

## TECHNICAL NOTE

JBA Project Code	2024s0432
Contract	EAF Project
Client	Tata Steel UK Ltd
Date	August 2024 – Version 4
Author	Alister Trendell BEng MCIWEM C.WEM
Reviewer	George Baker BEng AIEMA CEnv IEng MCIWEM C.WEM
Subject	Reservoir Flood Risk Assessment
Revisions	Updated to EAF Project and revised ground levels. Faye Tomalin BSc (Hons) MSc C.WEM MCIWEM

## 1 Risk of flooding from reservoir failure

### 1.1 Introduction

This technical note assesses the flood risk to the development site, from a potential failure of the Eglwys Nunydd reservoir.

The location of the reservoir and the proposed development site are shown in Figure 1-1, together with the predicted reservoir flood risk extent.

The predicted reservoir flood risk extent minorly encroaches into the proposed development site, extending to:

- Scrap storage and processing yards
- scanning facilities and railway weighbridge

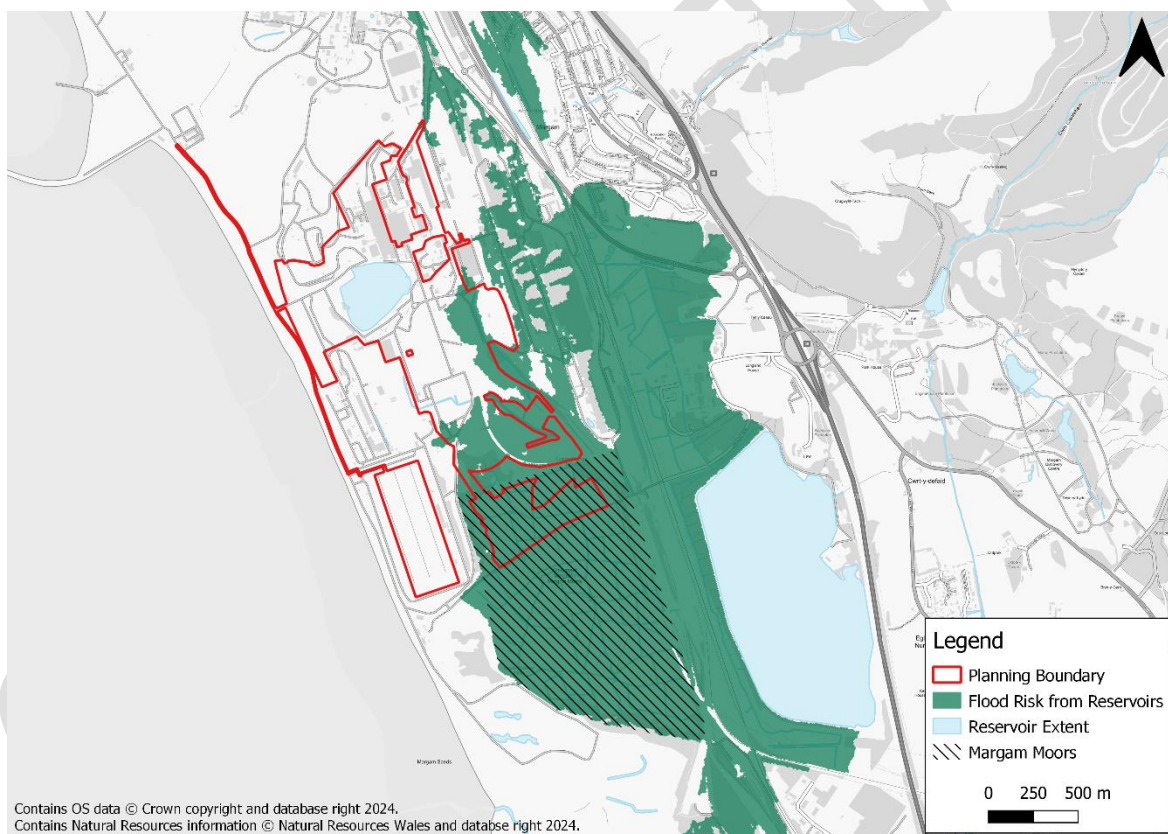


Figure 1-1: Reservoir and proposed development site locations

### 1.2 Planning policy

The extant TAN-15 says little about how reservoir flood risk should be considered, other than to recognise that they present a residual flood risk and that "A

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*precautionary approach should be adopted at vulnerable locations and the precautionary methodology applied in consultation with the canal operator or dam/reservoir owner.”<sup>1</sup>*

The draft consultation version of TAN-15 (2021) of which it is not known when it will come into force, contains the same advice as quoted above, but also offers a little more guidance:

*5.3 The Flood Map for Planning also allows users to view areas at potential risk of inundation from reservoirs. Reservoirs are maintained to very high standards in Wales and therefore the location of homes and businesses in reservoir inundation areas should not raise alarm. This information is presented to ensure open and constructive dialogue between planning authorities and reservoir operators or owners should Development Plans have implications for the risk categorisation of the reservoir. Further details are outlined in section 7.*

*7.27 Reservoirs in Wales are categorised according to the risk they pose to the public and environment in the unlikely event of a breach. The amount of development in the inundation catchment is an important factor in determining a reservoir's risk category.*

*7.28 Land use planning can inadvertently lead to a reclassification of risk if new development is located within the inundation area of a reservoir. This brings additional maintenance and insurance implications for owners and operators of reservoirs. The reservoir inundation maps on the Flood Map for Planning should be consulted when preparing Development Plans. Any potential implications for reservoir owners or operators, such as allocating development in inundation areas, should be raised by the planning authorities openly and constructively.*

### 1.3 The Eglwys Nunydd reservoir

From the last Section 10 inspection report undertaken by Atkins (2015) we understand the following:

- The Eglwys Nunydd reservoir is owned and managed by Tata Steel.
- Eglwys Nunydd is an offline storage reservoir formed by a low embankment that rises 5m above the coastal plain.
- The embankment stretches 2.5km around the north, west and south sides of the reservoir. The M4 Motorway runs along and generally above the eastern side.
- The spillway has a weir level of 8.077m AOD. At this level, the reservoir has a capacity of 3.8M m<sup>3</sup>, and a surface area of 1.03 km<sup>2</sup>.
- The reservoir supplies raw water to the steel works in the main but is also used for recreational purposes. Very limited public access is allowed around the reservoir.
- The embankment was originally constructed to a nominal crest level of 8.38m AOD
- The reservoir was raised by 900mm in the early 1970's from 6.06m AOD to the current level of 8.077m AOD. At this time, the crest level became 9.3m AOD.

<sup>1</sup> TAN15 (2004) para 11.25

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- The reservoir has a High-Risk classification.

### 1.4 Risk assessment

The consideration of risk is a factor of two functions; probability and consequence.

It is generally impossible to meaningfully assess the probability of catastrophic reservoir failure, as the UK has exceptionally rigorous safety standards<sup>2</sup> that make the probability of failure extremely low. There has been no loss of life in the UK from reservoir flooding since 1925. All large reservoirs must be inspected and supervised by reservoir panel engineers. As the enforcement authority for the Reservoirs Act 1975 in Wales, Natural Resources Wales (NRW), is responsible for ensure that reservoirs are inspected regularly, and essential safety work is carried out.

However, given the potentially extreme consequences of a reservoir failure it is appropriate to give due consideration to the consequences as identified in TAN-15.

### 1.5 Consequence assessment

NRW publish online flood extent maps<sup>3</sup> for reservoir flood risk. These maps are based on hydraulic modelling of worst-case reservoir breach scenarios. However, due to national security concerns only the flood extents are publicly available. NRW have also undertaken more recent and detailed flood modelling of reservoir flood risk, but they have informed us that this information is not presently available for review.

National security concerns, whilst understandable, make a detailed assessment of the flood hazards challenging. However, as far as practical, in the following section a high-level assessment of the flood risk to the proposed development has been undertaken.

- The reservoir failure flood levels have been estimated by analysing the LiDAR ground levels at the extents of the flood extents. From this, the reservoir failure flood level is estimated to be approximately 6.1mAOD. The flood level estimation analysis is shown in Figure 1-2.
- At this stage of the design, the proposed ground levels have not been firmly set (with the area within the reservoir flood extent forming part of the outline application area). However, it is highly likely that areas of built development will have differing ground levels to those currently present across the site as a consequence of natural build up of material, and ground levelling to facilitate new development.
  - Across Block 25, ground levels currently range from 5.2mAOD to 7.2mAOD. In levelling this area to form the scrap storage and processing yard, it is likely that ground levels shall be revised to levels ranging between 5.5mAOD and 6.5mAOD. Maximum flood depths of 600mm are therefore likely across this area.
  - Block 37 currently has a variable ground level ranging from between 4.8mAOD and 6.5mAOD, with stockpiles raised higher to levels greater than 10mAOD. In levelling this area, it is likely that ground levels shall be revised to

<sup>2</sup> Reservoirs Act 1975

<sup>3</sup> Flood Risk Assessment Wales <https://naturalresources.wales/evidence-and-data/maps/long-term-flood-risk1/?lang=en>



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approximately 5.8mAOD. This would result in maximum flood depths of 300mm in the event of reservoir failure.

- Blocks 29 and 30 have an existing ground level of 5.41mAOD. It is anticipated that there shall be no change in ground level to the proposed scanning facility and ground level due to its proposed location on the existing railway. However, it is likely that due to the nature of equipment, the majority of the new structures will be located above the estimate flood level.
- By comparison ground levels in Margam Moors, immediately to the south of the development, has a typical ground level of 4.0mAOD.
- Therefore, whilst ground levels are proposed to be amended across the Tata Steel site, the flood extent is unlikely to change to any great extent. Whilst not strictly a requirement, predicted flood depths across the site in the event of reservoir failure are within the tolerable limits (1000mm) set out within A1.15 of TAN-15. Whilst this is normally only applicable to tidal and fluvial flood risk, it provides an indication of tolerable flood depths in all flood eventualities.
- Should ground raising result in a change in flood extent as a result of the development proposals, a negligible increase in flood depths is likely to be seen across Margam Moors. The proposed ground levels are higher than the adjacent Margam Moors. The Margam Moors, which cover an area of approximately 1.3km<sup>2</sup>, are therefore likely to receive and store the vast majority of flood water from any failure of Eglwys Nunydd reservoir. The Moors therefore provide a significant low risk area/volume for the reservoir to relatively safely drain to with minimum consequence for the Tata works.
- Furthermore, as a requirement under the Reservoirs Act 1975, Tata Steel are required to ensure that the Eglwys Nunydd Reservoir is regularly inspected with essential maintenance work undertaken. An on-site emergency flood plan is required to be prepared, reviewed, updated and tested to manage flood risk across the site. Tata Steel, as landowners, have this plan in place. Consequently, Tata Steel are well placed to manage the risks of reservoir flooding across the new development.

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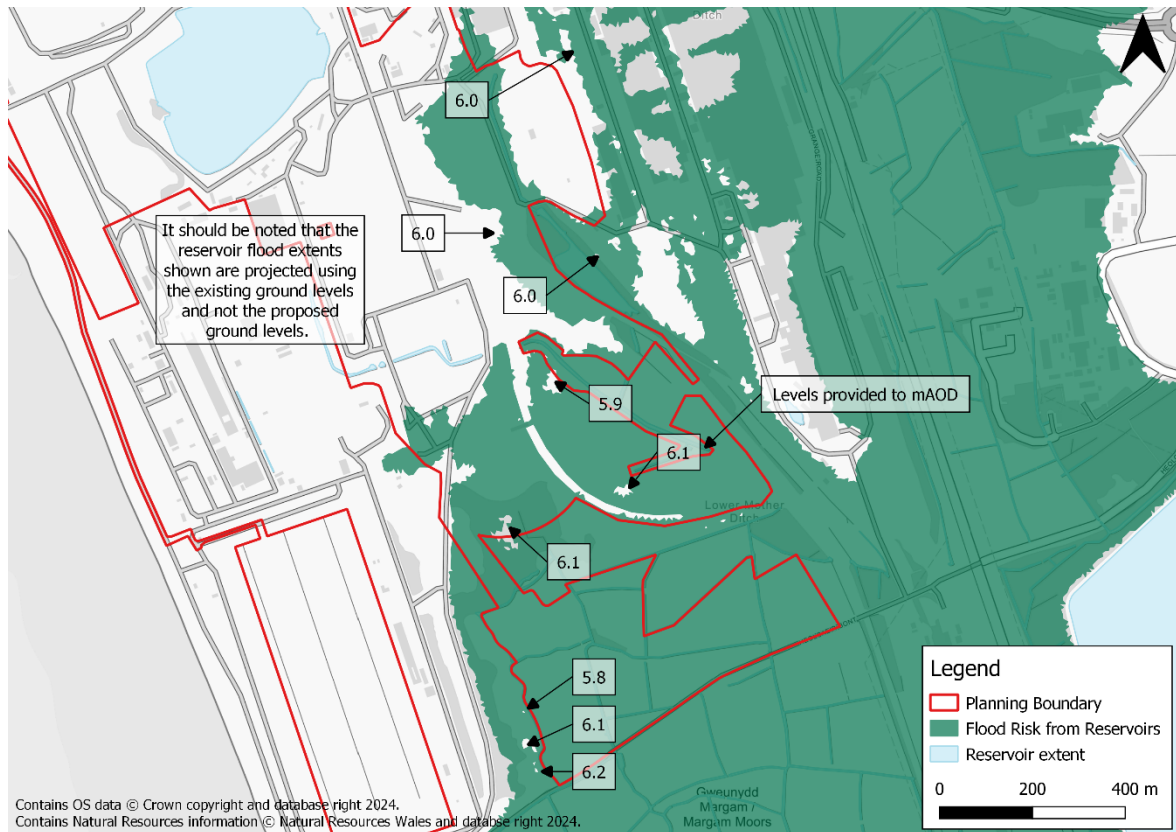


Figure 1-2: Reservoir failure flood depth estimation

### 1.6 Conclusions

In consideration of the reservoir risks to the proposed Tata Steel development, the following conclusions are made:

- The probability of a catastrophic reservoir failure is extremely low given the exceptionally rigorous UK reservoir safety standards.
- The estimated reservoir failure flood level is 6.1m AOD.
- The likely proposed ground levels of the built development within the predicted reservoir flood extent result in a maximum predicted flood depth of 600mm.
- The risk of flooding to the development site shall be managed through an on-site emergency flood plan, already held by Tata Steel.
- The reservoir failure flood risk to the proposed development is concluded to be **low**.
- Further assessment of the reservoir flood risk is not necessary.