Information sheet

Environmental Protection Act 1994

Voids in flood plains

This information sheet provides guidance on the floodplain definition as defined in the Environmental Protection Regulation 2019 for use in section 126D(3) of the Environmental Protection Act 1994.

1 Introduction

The Queensland Government's Mined Land Rehabilitation Policy ensures that land disturbed by mining activities is rehabilitated progressively as it becomes available to a safe and stable landform. The rehabilitation must minimise the risks of environmental impacts and reduce cumulative areas of disturbed land throughout the life of a site.

To implement this policy the *Environmental Protection Act 1994* (EP Act) was amended to include the requirement for environmental authority (EA) holders approved through a site-specific application for a mining activity relating to a mining lease to develop a Progressive Rehabilitation and Closure Plan (PRC plan). The PRC plan must include a PRCP schedule that is prepared by the EA holder and approved by the administering authority. A PRCP schedule details all post-mining land uses (PMLUs) and non-use management areas (NUMAs) and includes time-based milestones for actions that achieve progressive rehabilitation and closure works.

A NUMA can be proposed under two conditions (1) it would cause more environmental harm to rehabilitate the land or (2) the risk of environmental harm is confined and it is in the public interest for the land not to be rehabilitated. A void located within a flood plain would not be able to be proposed as a NUMA under these conditions as it would cause an unacceptable risk of environmental harm.

The Mined Land Rehabilitation Policy requires that all voids, located wholly or partly in a flood plain, must be rehabilitated to a safe and stable landform that is able to sustain an approved PMLU that does not cause environmental harm (stable condition). Section 126D(3) of the EP Act states that a proposed PRCP schedule that contains a void situated wholly or partly in a flood plain must provide for the rehabilitation of the land to a stable condition.

The department's guideline 'Progressive Rehabilitation and Closure Plans' (ESR/2019/4964) (the PRC plan guideline) includes statutory information requirements for a proposed PRC plan, including the requirement for flood plain modelling. Where required, this modelling must be done in accordance with the PRC plan guideline and section 41C of the Environmental Protection Regulation 2019 (EP Regulation) to determine the flood plain extent. Please note that the administering authority may require other flood estimates (e.g. probable maximum flood) for making other decisions.

2 Purpose

This information sheet is specific to section 41C of the EP Regulation and outlines the requirements for identifying a void situated wholly or partly within a flood plain and preparing flood plain modelling. It provides further clarification on the methodology required to identify a flood plain as defined in section 41C of the EP Regulation. Key elements of the flood plain criteria further described in detail below will assist in determining the mapped flood plain extent for the location of voids that are NUMAs. The

administering authority must refuse a void proposed as a NUMA in a flood plain when assessing a proposed PRCP schedule.

3 Flood plains

Section 41C(3) EP Regulation:
The administering authority must treat the land as a flood plain to the extent the results of the flood plain modelling show that, when all relevant activities carried out on the land have ended, the land is the same height as, or lower than, the level modelled as the peak water level 0.1% AEP for a relevant watercourse under the ARR.

Section 3.4 of the PRC plan guideline requires a flood plain model report and its associated flood modelling data to be included in the rehabilitation planning part of the PRC plan. This modelling is required to determine where a proposed void that is a NUMA can be located. Flood plain modelling is required for all sites with a void proposed as a NUMA.

With a consideration of current methods and approaches for flood plain definition, the use of 0.1% Annual Exceedance Probability (AEP) under the Australian Rainfall and Runoff Guideline (2019) was selected to ensure a uniform methodology for the determination of a flood plain. The required approach enables current industry standard modelling methodologies to be utilised, whilst taking into account the specific geographical context when defining a flood plain.

Spatial data outlining the mapped flood plain extent must be included in the final site design of the PRCP schedule. The mapped flood plain extent is a primary output from flood plain modelling and displays a peak water level for a chosen design flood event. The relevant design flood event for the flood plain modelling in the EP Regulation is a 0.1% AEP for a relevant watercourse. The AEP is the probability of an event being equalled or exceeded within a year.

4 Modelling

***Flood plain modelling**, for land the subject of a PRCP schedule, means modelling of the landform of the land—*
(a) carried out under the ARR; and
(b) excluding any artificial features for the land.

Flood plain modelling must be conducted in accordance with the guideline Australian Rainfall and Runoff (2019) (ARR), however this excludes any artificial features for the site as required in section 41C of the EP Regulation. This means artificial features inside the mining tenure will not contribute to the data inputs of a flood plain model for the purposes of mapping the flood plain extent (see section 6 below).

The ARR is the national guideline for the estimation of flood characteristics and underpins all technical work undertaken as part of flood plain modelling. Under the ARR, a range of hydroinformatic data will be input into a flood plain model that includes selection of specific catchment data from within and outside the mining tenure. Section 4.13.2 of the ARR describes consideration of standard catchment data inputs and includes:

- topographic and infrastructure data including structures within the floodplain including culverts, bridges, and pipe networks
- land use information
- vegetation data

- soil data.

Section 4.13.3 of the ARR further describes topographical and infrastructure data for consideration as a component of flood plain modelling.

When preparing a flood plain model for a PRC plan, a combination of data from within and outside the mining tenure boundary will be required to model the flood plain extent of a 0.1% AEP event. The final mapped flood plain extent will therefore be derived from a combination of:

1. All catchment data **outside** of the relevant tenure at the time of modelling to provide the broader catchment data required for flood plain modelling. This includes all existing and approved artificial features outside the mining tenure. The catchment data must align with the considerations mentioned in section 4.13.2 in the ARR.
2. All catchment data **on or within** the relevant mining tenure boundary, excluding any artificial features, to provide the catchment data required for the flood plain modelling.

The combined catchment data for input into the final flood plain model outlined above, in accordance with a 0.1% AEP flood event and excluding any artificial features on the land the subject of a PRCP schedule, will derive the final flood plain mapped extent.

5 Relevant watercourse

> ***Relevant watercourse*** *means—*
> *(a) a watercourse classified as stream order 4 or higher under the Strahler stream order classification system; or*
> *(b) if a watercourse mentioned in paragraph (a) is permanently diverted under—*
> *(i) a condition, or proposed condition, of an environmental authority mentioned in the Water Act 2000, section 98; or*
> *(ii) a water licence or proposed water licence under the Water Act 2000;*
> *the watercourse as permanently diverted.*

A watercourse is described in Schedule 19 of the EP Regulation as a river, creek or stream in which water flows permanently or intermittently-

a) in a natural channel, whether artificially improved or not; or
b) in an artificial channel that has changed the course of the watercourse.

A watercourse includes the bed and banks and any other element of a river, creek or stream confining or containing water. A 'relevant watercourse' for the purpose of flood plain modelling, only includes those watercourses that are ordered as a fourth or higher stream order under the Strahler stream order method.

Commonly the Strahler method describes and orders a watercourse, or stream, based on its number of additional tributaries, shown in Figure 1. Flood plains are less common in the upper catchment where the stream order is lower and slope is steeper. The occurrence of larger flood plains coincides with higher stream orders in the lower reaches of a catchment. The application for voids in the flood plain of streams with a stream

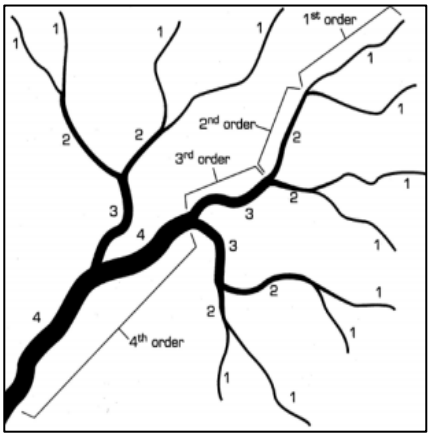

Figure 1. Strahler stream order method Source: Fink Martin & Patricia A. Rivers and Streams. 1999

order of three and lower are still assessed against the decision criteria in the EP Act and may be refused.

The Queensland Government provides digital data of hydrological features within the state for download on the Queensland Spatial Catalogue website. The 'Watercourse Lines – Queensland' dataset represents the state's drainage network and is regularly updated to include higher resolution imagery and data from a variety of sources. For most of the state this dataset includes watercourses with the Strahler stream order included in the metadata. Applicants are able to use this data for the purpose of identifying relevant watercourses, otherwise site specific data should be obtained (i.e. recent ground survey mapping) and be included in a flood plain model report.

If there are any fourth or higher stream order watercourses that have been permanently diverted the location of the watercourse in the flood plain modelling must be the location of the diversion. Permanent watercourse diversions can be approved under the *Water Act 2000* or as part of an environmental authority under the EP Act.

6 Artificial features

> ***Artificial feature**, for land the subject of a PRCP schedule, means—*
> *(a) a structure or feature that is temporary and, under the PRCP schedule or otherwise, is to be removed from the land; or*
> *(b) a structure or feature that, under the PRCP schedule, will require a level of maintenance after the land is surrendered that is greater than the level of maintenance that would be required for the land if the relevant activities the subject of the PRCP schedule had not been carried out; or*
> *(c) a feature forming part of the landform of the land, other than the natural landform, if the feature interferes with or affects—*
> *(i) a relevant watercourse; or*
> *(ii) the natural flow of water on the land.*

The intent of the flood plain modelling is to represent the flood plain at the time all temporary structures or features have been removed. Unless there is approval for a structure to remain post-surrender and the structure does not trigger the other artificial feature considerations, structures and features should not be included in the flood plain modelling.

Examples of artificial features required to be removed might include a levee deflecting floodwaters around an operational void or a temporary watercourse diversion. If there are any fourth or higher stream order watercourses that have been temporarily diverted, the location of the watercourse in the flood plain modelling must be the location of the watercourse after the temporary diversion has been removed.

Artificial features also include features or structures that require ongoing maintenance, to remain in a stable condition, of a level greater than the level of maintenance required to the land if the resource activity had not occurred. Maintenance that is greater than that required for land undisturbed by mining might include work required to be undertaken by an appropriately qualified person such as a registered professional engineer of Queensland (RPEQ) to assess the structural integrity of a levee or landform. General maintenance for a structure or feature that would not be considered an artificial feature might include vegetation maintenance (i.e. mowing and trimming of vegetation).

An artificial feature also includes a feature of the landform, other than a natural landform, that interferes with or affects a relevant watercourse or the natural flow of water on the land. The intent of

this section is for the flood plain modelling not to include any artificial landforms that may affect the flood plain extent over land or the location of the flood plain by redirecting any relevant watercourse or part thereof.

For a greenfield site, the flood plain modelling must be based on catchment data outside and inside the tenure boundaries prior to mining activities commencing. The impact of mining operations on the flood plain once commenced must not be included in the flood plain modelling.

For a brownfield site where disturbance has already occurred, the flood plain modelling must be based on the landform prior to mining activities commencing or the landform as a PMLU.

If the land that has been rehabilitated to a PMLU that does not reflect the natural landform or has been constructed for the purpose of interfering with the flood plain extent, this is not considered a natural landform and the flood plain modelling must be based on pre-disturbance catchment data within the tenure boundary.

7 Definitions

Appropriately qualified person—means a person who has professional qualifications, training, skills or experience relevant to the nominated subject matter and can give authoritative assessment, advice and analysis on performance relating to the subject matter using the relevant protocols, standards, methods or literature.

Strahler stream order—a method used to describe stream size based on the hierarchy of tributaries of the upstream network.

8 References

Ball J, Babister M, Nathan R, Weeks W, Weinmann E, Retallick M, Testoni I, (Editors) Australian Rainfall and Runoff: A Guide to Flood Estimation, © Commonwealth of Australia (Geoscience Australia), 2019.

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Enquiries:
Please contact your relevant Business Centre if you have any enquiries in relation to this information sheet.

Version history

Version	Effective date	Comments
1.00	11 MAR 2020	Document first effective
1.01	16 February 2024	Updated to align with the MOG