

Robertstown, Aberdare Broad Level Flood Consequence Assessment

Final
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Prepared for

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1 Introduction and Background

1.1 Requirement for a Broad Level Assessment

The Robertstown site in Aberdare is part of the Robertstown / Abernant strategic development site included within the Rhondda Cynon Taf County Borough Council (CBC) Local Development Plan (LDP). In order to ensure it can be feasibly developed, in flood risk terms, a Broad Level Assessment of the site is required.

1.2 Aim and Objectives

The aim of this report is to provide sufficient evidence to indicate that the site would be appropriate for the proposed development and that flood risks posed to the site could be managed effectively. In order to achieve this, the report provides a summary of flood risk related work that has been completed, or is currently ongoing, at the site. The following objectives have been met:

- Summarise the flood risks posed to the site;
- Summarise the work undertaken to assess the flooding consequences at the proposed site, taking into account the recommendations of Technical Advice Note 15: Development and Flood Risk (TAN15); and
- Provide a summary of proposed flood management at the site, compliant with TAN15.

1.3 Previous Work Undertaken

The proposed site has been subject to various flood-risk related studies, namely:

- Flood Consequence Assessment (FCA) in 2006;
- Strategic Flood Consequence Assessment (SFCA) in 2008;
- Areas Susceptible to Surface Water Flooding (ASTSWF) analysis in 2010; and
- FCA accompanied by 2-dimensional hydraulic modelling, currently under preparation.

The previous work undertaken has been reviewed and summarised in Section 2 below.

1.4 Introduction to the Site

1.1.1 Site Location

The site is located within the Robertstown area of Aberdare, adjacent to the Afon Cynon and the railway station. Wellington Street runs through the western extent of the site. The approximate NGR for the site is SO 003 030. The site location is provided in Appendix A. The wider strategic development site includes the existing Aberdare General Hospital site. The specific site assessed within this report only includes land adjacent to Wellington Street and the Afon Cynon.

The site lies within the Welsh Assembly Government (WAG) defined Development Advice Map (DAM) zone C2, meaning it is potentially at risk from a flood event of a 0.1% annual probability (1 in 1000 year return period) flood event. The site is also located within the Environment Agency defined Flood Zones 2 and 3, which indicates the 1% annual probability flood outline (Zone 3) and 0.1% annual probability flood outline (Zone 2).

The site is pre-developed, consisting of industrial land between Wellington Street and the river, and former railway sidings between Wellington Street and the railway. It is proposed that the site is allocated for employment (B1 light industrial and office development), commercial leisure (hotel, cinema or similar) and a medical centre (primary care health centre).

1.5 Policy Background – TAN15

TAN15 is the relevant planning policy document that relates to development and flood risk. TAN15 defines the vulnerability of various development types with employment, commercial and industrial types being defined as ‘Less Vulnerable development’ (Figure 2 of TAN15). Section 9 of TAN15 prescribes that Less Vulnerable development is suitable for location within DAM flood Zone C2, subject to the passing of the Justification Test.

1.5.1 Justification Test

TAN15 recognises that given the topography and geography of much of south Wales and the Rhondda Cynon Taf area, it is inevitable that some development, such as at Robertstown, would be located in flood risk areas. This would ensure the ongoing regeneration and development needs of the community are met, whilst taking into consideration other constraints such as wider sustainability issues. This is a particularly prevalent issue for pre-developed sites. Therefore, in order to ensure the ongoing regeneration and development needs of the community are met, without creating undue risks from flooding to the site, TAN15 utilises the justification test.

In order to pass the justification test, a site must meet certain criteria, as outlined in Section 6 of TAN15. Parts i – iii relate to the site meeting the needs for regeneration in the local area, and meet the definition of pre-developed land. Part iv is relevant to flood risk as is defined as follows:

- iv. The potential consequences of flooding for the type of development have been considered, and in terms of the criteria contained in sections 5 and 7 and appendix 1 (of TAN15) found to be acceptable.

Section 7 of TAN15 provides a ‘flooding threshold’ for different developments (section A1.14 of TAN15). Flooding of a greater magnitude than the flooding threshold can only occur if it is deemed to meet certain ‘tolerable conditions’. The flooding threshold and tolerable conditions for commercial and employment uses are provided in Table 1 below.

Table 1. Flooding threshold and tolerable conditions for commercial and employment land uses, as per TAN15.

Development Type	Threshold frequency	Maximum depth of flooding (mm)	Maximum rate of rise of floodwaters (m/hr)	Maximum speed of inundation of flood risk areas (hrs)	Maximum velocity (m/s)
Commercial and employment	1%	600	0.3	2	0.3

Hence, in order to meet the requirements of TAN15, the proposed site at Robertstown should remain flood-free during the 1% annual probability flood event (inclusive of climate change). For flood events of greater magnitude than the 1% annual probability event, the conditions on the site should be no worse than those provided in Table 1.

2 Flood Consequence Assessment

In order to provide a broad-level assessment of the flood risk posed to the site, a summary of the flood related studies already completed and currently ongoing has been undertaken.

This assessment has been undertaken following review of the previous works completed as well as discussions with Rhondda Cynon Taf CBC. In addition, Scott Wilson held a meeting with the Environment Agency in December 2009 and maintained ongoing liaison with them (notably Christian Servini and Gary Purnell) by telephone and e-mail.

2.1 2006 Flood Consequence Assessment

In 2006, JBA Consulting produced a FCA for the developer, Aberdare Developments Ltd, to support proposed commercial and residential development at the site (hence considered to be more vulnerable than the uses proposed in the LDP). This FCA considered fluvial flooding to present the most significant potential risk to the site and utilised hydraulic modelling (HEC-RAS software) to establish the flood mechanisms, depths, velocities and rate of onset at the site. It also utilised the hydraulic modelling to derive flood mitigation measures to ensure the site met the requirements of TAN15.

2.1.1 Assessment of Flood Consequences

The hydraulic modelling ascertained that floodwaters enter the site by spilling out of the Afon Cynon at a low point in the banks downstream of the A4059 road and railway bridges, then flowing overland onto the site. It was estimated that the spilling first occurred during the 10% annual probability (1 in 10 year return period) flow. The flood level and consequences at the site are shown in Table 2 below.

Table 2. Flooding consequences at the existing Robertstown site

Flood Event (annual probability)	Flood Mechanism	Rate of rise (hrs)	Velocities across the site (m/s)	Depth of water across the site (m)
1%	Overbank flow from Afon Cynon upstream of the site	3.25	0.8	0.2
1% plus climate change		3.75	0.7	0.6
0.1%		4.25	1.1	1.3

2.1.2 Proposed Flood Management

Given the excessive flood depths estimated at the site, as shown in Table 2 above, the FCA proposed various measures to alleviate potential flooding, notably:

- Raising existing river walls, particularly upstream of the site to prevent overbank spillage;
- Improve existing defences upstream and downstream of the site to improve flood protection to the wider community;

- Create a second channel adjacent to the existing Afon Cynon to retain flood flows, maintaining a conveyance of flows along the Afon Cynon;
- Raise ground levels on site to ensure they are above the 1% annual probability flood level (inclusive of climate change).

Following input of the above alleviation measures, the hydraulic model was re-run for various flood event scenarios. However, due to model instabilities, the 0.1% annual probability event was modelled in the steady state, which is known to result in conservative results. The resulting, post-development flood consequences are provided in Table 3 below.

Table 3. Flooding consequences post-development, inclusive of flood alleviation measures

Flood Event (annual probability)	Flood Mechanism	Velocities across the site (m/s)	Depth of water across the site (m)
1%	-	-	-
1% plus climate change	-	-	-
0.1%	Overbank flow from Afon Cynon upstream of the site	0.46	0.62

As shown in Table 3 above, once the proposed alleviation measures are in place, the proposed site would remain flood-free during the 1% annual probability event, inclusive of climate change. Some flooding may occur during the 0.1% annual probability event as this is deemed to be of greater magnitude than the 'flooding threshold' of TAN15 (which is 1% annual probability). The depths and velocities of this flooding would be slightly greater than the tolerable conditions outlined within TAN15. However, the modelling used to obtain this information is known to provide conservative estimates. In addition, the modelled depths and velocities are within the wading limits for children, in accordance with the Defra report 'Flood Risks to People Phase 1', Technical Report FD2317.

As a result of the above, it is considered that the site would be developable via achievable flood risk management techniques, subject to economic viability and Environment Agency consents, which would consist of the following:

- Obtaining a Flood Defence Consent, as required for any major works in or near a Main River;
- Obtaining a Water Abstraction Transfer License to support the proposed secondary channel; and/or
- Provision and acceptance of detailed designs of the proposed alleviation measures and secondary channel from the Environment Agency.

2.2 2008 SFCA

In 2008 Scott Wilson produced a SFCA principally to assess the 8 Strategic Development Sites included within the Rhondda Cynon Taf LDP. The Strategic Development Site for Robertstown

/ Abernant was included in the SFCA, however it considered the whole strategic development site and reached the following conclusions:

- The site experienced flooding from the Afon Cynon in 1979 (an event that caused widespread flooding throughout south Wales);
- Using GIS analysis along with Environment Agency data, the maximum flood depth at the site during the 0.1% annual probability event was estimated at 1.5m, similar to the hydraulic modelling results provided in Table 2;
- There is potential for overland flow flooding at the site, however, this is deemed to be less significant than fluvial flooding;
- Other sources of flooding (groundwater and sewers) are considered to be low and much less significant than the fluvial flood risk posed to the site.

As the SFCA considered the entire Strategic Development Site, it concluded that over 44% of the site is located within the DAM flood zone A and Environment Agency Flood Zone 1 and would be suitable for development. However, this assessment, along with the 2006 FCA and ongoing work are primarily concerned with the development site adjacent to the Afon Cynon.

Given the strategic nature of the SFCA, the outputs of the study would be superseded by more detailed work such as the 2006 FCA and ongoing work.

2.3 2010 Scott Wilson Reviews and Surface Water Analysis

In December 2009, Scott Wilson met the Environment Agency to ascertain the work required to aid Rhondda Cynon Taf in their LDP process with regard to the Robertstown site. During the meeting, the Environment Agency provided a background of work undertaken to date (including the 2006 FCA) and the ongoing work (see Section 2.4 below) being completed. The Environment Agency has a good working relationship with the consultants undertaking the ongoing work and has approved similar studies undertaken by them. In addition, given that the work was due for completion in early 2010, it was deemed inappropriate for Rhondda Cynon Taf to commission Scott Wilson to undertake significant hydraulic modelling for the proposed site. Minutes from this meeting are provided in Appendix B. Scott Wilson also undertook a site visit to confirm the observations made by the 2006 FCA, such as the lower banks adjacent to the bridges upstream of the site.

Scott Wilson undertook an analysis of all Draft LDP Land Allocations Identified by Screening for Further Assessment and Strategic Development Sites in line with recently released Areas Susceptible to Surface Water Flooding (ASTSWF) maps. As part of this work, the Robertstown site was assessed. Although the lower extent of the site was significantly constrained by areas susceptible to surface water flooding, such areas correlated with the fluvial flood outlines for the site. Therefore, given the relatively crude methodology behind generation of the ASTSWF maps, it is deemed that fluvial flooding presents a more significant risk to the site, hence the ASTSWF maps would be superseded by the 2006 FCA and ongoing FCA (see Section 2.4 below).

2.4 2010 Ongoing FCA

Waterman Quadrant consultants are currently undertaking detailed hydraulic modelling using 2-dimensional hydraulic modelling (believed to be a linked ISIS-TUFLOW model). This modelling exercise will be used to support a detailed FCA on behalf of Aberdare Developments Ltd to support development at the site. The site in question is similar to that which was assessed as part of the 2006 FCA. It is believed that hydraulic modelling and an FCA has already been completed, in discussion with the Environment Agency, for the most southerly portion of the site to support a primary care health centre.

At the time of writing, although the work was due for completion in early 2010, no outputs from the hydraulic modelling or FCA have been released for review by Scott Wilson in time for the LDP Examination hearings. Discussions with Waterman Quadrant have indicated that they are confident of achieving a suitable development that is compliant with TAN15. As the ongoing work is being undertaken using a 2-dimensional model, it would provide more accurate results and proposed mitigation than those obtained by the 2006 FCA.

2.5 Flood Risk Summary

2.5.1 Summary of Flood Risks

Fluvial flood risk is deemed to be the most significant flood risk posed to the site located adjacent to the Afon Cynon. The existing site is deemed to be at significant risk from fluvial flooding. However, the 2006 FCA indicated that a solution is available for the site such that it meets the requirements of TAN15. The more detailed hydraulic modelling currently ongoing would be able to provide a solution with greater confidence than the 2006 FCA given the software used and the lower vulnerability of the proposed site users.

2.5.2 Summary of Proposed Flood Management

The 2006 FCA proposed various measures for protecting the site and surrounding areas during the 1% annual probability flood event, inclusive of climate change, summarised as follows:

- Raising existing river walls, particularly upstream of the site to prevent overbank spillage;
- Improve existing defences upstream and downstream of the site to improve flood protection to the wider community;
- Create a second channel adjacent to the existing Afon Cynon to retain flood flows, maintaining a conveyance of flows along the Afon Cynon;
- Raise ground levels on site to ensure they are above the 1% annual probability flood level (inclusive of climate change).

In light of the above, it is deemed that the site would be achievable for development and would be applicable for inclusion within the LDP, subject to confirmation that it meets the wider regeneration needs of the community (i.e. items i, ii and iii in Section 6.2 of TAN15).

3 Summary

The Robertstown / Abernant strategic development site is located within Aberdare and consists of two separate development areas, one development area of which is located adjacent to the Afon Cynon and Wellington Street. The other development area is located on higher ground where Aberdare General Hospital stands.

The sites have been subject to various flood risk related studies, namely:

- An FCA in 2006, which included hydraulic modelling (using HEC-RAS software);
- An SFCA in 2008, which considered the Strategic Development Site, i.e. the two development areas considered as one site;
- An analysis of ASTSWF in 2010; and
- Ongoing 2-dimensional hydraulic modelling and associated FCA.

The 2006 FCA concluded that the existing site is at risk of flooding during the 1% and 0.1% annual probability events. Therefore, without mitigation, the site would not meet the requirements of TAN15. In order to manage flood risks appropriately, the FCA recommended improving or raising existing banks or walls, constructing a second channel and raising ground levels. Post-mitigation, it is deemed that the site would be compliant with the requirements of TAN15.

The 2008 SFCA considered the two development areas as one site. It concluded that fluvial flooding presents the most significant risk to the site and provided flood depths similar to those indicated within the 2006 FCA. Given the strategic nature of the study, the more detailed FCA work would supersede this assessment.

During a meeting in December 2009 between the Environment Agency and Scott Wilson, it was revealed that work is ongoing to complete detailed modelling at the site using a 2-dimensional hydraulic model (and therefore to greater detail than the 2006 FCA). At the time of the meeting, it was envisaged that this modelling would be completed in early 2010. Therefore, it was not deemed appropriate for Scott Wilson to undertake additional hydraulic modelling for the site. At the time of writing this report, the modelling has not been completed and could not be reviewed. However, discussions with the consultants undertaking the modelling indicate it is likely that a solution would be achievable to meet the requirements of TAN15.

Given the work undertaken to date, in particular the 2006 FCA, and the exclusion of more vulnerable uses, it is believed that a solution is achievable for mitigation at the site to ensure it meets the requirements of TAN15. Therefore, it is likely that the site would be deliverable as part of the LDP, subject to economic viability and Environment Agency consent.

Appendix A

Site Location

Appendix B

Correspondence

subject	Rhondda Cynon Taf LDP		
job no	D127086	Meeting No	1
date	7 th December 2009	time	10:30am
place	Environment Agency offices, St Mellons, Cardiff		
prepared by	Patrick Goodey (PG)		
distribution	Christian Servini (CS), Gary Purnell (GP), Jackie Walters (JW), Jon Robinson (JR)		
apologies	Phil Ratcliffe (PR)		

Item	Notes	Action
1.0	Following round the table introductions, GP and CS provided background to the Robertstown site	
2.0	<ul style="list-style-type: none"> In 2000, the EA produced a Feasibility Study for improving the flood defences at Robertstown and protect the local area, in particular a furniture factory; In 2003 the furniture factory burnt down, thus losing the benefits of the study and leading it to be abolished; In 2006 Aberdare developments promoted the scheme for mixed use development, including residential, and completed an FCA; The site went to appeal and was not pursued; In 2007, consultants Waterman Quadrant undertook a review of the FCA and additional modelling for a Primary Care Centre; Waterman Quadrant still undertaking work for the site but now incorporating the wider site, for a proposed mixed use development (commercial and industrial); It is believed their work will be complete in early 2010 	
3.0	PG obtained relevant details for Waterman Quadrant and will contact them to ascertain the ongoing work and predicted deadline/	PG
4.0	The EA stated they have a good relationship with Waterman Quadrant and have been happy with their work done to date, however they have not seen any outputs from Robertstown thus far.	
5.0	Agreed that no addition work should be undertaken for RCT at the site, given the nature and detail of the ongoing work.	
6.0	<i>The remainder of the meeting discussed potential work required for a site in Mountain Ash</i>	

