



Groundwater Monitoring and Modelling Plans - Information for prospective mining and petroleum exploration activities

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Purpose and scope

This document assists in the development of Groundwater Monitoring and Modelling Plans (GMMPs). These plans are required as a standard condition of licence for exploration (drilling) under the *Mining Act 1992* and *Petroleum (Onshore) Act 1991*.

This document also provides industry users with information about the *NSW Aquifer Interference Policy* (AIP) and other regulatory requirements under the *Water Act 1912* and the *Water Management Act 2000*, as they relate to mineral and petroleum prospecting.

The purpose is to provide information that will assist with the design of a groundwater (and associated surface water) monitoring programs that ensure the required data and information for:

- hydrogeological conceptualisation
- assessment of baseline and regional conditions
- time series data for any future groundwater model calibration.

Specifically, exploration involving the construction and use of boreholes under an exploration licence issued under the *Mining Act 1992* and *Petroleum (Onshore) Act 1991*, where it is required as a condition of that licence.

This document is designed to be used for the ongoing development of groundwater monitoring operations and groundwater modelling as a project matures beyond the exploration phase, to mining or petroleum production and beyond the life of the activity.

While there is a strong focus on groundwater monitoring and modelling required for assessing proposals against the requirements of the AIP through the stages of approval, groundwater monitoring and modelling beyond project approval is required to identify trends and deviations from modelled predictions and initiate response and mitigation prior to exceeding defined thresholds.

About the exploration licence condition

Licences for petroleum and mineral exploration administered by the NSW Department of Trade and Investment (Division of Mineral Resources and the Office of Coal Seam Gas) may include a standard condition which requires licence holders to prepare a Groundwater Monitoring and Modelling Plan in consultation with the NSW Office of Water.

The overall intention of this licence condition is to ensure proponents understand and comply with the regulatory controls for the protection of water resources and their dependent ecosystems.

The condition has been introduced in the early phases of project development to ensure the groundwater monitoring requirements, which can have a long lead time are adequately planned and underway when required.

The **licence condition** requiring a Groundwater Monitoring and Modelling Plan is shown below. Note that the specific wording of the condition can vary from licence to licence.

Prior to conducting prospecting operations involving the construction and use of boreholes (or petroleum wells), the licence holder must:

- a) Prepare a Groundwater Monitoring and Modelling Plan in consultation with the NSW Office of Water
- b) Ensure that the Groundwater Monitoring and Modelling Plan:
 - i. describes methods for identifying aquifers, their depths, behaviour, containing layers and connectivity with surrounding aquifers or surface water systems
 - ii. describes methods for collection of data relevant to the type, quantity and quality of water contained within aquifer systems likely to be encountered during prospecting operations
 - iii. provides for the future development of a conceptual model of regional groundwater behaviour
 - iv. provides for the future development of a calibrated computer model of regional groundwater behaviour, to enable the impacts of any proposed mining operations to be assessed
 - v. describes how records of all data collected will be maintained
 - vi. describes the staging process for implementation of the plan
 - vii. is prepared in accordance with any additional requirements prescribed by the Director-General.
- c) The Groundwater Monitoring and Modelling Plan must address the requirements identified in b)i) to b)vii) in a level of detail commensurate with the scale, timing and potential impact of proposed operation
- d) Have the Groundwater Monitoring and Modelling Plan approved by the Minister; and implement and comply with the approved Groundwater Monitoring and Modelling Plan.

Note: The Groundwater Monitoring and Modelling Plan is required to ensure:

- a) *there is sufficient groundwater data available to assess future operations against the **Aquifer Interference Policy (NSW Office of Water, 2012)**, as amended or replaced from time to time*
- b) *two years of baseline data is available prior to submitting an application for any future mining operations.*

An application may be made to the Department at any time to vary an approved Groundwater Monitoring and Modelling Plan.

Requirements of the Aquifer Interference Policy

The NSW Aquifer Interference Policy (AIP) was released by the NSW Government in September 2012. The purpose of the AIP is to explain the water licensing and assessment processes for aquifer interference activities under the *Water Management Act 2000* and other relevant legislative frameworks.

The AIP clarifies the requirements for obtaining water licenses for aquifer interference activities and defines considerations in assessing and providing advice on whether more than minimal impacts might occur to a key water-dependent asset.

The AIP can be found at www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference/Aquifer-interference

An understanding of the AIP is vital in the designing of a GMMP. The GMMP is required to ensure there is sufficient groundwater data available to assess future operations against the AIP.

The key requirements of the AIP are to:

1. **account for, or prevent, the take of water.** Where a proposed activity will take water from an aquifer or connected surface water source, adequate arrangements must be in place to account for this water. It is the proponent's responsibility to enable this to be estimated to a suitable level of accuracy, and to ensure necessary water licences are obtained and held

2. **address the 'minimal impact considerations'**. Aquifer interference activities can adversely impact groundwater and connected surface water sources by decreasing groundwater pressure and/or lowering the water table; deteriorating groundwater and surface water quality either due to pollution or increases in salinity; by affecting the health or viability of a groundwater dependent ecosystem (GDE), or impacting on a culturally significant site (CSS). The AIP provides objective, measurable thresholds for considering the degree of impact an activity may have on the water table, groundwater pressure and water quality changes. The assessment criteria differ between aquifer types (e.g. alluvial, porous, fractured) and whether the aquifer is deemed 'highly' or 'less' productive on the basis of natural water quality and extraction yields
3. **propose remedial actions**. Where impacts are greater than those that were predicted as part of the relevant approval, proposed remedial actions shall be in specified to manage those impacts.

Note that in relation to requirement 2, 'highly' and 'less' productive aquifer types have been defined by the NSW Office of Water and identified in a table and map on the Office of Water's web site.

The Office of Water should be contacted for advice if there is any uncertainty in identifying a water source.

Additionally, the AIP allows for the assessment of other potential environmental impacts such as:

- soils acidification
- water logging
- aquifer compaction or fracturing
- the disposal of waste water.

The AIP defines a suite of activities which are deemed to be **minimal impact activities** and thus exempt from requiring assessment against the AIP or from requiring any access licences under the *Water Act 1912* or approvals under the *Water Management Act 2000*.

Examples include;

- core holes
- stratigraphic (chip) holes
- geo-environmental and geotechnical bores
- certain groundwater monitoring bores
- sampling and coring using hand held equipment
- trenching and costeaning.

The AIP describes what proponents are required to provide so that an assessment can be made by the Office of Water. A GMMP, developed in consultation with the Office of Water ensures the data requirements, such as the establishment of a baseline and a history of data, that cannot be met retrospectively, are considered at the exploration phase.

Below is a condensed list of what is typically required by a proponent for an assessment against the AIP to be made. Some of these requirements are expanded upon in subsequent sections of this document and are used as the basis for designing a GMMP:

- Identification of aquifers, surface waters, Groundwater Dependent Ecosystems (GDEs) and Cultural Significant Sites (CSS) on which potential impacts of the prospective activities are to be considered.
- Establishment of baseline groundwater condition – level, quality etc.
- Details of potential water level, pressure or quality impacts on nearby water users, within source or in connected groundwater or surface water sources.
- Details of potential water level, pressure or quality impacts on nearby GDEs and CSSs.
- Details of potential for increased saline or contaminated water inflows to aquifers or connected groundwater or surface water sources.
- Details of the potential to cause or enhance hydraulic connection between aquifers.
- Details of the potential for river bank instability, or high wall instability or fracture to occur.
- Details of the management of waste water.

The AIP defines the minimum standards required for groundwater models, and the data that are applied to models. In some cases, a minimum of two years baseline data is required and the model must be consistent with the Australian Groundwater Modelling Guidelines and independently reviewed.

The staged approach

Any mining and petroleum exploration program is subject to numerous uncertainties, and in many instances exploration will fail to lead to eventual production.

Because of this uncertainty it is recognised that any GMMP will need to develop in a similar manner, commensurate with the stage the project is at.

The **staged approach** to developing the plan begins when exploratory drilling is planned. In the early stages, a GMMP might be as simple as demonstrating an understanding of the regulatory requirements for groundwater impact assessment and related water licensing requirements.

Highly resource intensive activities such as the construction of monitoring infrastructure and the development of a numerical groundwater model would not usually be required until much later in the exploration program.

As the project develops, the proponent may begin data inventory and collection and undertake a desktop-style analysis of available information.

In some cases, gathering of baseline information from existing bores and surface water sources would be advantageous at the earliest opportunity. When preparing to undertake exploratory drilling, the drilling techniques and bore construction methods should consider the potential for obtaining aquifer data and for future groundwater monitoring.

As exploration develops and the project moves closer to realising eventual production, further field investigations and the establishment of a wider network of monitoring infrastructure would proceed where there is justification for the higher capital costs.

At this point consideration would be given to the commissioning of a groundwater model.

Once a project reaches the stage of planning approval requiring the development of an Environmental Impact Statement (EIS), all elements of a GMMP should have been in place and underway for long enough to enable the considerations of the AIP and requirements under the water legislation and regulations to be met.

Information inventory and desktop analysis

The proponent should reference the requirement of the AIP, and the water legislative framework in general when designing a GMMP.

A key consideration is to:

1. firstly establish baseline groundwater condition
2. have a program in place which will allow for the measurement of groundwater level, pressure and quality change
3. allow the development of a groundwater model which meets the requirements of the AIP.

The following details the information collection and analysis **which should take place** in the initial stages of a GMMP development.

Understanding water sharing plans and water sources

Water sharing plans set the framework under which water is managed within NSW. They can be found at www.water.nsw.gov.au/Water-management/Water-sharing

A key element of water sharing plans is the definition and demarcation of **Water Sources**. For groundwater, these are defined and mapped by areal extent, geology and sometimes by depth. It is common for more than one water sharing plan to apply in any given area. These may refer to both groundwater and surface water sources, or multiple groundwater sources adjacent to or above and below each other.

The eventual design of a field monitoring program requires an understanding of the water sharing plan applicable to the project area. Nearby groundwater or surface water sources may be hydraulically connected and thus also potentially impacted and will need to be identified. This will in part determine the potential location and depth of groundwater monitoring bores, and what surface water monitoring may be required.

Where an exploration program advances to a stage where production is expected to proceed, the proponent will need to show a whole of system water balance that clearly identifies all inflows and outflows from all potentially affected water sources. All identified water take from all affected water sources must be accounted for and to ensure all necessary water licenses are acquired and held.

Identifying sensitive receptors

It is critical that any **sensitive receptors** within and near to the proposed project be identified. These can include:

- groundwater users
- Groundwater Dependent Ecosystems (GDEs)
- Culturally Significant Sites (CSS)
- connected groundwater and surface water sources.

Nearby licensed groundwater works can be identified from the Office of Water's Groundwater Data System (GDS). In some cases, it is advisable that a bore census survey be undertaken to confirm the location and currency of groundwater use in the area.

The proponent should take steps to establish the baseline conditions for any potentially impacted groundwater user which would in itself require:

- a bore census survey
- site visits
- sampling of private bores.

As a minimum, a desktop assessment should be completed to identify potential GDEs in the vicinity of the project. Several information sources are available for such a desktop analysis:

- The Groundwater Dependent Ecosystem Atlas (Bureau of Meteorology, 2012)
www.bom.gov.au/water/groundwater/gde/
- The Water Sharing Plan(s) relevant to the project site will list any identified high priority GDEs
- Mapping of high priority GDEs undertaken in some areas of the State.

It should also be considered whether the proposed activity planned for an area, is identified as **Biophysical Strategic Agricultural Land (BSAL)** which may need the identification of further sensitive receptors required by the **Strategic Regional Land Use Policy** and the **Gateway** approval process.

Conceptualising hydrogeology

A conceptual understanding of the hydrogeology and hydrodynamics of the project area is required to design a monitoring and modelling plan. The Australian Groundwater Modelling Guidelines (Barnett et. al., 2012) provides a thorough explanation of how to develop a conceptual hydrogeological model.

Although it is aimed primarily for the development of a numerical model, the principles explained are valid for occasions where the conceptualisation is required for other reasons that may not necessarily lead to a numerical model being created. The initial conceptualisation would be based on available desktop data and would be built on as exploration progresses.

In summary, hydrogeological conceptualisation includes the following elements:

- Establishing the hydrogeological domain
- Hydrostratigraphy
- Aquifer properties
- Geological and conceptual boundaries

- Stresses (water sources and sinks)
- Hydrodynamics
- Identification of significant structural controls and consideration of the effects of the activity on aquifer hydraulics and connectivity (through fracturing etc.)
- Consideration of water quality impacts on aquifer and connected water sources.

Completing the information inventory

A complete assembly of all relevant existing data, information and other knowledge sources will provide for a better designed and likely cheaper GMMP. Effort applied at this point to ensure all available information has been found, assessed and organised will improve the eventual outcome and avoid unnecessary and wasteful replication of effort where data and monitoring infrastructure already exist.

Sources of data and information include:

- NSW Office of Water (see Section 6.1 below)
- Bureau of Meteorology
- NSW Trade & Investment – Division of Resources and Energy
- NSW Office of Coal Seam Gas
- Research organisations including CSIRO and Universities.

Field program

The purpose of groundwater monitoring bores is to identify:

- hydrogeological strata, including aquifers
- determine their depth and thickness, hydraulic behaviour
- interaction between layers and any connected surface water bodies.

The placement of monitoring bores considers the depth where monitoring occurs as well its location on site. Commonly there is a need to place monitoring bores at different depths at the same location so that vertical dynamics can be understood. The network should aim to address gaps in the conceptual understanding of the site.

Generally the information obtained during the information inventory and desktop analysis stage will determine where monitoring will take place.

The number and location of groundwater monitoring bores, needs to be determined case by case. Similarly, the scale and detail will be very minor in the early stages of exploration, and grow as the project advances.

The network must be sufficient for gaining an understanding of the:

- hydraulic interactions between aquifers and surface water sources
- water quality effects, and to
- measure or allow the prediction of impacts to any identified sensitive receptors.

Consideration should be given to the required scale and configuration of monitoring.

In general, there are three basic types of monitoring:

- **Baseline:** To assess aquifer and catchment antecedent conditions allowing comparison against any changes brought about by the activity
- **Reference:** To assess conditions in undisturbed or least-disturbed setting to act as a reference against which targeted monitoring information can be compared
- **Targeted:** To assess local impacts of activities on water levels, quality etc.

A comprehensive monitoring program should contain all three components, and will often require **off-lease** monitoring which should be considered by the proponent in the early stages.

Additionally, the monitoring program should be engineered to reflect the elements of hydrogeological conceptualisation.

If known, the indicative mine location within the lease area should be included to help locate up and down gradient monitoring bores. The network can then evolve as mine planning develops.

Also, the possible location of potentially contaminating elements such as:

- stockpiles
- backfilled areas
- sediment ponds and dirty water storage areas.

should be considered for the placement of groundwater monitoring.

In some instances groundwater monitoring bores are exempt from requiring water licenses or approvals. All bores should be constructed by a licensed water driller in accordance with the [Minimum Construction Requirements for Water Bores in Australia](#).

The details of constructed bores should be captured and provided to the Office of Water using a 'Form A'. The Office can provide advice on what licensing requirements apply to the monitoring bores for individual projects.

Appropriately installed and calibrated vibrating wire piezometers can be an alternative to conventional open bore holes for monitoring pore pressures within a geological formation. These can be useful for gaining a detailed understanding of the vertical groundwater flow dynamics.

The Office of Water manages an extensive network of groundwater monitoring bores across NSW. Commonly these monitoring sites contain nested piezometers recording groundwater behaviour at multiple depths.

The data from these sites may be available from the Office of Water web-site or obtained by request from waterinfo@water.nsw.gov.au. The proponent may also identify these sites as candidates for inclusion in a monitoring network. This can avoid the unnecessary construction of new bores and has the potential benefit of including a long history of data, which would improve the understanding of baseline conditions and provide a longer record for eventual model calibration. Permission for bore access must be obtained from the Office of Water.

The use of existing landholder bores may be possible, but needs to be considered carefully and well documented. Accurate bore construction and condition need to be known to ensure collected information is representative of the formation being assessed.

Surface water monitoring should also occur where a surface water source has been identified as potentially impacted, and in some instances weather data (in-particular rainfall) may be beneficial for understanding catchment dynamics. The Office of Water operates stream-gauging stations on most significant streams and the Bureau of Meteorology record rainfall. These data sources should be pursued by the proponent. Surface water data when combined with flow can be very effective for quantifying baseflow, especially if adjacent groundwater EC is collected. This information can help to understand the baseflow dependence of surface water features.

In some instances, the impact of mining and other major activities on groundwater can continue beyond the life of the activity. Post-closure monitoring may be required to support on-going modelling and management of these impacts.

Groundwater levels and quality

A GMMP should describe the location and depth interval of all monitoring bores, and the frequency of groundwater level and quality measurement. In dynamic situations, data loggers should be considered the standard. Instances where this may be required are at the groundwater-surface water interface, or when assessing the shorter term impacts of any required groundwater pumping on nearby bore users.

Open-hole monitoring bores allow the sampling and analysis of groundwater for quality. Baseline, pre-development water quality must be known, with on-going, periodic sampling undertaken as the project progresses. Whilst total salinity is usually the primary water quality issue, major ions should be analysed as the minimum to determine baseline groundwater type. The possible range of water quality

considerations should also include potential pollutants that could be liberated into the surrounding water sources from exploration or production activities.

A GMMP needs to demonstrate that the full ranges of considerations have been explored and that a sampling and analysis program has been designed to suit. The NSW Environmental Protection Authority (EPA) should also be consulted as they may require certain groundwater quality parameters to be monitored as part of the conditions of an environmental protection licence, if applicable.

Standard methods should be followed and documented for Quality Assurance purposes.

Aquifer testing

Aquifer testing is used to determine the hydraulic characteristics of an aquifer and the characteristics of its hydraulic interaction with other aquifers and surface water sources. An independent measure of these hydraulic properties is often required to suitably constrain the calibration of a numerical model and can add to the robustness and reliability of model output.

Such testing could include pumping drawdown and recovery tests, slug tests, packer tests and laboratory core testing. Connection to overlying surface water and alluvial systems may also be assessed during longer term pump tests. This can be more effective when combined with detailed chemistry of the surface and groundwater. If feasible, efforts to record water make during early periods of mine development should be made as this can act as a large scale pumping test to determine native or host rock hydraulic conductivities.

Hydrogeochemical analysis and GDEs

In some instances, the sampling and analysis for a range of hydrogeochemical analytes may assist the assessment of hydrodynamic processes. For example, environmental isotopes can be used to better understand aquifer recharge and discharge processes, aquifer interconnectivity, groundwater-surface water interaction and GDEs. Consideration should be given to GDE monitoring. This may include stygofauna where applicable.

Scale and scope of monitoring

The AIP describes what is required from the proponent for Office of Water to undertake an effective assessment of the potential impact of aquifer interference activities.

This is given in a qualitative fashion which does not necessarily provide specific guidance as to the scale and scope (e.g. spatial density, temporal frequency and duration) of monitoring a proponent should aim for.

In most instances, such scale and scope will be governed by the local natural conditions and the nature of the proposed activity.

There is a general expectation that the scale and scope of monitoring should be described and justified by the proponent and their consultants.

A wide range of data and methods with varying costs and benefits may need to be considered by the proponent as to which is best for different situations.

At a very minimum, a monitoring plan must enable the establishment of baseline conditions, so that the state of the groundwater and connected water sources are understood prior to any potentially disturbing activities taking place.

The AIP contains a specific requirement for baseline data '*that has been collected at an appropriate frequency and scale and over a sufficient period of time to incorporate typical temporal variations*' where groundwater models are to be developed for certain situations.

The two year duration is designed to capture a full seasonal cycle twice

It is recognised that climatic variation may be significant over periods in excess of two years, however there are practical limitations to collecting data for longer periods.

Model calibration would reasonably require groundwater level data to be collected on a monthly basis as a minimum. Data loggers should be considered as standard, especially where water level changes are reasonably dynamic.

Less dynamic indicators such as water quality could be extended to quarterly or less frequent intervals where justifiable. Rainfall should be recorded daily. Where an activity has the potential to affect stream flows, appropriate river gauging techniques should occur to quantify the effects.

The spatial monitoring scale should expand beyond the distance the activity may conceivably affect.

The monitoring should also be designed to help identify the maximum extent of impact, and be placed in locations between any identified sensitive receptors and the proposed activity. Potentially affected water sources, including likely connected sensitive aquifers and surface water sources should be monitored for levels (volume) and water quality.

Monitoring on a vertical scale is critical to establish the baseline vertical head profile, and progressive changes to the head profile that are diagnostic of the development effects are valuable information for model calibration. The vertical distribution would be governed as each case requires, but usually would occur in the formation being mined, the overlying and underlying strata, the surficial (commonly alluvial) aquifer and other sensitive aquifers potentially impacted.

The specific details of a groundwater monitoring plan will evolve as a project progresses, and the process of consultation with the Office of Water will allow the proponent to design the details such that they meet the standards required for an adequate aquifer impact assessment.

Conceptual and numerical modelling

The AIP requires proponents to provide estimates of all water likely to be taken from any water source during or following the activity and all predicted impacts associated with the activity based on certain minimum standards. These standards provide guidance to proponents on the level of modelling effort required.

For all mining or coal seam gas production activities, water take estimates must be based on a complex modelling platforms (see note below re 'Gateway' process, if applicable) that is:

1. Calibrated and validated (where practical) to the available baseline data that has been collected at an appropriate frequency and scale and over a sufficient period of time to incorporate typical temporal variations. In instances where an activity has a high likelihood of causing more than minimal harm to a *'reliable water supply'*, at least two years of baseline data is required; and
2. Consistent with the [Australian Groundwater Modelling Guidelines](#) (AGMG); and
3. Independently reviewed and determined to be robust and reliable, and deemed fit-for-purpose to the satisfaction of the Minister (responsible for the administration of the *Water Management Act 2000*).

In practice, this requires a conceptual hydrogeological model that is developed to a sufficient level of complexity such that changes in fluxes between all relevant water sources caused by the activity can be estimated by numerical simulation to a reasonable level of confidence.

In developing a conceptual model, the proponent should consider the following elements:

- The location, timing, volume and method of take and use of water (and the prospective future take and use of water) by the proponent and other users of water sharing the resource.
- The potential to base the conceptualisation on existing geological models presumably developed for the resource investigation phase.
- Detailed cross sections or three-dimensional block diagrams showing stratigraphy, major aquifers, aquitards, flow paths and groundwater levels.
- Groundwater level contour maps.
- Time-series groundwater level and stream gauge data.
- Groundwater and surface water quality data.
- Aquifer characteristics including porosity, hydraulic conductivity, storativity and transmissivity.
- Groundwater age, residence time, recharge and discharge processes.
- Topographic and geomorphic information including stream locations and bed elevations.

The AIP requires groundwater modelling be undertaken in a fashion consistent with the AGMG. The AGMG is not prescriptive regarding the choice of numerical code and are scoped to allow for a broad range of model complexity.

The AIP requires numerical models for mining and coal seam gas production activity to be 'complex', hence there is a general expectation that models developed for these purposes should be Class 2 or Class 3 under the AGMG's classification scheme.

A Class 1 model would be acceptable only where activities are demonstrated to be particularly low risk.

The key considerations in assessing the suitability of a numerical groundwater model for assessment against the AIP include:

- suitability of conceptualisation
- duration of calibration period (two year minimum, in some instances)
- calibration performance
- model sensitivity and uncertainty analysis
- accounting for cumulative impacts where more than one aquifer interference activity may have an effect on the natural conditions
- the outcome of the independent peer review.

With reference to cumulative impacts, this is intended to apply to both where there is more than one activity by a single proponent, and where the activity of the proponent in combinations with other existing or proposed users that the proponent will interact with.

Finally, it must be demonstrated that the model is deemed fit-for-purpose to the satisfaction of the Minister (responsible for the administration of the *Water Management Act 2000*).

Note: The 'Gateway' process is a preliminary step prior to making application for development consent where a proposed development is on land identified as Bio Strategic Agricultural Land. The AIP requires assessments undertaken for the 'Gateway' process to be estimated based on a **simple** modelling platform using suitable baseline data that is fit-for-purpose. Further advice should be sought from the NSW Office of Water as to how this might apply for your specific proposal.

Consultation, reporting and approvals

The conditions on mining and petroleum exploration licences require the licence holder to 'Prepare a Groundwater Monitoring and Modelling Plan in **consultation** with the NSW Office of Water.'

Consultation with the Office of Water is expected from the very earliest stages of project development.

Where there is the potential for a third party impact, there is a general expectation that such third parties will be consulted regarding the predicted impact upon them.

The GMMP should be documented in a stand-alone report made available to the Office of Water.

The documentation is expected to evolve as the GMMP evolves. A program schedule should also be provided. It is important that the proponent maintains a thorough record of all consultation with the Office of Water and others.

The initial point of contact with the NSW Office of Water should be to the Strategic Stakeholder Liaison Unit by email at information@water.nsw.gov.au or on **1800 353 104**.

The Office of Water suggests the following process to undertake the consultation required:

1. With reference to these guidelines, scope and plan the development of GMMP, and begin development of the Plan.
2. To facilitate detailed consultation, at least an overview of the GMMP and the project, along with any specific queries of points of difficulty should be provided to Office of Water at an early stage. Where possible Office of Water will seek to address points of difficulty or provide feedback by email or telephone, but face to face meetings may also be required.

3. Following this early consultation, a final or late stage draft should be submitted to Office of Water for review. Allow around four weeks for Office of Water to undertake this review.
4. Once you have addressed the Office of Water's feedback, the final GMMP should be submitted to the Division of Resources and Energy or Office of Coal Seam Gas (whichever is relevant), along with the Office of Water's feedback.
5. It is recommended that you continue to consult with the Office of Water over the life of the exploration project as necessary, as the project evolves. Ideally, the GMMP should outline how and when the GMMP will be reviewed, and what ongoing consultation is required or planned.
6. The GMMP should provide a summary of consultation that has been undertaken with the Office of Water and other organisations.

Further guidelines on consultation with the Office of Water more broadly are under development.

Queries about the conditions on your exploration licence should be directed to the agency that issued the licence.

References

Barnett B, Townley LR, Post V, Evans RE, Hunt RJ, Peeters L, Richardson S, Werner, AD, Knapton A and Boronkay A. Australian Groundwater Modelling Guidelines, June 2012. [Australian Groundwater Modelling Guidelines](#)

Minimum Construction Standards for Water Bores in Australia (3rd Edition). National Uniform Drillers Licensing Committee 2012. [Minimum Construction Requirements for Water Bores in Australia](#)

NSW Aquifer Interference Policy: NSW Government policy for the licensing and assessment of aquifer interference activities. September 2012. www.water.nsw.gov.au/Water-management/Law-and-policy/Key-policies/Aquifer-interference/Aquifer-interference

Acronyms

AGMG – Australian Groundwater Modelling Guidelines

AIP – NSW Aquifer Interference Policy

CSS – Culturally Significant Site

DRE – Division of Energy and Resources

DTIRIS – Department of Trade and Investment, Regional Infrastructure and Services (NSW)

EIS – Environmental Impact Statement

GDE – Groundwater Dependent Ecosystem

GMMP – Groundwater Monitoring and Modelling Plan

More information

www.water.nsw.gov.au

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