



Independent Expert Scientific Committee  
on Coal Seam Gas and Large Coal Mining Development

# summary guide

## Assessing groundwater-dependent ecosystems

### Background

Groundwater-dependent ecosystems (GDEs) are ecosystems whose species and ecological processes rely on groundwater, either entirely or intermittently. Examples of GDEs include rivers, springs and swamps fed by groundwater, vegetation whose roots can access groundwater, and animals living in aquifers (stygo fauna) and cave streams.

Groundwater dependence of ecosystems varies greatly through both space and time. Dependence by their biota can be continuous (e.g. stygo fauna), episodic (e.g. riparian trees that use groundwater when soil moisture or surface water is not available) or strategically cued to critical life stages (e.g. fish using warm upwelling groundwater for spawning). Many GDEs contain high biodiversity and support valuable ecosystem services such as nutrient cycling and groundwater filtration.

Coal seam gas (CSG) and large coal mining (LCM) developments are important to Australia's economy yet pose potential risks to GDEs by altering groundwater regimes, groundwater quality or both. GDEs are vulnerable to CSG and LCM developments because of hydrological, hydrogeological and geological links between the development and adjacent GDEs.



*A Green and Golden Bell Frog*

### Context

Currently many environmental impact assessments of CSG and LCM projects overlook GDEs that use water episodically or opportunistically. Additionally, only protected or threatened ecological communities that have been listed tend to be considered. However, the legislative intent of the 'water trigger' is that potential impacts from CSG and LCM on **all** GDEs should be assessed.

To supplement the IESC Information Guidelines, the IESC developed an Explanatory Note on assessing groundwater-dependent ecosystems. This Explanatory Note provides additional guidance to proponents undertaking an impact assessment of GDEs. It outlines a logical framework for undertaking the assessment and suggests some tools and techniques that may be useful during the impact assessment.

The Explanatory Note contains a number of recommendations relevant to both greenfield projects and expansions of existing projects. Importantly, proponents need to consider all GDEs that are potentially affected by their project, including GDEs that are only partially or occasionally dependent on groundwater and/or do not support any listed species. Before development starts, all GDEs that are potentially impacted by the project or which could be used as reference sites should be mapped and baseline data collected on their ecological condition. These baseline data, together with an assessment of each GDE's ecosystem value, can be used to prioritise GDEs for further assessment, monitoring and management.

This initiative is funded by the Australian Government.

## Framework for assessing GDEs in an environmental impact assessment

Over the last decade, various methods and tools have been described for assessing Australian GDEs to aid identification and conceptualisation of how water may be used by a GDE. The Explanatory Note outlines these tools and suggests some additional tools and approaches. Together, these tools form the basis for the logical framework presented in the Explanatory Note.

The logical framework to guide preparation of information for an environmental impact assessment (EIA) that describes and assesses potential impacts, risks and mitigation options for CSG and LCM activities on GDEs comprises six steps:

1. defining the likely project impact area (which includes the footprint of surface infrastructure and the extent of groundwater depressurisation)
2. undertaking a desktop study to identify potential GDEs and potential risks to GDEs in the project impact area
3. assessing the level of groundwater dependence for each GDE and identifying the potential causal pathways for impacts from CSG or LCM activities
4. determining the baseline ecological condition and value of each GDE including potential control/reference sites
5. undertaking a risk assessment that includes consideration of the magnitude of potential impacts potentially arising from the CSG or LCM activity, their likelihood and their consequences on GDEs.
6. prioritising options to avoid or mitigate impacts on GDEs and establishing a monitoring plan to test the effectiveness of mitigation strategies.



*A monitoring bore*

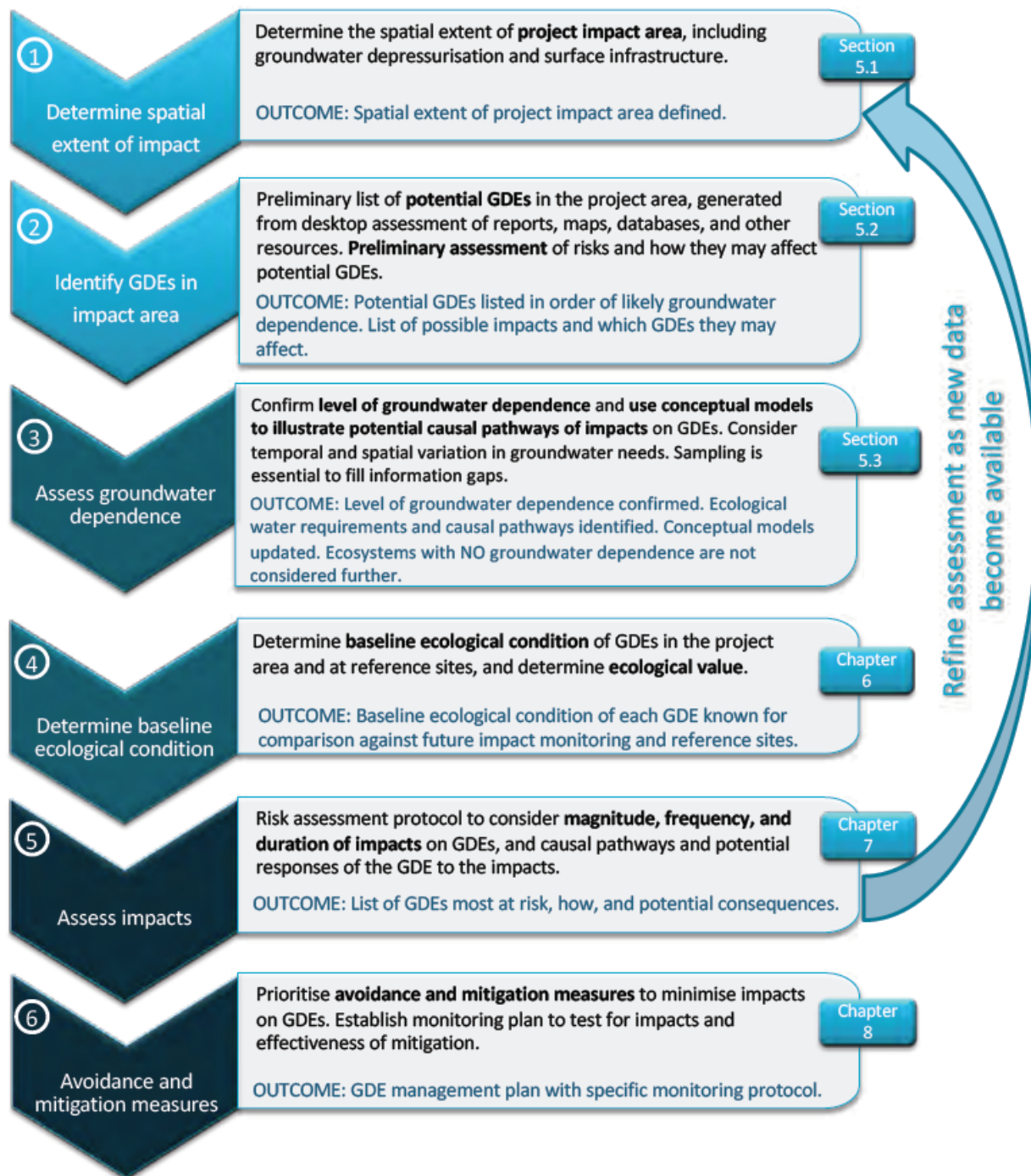
## Key Recommendations

The Explanatory Note presents several recommendations. The key ones include:

- Proponents should consider all GDEs that may be affected by the project. This includes GDEs that are only partially or occasionally dependent on groundwater as well as those that do not support any species listed in national or state legislation as threatened or endangered.
- Risk assessments will need data from desktop analyses and field surveys by qualified specialists who use appropriate methods, models and survey designs that include adequate reference sites and sufficient replication in space and time. Sampling should be more intensive in GDEs that are deemed of higher value (e.g. harbour rare or threatened species, provide valuable ecosystem services) and/or face greater risk of impacts. Ideally, GDE sampling sites should be located near groundwater monitoring bores so that concurrent hydrogeological and water quality data can be collected.
- Impacts on GDEs of particularly high value should be avoided. Where impacts cannot be avoided, mitigation strategies to minimise impacts are required and should be specified before operations commence. The choice of mitigation measures and their likely effectiveness should be justified in the environmental impact assessment. Targeted monitoring will be needed to confirm the effectiveness of these mitigation strategies, and alternative options proposed in case the strategies are ineffective.

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## A logical framework to guide preparation of information for sections in an EIA that describe and assess potential impacts, risks and mitigation options of CSG and LCM activities on GDEs



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