

## Technical note

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<b>Project</b>	Stroud Level 2 SFRA	<b>Date</b>	March 2014
<b>Note</b>	Hydraulic Modelling Methodology – Quedgeley	<b>Ref</b>	WNCCAC
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### 1 Overview

#### 1.1 Introduction

This technical note focuses on the hydraulic modelling approach taken for the modifications required by Stroud's Local Plan to the Level 2 SFRA model of the Quedgeley area in order to include the site allocations known as Quedgeley East (SA4a) and to improve the assessment of the site known as Hunts Grove extension (previously assessed as site 9, now identified as SA4). Quedgeley East is located between Shorn and Beaurepair Brook, while the Hunts Grove extension is located adjacent to the Beaurepair Brook.

#### 1.2 Existing Model & Data

- 1.2.1 There is an existing Level 2 SFRA model in which the Shorn or Beaurepair Brooks do not have an ISIS 1D component; instead they are represented by the DTM with structures represented as 1D unit but nested with in the 2D domain. Both brooks discharge to the Sharpness Canal which has a model which forms the downstream boundary and western boundary of this study area respectively. The Dimore Brook, upstream the Shorn and the Beaurepair Brooks is also included in the model and has an ISIS 1D model. Both sites and model components are shown in Figure 1.

#### 1.3 Site Visit

- 1.3.1 A site visit was undertaken to the Quedgeley area to obtain additional information required to ensure that both the existing and new 2D sections were representing local conditions and get an estimated dimensions of the structures.
- 1.3.2 The existing model has included two structures along the Shorn Brook which was considered sufficient for the purpose of the March 2012 Level 2 SFRA at the time it was carried out. For the purpose of this model update they have been retained.
- Shorn Brook at Church Lane: OS NGR SO 79431256
  - Culvert between Sticky Lane and the A38: OS NGR SO 80421245
- 1.3.3 On the Beaurepair Brook there were no sites to analyse therefore no structures were included in the existing model. In this instance, the analysis of Quedgeley East (SA4a) requires improving the representation of the Beaurepair Brook and during the site visit the below structures were visited and an estimate dimension was collected:
- Culvert under A38: OS NGR SO 79471149

- Culvert under B4008: OS NGR SO 80131140
- Culvert under M5: OS NGR SO 80511134
- Culvert under Haresfield Lane: OS NGR SO 81001141

1.3.4 Structure and culvert dimensions, bank levels, road deck levels and floodplain barrier openings were retained from the existing model.

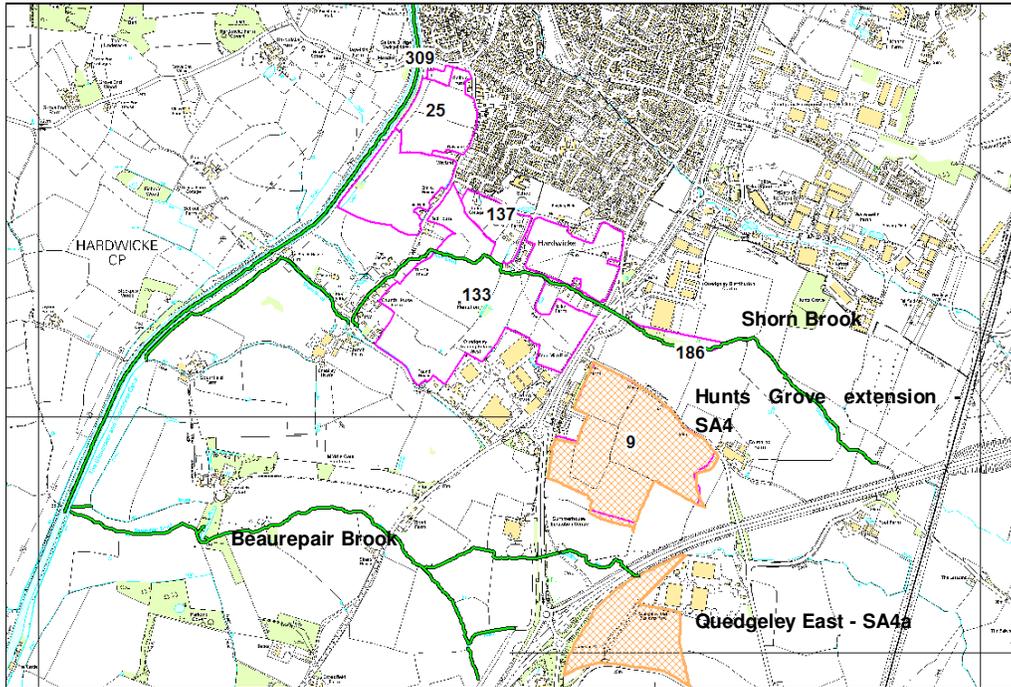


Figure 1. Location of the sites at Quedgeley.

## 2 Hydraulic Modelling

### 2.1 Methodology

- 2.1.1 This study comprises the south-western extension of the existing ISIS-TUFLOW model in order to include the Quedgeley East site (SA4a). This linked format enables hazard ratings output in addition to the depth and velocity grid output for all design return periods. All in bank structures with in the Dimore Brook are included in the model and their backwater effect is taken in to account.
- 2.1.2 The 8m grid resolution of the existing 2D model, along with the hydraulic roughness values for both the 1D and 2D components have been retained from the existing model.
- 2.1.3 The key structures on both the Shorn and Beaurepair Brooks were included in the ISIS 1D component and nested inside the 2D domain making use of the data collected during the site visit.

### 2.2 Model extent

- 2.2.1 The upstream extent of the Shorn Brook is at point about 400m upstream of the A38, OS NGR SO808122 and downstream is at the confluence with the Gloucester and Sharpness Canal, OS NGR SO790126.
- 2.2.2 The Beaurepair Brook upstream extent has been moved a further 1200m upstream, adjacent to the railway by Pool Farm, OS NGR SO816112 and the downstream end of the brook again at the confluence with the Gloucester and Sharpness Canal, OS NGR SO781115.
- 2.2.3 Figure 2 shows the full extent of the 2D model shown is blue line and the extent of the Sharpness and Dimore 1D models as pink dots.

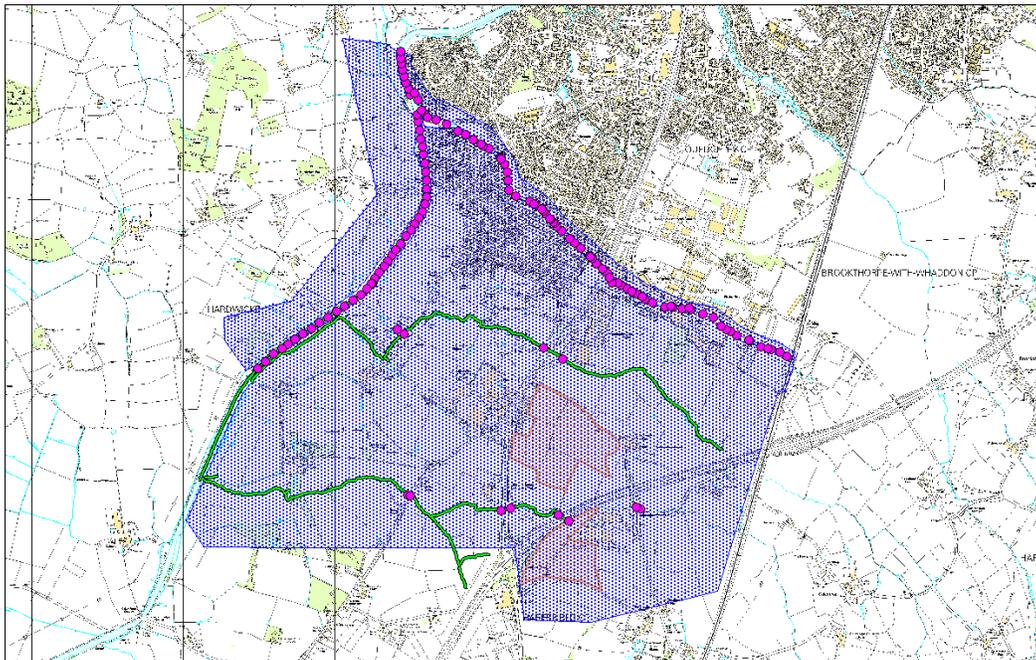


Figure 2. Quedgeley model extents.

## **2.3 Hydrological approach**

- 2.3.1 The hydrological approach taken for the Level 2 SFRA model has been retained.
- 2.3.2 The upstream inflow boundary for the Beaurepair Brook located at OS NGR 380481,211366 has been moved 1200m to match the upstream extent of the current modified model.
- 2.3.3 The value of peak flows for the development of the Flood Zones as well as the distributed approach to inflows has been preserved.

## **2.4 Sensitivity Analysis**

- 2.4.1 Sensitivity analysis to structural blockage was carried out and the result of the analyses is as follows. In the absence of a good and reliable calibration data, sensitivity analysis is to set the perspective in terms of how models results should be interpreted.
- 2.4.2 A 50% and 90% Blockage of the structures on both the Shorn and Beaurepair Brooks was carried out to assess the impact of the blockage. The results show the flood level increased immediately upstream the structures and hence it is recommended that the structures should be kept clear to keep the validity of the result and keep the residual risk controlled.

## **2.5 Assumptions & Limitations**

- 2.5.1 The current model retains the methodology adopted on the previous Level 2SFRA for consistency and as it was believed fit for this purpose.
- 2.5.2 Model has been extended under the assumption that the quality of the existing model and its data is of reasonable accuracy.
- 2.5.3 Data collected from the site visit for the structures was included on the extension of the model upstream inline with the previous SFRA study approach.
- 2.5.4 The key limitation of the modelling study is the lack of good calibration data against which the model performance would have been tested.
- 2.5.5 The adopted approach and data quality is judged fit for the purpose of this study, however, care must be taken with any further use of results for different applications. For example, a site specific flood risk assessment to support a development plan will require detailed channel and structural survey data.