requirements that proposed activities do not permanently impede upon the integrity of the Stock Route Network and that all elements of the Stock Route Network remain intact, even if they have been unused for a number of years. In accordance with the 'Framework Approach' developed for the impact assessment of the Project as per the requirements of the ToR, more detailed information regarding major infrastructure locations will be presented at the EA application stage of the approvals process. At this point in time, Stock Route Network infrastructure such as watering points, bores, windmills and holding yards etc. will be defined and where interference cannot be avoided, suitable mitigation measures will be implemented. These mitigation measures will be established with relevant stakeholders, including EHP.
218	The EIS claims throughout that CSG activities and farming activities can coexist, and that any conflicts would either be of a temporary nature or will be compensated for. There may be some instances where compatibility is not able to be achieved and potential land use conflicts will be unable to be avoided.	Land Use and Tenure chapter (Section 19), Soils chapter (Section 12), Geology chapter (Section 13), Soils	While there may be some instances of land use conflicts between existing agricultural activities and the Project, Arrow has adopted a position that through appropriate consultation with landholders and the broader community, together with CSG development planning, agricultural activities and CSG developments can coexist without

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	Provide detail about the potential for land use conflict. The investigation should follow the procedures set out in the planning guideline. The Identification of Good Quality Agricultural Land, which supports State Planning Policy 1/92	Technical Report (Appendix K) and Land Use and Tenure Technical Report (Appendix Q) of the EIS	causing permanent alienation of, or diminished productivity from existing agricultural activities. It is acknowledged that there will be inevitable land use conflict in the sense that the Project will temporarily displace the original land use, however, this displacement can be adequately mitigated and managed through Arrow's existing frameworks to minimise the perceived land use conflict in question. Detailed information regarding the propensity for land use conflicts and the coexistence objectives for the Project are contained in the Land Use and Tenure Technical Report (Appendix Q) of the EIS.
219	<u>Environmentally Sensitive Areas:</u> Additional critically limited and threshold regional ecosystems (RE) are not included as part of the list of environmentally sensitive areas. The proximity of the project to threshold regional ecosystems has not been identified nor does the EIS mention threshold regional ecosystems. In contrast, the technical terrestrial report does identify that there are 2 threshold RE's located in the project area. Provide revised maps / descriptions of proximity for those regional ecosystems that are listed in the Appendix 6 of the Queensland Biodiversity Offsets Policy as part of an SREIS.	Terrestrial Ecology chapter (Section 17) and Technical Report (Appendix P) of the EIS Terrestrial Ecology Technical Report (Appendix I, Section 4.1.2) of the SREIS	Both the Terrestrial Ecology chapter (Section 17) and Technical Report (Appendix P) of the EIS note that 2 threshold REs are found within the Project area, and that no critically limited REs are present (although 3 threshold REs are identified in the Terrestrial Ecology chapter (Section 17, Table 17-5) of the EIS). Updated information on critically limited and threshold REs are provided in the supplementary Terrestrial Ecology Report (Appendix I, Section 4.1.2) of the SREIS.
220	This section contains references to ERA thresholds that are no longer relevant since the commencement of the greentape reduction reprint of the <i>Environmental Protection Act 1994</i> . Include a revised section updating ERA triggers and requirements for environmental authority applications as part of the SREIS.	Project Approvals chapter (Section 2) of the SREIS	Changes to the EP Act and EP Regulation under the Greentape Reduction Act resulted in the deletion of 20 ERA thresholds. As such, the revised list of incidental activities (ERAs) expected to be applicable to the Project will likely include: <ul style="list-style-type: none"> • ERA 14(1) — Electricity generation; • ERA 15(1) — Fuel burning; • ERA 16(2)(a) — Extractive and screening activities; • ERA 56(2) — Regulated waste storage;

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<ul style="list-style-type: none"> • ERA 58 (1) — Regulated waste treatment; • ERA 60 (1) — Waste disposal; • ERA 63(1)(a) — Sewage treatment; and • ERA 64 (2) — Water treatment.
221	<p>The EIS and the accompanying technical report do not describe overland flow areas. The EIS mentions however that overland flow paths should not be disrupted.</p> <p>The SREIS to provide further details on likely overland flow impacts and management.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS</p> <p>Hydrology and Geomorphology chapter (Section 9) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS</p>	<p>The Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS provides an assessment of flood protection from 1% AEP events and overland flows of sub-catchments that have been tentatively identified as potential areas for two CGPF & WTF facilities and holding dams. Further site specific impacts based on overland flow from flood events may be presented, if relevant, once other locations are finalised in the EA application phase.</p>
222	<p>The EIS does not provide details of the likelihood of flooding, history of flooding, or the levels and frequency.</p> <p>Provide further details on the likelihood of flooding and the impacts of the project on environmental values of surface waters within the project area that may result.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS</p> <p>Hydrology and Geomorphology chapter (Section 9) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS</p>	<p>Impacts based on overland flow from flood events are presented for the broad study areas associated with the localities for two potential WTF sites. The SREIS includes consideration of potential changes in flood levels and overland flow due to climate change. A climate change impact assessment is included in the Hydrology and Geomorphology Technical Report (Appendix G, Section 4.3) of the SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
223	<p>The EIS does not provide a description of the present and potential water uses downstream of the areas affected by the project.</p> <p>Provide further details on present and potential downstream water users / uses as part of the SREIS.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>The existing licensed water users downstream of the proposed Project development activity are presented in the Surface Water Technical Report (Appendix N, Section 4.2.2.3, Table 4-3) of the EIS. It is assumed that the existing users also represent potential downstream users (discussed further in the Surface Water Technical Report (Appendix N, Section 4.2.2.3) of the EIS and the Surface Water Technical Report (Appendix F, Section 5.3) of the SREIS.</p>
224	<p>The relationships between water quality and seasonal variations or flow have not been described. In addition, seasonal variation in water quality has not been described.</p> <p>Update descriptions to include extent of seasonal variation of flows and water quality in surface waters within the project area as part of the SREIS.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8), Surface Water Technical Report (Appendix F) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS</p>	<p>The SREIS provides an update to the Surface Water chapter and includes a discussion of relevant seasonal variation of flows and water quality in surface waters within the Project area, using stream flow and water quality data from the DNRM gauge at Deverill. A Spells analysis is also presented in the Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS; this provides detailed analysis of the seasonal distribution of flows within the study area.</p>
225	<p>The EIS does not address potential impacts as result of stream diversions or changes to overland flows due to works or infrastructure such as the construction of linear infrastructure.</p> <p>The SREIS should further address waterway impacts to flow, need for diversions, and design and management of diversions.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Hydrology and Geomorphology</p>	<p>The potential impacts to the surface water environment arising from stream diversions or overland flow are assessed in the Hydrology and Geomorphology chapter (Section 9) and the Hydrology and Geomorphology Technical Report (Appendix G, Table 8-5) of the SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
		chapter (Section 9) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS	
226	<p>The EIS does not adequately identify whether stream discharges are proposed to be undertaken. If so information will be required on proposed controlled discharges where relevant, including–</p> <ul style="list-style-type: none"> • stream flow data and information on discharge water quality in combination with proposed discharge rates to estimate in-stream dilution and water quality • options for controlled discharge under times of natural stream flow to ensure that adequate flushing of waste water is achieved. An assessment of the available assimilative capacity of the receiving water given existing background levels and other potential point source discharges in the catchment" <p>The SREIS should further address discharges to waterways impacts to flow, water quality and cumulative impacts.</p>	Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); Surface Water Technical Report (Appendix F) and draft Coal Seam Gas Water and Salt Management Strategy (Appendix D) of the SREIS.	<p>The Surface Water chapter (Section 8) of the SREIS includes a revised impact assessment outlining potential discharges of treated and/or untreated coal seam water to the Isaac River. Surface water quality, geomorphology, aquatic ecology, environmental flows and hydraulic assessments have been undertaken at potential sites along the Isaac River main channel proposed to be the receiving environment, to ascertain their assimilative capacity. It is expected that further field assessment of these components will be undertaken as part of the EA assessment stage.</p> <p>Release scenarios and beneficial use options for CSG water were informed by the Coal Seam Gas Water and Salt Management Strategy (Appendix D) of the SREIS developed by Arrow.</p>
227	<p>The EIS does not describe the likely effects of predictable climatic extremes (e.g., storm events, floods and droughts) on the capacity of dams that will form part of the overarching CSG water management system to retain contaminants, the structural integrity of the containing walls, the quality of water contained and the flows and quality of water discharged. Also see the EHP advice on ToR section 3.5.5.</p> <p>The SREIS and any subsequent EA applications should further address design of water infrastructure, water quality and flow regime of intended discharges and receiving waters.</p>	Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); and Surface Water Technical Report (Appendix F) of the	A more detailed analysis of the water quality and flow regime of potential CSG water release scenarios, and within the Isaac River Main Channel sub-catchment (the potential receiving environment) is provided in the Surface Water Technical Report (Appendix F, Section 7) of the SREIS.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
		SREIS.	
228	<p>Chapter 15 Surface Water - Comments on surface water field surveys carried out by the proponents (Appendix N) Section 15.5.3 Summary of Potential Impacts and Mitigation Measures s15-25 Chapter 15; EIS - considering the regional location of the project and the type of land use in these regions the SREIS should detail the management of mobilisation of pesticides in soils to waterways as a potential impact during construction.</p> <p>The SREIS should reflect the following changes to paragraph 2; row 1; column 2; Table 15-2; p15-17 (changes underlined or stuck through):</p> <p>“Sediment exposed or generated during construction may also be carried by wind into surface water bodies. Additionally there is the potential for the presence of <u>pesticides and high levels of metals from in</u> soils that may enter watercourses as a consequence of sediment mobilisation <u>at levels that are toxic to aquatic organisms.</u>”</p> <p>The SREIS should detail how residues in soils, such as pesticides, will be dealt with.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS</p> <p>Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>A general assessment of impacts to surface water associated with sediment mobilisation is included in the Surface Water Technical Report (Appendix F, Section 9) of the SREIS; sediment mobilisation control and mitigation measures have been updated to include the potential impact of pesticides mobilised from disturbed soil where relevant.</p>
229	<p>Considering the size of the project area and the range of activities that could occur, having only 15 sampling points is insufficient to characterise the baseline condition for aquatic ecosystems. Only 9 sampling points were sampled over 2 seasons, including autumn (April-May) and spring (October). Detailed and sufficient information on the aquatic ecosystem baseline condition is particularly important where large or intensive operations and infrastructure are located e.g. release of CSG wastewater to streams. Identifying species and ecosystems sensitive to changes in flow and water quality is essential for the assessment of local impacts and management measures to prevent or reduce them. No commitment to conduct site-specific impact assessments</p>	<p>Surface Water chapter (Section 8); Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4) of the SREIS</p>	<p>The Surface Water chapter (Section 8) of the SREIS summarises a revised impact assessment of potential discharges to waterways. This has been undertaken at the local catchment level to ascertain the assimilative capacity of the likely receiving environments that will then dictate the allowable discharge parameters.</p> <p>The SREIS contains a detailed desktop assessment of water quality on a sub-catchment basis within the Project area using data collected by nearby coal mines. The water quality assessments include consideration of water quality relationships to stream flow using data from the Department of Natural Resources and Mines stream gauges at Goonyella and Deverill.</p> <p>The SREIS also provides a desktop assessment of the baseline</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>where disposal to watercourses is to occur appears in the EIS. A commitment to developing mitigation measures for surface water impacts appears in Section 1.5 Water Management Options for CSG Water p12; Appendix N; EIS</p> <p>The SREIS should outline how, when there is a high risk of impacting aquatic ecosystems, more comprehensive local ecological surveys would be conducted to determine the baseline condition, and how local species that might be sensitive to changes in water quality or changes in hydrological conditions would be identified. These surveys should be similar to those described in the Field Survey section of this chapter Section 16.2.2; p16-5; Chapter 16 including identification of macro-invertebrate; macrophyte; fish and turtle species for at least 2 seasons i.e. autumn (recessional wet) and spring (late dry). For any further guidance on carrying out ecological surveys refer to Australian and New Zealand guidelines for fresh and marine water quality (ANZECC & ARCANZ 2000).</p>		<p>existing literature to describe the surface water condition, geomorphic character and aquatic ecology of two reaches of the Isaac River main channel that are the potential receiving environment for discharge associated with the WTF localities.</p> <p>The SREIS report also presents an environmental flow / Spells assessment, as well as hydraulic modelling for the reaches of the Isaac River main channel identified as the potential receiving environment for discharge associated with the WTF localities. The baseline surface water, aquatic ecology and geomorphic characterisation of the Isaac River main channel used in combination with the hydraulic modelling of the river, supports the detailed impact assessment methodology proposed of any proposed treated or untreated coal seam gas water discharges into the receiving environment.</p> <p>Detailed field assessment of the receiving environment will be undertaken for the EA applications once infrastructure locations have been identified.</p>
230	<p>Species sensitive to changes in water quality or flow as a result of CSG activities may not necessarily be listed as of state or national significance. Species may be integral to ecosystem health such as the Australian Bony Bream (<i>Nematolosa erebi</i>) which is a non-threatened Australian freshwater fish (see link http://www.environment.gov.au/biodiversity/threatened/publications/action/fish/17.html). Significant impacts to aquatic ecosystems may occur when severe impacts occur on species that are not necessarily listed as endangered, threatened or vulnerable.</p> <p>The SREIS should redraft the rating for the significance impact assessment matrix at p16-9; Section 16.2.3 in view of the above information.</p>	<p>Aquatic Ecology chapter (Section 10) and Aquatic Ecology Technical Report (Appendix H, Section 4 and 6) of the SREIS</p>	<p>The tolerance of the assemblage of fish species typical for the Project area, to water quality, was examined in the supplementary Aquatic Ecology Technical Report (Section 4.3.2, Appendix H) of the SREIS. In this report, native fish known to, or likely to, occur within the reaches of the Isaac River associated with the study area are presented.</p> <p>The potential impacts on aquatic ecosystems were reassessed as part of this SREIS. Results of this assessment identified that the greatest risk to water quality is the uncontrolled release of untreated CSG water during high flow conditions (dam failure or operational emergency). In this potential release scenario, impacts include a slight increase in receiving environment salinity, although unlikely to exceed the receiving environment 80th percentile value.</p> <p>With consideration to the above scenario, the significance</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>assessment of potential impacts on fish species and aquatic values were re-evaluated as per the significance impact assessment matrix (see Aquatic Ecology Technical Report (Appendix H, Section 5.3) of the SREIS). The results of this assessment identified:</p> <ul style="list-style-type: none"> Given that salinity impacts are unlikely to exceed the receiving environment 80th percentile value, and that all fish assessed have a salinity tolerance higher than the 80th percentile of the Isaac River, a temporary increase in salinity within the receiving environment is thus considered likely to have a low to negligible impact on fish. <p>Dam failure or operational emergencies as discussed above are considered unlikely events. Typical release to watercourses would occur in a controlled fashion as per conditions determined during the site specific environmental approval process. In this scenario, impacts on the aquatic environment are low to negligible given the site specific studies and management measures which are required during the environmental authority process.</p> <p>With respect to the link provided in the submission, the significance impact assessment matrix adopted for the EIS (see Impact Assessment Methodology chapter (Section 6) of the EIS) and SREIS is designed to incorporate ecosystem functionality through the assessment of the sensitivity of an environmental value, as considered by technical specialists. Values such as ecosystem functionality have been considered during the SREIS impact assessment.</p>
231	As with Section 2.2 of Appendix AA, the description of wastewater produced during coal seam gas extraction is inadequate considering the large volume of wastewater expected to be produced. This section has also reported the presence of micro-organisms in the CSG water from the Bowen. It is not clear why this information is different to that in Section 2.2 of Appendix AA.	CSG Water and Salt Management Strategy (Appendix D) and Hydrology and Geomorphology Technical Report	Any microbes present in extracted CSG water represent natural levels of background microflora and are highly unlikely to be pathogenic to humans, farm animals or wildlife. Treatment of raw CSG water by RO, as indicated in the revised CSG Water and Salt Management Strategy (Appendix D) of the SREIS, would remove any traces of micro-organisms in the water.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>Micro-organisms may lead to health issues and disease in humans, stock and wildlife. Detail should be included on the type and levels of the micro-organisms present in the CSG water from the Bowen Basin.</p> <p>The SEIS should detail additional recommendations and information on the level and type of microorganisms present in the CSG water. Ensure that information on the characterisation of raw; untreated; produced CSG water is consistent throughout the EIS.</p>	(Appendix G) of the SREIS	
232	<p>The EIS commits to monitor the quality of the CSG water as the project progresses. Feed water characterisation studies are ongoing using pilot-well data in advance of treatment facility design. If this is the case it is not clear what parameters will be analysed. The EIS does not detail all of the potential contaminants that could arise from the activity, and that may be present at significant levels to cause impacts to aquatic organisms; irrigated plants; stock and / or humans. Contaminants of potential concern and not mentioned in relation to CSG extraction include hydrocarbons (including aromatics such as benzene or polycyclic aromatic hydrocarbons (PAHs)) and radioactive compounds potentially mobilised during the extraction of CSG. Process chemicals such as drilling mud additives may also be present in CSG produced water as could hydraulic fracturing chemicals. These chemicals will need to be considered in impact assessment.</p> <p>The SEIS should ensure that “feed water characterisation studies” mentioned on p10 of Section 1.3 Appendix N details the above issues. This should include a sampling and analysis design for these studies that includes, but is not limited to, location of sampling points and a list of analytes.</p>	Surface Water Quality Technical Report (Appendix F) of the SREIS	<p>An updated water quality monitoring program is included in the supplementary Surface Water Quality Technical Report (Appendix F) of the SREIS. Water quality parameters included in any ongoing water quality monitoring will be detailed during the EA application process once firm details of any possible CSG water discharges and locations of receiving environments are available.</p> <p>It is envisaged that assessment of water quality methodologies will include physico-chemical and biological parameters in accordance with the EHP Monitoring and Sampling Manual 2009, Version 2, July 2013. It is pertinent to note that BTEX are not used at any stage in the gas extraction process, including hydraulic fracturing of coal seams.</p>
233	Among the potential water management options is “disposal to	Surface Water chapter	The supplementary Surface Water Technical Report (Appendix F,

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>watercourses in the event the beneficial uses are temporarily unavailable, BUAs are not granted, significant or prolonged weather events or demand for water decreases and alternative disposal options are required to maintain dam safety and integrity". In this section, the proponent states that "a site specific impact assessment will be undertaken to determine the relevant parameters for discharge to the receiving environment" and this impact assessment would be provided to EHP as part of the EA amendment application (and is subject to public exhibition). The issue is that there is no information on what a site specific impact assessment would entail. The aim of the impact assessment should not be solely to determine the parameters for release to the receiving environment.</p> <p>The SREIS should detail the scope and parameters of any site specific impact assessment of any likely release to watercourses. It is recommended that the site specific impact assessment at sites where waste water discharge is proposed should include as a minimum:</p> <ul style="list-style-type: none"> • A description of the proposed activity, including: <ul style="list-style-type: none"> — identification of the potential contaminants of concern in the proposed release — description of the characteristics of proposed release (quality/quantity/variability) — confirmation best practice measures have been used to avoid or minimise releases — the location and configuration of the discharge from the proposed activity." 	<p>(Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); and Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>Sections 6 and 7) of the SREIS includes a revised impact assessment outlining potential discharges to waterways.</p> <p>This has been undertaken at the local catchment level to ascertain the aquatic ecosystem values, water quality parameters, flow regime, geomorphology and assimilative capacity of the likely receiving environments. This allows for a prediction of the discharge parameters, to be then refined further with more site specific studies at the EA stage following site selection.</p> <p>A description of the impact assessment; methodology for the potential development of two WTF facilities within the Isaac River Main Channel sub-catchment, is presented in the Surface Water Technical Report (Appendix F, Section 9) and the Surface Water chapter (Section 8) of the SREIS. The methodology also integrates relevant elements of the revised CSG Water and Salt Management Strategy (Appendix D) of the SREIS.</p>
234	<ul style="list-style-type: none"> • A description of the receiving environment as outlined in the surface water section of the draft TOR Section 4.5.1.1 pp27- 	<p>Surface Water chapter (Section 15) and</p>	<p>The supplementary Surface Water Technical Report (Appendix F, Sections 6 and 7) of the SREIS includes a revised impact</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>28; Appendix A at a more local scale for the likely discharge rather than the entire 8,000 km² project area. The description of the receiving environment would include:</p> <ul style="list-style-type: none"> — identification of the waters potentially affected by the proposed discharge — identification of relevant EVs and the water quality objectives (WQOs) to protect or enhance these values — an evaluation of other sources and loads of contaminants in the catchment" 	<p>Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); and Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>assessment outlining potential discharges to waterways.</p> <p>This has been undertaken at the local catchment level (within the Isaac River Main Channel sub-catchment) to ascertain the aquatic ecosystem values, water quality parameters, flow regime, geomorphology and assimilative capacity of the likely receiving environments within that sub-catchment.</p> <p>This allows for a prediction of discharge parameters, to be then refined further with more site specific studies at the EA stage following final site selection.</p> <p>The SREIS also outlines recommendations for subsequent studies at that EA stage when site specific impact assessment can be made to address local flow characteristics and water quality parameters.</p>
235	<ul style="list-style-type: none"> • Predicted outcomes or impact of likely proposed discharges including: <ul style="list-style-type: none"> — establishment of baseline condition (including information on flow regime; water quality of the receiving waters and ecological survey). This information is as required in the TOR Section 4.5.1.1; paragraphs 1-3 p 28; Appendix A — undertake predictive water quality modelling to ascertain the impact from the proposed wastewater discharge (include information on uncertainty of predictions) 	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); CSG Water and Salt Management Strategy (Appendix D), and Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>The supplementary Surface Water Technical Report (Appendix F, Sections 6 and 7) of the SREIS includes a revised impact assessment outlining potential discharges to waterways.</p> <p>This has been undertaken at the local catchment level to ascertain the baseline aquatic ecological values, water quality parameters, flow regime, geomorphology and assimilative capacity of the likely receiving environments. This allows for a prediction of discharge parameters, to be then refined further with more site specific studies at the EA stage following final site selection.</p> <p>The SREIS outlines the recommendations for subsequent studies at that EA stage when site specific impact assessment can be made to address local flow characteristics and water quality parameters.</p>
236	<ul style="list-style-type: none"> • Proposed circumstances, limits and monitoring conditions including: <ul style="list-style-type: none"> — specify any circumstances related to the approved 	<p>Surface Water chapter (Section 15) and Surface Water</p>	<p>The supplementary Surface Water Technical Report (Appendix F, Sections 6 and 7) of the SREIS includes a revised impact assessment outlining potential discharges to waterways.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>discharge</p> <ul style="list-style-type: none"> — end-of-pipe limits based on the approved discharge loads and characteristics — include reporting requirements for release and impact monitoring • In order to establish a baseline condition in areas where a release to surface water is proposed include: <ul style="list-style-type: none"> — at least 12 months of data over 2 seasons of baseline water quality. Refer to Australian and New Zealand guidelines for fresh and marine water quality (ANZECC & ARCANZ 2000) and the Queensland Water Quality Guidelines (DERM 2009) for guidance — a comprehensive assessment of local flow characteristics, including consideration of flooding; duration of no-flow and low flow periods — recommendations on aquatic ecology baseline studies outlined in above recommendations in this submission. 	<p>Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8); CSG Water and Salt Management Strategy (Appendix D), and Surface Water Technical Report (Appendix F) of the SREIS</p>	<p>This has been undertaken at the local catchment level to ascertain the baseline aquatic ecological values, water quality parameters, flow regime, geomorphology and assimilative capacity of the likely receiving environments. This allows for a prediction of discharge parameters, to be then refined further with more site specific studies at the EA stage following final site selection.</p>
237	<p>Data collected from Department of Natural Resources and Mines gauging stations (see link http://www.nrm.qld.gov.au/water/monitoring/pdf/stream_gauging2012.pdf) within, and in the vicinity of, the entire project area have been presented as flow duration curves. The flow duration curves for the six gauging station show that for >10-20% of the time there is low flow or no flow conditions in the streams represented. Key flow characteristics to determine potential impacts to aquatic ecosystems are not detailed. There may be changes to flow caused by CSG activities such as release of CSG wastewater to waters.</p> <p>Key flow characteristics include the minimum, maximum and mean durations of no flow and low flow (baseflow), as well as the</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Hydrology and Geomorphology chapter (Section 9); CSG Water and Salt Management Strategy (Appendix D) and Hydrology and Geomorphology</p>	<p>The Hydrology and Geomorphology chapter (Section 9) of the SREIS includes an environmental flow assessment and hydraulic / hydrological modelling of the likely receiving environments. This allows for a prediction of discharge parameters, to be then refined further with more site specific studies at the EA stage following final site selection. In particular, seasonal variations in flow are covered by a Spells analysis of hydrological flow regimes in the Isaac River, based on data from NRM gauges in the region (see the supplementary Hydrology and Geomorphology Technical Report (Appendix G, Section 2) of the SREIS).</p> <p>The SREIS outlines recommendations for any subsequent studies at the EA stage when site specific impact assessment can be made to address local flow characteristics and water quality parameters.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>mean and maximum duration of falls under baseline (or background/pre-project) conditions. This information is useful in understanding localised changes to hydrology (e.g. from discharges to waters) and potential direct or indirect impacts that may affect aquatic ecosystem health including increased baseflow.</p> <p>The SREIS and EA application should detail proposed releases of CSG wastewater to waters and include information on the hydrological conditions local to the proposed release point(s). This information should include periods and frequency of baseflow and no flow conditions. This information will guide the site specific impact assessment for surface waters from changes in flow caused by CSG activities such as release of CSG wastewater to ephemeral streams.</p>	<p>Technical Report (Appendix G) of the SREIS</p>	
238	<p>A significant increase in baseflow in a stream may lead to</p> <ul style="list-style-type: none"> • altered habitat diversity, availability and connectivity due to local changes in water depth and velocity • altered waterhole refuge persistence • decreased number and duration of no flow spells • increased saturation of banks and bank slumping; increased proportion of CSG water during dry seasons • loss of wetting and drying periodicity and dry season cues – concurrent loss of sensitive species (e.g. drought tolerant species with desiccation phases in the life cycle). <p>Changes to stream hydrology may also cause loss or disruption of reproductive cues, which can lead to altered recruitment opportunities; decreased communication of reproduction and resource availability and an increase in generalist and pest species.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Hydrology and Geomorphology chapter (Section 9); CSG Water and Salt Management Strategy (Appendix D) and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS</p>	<p>The Hydrology and Geomorphology chapter (Section 9) of the SREIS includes an environmental flow assessment and hydraulic/hydrological modelling of the likely receiving environments. This allows for a prediction of discharge parameters, to be then refined further with more site specific studies at the EA stage following final site selection. In particular, seasonal variations in flow are covered by a Spells analysis of hydrological flow regimes in the Isaac River (see the supplementary Hydrology and Geomorphology Technical Report (Appendix G, Section 2) of the SREIS).</p> <p>The SREIS outlines recommendations for any subsequent studies at the EA stage when site specific impact assessment can be made to address local flow characteristics and water quality parameters.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
239	<p>Data collected from desktop and field assessments is broad and not adequate to assess potential local scale impacts from high impact activities such as stream crossings (with pipelines or access roads).</p> <p>The SREIS should detail the site specific information on the fluvial geomorphology local to the proposed activity that may cause significant changes to stream geomorphology such as a stream crossing or release of CSG wastewater to waters to be provided with EA and other approval applications (where relevant). As described above, this information should supplement data already collected for the project.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Hydrology and Geomorphology chapter (Section 9); and Hydrology and Geomorphology Technical Report (Appendix G) of the SREIS.</p>	<p>The Hydrology and Geomorphology chapter (Section 9) of the SREIS includes an assessment of the baseline condition of the likely receiving environments along the Isaac River.</p> <p>The SREIS outlines recommendations for further studies at the EA stage when site specific impact assessment can be made to address local geomorphological characteristics, if required.</p>
240	<p>Data collected from the Department of Natural Resources and Mines gauging stations is presented in figures 7-1 to 7-3. The data from 2007 until the present has been pooled across seasons and flow conditions for electrical conductivity; temperature and turbidity. This means that the proponent has discounted temporal variability within seasons and under different flow conditions for these water quality parameters.</p> <p>The SREIS should present data under different flow conditions and provide data by season in Section 7.2.1.1 pp95-96; Appendix N.</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F) of the SREIS.</p>	<p>The Surface Water chapter (Section 8) of the SREIS includes a revised assessment of quantitative relationships between electrical conductivity and flow for the Isaac River main channel, which is tentatively identified as the receiving environment for treated and untreated CSG water discharge (see also the supplementary Surface Water Technical Report (Appendix F, Section 4.2.2.1) of the SREIS).</p> <p>Quantitative data for EC, turbidity and/or stream flow within the study area is generally limited to wet season periods, due to the highly ephemeral nature of the Isaac River.</p>
241	<p>The EIS describes 22 sampling points across the project area (8,000 km²; several different river basins) with sampling occurring at most sites within just the one season (April and May). This is not adequate to describe baseline conditions in the Bowen Gas Project area. Such large scale surveys are of limited value to supplement local scale water quality impact assessments.</p> <p>The SREIS should outline the conduct and results of further water</p>	<p>Surface Water chapter (Section 15) and Surface Water Technical Report (Appendix N) of the EIS Surface Water chapter (Section 8) and Surface</p>	<p>The Surface Water chapter (Section 8) of the SREIS includes a desktop assessment of water quality data obtained from coal mines within or in the vicinity of the Project area. This data represents a period of time of water quality monitoring long enough to delineate the baseline conditions of the Project area's waterways during both the dry and the wet seasons. The Surface Water chapter (Section 8) of the SREIS also provides the detail for the Project's ongoing water quality monitoring program. Additional, site-specific water</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	quality sampling where activities that have the potential to impact water quality are likely to occur. This water quality monitoring should occur across at least 2 seasons and should, where possible, incorporate different flow conditions (See 0).	Water Technical Report (Appendix F) of the SREIS.	quality studies will be undertaken at a later stage, where necessary.
242	<p>Given the past and current land use in and around the proposed project the mobilisation of pesticides as well as metals in potential impacts during the construction phase.</p> <p>The SREIS should include the following changes to dot point 2; p107; Section Z.4.7.2; Appendix Z (changes underlined and struck through below) to reflect potential impacts from mobilisation of sediments to surface waters during the construction period of the proposed Bowen Gas Project.</p> <p><i>"Sediment exposed or generated during construction may also be carried by wind into surface water bodies. Additionally there is the potential for the presence of high levels of metals and pesticides to be present from in soils that may enter watercourses at levels <u>toxic to aquatic organisms</u> as a consequence of sediment mobilisation"</i></p>	<p>Draft Environmental Management Plan (Appendix Z) of the EIS.</p> <p>Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F, Table 6-1) of the SREIS.</p>	<p>A general assessment of impacts to surface water associated with sediment mobilisation is included in the supplementary Surface Water Technical Report (Appendix F, Section 9) of the SREIS. The levels of sediment-bound pesticides are likely to be very low in green field sites.</p>
243	<p>The proposed performance criteria for surface waters across all project related activities [row 3; Table 21; Section Z.4.7.2; p109; Appendix Z] are insufficient and not measureable.</p> <p>The SREIS should include revised performance criteria to address potential impacts and ensure the performance criteria are measureable.</p>	<p>Draft Environmental Management Plan (Appendix Z) of the EIS.</p> <p>Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F, Table 6-1), and</p> <p>Commitments Update (Appendix O) of the SREIS</p>	<p>Monitoring programs will be implemented to ensure that any impacts on the receiving environment can be measured and controlled. These programs, as outlined in Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F, Table 6-1) of the SREIS, will be designed with greater detail at a later stage in the regulatory process once discharge locations have been confirmed.</p> <p>A full consolidated description of the specific Project mitigation commitments, including monitoring programs, is outlined in the Commitments Update (Appendix O) of the SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
244	<p>Inspection and monitoring commitments are insufficient. The EIS outlines plans to “establish water quality monitoring stations upstream and downstream of discharge points to watercourses as part of a monitoring program to ensure compliance with EA conditions and relevant standards.” [row 4; Table 21; Section Z.4.7.2; p113; Appendix Z]. Monitoring would also need to be conducted around activities that affect water quality; flow and stream morphology such as crossing of streams or large construction areas such as dams and facilities, to ensure that water quality, flow and stream geomorphology are not significantly impacted. There is no commitment to conduct receiving environment monitoring separate from compliance monitoring.</p> <p>The SREIS should expand on monitoring commitments to include monitoring of water quality, flow and stream morphology around activities other than point source discharge to waters, including stream crossings; large construction sites; areas of intensive activity. These activities may be associated with diffuse discharge of contaminants; affect overland flow and cause erosion and sediment all of which could impact water quality, stream flow and stream geomorphology. There should be a commitment to conduct some receiving environment monitoring to assess the general condition of the environment and if required trigger investigations should nominated objectives to protect EVs be exceeded.</p>	<p>Draft Environmental Management Plan (Appendix Z) of the EIS.</p> <p>Surface Water chapter (Section 8) and Surface Water Technical Report (Appendix F, Table 6-1) of the SREIS.</p>	<p>The supplementary Surface Water Technical Report (Appendix F, Section 10) details the Project's ongoing water quality monitoring programs, on the basis of the revised surface water assessment. This report contains an updated erosion and sediment impact assessment, as well as relevant control and mitigation measures.</p>
245	<p>The EIS states that “Constraints mapping does not provide a comprehensive list of all activities associated with the Project and their associated development constraints; its intent is to guide Project planning and development activities, and as a result protect the integrity and the long term viability of environmental values within the Project area through avoidance and impact minimisation.” [Section BB.1; p 1; Appendix BB; Arrow Bowen</p>	<p>Surface Water chapter (Section 15) and Constraints Mapping (Appendix BB, Section 1) of the EIS</p> <p>Surface Water chapter</p>	<p>The Surface Water chapter (Section 15) and Aquatic Ecology chapter (Section 16) of the EIS outlines a number of mitigation commitments for site specific management and monitoring requirements that are incorporated in the Draft Environmental Management Plan (Appendix Z) of the EIS.</p> <p>The SREIS further presents a supplementary Surface Water chapter (Section 8) and supplementary Surface Water Technical</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>Gas Project EIS].</p> <p>Not all impacts to surface waters can be avoided, especially at sites where there is construction and operation of large infrastructure (e.g. gas and / or water treatment hubs); water storage dams; release to surface water. It is also difficult to minimise impacts at each site when the location of large and intensive infrastructure is not yet known. It is unclear how potential site specific impacts to surface waters will be identified and appropriately mitigated, and at what stage these risk assessments will be completed.</p> <p>The SEIS should detail the conduct of appropriate assessment at sites where impacts such as from infrastructure; wastewater release; intensive activity cannot be avoided. The SEIS should state the stage and timing of local assessment and how and when access by public entities would occur. The SEIS should outline detailed commitments on conducting these impacts assessments (the when, where, why and how).</p>	<p>(Section 8); Aquatic Ecology chapter (Section 10); Supplementary Surface Water Technical Report (Appendix F) and Supplementary Aquatic Technical Report (Appendix H) of the SREIS.</p>	<p>Report (Appendix F), along with an aligned impact assessment undertaken for aquatic ecological values in the Aquatic Ecology chapter (Section 10) and Supplementary Aquatic Technical Report (Appendix H) of the SREIS.</p> <p>These assessments further define the processes for all proposed water management options, and provide updated detail of proposed construction and operations associated with water treatment facilities (WTFs) and potential discharge.</p> <p>While the preferred areas of interest for the WTFs have been identified within the Project area, the final locations for WTF's and specific associated discharge points are not finalised at the SREIS stage.</p> <p>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.</p> <p>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.</p> <p>The assessments outline further mitigation strategies and detail the commitment that discharge to water courses will only occur within environmental flow requirements and in accordance with EA conditions and other relevant approvals.</p> <p>A full consolidated description of the specific Project mitigation commitments is outlined in the Commitments Update (Appendix O) of the SREIS.</p>
246	<p>It is not clear in this section whether the intensity of an activity is considered in constraints mapping. While an activity in itself may prove low impact in isolation (e.g. gas well; gathering / flow pipeline; access tracks; etc.), the impact of the activity may</p>	<p>Constraints Mapping (Appendix BB, Section 2) of the EIS</p>	<p>Planning for infrastructure locations, such as well densities (or number of wells that will be placed in an area), flowline routes, and capacity and location of a gas compression or water treatment facility, i.e. "the intensity of an activity" is governed by the</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>increase significantly with intensity.</p> <p>The SEIS should provide information as to how the intensity of an activity is considered in the constraints approach e.g. whether there will be limitations on the number of wells where “limited petroleum activity” is permitted (within High; Moderate and Low constraint areas); what these limitations are, and how the limitations are determined.</p>		<p>constraints mapping no matter what the size or magnitude of the activity. So it is implicit in the application of different constraints areas that all infrastructure and therefore “activity intensity” will be limited by the allowable constraints categories.</p>
247	<p>The EIS does not describe what “site-specific environmental management measures”; “specific environmental management measures” or “standard environmental management measures” [terms used in Table BB-1; Section BB.2; pp2-3; Appendix BB] are. It is not clear what specific controls and mitigation activities will be implemented in low constraint areas that will contain the project activities with the highest impact for the project (e.g. dams; gas hubs; wastewater release; etc.).</p> <p>The SEIS should provide a short description (with examples) in Section BB.2 under Table BB-1 [p2; Appendix BB] of “site-specific environmental management measures”; “specific environmental management measures” or “standard environmental management measures”. The proponent should also indicate within the constraints mapping methodology if any site specific impact assessment will occur, including ground truthing of desktop results with field surveys. This information should inform the “site-specific environmental management measures” [Table BB- 1; Section BB.2; pp2-3; Appendix BB].</p>	<p>EIS Study Impact Assessment chapters (chapters 8 to 28) of the EIS</p> <p>Constraints Mapping (Appendix BB, Section 2) of the EIS</p> <p>Draft Environmental Management Plan (Appendix Z) of the EIS.</p> <p>Supplementary impact Assessment chapters (Sections 5 to 16) of the SREIS</p> <p>Commitments Update (Appendix O) of the SREIS.</p>	<p>Site specific environmental management measures have been presented as mitigation commitments that were derived from the impact assessment studies for the EIS (chapters 8 to 28), supplementary impact assessments for the SREIS (chapters 5 to 16) and incorporated in the Draft Environmental Management Plan (Appendix Z) of the EIS. Standard mitigations are applied to all sites. Where the development is in an area of higher constraint, further mitigation measures will be applied as required.</p> <p>A full consolidated description of all of the specific Project mitigation commitments is outlined in Commitments Update (Appendix O) of the SREIS.</p>
248	<p>The constraints approach uses environmentally sensitive areas (ESAs) – categories A, B and C [Section BB.2.1; p4; Appendix BB] to inform constraints mapping and development restrictions, with the intent of avoiding and minimising impacts to EVs that are considered particularly sensitive to mining or development.</p>	<p>Surface Water chapter (Section 15); Draft Environmental Management Plan (Appendix Z) and</p>	<p>The Surface Water chapter (Section 15) and Aquatic Ecology Chapter (Section 16) of the EIS outline a number of mitigation commitments for site specific management and monitoring requirements that are incorporated in the Draft Environmental Management Plan (Appendix Z) of the EIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>The EIS commits to having no petroleum activities within a Category A ESA. Managing impacts to aquatic flora and fauna or surface water ecosystems outside of these ESAs, or within the ESA buffer zones are fully addressed. Petroleum activities conducted in these areas have the potential to cause significant impacts to water quality, and are high risk to aquatic ecosystems. Detail is required on the scope, and the how and when a local site specific impact assessment will be undertaken.</p> <p>The SEIS should outline local site-specific impact assessments to be conducted for high risk activities (to surface water EVs). Appropriate commitments should be included in the environmental management plan as well as the Surface Water Chapter (15). See previous recommendation for details expected to be addressed.</p>	<p>Constraints Mapping (Appendix BB, Section 2.1) of the EIS</p> <p>Surface Water chapter (Section 8) of the SREIS</p>	<p>The SREIS further presents a supplementary Surface Water Chapter (Section 8) and supplementary Surface Water Technical Report (Appendix F), along with an aligned parallel impact assessment undertaken for aquatic ecological values in the Aquatic Ecology chapter (Section 10) and Supplementary Aquatic Ecology Technical Report (Appendix H) of the SREIS.</p> <p>These assessments further define the processes for all proposed water management options, and provide updated detail of proposed construction and operation associated with water treatment facilities (WTFs) and potential CSG water discharge.</p> <p>While the preferred areas of interest for the WTFs have been identified within the Project area, the final locations for WTF's and specific associated discharge points are not finalised at the SREIS stage.</p> <p>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.</p> <p>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. The assessments outline further mitigation strategies and detail the commitment that discharge to water courses will only occur within environmental flow requirements and in accordance with EA conditions and other relevant approvals.</p> <p>A full consolidated description of all of the specific Project mitigation commitments is outlined in Commitments Update (Appendix O) of the SREIS.</p>
249	"The SEIS should provide a summary in the water sections of the EIS (including Appendices) of the quality of the water to be	Surface Water Quality Technical Report	The quality of raw CSG water is variable as indicated in the EIS. Site-specific assessments of the water quality at confirmed

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>extracted from coal seams. The following extracts from the EIS are vague (see Section 2.2; paragraph 4; p7/24; Appendix AA):</p> <ul style="list-style-type: none"> • pH ranging from 7 – 11 • salinity ranging from 3,000 – 8,000 mg/L TDS with sodium and bicarbonate salts, chlorides and others • suspended solids from the well that will usually settle over time • other ions calcium, magnesium, potassium, fluoride, silicon and sulphate (as SO₄) • trace metals and low levels of nutrients <p>The EIS offers limited information on likely CSG water quality. Water is a major waste product by volume due to CSG extraction. All waste products from the activity should be appropriately characterised so that disposal options and levels of treatment required to protect EVs can be adequately considered. Information on untreated CSG water quality is also required for the impact assessment particularly where there is an intent for waste water release to surface waters.</p> <p>Given the activity is a potential source of hydrocarbons the SEIS should present data on the level and type of hydrocarbons and metals present. This information is important because hydrocarbons such as polycyclic aromatic hydrocarbons (PAH) and many metals can be toxic to aquatic organisms, even at trace levels. The levels of metals should be presented in total and dissolved phases of the untreated CSG water for comparison to water quality guideline values.</p> <p>An increase in nutrients can have indirect impacts to aquatic ecosystems through eutrophication (decrease in dissolve oxygen levels, etc.), and can be aesthetically unappealing for recreational activities. In addition to this, some nutrients are toxic to aquatic organisms; humans and domestic animals (e.g. ammonia, nitrite,</p>	(Appendix F) and CSG Water and Salt Management Strategy (Appendix D) of the SREIS	locations of potential CSG discharge points will be undertaken as part of the EA application process. The discharge rates, timing, frequency and duration of CSG water releases that will be considered as part of the EA process and will address a number of variables including stream flows, stream water quality and CSG water quality. As an overarching objective, discharge of treated or untreated CSG water is considered appropriate only where disposal to receiving waterways will not significantly impact the environmental values of the aquatic environment, in line with legislative requirement.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>nitrate). The SEIS should detail the “low levels of nutrients” [Section 2.2; dot point 5; p7/24; Appendix AA] detected in untreated CSG water.</p> <p>The SEIS should include a revised Chapter 15 and Appendix N including:</p> <ul style="list-style-type: none"> • data on the type of hydrocarbons present and at what concentration ranges • information on the metals that are present and at what concentrations (minimum and maximum values) • information on levels of metals in total and dissolved phases of the untreated CSG water for comparison to water quality guideline values • information on the type and levels of nutrients present in the untreated CSG water • an explanation on the following statement “suspended solids from the well that will usually settle over time”, including information on where the suspended solids will settle out, time scale for the suspended solids to settle out, and likely range of suspended solids levels. 		
250	<p>The EIS states “another option for brine is disposal to a suitably licenced landfill, investigations have confirmed that such facilities exist.” The local facilities listed in section 28: waste management do not include any facility that will be able to accept this type of waste and volumes anticipated (41,000t/annum average). The EIS also states “if commercial volumes of brine exist... then new facilities might be developed to respond to demand”. This leaves the responsibility of new technologies to industry innovation which may be slow to develop this disposal option. Landfill disposal is a likely option as ocean outfall and reinjection are costly with ill-defined environmental impacts</p>	<p>Waste Management chapter (Sections 16.1.2, 16.2 and 16.3) of the SREIS</p>	<p>Stuart Landfill in Townsville City Council is licensed to receive up to 200,000 tonnes per year of regulated waste or a combination of regulated waste and general waste. Potentially, this site would be suitable to receive the residual regulated and general waste streams from the Project, subject to further discussions with Townsville City Council. It is noted that there are several other landfills located in closer proximity to the Project area, which would be preferable to transporting the waste to Townsville, subject to their suitability to accept the types and quantities of waste generated from the Project.</p> <p>Disposal of the waste salt concentrate to landfill is not expected to</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			commence until approximately 30 years after commencing water production. Arrow expect a third party landfill operator will take advantage of the commercial opportunity to develop and operate a suitable regulated waste facility local to the Arrow WTFs.
251	The EIS states these (brine/salt wastes) will be taken to an authorised treatment facility prior to reuse or recycling or a disposal facility as a least preferred option.	Waste Management chapter (Section 16, Table 16-1) of the SREIS	Table 16-3 of the SREIS Waste Management chapter (Section 16) identifies additional waste facilities surrounding the Project area. This table identifies the type of waste accepted and the threshold.
252	The Water Act 2000 requirements as stated in the EIS TOR have applied for some of the tenements included in the BGP area including approval of the Underground Water Impact Report (UWIRs) for ATP1103 and the Surat Cumulative Area UWIR (which includes part of ATP1025 in the south). Any new data presented in the EIS and SEIS should be included in the ongoing operational reporting and review process of these UWIRs. For this EIS EHP officers have not undertaken a comprehensive technical review of the quality of the groundwater data.	Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS	Noted. Under the <i>Water Act 2000</i> (Qld) (Water Act), and in accordance with commitment B260, Arrow is required to develop an Underground Water Impact Report (UWIR), including a water monitoring strategy in the most appropriate manner for the tenures. This may involve an individual UWIR for each tenure within the Project area or a single UWIR for the Project incorporating all tenures within the Project area (excluding those within the Surat Cumulative Management Area (CMA)). New information presented in the SREIS will be incorporated into future UWIRs where relevant.
253	The groundwater impacts model does not consider the impacts of dams. Modelling used may not have the capacity to include dam impacts (e.g. leakage from dams) to the requisite detail. The mitigation and management measures identified specifically for dams should address groundwater impacts.	Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS	The regional groundwater model prepared for the EIS is a tool used to predict groundwater drawdown in aquifers as a result of coal seam gas extraction within the Project area. It is not designed to consider potential groundwater (artificial recharge) impacts from dams. A groundwater model is not required to determine the mitigation measures required to protect groundwater values from impacts related to installation of dams within the Project area. Potential impacts of leaks and spills from existing and future dams constructed for the project are expected to be low to very low. This considers the small volumes of coal seam gas water stored at the surface and the dam design and construction, to relevant engineering standards. The EIS presented a series of commitments associated with the design, construction, operation, decommissioning, and inspection

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>and monitoring of dams. Implementation of these control measures ensures potential impacts on a range of environmental values (e.g., soils, surface water, terrestrial and aquatic ecology and groundwater) are managed appropriately.</p> <p>Commitments B353, B255, and B256 presented in the SREIS detail mitigation measures associated with potential impacts from dams on groundwater values. Specifically, Commitment B353 requires Arrow to consider local groundwater and surface water conditions when identifying sites for CSG water storage dams, treated water facilities and associated brine storage facilities and related storage areas.</p> <p>When a potential location for a dam is identified, Arrow is required to lodge a separate approval to the regulating authority for each dam. Each approval will require the incorporation of general and specific controls to avoid, mitigate or manage threats associated with site specific conditions, including groundwater.</p>
254	<p>The ToR requires that, “Surface water and groundwater quantity and quality fluxes including impacts of the proposal on the water resource, water balance and solute balance” are described. The EIS discusses quantity and quality fluxes but not in detail or with reference to specific quantified site data. The solute balance is also not specifically addressed. Groundwater/ surface water relationships are described as being seasonal with groundwater supply to surface occurring for short periods following rainfall events. This relationship therefore describes the extent to which groundwater dependant ecosystems (GDE) are reliant on that source of groundwater.</p> <p>Further work on groundwater/surface water impacts on GDE will be required for any EA application.</p>	<p>Groundwater and Geology Technical Report (Appendix L, Section 4.7) of the EIS Supplementary Groundwater Assessment (Appendix E) of the SREIS</p>	<p>A conceptual water balance has been prepared and is now included in Section 6 of SREIS. The water balance details basin wide inputs and outputs, including recharge, discharge, groundwater extraction, associated water, and river baseflow. Additional data describing groundwater fluxes is provided in the Arrow Bowen Basin EIS groundwater model report (Appendix M) of the EIS.</p> <p>Groundwater quality data describing aquifer solutes are presented in the Groundwater and Geology Technical Report (Appendix L, Section 4.7) of the EIS. Figure 4-9 provides a groundwater quality map for the Project area. Figure 3-6 CSG Water and Salt Management Overview shows the preferred options for management of coal seam gas water which will be treated using reverse osmosis. The expected recovery of solute (brine) from reverse osmosis is 10% of the volume of water treated i.e., 90%</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>recovery of permeate or treated water. Approximately 4.3 tonnes of salt per megalitre of water treated will be produced. Salt concentrate from brine storage ponds will be disposed to regulated landfill at the cessation of production. See Project Description chapter (Section 3.5) of the SREIS.</p> <p>Additional assessment of GDEs and potential GDEs has been completed since the release of the EIS and is described in detail in the Supplementary Groundwater Assessment (Appendix E, Section 5.3) of the SREIS. The information presented identifies a number of potential groundwater dependent features within and surrounding the Project area, including the potential for groundwater-surface water interaction along some watercourses, which is likely to vary seasonally. Potential impacts on these features are presented in the Supplementary Groundwater Assessment (Appendix E, Section 8) of the SREIS. Impacts to GDEs are generally unlikely because the water table is typically greater than 10 m below ground level which is beyond the reach of root systems, and stream reaches that are known to be reliant on groundwater (at least in part) are beyond the predicted area of groundwater drawdown impact.</p>
255	A spring impact management strategy required by the ToR has not been presented in the EIS as it is claimed the trigger threshold for a spring has not been exceeded based on the modelled impacts of CSG extraction in the EIS.	Groundwater chapter (Section 14) and Groundwater and Geology Technical Report (Appendix L) of the EIS	<p>A Spring Impact Management Strategy (SIMS) was not developed as part of the EIS because no springs have been identified within the Project area and springs located beyond the Project area were not predicted to be impacted by groundwater level drawdown associated with the extraction of coal seam gas.</p> <p>The assessment of potential impacts on springs adopted for the supplementary groundwater assessment aligns with the approach used by the Office of Groundwater Impact Assessment (OGIA) and presented in the Surat Cumulative Management Area (CMA) Underground Water Impact Report (UWIR). This approach was approved by way of the endorsement of the Surat CMA UWIR by the Chief Executive of EHP and the subsequent finalisation of the</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>document in December 2012. This occurred shortly after the completion of the groundwater assessment prepared for the EIS, which was completed in November 2012.</p> <p>Application of this approach to the supplementary groundwater assessment has resulted in the identification of a single 'potentially affected spring', as it is located within the 10 km buffer beyond the 0.2 m drawdown trigger threshold for any underlying aquifer (the buffer zone for drawdown within the coal seam aquifers extends to this area). However, the spring is a recharge spring, which means groundwater supply to the spring is from a local groundwater system, disconnected from the underlying systems associated with the coal measures. Further the source aquifer is assumed to be associated with the outcrop geology (Cainozoic sandy gravel) and no drawdown is predicted at this location in the formations overlying the coal measures, the spring is not actually considered to be impacted.</p> <p>As the spring meets the criteria for being 'potentially affected', despite not actually being considered to be impacted, it requires assessment and management under and approved UWIR. This spring is located to the south of ATP1025, the southern-most tenement within the Project Area. ATP1025 and the potentially impacted spring falls within the Surat CMA, and therefore will be managed under the SIMS presented in the Surat CMA UWIR prepared by the OGIA.</p> <p>For the remainder of the Project area, as outlined in Hydrology and Geomorphology chapter (Section 9.3.4) of the SREIS, should springs be identified in the future within the Project area or where impact is predicted as a result of Arrow's coal seam gas extraction activities, a SIMS will be developed. Arrow will be required to comply with the obligations of the SIMS set out under the <i>Water Act 2000 (Qld) (Water Act)</i> and/or Cumulative Management Area</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			(CMA) Underground Water Impact Report (UWIR) should one be declared. This aligns with commitment B246 which outlines Arrow's commitment to manage potential impacts to groundwater dependent ecosystems including identified spring complexes.
256	Appendices B & C of Appendix M 'Groundwater Model Technical Report' were not included in the packaged EIS received. EHP officers request the Appendices to determine if the proposed model has been peer reviewed (refer to page 32 of the TOR).	Groundwater Model Technical Report (Appendix M) of the EIS	Appendix B (Geological Model and Discretisation Report) and Appendix C (Parameterisation and Calibration Report) of the Groundwater Model Technical Report (Appendix M of the EIS) are available from Arrow's website, www.arrowenergy.com.au . The entire EIS for the Bowen Gas Project is available from this website. In accordance with Section 4.5.2.2 of the Terms of Reference, a peer review of the numerical groundwater model was completed prior to finalisation of the EIS. The findings of the peer review were formally documented in a report prepared by CDM Smith following the release of the EIS. The peer review concluded that the regional groundwater model developed by Ausenco for Arrow's Bowen Gas Project conforms to best industry practice, is fit for purpose, and fulfils the appropriate portions of the Australian Groundwater Modelling Guidelines. A copy of the peer review report is provided as an appendix to the supplementary groundwater assessment report (Appendix E of Appendix E of the SREIS).
257	Appendix AA discusses the future development of a groundwater monitoring network that will be used to determine any impacts to underlying groundwater resources from the operation of infrastructure such as CSG water storage dams. The EIS states that the groundwater monitoring program will establish suitable parameters to be monitored at a suitable frequency and using a suitable methodology. Trigger values for future investigations for measured parameters will be established.	Coal Seam Gas Water and Salt Management Strategy (Appendix AA) of the EIS	Noted. The EIS presented a series of commitments associated with the design, construction, operation, decommissioning, and inspection and monitoring of dams. Implementation of these control measures ensures potential impacts on a range of environmental values (e.g., soils, surface water, terrestrial and aquatic ecology and groundwater) are managed appropriately. Commitments B255, B256, and B353 detailed mitigation measures associated with potential impacts from dams on groundwater values. Commitment B256 states that monitoring bores installed near dams will monitor groundwater levels and relevant water quality parameters on a routine basis.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
			<p>Arrow's strategy for management of coal seam gas water and salt has been updated since the release of the EIS. The updated strategy document is contained in Appendix D of the SREIS.</p> <p>The coal seam gas water and brine/salt management options chosen during the project will be detailed in the Coal Seam Gas Water Management Plan for the Environmental Authority application or amendment application process. The management plan will include detailed coal seam gas water and salt impact assessments and management strategies, including details on monitoring requirements. Establishment of suitable groundwater parameters to be monitored and the appropriate frequency and method of monitoring will be determined when the location of infrastructure is finalised, and site specific conditions are assessed as required in the Environmental Authority application or amendment application process.</p>
258	<p><u>Quality and quantity of air data:</u></p> <p>The assessment of impacts to air based on predictive modelling described in the EIS concluded that no adverse impacts to regional air quality were likely. Limited exceedances of some criteria air pollutants were predicted around the representative local project infrastructure sites. Buffer distances ranging from 1100 to 1400 metres were recommended.</p> <p>The reliability of the assessment is questionable as modelling inputs for both regional and local scale studies were based on limited-site-specific information. No site-specific data were reported. Ambient contaminant information was drawn from historical data for unrelated locations with known NOX emission sources, or estimated using dispersion modelling techniques. As such, the reliability of the information in terms of representing the existing contaminant levels in the project area is questionable. Measuring ambient concentrations would have provided reliable</p>	<p>Air Quality chapter (Section 9) and Air Quality Technical Report (Appendix B of Appendix H) of the EIS</p> <p>Air Quality Technical Report (Appendix B, Sections 4.3.6, 4.4, 7.2 and 7.3) of the SREIS</p>	<p>The air quality modelling results presented in the EIS are based on the datasets that were available at the time. There are currently no known records of existing air pollutants other than PM₁₀ for the Project area. However, in order to produce a conservative estimate of existing air quality, data from areas that are more urbanised and industrially intensive than the Project area have been used. This is a conservative approach. Note that the Project area covers 8,000 km² and the site-specific information can be different for different parts of the study area. Conservative background datasets and conservative estimates extracted from the baseline modelling used in the assessment are believed to be at the upper end of what might be feasible to represent background concentrations at the study area.</p> <p>A further review of available background pollutant datasets and non-Project related sources was undertaken in the Air Quality Technical Report (Appendix B, Section 4.3.6, 4.4) of the SREIS.</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>information that could be used with confidence for the impact assessment, and as a baseline for later studies. It is noted that although information for existing or approved industries was included in the background air quality assessments (see Appendix A of Appendix H), CSG activities were not.</p> <p>The EIS commits to further dispersion modelling studies once detailed engineering and infrastructure location information becomes available. Doing so would commence to address the issues identified if modelling study inputs based on existing operational activities and background air quality measurements are used. A credible assessment of the potential for adverse impacts on air quality could only be undertaken once infrastructure locations and any sensitive receptors have been identified. Such an assessment would result in a revision of the buffer distances proposed in the EIS.</p> <p>The SREIS should detail how detailed local assessments of impacts to air for the major infrastructure and how this information will be used to site and manage impacts. Site specific studies should be completed before application for any approval for the project.</p>		<p>For the baseline and cumulative impact modelling on a regional scale, 68 industrial sources were identified based upon the latest (2011/2012) NPI NEPM and available information on future approved projects. Following the EIS methodology, the highest predicted values of pollutants for the selected meteorological regions were adopted to represent background NO₂ concentrations in the local scale modelling. These values are conservative because they were selected from a location between Newlands Coal and Burton Coal mines, thus representing clustering of Project sources with the existing sources in the area.</p> <p>In the SREIS, the models were updated to include the latest refined engineering and infrastructure information and locations of sensitive receptors. The predicted ground level concentrations of NO₂ and ozone at the identified sensitive receptors were extracted from the regional scale modelling results and presented in the EIS Air Quality Technical Report (Appendix B of Appendix H) and in the SREIS Air Quality Technical Report (Appendix B).</p> <p>The buffer distances for Project sources have been reassessed in the SREIS based on the new information (Air Quality Technical Report (Appendix B, Section 7.2) of the SREIS), however it is acknowledged that upon finalising locations and completion of the detailed design of specific facilities, further modelling will be undertaken by Arrow. Mitigation of impacts based on new predictions is discussed in Section 7.3 of the same report.</p>
259	<p>Section 4.6.2 of the TOR requires that "Where possible, estimates of emission rates should be based on actual measurements from samples taken from similar facilities...". Arrow operates similar facilities in Queensland. No emissions data from those facilities was used in the modelling studies. Emission inputs for local studies used generic emission factors sourced from the literature. The errors associated with the use of generic emission factors</p>	<p>Air Quality chapter (Section 9) of the EIS Air Quality Technical Report (Appendix B, Section 4.3, 5.2 and 5.3) of the SREIS</p>	<p>Arrow's existing facilities are different to the facilities proposed in the Bowen Gas Project. For this reason, a conservative assessment approach which minimises errors associated with spatial variability of the Project impacts within the study area has been taken. The approach is described as follows:</p> <p><u>Source emission factors and engine loadings</u></p> <p>In the SREIS, emissions from Project sources are reassessed</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>and the questionable background contaminant levels add to those already inherent in the air quality modelling tools. Further, modelling air quality impacts are sensitive to site-specific location selection. In all, there is likely to be a degree of error associated with the proposed buffer distances. It is not possible to comment on the level of error as it was not quantified.</p> <p>The SREIS and EA application are required to address the level of error in the air modelling issues identified above. Site specific studies including error estimates should be completed before any approval for the project may be considered.</p>		<p>based on emission factors from manufacturer specifications for typical equipment configurations adopted for the Project under the current development concept. A conservative approach is used in the assessment. For instance, pollutant emission estimates for gas power generation are based on equipment manufacturer specifications for fuel consumption at 75% loading plus additional 10%. Note that emissions for 75% loading are higher than for 100% loading. For further details see the Air Quality Technical Report (Appendix B, Section 4.3) of the SREIS.</p> <p><u>Site-specific location selection</u></p> <p>To minimise errors associated with site-specific location selection the following approach was designed and implemented in both EIS and SREIS assessments.</p> <ul style="list-style-type: none"> • Four meteorological subregions were selected within the study area to represent variability in meteorological conditions affected by a number of factors, including terrain. Local scale modelling was undertaken for each of the selected subregions and cumulative impacts were assessed using conservative baseline concentrations (see the Air Quality Technical Report (Appendix B, Sections 5.2 and 5.3) of the SREIS) for each subregion. • To avoid uncertainties associated with wind direction, ground level concentrations were predicted at model receptors set out at different radial distances from the emission sources and the highest concentrations at each distance were selected, regardless of their angular position. The maximum buffer distance from the predicted values for the four regions was selected as a minimum separation distance to mitigate adverse health impacts from short term NO₂ exposure for the entire Project.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
260	<p>Fugitive emissions were not included in the emissions inventory. Estimates of fugitive emissions from various aspects of the proposal could have been provided, based on measurements from existing operations. Further, that the proponent "Provide a complete list of emissions to the atmosphere..." Volatile organic compounds (VOCs) is included in the TOR list. Methane is a VOC and the primary constituent of coal seam gas. Methane was not included in the list of emissions. Estimates of methane and other VOC emissions could have been provided, based on measurements from existing operations.</p> <p>The SREIS and EA application are required to address fugitive emissions identified above. Site specific studies including fugitive emissions should be completed before any approval for the project may be considered.</p>	Air Quality Technical Report (Appendix H, Section 5.2.3.1) of the EIS	<p>Fugitive emissions were included in the emissions inventory presented in the EIS (see Air Quality Technical Report (Appendix H, Section 5.2.1.3) of the EIS and the Air Quality Technical Report (Appendix B) of the SREIS). A conservative emission estimate of VOCs was adopted for the EIS to represent fugitive gas emissions associated with gas processing facilities, water gathering lines, degassing of feed dams, production well surface facilities and related gas production infrastructure.</p> <p>A similar approach to assess fugitive emissions was adopted for the SREIS assessment. However, in the SREIS the same amount of fugitive emissions was distributed over a much smaller area than in the EIS because during the first two years of the Project only northern and central production areas will be developed. This represents a more conservative approach than the EIS.</p> <p>Consistent with the definition of VOCs provided in the NPI NEPM (http://www.npi.gov.au/system/files/resources/1b6b7496-8e6c-4640-8081-4c640d64547f/files/voc.pdf), VOCs assessed in the air quality assessment are generally defined as any organic compound that participates in atmospheric photochemical reactions. As such methane is specifically excluded from the VOC substance grouping, because it is one of the least reactive atmospheric hydrocarbons, so that its participation in the formation of pollutant photochemical reaction products is minimal.</p> <p>Since the main impact of methane is on a global scale, as a GHG, the impacts of methane emissions were assessed in the Greenhouse Gas Technical Report (Appendix I) of the EIS and the Greenhouse Gas Technical Report (Appendix C) of the SREIS.</p>
261	EIS s22.3 Environmental values - The quality objectives considered have been expressed for both outdoor and indoor levels with an attenuation of 15dB. The outdoor lifestyle in Queensland involves the use of fully open windows as a default	Noise and Vibration Technical Report (Appendix S, Section 3.1, Table 3-1) of the	<p>The EIS outlines quality objectives to protect the specific environmental values and these quality objectives are taken directly out of the EPP (Noise) Schedule 1.</p> <p>The Noise and Vibration Technical Report (Appendix S, Section</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>and as such the resulting sound attenuation used in moving from indoor to outdoor is considered to be in the vicinity of 7dB.</p> <p>The value set in the quality objectives should use an attenuation of 7dB to reflect fully open windows. The outdoor and indoor levels need to be amended to reflect sound attenuation with fully open windows.</p>	EIS	3.1, Table 3-1) of the EIS details the quality objectives from Schedule 1 of the Environmental Protection (Noise) Policy, 2008.
262	<p>"Appendices S Section 5 – Acoustics Modelling – Mitigation packages - The mitigation package description should be presented in more detail. Acoustics enclosures are not only about the thickness of the material but also how it is constructed e.g. how the panels are mounted and description of the design of the air intake and outlet as well as the doors seals.</p> <p>As an example, it is difficult to match the attenuation from an enclosure for both the air inlet and outlet. The model provided shows the same attenuation in any direction.</p> <p>Provide further information on</p> <ul style="list-style-type: none"> • the intended design of an enclosure as well as the air inlet and outlets attenuation. Expected insertion loss should be given for the air inlet and air outlet for each package as a function of frequency • details of the construction assembly together with the design of the air intake and air outlet • the design detail for the mufflers and air filters • the flow rate and flow temperature for which the insertion losses were given. 	Noise and Vibration Technical Report (Appendix L, Section 6.1) of the SREIS	<p>The Noise and Vibration Technical Report (Appendix L, Section 6.1) of the SREIS provides further clarification that the noise mitigation treatments are indicative only, with no detail of sound directivity included.</p> <p>Detailed design of acoustic treatments during Project implementation will be based on actual procured plant noise emissions, including separate noise emissions and noise source directivity from mechanical components such as air intake / outlet and exhaust with regard to the location of potential receptors.</p>
263	<p>Table 5-14 lists construction equipment. The description of equipment to be used does not refer to the size of equipment. While the model number or make of equipment may not be known at this EIS stage, the choice of the equipment must be assumed or made on the size to carry out the work. For example a 30 tonne</p>	Noise and Vibration Technical Report (Appendix L, Table A-1 of Appendix A) of the	The SREIS includes an amended Table 5-14 (see the Noise and Vibration Technical Report (Appendix L, Table A-1, of Appendix A) of the SREIS) to provide further description around size of equipment likely to be used for the Project. During detailed design the level of attenuation for specific plant at specific locations will be

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	excavator should be described with the corresponding sound power level for a 30 tonne attributed accordingly. The SREIS should include an amended Table 5-14 to describe the likely sizing of equipment and use the corresponding sound power level corresponding to the equipment size.	SREIS	engineered and established, and subsequently provided in the EA application.
264	Description of environmental values - Sensitive receptors are not identified by the EIS due to the claimed uncertainty surrounding the location of activities. There is a sensitive receptor map in the Air Quality report (fig 3-2). The sensitive receptors identified for the Air Quality report should have been used in the Noise & Vibration (NV) report in order to meet the TOR even though noise monitoring wasn't undertaken at all locations. Include a map of potential noise sensitive receptors in the SREIS and estimate noise impacts together with noise management details to be implemented.	Noise and Vibration chapter (Section 22.6.2) of the EIS Noise and Vibration chapter (Section 14) of the SREIS	The Noise and Vibration chapter (Section 22.6.2) of the EIS states: "Arrow will undertake the selection of locations for production facilities and wells on the basis of many criteria including environmental and engineering constraints, and the setback distances for noise described in Section 22.5 of this report will be one of them [B365]. This is consistent with the EPP (Noise) management hierarchy whereby avoidance must be considered first." See the Noise and Vibration chapter (Section 14, Figure 14-1) of the SREIS for a map of potential noise sensitive receptors.
265	There are several general statements about the background noise levels in Section 22 of EIS (p22-5) and N&V report (s3.2.3.1) that suburban noise is observed near Blackwater, Moranbah, Middlemount, Dysart, Coppabella and Glenden. Blackwater and Coppabella are the only towns where noise monitoring was undertaken (ML6 & 3 respectively). There is no clear statement about what appears to be personal observations (the section is called 3.2.3.1 Observations) or from review of monitoring data. Provide further justification for the comments referred to above as part of the SEIS.	Noise and Vibration Technical Report (Appendix L) of the SREIS	Further clarification is provided in the SREIS on personal observations from review of monitoring data in the Noise and Vibration Technical Report (Appendix L) of the SREIS.
266	There are repeated references to Coppabella and Middlemount although these towns are not marked on the maps (Fig 22-1 EIS & Fig 3-1 NV Report). Descriptions of monitoring locations in tables 22-1 of EIS, and 3-2 & 3-4 of the NV Report should contain clarifications and descriptions of where the monitoring was	Noise and Vibration chapter (Section 14) of the SREIS	The SREIS includes the proposed amendments to Figures 22-1, and Tables 22-1 and 22-2 of the EIS Noise and Vibration chapter (Section 22); and Figure 3-1 and Tables 3-2 and 3-4 of the Noise and Vibration Technical Report (Appendix S) of the EIS. These revisions are included in the Noise and Vibration chapter

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>undertaken e.g. within XX town, 2 km from XX town, next to XX Hwy, no industrial or road infrastructure visible. In the NV Report table 3-2 description of location should flow into notes about noise features in table 3-4.</p> <p>Provide further justification for the comments referred to above as part of the SREIS.</p>		<p>(Section 14) of the SREIS.</p> <p>The SREIS includes an amended version of EIS Figure 22-1 showing the towns of Middlemount and Coppabella and Table 22-1 has been expanded to provide a description of monitoring locations including approximate distances to towns and/or roads / railways / industry, and a general description of the acoustic environment including noise features at each monitoring location.</p>
267	<p>"Although required in the TOR, there is no discussion of vibration in the existing environment sections (s3.2 of NV Report & s22.3 of EIS).</p> <p>TOR s4.7.2 requires that "the assessment of noise impacts should refer to the EHP guideline – Prescribing Noise Conditions for Environmental Authorities for Petroleum and Gas Activities, and include matters raised in the document The Health Effects of Environmental Noise – Other than Hearing Loss published by the Health Council, 2004 (or later editions), ISBN 0 642 82304 9" The Health Council document is only referred to in relation to the environmental values in s3.1 of NV Report and not in the EIS main text at all.</p> <p>TOR s4.7.2. paragraph 3 requires "assessment must include an assessment of noise on any nearby protected areas". No reference is made to protected areas or fauna in the NV Report of s22 of EIS.</p> <p>Provide a response to the issues raised above as part of the SREIS.</p>	<p>Noise and Vibration Technical Report (Appendix L, Section 5.1.2)</p> <p>Noise and Vibration Technical Report (Appendix L, Section 5.4) of the SREIS</p> <p>Terrestrial Ecology Technical Report (Appendix P, Sections 6.6.4 and 7.8.4) and Terrestrial Ecology chapter (Section 17.5.3.2) of the EIS</p>	<p>A discussion of existing sources of vibration in the locality of the Project has been included in the SREIS s14.4.3 and in the Noise and Vibration Technical Report (Appendix L, Section 5.1.2).</p> <p>The enHealth document has been referenced and discussed in the Noise and Vibration chapter (Section 14.4) of the SREIS.</p> <p>Noise impact on protected areas and mitigation and management measures are discussed in Terrestrial Ecology Technical Report (Appendix P, Sections 6.6.4 and 7.8.4) and Terrestrial Ecology chapter (Section 17.5.3.2) of the EIS.</p>
268	<p>Description is broad for this stage in the project planning. Further details on specific environmental values and proposed mitigation and protection commitments for major infrastructure required for the initial phase of project delivery will be required before the EIS process is completed.</p>	<p>Project Description chapter (Section 3.2) of the SREIS.</p>	<p>The updated SREIS Project Description chapter (Section 3) presents indicative locations of Project infrastructure.</p> <p>The revised SREIS Project Description chapter (Section 3.2) details the changes to the development plan and sequencing of the Project. This outlines the project development phasing and a</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	Provide more specific details for major infrastructure as part of SREIS.		description, and likely general locality of major infrastructure. Management prescriptions for potentially impacted environmental values have been detailed in the EIS. The SREIS will elaborate on the specific field management protocols, site scouting and survey methodologies. Site specific EM Plans will be prepared for the associated EA applications to implement appropriate and relevant mitigation and management measures for site specific values, following finalisation of major infrastructure locations.
269	<p>Incomplete incorporation of Category C Environmentally Sensitive Areas (ESA) as per EHP conditions for petroleum and gas activities - separation of areas into:</p> <ul style="list-style-type: none"> • 'no-go areas' which roughly align with Category A ESAs as well as locations of towns, and sensitive receptor stes • 'high constraint areas' which roughly align with endangered regional ecosystems • buffers for sensitive receptors • buffers of no-go areas • Cat B ESAs and some buffer zones • attenuation areas due to noise impacts does not appear to include economic constraints (other than where not feasible?). Critically endangered and threshold ecosystems are also not included as part of the definitions for the Constraints Mapping. <p>The SREIS should include critically endangered and threshold ecosystems not included as part of the definitions for the Constraints Mapping.</p>	Terrestrial Ecology chapter (Section 17) and Technical Report (Appendix P) of the EIS.	<p>The Terrestrial Ecology chapter (Section 17) of the EIS details the measures proposed for environmental protection of high-value environmental areas. The chapter stipulates that for category C ESAs, including Arthur's Bluff State Forest and gazetted nature reserves, disturbance will be avoided where possible.</p> <p>Both the Terrestrial Ecology chapter (Section 17) and Technical Report (Appendix P) of the EIS note that two threshold REs are found within the Project area, and that no critically limited REs are present (although three threshold REs are identified in Table 17-5 of the EIS chapter).</p> <p>The SREIS provides an updated Terrestrial Ecology chapter (Section 11) that clarifies the presence and number of threshold and critically limited REs as well as providing revised threshold and critically limited RE mapping.</p> <p>It should also be noted that all cited buffer zones are based on the current regulatory conditions; however these may be subject to change in future. The buffers that will be implemented for the project will be in line with the regulatory requirements at the time of implementation.</p>
270	Information included in constraints analyses is stated as being largely based on publicly available government data. Mention is	Terrestrial Ecology chapter (Section	The detailed survey methodology for the targeted field surveys undertaken for the ecological assessments is provided in the

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>made of some field surveys, but no details are provided about how results of field surveys have been incorporated into the constraints mapping framework. No details of methodologies for field surveys are provided e.g. reference to the methodology used to determine 'correct' vegetation type.</p> <p>SEIS to provide details of field survey methodology to be undertaken, and how that information will feed into the overarching Constraints Analyses framework for project development.</p>	<p>17.2.4); Terrestrial Ecology Technical Report (Appendix P) and Constraints Mapping (Appendix BB, Section 7) of the EIS Terrestrial Ecology charter (Section 11) of the SREIS.</p>	<p>Terrestrial Ecology chapter (Section 17.2.4) of the EIS.</p> <p>All ground truthed vegetation survey data and ground truthed RE mapping, as provided in the Terrestrial Ecology Technical Report (Appendix P) of the EIS is incorporated into the constraints mapping layer for Natural Values / Terrestrial Ecology.</p> <p>To assist in mitigating impacts, pre-clearance surveys, coupled with refined vegetation mapping at an appropriate scale, will be undertaken prior to development to quantify the presence of EVNT species and habitats. Following further field survey and revised mapping, possible habitat may be revised to "habitat known" or can be revised to areas in which the absence of EVNT habitat is known.</p> <p>The methodology for undertaking these surveys will be implemented through Arrow's Ecological Impact Assessment Procedure (99-H-PR-0081), Fauna Survey Guideline (99-H-GDL-0061) and Ecological Survey Guideline (99-H-GDL-00091).</p> <p>This process is further detailed in the Terrestrial Ecology chapter (Section 11) of the SREIS.</p>
271	<p>Appendix BB and Section 7 of the EIS - These sections describe the maintenance of a project GIS, a live system which is intended to be periodically updated based on Australian and Queensland government GIS data as well as results of ecological and pre-construction clearance surveys and other EIA processes. No details are provided on how formation of a changed project GIS constraints layer will be used and communicated to other working units within the proponent's company, including contractors.</p> <p>SEIS to provide further details on how the project GIS is updated and how it will be used in all relevant areas of the environmental management of the proposed project.</p>	<p>Constraints Mapping (Appendix BB, Section 7) of the EIS</p>	<p>Arrow utilise a central single GIS database of constraints mapping and Project planning, This GIS database is the basis for distribution of relevant information to relevant end users, from development engineers during concept select through to execution of works and operations.</p>
272	<p>Section Z.3.3.4 discusses the use of aggregate dams for storage of water prior to its transfer to the pre-treatment stage of the water</p>	<p>CSG Water and Salt Management Strategy</p>	<p>As outlined in the CSG Water and Salt Management Strategy (Appendix D, Section 4.2) of the SREIS, water production profiles</p>

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	<p>treatment facilities. However, no mention is made as to how long this water is to be stored prior to treatment. Given the State government's position on evaporation dams (see http://www.ehp.qld.gov.au/management/non-mining/csg-water.html)</p> <p>there should be further information on the holding time expected and estimates of the rates of evaporative loss of CSG water form storage in the accompanying diagrams.</p> <p>Include holding time and evaporative loss estimates in the SEIS. The SEIS should also present an update on CSG water management for the project in line with the recently released Queensland CSG water policy.</p>	(Appendix D) of the SREIS	<p>and assumptions for well counts are obtained from reservoir engineering based on current and proposed field development plans. Dynamic reservoir modelling and the development of low, mid and high case production scenarios for both gas and water are developed from this information.</p> <p>The resulting water balance models and the water forecasting process are maintained by the Arrow Water Operations Team and used for short, medium and long term planning of water management and supply infrastructure, including water supply and end use. The model simulates expected dam storage capacity based on forecast production rates, climatic data and anticipated water usage rates. The following items are incorporated into the model:</p> <ul style="list-style-type: none"> • Forecast water production; • Dam storage capacity, surface area and current levels; • Rainfall and evaporation based on dam surface area and local historical meteorologic conditions; • Evaporation factors comprised of surface area and salinity factors; • Beneficial use off-takes and disposal; and • Treatment capacity, including allowances for plant availability and recovery.
273	<p>Statement that RO has been selected as the preferred treatment technology for the CSG water expected to be produced within the project area. The Queensland CSG water policy provides for other water treatment technologies that may be available for the treatment of water of the expected quality for reuse or discharge for downstream uses.</p> <p>The SEIS should detail why RO has been selected as the preferred treatment technology, including a comparison of other</p>	CSG Water and Salt Management Strategy (Appendix D, Section 4.4.2) of the SREIS	As outlined in the CSG Water and Salt Management Strategy (Appendix D, Section 4.4.2) of the SREIS, Arrow has undertaken a comprehensive assessment to evaluate the various technologies available for the treatment of CSG water. RO has been selected as the treatment technology of choice for CSG water.

Section 22 Department of Environment and Heritage Protection Submission Responses

Issue Number	Submission / Issue	Reference	Response
	technologies and why they have not been preferred. The SEIS should address this issue as part of an update on CSG water management for the project.		
274	Some terminology may have changed since the commencement of amendments to the EP Act. The SREIS should identify and address any change in approvals due to EP Act amendments (including greentape reduction).	Project Approvals chapter (Section 2) of the SREIS	A revised Project Approvals chapter (Section 2) detailing the recent changes resulting from the Greentape Reduction Act has been developed for inclusion into the SREIS.
275	The definition of standard criteria has changed since the commencement of the amendments to the EP Act dealing with greentape reduction. This Appendix should be updated in the SREIS to reflect changes to the standard criteria.	Project Approvals chapter (Section 2) of the SREIS	Standard criteria is currently being reviewed and amended in line with legislative changes. An assessment of Project activities will be undertaken against the current standard criteria at the EA application stage. A revised Project Approvals chapter (Section 2) detailing the recent changes resulting from the Greentape Reduction Act has been developed for inclusion into the SREIS.