

Llantarnam Industrial Estate (C2 and C3)

Flood Risk Report
25 January 2016



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1. Introduction

1.1. Purpose of this Report

This report comprises a Flood Risk Report for the proposed development of Llantarnam Park, Industrial Estate, Cwmbran, specifically related to site numbers C2 and C3. This report identifies if there are any flooding issues related to a development site which may warrant further consideration. Gwent Police are considering a number of sites to which they may relocate from their current location at Cwmbran Police HQ.

We describe the assessment of flood risks associated with the proposed development. This includes an assessment of the baseline flood risks to the existing site and that of the proposed development. It is important to demonstrate that the development will have an acceptable level of flood risk and that the proposed development does not make flooding worse elsewhere.

1.2. Site Location

The proposed development site is located in Cwmbran, in Torfaen County Borough Council district. The figure below shows the proposed development site. The sites grid reference is ST298933.



Figure 1-1 Proposed development location

1.3. Development Proposals

Gwent Police are considering relocation of their HQ from their current location to Llantarnam Park, Industrial Estate, Cwmbran. Figure 1-1 shows the proposed extents of the development. Initial plans are to locate the following facilities as set out below:

- Plot C2: HQ buildings with the Force Control Room; and
- Plot C3: is being considered for parking only.

1.4. Assessing Flood Risks

CIRIA C624¹ provides guidance on the implementation and good practice in assessing flood risks through the development process. The aim of C624 is to promote developments that are sustainable with regard to flood risk. The document recommends that a Flood Consequences Assessment (FCA) should be undertaken in phases so that the type of development corresponds with the detail required. There are three levels of assessment:

- **Level 1 FCA (Screening Study):** To identify if there are any flooding issues related to a development site which may warrant further consideration. The screening study will ascertain whether a Level 2 or Level 3 FRA is required;
- **Level 2 FCA (Scoping Study):** Undertaken if a Level 1 study indicates that the site may lie within an area which is prone to flooding or that the site may increase flood risk due to increased runoff; and to confirm the possible sources of flooding which may affect the site. The Scoping Study will identify any residual risks that cannot easily be controlled and, if necessary will recommend that a Level 3 FCA is undertaken; and
- **Level 3 FCA (Detailed Study):** Undertaken if the Level 2 study concludes that quantitative analysis is required to assess flood risk issues related to the development site. This may include detailed hydraulic modelling of rivers or drainage systems.

This report is a Flood Risk report which will provide data for the subsequent FCA which will review all forms of flood risk.

1.5. Structure of the Report

This report is structured as follows:

- Chapter 2 presents a review of flood risk policies and local flood risk documents relevant for the proposed development site;
- Chapter 3 reviews all forms of flood risk and identifies those that require more detailed assessment;
- Chapter 4 focuses on key flood risks at the development site; and
- Chapter 5 presents the main conclusions and recommendations for the development.

¹ Lancaster, J.W., Preene, M. & Marshall, C.T. (2004) Development & Flood Risk – Guidance for the Construction Industry. CIRIA publication C624.

2. Flood Risk Policy

2.1. Flood Risk and Flood Probability

Flooding is a natural process that can present a range of different risks depending on its form. Flood practitioners and professionals define the risks presented by flooding according to an Annual Exceedance Probability (AEP), or as having a 'return period.'

Flood risk includes the statistical probability of an event occurring and the scale of the potential consequences. Flood risk is estimated from historical data and expressed in terms of the expected frequency of a flood of a given magnitude. The 10-Year, 50-Year and the 100-Year floods have a 10%, 2% and 1% chance of occurring in any given year, respectively. However, over a longer period the probability of flooding is considerably greater.

For example, for the 100-Year return period flood:

1. There is a 1% chance of the 100-year flood occurring or being exceeded in any single year;
2. There is a 26% chance if the 100-year flood occurring or being exceeded in a 30-year period;
3. There is a 51% chance of the 100-year flood occurring or being exceeded at least once in a 70-year period.

The table below provides a summary of the relevant AEP and corresponding return period events of a particular sensitivity.

Table 2-1 Definition of AEP and Return Period Flood Events

AEP%	Return Period (Years)
100%	1 in 1-year (annual)
10%	1 in 10-year
2%	1 in 50-year
1%	1 in 100-year
0.5%	1 in 200-year
0.1%	1 in 1000-year (extreme)

2.2. Planning Policy Guidance

This report is undertaken in compliance with the Planning Policy Wales (PPW), Technical Advice Note 15, Development and Flood Risk (TAN15) (2004), which supplements the policies set out in Planning Policy Wales, 2002 (PPW). Flood risk must be considered over the anticipated lifetime of each development.

The Development Advice Map (DAM) which accompanies TAN15 contains three zones (A, B and C with subdivisions C1 and C2) which trigger the appropriate planning tests in relation to sections 6 and 7 and Appendix 1 of TAN15. These are defined as follows:

- Zone A: Little or no risk of fluvial or tidal flooding;
- Zone B: Areas known to have been flooded in the past evidenced by sedimentary deposits;
- Zone C1: Areas at risk of flooding from fluvial or tidal sources (based on EA extreme flood outline for 0.1% annual chance event), but currently developed and served by significant infrastructure, including flood defences; and

- Zone C2: Areas at risk of flooding from fluvial or tidal sources (based on EA extreme flood outline for 0.1% annual chance event) and without flood defence infrastructure.

The proposed development is considered in terms of the criteria defined in Section 5 of TAN15 as highly vulnerable development.

Appendix A1.14 of TAN15 defines that such highly vulnerable development, such as Emergency Services should be flood free during the 1% (1 in 100) annual chance fluvial flood event allowing for climate change over the development lifetime. It is accepted in TAN15 that developments may flood during a more extreme/less probable 0.1% (1 in 1000) annual chance event. Indicative acceptance criteria including the maximum depths and velocities of flood water are given in Appendix A1.15.

Local authorities should only consider development in flood risk areas as appropriate where informed by a site-specific FCA, based upon the Environment Agency's Standing Advice on flood risk. The FCA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how flood risks will be managed so that the development remains safe through its lifetime, taking climate change into account.

For flood risks in general, there is a hierarchy that should be applied for flood risk management, with avoidance or prevention being the preferred first measure to reduce flood risk. The table below presents the flood risk management hierarchy:

Table 2-2 Flood Risk Hierarchy

Flood Risk Management Hierarchy		What it means
1	Assess	Undertake studies to collect data at the appropriate scale and level of detail to understand what the flood risk is
2	Avoidance/ Prevention	Allocate development to areas of least risk and apportion development types to the impact of flooding to areas of least flood risk
3	Substitution	Substitute less vulnerable development types for those compatible with the degree of flood risk
4	Control	Implement flood risk management measures to reduce the impact of new development of flood frequency and use appropriate design
5	Mitigation	Implement measures to mitigate residual flood risks

2.3. Local Planning Policy

Torfaen County Borough Council issued their Local Flood Risk Management Strategy in 2013. Torfaen County Borough Council issued their draft Flood Risk Management Plan in 2014.

Neither of the reports named above explicitly assess the proposed development site.

3. Sources of Flooding

3.1. History of Flooding

National Resources Wales (NRW) provided historic flood extents at the proposed site location; these are shown in Figure 3-1. This indicates that no part of the proposed development site falls within an area that has flooded in the past.



Figure 3-1 Historic flood outlines

3.2. Flooding from Rivers

The TAN15 Development Advice Maps (DAMs) indicate that the two sites fall within Zone A, defined as areas “considered to be at low or no risk of fluvial or coastal flooding”, which is shown in Figure 3-2.

A number of roads in the area are shown to fall within the floodplain areas, however alternative access is available to sites C2 and C3.

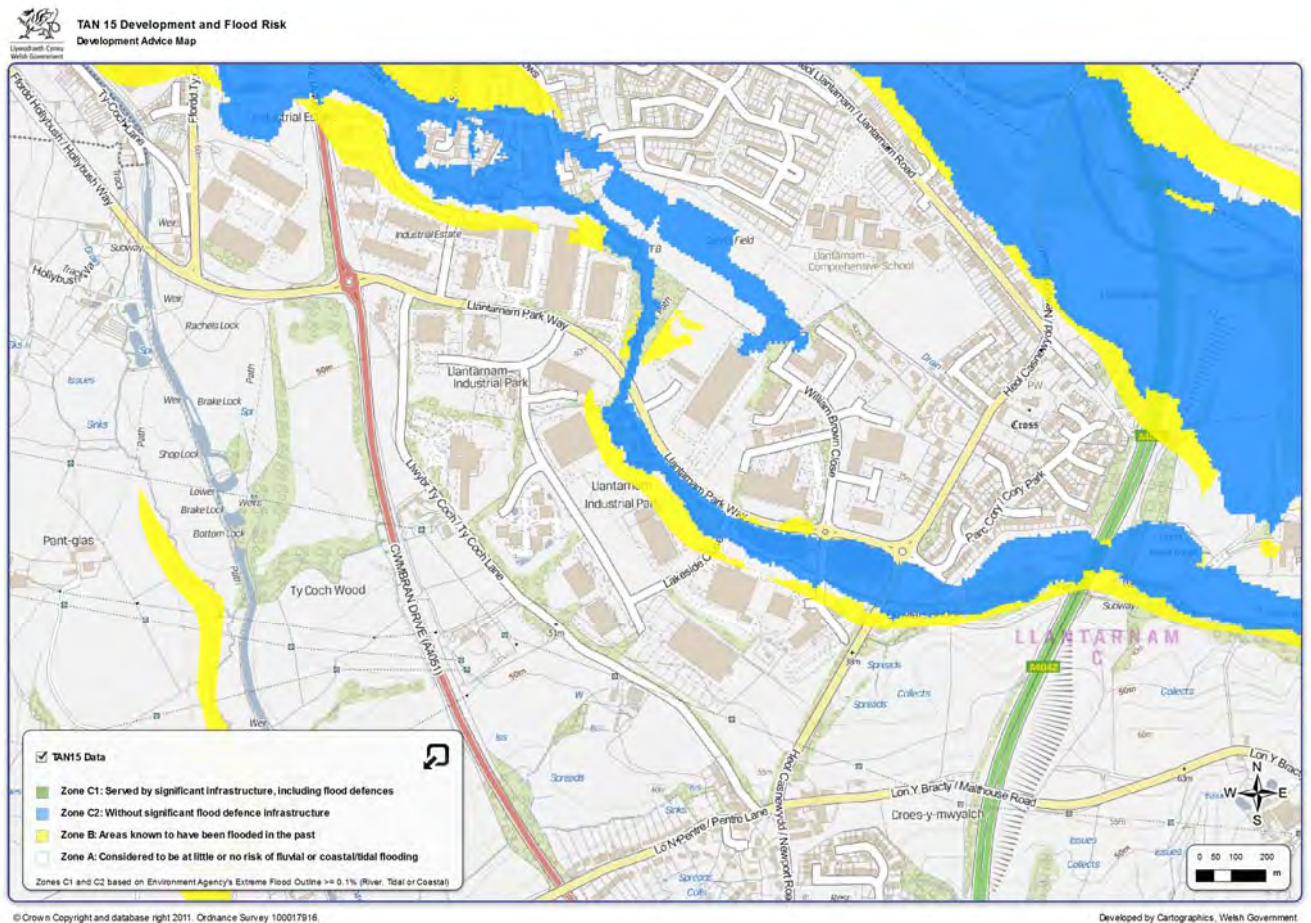


Figure 3-2 Development Advice Maps

Using the provided NRW flood outlines derived from hydrological and hydraulic models, it is clear that the sites C2 and C3 lie outside of the 0.1% AEP / Flood Zone 2, which is shown in Figure 3-3.



Figure 3-3 NRW Flood Zones 2 and 3

3.3. Flooding from Surface Water Runoff

Flooding from surface water runoff includes water flowing over the ground that has not reached a natural or artificial drainage channel. This can occur when intense rainfall exceeds the infiltration capacity of the ground, or when the ground is so highly saturated that infiltration is impeded. Excess surface water runoff can originate either from on-site or from adjacent sites.

The updated Flood Map for Surface Water (uFMfSW) is a nationally available dataset which has been used to assess the risks of surface water flooding to the site. These maps are described as follows:

“The Environment Agency’s surface water flood maps give an indication of the broad areas likely to be at risk of surface water flooding, i.e. areas where surface water would be expected to flow or pond.” And

“The surface water flood mapping will pick out natural drainage channels, rivers, low areas in floodplains, and flow paths between buildings.”

The national dataset have been improved with local data, where available, but it is not known whether this was possible for the areas specific to this site. The uFMfSW indicate that the access road to site C2 has a

small area of high risk (3.3% AEP) surface water flooding. The boundary of site C3 shows a small area at risk (3.3% AEP) of surface water flooding.

The surface water flooding is very localised and is likely to be due to an area of lower ground levels. These areas can be managed with landscaping.



Figure 3-4 Updated Flood Maps for Surface Water (Orange – High Risk, Light Orange medium risk and Yellow – Low risk)

3.4. Flooding from the Sea

The proposed development site is over 30km upstream of the Severn Estuary and is therefore not at risk of flooding from this source.

3.5. Flooding from Groundwater

Groundwater flooding is caused by water originating from beneath the ground surface from permeable strata through a natural process, usually after periods of higher than average rainfall. This can lead to high levels of

infiltration to sewers, underground services and soakaways, reducing their capacity to remove surface water runoff.

There is no reported groundwater flooding affecting sites C2 and C3.

3.6. Flooding from Sewers

The risk of developments flooding from sewers comes from either poorly performing drains and/or from the system drainage surcharging due to higher river water levels in the receiving watercourse. Available historical information indicates that there are no records of sewer flooding occurring at this site. The risk of flooding from rainfall intensities exceeding the ability of the system to collect and drain the site is described in the surface water runoff section above.

3.7. Flooding from Infrastructure Failure

Flood risk can result from failure of infrastructure which transmits, retains or controls the flow of water. Examples could include failure of a dam, canals, burst water mains or blocked sewers.

There is no risk of flooding of the proposed development from canals or reservoirs. The NRW flood defence data showed no flood defences protecting the site.

4. Assessment of Actual Flood Risk

4.1. Flood Risks Scoped Out

As described in Section 3 the following flood risks have been scoped out from more detailed assessment:

- Flooding from the sea;
- Flooding from groundwater;
- Flooding from sewers; and
- Flooding from infrastructure failure.

4.2. Data Collection

The following information was collected or sought for the study:

- NRW Flood Maps covering the site and adjacent areas;
- Details of the proposed development site layout;
- LiDAR data;
- Historical flooding data for the site and surrounding areas; and
- Available flood warning and flood forecasting information relating to the site.

4.3. Assessment of Fluvial Flood Risks

NRW have been consulted throughout the development of this report. The proposed development site falls within Flood Zone A, defined as areas with “Little or no risk of fluvial or tidal flooding”. The hydrological and hydraulic model results were requested from NRW so that the site levels could be compared to the predicted 1% AEP (Flood Zone 3) and 0.1% AEP (Flood Zone 2) flood event peak water levels. NRW confirmed that the existing flood outline for the Dowlais Brook was defined using JFLOW. NRW stated that they do not provide JFLOW data as it is too generic for use in site specific FCAs and Flood Risk Reports.

A small HEC-RAS model exists for the Dowlais Brook, however this covers the section of the Dowlais Brook immediately upstream of the proposed development site. Results from this model were not therefore available for the proposed development site.

NRW do not hold any information for the Dowlais Brook at or near Llantarnam Park itself, but have provided a high flow estimate conducted at Ponthir (ST 32400 92500) which is the closest gauge to the site. The peak flow estimates were as follows:

- 50% AEP: 6.4 m³/s,
- 1% AEP: 21.1 m³/s; and
- 0.1% AEP: 38.8 m³/s.

NRW suggested that they would be pleased to undertake a site visit to discuss further if required.

4.4. Assessment of Surface Water Runoff Flood Risks

Surface water flood maps for the site show some small areas of risk. These correspond to low points on the site as shown in Figure 4.1.

Torfaen County Borough Council investigated the low point on the access road to site C2 shown to flood on the uFMfSW. The engineer estimated that the road at NGR 329846,193255 would be flooded to no more than 150mm in any intensity of storm as water will flow over the footway and onto the grass area adjacent. This low spot could be managed by careful landscaping in this area which could be specified during detailed design.

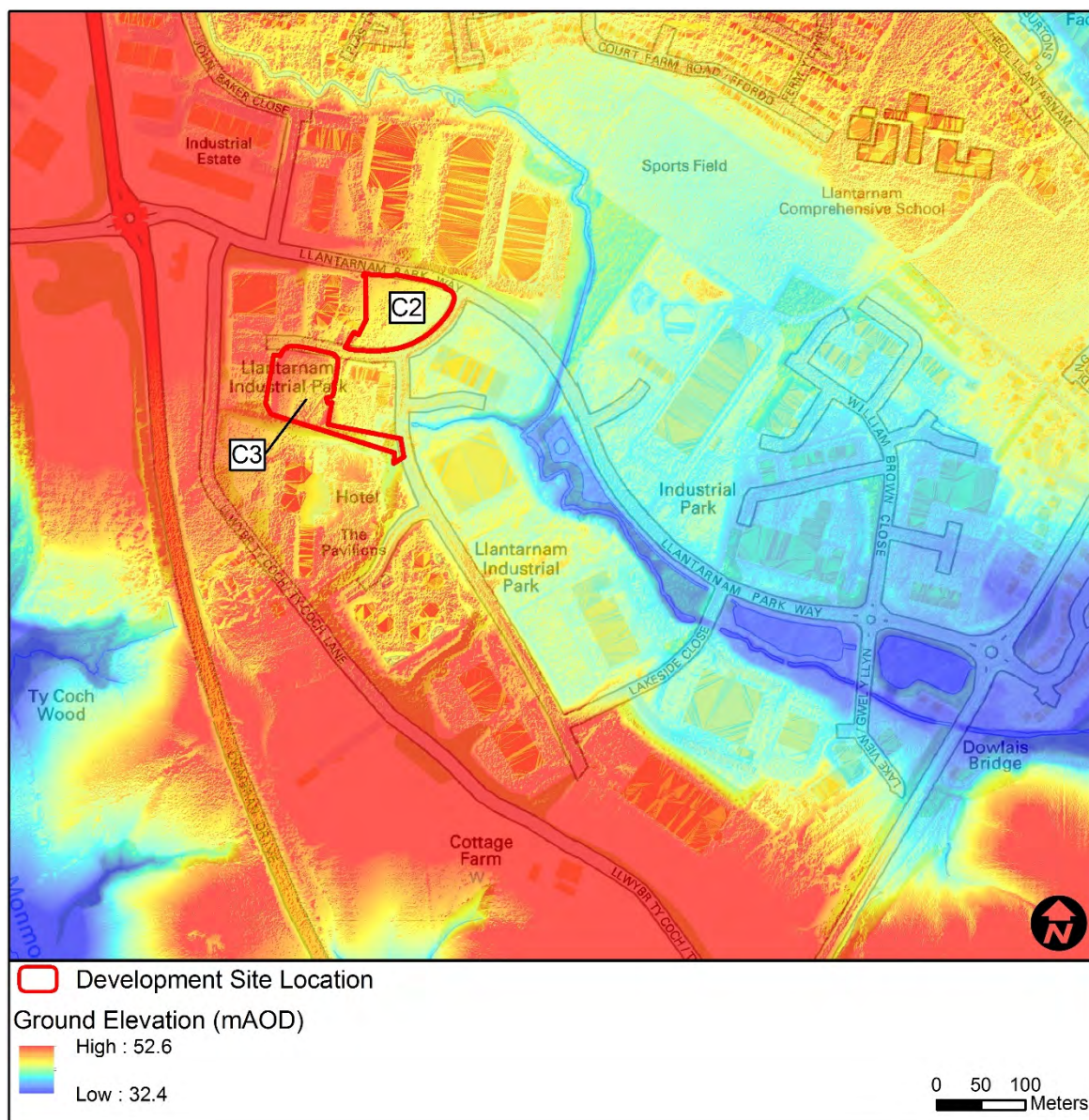


Figure 4-1 Site ground levels (LiDAR)

As part of the subsequent design stages it is recommended that a surface water management plan for the proposed development site is developed involving the use of Sustainable Drainage Systems (SuDS). A SuDS strategy should be used to collect, clean and store runoff from the developed area, to discharge at the existing rate. SuDS options will be developed further during the detailed design stage.

5. Conclusions and Recommendations

5.1. Conclusions

This report has the following conclusions:

- The TAN15 Development Advice Maps (DAMs) indicate that the sites and their access and egress routes are within Zone A, defined as areas “considered to be at low or no risk of fluvial or coastal flooding”.
- Therefore the sites C2 and C3 are suitable for the proposed development with regard to flood risk.
- The uFMfSW indicate that a small area of the access road and the boundary of C3 would be at risk.
- Torfaen County Borough Council investigated the low point on the access road to site C2 shown on the uFMfSW. The engineer estimated that the road at NGR 329846,193255 would be flooded to no more than 150mm in any intensity of storm as water will flow over the footway and onto the grass area adjacent.

5.2. Recommendations

This report makes the following recommendations:

- The low spot on the access road to C2 could be managed by careful landscaping in this area which should be specified during detailed design;
- As part of subsequent stages SuDS should be considered to manage surface water runoff on the site;
- Undertake a site visit with NRW to discuss proposals; and
- Formalise this report into a full FCA as required.

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