Blaenau Gwent County Borough Council

Former Steelworks, Ebbw Vale
Flood Risk Assessment supporting Application for Planning Consent for the re-development of the General Offices
September 2008

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Contents Amendment Record

This report has been issued and amended as follows:

Issue	Revision	Description	Date	Approved by
1	0	First issue	Sept 08	

Contents

1 Introduction

1.1 General

Halcrow Group Ltd (Halcrow) has been commissioned by Blaenau Gwent County Borough Council, BGCBC, to prepare a design for the remediation and development of the former steelworks site in Ebbw Vale.

The 75 hectare former steelworks site, located on the in-filled floor of the Ebbw valley, is to be regenerated to facilitate the implementation of a development masterplan and landscape framework which it is anticipated will effect an economic step change in the community of Ebbw Vale and the wider Blaenau Gwent area.

The regeneration works which are approaching completion comprise:

- A comprehensive site wide de-contamination operation aimed at the identification and remediation of all areas of contamination within the site including the extensive network of basements
- The partial demolition and infilling of the majority of the former basements
- Clearance of all artificial obstructions down to a depth of approximately 2m
- Re-grading the upper Cold Mill and Hot Mill plateau areas to create future development platforms
- Establishing a semi wetland habitat in an area referred colloquially as the Central Valley and
- Securing the site's existing drainage infrastructure by replacement or remediation as appropriate.

The development works involve the implementation of the development proposals as depicted by the masterplan. The development is due to be implemented in a phased programme, comprising five phases for implementation between 2008-2018. The use of the site is mixed and will include residential, leisure, educational and commercial facilities.

As part of these works it is proposed to refurbish the General Offices which is a Grade II* listed building located on the north eastern corner of the site fronting on to Steelworks Road, reference drawing PO/FEVD/PLOT1A /FRA/001. The refurbished building will be retained as a landmark feature of the Works and converted for the mixed-use of offices, arts, education and leisure use. In addition to the refurbishment an extension will be constructed for document storage for use by Gwent Records Office.

1.2 Purpose of Report

This report is submitted by Halcrow Group Limited on behalf of BGCBC in support of an application for Planning Consent for the refurbishment of the General Offices incorporating an extension detailed on drawing PO/FEVD/PLOT1A/FRA/003. The General Office was built in 1915-16 and continued in use by Corus until the steelworks closed in 2002.

Demolition and decommissioning of the works by Corus continued until 2005 and following this was acquired by BGCBC in November 2005. The re-development of the General Offices formed part of a previous planning application which covered the whole site development. The proposed extensions and alterations to the General Offices require listed building consent; therefore a separate application is necessary. In addition, the extensions to the General Offices proposed following the outline planning permission has also resulted in the need to gain full planning permission for the proposed works. This FRA has been submitted to support the listed building consent and full planning applications.

1.3 General Situation and Development Proposals

The General Offices are located at the North eastern extremity of the former Cold Mill plateau at a level of approximately 274.00mOD. The building is situated on a small level plot of land between Steelworks Road and the main northern access road to the former steelworks. It is proposed that both of the roads will be re-aligned as part of the overall site redevelopment. It is currently envisaged that Steelworks Road will be developed to function as a Peripheral Distributor Road, PDR, which will be constructed in phase 3 of the masterplan (2012-2014). The former site access is to be incorporated into the Main Street through the Cold Mill site which will form part of the development works. The section of Main Street to the immediate west and north of the General Offices, Main Street North, is programmed for completion mid 2009. In the intervening period the offices are to be accessed by the existing infrastructure.

A number of bowling greens have been established on a low lying parcel of land located to the immediate north of the General Offices. The level of the greens probably reflects the original ground level which existed prior to development of the former steelworks. In developing the former works the Cold Mill site including the General Offices, an area of approximately 25.5 hectares, was raised to a common level of approximately 274mOD. A similar operation was undertaken on the Hot Mill site and the Central Valley and as a result the former Ebbw floodplain was in-filled to a maximum depth in excess of 20m.

To enable the development of the steelworks the course of the river Ebbw was re-aligned and long sections were placed in culvert. The most significant section of culvert is located some 570m to the south of the General Offices where the watercourse enters a long culvert that is aligned at depth under the Central Valley, Cold Mill plateau and adjacent business parks to outfall some 1.8 km downstream in deeply incised channel at Victoria. For the purpose of this and other associated reports this culvert is referred to as the Main Culvert. The reach of the river Ebbw immediately upstream of the Main Culvert is accommodated in a deeply incised channel that is aligned along the eastern flank of the valley. Over this reach the route of the river lies adjacent to and to the immediate east of Steelworks Road which is typically aligned some 6m above the watercourse. A 350m length of this reach of watercourse to the east of the General Office is also conveyed in culvert through an area of derelict land that formerly accommodated industrial buildings associated with the steelworks. This level partially landscaped area of land which fronts the General Offices is owned by BGCBC. For the purpose of identification this in this and other associated reports this upstream culvert is referred to as the Northern Culvert

Details of the general existing site topography including salient levels relevant to both the site and the General Offices are included on drawings nos. PO/FEVD/PLOT1A/FRA/001 & 002.

1.4 Development Proposals

It is proposed that development of the General Offices and supporting infrastructure will be undertaken in a phased manner with the initial works being the refurbishment of the existing two storey building and basements. As part of the General Office contract a new 8350sq ft building is to be constructed to the immediate north west of the existing structure. Work on the refurbishment of the General Office is ongoing and a contract for the construction of the new associated building is planned to commence in 2009. The buildings, general details of which are provided on drawing PO/FEVD/PLOT1A/FRA/005, are to be used for general commercial purposes and as tourist information centre with the new extension being earmarked as a document archive. The central basement will house the heat interface unit and associated plant equipment, whilst the Western basement will house the air handling unit. Currently there are no plans to develop the WC basement. This development is programmed for completion in 2010.

The land surrounding the General Office plot is all subject to re-development under the main site development works, details of which are shown on PO/FEVD/PLOT1A/FRA/000-004. The bowling greens and adjacent parcels of land to the north and west of the General Offices are planned to be remediated and re-profiled to enable their development primarily for residential purposes. This zone of the site is referred to as the Northgate site. As part of the Northgate works the area of the bowling greens will be in-filled such that the ground levels are marginally higher than the highway corridors bounding the site.

New highways will be established to service the Northgate site development. As explained in section 1.3 both the existing former site access road and Steelworks Road will be re-aligned as part of the overall site redevelopment forming part of the Main Street North and the PDR respectively. It is currently envisaged that works on Steelworks Road will be completed towards the end of 2014. The section of Main Street to the immediate west of the General Offices, Main Street North, is programmed for completion in 2009. In the intervening period the offices and extension are to be accessed by the existing infrastructure.

Outline details of the phasing of the works are provided on drawings PO/FEVD/PLOT1A/FRA/002-004.

2 Flood Risk

2.1 *Development advice map and Flood Consequence Assessment*

Planning Policy Wales 2002 prescribes minimum standards of protection for new development in flood risk areas. Flood risk zones across Wales have been identified through Development Advice Maps included with the Technical Advice Note 15 (TAN 15) Development and Flood Risk guidelines. The actual General Offices is identified on the associated Advice Map as being located just outside a Zone C2 classification area, i.e. an area falling within the Environment Agency's 0.1% probability flood envelope without significant flood defences, reference Figure PO/FEVD/PLOT1A/FRA/006 and Plate 1 below. It would appear however from inspection that the proposed extension building does fall within Zone C2. Furthermore it is apparent from inspection that much of the former steelworks site falls within Zone A.

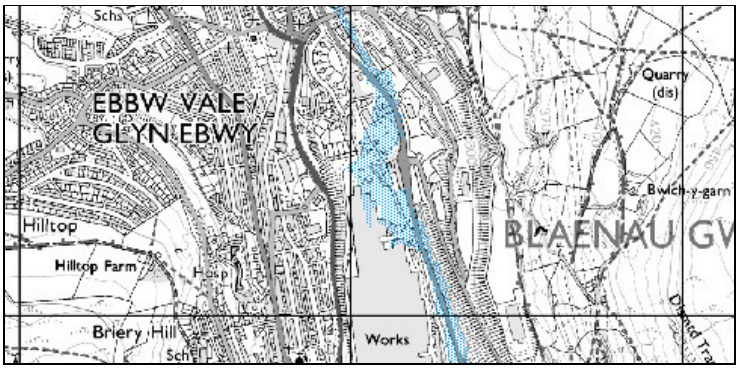

Plate 1: TAN 15 Development and Flood Risk – Development Map

In accordance with the requirements of TAN 15 a flood consequences assessment, FCA, has been undertaken for the main development and this formed part of the submission for the planning consent for the reclamation works. The FCA primarily investigated the fluvial flood regime although consideration was given to the impact that overland flows could have on the development and the risk of an increase in runoff adversely impacting on downstream flood regimes. This assessment was based on a preliminary version of the Masterplan which has since been developed and amended to address site constraints and BGCBC's aspirations. At the stage when the FCA was undertaken the ground model was still at a somewhat preliminary stage which to some extent compromised the ability to predict future overland flow regimes. Notwithstanding this it was agreed with the Environment Agency that there was sufficient detailed information available at that time for the purposes of the reclamation scheme proposals and it formed part of the submission for the outline planning application for the development scheme.

The associated 1D ISIS study demonstrated that the Ebbw watercourse, including the existing culverts described in the earlier text, was capable of conveying the 1% and 0.1% probability floods within channel. Details of the associated flow profiles are provided on drawing

PO/FEVD/PLOT1A/FRA/007. Modelling indicated that flooding would only be an issue in a partial blockage scenario and even this was limited to the Main Culvert and only under the more onerous events namely:

- 1% probability event plus climate change with a 50% blockage of the culvert when a peak overland discharge approaching 0.5 cumecs is predicted

- 0.1% probability event again with a 50% blockage of the culvert when a peak overland discharge approaching 6 cumecs is predicted

The spillage and associated overland flow is predicted to occur immediately upstream of the Main Culvert and if not mitigated would effect the Central Valley where a wetland is in the process of being established.

Modelling demonstrates that even with a partial blockage of the Northern Culvert flows would be retained within channel albeit under the most extreme event the surcharge is predicted to almost reach top of bank at the culvert entrance. To quote from the original FCA;

'Acceptable consequences for the nature of use

The analysis demonstrates that only a small portion of the proposed development site falls within the risk zone associated with the 0.1% and 1% probability flood zones. Even this is only for the more extreme partial blockage scenario, and under the appropriate 1% event the flow rates can be adequately managed for the general infrastructure development proposed. Notwithstanding this, it is proposed that in establishing the infrastructure development, mitigation works, in the form of a large earth embankment will be constructed, which will effectively protect the whole site from the most extreme 0.1% event considered.

The residual of the site has been shown to fall outside the floodplain and the associated development is not at risk from fluvial flooding. The most vulnerable area of the site, the Bowling Green, although it is outside of the 0.1% zone is to be raised to ensure its future safety.'

The reference to '*General Infrastructure*' and '*appropriate event*' in this extract relates to the development categories as defined in TAN15 which are summarised in Table 2.1 below along with their respective Frequency Thresholds of Flooding for fluvial events, reference Figure 2, TAN 15.

With respect to the proposals for the General Office the uses identified are a mix of commercial and public offices with a County Archive and tourist information centre in the new extension. This mix of development is assessed as falling within the Highly and Less vulnerable classification and as such should be designed to be flood free under the 1% threshold frequency fluvial event with an allowance for the effects of climate change.

Development	TAN 15 Category	Threshold Frequency (years)	
		Fluvial	Tidal
Residential (including hotels and caravan parks)	Highly vulnerable	1%	0.5%
Public Buildings	Highly vulnerable	1%	0.5%
Especially vulnerable industrial development and waste disposal sites	Highly vulnerable	1%	0.5%
Commercial/Retail and Industrial	Less Vulnerable	1%	0.5%
Emergency Services	Emergency services	0.1%	0.1%
General Infrastructure (Highway Corridor)	Less Vulnerable	1%	0.5%

Table 2.1 TAN15 development categories

2.2 Fluvial Flood Risk

As explained above the modelling undertaken as part of the FCA indicates there is no risk that fluvial floods associated with the River Ebbw would affect the General Offices or the surrounding area. In addition there are no other side-streams in this locality which could pose a hazard to this development.

There was a former small surface water drainage system routed through the bowling greens that discharged to the Northern Culvert but this has been investigated and found to be largely redundant. A man entry inspection was made of this culvert which was found to be stanked off at a location close to the north eastern corner of the General Offices.

2.3 Overland Flood Risk

The General Offices are situated in a relatively narrow location on the floor of the Ebbw valley. The adjacent land to the east and west rises steeply. Although much of the surrounding land is developed and has formal drainage in the form of urban drainage systems if an extreme rainfall event was to occur on this catchment it would undoubtedly result in significant overland flow with runoff either not able to gain entry to the sewers or the flows being in excess of their capacity. Experience indicates that under such conditions the majority of this overland flow is normally conveyed towards the valley floor via the local highway infrastructure i.e. the roads and footpaths.

Incidents of this nature are not that infrequent in this area of the valley. Quite recently, significant flooding was experienced on the A4046 when overland flow from the urban area of central Ebbw Vale on the uphill western hillside was conveyed down via Church Street and ponded in a low point of the road before overspilling into the former steelworks site. This overland flow was supplemented by discharge from a primary public combined sewer that is aligned through this area of the site. This sewer frequently surcharges due to inadequate downstream capacity and an un-charted overflow located has been identified during the course of the investigations. The un-charted combined sewer overflow, CSO, lies just within the site boundary and discharges to the sites main surface water

drainage system which ultimately outfalls to the River Ebbw just upstream of the entrance to the Main Culvert. The Environment Agency was advised of the presence of the CSO and the un-consented discharge to the River Ebbw. It is understood they are liaising with Dwr Cymru Welsh Water over this issue.

A number of potential overland flow routes which could, in the event of an extreme rainfall event, convey flows towards the area around the General Offices have been identified and are detailed on drawing no PO/FEVD/PLOT1A/FRA/002. Each of these overland flow routes are aligned for much of their length along steeply inclined highways and have the potential to drain an estimated catchment of approximately 24 hectares. Analysis has been undertaken to assess the order of magnitude of flows that could be expected to be generated under rainfall events of return periods of between 20 and 100 years. Details of the results of this analysis which assumes a time of concentration of 15 minutes and a 24 hectare catchment are provided in Table 2.2 below.

Return Period – Years	Rainfall Intensity mm/hr	Peak Flow cumecs	Volume cubic metres
20	68.7	2.85	2568
50	80.7	3.35	3016
100	93.9	3.90	3508

Table 2.2

These overland flow values represent the total flow from the assessed catchment which would enter the environs of the General Office primarily from the east and west with the majority of the discharge being conveyed along or onto Steelworks Road.

Although the peak flow associated with each of these long return period storms is not insignificant the actual volumes involved are relatively minor.

The manner in which such overland flows are conveyed or build up around the General Offices will depend on the local topography.

As explained the proposals for this area involve a staged development which it is currently believed would take place in the following sequence.

Stage 1	General Offices refurbished with bowling green unfilled (PO/FEVD/PLOT1A/FRA/002.)
Stage 2	General Offices refurbished and the bowling green filled and re-profiled.
Stage 3	General Offices and Extension with Main Street North.
Stage 4	General Offices and Extension with Main Street North and Northgate development (PO/FEVD/PLOT1A/FRA/003).
Stage 5	General Offices and Extension with Main Street North, Northgate development plus Steelworks Road re-aligned to form Peripheral Distributor Road, PDR (PO/FEVD/PLOT1A/FRA/004).

These proposals will result in significant changes in the land form in the vicinity of the General Offices which will impact on the manner in which overland flow could potentially affect the building and the proposed extension as described below.

Stage 1 This in effect is the situation that will apply on completion of the site remediation works. The most significant point that needs to be noted is that the current vertical alignment of Steelworks Road is such that the General Offices are situated in a localised low spot with the level immediately in front of the offices being at an approximate level of 273.9 mOD and the road rising to a summit of 274.25 mOD some 300m to the south, reference drawing no PO/FEVD/PLOT1A/FRA/002. As such there is the potential in an extreme rainfall event, if the local drainage were to surcharge, for overland flow to collect in this length of highway to a depth of some 350mm before overspilling and discharging southwards. This is obviously not ideal however, as the threshold of the General Office is at a level of approximately 274.6 mOD the offices would actually be above the impoundment level and the building would thus be protected from the impact of overland flow from the east via Steelworks Road. Following completion of the reclamation works the landform to the west of the building would tend to dissipate any overland flows that may be conveyed along the former works access road southwards into the area of the Central Valley.

There is also the potential that flow paths could be established from Steelworks Road and the former works access road into the bowling-green area, which being at a level of 272.0mOD is significantly lower than either road or the surrounding land. Analysis shows that there is the potential to store in excess of 25,000 cubic metres within the area of the bowling greens which is an order of magnitude greater than the volumes of overland flow predicted for even the most extreme rainfall event.

Stage 2 A similar situation would prevail as with Stage 1 without the potential for storage in the bowling green which would be in-filled.

If deemed necessary it would at this stage be feasible to mitigate the potential for extreme runoff to collect in front of the General Offices by re-profiling the eastern verge of Steelworks Road to create a discharge route southward to the river Ebbw at downstream limits of the Northern Culvert. It is understood the verge and the parcel of land to the east which was originally occupied by steelworks buildings is now in the ownership of BGCBC. Minor landscaping works have been undertaken on this parcel of land through which the Northern culvert is aligned. The presence of the culvert and associated easements precludes any significant development and thus re-profiling to create a broad shallow 'swale' like feature would not compromise any future development aspirations. An approximate area of landscaping required to create such a feature is shown on drawing PO/FEVD/PLOT1A/FRA/003

Stage 3 & 4 As Stage 2 with a more formalised and defined flow path into the Central Valley

Stage 5 The provision of the PDR will provide the opportunity to remove the potential impact that the current summit in the road profile has on the local drainage or alternatively formulate a positive means of emergency discharge into a swale established along the eastern verge.

It is concluded that although the local topography is not ideal and there is the potential for overland flow to impact on the environs of the General Offices the actual building and proposed extension would not be threatened by overland flow although there is the potential that the building could in extreme conditions become somewhat isolated but the depth of water would not be extreme and the infilling of the bowling green would provide a means of emergency access and egress. The situation could be improved by minor re-profiling of the eastern verge to provide a means of discharge for overland flow however it should be noted that there is no history of flooding in this area.

2.4 Groundwater Flood Risk

There are no significant issues, levels or mine shafts in the locality of the General Offices which is located in a reasonably open position. The general hydrogeology of the area is dominated by former mining operations and the River Ebbw. Long term monitoring indicates that ground water levels in this locality are at a significant depth below ground level and the risk of it impacting on local flood regime is classified as very remote. The basements below the offices show no evidence of ingress of ground water even though the building has been vacated for a significant period.

2.5 Risk of Flooding from Sewage Infrastructure

A number of drainage systems are aligned in close proximity to the General Offices and could potentially impact on both it and the associated extension, reference drawing PO/FEVD/PLOT1A/FRA/004. The Western Valley Trunk Sewer which is aligned at depth close to the west bank of the River Ebbw is the most strategically important sewer in this locality and is one to which the foul drainage will discharge. There is a storm water overflow located a short distance upstream of the Northern Culvert which would function when the sewer approaches capacity preventing the system surcharging. As such the trunk sewer should pose no risk to the proposed development.

The only other significant drain in the locality is a 450mm surface water drain that is aligned in the former access road and falls in a southerly direction discharging to the River Ebbw some distance upstream of the Main Culvert. This drain forms part of the original Corus site surface water drainage system that will be diverted in the early stage of the site development. There is no history of it surcharging and in the event that it did the flow would dissipate in a southerly direction towards the Central Valley and should not impact on the General Offices.

2.6 Flood Risk to Adjacent Properties

The proposals primarily relate to an existing building and involve minimal changes in land form. As such there will be no changes in overland flow routes that would have an adverse impact on any adjacent property.

2.7 Flood Risk due to increased Runoff

There will be no perceptible increase in impermeable area as a result of this development. The overall impact of the re-development will effect a significant reduction in impermeable area as the former steelworks had an exceedingly high percentage of impermeable surfacing all of which discharged direct to the River Ebbw without attenuation. The proposed separation of surface water and re-use of grey water will effect an actual reduction in discharge to the local sewerage system.

3 Acceptability Criteria

3.1 TAN 15 - acceptable consequences for the nature of use

TAN15 sets a range of acceptability criteria that need to be addressed in testing whether a development is appropriate for the location proposed. The criteria cover fundamental matters such as whether the consequences of such a proposal are appropriate for the area, the impact of floods, the adequacy of escape routes, etc. The issues deemed relevant to this development and the opinions on these matters are summarised below.

3.2 Fluvial flooding

Although from inspection of the 'Advice Maps' the General Offices does not lie within a Zone C the proposed extension is shown to encroach within Zone C2. However, analysis demonstrates that even under the more extreme partial blockage scenario the adjacent reach of the Afon Ebbw is capable of conveying the 0.1% and 1% probability floods within channel and hence it is considered that the proposed extension does not lie within a Zone C2.

3.3 Overland Flooding

Investigations indicate the existing and future site topography is such that the General Offices and the proposed extension are and will in the future be vulnerable to overland flows.

3.4 Escape and Evacuation Routes

Although the existing section of Steelworks Road fronting the General Offices could under very extreme conditions be vulnerable to flooding as a result of overland flows such an event would not compromise the safety of occupants of the building and escape would be possible via alternative routes. It should be noted that there is no history of flooding in this locality.

The proposed highway routes will all be flood free and provide a means of access to and egress from the area in the event of an extreme overland flow event.

3.5 Impact on Flooding Elsewhere

The mitigation works proposed for the highway infrastructure will reduce the potential risk of overland flooding no matter how remote such a risk is. In the intervening period, if deemed necessary, provision could relatively easily be made to enable the Bowling Green area to be used for emergency flood storage purposes.

3.6 Drainage from the Site

The proposed development which will involve the use of re-cycled rainwater will affect a reduction in the rate and quantity of runoff from this site which will be of benefit to the existing surface water regime. In addition the establishment of flow routes for exceedance flows will also be of benefit to the area.

4 Conclusions

This assessment has identified and analysed the flood risks associated with the re-development of the General Offices and associated extension building. The Analyses have shown that the development satisfies all of the 'Acceptability rules' stipulated in TAN15 and therefore flood risk does not represent a barrier to the proposed scheme.

Appendix

Drawings