

TECHNICAL NOTE

Project: **East Witney - Cogges Link Road**
Subject: Flood Risk & Drainage Review
Prepared by Zeean Brydon (Associate Director)
Approved by Iain McNeill (Associate Director)

Job No: **WE01386-TN02**
Page 1 of 10
Rev D
11-04-2011

1 Introduction

This Technical Note provides a review of the Cogges Link Road Fluvial Flood Risk Assessment and Mitigation Report, January 2011 as prepared by Jacobs Engineering UK Ltd.

The Technical Note should be read in conjunction with the following drawings:

- WE01386-C-101: Jacobs January 2011 calibrated Flood Model
- WE01386-C-102: EA flood map (Post 2011)
- WE01386-C-103: Historic Flood Evidence
- WE01386-C-111: Differences between Jacobs 2011 Flood Map and EA Post 2011 Flood Map
- WE01386-C-112: Differences between Jacobs 2011 calibrated Flood Model and Historic Flood Evidence

2 Comparison with the Environment Agency – Revised Flood Map February 2011

Further to the 2008 Technical Reports and 2010 Section 73 Application, the Environment Agency published a revised Flood Map for Witney in February 2011.

The differences between the Jacobs 2011 calibrated Flood Model and the EA Post February 2011 flood map are shown on Drawing WE01386 – C – 111, with the key differences being:

- The area of Flood Zone 3 downstream of Bridge Street and upstream of the A40 has been significantly increased on the new EA maps.
- The EA map shows the area between the East Windrush and Hardwick Brook as Flood Zone 3 – being at risk of flooding during a 1 in 100 year event (1% average annual probability of flooding). The Jacobs 2011 calibrated Flood Model does not identify any flooding within this area.
- The EA map show the CLR footprint between the West and East Windrush as being Flood Zone 2 – being at risk of flooding during events up to a 1 in 1000 year event (0.1% average annual probability of flooding). The Jacobs 2011 calibrated Flood Model identifies only limited flooding in a 1 in 100 year + 20% event in this area.

TECHNICAL NOTE

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Subject: Flood Risk & Drainage Review
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Job No: **WE01386-TN02**
Page 2 of 10
Rev D
11-04-2011

- The EA map shows an area to the east of the Hardwick Brook as Flood Zone 2. The Jacobs 2011 calibrated Flood Model does not identify any flooding in this area.

The revised EA Flood Map suggests that all of the Cogges Link Road between the East Windrush and Hardwick Brook will be constructed within Flood Zone 3 and as such the proposed development will require flood mitigation to demonstrate no increase in flood risk within the upstream catchment.

3 Flood Risk Assessment and Mitigation Report Review

Section 2.5.1 of the Report confirms that the 1 in 100 year modelled flood event with 20% allowance for climate change would have a current return period of 273 years and would be a little more severe than the July 2007 flooding.

Section 3.4.3 confirms that initial trails with the recorded July 2007 flows suggests that the (July 2007) flood could have been of the same order as the 100 year plus 20% flood.

It is therefore appropriate to expect that the Design Flood Event (100 year + 20% flood) will mimic the July 2007 flood extent i.e areas that evidenced flooding in July 2007 should be shown as Flood Zone 3. As illustrated below the Flood Modelling work does not provide an accurate reflection of the extent of the July 2007 flooding and is therefore not considered to be appropriate for use.

Section 3.4.1 states that there was 'apparently relatively little [flooding] in the area of the CLR scheme'.

Section 3.4.2 of the report states that the 'verified flood mapping (verified by the Environment Agency) for the July 2007 event appears to be consistent with observations of the flooding which showed no inundation in the area of the CLR, although the EA does not warrant that areas shown as not flooding in July 2007 did not actually flood.'

As the report states the EA does not warrant that areas shown as not flooding did not actually flood.

Further to this Jacobs did not visit site until the 25th July 2007 (Section 5.3.1 confirms that by the 25th July the River Windrush had generally returned to an in-bank situation)

TECHNICAL NOTE

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Job No: **WE01386-TN02**
Page 3 of 10
Rev D
11-04-2011

Photographic Evidence gathered at or near peak flood confirms significant flood flow through the Country Park as a result of overtopping of the River Windrush. Eye Witness accounts confirm that flood waters breaching the banks of the Western Windrush flowed from north to south along the Farm Mill access road and into the Country Park. Eye Witness accounts confirm that flood flows also breached the Eastern Windrush channel contributing to the flood flow along the Farm Mill access road and into the Country Park. (Refer Photographs A, G and E on Drawing WE01386-C-103). Photograph A is enlarged below for clarity. Further photographs can be provided if required.



Photograph A Extract Showing Flooding within the Country Park. Flood water can be seen on the footpaths in the park, it is reasonable to assume floodwater extends into the tall grass either side of the footpath.

The statements that “there was relatively little flooding in the area of the CLR scheme” and that “the verified EA mapping appears consistent with observations which showed no inundation in the area” do not therefore reflect the observed flooding.

Section 5.3 of the report describes how the Flood Model has been calibrated to match the Jacobs Flood Observations.

It is demonstrated above that the EA verified July 2007 flood record and Jacobs Observations do not reflect the observed flooding. Calibration of the model in accordance with the EA Flood Map and Jacobs Observations would

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Job No: **WE01386-TN02**
Page 4 of 10
Rev D
11-04-2011

be expected to be under-estimate flood flows across land intersected by the proposed CLR.

Section 5.3.3 of the report specifically states that the Flood Model showed a small flow into the floodplain area from the Farm Mill area. Water levels in the eastern channel were said to 'remain below the modelled bank levels', but with a 'freeboard of only 0.1m'. The reports states that this is 'consistent with some local overtopping' of the watercourse, possibly assisted by being on the outside of a bend.

Photographic Evidence of the July 2007 flooding (Photographs E and G of Drawing WE01386-C-103) clearly demonstrates that the flood flows were not contained within the river banks and that overtopping could not be described as 'some local overtopping'.

The difference between the flood model results (as presented in Section 5.3.3) and the observed flooding further supports the fact that the calibration of the model in accordance with the Jacob observations is likely to underestimate flood flows across land intersected by the proposed CLR.

Figure 23 and Section 5.7 of the report compares the proposed 100 year flood extent with the Section 105 flood extent. The report clarifies that this comparison shows "a number of areas where the 100year plus 20% flood extent requires refinement. In particularly the area south east of Bridge Street should be shown to be subject to more general flooding, and flooding along the streets on the opposite side of the river should be clarified".

The report goes on to correctly identify that the S105 outline shows "substantial areas of flood risk in the general vicinity of the CLR" which are not replicated by the Jacobs 2011 calibrated flood model. The reports states that the model shows "small flows taking place over the banks of the various channels into the historic floodplain areas and across the proposed CLR alignment", but confirms that the lack of ponding is a result of "sufficient gradient" across the floodplain.

Within Section 5.7 Jacobs acknowledge that their model requires further refinement to match the S105 flood extent within the vicinity of Bridge Street. This statement gives credence to the validity of the S105 model in representing flood flows within the Witney catchment.

Whilst acknowledging within the text that there are substantial differences between the Jacobs flood model and the S105 flood extent within the vicinity of the CLR no satisfactory explanation is given regarding the difference between the models. The report states merely that "small flows occur" and

TECHNICAL NOTE

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Job No: **WE01386-TN02**
Page 5 of 10
Rev D
11-04-2011

that the "lack of ponding is a result of sufficient gradient" across the floodplain. Both statements would appear to be presented solely on the basis that the Jacobs Flood Model and the observations on which it was based are correct. As shown above this starting point is incorrect.

Indeed the extent of flooding within the vicinity of the CLR and properties within the Cogges area, as shown on the S105 model, is considered more representative of the actual flooding as experienced and as supported by photographs which were taken at or near peak flood support.

Again there is no satisfactory explanation as to why these areas of flooding have been removed from the calibrated model.

Figure 23 is attached for clarity.

Section 5.7 of the report discusses the design flood extent (being the extent of the 100 year + 20% flood).

Section 5.7.2 of the report states that the "modelling shows small flows taking place over the banks of the various channels into the historic floodplain areas and across the proposed CLR". The flooding is identified as minor in nature, being less than $0.01\text{m}^3/\text{s}$ (between the Windrush channels) and $0.21\text{m}^3/\text{s}$ (flowing into the area east of the Windrush). The Jacobs 2011 flood mapping does not show any flood flow paths crossing the Country Park. The report states that the 'minor flooding is evidenced by small patches of ponded storage within the footprint of the (proposed) CLR'.

$0.01\text{m}^3/\text{s}$ (10l/s) is approximately equivalent to the flow from five 2litre milk bottles overtopping the eastern channel on Farm Mill Road and flowing through the Country Park every second. Photographs E and G show flood flows which are significantly greater than 10l/s. Photograph E (included below) shows a flood flow approximately 5-6m wide with a depth in the order of 100 to 200mm. The flow rate is estimated to be in the order of 1m/s, giving a flood volume in the order of $0.5\text{m}^3/\text{s}$ to $1.2\text{m}^3/\text{s}$ significantly (50 to 120x) greater than that suggested by Jacobs. The Jacobs 2011 Flood Model and Flood Mapping does not therefore accurately predict the flood flows as experienced on site in July 2007.

TECHNICAL NOTE

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Subject: Flood Risk & Drainage Review
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Job No: **WE01386-TN02**
Page 6 of 10
Rev D
11-04-2011



Photograph E – Flood Flows entering the Country Park

Section 5.8.2 of the report states that the 'absence of reported flooding within the vicinity of properties in the Cogges area, including the school and Cogges Museum, is consistent with the modelled flood extents.

Photographic Evidence (photographs D, I and H of Drawing WE01386-C-103) shows flooding within the Cogges Museum Car Park and Cogges Link Area. Further anecdotal information suggests widespread flooding in this area.

Section 5.8.3 identifies that flooding within Witney also occurred as a result of surcharge from ordinary watercourses such as the Madley Brook near Cogges. The report states that Cogges residents refer to flooding on Friday 20th July when the main body of rainfall occurred whereas the peak flow at Worsham was not recorded until the morning of the 21st July and this ties up with observations that levels on the floodplain continued to rise.

Section 5.8.3 suggests there was flooding in Cogges but this was caused by the Madley Brook on the Friday rather than the Windrush on the Saturday. This is disputed by residents and is disproved by the photographic evidence which identify flooding in excess of that expected to be experienced as a result of flooding from Madley Brook alone.

TECHNICAL NOTE

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Job No: **WE01386-TN02**
Page 7 of 10
Rev D
11-04-2011

The Jacobs Flood Model does not therefore accurately reflect flooding within the vicinity in the Cogges area.

Figure 24 of the report shows the calibrated modelled 100 year + 20% design flood extent.

Figure 24 has been overlaid and compared with the observed flooding as illustrated on Drawing WE01386-C-103, with the results shown on drawing WE01386-C-112.

Drawing WE01386-C-112 shows that the calibrated flood flow modelling does not accurately identify flooding:

- *flooding within the Country Park (discussed above)*
- *within the Cogges area (discussed above),*
- *flooding of the Council depot (Photograph C) .*
- *flooding at the Two Rivers Industrial Estate (Photographs A and B).*
- *observed flooding within the vicinity of the Pumping Station*

The calibrated flood model is seen to be significantly underestimating the extent of flooding within the vicinity of the proposed CLR.

Section 6.2.1 of the report states that the CLR has 'little direct impact' on the ponded storage within the floodplain.

Section 6.2.2 of the report states that flows overtopping the bank of the River Windrush will run 'across' the line of the proposed CLR site collecting in open area south of the proposed alignment.

As demonstrated above the flood model is considered to be underestimating the extent of flooding within the vicinity of the CLR.

On the basis of the July 2007 flood extents (as evidenced) and the potential underestimate of the flood model the statement that the CLR will have little direct impact on ponded storage within the floodplain cannot be made with any certainty.

Section 6.3.3 of the report identified the proposed solution for dealing with the flood flows crossing the open areas intersected by the proposed CLR is to link the flood plains to the north and south of the road with the creation of orifices, equivalent to 300mm diameter pipes across the CLR embankment.

TECHNICAL NOTE

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Job No: **WE01386-TN02**
Page 8 of 10
Rev D
11-04-2011

Figure 27 shows the impact of flood modelling with the inclusion of the CLR, realigned river channel, orifices and lowering of the eastern bank of the River Windrush.

The flood model shows new areas of flooding upstream of the CLR and decrease in flood extent downstream (south) of the CLR.

The eastern area of increased flooding is third party land outside of the CLR application boundary and CPO boundary.

As noted above the flood model is anticipated to underestimate flood flows and it is likely therefore that the impact on third party land is increased beyond that identified in Figure 27.

Options to mitigate the impact of the CLR are discussed in Section 7 and Section 8 of the report. The proposal involves:

- lowering a section of the Eastern Windrush River bank to direct flood flows in the area identified for flood compensatory storage.
- Lowering of ground levels within the area identified for ecological mitigation to provide compensatory flood storage.
- Provision of pipes with 300mm diameter entry orifice to facilitate transfer of flood flows from north of the CLR to south of the CLR.
- Lower of levels to ensure gravity connections.

The proposed mitigation is based on a flood model which (as identified above) does not accurately reflect flooding as observed in July 2007. There is no evidence therefore to confirm that the proposed mitigation will not result in additional flood risk to third party land outside of the CLR planning boundary.

The proposals are based on lowering levels to ensure gravity flow paths are maintained.

There is no supporting information (topographic survey, engineering design / sections / geotechnical information in particular confirmation of water table levels within the area) to demonstrate that the proposed mitigation strategy is deliverable.

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Job No: **WE01386-TN02**
Page 9 of 10
Rev D
11-04-2011

4 Functional Floodplain

Functional Floodplain (Flood Zone 3b) is land which would flood with an annual probability of 1 in 20 (5%) or greater in any or, or land which is design to convey or store water during a flood event. PPS25 states that only water compatible and essential infrastructure should be permitted within Flood Zone 3b, and then only then the design does not:

- impede water flows,
- result in a net loss in floodplain storage,
- increase flood risk elsewhere.

The Cogges Link Road evidence base considers only the 1 in 100 year flood event with climate change. The evidence base does not demonstrate the extent of functional floodplain and does not address the potential impact on any areas of functional floodplain potentially associated with the River Windrush.

The report does not identify any alternative infrastructure solution to the CLR that would avoid any impact on the functional flood plain.

Extract from Jacobs Fluvial Flood Risk Assessment January 2011

Cogges Link Road

Fluvial Flood Risk Assessment and Mitigation - December 2010

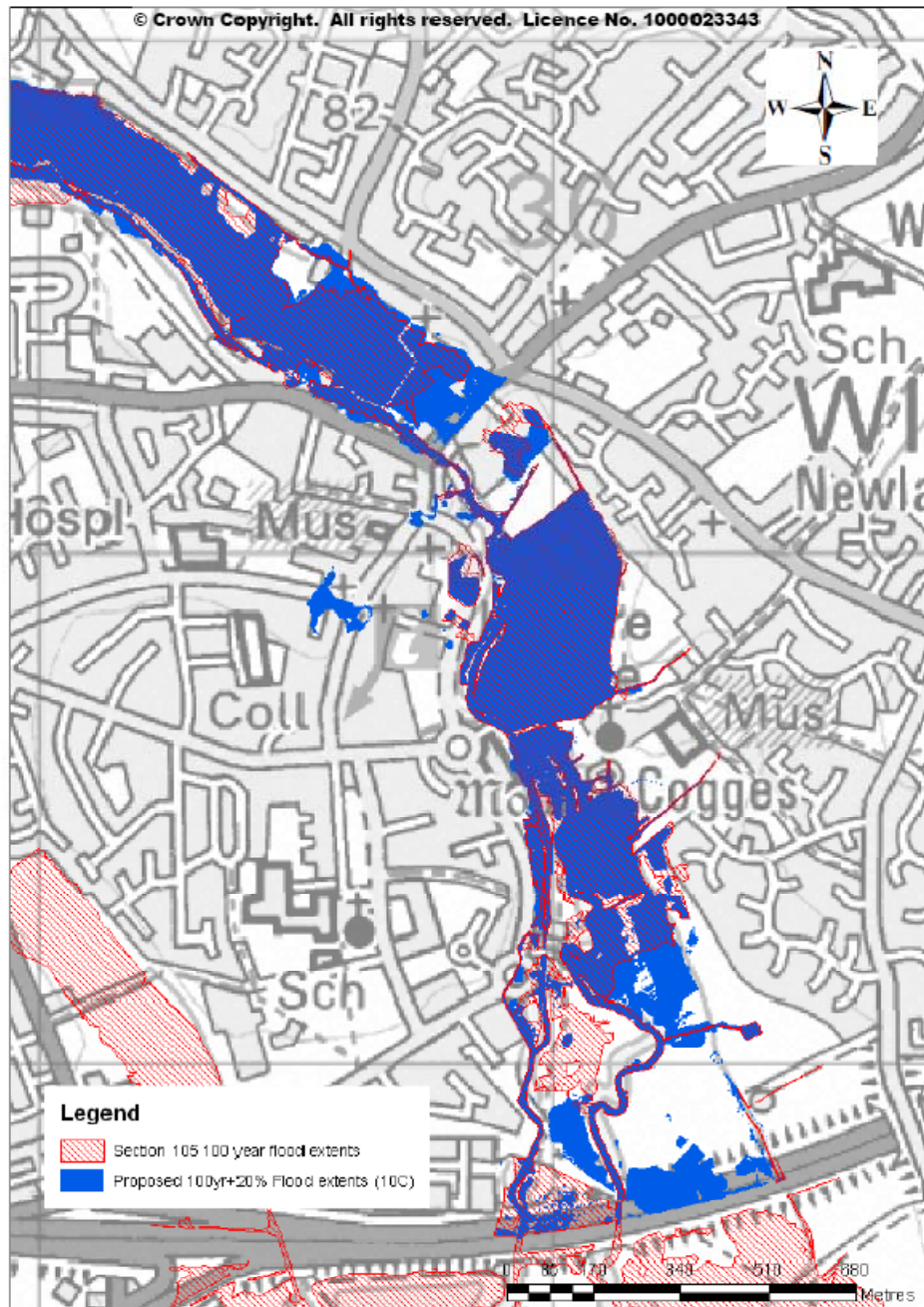


Figure 23 100 Year plus 20% Design Flood Extent