Queensland Murray-Darling Committee Inc. Submission on the Inquiry into management of the Murray Darling Basin – impact of mining coal seam gas

18 July 2011

Submission to:

Committee Secretary
Senate Standing Committees on Rural Affairs and Transport
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This submission is presented by the Chief Executive Officer, Geoff Penton, on behalf of the Queensland Murray-Darling Committee Inc. (QMDC). QMDC is a regional natural resource management (NRM) group that supports communities in the Queensland Murray-Darling Basin (QMDB) to sustainably manage their natural resources.

1.0 Background

QMDC's internal policy, *Mining and energy industry impacts on natural resources in the Queensland Murray-Darling Basin Policy Final Draft 03 December 2009* (the QMDC Mining and Energy policy) provides a framework for QMDC's submission to the Senate Standing Committees on Rural Affairs and Transport (the Standing Committees). This policy document has been prepared by the QMDC in consultation with those communities, organisations and stakeholders QMDC is working with in the region. It is currently being reviewed to reflect QMDC's growing knowledge on the CSG mining activities and infrastructure. The policy's purpose is twofold:

- to address the impacts of the mining and energy industry (the industry) on the Queensland Murray-Darling Basin's natural resources; and
- to provide a framework for best practice and policy decision-making, risk management and responses to the specific and cumulative impacts of the industry on the QMDB's natural resources.

Funded by:

QMDC is supportive of the need for the mining and energy industry, recognising the potential for economic and social benefits to the region and State. QMDC has taken this position however on the basis that the industry must primarily avoid, effectively manage or mitigate impacts on the region's natural resources and environment.

Sustainable social and economic benefits are reliant on development in the QMDB which advances and supports a regional economy .There are many facets of this region's economy and social well-being that rely on a healthy natural environment including agriculture, tourism and natural amenity for quality of life.

In response to existing and emerging issues relating to both site specific and cumulative impacts on natural resources from CSG mining, given the stage of industry, this submission primarily urges the Standing Committees to make recommendations that serve to prevent adverse effects on the QMDB's natural resources and the communities of this region.

1.1 Key risks to natural resources

QMDC has identified the key risks to natural resource assets in the regional NRM plan.

The below named natural resource assets are identified as being at risk to the impacts caused by activities and infrastructure proposed by CSG projects:

- **Water (surface and groundwater)**
- **Vegetation & Biodiversity**
- **Land and soils**
- **Air**

The following sections summarise some of the key risks to natural resource assets caused by CSG mining proposed activities and associated infrastructure.

1.1.1 Adverse impacts to the extent, value and function of the region's biodiversity through further fragmentation due to vegetation clearing.

1.1.2 Adverse impact on water quality in the region's catchments such as the pollution/sedimentation of water ways (aquifers, rivers, creeks and wetlands) caused for example by the erosion; leakages from storage ponds and dams; wastewater & effluent discharge or irrigation etc.

1.1.3 The erosion of floodplains and creek banks; slumping; diminished connectivity between river channels and off-stream wetlands; and the modification of river, stream and floodplains flows caused by creek, and river diversions, waste water discharge to streams and floodplain levy banks diverting flows.

1.1.4 Salinity risks associated with the use of wastewater when used for dust suppression, cleaning coal or irrigation and the damage increased salinity or other toxins may cause soils, farming land, creeks, rivers and wetlands.

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1.1.5 Conflicting land use where CSG activities and associated infrastructure may use or permanently alienate areas of good quality soil (agricultural land) that are not able to be rehabilitated causing productive farming land or Strategic Cropping Land to be lost forever.

1.1.6 Weed seed spread from machinery and other vehicles.

1.1.7 Adverse impact on air quality caused by greenhouse gas emissions, dust, noise etc

1.1.8 Contamination of soil, waterways, aquifers caused by CSG operations and discharge

1.2 Recommendation

That the below flow chart taken from the QMDC Mining and Energy policy is viewed as an appropriate decision making framework for the Senate Standing Committees to:

- **address site specific and cumulative impacts on air, land, water, vegetation and biodiversity;**
- **prevent impacts within determined thresholds; and**
- **identify minimisation and mitigation options**

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Key Asset Area

Prevention

Regional impact

1. Prevent adverse impacts to the extent, value and function of the asset across the Queensland Murray-Darling Basin.

⇩

2. Manage the cumulative impact of individual site activities and associated infrastructure on the extent, value and function of the asset across the Queensland Murray-Darling Basin.

⇩

Individual site impact

3. Prevent the direct impact of individual site activities on the asset.

⇩

4. Prevent the indirect or off-site impact of individual site activities on the asset.

⇩

5. Where impacts of individual site activities cannot be prevented they are:

⇩

a. Not permitted where the impact is not acceptable, includes enforcing existing legislation where it adequately protects the asset.

⇩

b. Within determined threshold limits for the asset, defining the point at which the impact is no longer acceptable.

Minimisation

⇩

c. Minimised through appropriate planning, design and execution.

Mitigation

⇩

d. Offset – to be clearly defined and appropriate.

⇩

e. Actively managed.

⇩

f. Rehabilitated – to previous state and be clearly defined and appropriate.

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2.0 The sustainability of water aquifers and future water licensing arrangements

2.1 Water legislation

QMDC supports the relocation and expansion of the existing regulatory framework for managing the groundwater impacts of the petroleum industry from the *Petroleum Act 1923* and *Petroleum & Gas (Production and Safety) Act 2004* (Petroleum Legislation) into the *Water Act 2000* (Water Act).

QMDC believes mechanisms by which the currently amended Water legislation attempts to deliver on the commitment in the LNG Blueprint to protect groundwater resources are both commendable and inherently flawed.

QMDC asserts that legislation that allows a petroleum tenure holder's right to take unlimited groundwater should be amended. Any use or extraction of groundwater must be managed to not only protect bore owners and natural spring ecosystems which are comparatively vulnerable in these circumstances but also to protect the QMDB, and the Great Artesian Basin (GAB). QMDC submits that a petroleum tenure holder's right to take underground water as part of their authorised petroleum activities because it is allowed for in the Petroleum Legislation is inherently flawed because that right has no limit placed on it and conflicts with the as of right of access for stock and domestic supply in the Water Act. The tenet that water is consequential to the extraction of petroleum or gas allows for unsustainable practices that should not be perpetuated in light of this region's current state of environment.

QMDC submits that the Senate and/or Water legislation should promote and encourage sustainable use of GAB water and ensure that practices relating to the exercise of water "rights" by CSG and petroleum projects will ensure high-quality stewardship of GAB resources; minimise disturbances to GAB resources; and protect GAB resources for future human and environmental purposes.

GAB water allocations have been reviewed as part of the GAB WRP. The CSG mining industry now proposes to take large quantities of water from the coal seams which are aquifers. Results of modelling presented by CSG companies have indicated that the removal of water from the coal seams will have no measurable effect on the GAB productive capacity. It is suggested that this is not a safe assumption on the grounds that:

- Time frames for impacts may be longer than those presented in model outputs – ie decades to centuries rather than the years to decades described in economic, production and impact assessments presented in public forums. Even if impacts are likely to be over extended periods, the public deserves to know what the likely impacts are so they can assess the merits of ongoing development.
- Cumulative impacts are only now being assessed via overall modelling and the computer models being currently used will need ongoing verification through actual monitoring.

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The Water Act framework although it will manage impacts on water supply bores and springs from the extraction of groundwater by coal seam gas and petroleum tenure holders, should also clearly define when activities or the level of impacts affecting groundwater resources and other sources of water is too high, requiring a threshold to be met.

QGC for instance have stated in their Environmental Management Plan for the Central Project Area that modeling predicted that for a production life of 40 years, it would take from cessation to 75 years post-production for recovery to commence in various aquifers (*See QGC's Environmental Authority Amendment Application PEN 100020207, EMP, July 2010 at p.213*)

Overall QMDC believes that CSG water management should be subject to the Murray-Darling basin Water Plan.

The National Water Initiative could include a focus area on monitoring to ensure a range of water quality monitoring activities including the Water Commission to be coordinated. This may include ensuring that BOM has access to all surface and groundwater monitoring.

2.2. Pollutant risks and surface water aquatic ecosystems

The Australian government should require bioaccumulation or ecotoxicity assessment of any CSG water intended to be released to the environment for potential impacts on EPBC Act listed species. QMDC suggests that the GAB be listed under the EPBC Act as an environmental asset and CSG and coal mining (open cut and undeground) as a threatening process.

For many of the pollutants listed in Environmental Authorities (EA) applications and the associated conditions once an EA is granted the bioaccumulation or ecotoxicity of the pollutants in surface water systems is poorly understood. This also applies to RO treated water and the resultant waste chemicals.

Re-using CSG water does not remove the risk. Scientific evidence and certainty does not exist to assure beneficial use or re-use of CSG water is not causing any inherent future risks.

2.3 Risks to groundwater quality and quantity

110 bores in the Gubberamunda and Springbok Sandstone aquifers have been identified by Origin's own assessment of the cumulative impact (not included in their EIS) in relation to Origin tenements as currently or likely to be impacted exceeding the state trigger thresholds (Origin presentation to QMDC on 15 July 2010).

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The assumption there is minimal risk associated with inter aquifer water transfer due to CSG activities is not a safe assumption on the grounds that:

- Time frames for impacts may be longer than those presented in model outputs – ie decades to centuries rather than the years to decades described in economic, production and impact assessments presented in public forums. Even if impacts are likely to be over extended periods, the public deserves to know what the likely impacts are so they can assess the merits of ongoing development.

- Modelling presumes initial and ongoing integrity of all aquifers and aquacludes.

The initial integrity and homogeneity of geological structures should be increasingly better informed by ongoing drilling information. It is important that this information is reviewed regularly from a system integrity risk angle as well as from economic/production perspectives.

Risks associated with aquifer and aquaclude integrity being compromised by drilling, fraccing and repatriation activities is not accommodated in any modelling results presented in public forums. It is known that on two occasions aquifers neighbouring the coal seams were compromised and that remediation only occurred after public alerts were raised. It must be assumed that aquifers have been compromised on other occasions but that they have been undiscovered, undisclosed, or possibly, remediated without public disclosure. With 10s of thousands of holes to be drilled in the region it is surely worth acknowledging and quantifying the risks to groundwater quantity associated with aquifer and aquaclude integrity being compromised by drilling, fraccing and repatriation activities.

QMDC does not support the re-injection of associated water into aquifers because it has not been able to be done successfully during current trials and there is no peer reviewed scientific data or certainty that there will be no impact to the water quality of receiving or other connected aquifers.

In areas where the controversial hydraulic fracturing (fraccing) process is used, there is serious and unquantified risk of groundwater being contaminated, either by fraccing fluids, by saline associated water contaminated with the chemicals naturally present in the coal seam entering a freshwater aquifer, and / or by the gas itself.

The CSG industry frequently states that the chemicals in fraccing fluids are found in everyday, household items on any supermarket shelf, *implying* but never actually stating that this therefore makes them safe. According to APPEA, 23 chemicals are used in the fraccing process in Australia.1[5] The National Toxics Network has called for a moratorium on the use of fraccing chemicals on the grounds that only 2 of 23 chemicals used in the process have ever been tested.

1[5] http://www.appea.com.au/images/stories/mb_files/APPEA_fraccing_chemicals.pdf

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An estimated 30% to 70% of the fraccing fluid resurfaces, bringing with it toxic substances naturally present in underground oil and gas deposits.

QGC state that drilling activities have the potential to impact on the aquifers through a loss of containment of drilling fluids causing contamination (*See QGC's Environmental Authority Amendment Application PEN 100020207, EMP, July 2010 at p.214*). The disposal of fraccing chemicals to the exploration and appraisal ponds required for pilot production testing (*See QGC's Environmental Authority Amendment Application PEN 100020207, EMP, July 2010 at p.20*) could pose risk of contamination from the construction of ponds and associated gathering lines.
Overall QMDC wants CSG operations particularly fraccing as a threat to the GAB and therefore come under greater Australian government scrutiny.

2.4 Total water balance

An underlying issue is that there does not seem to be a total water balance and total salt (pollutants) balance approach to management of water from CSG activities within the QMDB and Surat Basin. If such an approach has been attempted details have not been disclosed for public consideration. There are very real implications with an increase in salt additions to basin streams for Basin salinity targets, environmental watering plans and SDLs in the event that dilution flows are required.

In the Queensland part of the MDB, most CSG is extracted from the Walloon Coal Measures, an aquifer of the GAB. Although parts of the GAB underlie the MDB, GAB water is not part of the forthcoming MDB Plan. How water will be accounted for and managed when it 'straddles' two different water plans?

Massive extraction and drawdown of GAB aquifers is relevant because in some parts of the MDB, communities, business operators and landholders currently dependent on GAB water and may need to access MDB water if their existing supplies are depleted.

Connectivity between Walloon Coal Measures and shallower Condamine Alluvium presents clear implications for MDB water resources and the water licensing and accounting arrangements that need to accompany the MDB Plan.

Overall all CSG and coal mine water impacts should come under the Murray-Darling Water Planning process.

2.5 Aquatic Ecosystem Value Issues

ACAs and AquaBAMM product can be used to guide environmental values assessments and management impacts. This will assist natural resource management practices when the QMDB AquaBAMM is released. QMDC supports the productive use of aquatic biodiversity assessments in the context of CSG mining operations.

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2.6 Water Monitoring Issues

In many areas where CSG production occurs, comprehensive baseline data is not available. This is essential for adequate assessment of potential impacts to groundwater resources.

QMDC submits that it should be a mandatory requirement that all CSG companies use a set monitoring and data collection methodology that is independently reviewed and regularly evaluated against community values and regional guidelines on, for example, water quality. Raw data and methodology should be made public per evolving water data transfer protocols as they progress under the Federal Government's Water Regulations Act. This should assist in filling gaps in the identified need to have baseline data as per the above paragraph.

QMDC supports the requirement for draft underground water impact reports to be published by QWC for public consultation. However in order for this to be valuable it requires statutory timeframes that allow for real time disclosure and consultation.

Monitoring plans are integral to EMPs and seem to be well developed albeit with some detail from DERM often being required in the EA application process. However there is no evidence of independent access to monitoring data or of links to development and conformity to local water quality guidelines. The plethora of data currently being collected by CSG companies dwarfs the currently available public data used for assessing norms and for water quality and aquatic ecosystem health condition and trend assessments.

2.7 Recommendations

2.7.1 That petroleum tenure holders should not be granted an EA or permitted to start new projects or production until they have addressed all of the impacts of groundwater extraction, including for example the use of water for staff camps and the subsequent wastewater disposal process associated with these camps.

2.7.2 That camps should be required to recycle water and that septic tanks for a temporary industry are an unacceptable practice.

2.7.3 That landholders' existing and new water supply bores are protected from the impact of the extraction of underground water by not only requiring petroleum tenure holders to take a proactive approach to entering "make good" agreements with bore owners but also by recognizing that "make good" arrangements must clearly outline how they will address the recharge of an aquifer after post production given the time span it may take to do so.

2.7.4 That not only natural springs are protected from groundwater extraction impacts but also other waterways such as wetlands and streams. Legislative protection must also be afforded to Ramsar listed wetlands and feeder streams.

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2.7.5 That the management of cumulative impacts on underground water caused by petroleum tenure holders is addressed by establishing thresholds beyond which there are unacceptable impacts that must be avoided.

2.7.6 That all water to be accounted for by CSG companies and be subject to Water Resource Planning and associated conditions regulating changes to and allocation of overland flow, surface water and groundwater flow systems.

2.7.7 That activities where the impacts are known to exceed the state trigger thresholds and cause decline for stock and domestic or irrigation supply bores and which will impact on groundwater quality, quantity and pressures in the Great Artesian Basin in relation to its associated springs not be permitted.

2.7.8 That threshold limits for pollutant concentrations and discharge volumes must be set so that unacceptable pollutant load risks are not permitted for both individual site and cumulative impacts of the whole CSG industry.

2.7.9 That CSG companies should not be exempt from responsibility for water after on selling but instead should have responsibility from "cradle to grave" for the water and associated pollutants.

2.7.10 That water "by-products" must be disposed of in a manner whereby 'disposal' is defined against specific criteria and limitations that mitigates the risks associated with the storage, transport, destination, and cumulative and long-term impacts of such volumes of water. Specific criteria to include but not be limited to the following:

- **does not result in a contaminated site**
- **does not permit untreated CSG water emergency disposal**

2.7.11 That risks from drilling, fraccing and repatriation activities to groundwater quantity associated with aquifer and aquaclude integrity be quantified by CSG companies.

2.7.12 That the collation of data by the Queensland Water Commission (QWC) reports on the cumulative impact estimates based on a total water balance model (sky to sea or the GAB).

2.7.13 That the management and mitigation of impacts on the aquatic ecosystems of the QMDB are determined by the associated documented conservation values.

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2.7.14 That direct disturbance to streams and associated riverine, floodplain or wetland environments, or hydrological downstream impacts by the act of discharging treated water and the construction of pipelines and other infrastructure consider inherent conservation and ecological values and function by taking into account:

- **in-stream flow regimes**
- **surface water flow systems (including potential contaminants such as salt, erosion, groundwater interface, barriers to movement of flow and in-stream species risks)**
- **groundwater flow systems**
- **riparian function (ground cover, bank stability, habitat, connectivity)**
- **wetland and floodplain function**

2.7.15 That the regulator requires independent publically accessible monitoring for all CSG operations to ensure transparency and accountability to local and regional communities.

2.7.16 That monitoring data be made public in a format conforming to national water data management protocols to allow public access within real time. Additionally independent review of local and regional conditions and trends should be required.

2.7.17 That EA monitoring and management plans are consistent (including units of measure), within the defined asset, and across CSG industry operations and that they report against site, total and cumulative thresholds.

3.0 The property rights and values of landholders

CSG industry is exempt from many pieces of legislation under which other landholders must comply eg salinity management in the QMDB.

The self-assessment and self-monitoring tenets of the EIS and EA approval processes lack transparency. Other landholders are regulated externally whereas the regulator relies on the CSG industry to be its own “police”. This is not a good basis for community confidence especially when the environment needs protection.

The precautionary principle means effectively means ‘if in doubt, do not proceed.’ Adaptive management is about learning on the job, including learning from mistakes made. QMDC argues that the CSG mining industry should not be afforded the right to make mistakes and fix up later. QMDC submits that potentially irreversible risks should be not taken.

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4.0 The sustainability of prime agricultural land and Australia's food task

4.1 Regional planning

QMDC asserts that regional plans must ensure their mechanisms are clearly committed to providing protection for agricultural land resources and be equally committed to informing further direction on the implementation of *Strategic Cropping Land* legislation (SCL legislation). Striking a balance, for the region's communities, is clearly associated with the increasing need to protect agricultural land resources and future food security against the negative impacts of CSG mining.

QMDC also submits that planning and approval powers should have a "specific" rather than a "general" aim to protect SCL from developments that lead to its permanent alienation or diminished productivity.

Farmers with CSG infrastructure on their land are at risk of losing control of their businesses and day-to-day property management. Parts of their farms will be put out of production for 20-30 years. Roads, pipelines interfere with cropping (ploughing) and contracts being signed with CSG companies may not be encapsulating farmers' current and future needs.

Fifty years is considered by QMDC too long a timeframe by which to measure diminished productivity because:

- The average age of landholders is 59 years however average length of land ownership (as per 2006 census) is 15 years
- A generation is considered 25 years
- Most State Government planning cycles are 5 years – some for example Water Plans are 10 -15 years at the most
- Delbessie Lease renewals are done to 30 years.

A 50 year timeframe therefore does not mirror key factors that impact on a range of related SCL and regional planning matters. QMDC considers 20 -30 years a more reliable timeframe for the Senate Standing Committees to address issues pertinent to the duration of an industry and local and regional productivity.

4.2 Inherent risks and impacts

QMDC argues that the below impacts will or may be caused by CSG mining:

- Erosion due to soil type
- Alienation of potential strategic cropping land
- Land contamination

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- Conflicting land use

The sustainability of prime agricultural land and Australia's food task requires the CSG mining industry to view the soil as a finite resource and not a receiving medium for a whole range of toxic substances. Various EISs and EA applications identify a large number of activities that have the potential to cause land contamination. Farmers' most important asset is the soil.

In accordance with the proposed *Strategic Cropping Land Policy* if considered "relevant development" proposed CSG projects should avoid locating or impacting on strategic cropping land (SCL). Unless the projects can demonstrate "exceptional circumstances" they will not be allowed to develop on strategic cropping land unless "the site can be fully restored to strategic cropping land condition".

QMDC is concerned that because of the number of activities proposed in EISs and EA applications that either involve major soil movement, long term storage dams or facilities or have inherent contamination risks then should the land associated with these projects be deemed strategic cropping land it will not be able to be reinstated or fully restored to strategic cropping land condition. The development would therefore permanently alienate rather than temporarily diminish productivity which would then require the companies to demonstrate that there is no other site than on strategic cropping land or for the Minister to declare the project to be "Excepted Development".

QMDC submits that thorough and detailed rehabilitation research programmes have not yet demonstrated that mining prime agricultural land is only a temporary cessation to agricultural production and that disturbed landscapes and soils can be reconstructed to pre-mine capability and productivity. In order to return the soil close to its original state (and cropping potential), entire soil profiles would have to be cut into layers and then stockpiled separately and replaced, in order, after mining. Mixing of the soil profile is likely to result in depression of crop yields due to the increased salinity and exchangeable sodium percentage in the upper layers. Additionally, the stockpiling of soil, which would be necessitated because of the restraints of the mining process, would result in organic matter breakdown in the surface layer and in the dispersion and erosion of the subsoil layers. If the projects stockpiled a pile of topsoil for 10 years, most of it would be anaerobic. It would lose its biology and structure.

Another consideration is that if any proposed facilities are to be situated in flood prone areas this will mean that flooding poses the risk of further damage to stockpiles. The potential impacts of CSG projects on the cropping soils could include a reduction in the yield potential of the reinstated soil, loss or reduction of underground water supplies and dust impacts on surrounding crops.

The risk is that CSG projects because they are likely to occur within existing and/or proposed food production areas they will result in a fragmented landscape with inadequate buffers. Failure to protect agricultural areas will impact on landscape features that support agricultural systems, resulting in either complete losses of agricultural uses on affected lands or diminished productivity.

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QMDC argues that by focussing on existing land use the opportunity to secure strategic cropping areas that will prove invaluable as climate refugia for cropping in the future is being overlooked.

Protecting SCL and associated soils requires addressing the need to protect water. If land achieves the versatile cropping land classification it is because of access to groundwater as well as cropping reliability etc.

4.3 Contaminated land

QMDC asserts that mine drainage or acid run-off which dissolves heavy metals such as copper, lead and mercury into ground and surface water must be prevented. This impact is too great to support mere actions of management or mitigation. Proposed CSG projects therefore must be required to demonstrate and guarantee that their proposed mine management methods can prevent the problem of heavy metal contamination, and that mine design is effective and able to keep water away from acid generating materials and help prevent contamination occurring. Whether heavy metals are treated actively through a water treatment plant or passively through a self-operating system any contamination is not acceptable.

The storage of large volumes of associated water awaiting treatment or reuse, potentially contaminated with many toxic substances, is a serious risk. This water may contain 5-8 tonnes of salt/ML.2[1] If untreated CSG water comes into contact with good clay soils, they become impervious to water and useless for agriculture.3[2]

There are also contamination risks associated with dam wall-failure and spills after intense rainfall events, as well as re-injected water contaminating aquifers.

4.4 Recommendations

4.4.1 That no new CSG applications be approved until all its development and activities are assessed against the proposed *Strategic Cropping Land Policy.*

2[1] Arrow Energy: Water and Salt Management, June 2010.

http://www.arrowenergy.com.au/icms_docs/73090_Water_and_salt_management_brochure.pdf

3[2] Water For Profit: Effect of water quality on micro-irrigation maintenance.

http://www.growcom.com.au/_uploads/21514water_quality_micro-irrigation.pdf#System_maintenance

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4.4.2 That both DERM and the CSG mining industry must be required to articulate before any more CSG mining approvals or permits are allowed:

- **why a minimum impact to SCL is acceptable**
- **whether an impact on water supporting SCL will trigger the proposed SCL Policy's intent to protect SCL**
- **what area of land or size of footprint triggers the indicator that productivity has been temporarily diminished**
- **at what point does volume and configuration impact on productivity**
- **whether creating a buffer zone to protect cropping capacity from a CSG project's development will address other landscape impacts such as significant streams, wetlands, cultural sites etc.**
- **whether the site can be "Fully restored" back to the parameters in the original land suitability assessment and demonstrate how this is possible based on peer reviewed scientific evidence**
- **that there are no alternative sites**
- **that SCL can be fully restored back to original assessed condition as per all criteria within suitability assessment;**
- **the CSG proposal is of significant community benefit.**

4.4.3 That compaction and disturbance of vertisol or cray-cracking soils is not permitted owing to scientific evidence that the structure or condition is unable to be rehabilitated.

5.0 The social and economic benefits or otherwise for regional towns and the effective management of relationships between mining and other interests

5.1 Urban foot-printing

QMDC submits that because urban foot-printing for this region is not locked down, settlement planning is not well advanced because of a lack of local, regional and State planning. This requires the State Government to provide clear parameters for Councils, property developers etc in terms of the social and economic impacts of CSG mining on sustainable planning for towns and regions, for example, should:

- property development including housing settlements become high rise estates?
- there be intensification of existing settlement?
- there be relocation of industrial to urban satellite suburbs?

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5.2 Buffer zones

The creation of buffer zones within regional planning will serve to protect cropping capacity and should address other landscape impacts from CSG mine sites on urban areas, significant streams, wetlands, cultural sites etc. A clear message from landholders to QMDC has been if there is no good quality water, there is, for example, no good strategic cropping land. QMDC submits that buffer zones are dependent on types of industry. Distances of those buffers therefore need to be determined according to the impact of that industry whether it be noise, lighting, dust, vibrations, traffic etc.

Direct disturbance to riverine, floodplain or wetland environments, or hydrological downstream impacts caused by the construction or location of infrastructure can be minimised by establishing and managing buffer zones.

QMDC submits that as a general rule, buffer zones should exclude development from within a defined buffer zone for waterways appropriate to stream order and defined buffer zones upstream from and including wetlands.The limitation of water resources is clearly recognised by the Murray Darling Basin Plan and should therefore pose ongoing restriction to growth.

5.3 Settlement site selection

Serious consideration must be given to access to and planning for local public transport networks to make new settlements associated with CSG mining functional when transport costs rise. Settlement site selection should consider matters such as solar orientation, prevailing wind directions that affect how comfortable and safe a dwelling might be, and how efficient it is to 'run' (heating, cooling bills). Settlements should also consider a wide range of residential needs – from single people to those with pre-schoolers, school kids, workers and retired people – and the type and level of services each needs to access. In some cases, urban 'infill' development (ie denser housing – units etc) would be appropriate.

QMDC is concerned that land that may already be designated for urban development and State infrastructure and is deemed to provide significant community benefits such as roads, rail and power lines albeit they may have been decided upon to support the CSG industry could lead to large tracts of potential SCL being permanently alienated. QMDC is therefore concerned about the impact that new infrastructure will have. QMDC submits that at a minimum any infrastructure should be on shared easements.

5.4 Regional ecosystems

Settlement plans should not permit the clearing of regional ecosystems mapped as 'endangered' or 'of concern' protected under the *Vegetation Management Act 1999*, or listed ecological communities under the EPBC Act. A regional planning assessment of growth in the Surat Basin must consider the cumulative impacts of small-patch clearing, where such clearing is currently permitted under state or federal legislation to avoid further fragmentation of the landscape. Offsets, at an absolute minimum, should achieve no net loss and should require the re-establishment of vegetation to an equivalent condition and not simply protect existing vegetation.

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6.0 Health impacts

6.1 Water Supply (Safety and Reliability) Act 2008

The aim of the amendments to the *Water Supply (Safety and Reliability) Act 2008* (Water Supply Act) "to establish purpose built rigorous requirements under the existing recycled water regulatory framework, for coal seam gas water impacting on town drinking water supply sources" is supported by QMDC. However DERM has to this date not released relevant information or facilitated robust community and stakeholder consultation on indirect and direct augmentation of coal seam gas recycled water into water sources. Without access to and discussion on scientific and social research both international and local the amendments are unable to provide QMDC assurance that public health will be protected.

It is not only the responsibility of coal seam gas producers to dispose of the coal seam gas recycled water in an environmentally acceptable manner but in the view of QMDC also the responsibility of legislators and regulators to implement legislation and policy that provide a high level of protection for the QMDB.

Disposal should consider this region's NRM Plan whilst taking into consideration not only the individual impacts of each CSG proposal but also the cumulative impacts of the whole CSG industry and other water users.

Options for disposal of coal seam gas recycled water currently include release into a water source (including to a watercourse, lake, dams, weirs or aquifers) or by directly supplying treated coal seam gas recycled water to a town as a source for drinking water supply are still contentious and fraught with scientific uncertainty.

QMDC submits that DERM needs to facilitate community forums on the supply of coal seam gas recycled water as a source for drinking water supply including the content of a recycled water management plan, and its approval process. QMDC has concerns because it has been stated by DERM that "coal seam gas recycled water poses greater risks than indirect augmentation into a water source, as there is no retention of the treated coal seam gas recycled water in a buffer zone and no dilution of it" and therefore "stronger measures are required to ensure that public health is protected".

QMDC seeks clarity on augmentation and how DERM proposes to determine that "no material impact on the town's drinking water supply source" will result from CSG recycled water. DERM has said that "coal seam gas recycled water has a different risk profile to other recycled water and that the "risks associated with coal seam gas recycled water are generally considered to be chronic rather than acute" raises concerns for QMDC.

Legislation needs to provide clarity on the listing of CSG water by-products as a *regulated waste* under State legislation and whether it should also be considered as *hazardous waste* under Federal Government legislation. Should CSG water by-products be deemed as being "imported" into the landscape this will also require regulation under the Federal Government's *Hazardous Waste (Regulation of Exports and Imports) Act 1989* for which "The main purpose of the Act is to regulate the export and import of hazardous waste to ensure that hazardous waste is disposed of safely so that human beings and the environment, both within and outside Australia, are protected from the harmful effects of the waste."

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Extraction of CSG water should be viewed as a threatening action under the EPBC Act.

6.2 Greenhouse gas (GHG) emissions

GHG emissions are relevant to this inquiry because, as the prolonged drought and recent floods have demonstrated, the QMDB is vulnerable to the impacts of climate change and urgent action is needed to mitigate both the effects and costs of climate related damage.

The impacts associated with climate change are also related to changes in climate variability. Changes in both the magnitude and frequency of rainfall currently have unknown impacts on the water cycle associated with the Catchment areas CSG projects will impact upon.

The CSG projects' EISs must satisfactorily address what affect seasonal shifts in rainfall, temperature changes and evaporation will have on the development area including infrastructure and operations and take into account 2010 and 2011 flooding events. Queensland has been identified as the fastest growing and most energy intensive state in Australia. Additionally more harmful greenhouse gases (GHG) are produced per person in Queensland than any other state with approximately 43 tonnes of greenhouse gas emissions per capita (2010). The activities required to fully support a project will require a large consumption of energy and will result in increased GHG emissions.
QMDC asserts that there is the enormous potential for the coal mining industry to realize savings in energy costs and associated GHG emissions through energy efficiency improvements.

A full cost accounting must be done on the total sum of all GHG emissions produced by proposed projects and details on the cumulative impact of GHG of the whole CSG mining industry must be considered. This should include a calculation to ascertain the total footprint created by diesel fuel usage for transport, drilling and other operations.

QMDC submits the implementation of an environmental re-vegetation offset program to offset GHG emissions masks the fact that construction clearing may disturb terrestrial vegetation corridors, cause scouring and erosion of river banks. The biodiversity condition and ecological health of native vegetation in priority catchments must be maintained or improved regardless of the need for GHG emission offsets.

6.3 Air quality

QMDC asserts that regional air quality issues must be analysed in relation to the cumulative impact of:

1. all operations of the proposed development area

2. all operations of the energy and mining industries; and

3. all other regional industries such as agriculture, power plants, transport services etc.

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The control measures described by CSG projects must indicate how they will put in place regular and ongoing monitoring rather than merely promote monitoring on a complaint basis **only**.

CSG project control strategies to deal with adverse weather conditions before construction activities require serious consideration and should be articulated clearly within their *Air Management Plans*. The projects need to identify areas where construction cannot proceed because of risks associated with climate change and variability.

The CSG industry must address carbon emissions and carbon offsets based on CSG mining life-cycle emissions (including direct, fugitive and downstream) when considering energy production and environmental sustainability. An assessment of carbon emissions and the carbon offsets required need to ensure that interactions between terrestrial carbon disturbance and coal seam gas production can be managed or mitigated for example by:

- reduction in the rate of deforestation and land degradation;
- development of carbon sequestration projects in forestry and agriculture;
- promoting energy efficiency;
- development of alternative and renewable energy sources;
- reduction in solid and liquid waste;
- shifting to low emission transportation modes;
- adopting optimal mining surface disturbance practices;
- soil and biomass storage, and
- advancing reclamation best practices.

Fugitive emissions are recognized as resulting from the following sources:

- Point Sources
- Equipment Leaks
- Open Vats and Mixing
- Storage Tanks
- Wastewater Treatment
- Emissions from Cooling Towers
- Maintenance Operations
- Vehicle Movement and Exhaust
- Liquid Spills
- Storage Piles
- Bulk Materials Handling and Unit Operations
- Loading and Unloading of Vehicles
- Painting
- Equipment Cleaning and Solvent Degreasing
- Surface Coating
- Abrasive Blasting
- Asphalt Paving
- Construction and Demolition
- Welding
- Open Area Wind Erosion

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6.4 Recommendations

6.4.1 That where the CSG companies make CSG recycled water available for 'beneficial use', the water must be:

- **Subject to risk assessments based on the immediate, future or cumulative impact which may result from its use, taking into account potential contaminants including salt, surface and ground water interaction, changes to overland flow, and new and existing infrastructure.**

- **When water is released into streams or weirs, those streams or weirs are subject to chemical and biological monitoring to assess impacts; and all monitoring data be made available to the public within one month of collection.**

6.4.2 That a recycled water management plan should be required to regulate coal seam gas recycled water impacts on town drinking water supplies. QMDC does not support the "exception" option that where it can be demonstrated that there is no material impact on the town's drinking water supply or where certain requirements specific to aquifers are met a plan is not required.

6.4.3 That the coal seam gas recycled water quality standards which are required to manage the chemical and radiological public health risks of short and long term exposure, and the relevant water quality standards to be prescribed by Queensland Health under the Public Health Regulation 2005, are discussed with the community to examine risks to human health and if appropriate promote public assurance.

6.4.4 That section 185(2) of the amended Water Act perpetuates the flawed philosophy that the extraction or use of groundwater is a "right". QMDC recommends that the word "rights" should be omitted and replaced with "use" or "extraction" and that this "use" or "extraction" is subject *to the tenure holder complying with the holder's underground water obligations* as per section 185 (2) (b) and to a greater environmental and social imperative namely the sustainability of the water as a future resource for environmental and human purposes.

6.4.5 CSG projects need to outline what:

1. specific baseline air quality monitoring over the mine development area will be conducted

2. regular and ongoing air quality monitoring throughout construction phase and during its operation will be conducted

3. independent monitoring they propose for all their operations to ensure transparency and accountability to local and regional communities

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4. monitoring data will be made public and in what format so that it conforms to the goals of the Environmental Protection Air Policy 2008 and allows public access and independent review of local and regional conditions and trends

5. will be done to ensure monitoring and management plans are consistent (including units of measure), within the defined asset, and across coal mining industry operations and how they will report against site, total and cumulative thresholds

6. areas are there where infrastructure should not be constructed because of risks associated with risks to human health and in relation to climate change and variability.

6.4.6 That the CSG projects must identify how they plan to firstly prevent, and secondly mitigate through carbon offsets fugitive emissions from all of the abovenamed sources should they be a part of their operations. Fugitive emissions form 34% of Australia's total carbon emissions.

7.0 Other related matters

7.1 Cumulative Impact Issues

The current draft Terms Of References for EISs or conditions imposed by EAs do not give clear instruction on what is meant by cumulative impacts and the type of impacts that contribute to cumulative impacts (SEE *Assessing the cumulative impacts of mining on regional communities: an exploratory study of coal mining in the Muswellbrook area of NSW* (2008) at pp xvi, xvii for discussion on definitional issues).

Do the cumulative impacts referred to in Draft TORs or EA conditions include the successive, incremental and combined impacts of coal mining on regional communities, their economy and the environment that sustains them? If so then what are the different types of impact that must be studied to gain a true and accurate picture of the proposed CSG projects in their totality?

Are they:

- *Spatial extent impacts* those which occur over an area, e.g. the area of vegetation that has been cleared for the mine site and its associated infrastructure, the amount of land disturbed and managed to post mine use?

- *Spatial intensity impacts* where a location is impacted on by the activities of multiple sites e.g. where the emergency discharge of several upstream mine sites contributes to elevated levels of sedimentation in particular catchment areas?

- *Simple temporal impacts* which have a specific time of commencement and a measured form over time e.g. the amount of land contaminated over time as a reflection of the stage of development of the mine life?

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- *Offset temporal impacts* which occur when multiple simple temporal impacts are superimposed upon one-another over time e.g. materials moving through rivers or the extraction of water for a mine being proportional to its coal production. Initially, a smaller volume of water is extracted; however this increases until the mine reaches peak production and plateaus out. As the mine progresses towards the end of its life extraction again declines. If a second mine starts mining half way through the life of the first mine and extracts water in the same manner, the cumulative impact will be the superposition of the two simple temporal impacts offset in time.

- *Linked triggered impacts* which occur when one impact, either by its occurrence or by reaching a threshold level, triggers another impact that would not otherwise have occurred. The second impact is the triggered impact.

- *Linked associative impacts* occur where multiple impacts occur as a result of a single event or change, e.g. as a result of opening a new mine, expanding a mine or changing operations.

QMDC argues that owing to the complex nature of cumulative impacts, the EIS and EA application processes must provide a clear direction to the proponents on how cumulative impacts should be defined and measured. A simple typology used in the above named 2008 study that distinguishes between spatial, temporal and linked impacts recognises that there is no one way in which impacts are cumulative and that a more differentiated approach is needed for both the measurement and management of such impacts (*SEE p.17 of the above named study*).

EISs and EA applications do not currently address the cumulative impacts a new development and associated operations will have on the site as a whole, for example, the impacts on the ephemeral nature of the stream the project wishes to discharge to, the quality and quantity of groundwater, the ongoing fragmentation caused by the proposed infrastructure on the terrestrial ecosystems, residual risks from gas and water treatment by-products, accelerated consumption of a finite non-renewable resource etc. and the social, economic and environmental stresses caused by the construction and operation of associated infrastructure. Nor do they address the impacts caused by the whole of the CSG industry on the GAB, on the total air quality of the region, on the soils of the region and so forth.

7.2 Landscape character

QMDC asserts when examining the impact of CSG mining priority landscape scale regional ecosystems should also be examined in order that they be maintained or improved. QMDC recognises that ecological processes and ecosystem linkages need to be increased in extent and abundance at priority catchment scales.

The decline in populations of ‘at risk’ flora and fauna species must be prevented. It should not be assumed fauna can be removed to another ecosystem if found where vegetation is to be cleared and that birds will simply fly away to somewhere else if disturbed by noise, dust etc. The EIS and EA application processes must require CSG projects to demonstrate scientific understanding of the importance of remnant vegetation and preventing further fragmentation or destruction of ecosystem corridors.

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Destroying habitat before equivalent habitat has been restored increases the risk of species extinction. Additionally, species need time to colonise a restored habitat, and too frequent a turnover of habitat may increase the risk of species extinction.

The long term conservation of biodiversity and the wellbeing of the region's communities depend upon both the protection of natural assets and maintaining the integrity of the ecological processes that sustain them. A focus on process recognizes that ecosystems are temporally and spatially dynamic and that the components of ecosystems interact in complex and diverse ways that contribute to, and sustain biodiversity. Processes may also act as selective forces to which particular species are constantly adapting.

QMDC believes that any *Terrestrial ecological environmental plans* (TEEPs) must demonstrate an understanding that modification or destruction of ecological processes are, in practice, often irreversible and an ecosystem will not necessarily rehabilitate to its prior function.

QMDC submits that the EIS and EA application processes must ensure that no TEEP fails to respond adequately to the complexities in the ways in which threats affect ecological processes and regional ecosystems. For example:

- Impacts may occur far from the location of the initial threat or disturbance.
- Threats that affect one species may have cascading effects on other species.
- Environmental responses to a threat are not necessarily directly proportional to the level of threat (ie a linear response). Non-linear responses mean there are critical thresholds where small increments of change can result in dramatic shifts in the state of the system.
- There is often a time delay, from days to decades, between alteration to an ecological process and its full effects on biodiversity.
- Threats may have a combined impact greater than their independent effects.
- Complexities in interrelationships among species and chance environmental variation may mean that often there will be uncertainty about the effects of a particular threat on processes.
- QMDC recognizes the value of the terrestrial ecology studies that may have already been conducted in A proposed development area. QMDC submits that further studies are required to ascertain which processes have the greatest influence in the project development area, their role, the spatial extent over which they operate, the kinds of threats that are limiting their function. This will assist the TEEPs to direct their management strategies where they will have the greatest impact.

A fundamental tenet of regional ecosystems is recognition of the interaction between pattern and process. The identification and management of locations directly associated with a specific process is a practical way for the projects to protect regional ecological processes. Examples project development areas could include:

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- Protecting floodplains adjacent to river channels to maintain lateral hydrological connectivity and the ecological benefits of periodic flooding.
- Maintaining continuous vegetation along elevational gradients to enhance opportunities for altitudinal migration or range shifts in a changing climate.
- Protecting key wetlands along the migration paths of waterbirds as critical stops for refueling.
- Maintaining riparian vegetation to promote interactions between terrestrial and freshwater systems.
- Protecting "keystone" such as small ephemeral streams and wetlands to aid the re-establishment of ecological process in restoration.

7.3 Recommendations

7.3.1 That a cumulative impact assessment be done to illustrate the totality of impact caused by the total footprint of each CSG project application.

7.3.2 That the EIS and EA application processes must be enforced so that:

• the operations of the Project will not be permitted to impact on high-conservation areas

• land is allocated by the Project for habitat connectivity to allow species to move as climate zones change

• the construction of infrastructure not be approved until a detailed site investigation is carried out and an official map modification is approved as per the Queensland Herbarium process giving accurate details of the regional ecosystem and its biodiversity

• the Project identifies the processes that are most important in sustaining the regional ecosystems or species in their development areas

• the Project establishes a long term monitoring programme to measure environmental change and generate information on:

i. The direction and magnitude of change (taking into account natural fluctuation)
ii. The rate of change
iii. The pattern of the change response

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