Draft TOR Acland Coal Mine

Coments

Queensland Murray-Darling Committee Inc. comments on the New Acland Coal Mine Stage 3 Draft terms of reference for an environmental impact statement November 2012

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Comments to:

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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 General comments

QMDC asserts there a large number of important outstanding issues pertaining to existing operations still to be addressed. Consideration of any expansion of the current mining operations must therefore take into account the priority to prevent and manage current social and environmental impacts before adding new impacts, hazards and /or harm.

QMDC were of the understanding that the then Leader of the Opposition, now the Premier had announced in 2012 that Stage 3 would not proceed. Overall should this development proceed this would create a serious lack of trust in the current government.

A serious consideration of the cumulative impacts of the newly proposed Stage 3 although it has addressed some of the concerns related to impacts on local communities and SCL will still have impacts that in QMDC's opinion are unacceptable and will be detrimental to the local communities and potential SCL and GQAL.

The QMDC argues that the TOR must be strengthened to require the proponent to define strategies that illustrate how impacts, hazards and risks will be avoided. Too much emphasis is placed on mitigation which in our opinion undermines the purpose of an EIS and best NRM practices for the region.

QMDC support the development of renewable energy resources as the region's first preference for energy supply and where that development can provide a sustainable source of energy for the region without causing adverse environmental effects. The context of this submission is based on the need to replace non-renewable energy resources such as coal with renewable resources.

The QMDB's Natural Resource Management (NRM) Plan, accredited by State and Federal Governments (Joint Steering Committee), documents both the key natural resource assets and values of the region and targets for their management. The potential risks to these assets, whether direct or indirect, from the Stage 3 Project are the foundation for this submission and have been considered in context of the QMDC Mining and Energy policy and the QMDB Regional NRM Plan.

QMDC would urge the development and deployment of renewable energy as quickly as possible.

2.0 Specific comments

2.1 Part A About the project. Section 1 Project summary (pp3-5).

QMDC notes there are a number of key elements of the Stage 3 project that include upgrading existing operations, techniques and infrastructure. This raises our concerns as per the above general comments.

QMDC is concerned by the corruption of the term "sustainable" as per the bullet point identifying the one of the key elements of the project being the "*amendment of NAC's existing EA authorising a sustainable level of environmental harm commensurate to the project's size and scope.*"

Sustainable levels of harm should not be a key element of any project heedless of its size or scope. QMDC believes this illustrates a serious misrepresentation of the EIS process.

QMDC seeks assurance that the Coordinator General will be seeking a response from the proponent that allows the Queensland Government to decide not whether the level of harm is "sustainable" but rather whether the level of harm is "acceptable" in terms of the core principles of sustainable development and planning.

QMDC recognises the potential for economic and social benefits to the region and State from the mining industry. This recognition however is 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 and tourism.

In response to existing and emerging issues relating to both site specific and cumulative impacts on natural resources from coal mining, given the stage of industry, this submission primarily requires the Coordinator General as the decision maker to make a determination on the Stage 3 Project that serves to prevent adverse effects on the QMDB's natural resources and the communities of this region.

2.2 Section 3.1 Project proponent (p.11)

QMDC recommends to this section so that the proponent includes a description of its experience and commitment with and to international, national, regional and local environmental, health, safety and community policies. This should include details on any past compliance breaches, workplace accidents and deaths etc.

2.3 Section 3.3 Project rationale (p.11)

The Stage 3 project runs the risk of alienating 500ha of SCL in the development area through, for example, the potential risk of contamination, roading and infrastructure impacts, water allocations being given to the mining company instead of local producers and irrigators.

The State Government's proposed policy direction which aims to define SCL by its ability to be irrigated highlights that prioritising water allocation to the mine over the agriculture industry is preventing the ability of the region to improve intensification of agriculture as per the State's plan. The development area is ideal for the intensification of agriculture, but is compromised particularly because of the water being taken away from potential Gowrie Creek irrigators. Acland has over 4000mgL water allocation for the area and over 500ha is currently SCL this area therefore has a high potential to be highly valued as irrigated SCL. The loss of productivity is substantially greater than may otherwise be portrayed by the project proposal.

Between now and 2017 QMDC asserts a balance is needed to rectify current unacceptable impacts and hazards and deal with current operations rather than adding more impacts and issues with a Stage 3 project. Managing the coal heaps to prevent flooding impacts through bunding, for example, is urgent.

The 1901 constitutional rights attached to the Acland Mine project should be carefully considered. The argument that public costs associated with roading, linear infrastructure, environmental damage, destruction of GQAL, alienation of SCL etc are offset by royalties paid to the State so there is a net benefit to the public is not necessarily the case in this situation because of the 1901 pre-existing rights to royalties. This historical tenure means royalties to the State from this project are limited. The short term employment opportunities and other associated economic gains do not make it a lucrative development for the State nor the communities of the region. Therefore we are concerned as whether there would be an overall net benefit to the community and the State from the project.

The proponent should be required to demonstrate there will be a net benefit to the community from extracting this public resource.

QMDC recommends an international context be addressed in this section as well.

2.4 Section 3.4 Relationship to other projects (pp.11-12)

QMDC recommends that the proponent describe how the project relates to other local and regional economic development projects e.g. agribusiness/tourism opportunities and plans for Oakey and surrounding areas; and conservation projects e.g. Land for Wildlife, national wildlife corridors.

2.5 Section 3.5 Project alternatives (p.12)

QMDC submits that a description of feasible alternatives to the Stage 3 project must address impacts relevant to a quadruple bottom-line approach to sustainable development (environmental, social, economic, governance), and which can be applied to the town and regions which the proposed project will impact upon both directly and indirectly.

QMDC submits that a full cost and benefit analysis which includes an environmental audit and comparative analysis of the Stage 3 project's estimated contributions to the State's economy needs to be conducted in terms of the project and all associated infrastructure and its contribution to increases in greenhouse gas emissions, waste production, road damage, vegetation and biodiversity loss, air pollution, water and fuel consumption etc and the financial burden this potentially places on future generations and government. Does the benefit to Queensland from royalties to the State reflect a true economic gain?

Challenges associated with economic growth created by the coal mining industry require more in depth economic analysis in relation to potential and long term impacts on natural resources, social infrastructure and local economies.

QMDC asserts that the economic theory informing the comparative analysis of alternatives must highlight the importance of ecosystems, equity and governance and have its roots in valuing natural and social capital in its economic analysis. Ecological economics that integrates natural and social capital into traditional economic theory will assist regional planning processes to develop a region's future direction and assess coal mining projects in a more sustainable manner.

If pressures on local and regional infrastructure are clearly identified regions will need to define what is considered appropriate new infrastructure based on social needs and environmental factors such as water quality, risks of salinity, impediment to natural water flows, floodplain risks, threats to the region's biodiversity etc.

Plans for extensive new infrastructure, in our opinion require the EIS process to pay serious attention to the cumulative impact of this infrastructure especially in light of the impacts experienced in the regions during recent 2010/2011 flood events.

The fiscal contribution made by natural capital to the region's economy and society must not be invisibilised by the proposed alternatives and any economic justification for the Stage 3 project. Although it is often difficult to define and quantify, an evaluation of natural capital is essential to a region's future planning.

Social capital, like natural capital is also hard to define in economic terms, yet is also essential because it represents the core fabric of social communities. Ranging from the drive for education, to the commitment to cultural tradition, to religious faith, to energy for community alliances; it also includes a region's need for safety and security, friendship and community, a sense of identity, access to knowledge and passion for family welfare. QMDC recognises the need to address cumulative impacts, changing social dynamics and health issues more thoroughly as part of the EIS processes. Social impact caused by current and potential development for landholders and rural towns raises concerns about:

- The increasing alienation of farmers from land, if no one around to farm, there will be no strategic cropping land
- The changing value placed on agricultural land e.g. global demand for food versus energy demand
- The dynamics of change when mining companies come into rural towns and the correlated change in mindsets and values of the townspeople.
- The limitation of water resources must be recognised within an environmental best practice framework that takes into account social and economic factors. RO water for dust suppression, cleaning coal etc is not an opportunity without inherent risks and impacts. A full cost environmental accounting of water use and disposal requires social and economic issues to be addressed.

Regional planning must address feasibility issues with specific regard to the disposal of coal mining "by-products". Infrastructure and associated industrial operations associated with disposal of "by-products" should be defined against specific criteria and limitations that prevent, minimise and mitigate the risks associated with the storage, transport, destination, and cumulative and long-term impacts of such volumes of waste. Are the region's communities prepared to have an accumulation of contaminated sites or "stockpiles" of by-product to be dealt with once a future solution is found or untreated waste water is released for emergency disposal?

2.6 Section 3.6.2 Objectives of the EIS (pp12-13)

QMDC recommends that the purpose of the EIS should include the provision of accurate information and reports that are scientifically based, independently peer reviewed, and inclusive of by local knowledge. QMDC is concerned that the EIS process is prone to a pro-development ethos which does not support an accurate or thorough investigation or consideration of social and environmental risks and impacts.

2.7 Sections 3.7 Consultation process & 3.7.1 Overview (p13)

Community engagement, disclosure of information and public consultation has improved to meet community expectations for a more enduring and direct role in the planning, decision-making and implementation of natural resource policies and activities as they relate to coal mining projects.

This process still needs improving to ensure timely and adequate notification of proposed developments, particularly to individual landholders, local governments and communities where the development and associated developments have the potential to impact on the planning and resourcing of supporting infrastructure, services and land use e.g. farming, Industrial and residential zoning, waste management, sewerage management, roads, infrastructure, services (health, police, schools), airports, and emergency services.

QMDC submits that public engagement that is timely, meaningful and relevant and conducted appropriately for each stakeholder will encourage and facilitate active public consultation. This also includes public notification and consultation for any proposed changes to Environmental Management policies or authorities from that initially agreed to by the State government.

QMDC recommends that the mining industry contribute to the resourcing of a regional Advisory Committee to advise the State government on proposed coal mining projects and their EIS's would advance the public consultation process. This Committee would need to be appointed by the region's communities to represent key regional stakeholders including local landholders.

2.8 Section 3.7.3 Public consultation report (p.14)

QMDC recommends the inclusion of a list of unresolved scientific and community issues in this report

2.9 Section 3.8.2 Relevant plans (p.16)

QMDC recommends that the proponent is directed to outline the project's consistency with the Regional NRM Plan.

2.10 Section 4.1 Overview of the project (p.17)

It has been QMDC's experience that during the EIS process some proponents do not provide full disclosure of all relevant activities, operations and infrastructure to a project. Proponents sometimes seek to gain permits for these activities as part of local government legal application process and thereby avoid public scrutiny or more stringent social and environmental assessment.

The project overview states: "The Walloon Coal Measures aquifer outcrops over much of the revised Project site" and "The Walloon Coal Measures is the major groundwater aquifer intersected by the revised Project". The current evidence suggests that there is vertical discharge from the measure into the overlying alluvium of Oakey Creek (that intersects Jondaryan) where the stream meets the Walloon strata. (Hillier Report 2010) The concentration of salts in the area from the Walloon coal measures may be quite high.

The 'liberation' of these salts and their storage has to be monitored. In the Stage 3 project overview (Figure 12) they say shallow groundwater bores go to a 'sediment dam', then to an 'environmental dam', finally to an 'off site discharge'.) But they do not say what this off site discharge means. This needs to be questioned at length. Where are they storing this water, and how are any resulting precipitated salts being disposed of? The salinity risk assessment done by DERM (2007) (in conjunction with Condamine Alliance) has shown that the mine site region is prone to salinity outbreaks.

It is also worth noting here that Oakey Creek, which confluences with Lagoon at Jondaryan, may be moderately groundwater dependant (is listed in the federal database of ground water dependant ecosystems).

QMDC is concerned the proponent's future use of recycled water and the possible construction of coal to liquid facilities are not being disclosed in the details of the project and the assessment of their potential impacts both site specific and cumulative will not be addressed through the EIS process.

A 'Potential Specialised Water Treatment Flow Path (Hydrocarbons)' is referred in to the Stage 3 project overview. Is this going to remain 'potential' or is a plan in place to have a treatment facility installed, and if so how does it plan to deal with these compounds?

QMDC recommends a clear directive from the Coordinator General requiring full disclosure and assessment of all new proposed and future activities associated with Stage 3 and all existing activities that will be used to advance Stage 3.

QMDC also recommends a full cost benefit analysis as per above recommendations at 2.5.

2.11 Section 4.6 Associated infrastructure (p.20)

QMDC recommends including in this section details regarding the currency of the existing and proposed infrastructure and whether its design is meeting not only current environmental design standards but also international and national future clean and efficient energy aspirations.

2.12 Section 4.6.1 On-site water supply infrastructure (pp20-21)

The information required as part of this draft TOR does not require details on how local communities, landholders, farmers and irrigators are impacted by the proponent sourcing water e.g. from bores, municipal water supplies etc. Water supply and demand for the project is potentially denying its availability to other businesses and industry. What short and long term impact does this have on the sustainable economic development of the region and liveability for local communities.

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2.13 Section 5 Environmental values and management of impacts (p.23)

QMDC submits the proponents must be given 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 the Draft TOR 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 Stage 3 project in its 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?

- *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 submits that owing to the complex nature of cumulative impacts, the EIS process must provide a clear direction to the proponent on how cumulative impacts should be defined and measured. A simple typology used in the abovenamed 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 abovenamed study).

Justification for a project must highlight how that project will safeguard environmental values and management of impacts on natural resource and community assets and values, and traditional or potential economic opportunities in the region in the short to long term, rather than from the short to medium term of a project. Any discussions pertaining to the status of the project in a regional, state and national context must be analysed in context of the project's potential harm and contribution to the cumulative impact on region, state and country, for example, an increase in:

- air pollution
- leachate pollution
- greenhouse gases
- contaminated sites
- degradation of groundwater
- disturbance of farming land
- land subsidence
- thermal pollution
- water consumption
- waste etc.

2.14 Section 5.1.1. Flood management (pp24-25)

Improving the resilience of communities in the QMDB requires the correction of past mistakes and not permitting the building of new infrastructure or levees on floodplains within established buffer zones. It also requires enforcing the Floodplain Management Guidelines.

The TOR must therefore require the proponent to demonstrate that its operations are not in a flood zone. It is apparent from maps that the proponent has chosen for the new rail loading facility and coal stockpile the flood zone of Lagoon Creek.

Lagoon Creek runs adjacent to the existing mine site (less than 1Km at north east side) and travels for approximately 18km before reaching Jondaryan. Local knowledge suggests that this waterway has been known to swell to a width of more than 350m wide during high flow conditions. The proposed mine expansion would see pit areas placed either side of Lagoon creek, at a distance of approximately (estimated from draft TOR document) 250m from the creek (approximate central point: -27.315145, 151.713557). In the event of an extreme weather event, the question of how the proponent plans to protect the pits from encroaching and exiting high velocity flows must be asked. Furthermore, what arrangements are being made for the refilling of these pits? How can these be guaranteed not to erode and travel with flows into Jondaryan during initial stages of 'rehabilitation'?

Other concerns that need to be addressed:

- Where will the proposed Tailings Storage Facilities (TSFs) or Tailings Dams be located? Will these 'in-pit' areas also be located close to the waterways? If they are planned to be elevated, will the height be enough to withstand up to two meters depth of water in high flow events. (Local knowledge says historically water can reach this depth)
- Strategies in place to contain coal stacks beside the creek in event of flood?
- Has any material safety data information (MSDS) been provided on any dust suppressant/soil stabilisation compounds or binding agents to stakeholders?

How soluble are these? Is there any chance of such agents dissolving during wet weather and being transported into groundwater through infiltration and/or runoff into surface water bodies? (The use of various salts in dust suppression compounds may contribute substantial amounts of ions in runoff = bad for water).

Appropriate planning and design of infrastructure at the landscape and local level is needed to identify and adequately protect all waterways, floodplain functioning and wetlands, environmental values and function, taking into account:

- In-stream flow regimes;
- Surface water flow systems (eg potential contaminants such as salt, erosion, groundwater interface, barriers to movement of flow and in-stream species risks);
- Ground water flow systems;
- Riparian function (e.g. ground cover, bank stability, habitat, connectivity); and
- Wetland and floodplain function.

QMDC questions whether the State's power to determine a proposed development as a 'significant project' is improving the resilience of communities in the QMDB. 'Significant project' design should be required to incorporate state planning policies into their decision making. Permitting the continuation of development in the floodplains on a large scale such as an open cut mine does not take seriously the vulnerabilities of development in a floodplain.

QMDC supports the objective to promote a greater correlation between floodplain management and land use planning. The objectives of the proponent's flood management strategies need to state to what extent the effect of and damage caused by flooding will be limited and, illustrate how the project recognises the multiple functions of a floodplain; identify what natural and human assets are at greatest risk and which strategically require the greatest protection, for example, aquatic ecosystems, strategic cropping land, endangered vegetation, community health infrastructure etc

QMDC supports an environmental protection objective aimed at protecting the natural function of the floodplain. A floodplain's natural function may therefore not allow for multiple land uses and planning may need to encourage limited land use on a floodplain. This principle should be incorporated into the terms of the TOR. An additional consideration should be the objective to spread flood flows across floodplains in order to protect key assets.

QMDC agrees with the tenets of community ownership and catchment and landscape planning and governance. The benefits gained by reaching agreement amongst stakeholders dependent on river systems will be reflected by stakeholders in their willingness to collaborate on flood management actions.

QMDC would recommend that the TOR highlight the importance of considering land use planning and landscape planning in order to promote a total catchment approach. There is a need to understand surface and ground water interactions at a landscape level. The development assessment process needs to account for cumulative effects.

A fundamental component of any floodplain analysis and its management should therefore include agreement from community and industry groups on key principles and objectives for the project's flood management strategies.

In addition to hydraulic and hydrologic analyses, consideration should be given to wider landscape relationships e.g. groundwater and surface water processes; assets to be protected; and consultation objectives.

The EIS process should primarily require the proponent to demonstrate how flood impacts associated with the Stage 3 project will be prevented rather than merely minimised.

2.15 Section 5.2.3 Land contamination

QMDC asserts that Queensland's contaminated land policy and legislative framework needs to be strengthened to reflect the need to primarily **avoid** impact caused by waste generation and the disposal of hazardous contaminants. Currently it is mostly focussed on a mitigation or minimisation objective. Critical to the TOR should be an environmental, social and economic audit and analysis of the total number of current contaminated sites registered on the Environmental Management and Contaminated land Registers. Intelligent consideration of these registered lands and the cumulative impact of contamination on human health, land, water and air quality, current and future land use capacity and economic sustainability is urgent.

Such important information and consideration is not being offered by the government to facilitate future land use in Queensland. Consequentially this means the TOR are based on values that support ongoing contamination regardless of existing contamination and its restrictions on land use, its hazards to health, its detriment to economic sustainability and its contradiction to community aspirations for a clean future with less toxic pollutants.

QMDC is concerned that common toxic contaminants (See Appendix 4 of the "Environmental Guidelines: Assessment, Classification and Management of Non-Liquid Wastes" (NSW EPA, 1997)) are ever increasing in Queensland. These are contaminants found in products, by-products and waste.

Ongoing development in Queensland is creating the opportunity for more industrial pollution and land use known to be associated with land contamination. The Australian And New Zealand Guidelines For The Assessment And Management Of Contaminated Sites (ANZECC Guidelines) lists 30 industries and land uses that are known to have been associated with land contamination (ANZECC & NHMRC, 1992). A similar list is also included in the "Contaminated Land Practice Standard" by the Australian Institute of Valuers and Land Economists (AIVLE, 1994). It contains 67 items and incorporates most of the ANZECC Guidelines items. Some of these are industries are expanding in Queensland.

The EIS therefore needs to provide accurate information to demonstrate:

- If there are "no go" zones where any land contamination is not acceptable; and
- Clear and predetermined standard environmental practices acceptable under legislation e.g. safe effluent disposal, defined buffer zones for activities and infrastructure against stream order classifications.

Management of land contamination action targets should focus on motivating changes in land use and in environmental management practices, protecting and conserving regional and catchment environmental values and, as appropriate, undertake activities to arrest degradation and rehabilitate degraded areas.

Regional NRM Plans, and associated technical reports, regional profiles or overviews can provide important data on resource condition and trend analysis. These Plans therefore offer the proponent a better understanding on the waste reduction and recycling investment activities needed for the long term health and sustainability of a region's natural assets and its communities.

Queensland is fast becoming a "cess pit" for an extensive array of mining activities that produce hazardous contaminants e.g. drilling fluid, brine, leachate, $PM^{2.5}$ dust etc

QMDC asserts the TOR need to address best practices which adequately address the unique operations of a specific project and the nature of the hazardous contaminant.

A more strategic and environmentally responsive EIS relies on the proponent addressing land contamination in terms of improving or maintaining resource condition and meeting aspirational targets for Queensland's regional assets will improve the capacity of regional communities to achieve waste management aspirations encapsulated in the NRM Plans. This level of responsiveness is clearly needed to enable the alignment of state and regional planning processes.

QMDC recommends the inclusion of a threshold limit approach in the TOR. This approach would provide greater clarity and certainty because thresholds limits would help to define those natural resource assets identified as being both nationally and regionally at risk to the impacts caused by activities and infrastructure associated with the land contamination.

Setting threshold limits for natural assets (water (surface and groundwater); vegetation and biodiversity; land and soils; air) will help the contaminated land professionals to identify whether a new development or existing industries or businesses can operate without generating or disposing of levels of hazardous waste that will cause unacceptable impacts on those assets within the defined threshold limits.

QMDC is concerned that contamination of agricultural land by mining activities may in the future lead to failure of produce to comply with the Australian Food Standards Code, or create problems with export market standards. Maximum Residue Limits and Maximum Permitted Concentrations for contaminants in commercially-produced foods, whilst taking protection of health into consideration, tend to be based upon what is achievable with good agricultural practice rather than purely toxicological/public health grounds.

A further policy consideration is the principle, of 'maximum beneficial land use', which represents an ideal situation where remediation of contaminated sites occurs to the point where the land becomes suitable for all potential uses. If such remediation does not occur, and only one particular type of land use is deemed safe or permitted to occur on a contaminated site, then clearly there need to be planning control mechanisms so that changes to more sensitive land uses are restricted.

This was recommended in the
ANZECC position paper, '*Financial Liability for Contaminated Site Remediation'* (1994):

> 'Governments should put in place appropriate mechanisms within the planning process to ensure that potentially contaminated land is not rezoned to allow a more sensitive use without adequate assessment of environmental and human health risks and appropriate remediation where necessary.'

QMDC argues that there are likely to be occasional instances where the existing investigation criteria are inadequately protective of ecosystems or groundwater resources, and perhaps even under-protective of humans if all possible exposure pathways are investigated and taken into account. This means that there always remains a need to consider sites on their respective merits, rather than unthinkingly comparing soil sample analytical results to established criteria.

The National Land and Water Resources Audit (NLWRA) reported in 2000 that a total of 48 000 ha of land was estimated to be affected by salinity in Queensland (CoA 2001). The Australian Bureau of Statistics reported in 2002, however, that the current area of saline land in Queensland was 107 000 ha (ABS 2002). This represents a more than twofold increase in saline area in just two years. This increase in area is attributable mainly to landholders' greater understanding or recognition of salinity. The NLWRA has estimated that if no preventive measures are taken, the saline area will to increase to about 3.1 million ha by the year 2050".

Daniel Brough (Department of Natural Resources and Water) in a report assessing land in Queensland affected by salinity states that, "the value of assets affected by salinity is not well quantified", and notes that the costs to the community of salinity affecting agricultural land will potentially be significant. Productive land is a finite resource. The communities of Queensland will bear the full cost of the loss of productive land, to a potentially irreversible salinity outbreak.
http://www.derm.qld.gov.au/environmental_management/state_of_the_environment/state_of_the_environment_queensland_2007/state_of_the_environment_queensland_2007_contents/land_salinity.html

The development area is prone to salinity outbreaks. QMDC therefore recommends serious consideration on the management of salinity issues.

The sustainability of prime agricultural land and Australia's food security requires all industries and development to view the soil as a finite resource and not a receiving medium for a whole range of toxic substances. Australia's most important asset is the soil.

Queensland's *Strategic Cropping Land Policy* and existing *Good Quality Agricultural Land Policy* SPP1/92 should be rigorously implemented so that industrial or development projects including residential avoid land contamination on productive land assets.

Many CSG, coal mining and other development Environment Impact Statements (EISs) and Environmental Authority (EA) applications have identified a large number of activities that have the potential to cause land contamination and or sterilisation.

QMDC asserts that mine drainage or acid run-off which dissolves heavy metals such as copper, lead and mercury into ground and surface water may also prevent Australia's ability to secure food for the future. This impact is too great to support mere actions of management or mitigation.

The TOR should therefore require information on:

- site-specific investigations once contaminants are deemed to exceed the investigation criteria for that particular land use; and
- protocols on complex issues such as air monitoring for volatiles, groundwater testing, and the implications of complex mixtures for health risk assessment.

QMDC asserts that the TOR must require the proponent 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 of water sources, agricultural land and soils occurring. Whether heavy metals are treated actively through a water treatment plant or passively through a self-operating system any contamination is in QMDC's opinion, unacceptable.

The storage of large volumes of associated water awaiting treatment or reuse, potentially contaminated with many toxic substances, is a serious risk. If untreated CSG water is used for coal washing or dust suppression, and for example, comes into contact with good clay soils, they become impervious to water and useless for agriculture.

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

Should the land associated with these projects be deemed SCL it may not be able to be reinstated or fully restored to a strategic cropping land condition. The development would therefore permanently alienate rather than temporarily diminish productivity.

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 (through open cut coal mining), 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.

The potential impacts of mining on the cropping soils of the Darling Downs and surrounds have been associated with (1) reduction in the yield potential of the reinstated soil, (2) loss or reduction of underground water supplies and (3) dust impacts on surrounding crops (ASSSI, 2009).

In regards to the natural soil assets of the QMDB, to the knowledge of QMDC, no field research has been undertaken to show the feasibility of reinstating prime agricultural land based on Vertosols on the Darling Downs.

QMDC assert that due to the productivity of these areas and the potential detrimental effects that may occur during the permitted land use activity including remediation and rehabilitation, it is essential that research should be conducted to demonstrate whether it is even feasible to reinstate these landscapes, before the activity is permitted.

QMDC recognises that the Australian mining industry has developed the technology to rehabilitate diverse landscapes back to native vegetation or grazing, particularly in the case of mining of bauxite and mineral sands. Rehabilitation of land mined for coal by open-cut methods in QLD and NSW has involved, in almost all cases, establishment of pastures for grazing or of native ecosystems on land that was capable only of supporting grazing or forestry (Mulligan, 1996). There is no scientific evidence that Vertosols can be reinstated post mining activities.

2.16 Section 5.3 Nature conservation (pp34-36)

The TOR of must require the proponent to demonstrate scientific understanding of the importance of remnant vegetation and preventing further fragmentation or destruction of ecosystem corridors. 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 studies required by the TOR 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 asserts that the TOR must ensure that the proponent does not fail 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.

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. QMDC recommends that the proponent must demonstrate how it will:

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

QMDC asserts, the TOR should make it clear that the proponent will not be permitted to clear regional ecosystems mapped as ‘endangered’ or ‘of concern’ protected under the *Vegetation Management Act 1999*, or listed ecological communities under the EPBC Act. The TOR must also 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.

A search on the area found that native grasslands that at least two 'stands' of "Themeda on alluvial plains" may be present. (RE: 11.3.24). This ecosystem is listed both by state and federally. It is classified endangered under the Vegetation Management Act 1999 and Biodiversity Act 2004. It is listed as "Critically Endangered" under the federal Environment Protection and Biodiversity Conservation Act 1999. (This is a wetland based ecosystem mind).

2.17 Section 5.5 Air quality (pp46-49)

Adequate analysis must be provided to fully address the impact of dust in relation to the prevailing winds and annual mean wind speed. The level of particle pollution in the air in the region should be a major concern as there is increasing evidence that exposure to fine particles has the potential to affect human health, with no known safe level of exposure. Air pollution is known to have a negative effect on the respiratory system (lungs and airways) and on the cardiovascular system (heart function and blood circulation).

It is most likely that each individual and sensitive receptor will react differently to air pollution depending on their health status, the length of time spent outside, and the concentration of pollutants.

QMDC is informed that local landholders in the Muldu region, adjacent to Acland Coal mine have discovered coal debris is regularly present in the area on roadside reserves in the area. In QMDC's opinion the TOR should require the proponent to address this issue and outline what future soil testing and monitoring they will conduct to assess this issue. According to local knowledge it would be advantageous to obtain a baseline soil assay at the Southern end of the under-road drainage pipe (approx.: -27.273896, 151.689024) to review for any cumulative impacts of coal contaminants on soils (10 years of mining activity).

Landholders in the general vicinity (Muldu) of the existing mine have also complained of considerable coal dust deposition in their rainwater storage facilities – which are for human use. In QMDC's opinion current guidelines for controlling dust are either not adequate to start with, or are not being followed. This needs to be addressed in the TOR and new guidelines need to be considered and/or developed prior to the start of any expansion, as these will need to include cover all blasting procedures.

"Research suggests that air pollution is responsible for 2.3% of all deaths in Australia. It is estimated that air pollution causes 640 to 1400 premature deaths and almost 2000 hospitalisations per year in the Greater Sydney Metropolitan Region. Air pollution costs New South Wales around $ 4.7 billion dollars per year in health costs."

http://www.health.nsw.gov.au/publichealth/environment/air/air_pollution.asp

It is recommended that a monitoring network be established that will consist of high-quality ambient air quality monitoring stations located in strategic locations around the Project development area and population centres to give accurate, quality assured and up-to-date data to the community on regional air quality.

The air quality data, as well as data on wind speed and direction, should inform an Air Quality Index (AQI) for reporting daily air quality and indicate how clean or polluted the air is, the associated health effects and the impact on sensitive groups.

The AQI should be designed to let local community members and company staff know:

- Air pollution levels in their community and work site
- Tomorrow's air quality forecast - to help town residents and sensitive receptors plan their day
- Who is at risk from air pollution
- Simple steps people can take to protect themselves

This monitoring regime needs to go beyond the proposed monitoring which is largely associated with monitoring the operation of this specific project. It must also be readily accessible to the neighbouring towns and their communities.

This information should therefore be up-dated on the EPH and other relevant government and community websites hourly to provide real time public access to a continuous information stream for community, company staff, industry and government.

It is recommended that the project's air quality monitoring regime provide a clear picture of the regional air quality which the general community can experience in real time as well as provide information that can be used to identify the cause of any change in air quality and to help identify the major sources of particles in the region.
QMDC asserts that regional air quality issues must be analysed in relation to the cumulative impact of:

- all operations of the proposed development area;
- all operations of the energy and mining industries; and
- all other regional industries such as agriculture, power plants, transport services etc.

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

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

2.18 Section 5.6 Greenhouse gas emissions

GHG emissions are relevant to this application because, as the prolonged drought and recent floods have demonstrated, Queensland 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 the project will impact upon.

The proponent 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.

The TOR must address carbon emissions and carbon offsets based on coal 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 form 34% of Australia's total carbon emissions and 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

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 proponent 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 coal 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 protected.

QMDC recommends that scope 3 emissions to be included in the assessment of emissions associated with the proposed project. The TOR if it adopts the GHG Protocol (The Protocol) definition, stipulates that "scope 3 emissions are a consequence of the activities of the company, but occur from sources not owned or controlled by the company. Some examples of scope 3 activities are extraction and production of purchased materials; transportation of purchased fuels; and use of sold products and services."[1]

The TOR should therefore clearly indicate that "direct associations" should include emissions produced as a result of transportation of the coal, and emissions produced as a result of the end-use of the coal.

It is submitted that the scope 3 emissions relating to the transportation and end use of the coal are the most relevant scope 3 emissions to the project.

Arguing that scope 3 emissions are not 'readily identifiable' should not be used to justify a refusal to quantify emissions where there are uncertainties involved in such quantification. Where uncertainties exist, for example in calculating the emissions generated by exporting the coal, it would still be possible to provide a minimum estimate by calculating the emissions generated by the most energy efficient form of transport to the nearest foreign market. Similar efforts could be made to calculate the maximum and median range of expected emissions.

QMDC recommends that the TOR should expressly require the proponent to calculate scope 3 emissions from the project, including those emissions produced as a result of transportation and end-use of the coal. Calculations should be made on both an annual and life of project basis. Uncertainties and data inaccuracy should not justify a failure to provide any estimation of such emissions.

2.19 Section 5.8.2 Waste management (pp52-56)

See comments on land contamination and air quality.

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1 1 World Resources Institute / World Business Council for Sustainable Development (2004) *The Greenhouse Gas Protocol: A Corporate Accounting and Reporting Standard (Revised Edition)*. Page 25.

2.20 Section 8 Hazard and risk (p69)

QMDC asserts the TOR must be improved in order to address identified major flaws of conventional risk assessment. QMDC argues that what EISs deem as acceptable levels of risk does not align to current public concern and the value communities place on preventing harm minor and serious to the environment, to themselves, their families and communities, to the future generations.

QMDC recommends the proponent defines, for example, what constitutes an 'emergency' with regards to having to access groundwater from the Helidon (Precipice) and Marburg (Hutton) aquifers, in addition to the 5650ML to be supplied from municipal means. These aquifers are not intimately connected to the Walloon Coal Measure.

Risk assessment assumes humans and the environment can absorb a certain amount of pollution and render it harmless, known as "assimilative capacity". As stated earlier, QMDC is concerned that eliminating risk altogether is not the goal of risk assessment within the TOR— it is used to mitigate, manage and reduce risks, not to prevent harm.

Risk assessment focuses on quantifying and analysing problems, rather than solving them. It asks, "how much pollution is safe or acceptable; which problems are we willing to live with; how should limited resources be directed?" It does not ask, "how do we prevent harmful exposures; move toward safer and cleaner alternatives; involve society in identifying, ranking, and implementing solutions?"

Risk assessments use different models with high uncertainty. Current risk assessment is based on many different assumptions about exposure, dose-response and the extrapolation of results from animals to humans.

Risk assessment allows dangerous activities to continue under the guise of "acceptable risk." It allows the continuation of activities that lead to greater pollution and degradation of health under the premise that it is either safe or acceptable to those who are exposed. It prevents action.

Risk assessment is fundamentally undemocratic. The risk assessment process is most often confined to agency and industry scientists, and consultants. It traditionally does not include public or community perceptions, priorities, or needs, and does not use widespread public participation.

Risk assessment puts responsibility in the wrong place. It assumes that society as a whole must deal with environmental harm, because that is the price of "economic growth'. It diverts attention from those responsible for harm and those who created it. It focuses government resources on studying the problems rather than identifying safer alternatives to potentially dangerous activities.

Risk assessment often poses a choice between economic development and environmental protection. Governments and industry often tie 'scientific' process of risk assessment to cost-benefit analysis but fail to question who assumes the cost and who reaps the benefits. The economic benefits of cleaner production have been clearly demonstrated but often not acknowledged. Also, the cost of under-regulating will typically be greater than overregulating, when considering the subsequent clean-up and health costs.

Terry Hardy in a report entitled *The Role of Human Factors in Safety Risk Assessment* (Great Circle Analytics, June 1, 2010) Retrieved from http://www.gcirc.com/images/role.pdf draws attention to are a number of factors that can negatively affect the integrity of a qualitative risk analysis.

Hardy states that researchers have shown that a number of biases affect how humans make judgments in the face of uncertainty. Such biases can affect risk assessments. Hardy lists some of those biases as follows:

- *Availability bias.* Availability bias is overestimating the available information.

- *Confirmation bias.* Many studies have shown the propensity for humans to use existing information, and neglect nonconforming information, to confirm a pre-existing assumption, whether that assumption is true or not. In other words, people tend to see what they want to see. If one believes that tank overpressure will never be a problem, then they will search for all the ways a tank cannot possibly rupture and ignore other problems such as leakage at interfaces.

- *Hindsight bias*. Hindsight bias leads people to exaggerate in retrospect what was known in advance, often oversimplifying the chain of events. For example, if one knew from an accident investigation that structural failure was a contributing factor, then they might assign a high likelihood in a new hazard analysis to structural failure because of that investigation, when in fact a number of other random events may have also occurred to cause that particular accident.

- *Insufficient adjustment bias.* Studies have found that the final subjective probability can be highly dependent on the initial value chosen. For example, if the initial likelihood value is selected to be “very low,” but subsequent information shows that the likelihood of an event is actually high, the bias is to allow the likelihood to remain at the “very low” end of the scale, possibly raising it a bit to “low” based on the new information.

- *Representative bias.* This bias refers to overemphasizing similarities. For example, if a steel tank showed a low probability of a rupture based on previous tests and analyses, then the inclination is to assign the next tank under analysis that same likelihood. However, that next tank might be made of composite materials that have not been tested under similar conditions and therefore may not truly be similar to the previous tank. Representative bias can lead to what is known as base-rate neglect, where actual data and failure frequency are ignored.

- *Insensitivity to sample size.* This bias is similar to availability bias in that it implies an overreliance on a limited amount of data. It also comes from a philosophy that if something has worked before then it will work again, even if there are limited data to back up that conclusion.

- *Overconfidence bias.* Overconfidence is the tendency of humans to exaggerate their knowledge of uncertain events. Humans tend to become especially overconfident if they have had a string of successes without failure. For example, studies have shown that most people think they are better than average automobile drivers, in part because they have not been involved in a serious automobile accident. Their overconfidence is based on a series of successes and lack of feedback.

- *Organizational and personal bias.* Risk assessments can be biased by organizational or personal pressures. Most of the time this bias does not reflect a situation where fraud and abuse are present (although it can). Rather, this is usually an attempt to make an unacceptably high risk more acceptable, because higher risk requires justification and acceptance at a higher management level. For example, if a risk is shown as “catastrophic” and “high,” a panel may find ways to convince itself that the likelihood is something lower to avoid additional justification to senior management.

Hardy also identifies process failures in addition to biases that may affect a risk assessment:

- *Lack of standardization of risk matrices.* One problem area in risk assessment efforts is that different risk acceptance matrices are used within industries and between industries. The wording is usually different on these risk matrices, leading to potential confusion.

- *Misunderstanding about what the likelihood and severity definitions mean.* Five people could have five different interpretations of the likelihood and severity definitions. If there is not specific guidance and training on those meanings, with frequent refreshers, then everyone in a given room could agree on a risk level, but could in fact be agreeing on different things.

  Even if the same risk matrices are used within one organization, different projects can assign their own meanings. This problem becomes much worse when the likelihood definitions have no probabilistic values assigned. Even when probabilistic values are assigned to the likelihood definitions, there can be confusion if no units (e.g., likelihood per day, per hour, per second) are assigned to the probabilities. In addition, applying likelihood definitions meant for continuous operation based on time (such as in a chemical plant) may be incompatible with operations that are discrete (such as a rocket launch).

- *Making unrealistic assumptions about the system and operations.* Hazard analyses typically assume that the quality control procedures are adequate to assure that the design conforms to requirements, that testing will adequately verify the operation of the system, that the operators are trained and capable, and that operational procedures are clearly defined. Analysts must make assumptions or the analysis can become unreasonably large and unwieldy, but these assumptions may be incorrect and therefore bias the results of the assessment.

- *Focusing on the worst credible event and ignoring more likely but less severe events.* System Safety analyses tend to focus on the worst credible event, and then determine risk based on the likelihood of that event. However, because risks are a combination of likelihood and severity, risks with less severe consequences cannot be ignored. For example, tornados may occur infrequently enough in some areas of the country to justify acceptance of the risk of tornado-level winds in structural design. But high winds with less strength may actually produce damage more frequently, requiring additional structural margins.

- *Failure to recognize when risks are not independent.* Correlated causes can lead to a higher overall system risk, and a failure to understand when causes are dependent can lead to an underestimation of risk.

- *Failure to realize that risks tend to be additive.* In reality, accidents occur because a number of unlikely events occurred in concert, usually involving hardware failures, human error, and procedural failures. When considered individually, these risks often are small, but when added together they create one large risk to the system. Risk analyses often focus on individual hazard causes and therefore may underestimate the risk to the system. Sometimes this process failure is referred to as conjunctive distortion, which is misjudging the probability of combined events relative to their individual values.

- *Failure to measure the effectiveness of the method.* Most quantitative models are validated against real data. However, qualitative methods are rarely validated. Although some organizations are interested in such an activity, resources are usually not available to compare the qualitative analysis to results in the field, often because the program has ended or because the system is operational and precious resources are spent running that system.

Personnel and organizations charged with developing and evaluating the risk assessments can also affect the quality of the outcome.

- *Lack of training and experience with risk assessment methodologies.* Sometimes the organization performing the risk assessment, or even the one evaluating the results, has little experience with that process. Inexperienced analysts may complete the analysis procedure, but they may not understand the significance of each step. In these cases parties can walk away thinking they have completed an acceptable safety analysis and review, when in fact no one truly understood what they had just analysed or the implications of the results. This can lead to a significant underestimation of the actual risk.

- *Only relying on experts with extensive experience to dictate the risk assessment.* While using inexperienced personnel can be a problem, relying on experts can also provide a false sense of security. Experience is a tremendous help when trying to perform risk assessments. However, in addition to the biases described above, there are some caveats with regard to relying on expert assessors:

  > Experience is based on one's memory of events, and people tend to be very selective of what they remember. What one decides to conclude from their experiences may be based on emotion or faulty logic.

Experience may be based on internal processing, and unless one is exposed to reliable feedback, they may actually be learning the wrong lessons.

Experience may not be applied consistently.

- *Failure to include the safety and management culture in the assessment of risk.* Evaluating the management culture and how that culture influences the assessment and reduction of risk can be difficult. But a failure to include management and organization factors in the assessment could result in a gross underestimation of the risk, as evidenced by a number of accidents with root causes tied to organizational factors.

QMDC recommends that the following of Hardy's suggestions to improve qualitative risk assessments are worthy of serious consideration to improve the TOR:

- *Measure the effectiveness of the risk assessment effort.* Engineers and scientists should not assume that their approach to risk assessment is valid. Questions to be considered are: do the risk assessment efforts work, would anyone know if they didn't work, and if they did not work what would be the consequences. Risk assessments should be subject to the same rigor as other engineering efforts. Resources should be made available to determine whether the likelihoods and severities identified in the qualitative analyses are consistent with the experience in the field and to learn if safety engineering and management are weakening.

- *Insist on quantitative bounds for qualitative likelihoods and severities.* Efforts should be made to justify that the risk falls within quantitative bounds through additional analyses, including quantitative assessments. Even with quantitative bounds on hazard likelihoods there can be misinterpretations, but without them there is no basis for the assessment.

  Similarly, it is important to understand the potential for large numbers of casualties and large property and environmental losses. Therefore, efforts should be made to perform quantitative consequence analyses to determine severity for potentially catastrophic risks.

- *Train analysts and evaluators on the meanings of qualitative likelihoods and severity classifications.* Training is essential to achieve a mutual understanding of the meanings of the classifications, especially where terms such as "frequent" or "critical" are concerned. This training does not have to be extensive, but without an opportunity for mutual understanding, the risk assessment effort is bound to be inconsistent and could lead to a gross misunderstanding of the risk.

- *Train analysts and evaluators on the potential biases in the process.* It is also important that analysts and evaluators understand the implications of intentional and unintentional bias and their own perceptions of risk. Biases are, in essence, mental shortcuts used to assess risk under uncertainty, and not all shortcuts are bad - "Garbage in, garbage out" is one such shortcut that warns against representative bias. But by understanding these biases we can guard against the potential for overconfidence.

- *Explicitly state and document assumptions.* Although assumptions are necessary to conduct any analysis, it is important for all members of an organization to understand, and agree to, the assumptions and the limitations in that analysis.

- *Include management and organizational factors as potential causes in system hazard analyses.* History has proven that cost, schedule, and management factors have the potential to lead to accidents. Although difficult to measure, and sometimes difficult to control, explicitly detailing these factors will bring this risk to the attention of decision makers.

- *Analyse risk individually for each cause and for each consequence.* Decomposing the risk allows a more complete and accurate picture of the system risk. Risk should be analysed for each cause, and for each phase.

- *Incorporate methods that use realistic models of risk.* Consideration should be given to accident models that take into account interdependencies of individual risk, recognizing when common causes can defeat redundancy and increase risk. Risk assessments should also reflect the reality that small risks can add up to create a hazardous condition, and analyses should include the use of risk summation and cumulative risk approaches. Therefore, a risk assessment should not only decompose risks, but also consider ways to "roll up" risk to determine cumulative effects.

- *Do not rely solely on scoring methods for safety risk assessment.* A major reason that scoring methods such as the risk acceptance matrix are used is because they are perceived as being easy to implement. In fact, if done correctly, risk assessment is a difficult and complex process. Therefore, in the face of difficult decisions on complex systems, decision-makers should not only rely on qualitative methods. Quantitative risk assessments should be used to verify the likelihood estimates, at a minimum, to assist in those decisions.

2.21 Section 9 Cumulative impacts (p72)

QMDC recommends that the proponent clearly demonstrates that there will be no impact on the Great Artesian Basin.

2.22 Section 11 Environmental management plan

QMDC recommends that if an impact cannot be prevented then reasons must be articulated backed up by scientific evidence why it is acceptable to only mitigate.

Additionally QMDC would like it clearly articulated in the TOR the definition of "rehabilitation".

2.23 Section 12 Conclusions and recommendations (p74)

QMDC asserts conclusions and recommendations formulated from reports and studies undertaken for the proponent must be independently peer reviewed. Scientific research is urgently needed to gain better knowledge and intelligence on the site specific and cumulative impacts caused by the mining industry on local, regional and national water resources. There is in our opinion major gaps in the science informing both the Australian and Queensland Governments' decisions on coal mining developments.

On this basis QMDC supports the involvement of the Independent Scientific Committee in order that the Coordinator General obtains independent advice which provides recommendations on:

- Best practice responses to and controlling provisions for the specific impacts of coal mining operations and activities;
- Best practice responses to the cumulative impacts of the coal mining industry;
- Alignment with Regional NRM Plans and other relevant regional policies and plans;
- How the coal mining industry must primarily avoid impacts or risks on national water resources and ecosystems; and
- Long term effective management or mitigation strategies for national water resources and ecosystems.