

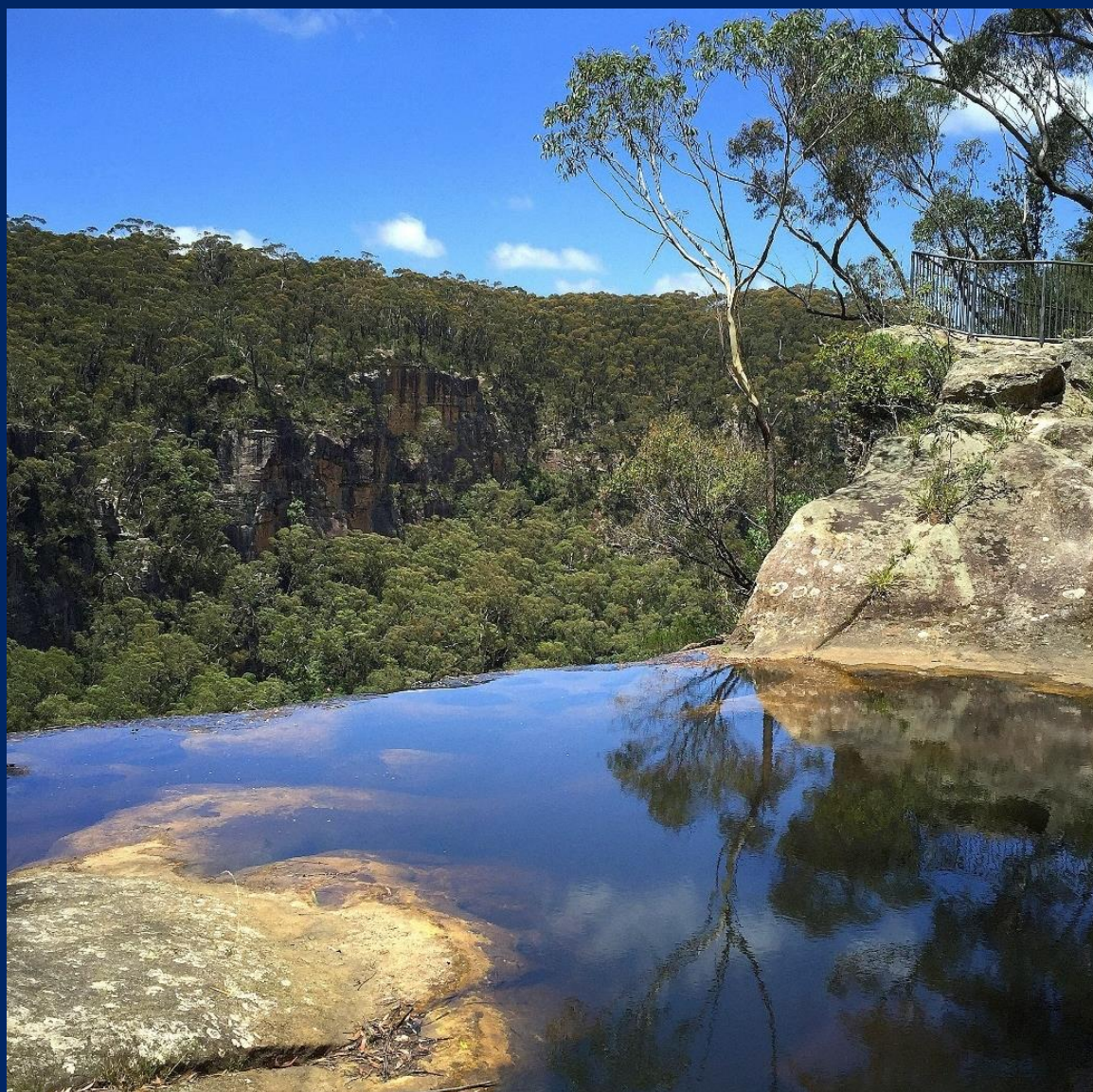
Department of Planning and Environment

[dpie.nsw.gov.au](http://dpie.nsw.gov.au)



# Extraction Plan Guideline

October 2022





# Acknowledgement of Country

The Department of Planning and Environment acknowledges that it stands on Aboriginal land. We acknowledge the Traditional Custodians of the land and show our respect for Elders past, present and emerging through thoughtful and collaborative approaches to our work, seeking to demonstrate our ongoing commitment to providing places in which Aboriginal people are included socially, culturally and economically.

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# Definition of key terms

Table 1. Definition of key terms used in this report

Key term	Definition
<b>Adaptive management</b>	The process of monitoring subsidence impacts and effects and, based on the results, modifying the mining plan as mining proceeds to ensure that the effects, impacts and/or associated environmental consequences remain within predicted ranges and in compliance with the conditions of consent
<b>Environmental consequences</b>	The consequences of subsidence on: <ul style="list-style-type: none"> <li>the natural environment, including loss of surface flows to the subsurface, loss of standing pools, adverse water quality impacts, impacts to swamps, impacts to aquifers, cliff falls, rock falls, damage to Aboriginal and other heritage sites, impacts on terrestrial and aquatic biodiversity and ecology, ponding, scouring and erosion</li> <li>the built environment, including buckling of roads and railways, breakage or risk of breakage to pipelines and cables, loss of stability in transmission towers or poles, and damage to houses and other buildings and structures</li> </ul>
<b>Incident</b>	An occurrence or set of circumstances that causes or threatens to cause material harm and which may or may not cause a non-compliance
<b>Upsidence</b>	Relative upward movement, or uplift, created by the horizontal compression and buckling behaviour of the rock strata in the vicinity of a valley floor. Upsidence is generally measured as a reduction in overall vertical subsidence, rather than an absolute increase in surface height
<b>Performance measures</b>	Standards or targets included in a development consent that relate to the management of subsidence impacts on the natural and built environment
<b>Performance indicators</b>	Quantitative or qualitative measurements by which performance may be assessed in comparison with the performance measures
<b>Subsidence effects</b>	The deformation of the ground surrounding a mine due to mining activity, including all mining-induced ground movements such as vertical and horizontal displacement, tilt, strain and curvature

Key term	Definition
<b>Subsidence impacts</b>	<p>The physical changes to the ground and its surface caused by subsidence effects</p> <p>These impacts are principally tensile and shear cracking of the rock mass and localised buckling of strata caused by valley closure and upsidence but also include subsidence depressions or troughs.</p>
<b>Trigger action response plan (TARP)</b>	<p>A plan designed to prevent a threat from escalating or occurring by:</p> <ul style="list-style-type: none"> <li>• identifying potential precursors ('triggers') to the threat event</li> <li>• assigning a hierarchy of alarms ('trigger levels') to each potential precursor</li> <li>• specifying 'responses' to any breach of a trigger level</li> </ul>
<b>Valley closure</b>	<p>A phenomenon where one or both sides of a valley move horizontally towards the valley centreline due to changed stress conditions beneath the valley and its confining land masses</p>

# 1 Application of this guideline

This guideline applies when preparing an extraction plan required for underground coal mining approved under the NSW *Environmental Planning & Assessment Act 1979* (EP&A Act).

This guideline also applies to subsidence management plans (SMP) or subsidence environmental management plans (SEMP), which are required under consents and approvals. Within this guideline, the term 'extraction plan' also includes SMPs and SEMPs.

# 2 Overview of extraction plans

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## 2.1 Purpose

An extraction plan is used to manage subsidence associated with underground coal mining. It is prepared after a mine has been given development consent. An extraction plan is not prepared to support an environmental impact assessment process or to obtain consent for the development.

An extraction plan is a management plan. It is an operational document primarily used by mining companies and regulators to ensure compliance. It also provides the community with transparency about the environmental management of the development.

An extraction plan cannot expand an underground mining area approved under a development consent or propose a method of mining or a mine plan that increases subsidence impacts or environmental consequences beyond those approved. It can only describe how approved mining operations are to be undertaken, managed, monitored, reported and remediated.

An extraction plan may identify a reduced mining area or mining intensity or provide for subsidence impacts and/or environmental consequences that are less than those approved. However, the extraction plan process does not provide an opportunity for the department or other stakeholders to reduce any of these impacts below those permitted by the consent.

If a mining company proposes to vary its approved mining development in a way that does not comply with the conditions of consent, it must lodge an application to modify its consent.

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## 2.2 Scope

An extraction plan generally covers a limited area of the total approved underground mining area. In the case of longwall mining, this is commonly between one and 7 longwall panels. While the scope of an extraction plan is a matter for the mining company, it is recommended it covers multiple panels where possible.

In circumstances where extraction plans do not cover the full number of longwalls, subsequent extraction plans (covering additional panels) should be an updated version of an existing plan – subsequent extraction plans should effectively absorb earlier versions.

This means that most of the new extraction plan will focus on the next set of panels. Monitoring and reporting will continue for the previous panels (for as long as such monitoring is required). In this way, the performance indicators, monitoring programs, trigger action response plans (TARPs) and reporting requirements in the new extraction plan are also applied to the previously mined panels.

When preparing an extraction plan, companies should always conduct a full review of the adequacy and effectiveness of any previous plan. This review should focus on management and monitoring measures, including a review of all existing TARPs.

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## 2.3 Consultation

Conditions of consent commonly require a mining company to consult with specific agencies or public authorities when preparing a draft extraction plan. However, these lists are not exhaustive, and mining companies are encouraged to consult with all relevant agencies.

Mining companies should undertake consultation before submitting the draft plan to the Department of Planning and Environment. Companies should undertake this consultation through the [NSW Planning Portal](#).<sup>1</sup>

The department will usually consult with key agencies during its review and approval process. This process will be more efficient if agency concerns are resolved before a company submits the draft extraction plan to the department.

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## 2.4 Approval

Extraction plans must be prepared to the satisfaction of and approved by the Secretary of the department. Ordinarily, this approval is given by a delegate of the Secretary.

Mining companies should submit applications for approval via the NSW Planning Portal at least 90 business days (roughly 18 weeks) prior to the proposed commencement of mining that may cause subsidence.

The department may require additional information or changes to the draft extraction plan before granting approval. Extraction plans may be approved subject to conditions additional to those included in the consent.

### 2.4.1 Independent Advisory Panel for Underground Mining

In August 2020, the NSW Government established the Independent Advisory Panel for Underground Mining (commonly referred to as the Mining Panel) to provide technical advice on new underground coal mining proposals and subsidence-related post approval matters, including extraction plans.

The department is likely to request the Mining Panel's advice where there are significant complexities or uncertainties in predicting, understanding or managing subsidence effects, subsidence impacts and/or environmental consequences.

Engagement with the Mining Panel is likely to extend the time needed for the department to review and approve an extraction plan. Mining companies should expect this to take an additional 45 business days. Mining companies may consult with the department before lodging a draft extraction plan to identify whether a referral to the Mining Panel is likely. You can find additional information on the [Mining Panel pages of the department's website](#).<sup>2</sup>

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<sup>1</sup> [pp.planningportal.nsw.gov.au](http://pp.planningportal.nsw.gov.au)

<sup>2</sup> [www.planning.nsw.gov.au/Policy-and-Legislation/Mining-and-Resources/Independent-Advisory-Panel-for-Underground-Mining](http://www.planning.nsw.gov.au/Policy-and-Legislation/Mining-and-Resources/Independent-Advisory-Panel-for-Underground-Mining)



## 2.4.2 Sydney drinking water catchment

In 2019, the government's Independent Expert Panel for Mining in the Catchment made recommendations relevant to extraction plans for coal mining in Sydney's drinking water catchment.

Mining companies developing extraction plans should consider these recommendations, which include that:

- TARP triggers for surface and groundwater should be based on meaningful indicators developed in consultation with relevant agencies and authorities
- in situations where performance measures of negligible or minor environmental consequences are set by government, mine planning should incorporate appropriate factors of safety to avoid marginal situations associated with gaps in the current knowledge base.

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## 2.5 Relationship to conditions of development consent

It is critical that extraction plans effectively address and implement all conditions of the development consent that relate to subsidence effects, impacts and environmental consequences. Mining companies should also ensure that extraction plans effectively address and implement all relevant commitments made in the environmental impact assessment and associated documents.

### 2.5.1 Management plans

Mining companies must develop several important management plans in addition to extraction plans. Some of these may appear to overlap with the matters covered by an extraction plan (such as in the areas of biodiversity, water, rehabilitation and Aboriginal cultural heritage).

However, the department's does not intend that the extraction plan (and its sub-plans, see section 3.8.1) overlap or duplicate other management plans.

The extraction plan must focus on the predicted and potential subsidence impacts and associated environmental consequences, not impacts from other mining operations, such as those associated with surface disturbance from ancillary infrastructure. Management plans may focus on impacts resulting from surface disturbance (as opposed to subsidence).

While not all consents make these relationships clear, the department will consider approaches to minimise overlap and duplication providing the conditions can be satisfied.

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## 2.6 Review and amendment

Conditions of development consent generally set out the circumstances in which the mining company must review approved extraction plans and other management plans and, if necessary, update them (see section 3.8).

In cases where revisions are required to an approved extraction plan, the company should submit an amended plan via the NSW Planning Portal at least 45 business days (approximately 9 weeks) before commencement of mining subject to the revisions.

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## 2.7 Agency regulatory roles

The Department of Planning and Environment is responsible for approving the extraction plan and regulating compliance with the development consent.

The NSW Resources Regulator is responsible for regulating compliance with the NSW *Mining Act 1992* and relevant safety legislation. These regulatory roles primarily relate to the health and safety of people, resource recovery and rehabilitation of subsidence impacts.

The NSW Work Health and Safety (Mines and Petroleum Sites) Regulation 2014 requires mining companies to notify the Resources Regulator of their intention to conduct a 'high risk activity' (including the secondary extraction of coal) at least 3 months prior to carrying out that activity. This enables the Resources Regulator to review the company's risk assessment and proposed management measures.

To streamline the review process and ensure a comprehensive assessment of risk, the applicant should provide a draft extraction plan to the Resources Regulator for consultation at the same time it provides this high risk activity notification. You can find more information on the [high-risk activities notification pages on the Resource Regulator's website](#)<sup>3</sup>.

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<sup>3</sup> [www.resourcesregulator.nsw.gov.au/safety/notifications/high-risk-activities-notification](http://www.resourcesregulator.nsw.gov.au/safety/notifications/high-risk-activities-notification)

# 3 Structure and content of extraction plans

The overall framework for an extraction plan is set by the conditions of consent. These conditions are relatively standard but contain variations that reflect the individual circumstances of mines (particularly the required subsidence impact performance measures). Mining companies should pay close regard to the subsidence impact performance measures and the consent condition that establishes the requirement for the extraction plan.

The department recognises that different mining methods result in varying types and levels of subsidence impacts and environmental consequences. The level of detail provided in the extraction plan should be commensurate with the risks presented by the approved mining method and the affected environmental values.

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## 3.1 Structure

Extraction plans should address the:

- predicted subsidence impacts and environmental consequences of the proposed underground mining
- proposed monitoring and management controls
- proposed mitigation and remediation measures.

The extraction plan should focus on what the mining company will do to avoid, minimise, monitor, manage, mitigate, remediate and report subsidence impacts and environmental consequences.

All documents or other material that support the extraction plan should be included as attachments. This includes various specialist reports that may have been prepared to inform and support the management approaches set out in the plan. Include any required coal resource recovery plan as an attachment.

It is recommended that extraction plans follow a standard structure to enable regulators and the community to easily navigate and compare plans. This structure is set out in Table 2 and described in detail in the following sections.

Table 2. Extraction plan structure

Section	Section title	Section contents
1	Introduction	<ul style="list-style-type: none"> <li>Title Page, executive summary and table of contents</li> <li>Background</li> <li>Plans of the approved development</li> <li>Scope of the plan</li> <li>Plan structure</li> </ul>
2	Plan development and consultation	<ul style="list-style-type: none"> <li>Statutory requirements</li> <li>Specialist assessments</li> <li>Review of previous subsidence predictions</li> <li>Risk assessment</li> <li>Avoidance and minimisation strategies (if applicable)</li> <li>Consultation</li> </ul>
3	Subsidence assessment	<ul style="list-style-type: none"> <li>Overview only</li> </ul>
4	Monitoring programs	<ul style="list-style-type: none"> <li>Subsidence monitoring program</li> <li>Environmental monitoring program <ul style="list-style-type: none"> <li>baseline data</li> <li>surface water flows and quality</li> <li>swamps (if applicable)</li> <li>groundwater flows and quality</li> <li>landforms</li> <li>biodiversity</li> <li>heritage features</li> <li>infrastructure and other built features</li> </ul> </li> <li>Ongoing baseline data collection program</li> </ul>
5	Management, mitigation, remediation and reporting measures	<ul style="list-style-type: none"> <li>Performance measures and indicators</li> <li>Management and mitigation measures</li> <li>Remediation and rehabilitation measures</li> <li>Master TARP</li> <li>Adaptive management and contingency planning</li> <li>Incidents, complaints, exceedances and non-compliances</li> <li>Reporting, review and auditing</li> </ul>
6	Plan administration and responsibilities	<ul style="list-style-type: none"> <li>Review of other management plans</li> <li>Review of the extraction plan</li> <li>Key responsibilities</li> </ul>
7	References	Any relevant references to other documents
8	Appendices	<ul style="list-style-type: none"> <li>Key sub-plans</li> <li>Required mine plans</li> </ul>
9	Other attachments	<ul style="list-style-type: none"> <li>Specialist assessment reports</li> <li>Coal resource recovery plan (if required)</li> </ul>

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## 3.2 Introduction

The introductory section should include a title page containing the:

- extraction plan title, date and version number
- name of the mining company
- name of the mine
- development consent and mining lease reference numbers
- signature(s) of person(s) taking responsibility for the accuracy and comprehensiveness of the information contained within the Plan.

The introductory section should include an executive summary and a clear and comprehensive table of contents. It should also include background information about the project (including the approvals history) and the scope and structure of the extraction plan. It should also include graphical figures that clearly show the approved development including the approved mining area, the associated surface development and the underground mining area to which the plan applies.

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## 3.3 Plan development and consultation

### 3.3.1 Plan development

This subsection should describe the process that the mining company took to develop the extraction plan. It should address relevant requirements of the development consent, mining lease, mine safety legislation, mine subsidence compensation legislation, environment protection licence and any other approvals.

It should indicate the independent consultants or internal technical specialists engaged in preparing the plan or any specialist assessments that support it, and provide a brief overview of the purpose and content of these specialist assessments.

This subsection should describe the process of reviewing and updating previous subsidence predictions used in the environmental impact assessment or in any previous extraction plan. This subsection should also provide assurances that previous predictions remain relevant or have been revised to consider more recent monitoring.

Extraction plans should be supported by at least two years of appropriate baseline data. This subsection should summarise the type and extent of baseline data collection undertaken, including whether the two-year standard has been met (or would be met prior to subsidence impacts occurring). If circumstances prevent this standard being met, then justification must be provided.

This section should also outline the approach taken by the mining company to risk assessment in developing the plan. Any risk minimisation or avoidance strategies that have resulted from the risk assessment or the decisions of the mining company should also be outlined.

### 3.3.2 Consultation

This subsection should address all consultation undertaken by the mining company with relevant agencies and other key stakeholders (such as the owners and/or operators of both publicly and privately owned land and infrastructure and the mine's community consultative committee).

Where conditions of consent require consultation with agencies, include or append evidence of this consultation. This evidence should address who was consulted and when, and to what degree the feedback has been incorporated into the plan.

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## 3.4 Subsidence assessment

Include a short overview of the subsidence impact assessment in the body of the plan and attach the full subsidence assessment.

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## 3.5 Monitoring programs

This section is one of the key elements of the extraction plan. It should set out in detail all monitoring measures proposed to support the assessment of the scale and nature of subsidence effects, subsidence impacts and environmental consequences.

### 3.5.1 Subsidence monitoring program

The subsidence monitoring program should have clearly stated objectives and include:

- proposed subsidence monitoring activities, including the use of land-based and/or satellite and other remote survey techniques and the accuracy of proposed techniques
- information or subsidence parameters to be obtained from each monitoring activity
- proposed locations and/or extents where each monitoring activity will take place – in particular, the proposed layout and/or locations of instrumentation, monitoring points or inspections (including plans)
- proposed timing, frequency and duration of each monitoring activity
- proposed monitoring methods and technologies and industry standards or codes of practice to be applied
- proposed measures and procedures for quality assurance and competence of personnel undertaking monitoring
- proposed procedures to record monitoring results
- proposed reporting of monitoring results, including the frequency of reporting, which will depend on the nature of the risk
- capacity of the program to detect early warning of deviations from the consent's performance measures and associated performance indicators.

### **3.5.2 Environmental monitoring program**

This subsection should summarise and consolidate the environmental monitoring programs presented in each of the key sub-plans (see section 3.8.1). The environmental monitoring program should have clearly stated objective(s) and be based on contemporary best practice. It should provide detailed information on the existing baseline and proposed monitoring programs, with a similar level of detail that was suggested for the subsidence monitoring program.

This subsection should contain figures showing existing baseline and proposed impact monitoring sites for each of the various monitoring programs, as well as a consolidated figure showing all monitoring sites.

### **3.5.3 Ongoing baseline data collection program**

This section must outline a data collection program that is designed to collect baseline data for any future extraction plan(s).

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## **3.6 Management, mitigation, remediation and reporting measures**

This section should outline the management, mitigation, remediation and reporting measures the company proposes when responding to potential subsidence impacts and environmental consequences. It should summarise and consolidate the various management, mitigation, remediation and reporting measures presented in each of the key sub-plans (see section 3.8.1).

The structure outlined in the following sections is a useful guide. However, it may be appropriate for a number of the subsections to be combined.

### **3.6.1 Performance measures and performance indicators**

Conditions of consent generally require the mining company to develop performance indicators to ensure that the subsidence impact performance measures are not exceeded. Careful selection of performance indicators will provide an early warning mechanism that can lead to successful adaptive management.

Wherever possible, performance indicators should be quantitative and not rely on qualitative interpretation. The language used should be clear and straightforward. The subsection should describe how the performance indicators will help achieve the performance measures. This should include a summary table listing the relevant performance measures and the proposed performance indicators and cross-references to where these are discussed in detail.

### **3.6.2 Management and mitigation measures**

This subsection should set out any subsidence management and mitigation measures that would be implemented in response to predicted subsidence impacts and/or environmental consequences.

### 3.6.3 Remediation and rehabilitation measures

This subsection should address the remediation and rehabilitation measures proposed to be implemented in response to predicted subsidence impacts and/or environmental consequences.

### 3.6.4 TARPs

Conditions of consent generally require the use of TARPs within extraction plans and key sub-plans. TARPs are key forward-looking management documents that tabulate what, when and how specified management responses will be implemented if certain triggers are exceeded.

TARPs should be aimed at ensuring compliance with all relevant performance measures and other restrictions set within the consent. TARPs may also address achievement of limits that are self-imposed by the mining company to achieve appropriate outcomes (for example reducing damage to built and/or natural features to reduce remediation costs).

All TARPs should be presented in table form and include at a minimum:

- relevant performance measures and performance indicators
- multilevel triggers
- containment and remediation measures
- actions that will be implemented in response to any triggers (including adaptive management measures and contingency plans).

Triggers should generally be set as exceedances of particular performance indicators. However, it may be appropriate to include a trigger level before a performance indicator is exceeded. Any exceedance of a trigger should lead to specific listed actions in response. These may include additional monitoring, reporting, investigation, rehabilitation actions and adaptive management. TARPs should also include the responsible role.

TARPs should be easily understood by operational personnel, contractors, regulatory agencies, and the community. They should be self-contained documents that are consistent, comprehensive, and not subject to external variables that may turn particular actions on or off. If they make references to other documents, these references should be transparent and straightforward.

TARPs should include regular reporting (typically 3 monthly or 6 monthly) of all trigger exceedances and company actions taken in response. TARPs should involve regulatory agencies in discussions about the design and implementation of corrective management actions where applicable.

### 3.6.5 Adaptive management and contingency planning

Adaptive management involves the monitoring and periodic evaluation of environmental consequences against performance measures. Where unpredicted subsidence impacts and/or environmental consequences have occurred, adaptive management requires implementation of measures to prevent their recurrence.

This subsection should address any specific requirements for adaptive management included in the conditions of consent, particularly regarding TARPs and contingency planning.



For ease of reference, this information is best presented in a tabulated 'master TARP' that consolidates all TARPs included in the sub-plans. It should also include all specific adaptive management measures aimed at achieving the performance measures and responding to any triggers or potential exceedances of the performance measures.

Conditions of consent generally require developing a contingency plan. This plan provides for adaptive management when monitoring indicates an exceedance of any of the consent's subsidence impact performance measures, or where any such exceedance appears likely. It should also include an assessment of remediation measure and the capacity to implement those measures.

At times, mine planning and design must change to avoid repetition of unpredicted subsidence impacts and/or environmental consequences, particularly if these exceed performance measures. If necessary, mitigation measures, mine design and/or mining extent may need to be adjusted to achieve the performance measures.

### **3.6.6 Incidents, complaints, exceedances and non-compliances**

This subsection should include procedures for investigating environmental incidents, community complaints, exceedances of performance measures and any non-compliances. It should also outline an appropriate response to these issues.

### **3.6.7 Reporting, review and auditing**

The reporting framework is another important section of the extraction plan. The plan must describe elements of this framework including:

- environmental incident reporting following any incident (as defined in the consent) in accordance with the conditions of consent and/or environment protection licence
- any additional requirements for reporting set out within the TARPs (for example, reporting trigger exceedances and company actions taken in response)
- an annual review of all subsidence impacts, environmental consequences and environmental monitoring results, including:
  - a comprehensive summary of all quantitative and qualitative environmental monitoring results, including landscape monitoring, water quality data, water flow and pool level data, piezometer readings and other results
  - a summary of the results of the subsidence monitoring program
  - a comprehensive summary of all subsidence impacts and environmental consequences
  - a full description of subsidence impacts and environmental consequences, including location identification using aerial photos with longwall layout superimposed and characterisation of the impact in accordance with the relevant TARP(s)
  - clear distinction between impacts and consequences that are within predictions, those that exceed predictions but remain within performance measures and/or performance indicators, and those that exceed performance measures and/or performance indicators
  - an assessment of compliance with all relevant performance measures and indicators
  - proposed actions or responses resulting from TARP triggers being exceeded
  - any other proposed actions or responses.

The department may require reporting at more regular intervals than the annual review (for example, biannual, quarterly or monthly reporting) where subsidence impacts and/or environmental consequences are significant or are exceeding predictions.

Other agencies may require other regular reports for their own purposes, such as reports to the NSW Resources Regulator or Dams Safety NSW. This may include reports assessing impacts of mining close to sensitive features, such as dams, railways, bridges, pipelines, transmission towers, optic fibre cables and waterfalls. The department expects to receive copies of these reports.

Other regular reports, such as regular subsidence management status reports (sometimes required by the NSW Resources Regulator) or end of panel reports (unless separately required by conditions of consent), do not need to be provided to the department.

This section of the extraction plan should also set out clearly in a table which agencies will receive copies of each of the types of reports discussed above. The timeframes and means of submission should also be set out.

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## 3.7 Plan administration and responsibilities

This section should address all key elements of how the plan will be implemented.

### 3.7.1 Review of other management plans

Development of an extraction plan may lead to a requirement to review other management plans. This section of the extraction plan should set out the process and general results of this review, but not the proposed revisions themselves. The proposed revisions should be forwarded separately as proposed amendments to the relevant plans.

### 3.7.2 Review of the extraction plan

Processes for the future review of the extraction plan should also be set out. Such reviews should take place:

- as required under consent conditions
- where the application of adaptive management strategies requires a review (where exceedances are significant and/or are continuing to occur)
- where unpredicted subsidence impacts and/or environmental consequences have required implementation of a contingency plan
- when preparing a subsequent extraction plan (see section 2.2).

### 3.7.3 Key responsibilities

This subsection should set out who is responsible for implementing the extraction plan and its various requirements. It should clearly identify which officers of the mining company have key responsibility for:

- ensuring implementation of the extraction plan and its key sub-plans and other elements

- incident and other reporting
- decisions to activate TARP responses and/or contingency planning
- initiating and/or undertaking required or occasional review of the plan or any of its elements.

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## 3.8 Including appendices in the plan

All documents or other material that provide additional detail should be included as appendices.

### 3.8.1 Key sub-plans

Key sub-plans are required to support the extraction plan and must be revised during the preparation of each new extraction plan. Sub-plans are generally best presented as Appendices to the main body of the extraction plan.

#### General requirements

The required content for each sub-plan is specified in conditions of consent. Subject to these requirements, each sub-plan should mimic the structure of the extraction plan itself, but with greater detail about relevant landscape features, heritage sites, environmental values, built features or other values to be managed under the sub-plan.

This structure might involve:

- a short overview of relevant landscape features, heritage sites, environmental values, built features or other values to be managed under the sub-plan
- setting out the consent's performance measures directly relevant to the features or values to be managed under the sub-plan
- setting out clear objectives to ensure the delivery of the performance measures and all other relevant statutory requirements
- setting out performance indicators to ensure compliance with the performance measures and statutory requirements
- a description of the relevant features or values to be managed under the sub-plan and their significance
- a description of all currently predicted subsidence impacts and environmental consequences relevant to the features and values to be managed under the sub-plan
- a description of all measures planned to remediate these impacts and/or consequences, including any measures proposed to ensure that impacts and/or consequences comply with performance measures and/or the mining company's commitments
- a description of the baseline monitoring network and baseline monitoring results, including pre-subsidence photographic surveys of key landscape features and key heritage sites that may be subject to significant subsidence impacts (such as significant watercourses, swamps and Aboriginal heritage sites)
- a description of the proposed environmental monitoring of subsidence impacts and environmental consequences

- a description of proposed monitoring of remediation measures
- a description of adaptive management
- listing responsibilities for implementation of the Plan
- an attached TARP (see section 3.6.4).

Video footage of sensitive features (such as watercourses and cliffs) from a helicopter or drone may also be useful in communicating the value of specific sites.

## Risk assessment

All sub-plans should consider risk assessment and risk management, particularly for public safety management plans and built features management plans. These 2 plans should include:

- the results of risk assessment conducted by a competent person in accordance with relevant standards and guidelines
- a description of the investigation and analysis methods used in determining the risk control measures and procedures, carried out by a competent person
- a description of all risk control measures and procedures, including a statement of the feasibility to manage identified risks
- a program for implementing the proposed risk control measures and procedures.

Risk assessments should be carried out in accordance with ISO 31000:2018 Risk Management - Guidelines. Also pay careful regard to MDG-1010 and MDG-1014, risk assessment guidelines published by the NSW Government in 2011 and 1997 respectively.

Further information on risk assessment is also available in *Ground Engineering – Principles and Practices for Underground Coal Mining* (2016), see pp 533–538.

## Particular public safety requirements

The public safety management plan must address health and safety risks to the public due to:

- potential subsidence impacts on built features
- potential instability of cliff formations or steep slopes caused by subsidence
- deformations or fracturing of any land caused by subsidence
- any other impacts of subsidence.

This plan should address management measures such as:

- monitoring of areas posing safety risks
- erecting warning signs and possible entry or use restrictions
- backfilling surface cracks and/or re-profiling of humps and swales on tracks and roads
- infilling potholes and sinkholes
- securing potentially unstable structures and rock masses
- identifying potential flood-related impacts that may pose a risk to public safety
- providing regular updates on mining progress to the community where management of public safety is a significant issue.

## Compensation and offsets

It may be appropriate that owners of either land or infrastructure are compensated in some manner for damage, disturbance or other inconvenience associated with mining and subsidence.

Such compensation may reflect the requirements of the NSW *Coal Mine Subsidence Compensation Act 2017*, Part 13 of the NSW *Mining Act 1992*, the NSW Aquifer Interference Policy and/or conditions of development consent.

On other occasions, mining companies have entered into compensation agreements with affected landowners that are outside the scope of these provisions. In such circumstances, details of the predicted damage, disturbance, access requirements or other inconvenience and the proposed measures (such as acquisition, re-location, repair, alternative water supply, compensation and/or offsets) should be set out in the relevant sub-plan.

Biodiversity offsets generally take place in accordance with the consent conditions and may be linked to post approval requirements. All offset obligations should be reflected in the relevant key sub-plan (such as the biodiversity management plan).

## Subsidiary plans

It may be convenient or necessary for some sub-plans to include or be split into other subsidiary plans specific to the management of individual features or classes of features. For example, the water management plan may be broken up into watercourse, swamp and groundwater plans. The heritage management plan may contain individual subsidiary plans for different heritage features.

### 3.8.2 Required figures

Mining companies must include detailed figures as appendices in the extraction plan. The requirements for these figures are outline in Table 3. Mining companies may be asked to supply any or all of the data incorporated within these figures as geographic information system (GIS) files.

Table 3. Required figures

Figure	Detailed requirements
<b>1. Extraction area: Existing and Proposed Workings</b>	<ul style="list-style-type: none"><li>Existing and proposed workings within the seam being mined relevant to the application</li><li>All existing workings within 500 m of the voids to be created by the proposed mining</li><li>All future workings required for the mining system with full dimensions</li><li>The dimensions of abutment pillars adjacent to the extracted voids</li><li>The dimensions of all voids to be created as part of the proposal</li><li>All other areas previously approved for mining within the area of the plan</li></ul>

Figure	Detailed requirements
<b>2. Surface features</b>	<ul style="list-style-type: none"> <li>• All natural and man-made surface features that may be affected by subsidence resulting from the proposed mining</li> <li>• An outline showing the extent of the area that may be affected by subsidence resulting from the proposed mining</li> <li>• Surface contour lines</li> <li>• Boundaries and identifications of any mine subsidence districts</li> <li>• Proposed and existing workings that are shown in Figure 1</li> </ul>
<b>3. Proposed workings: seam and depth of cover</b>	<ul style="list-style-type: none"> <li>• Geological and seam data relevant to the proposed workings</li> <li>• The proposed and existing workings that are shown in Figure 1</li> <li>• Overburden thickness isopachs</li> <li>• Seam thickness isopachs</li> <li>• All known geological structures</li> </ul>
<b>4. All workings: seam and depth of cover</b>	<ul style="list-style-type: none"> <li>• All existing and/or planned future workings in seams above and/or below the proposed workings</li> <li>• Overburden thickness isopachs relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings</li> <li>• Seam thickness isopachs relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings</li> <li>• All known geological structures relevant to the existing and/or planned future workings in the seams above and/or below the proposed workings</li> </ul>
<b>5. Mining titles and land ownership</b>	<ul style="list-style-type: none"> <li>• Details of mining titles and land ownership</li> <li>• Areas affected by lease and/or consent conditions or restrictions in relation to subsidence</li> <li>• The owners of all land affected by the proposal other than for individual domestic dwellings and small commercial properties</li> <li>• The proposed and existing workings that are shown in Figure 1</li> </ul>

Figure	Detailed requirements
<p><b>6. Geological strata</b></p>	<ul style="list-style-type: none"> <li>• Geological sections and/or borehole illustrations of the overburden strata Where there is significant variation across the area, adequate information should be given to demonstrate the variation</li> <li>• A detailed geotechnical log for strata within a minimum distance of the seam being mined relevant to the application if the proposed mine layouts are designed for supporting the surface (this minimum distance should generally be subject to appraisal by geotechnical specialists)</li> <li>• Specific attention should be paid to the existence and characteristics of claystone units or other mechanically weak layers or strata within the above-specified distance). Additional geotechnical log(s) should be provided for strata within the minimum distance of the seam(s) above and/or below the proposed mine layouts where any existing or planned future workings may interact with the proposed workings.</li> </ul>

Figure	Detailed requirements
7. Subsidence monitoring	<ul style="list-style-type: none"> <li>• The proposed and existing workings that are shown on Figure 1</li> <li>• Surface features that are shown on Figure 2</li> <li>• The proposed and existing locations and layout of subsidence survey grids/marks and any other subsidence monitoring devices (such as tiltmeters and strain gauges and similar</li> <li>• Surface counter lines</li> <li>• A coordinate grid in accordance with <u>Map Grid of Australia (MGA)</u></li> <li>• Registered surveyor’s signature certifying the accuracy of the plan</li> </ul> <p><b>Notes:</b></p> <p>The scope of Figure 7 should be consistent with the scope of the subsidence monitoring program.</p> <p>Solid lines or similar may be used to indicate the general locations and layout of proposed subsidence survey grids/marks and other subsidence monitoring devices. However, a detailed electronic version must be submitted prior to any potential influence of subsidence arising from the proposed mining.</p> <p>Large-scale diagrams showing monitoring details for specific and important surface features, such as bridges or transmission towers, are required as part of the subsidence monitoring program. Figure 7 should identify the locations where such monitoring is to be conducted and provide clear reference as to where the diagrams can be found in the extraction plan.</p> <p>Orthophoto backgrounds should not be used.</p>



Figure	Detailed requirements
<p><b>General requirements</b></p>	<p>While the figures need not be in the exact format set out above, all the requested information must be supplied.</p> <p>All figures need to be clear, uncluttered and legible.</p> <p>All figures should be of the same scale and size and cover the same area.</p> <p>Coloured aerial photography of the extraction plan application area and its immediate surroundings with an outline of existing and proposed workings should be included, where available.</p> <p>Include a title block on the plans containing name of the mining company, name of the mine, extraction plan title and version, graphical plan title and reference number, scale, date of last revision, mine manager’s signature and date of signing.</p> <p>Include a coordinate grid (MGA) on all figures where possible.</p>