

Guideline

Environmental Protection Act 1994

Application requirements for activities with impacts to land

This guideline outlines the information to be provided to support an environmental authority application for activities with impacts to land.

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Version history

Version	Date	Comments
1.00	31 March 2013	Document first published
2.00	2 January 2014	Fixing broken links
3.00	15 August 2016	Updated for <i>Environmental Offsets Act 2014</i> , replaced wild rivers information with areas of regional interest, updated info on acid sulfate soils
4.00	6 March 2017	Updated details of applications that can be made through Connect.
4.01	11 June 2018	Document rebranded to align with machinery of government changes
4.02	08 October 2019	Updated for the commencement of Environmental Protection Regulation 2019
4.03	21 September 2021	Updated Connect references to Online Services

1 Introduction

This guideline focuses on the types of impacts that environmentally relevant activities (ERAs) can have on land, and outlines the information to be provided to the department as part of the ERA application process.

This guideline seeks to assist both regulators and operators of an ERA with the potential to impact land to identify, quantify and evaluate the impacts to the environmental values of land and to ensure that these impacts are managed in a way that achieves a balance between the social benefits of development and maintaining the environmental values of the receiving environment.

There are three key areas to be address during the ERA application process:

- Identify the environmental values of the site, including any significant flora and fauna associated with the land.
- Identify the possible impacts due to the proposed activity and all associated risks to the environmental values.
- Identify the strategies to mitigate the identified risks to the environmental values.

This guideline describes the types of information the applicant must provide to demonstrate that the three key points listed above have been addressed. The information provided will assist the department in deciding the application and conditioning the environmental authority.

For impacts to land, a requirement may also exist to identify strategies to rehabilitate the site both progressively and at completion of the activity.

1.1 Using this guideline

The information provided in this guideline is updated regularly by the Department of Environment and Science (the department) and is subject to change without notice. Applicants should check the department's website for the latest copy prior to lodgement.

Sections 3–6 set out the information that applicants need to provide to the department with their application. Section 7 sets out some useful references to help applicants develop their application material.

The information provided in this guideline is general in nature and is designed to assist applicants identify key areas of concern associated with each ERA. Further information on industry-specific land impacts can be found at www.business.qld.gov.au.

Additionally, the level of detail required to support an application will depend on the type of ERA proposed and its likely impact on the receiving environment. Some activities will require more detailed information to be provided. In order to assist applicants to identify potential areas of concern associated with their individual applications, applicants are encouraged to participate in a pre-lodgement meeting.

Applications can now be made to the department online through Online Services. Supporting documentation that addresses each environmental value (EV) impacted by the activity can be uploaded electronically. Supporting documentation can be uploaded as a separate document for each EV or as one document uploaded at the end of the online application process. For more information and to register to use Online Services go to <https://www.qld.gov.au/environment/pollution/licences-permits/onlineservices>.

This guideline is relevant for applications for prescribed ERAs and mining ERAs. For applications relating to petroleum, geothermal or greenhouse gas storage ERAs, refer to the guideline 'Application requirements for petroleum activities' (ESR/2016/2357).

1.2 What is 'land'?

'Land' includes characteristics of the landscape, such as the topography or vegetation and ecosystems that it supports, as well as the chemical and physical properties of soils. Impacts are typically associated with the release (intentional or otherwise) of contaminants from the activity to land, or land disturbance caused by the ERA. These impacts can reduce the useability of land, degrade the soils, make it more susceptible to erosion, affect the health and biodiversity of ecosystems, and where acid sulfate soil or acid drainage is involved, even cause degradation of buildings or structures and significant offsite impacts. Impacts may be short term, last many decades, or even be irreparable.

Predicting the likely impacts of land disturbance or contamination can be complex. A number of characteristics can influence the extent of impacts, including soil profiles, underlying geology, topography, vegetation cover, rainfall, the area of disturbance, or types of contaminants released.

1.3 Queensland environmental law

In Queensland, the environmental impacts to land associated with ERAs are regulated under the *Environmental Protection Act 1994* (EP Act) and subordinate legislation, including the Environmental Protection Regulation 2019 (EP Regulation). The EP Act sets out the criteria for ERAs, which are activities that are likely to cause environmental impacts. An environmental authority is required to conduct an ERA and will include conditions to protect land from environmental harm and, where applicable, to ensure that the land is rehabilitated. Environmental harm includes any adverse effect, or potentially adverse effect, on an environmental value.

The EP Act also recognises that there are ERAs as well as other types of activities which have the potential to cause land contamination. These are referred to as 'notifiable activities' and the EP Act includes provision for the maintenance of the Environmental Management Register and Contaminated Land Register. These registers keep a record of land on which notifiable activities have been conducted, or that may have otherwise been affected by hazardous contaminants. Applicants applying to undertake a notifiable activity are required to advise the department at the time of application. Additionally, applicants are encouraged to identify whether the proposed site is listed on either register as this may influence the types of activities which are appropriate for the site.

When making an application the applicant may also need to refer to the State planning policy and State planning regulatory provisions to determine if they are applicable to the land being proposed for the ERA.

2 Making an application involving impacts to land

The EP Act specifies what information must be included with applications for environmental authorities. This guideline outlines the information required in further detail and clarifies how the department will use this information to make a decision on the application. In making a decision, the department is required to assess the application against the requirements stated in the EP Act and the EP Regulation.

For environmental authority applications that have potential impacts to land, the application must demonstrate how the following environmental objective and performance outcomes for the ERA will be achieved. Under Schedule 8, Part 3, Division 1 of the EP Regulation, the environmental objectives for land are:

Environmental objective

The activity is operated in a way that protects the environmental values of land including soils, subsoils, landforms and associated flora and fauna.

Performance outcomes

There is no actual or potential disturbance or adverse effect to the environmental values of land as part of carrying out the activity, or

All of the following:

- (a) Activities that disturb land, soils, subsoils, landforms and associated flora and fauna will be managed in a way that prevents or minimises adverse effects on the environmental values of land, and
- (b) Areas disturbed will be rehabilitated or restored to achieve sites that are:
 - i) safe to humans and wildlife
 - ii) non-polluting
 - iii) stable; and
 - iv) able to sustain an appropriate land use after rehabilitation or restoration.
- (c) The activity will be managed to prevent or minimise adverse effects on the environmental values of land due to unplanned releases or discharges, including spills and leaks of contaminants.
- (d) The application of water or waste to the land is sustainable and is managed to prevent or minimise adverse effects on the composition or structure of soils and subsoils.

3 Environmental values of the site

The term 'environmental value' is used to describe the physical, aesthetic, social and cultural values of a location or proposed site. The first step in making an application for an ERA is to accurately identify the environmental values of the site. The following table outlines a number of different tools, strategies and suggestions to assist applicants in identifying the environmental values of the proposed site.

In addition to general information about the site and the environmental values there are a number of key environmental priority areas which, if applicable, should be addressed in detail by the applicant. If applicable, these environmental priorities have regulatory assessment requirements.

Site description

Provide a description of the existing site and its previous land uses. The applicant may need to undertake a site inspection to accurately describe the existing land use (e.g. residential, rural residential, grazing land, cropping land, industrial, commercial etc.). Some necessary information will include lot on plan, address, tenure and information about existing roads, easements, and other major infrastructure already onsite.

Identify environmental values

Identify the environmental values of land, both on and offsite, which may be impacted by the proposed ERA (i.e. where disturbance to land is proposed). This must include the environmental values of any land proposed to receive wastes as a result of the ERA. For example, where irrigation of treated waste waters to land is proposed as a method of disposal.

Environmental values may include any of the following:

- Physical description of the land including identification of the terrain, geology, shallow groundwater systems, floodplains, springs, soil descriptions and the presence of distinct or unique features.
- Soil health and function, and the ability for soil to sustain growth of native vegetation, crops and other flora (i.e. soil suitability).
- Bioregions and regional ecosystems including their health and biodiversity.
Note: If the application is for a mining activity and it is proposed to occur in an endangered regional ecosystem, refer to the information sheet 'Undertaking environmentally relevant activities in or near endangered regional ecosystems' for more information.
- The natural interaction of the relevant land with other ecosystems, including wetlands, faults connecting groundwater systems, surface waters etc.
- Flora including vegetation communities endangered, vulnerable, rare or near threatened species and pest species.
- Fauna including fauna present, protected animal breeding places, endangered, vulnerable, rare or near threatened species, pest species, plants or animals and their habitats, including threatened wildlife, near threatened wildlife and rare wildlife under the relevant legislation including *Nature Conservation Act 1992*. Flora and fauna identification will likely require detailed studies to be undertaken to allow the applicant to accurately describe these environmental values.
- Category A and B and C environmentally sensitive areas for resource activities. Both category A and B environmentally sensitive areas are listed within the EP Regulation.

Note: Applicants can request a map showing environmentally sensitive areas for a particular location from the [department's website](#).

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- Areas with high ecological significance values including, but not necessarily limited to, wetlands, nationally threatened ecological communities, large tracts of remnant vegetation, corridors and special biodiversity areas.
- Prescribed environmental matters as defined in the Queensland *Environmental Offsets Act 2014*.
Note: The [Queensland environmental offsets policy general guide](#) provides a useful summary of the offsets framework and associated requirements.
- For land that may be used in primary industry or for agricultural purposes, the suitability of the land for that use.
- For land that may be used for recreation or aesthetic purposes, the suitability of the land for that purpose.
- For land that may be used for industrial purposes, the suitability of that industrial use.
- The cultural and spiritual values of the land.
- Qualities of the land which are conducive to human health and wellbeing.
- The qualities of the land which are conducive to protecting the aesthetics of the environment, including the appearance of buildings, structures and other property.

Areas of regional interest

Identify if the ERA impacts on areas of regional interests (ARI) under the *Regional Planning Interests Act 2014* (RPI Act) as described on the [Department of State Development, Manufacturing, Infrastructure and Planning \(DSDMIP\) website](#). ARIs include priority agricultural areas (PAAs), priority living areas (PLAs), strategic environmental areas (SEAs) (replaces wild rivers) and strategic cropping areas (SCAs) (replaces strategic cropping land).

Acid sulfate soils

Identify whether acid sulfate soils (ASS) occur on the site. These are particularly a risk where:

- The site is in a coastal area and is at or below an elevation of 5mAHD.
- The site is in a coastal area and the ERA will result in drainage, disturbance or excavation of soils to a depth at or below 5mAHD.
- The site exhibits geomorphic or site [indicators](#) for acid sulfate soils.
- The site is in an area of higher elevation that has previously been found to have ASS present due to its geomorphology. This may be indicated on various maps such as [Queensland globe](#) and the [Atlas of Australian acid sulfate soils](#).

3.1 How information provided on environmental values will be used by the department

This information will be used to establish the contextual details, including the environmental values of the site and the surrounding area.

This information will be considered when determining whether the ERA and its components can be operated on the site in a way that minimises the impacts to environmental values. Also, if the application is approved, this information will be used to inform the conditions placed upon the environmental authority.

4 Possible impacts to identified environmental values

Once the environmental values of the site have been identified, applicants must identify the potential impacts to the site which are likely to arise from the proposed activity. This can include, but is not limited to, emissions and releases of contaminants or discharges. It also includes any proposed physical disturbance to the site such as vegetation clearing, land disturbance or excavation.

In addition to providing details of any emissions or releases likely to be generated, the EP Act requires applicants to provide a description of the relative risks and likely magnitude of impacts on the environmental values.

The following table includes a number of key areas which, if applicable, should be addressed in the application documentation.

<p>Site diagram</p> <p>Provide a drawing/site plan showing the impacts to land as a result of the ERA. This must include the maximum areas of disturbance, depths of disturbance, areas used for waste storage and disposal (include point of release if relevant), areas of subsidence, filling and reshaping land.</p>
<p>Land disturbance</p> <p>Describe in detail all land disturbance associated with the ERA, including:</p> <ul style="list-style-type: none"> • The extent of disturbance over the life of the project (including maximum depth, levels, surface area and quantity of vegetation clearing, excavation, fill or other earthworks for project infrastructure). • The type(s) of disturbance (e.g. extraction of quarry material, extraction of the resource, drilling, construction of dams or bunds, filling, vegetation clearing, subsidence etc.). <p>This must clearly identify the land which will be disturbed including the land used for storage or disposal of wastes (e.g. tailings dams, landfill cells, waste rock dumps etc.).</p>
<p>Proposed and potential releases</p> <p>Describe in detail any proposed releases of contaminants to land associated with the ERA. For example, low point drains, hydrostatic test water for pipelines, irrigation of treated effluent, waste disposal etc.</p> <p>Describe in detail any potential releases to land associated with the ERA, which may occur unexpectedly (e.g. releases from chemical and fuel storages onsite or vehicles). This must include the location and details of any storages of fuels, chemicals or other products (included those which are wastes) which, if unintentionally spilled or released to land, may cause land contamination.</p>
<p>Environmental risk assessment</p> <p>Provide an environmental risk assessment assessing the likelihood of impacts to land from the proposed ERA, including from land disturbance and waste disposal to land. This assessment must also identify the extent of the impacts to all of the relevant environmental values (as identified above). Environmental risks should be considered for all phases of the proposed activity (i.e. start-up, operations/management, waste reuse and disposal).</p> <p>Examples of areas for consideration include:</p>

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- Clearing for site preparation, roads, extraction etc. (issues include biodiversity and erosion/sediment control).
- Contamination from chemicals, wastes or other contaminants including overburden, tailings, acid rock etc. (issues include groundwater contamination, biodiversity and final land use).
- Reshaping, voids and subsidence (issues include final land use, stability, safety, erosion/sediment control, overland flow and groundwater interference).

Where waste disposal to land is proposed the risk assessment must include:

- A description of the land which will receive the waste, including area, slope, flood potential, erosion potential and vegetation.
- Soil characteristics, including results of any soil tests or percolation tests. This includes salinity, acidity, alkalinity and permeability.
- Rainfall and evaporation data for the area.
- Groundwater level and use.
- Proximity of any streams, drains, watercourses, dams, soaks or springs.
- Proximity of roads and public access.
- Characteristics of the proposed discharges including the following details:
 - method of application (surface or sub-surface irrigation)
 - the location of discharge
 - description of the sources of contaminants
 - type(s) of contaminant(s) and expected concentrations (include range)
 - quantity of each contaminant release, including:
 - maximum and background concentrations of each contaminant (if available)
 - any variation in each contaminant released such as peak flows or abnormal events.
- An assessment of the likely effect of the discharges to land on the environment including results of water/nutrient balance calculations.
- The risk assessment must also consider the indirect risks to land as a result of operating the proposed ERA.

Acid-producing rock

Identify whether the proposed ERA involves, or may involve, disturbance of acid-producing rock. Where acid-producing rock does occur, the following must be provided: details of the acid drainage potential and heavy metal content for each overburden and rock type mined or exposed, and for any materials, such as waste or tailings, generated by processing.

Overburden

Where the proposed ERA involves, or may involve, overburden management the applicant must provide a characterisation of the overburden. This includes the types of contaminants that may be generated.

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Tailings

Where the proposed ERA involves, or may involve, tailings management the applicant must provide a characterisation of the tailings. This may include a chemical analysis.

Acid sulfate soils

If acid sulfate soils are likely to be present at the site and may potentially be disturbed as a result of the ERA, an acid sulfate soils investigation must be provided with the application. The acid sulfate soils investigation must be produced in accordance with the QASSIT Guidelines and Laboratory Methods Guidelines (using the latest version, as such become available).

The following information may be useful to applicants in identifying and managing any acid sulfate soils.

A full list of currently available mapping for acid sulfate soils is available at the [department's website](#). Copies of maps are available via the [department's library catalogue](#).

The details of an acid sulfate soils investigation are set out in the Guidelines for sampling and analysis of lowland acid sulfate soils (ASS) in Queensland 1998.

Waste storage

Provide details of any proposed waste storage to be conducted onsite.

Waste storage must be considered a temporary, and not a permanent, solution to waste management. Waste should always be safely stored pending removal or processing. Where waste cannot be stored in suitable containers, the siting of a storage location and the preparation of a suitable storage pad is critical.

Information about waste storage onsite should include:

- Where and how wastes are stored and contained (bins, pits, bunkers, skips, bags, tanks, lagoons etc.).
- In what quantity the wastes are stored.
- The expected storage time for the relevant wastes.
- What containment measures are in place to prevent the waste escaping from storage.
- Identify incompatible waste streams and outline how these waste streams will be managed to ensure that they are not mixed.

Where there is a potential environmental impact as a result of waste storage sufficient investigation, modelling, and where necessary, material balances should be provided. Where there is a best practice management standard or Australian standard for the storage of wastes on site, this should be adopted.

Areas of regional interest

If impacts are likely to areas of regional interests (ARI) under the *Regional Planning Interests Act 2014* (RPI Act), a regional interests development approval (RIDA) may be required from DILGP.

Land disturbance mitigation

Demonstrate how the ERA will be managed to minimise the extent and severity of land disturbance. This should include identifying any staged disturbance and planned progressive rehabilitation as well as any anticipated long-term impacts to the land. This includes identifying areas which will be impacted in such a way that they will no longer provide a beneficial use after the ERA is ceased. Additionally, any areas which are likely to experience underground subsidence are to be identified.

4.1 How information provided on risks to the environmental values will be used by the department

This information provided will be used to establish the contextual details of the proposed activity. This will be considered when determining appropriate performance objectives for land.

Additionally, the information provided will tie together the details of the ERA being conducted and its site and surrounds. This will allow the department to assess whether the activity, if approved, requires specific conditions to minimise or mitigate the risk of environmental harm.

5 Proposed management practices

Once the magnitude and risk of each potential impact to the environmental values is known, the applicant must identify proposed mitigation strategies to address the risk.

These strategies can include physical works, processes or treatments. Similarly, they could include management or monitoring practices. In many cases, adequate environmental management will require both physical works as well as management practices.

When identifying mitigation strategies the applicant should clearly detail how the works or practices will link back to and address the previously identified risk.

The following table provides general information to assist all applicants in identifying the type of information required to support the selected mitigation strategies. Additionally, this table provides information on a number of key areas which, if applicable, will require the applicant to provide additional information on the proposed environmental management practices to be used.

Contaminant management

Describe how any storage of fuel, chemicals, wastes or other products that may contaminate soils will be contained and managed (during handling, storage, and in the event of an incident such as fire). Include details of spill kits, containments systems and contingency plans.

How information on contaminant management will be used by the department

Applicants must identify a mitigation strategy for each identified risk. This must include strategies to address both non-routine and emergency situations. If a mitigation strategy has not been identified and a high risk is associated with the contaminant, the administering authority may condition the activity to address the risk.

Note: for applications which include the discharge of waste water to land, the administering authority is unable to allow land contamination from:

- Poor siting of irrigation areas. For example, areas where soil salinity or sodium ions are too high and are easily mobilised or soil permeability is too high or too low. Also, where the groundwater is likely to be contaminated (i.e. the groundwater table is at less than two metres below the area of irrigation).
- Poor or inadequate design of effluent irrigation area (e.g. due to insufficient area for irrigation).

Advisory information

AS 1940-2004 provides information on the storage and handling of flammable and combustible liquids including design of a chemical storage area and separation distances.

Management of environmentally sensitive areas (ESAs)

Describe how any impacts to ESAs will be managed. Preference is to be given to firstly avoiding, and secondly minimise, impacts on any ESAs.

How information on ESAs will be used by the department

If an ESA is likely to be impacted or disturbed by an ERA, the department will take this into consideration when deciding the application. Additionally, if approved, the department may include specific conditions to further mitigate any impacts.

If the ERA is for mining, there are additional buffer distances that must be taken into consideration. For example, if a mining activity is to occur within 2km of a Category A or 1km of a Category B ESA, the

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department may apply additional conditions to mitigate any potentially adverse impacts occurring to the ESA. Petroleum activities may also require buffer distances around ESAs.

Advisory information

Information sheet 'Undertaking environmentally relevant activities in or near endangered regional ecosystems'.

Dredge spoil

Where reclamation of dredge spoil is proposed for land reuse or treatment on land, provide details of how this will be managed to minimise the impacts on the treatment and reuse areas. Information should include:

- dust
- potential for contamination (dependent on the type of material being recovered and the location e.g. sludge, marina sediment build up etc.)
- erosion and sediment control.

How information on dredge spoil will be used by the department

In line with the waste management strategy, where other reuse options might be applicable, these should be investigated with disposal being the least desirable option. Additionally, in some instances material may not be appropriate for disposal to land where contamination levels cannot be adequately reduced.

Based upon the information provide the department will decide the application and, if approved, may apply conditions to the environmental authority.

Prescribed environmental matters – offsets

Impacts to prescribed environmental matters must be considered. An environmental offset may be required as a condition of approval where—following consideration of avoidance and mitigation measures—the activity is likely to result in a significant residual impact on prescribed environmental matters.

General information on environmental offsets is available [here](#). The [Queensland environmental offsets policy general guide](#) provides a useful summary of the offsets framework and associated requirements.

Biodiversity

Where land disturbance will impact on other biodiversity matters (not covered above) the applicant must demonstrate that the ERA will be managed to minimise impacts on these values.

The department will require baseline flora and fauna studies to be undertaken over a minimum of 12 months to account for seasonality, in particular, to ensure that wet season information can be incorporated adequately into the planning and management proposals.

However, the level of information required and the length of the sampling period generally reflect the proposed level of disturbance. At a minimum, the information provided should cover the following in relation to biodiversity impacts:

- Area of land disturbed (including types of vegetation to be disturbed etc.) and the types of disturbance (e.g. tailing storage facilities, waste rock dumps, voids, pits etc.).
- Baseline flora/fauna studies.
- Conservation issues and biodiversity (e.g. bats, quolls etc.).

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- Contamination of land due to waste, tailings storage, chemical processing, fuel storage etc.
- Downgrades to land capability and suitability including areas of non-beneficial land to remain post mining.
- Bioremediation pads/biosolids—proposed use of material.
- Changes to topography including storage of tailings and waste rock.
- Subsidence from underground workings.
- Final land use proposed and management of the land use (e.g. for low intensity grazing define stocking rates).
- Progressive rehabilitation options and success criteria:
 - endemic species for revegetation
 - weed management
 - proposed monitoring regimes.
- Environmental offsets.

How information on biodiversity will be used by the department

The department will identify whether it is necessary to impose a specific condition to protect any identified biodiversity.

5.1 Management plans

In keeping with its regulatory strategy, the department no longer approves management documents or operational plans. However, applicants are strongly encouraged to develop all relevant documents to support the successful operation of their site, including necessary management plans.

The department will condition for environmental outcomes. If provided at the time of the application, appropriate management plans may be used to inform the nature of conditions, particularly if prescriptive conditions are required to reduce the level of risk associated with certain 'high risk' activities.

Additionally, the process of developing the necessary plans may be useful to applicants in demonstrating both due diligence as well as how the applicant will meet their environmental obligations.

The following table includes a number of management documents which may be relevant.

Land release management

If the application involves the release of waste water to land, the applicant is encouraged to provide a land release management plan sufficient to demonstrate sustainable wastewater application rates and strategies to ensure that the release will not cause environmental harm.

This plan should describe how the applicant will achieve the following outcomes:

- The efficient application of waste water using best practice methods.
- Control of sodicity in the soil.
- Minimal degradation of soil structure.
- Control of the build-up (from water, waste or other contaminants) of nutrients and contaminants in the soil and subsoil.
- Prevention of subterranean flows of contaminants to waters.
- Prevention of impact of infiltration to groundwater resources.
- Prevention of run-off (e.g. by controlling the rate of application of water or waste, and by using structures, such as tailwater dams).
- Prevention of surface ponding.
- Prevention of spray drift or overspray.
- Prevention of damage to native vegetation.
- Provision for monitoring and reporting the results of monitoring.

Applicants are encouraged to undertake modelling, based on the local land and rainfall factors e.g. MEDLI (model for effluent disposal using land irrigation) and to ensure that the inputs used (e.g. effluent quality and volumes) for the modelling are accurate and appropriate.

Information regarding MEDLI is available online.

Applicants should also ensure that other aspects are considered including:

- The site topography is suitable. For example, effluent run-off is unlikely and nearby sensitive areas will not be impacted, and that the irrigation area will not be frequently subject to flooding. Further information regarding irrigating with effluent is available on the [Business Queensland website](#).
- There is a sufficient amount of suitable land available for disposal of the waste or water, and that this land will continue to be available for the life of the ERA.
- Climatic conditions have been taken into account when determining sustainable contaminant application rates. For example, the site doesn't experience long periods of rainfall, which may make the land inappropriate for water or waste disposal for certain periods of the year.
- The applicant has sufficient storage capacity or the ability to tanker waste water off-site when wet weather prevents irrigation.
- The water or waste will be released in a manner that will ensure appropriate distribution of contaminants across the disposal area.
- Where applicable, soil and plants will be protected from damage. In particular, the accumulation of salts and nutrients is avoided.

- The potential for infiltration of the water or waste to groundwater is minimised.
- The potential for generation of aerosols or odours from the water or waste is minimised.
- The contaminants will not be transferred to surface waters in run-off from the site.

Acid mine drainage management

Where the proposed ERA involves disturbance which may result in acid mine drainage, neutral mine drainage, metals, metalloids and salinity being generated, applicants are encouraged to develop a detailed management strategy. This strategy should demonstrate that the ERA will be managed to minimise the impacts on the environment. The level of detail included will depend on the risk associated with rock types. However, at a minimum, the strategy should include:

- Mapping the occurrence and extent of the ore body.
- Geochemical characterisation (i.e. geochemical modelling program), including appropriate sampling frequencies of all mine rock and process waste materials including lab analysis.
- Waste rock geochemical and geotechnical block modelling.
- Waste rock management including:
 - waste storage and handling (i.e. waste rock dumps)
 - in-pit/underground waste identification
 - validation sampling program
 - waste rock transport issues with dust and contamination
 - waste rock dump design (both considering geotechnical stability and geochemical stability – based on geochemical characterisation and block modelling)
 - mine sequencing and ability to construct in accordance with mine design
 - wet season waste rock management and dumping procedures
 - waste rock dump regular review
 - hydrology of waste rock dumps, including infiltration rates and water quality of infiltrated and shedded water
 - visual amenity issues with waste rock dump
 - waste rock dump design and ability to integrate into surrounding natural topography and landscape
 - closure trials.
- Potential radio-nuclides and implications for environment/public health regarding radiation risks.
- Proposed disposal techniques for waste rock including:
 - Potentially acid forming (PAF) cells
 - lining
 - progressive backfilling of pits
 - co-disposal

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- blending
- underground stope disposal.
- Closure design including:
 - capping design—capillary flow
 - final landform design
 - revegetation
 - leachate collection/treatment systems
 - passivation lag times—short term/long term.

In developing the plan, operators are encouraged to include the following:

- A geology and lithology characterisation (including alteration, oxidation, grain size, secondary minerals, and physical/structural elements).
- A mineralogical assessment.
- Short-term leach testing.
- A whole rock analysis (tied to lithology, not composite samples).
- Field performance testing (i.e. humidity cells, long-term columns, field tests, on-site monitoring).
- Results from geochemical testing incorporated with water balance information/block models to generate leachate quality predictions and chemical loading on the environment.
- Site hydrology/hydrogeology as well as climate to input with leachate quality for generating inputs for geochemical models.
- Geochemical models and geo-environmental models to design the mine plan and infrastructure.

It is critical that geochemical characterisation is done prior to the ERA being conducted and emphasis is placed on this testing being done at the exploration/pre-feasibility stage.

Understanding the geology and chemistry of the rocks is critical to evaluating the environmental risk and designing geochemical tests. This includes identification of the surface area, particle size distribution, mineralogy, chemical composition, acid neutralisation potential, and acid generation potential.

In determining the potential contaminants testing should include pH, electrical conductivity, acidity, sulphur and heavy metals rather than being limited to the acid generation potential. By limiting the contaminant testing to the acid generation potential, critical aspects of the geochemical characterisation procedure are excluded.

Applicants are encouraged to ensure that the number of waste rock samples taken is sufficient based on the volume of disturbance proposed. The use of composite samples (i.e. combining samples of completely different geology, chemistry, weathering, alteration and physical factors) is inappropriate.

Both sequential static testing and long-term leaching procedures will be particularly important in helping to determine under what physical and chemical conditions the contaminants will become mobile and enter the receiving environment. This will inform where mobilised contaminants will go and what environmental fate they will have.

Advisory information

More specific information can be found in the 'Global acid rock drainage (GARD) guide'.

Technical information on acid mine drainage is available within the guideline 'Assessment and management of acid drainage'.

Overburden management

Where the proposed ERA involves, or may involve, overburden management the applicant is encouraged to document and provide details of how this will be managed. This should include:

- Characterisation of the overburden.
- Management actions for overburden that has been identified as potentially acid forming, and the impacts this will have on planned rehabilitation.
- Control measures for routine operations to minimise likelihood of environmental harm.
- Contingency plans and emergency procedures for non-routine situations.

Tailings management

Where the proposed ERA involves, or may involve, tailings management, particularly for tailings which have been identified as being potentially acid forming, the applicant is encouraged to document and provide details of how this will be managed. Management should minimise the impacts to the environment and information should address the steps to be taken to ensure environmental harm will not be caused. Generally the information relevant to tailings management includes:

- Proposed placement strategies and the methods for placement and transport of tailings (course and fine rejects).
- Control measures for routine operations to minimise likelihood of environmental harm.
- Contingency plans and emergency procedures for non-routine situations.

Where the ERA will require a tailings storage facility, hazardous storages or a regulated structure onsite the following information should also be provided:

- Consideration for the manual for dams containing hazardous waste.
- Liners and basement preparations for any structure.
- How capillary rise in tailings storage facility will be managed (operationally and post closure e.g. capillary breaks).
- Proposed leak detection systems.
- Structural geology below dams and geotechnical and seepage implications.
- Fracturing and springs and potential to cause increase into structures and lift liners.
- Design storage allowance and design standard being adopted.
- Heap leach pads and carbon in pulp/leach treatment, and how the highly contaminated waters will be managed (i.e. cyanide and acid leach issues).
- Pregnant/barren ponds management and risk of cascading water quality from these facilities impacting mildly contaminated dams.
- Proposed capping and closure design.

- Co-disposal options and risks.
- Geochemical characterisation (refer to geochemical modelling program (e.g. HydroHawk))
- Restriction of access of cattle and wildlife to contaminated waters in structures.
- Spillway location.
- Chemical storage on site (including explosives).
- Perimeter spigot—central discharge and coarse grind towards closure.
- Potential radio-nuclides and implications for environment and public health regarding radiation risks.

Acid sulfate soil

Where the ERA is likely to disturb acid sulfate soil (confirmed by the ASS investigation) an acid sulfate soil management plan should be provided. Applicants can use an acid sulfate soil management plan to demonstrate that the impacts to the environment will be minimised and that environmental harm will not be caused. The acid sulfate soil management plan should include:

- Identification and description of acid sulfate and potential acid sulfate soils likely to be disturbed by the proposed ERA.
- The likely effects of any such disturbance.
- Preventing acid formation such as maintaining water-table levels.
- Storage and treatment of any excavated materials.
- Management of acid sulfate soil.
- Management of stormwater runoff and leachate from disturbed areas and storage areas.
- A program to monitor the effectiveness of any remedial measures adopted.

The acid sulfate soil management plan should address all of the necessary requirements for the management of acid sulfate soil and it must be appropriate based on the location, size, scale and environmental impacts posed by the ERA. It should also include management measures which are appropriate over the life of the project.

Advisory information

Acid sulfate soils [web pages](#).

QASSMAC Acid sulfate soils management strategy for Queensland

Procedural guide Assessing applications with acid sulfate soil (ASS) management issues

Queensland acid sulfate soil technical manual

Management techniques for ASS are described in modules A–E of the Instructions for the treatment and management of acid sulfate soils, 2001

Subsidence

Where the proposed ERA involves, or may involve, subsidence applicants are encouraged to provide details of how this will be managed within a subsidence management plan. The management plan should include options for mitigating any impacts associated with subsidence and specify how these mitigation methods will be implemented.

The management plan should address all of the potential impacts resulting from subsidence at the site, including:

- The physical condition of surface drainage:
 - erosion
 - areas susceptible to high levels of erosion such as watercourse confluences
 - incision processes
 - stream widening
 - tension cracking
 - lowering of bed and banks
 - creation of in-stream waterholes
 - changes to local drainage patterns.
- Overland flow:
 - capture of overland flow by subsided long-wall panels
 - increased overbank flows due to lowering of high bank watercourses
 - the portion of local and large scale catchment likely to be captured by subsided long-wall panels and the associated impacts on downstream users.
- Land condition and future suitability.

Unsurfaced areas

For roads, rail loops, and other unsurfaced areas used onsite (not covered above) applicants are encouraged to develop a management plan for minimising the impacts on the relevant environmental values. Information should include management strategies to address:

- Dust (including health implications for mining lead, arsenic or uranium enriched ore bodies).
- Contamination (including baseline studies along haul roads and other areas likely to become contaminated as a result of the ERA e.g. spillage from rail wagons, transfer of material, etc.)
- Erosion and sediment control (including for creek crossings, culverts, slopes and any disturbed areas).

6 Rehabilitation of the site

The final step to the application process for activities which will have an impact to land is to detail the proposed rehabilitation measures to be used. This includes providing details of how the land the subject of the application will be rehabilitated after each relevant activity ceases.

Rehabilitation

Where disturbance to land is proposed as part of the ERA, the applicant is required to detail how the site will be rehabilitated. The information must provide for the effective management of actual and potential environmental impacts and for the rehabilitation of significantly disturbed land resulting from the proposed activities. It must also identify the proposed monitoring strategy which will be used to verify rehabilitation success. The level of detail to be provided will vary depending on the level of disturbance proposed and the post land use proposed for the site. Additionally, the information provided must include justification as to the options and management measures proposed.

Proposed rehabilitation must ensure that disturbed areas will be rehabilitated to an agreed end use that is:

- safe to humans, stock and wildlife
- non-polluting
- stable
- able to sustain an agreed post-ERA land use.

Where relevant, the information supplied must provide for the following:

- A description of the proposed post operation land use based on the land capability and suitability.
- Alternate land use options for the site, post operations.
- Details, including a schematic representation, of the post ERA landscape. This information may need to be shown in stages and must include:
 - slope ranges
 - length of slopes (slope designs)
 - erosion control structures
 - drainage design and features
 - cover design
 - the size and location of any residual voids.
- Measures to achieve stable post disturbance landforms (particularly for areas such as pits or open voids), including
 - land form design and construction, including wall stability and geotechnical stability
 - staging
 - backfilling options and implications
 - overburden
 - waste rock dumps

Application requirements for activities with impacts to land

- subsidence
- topsoil management
- erosion control
- revegetation
- protection of aesthetic and cultural landscape considerations.
- Modelled flood levels for the post operation land form, including proposed protection of any residual void or significant hazard from flooding (probable maximum flood).
- Details of how contaminated areas of land will be rehabilitated (i.e. those contaminated by hazardous waste rock, treatment pads, chemical storage or tailings).
- Rehabilitation objectives for each domain (e.g. slopes, borrow pits, stockpiles, screening areas, mine pit, waste rock piles, tailings dam, subsidence, infrastructure areas etc.).
- A program for monitoring all land undergoing rehabilitation and rehabilitated areas including the verification of rehabilitation success. The monitoring program should include:
 - completion criteria to enable the success of rehabilitation to be measured.
 - indicators that can measure progress towards the objectives and completion criteria (i.e. the identification of reference sites where required).
 - a minimum sampling intensity for the monitoring of progressive rehabilitation with sufficient replication of monitoring to enable statistical analysis of results at an acceptable power (i.e. not more than twelve monthly intervals).
 - contingency procedures for rehabilitation maintenance or redesign.

Where the *Queensland Environmental Offsets Act 2014*, regulation and policy apply, certain rehabilitation requirements and specific criteria may be required. Examples might include:

- For exploration activities:
 - limiting the number of drill pads, tracks and other disturbance within the buffer to ensure edge effects to the ESA are minimised.
 - if the ESA is noted for a particular environmental value, identifying key features for the protection of that value (i.e. the black throated finch has particular breeding requirements that could be protected).
 - prohibiting the construction of campsites and dams within the buffer of the ESA.
 - setting particular rehabilitation requirements.
- For mining activities:
 - setting timeframes for disturbance and particular rehabilitation requirements within the buffer of the ESA (i.e. no residual voids, must be rehabilitated to meet certain outcomes and with certain species compositions).
 - prohibiting certain activities within the buffer of the ESA, such as tailings dams, heap leach pads etc.

Where the proposed ERA involves land contamination the assessing officer will search the environmental land

register/contaminated land register (EMR/CLR) and determine if there are any specific requirements to be met during rehabilitation. Generally areas that have been contaminated must be remediated or managed in an appropriate way to ensure that potential impacts to the environment don't eventuate.

6.1 How information provided on rehabilitation will be used by the department

The department will review any submitted rehabilitation plan in accordance with the department's guideline 'Rehabilitation requirements for mining projects' (available at www.qld.gov.au using the publication number ESR/2016/1875 as a search term).

When considering the rehabilitation objectives, indicators and completion criteria the department will have regard to a hierarchy for rehabilitation. The strategies listed at the top of the hierarchy should be adopted in preference to those listed lower, unless there are significant environmental, economic or social issues that override such a selection. The rehabilitation hierarchy is:

1. Avoid disturbance that will require rehabilitation.
2. Reinstatement a 'natural' ecosystem as similar as possible to the original ecosystem.
3. Develop an alternative outcome with a higher economic value than the previous land use.
4. Reinstatement previous land use (e.g. cropping or grazing).
5. Develop lower value land use.
6. Leave the site in an unusable condition or with a potential to generate future pollution or adversely affect environmental values.

While point 6 is an option, it is generally unfavourable. However, in some instances some landforms and areas of a site will not be usable and will have the potential to generate future pollution (i.e. residual voids).

7 Information and references

Information and references relevant to land

Type	Title
Plans/policies	<p>Environmental Protection Act 1994</p> <p>Environmental Protection Regulation 2019</p> <p>State planning policy</p> <p>Queensland environmental offsets policy</p>
Departmental documents and guidelines	<p>The following documents are available via the department's library catalogue:</p> <p>Instructions for the treatment and management of acid sulfate soils, 2001</p> <p>QASSMAC Acid sulfate soils management strategy for Queensland</p> <p>Queensland acid sulfate soil technical manual—consisting of:</p> <ul style="list-style-type: none"> Legislation and policy guideline Acid sulfate soils laboratory methods guidelines Soil management guidelines Guidelines for sampling and analysis of lowland acid sulfate soils (ASS) in Queensland 1998 <p>Rehabilitation requirements for mining projects, available at www.qld.gov.au using the publication number ESR/2016/1875 as a search term</p> <p>Erosion control in cropping lands—L13</p> <p>Erosion control in grazing lands—L91</p> <p>Gully erosion—L81</p> <p>How healthy is your watercourse?—R34</p> <p>Managing stock in and around waterways—R33</p> <p>Stream bank planting guidelines and hints—R31</p> <p>Stream bank vegetation is valuable—R30</p> <p>What cause bank erosion?—R2</p> <p>What causes stream bed erosion?—R20</p> <p>Managing grazing lands in Queensland</p> <p>Wind erosion—L259</p> <p>Catchments and water quality—C2</p> <p>Maintaining contour banks—L202</p> <p>Contour bank specifications—L205</p>

Application requirements for activities with impacts to land

Type	Title
	<p>Erosion control on property roads and tracks - cross sections and locations—L239</p> <p>Erosion control on property roads and tracks - managing runoff—L240</p> <p>Erosion control on fences and firebreaks—L241</p> <p>Soil conservation waterways - Planning and design—L272</p> <p>Soil conservation waterways - Construction and management—L270</p> <p>Soil conservation waterways - Plants for stabilisation—L271</p> <p>Manual for assessing consequence categories and hydraulic performance of structures, available at www.qld.gov.au using the publication number ESR/2016/1933 as a search term</p> <p>Undertaking environmentally relevant activities in or near endangered regional ecosystems, available at www.qld.gov.au using the publication number ESR/2016/2413 as a search term</p>
Relevant Australian Standards	<p>AS 1940-2004: The storage and handling of flammable and combustible liquids</p> <p>AS/NZS 2022:2003: Anhydrous ammonia - Storage and handling</p>
Best practice guidelines	<p>Environment Protection Agency (1995). <i>Best practice environmental management in mining series</i>. Commonwealth of Australia.</p> <p>International Erosion Control Association Australia <i>Best practice erosion and sediment control</i></p>
Other	<p>McDonald, R.C., Isbell, R.F., Speight, J.G., Walker, J. and Hopkins, M.S. (1990) <i>Australian soil and land survey field handbook</i> (2nd Edition). Inkata Press, Melbourne.</p> <p>Global acid rock drainage guide</p>