



## Environmental Factor Guideline

# Hydrological Processes

The objective of the factor *Hydrological Processes* is:

*To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected.*

### Purpose

The purpose of this guideline is to communicate how the factor *Hydrological Processes* is considered by the Environmental Protection Authority (EPA) in the environmental impact assessment (EIA) process.

Specifically, the guideline:

- describes the factor *Hydrological Processes* and explains the associated objective
- describes EIA considerations for this factor
- discusses the environmental values supported by hydrological processes, and their significance
- describes issues commonly encountered by the EPA during EIA of this factor
- identifies activities that can impact on hydrological processes
- provides a summary of the type of information that may be required by the EPA to undertake EIA related to this factor.

### What are hydrological processes?

For the purposes of EIA, the EPA defines the factor *Hydrological Processes* as:

*The occurrence, distribution, connectivity, movement, and quantity of water.*

### The environmental objective for the factor *Hydrological Processes*

The EPA's objective for the factor *Hydrological Processes* is: "To maintain the hydrological regimes of groundwater and surface water so that environmental values are protected".

This objective recognises the fundamental link between hydrological regimes and the environmental values they support. These values include water dependent ecosystems, amenity, cultural values, recreation, public drinking water supplies, and agricultural and industry use of water.

Therefore, the focus of this factor and its associated objective is on how any alteration of hydrological regime significantly impacts on water dependent ecosystems and other values supported by groundwater and surface water.

## Considerations for environmental impact assessment

Considerations for EIA for the factor *Hydrological Processes* include:

- application of the mitigation hierarchy to avoid and minimise impacts to hydrological processes, where possible
- the environmental values which are potentially impacted, and their significance
- the significance of the potential impacts in the context of the location, regional cumulative impacts, climate, and other relevant issues discussed in this guideline
- that all analyses are undertaken to a recognised standard
- the current state of knowledge and the level of confidence in predicting the residual environmental impacts
- the risk to environmental values, should the predictions be incorrect
- whether proposed mitigation is technically and practically feasible.

## Environmental values supported by hydrological processes, and their significance

Environmental value is defined under the *Environmental Protection Act 1986* as a beneficial use or an ecosystem health condition.

The ecosystem health values related to hydrological processes include vegetation, aquatic fauna and the ecological processes that support them. The beneficial uses include recreation, cultural and aesthetic values, and the use of water for drinking, agriculture and industry.

For the purposes of EIA, it is useful to consider the environmental values as either in-situ values or extractive values:

- in-situ values are water dependent ecosystems and their associated recreational, cultural and aesthetic values
- extractive values are consumptive use for public water supply, agriculture, and industry.

In relation to in-situ values, the EPA is focused on impacts to **environmentally significant** water dependent ecosystems. Environmentally significant water dependent ecosystems include, but are not limited to:

- wetlands which are Ramsar listed, Conservation Category, or listed in the Directory of Important Wetlands in Australia
- wild and scenic rivers
- wetland types which may be poorly represented
- natural springs and pools, particularly in arid areas
- ecosystems which support conservation significant flora/vegetation and fauna species or communities, including migratory waterbirds, bats, and subterranean fauna
- ecosystems which support significant amenity, recreation and cultural values.

In relation to extractive values, the EPA is focused on impacts to significant current or potential water supplies, such as regional scale aquifers, and fresh, high order surface water systems.

## Issues

The following issues are matters that are commonly encountered by the EPA due to the nature of proposals that are referred to it. Background on these issues is provided here to help proponents and the community engage with EIA. This issues section will be updated from time to time to reflect new issues as they arise in referrals and EIA.

### ***Changing water regimes in the South West***

There has been a significant overall downward trend in runoff and recharge in the South West as a result of reducing rainfall over the past 40 years. This has contributed significantly to declining groundwater levels and reduced stream flows. In turn, in-situ values and water availability for use have been significantly impacted.

Where water regimes have been significantly impacted through changes to rainfall, the EPA will consider significant impacts on water regimes in the context of the historic, current and predicted future cumulative impact to those systems.

### ***Variable knowledge of groundwater and surface water systems***

The level of understanding about groundwater and surface water systems and the values they support varies considerably across WA. Where knowledge is good, the impacts from proposals will be better informed by science, enabling the EPA to have greater confidence through the EIA process.

A key issue for the EPA is the level of understanding about the various sedimentary basins and the aquifer systems which may be impacted by hydraulic fracturing. There is generally a good fundamental knowledge about the Perth Basin as a result of many years' investigative work and monitoring. The hydrogeology of the Canning, Carnarvon and Officer basins are less well understood.

For all proposals which significantly impact on hydrogeological processes, the EPA will take into account the level of knowledge in determining the environmental impacts and risks. While region-wide studies are beyond the capacity of any individual proponent the EPA will encourage cooperative efforts to build information about poorly known systems which may be targeted for future development.

### ***Surplus water discharge to creeks and wetlands***

Dewatering is an essential component of many mining operations where mining occurs below the water table. Excess water not used through the mining operation is often discharged to local waterways, which can alter hydrological regimes with consequent changes to ecology and potential destabilisation and erosion of banks.

The EPA considers that disposal of excess water to waterways should only be undertaken after other potential uses have been maximised, including mitigating environmental impacts, fit for purpose on-site activities, meeting the demands of other water users, and aquifer reinjection.

## Impacts

The development activities that have the potential to impact on hydrological processes include, but are not necessarily limited to:

- dewatering of aquifers where there are potential impacts to groundwater dependent ecosystems through drawdown of water levels
- disposal of mine dewater to surface water systems, where this may significantly alter the hydrology of the streams, with consequent impacts to aquatic or riparian ecosystems

- significant additional abstraction of groundwater for consumptive uses including water supply and agriculture, which impact on groundwater dependent ecosystems, connected surface water systems and other water values
- drilling of wells which intercept a number of aquifers, without adequate safeguards to prevent breaching of natural seals or connecting aquifers
- hydraulic fracturing activities, particularly where multiple wells are involved or there is a risk of induced seismicity
- construction of dams or other water off-takes on surface water systems, which significantly affect downstream flows and aquatic and riparian ecosystems
- diversion of surface water systems, such as to access mineral resources or to divert poor water quality away from water supply dams
- construction or significant modification to drainage systems which intercept groundwater and have consequent impacts for dependent ecosystems, including those where drainage water is discharged.

## Information required for EIA

Where *Hydrological Processes* has been identified as an environmental factor the EPA may require the proponent to provide information or studies within the following broad topics:

- characterisation of the surface water and/or groundwater systems, including climatic influences on water availability
- information on the water to be used in the project, and other current and potential water use in the area
- modelling of the impact of water abstraction and use for the proposal on water regimes and other users
- predictions of the likely impacts of water use on water dependent ecosystems
- description of how excess water is to be disposed of and how this might impact the environment
- description of the approach to maintaining well integrity for wells which intercept multiple aquifers
- description of monitoring, management, closure and rehabilitation arrangements.

Environmental Protection Authority 2016, *Environmental Factor Guideline: Hydrological Processes*, EPA, Western Australia.

This document is available in alternative formats upon request.

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