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Environment Agency

Mrs Mahnaz Chowdhery
Waltham Forest Borough Council
Planning & Transportation Service

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Our ref: NE/2011/112080/02-L01
Your ref: 2011/0278

Date: 17 October 2011

Dear Mrs Chowdhery

Use of rear half of site for coach/bus depot for 64 buses/coaches and 38 mini buses with associated, plant storage facility, ancillary office and associated landscaping and formation of access from Walthamstow Avenue roundabout.

Car Park opposite Dog Stadium, 457 Chingford Road Chingford, E4

We refer to the further information received from Mr John Pulsford of Peter Brett Associates on 23 September 2011 (Ref: 24717/009/JNP/CBH/SMK, dated 20 September 2011), which I understand was copied to you.

Following receipt of the HCT Design Models and Technical Note (dated September 2011), our Flood Risk Mapping and Data Management team referred the modelling files to JBA Consulting for an external review. A copy of the JBA Consulting model review certificate (Ref: 2011s5185, dated 30 September 2011) is attached for your information.

The review of the model shows that there appears to be a minor increase in flood risk in the 1 in 100 year scenario along Chingford Road. There is no increase in flood risk in the 1 in 100 year plus climate change scenario, in fact there 2 locations where there is a reduction in flood risk.

Considering the results of the model review in light of previous correspondence regarding the Flood Risk Assessment (FRA) prepared by Peter Brett Associates (Ref: 24717/005/FRA, dated May 2011), we are now satisfied that the proposed development will not cause an unacceptable increase in flood risk.

We therefore consider that planning permission may be granted to the proposed development as submitted, provided that the following planning conditions are imposed as set out below. Without these conditions, the proposed development on this site poses an unacceptable risk to the environment and we would wish to object to the application.

Condition EA1:
The development shall only be carried out in accordance with the approved Flood Risk Assessment (FRA) carried out by Peter Brett Associates (Ref: 24717/005/FRA, dated May 2011) and the associated application documents, and the following mitigation measures detailed therein:

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- *Provision of a covenant in the deeds of the of the property, to ensure that the floodplain storage beneath the building(s) will be available for the full lifetime of the development.*
- *Provision of safe routes into and out of the site to an appropriate safe haven.*

Reason: *To prevent increased flood risk and to ensure that site users remain safe from flood risk.*

Condition EA2:
The development shall not be commenced until such time as a scheme to of foul and surface water has been submitted to, and approved in writing by, the local planning authority. The scheme shall be implemented as approved.

Reason: *To prevent pollution to watercourse and to improve water quality*

Advice to the Applicant

Any above ground oil storage tank(s) should be sited on an impervious base and surrounded by a suitable liquid tight bunded compound. No drainage outlet should be provided. The bunded area should be capable of containing 110% of the volume of the largest tank and all fill pipes, draw pipes and sight gauges should be enclosed within its curtilage. The vent pipe should be directed downwards into the bund. Guidelines are available from our website[1] (see 'PPG2').

All drums and small containers used for oil and other chemicals shall be stored in bunded areas which do not drain to any watercourse, surface water sewer or soakaway. Facilities should be provided to ensure that waste oil is stored and disposed of in a manner that will not lead to pollution

Prior to being discharged into any watercourse, surface water sewer or soakaway system, all surface water drainage from lorry parks, parking areas for fifty car park spaces or more, and other areas of hardstanding should be passed through an oil interceptor designed compatible with the site being drained. Roof water shall not pass through the interceptor (see 'PPG3').

All cleaning and washing operations should be carried out in designated areas isolated from the surface water system and draining to the foul sewer (with the approval of the sewerage undertaker). The area should be clearly marked and a kerb surround is recommended. All wash down and disinfectant waters shall be discharged to the foul sewer. Detergents entering oil interceptors may render them ineffective.

If any controlled waste is to be removed off site, then site operator must ensure a registered waste carrier is used to convey the waste material off site to a suitably authorised facility.

The Duty of Care regulations for dealing with waste materials are applicable for any off-site movements of wastes. The operator as waste producer therefore has a duty of care to ensure all materials removed go to an appropriate licensed disposal site and all relevant documentation is completed and kept in line with regulations.

During site construction, the developer should consider reduction, reuse and recovery of waste in preference to off site incineration and disposal to landfill, in accordance with the waste hierarchy.

[1] www.environment-agency.gov.uk/business/topics/pollution/39083.aspx

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If any waste is to be used on site, the applicant will be required to obtain the appropriate exemption or authorisation from us. We are unable to specify what exactly would be required if anything, due to the limited amount of information provided.

If the operator requires more specific advice they should contact the Environment Management team at our Hatfield offices on 03708 506 506 or look at available guidance on our website[2].

Further Information

We trust these comments are helpful as you consider the application. If you have any queries, please contact me quoting our reference number.

Yours sincerely

Mr Simon Banks
Planning Officer

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cc Peter Brett Associates

encl. JBA Model Review Certificate (Ref: 2011s5185)

[2] www.environment-agency.gov.uk/subjects/waste

End

Project	NE Thames Area Evaluation of Models and Flood Risk: 2 - Car Park Opposite Dog Stadium 457 Chingford Road Chingford, E4	**Project No.**	2011s5185
Subject of Review	ISIS-TUFLOW hydraulic model		
Revision	1	**Date**	30/09/11
Project Manager	Francesca Hurt	**Reviewer**	Alistair Clark
Documents used in Review	The control files and model layers have been provided for modelled scenario. 2D model check files, 1D and 2D model results have been provided for all scenarios. Technical Report – Overview of hydraulic modelling		
Applicable Standards or Guidance	TUFLOW User Manual 2008 – BMTWBM 1D-2D Model QA Training - Model Audit Proforma – JBA Living Draft		
Purpose of Study	Flood Risk Assessment (FRA) for redevelopment of former car park at Walthamstow Stadium to new bus park, which includes new office building, bus wash facility, fuel tank, store and plant room. Site is partly located in Flood Zone 3		

Colour coding used:
Green – suggestion for improved / good practice but which is unlikely to change the model outcomes.
Amber – non-standard method or method not following guidance but unlikely to have impacted on model results
Red – omission that could make the model findings subject to challenge and which requires correction/further work.

Initial Review

1. Supplied data

1-1 The control files, check files and model layers have been provided for both the baseline model and the FRA model, along with a technical note outlining changes to the model for the FRA.

2. Overview of model

2-1 The model is an update of the existing ISIS-TUFLOW model for the River Ching, originally produced by PBA in November 2009. The 1D model includes the section of The Ching between the railway line at Winchester Road and playing fields at Morrison Avenue and the 2D domain extends to cover the same extent.

2-2 The ISIS model has been linked to a 2D TUFLOW model. As the underlying hydrology and the majority of ISIS-TULOW model are based on an existing approved EA model. This review will focus on the 2D TUFLOW model, but will also incorporate a basic check on the existing 1D model and 1D-2D linking elements of the model.

2-3 The structure of the model appears sensible and easy to understand and rerun. It would be useful to have more detailed comments within the model.

2-4 The EA have requested that the review should concentrate on the following points:

1. Is the modelling methodology used appropriate for the scale of development, plans for

development and level of flood risk to the site?

2. Is the model fit for the purposes of Flood Risk Assessment?

3. Confirm that the appropriate debris factor has been used in hazard mapping.

4. Does the model show whether the proposed development causes any increases in flood risk offsite (anywhere within the modelled area)?

3. 1D Model

3.0-1 The 1D element of the model uses the existing ISIS model developed in 2009. No changes have been made to the model for use in the FRA. A cursory check of the 1D model has been completed to ensure that it is suitable for the FRA as requested by the EA.

3.1 Boundaries

3.1-1 Model inflows are FEH boundary units and these are unchanged from the baseline models.

3.1-2 The downstream boundary conditions are also unchanged from the baseline model.

3.2 Cross section data/floodplains

3.2-1 The floodplain has been represented in the 2D model domain.

3.2-2 In places the ISIS channel appears much wider than necessary for a linked model. Best practice is that the ISIS channel width be 2x cell size (8m) and in some cases the ISIS channel width is 5x cell width. This was considered appropriate during the original review of the 2009 model and is therefore the model is considered fit for purpose for the FRA.

3.3 Structures

3.3-1 In general, the culvert inlet and outlet units are included in the representation of culverts. In some cases Bernoulli loss units have been used to model the outlet losses. This is an acceptable method of modelling losses at structures

3.3-2 A check of the head losses at the culverts in the linked section of the model is shown in Table 1 below. The losses shown for the culvert at CG.029 and CG.025 are as expected for culverts of similar lengths, 163.5m and 50m respectively. The losses at CG.043 are considered quite high for a relatively short culvert; however, the culvert passes beneath a raised road and this would suggest that the loss could be considered acceptable.

3.3-3 The losses are the same for both the baseline model and the HCT model which suggests that the development has no impact on the water levels within the channel.

Table 1 - Head losses at culverts within the study area

Culvert reference	Baseline Model		HCT Model	
	100yr	100yr20	100yr	100yr20
CG.043	1.137	1.116	1.136	1.116
CG.029	0.796	0.796	0.796	0.796
CG.025	0.235	0.239	0.235	0.239

3.4 Roughness

3.4-1 Manning's n values for the channel within the 1D ISIS model range from 0.03 to 0.07. The Manning's n values appear reasonable and it is assumed that justification of the values used was included in the original baseline model report.

4. 2D Model

4.1 2D Domain

4.1-1 The TUFLOW model extends from the railway line between Beech Hall Road and Winchester Road to the East to Walthamstow Avenue to the south and the playing fields off Morrison Avenue to the west.

4.1-2 The extents of the TUFLOW model are appropriate. An HQ boundary has been included using a 2d_bc layer file to allow flooding to continue out of the domain and prevent glass walling to the south-west of the site. An HX boundary has been used at the western boundary of the 2D domain to re-route flooding back into the 1D only model downstream of the study site.

4.2 2D model topography

4.2-1 The 2D model domain uses a 4-metre grid. The original LIDAR is 1m resolution and therefore it is appropriate to use a 4m grid. This grid size is appropriate for the level of detail required for an FRA of this type.

4.2-2 The model grid is orientated West-south-west to East-north-east. This is a little off the general direction of the watercourse; however it does match the general change in elevation within the 2D domain, and is therefore considered to be appropriate.

4.2-3 A series of topography modifications have been made to the baseline model using zpoint patches, zTIN and zshapes. A zTIN has been used to model the underpass at the junction between Walthamstow Avenue and Chingford Road. Z-point patches based on topographic survey have been used to update the LIDAR around the site. Z-shape files have been used to model additional details of the study area including gullies, walls and topographic details of the roads. The various topographic changes have been applied in a reasonable order and result in an appropriately detailed topographic model.

4.2-4 The model topography has been amended further for the FRA model. A single Z-shape file has been applied to make all the amendments required. The topographic modifications are as follows:

a. Amend the elevation of the existing wall at the southern boundary of the Car Park site to match with the smaller wall in the design. A line with an elevation of 14.3 has been used to set the levels along the boundary of the site. This has been applied appropriately and amends the levels in the potential flow path.

b. Amend the ground elevation to model the solid store, plant room and fuel tank. These have been included as polygons with a level of 15mAOD. The amendment have been made in an appropriate manner.

c. Lines and a polygon have been used to model the bus wash area. This is an acceptable way to represent the bus wash assuming that the main area is not expected to act as a flow route. For the wash area to act as a flow route it should be at least 3 cell widths and this would require a smaller grid size. To ensure thoroughness it would be advisable to snap the lines to the z-points

4.2-5 2d_fcsh files have been used to model the planned voids under the new office building at the site and obstructions within the site. The fcsh file allows the flow constriction to be modelled within the area and a virtual top to be applied to the cells within the location. The fcsh lines have been digitised along the edges of the 2d grid and The model uses a blockage of 10% for the front and rear walls and 25% for the side walls of the building. The report states that the blockages are based on a review of the office block elevation drawings; however these have not been provided with the review so cannot be checked.

4.2-6 The 2d_fcsh file also models the blockage caused by the palisade fence at the east of the site. The blockage is set at 20% which is appropriate for a fence and consistent with the value used in the Car Park site 1 FRA model.

4.2-7 The form loss co-efficient (FLC) has been set at 0.1 for both the fence and the office block. Sensitivity testing of the FLC values used in the 2d_fcsh is reported to have been undertaken showing no significant impacts; however the results were not provided and therefore cannot be checked.

4.3 1D-2D Linking and *Cross Sections*

4.3-1 No amendments have been made to the 1D-2D linking of the models for the purpose of the FRA and therefore a cursory check of the linking has been undertaken to ensure that no major

issues have been identified. As the base-model was deemed acceptable model is reasonable for the purpose of the FRA.

4.4 Roughness Coefficients

4.4-1 In the 2D domain, the floodplain has been split into a series of surface types using a 2d_mat, materials file. Most of the major buildings and open spaces have been identified in the materials layer; however in areas that have not been given a specific landuse a default value of 0.03 has been applied. In general, a logical approach has been taken and the majority of values used appear reasonable and the attached technical note states that sensitivity testing was carried out on the baseline model and no significant changes in the water levels were found.

4.4-2 For the FRA model an additional material layer has been included to model the changes in the Manning's n within the site as a result of development. The roughness has been reduced from 0.05 to 0.03 to account for the change from gravel to new hard surfaces.

5. Sensitivity Tests

5-1 The technical note that accompanies the model states that Sensitivity analysis has been undertaken on the Manning's n for the baseline model and the FLC value for the updated FRA model. The technical note states that no significant changes in water level are found following the sensitivity analysis.

6. *Model Run Parameters*

6-1 Model time steps of 2 seconds (2D) and 1 second (1D) have been specified. This follows standard good practice of setting the 2D model time step to ½ the model grid size and the 1D time step ½ the 2D time step.

6-2 In the 100YR and 100YR20 ISIS .ief file some parameters have been changed from their defaults.

- Automated Preissmann Slot for River Sections has been activated
- Maximum iteration increased to 19

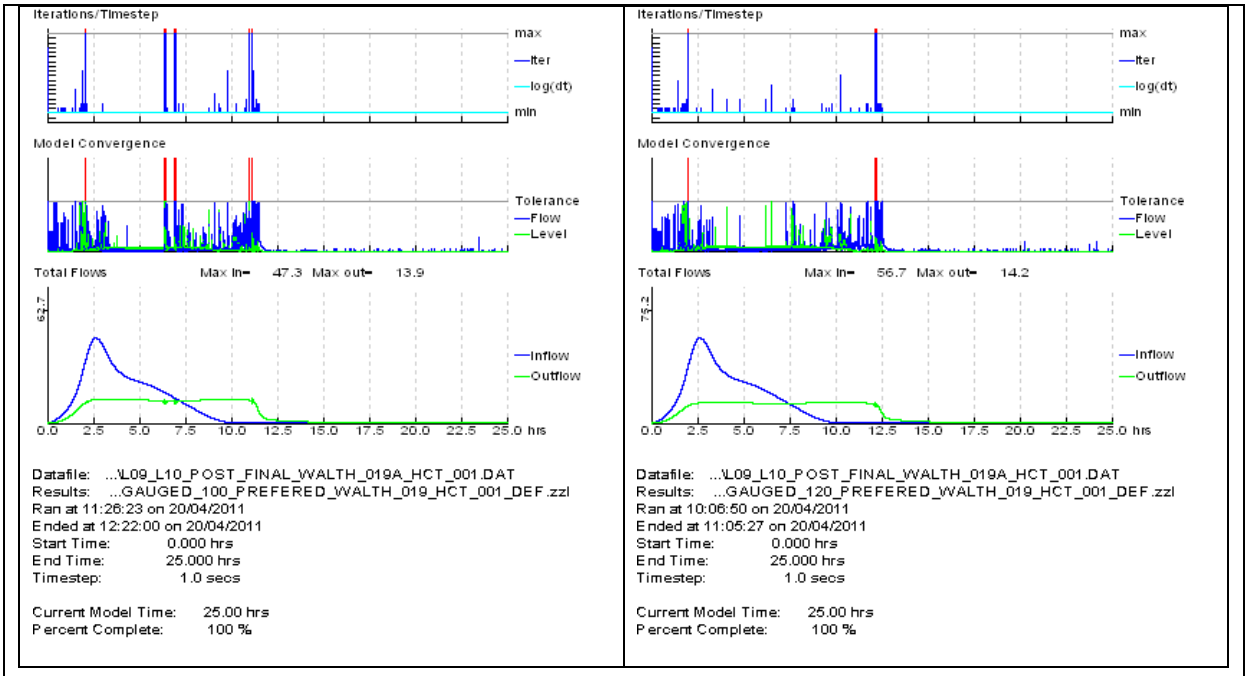
Such changes are likely to smooth out instability and make the model appear to run better; it is assumed that theses changes have been made to improve stability at the start of the model run. The changes are consistent with the baseline model and are not expected to affect the model results.

7. Model results

7-1 This section has been assessed using the 100YR and 100yr20 event results provided. The 1D model results for the 100YR run show that the model is relatively stable (Figure 1). The 100yr20 event model shows that the model is more stable during the falling limb of the flood hydrograph.

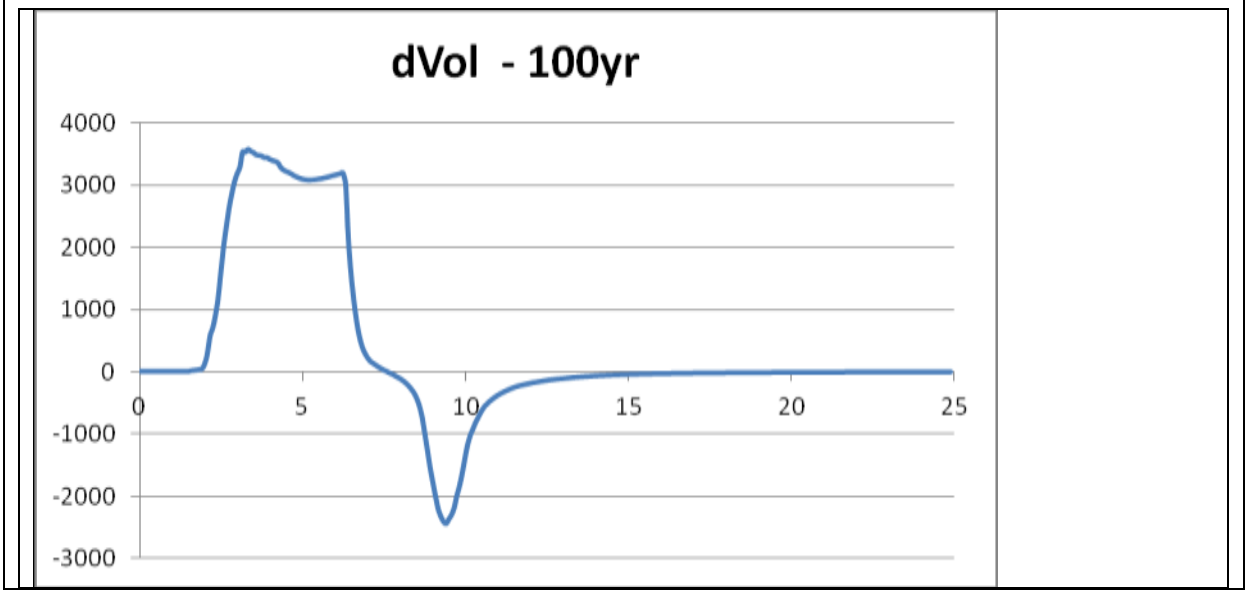
Figure 1: 1D ISIS Diagnostic Plot

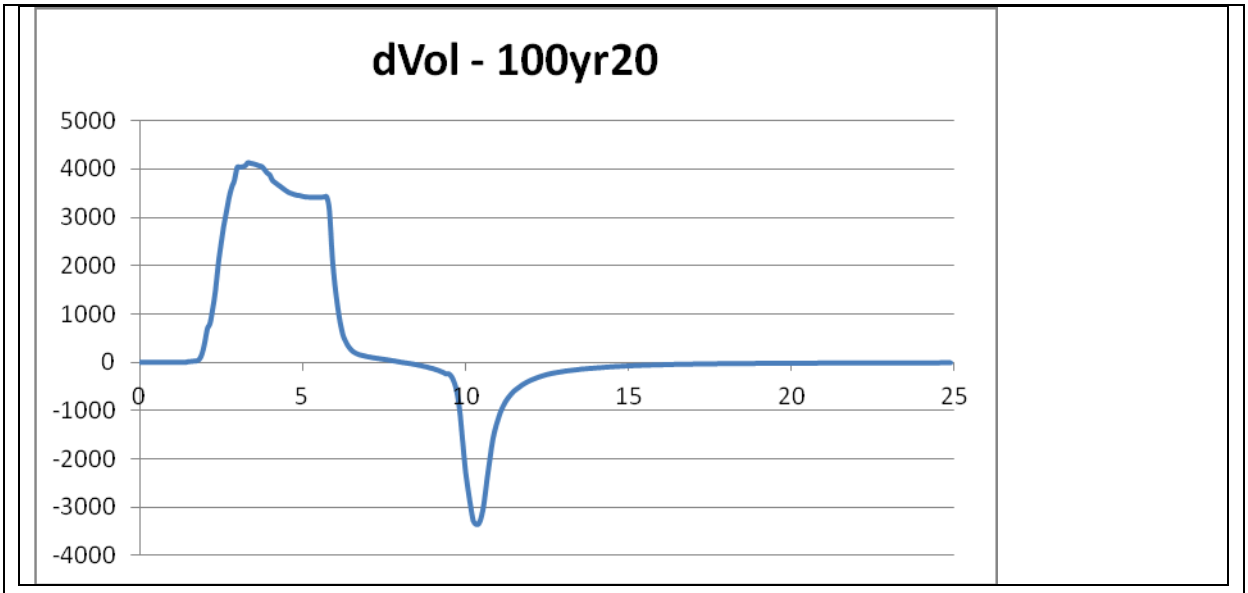
100YR	100yr20



7-2 The dVol output from TUFLOW (Figure 3) representing the change in volume in the 2D domain is a good indicator of model stability and should be a smooth transition from one timestep to the next. Figure 3 shows that there is a smooth transition throughout the model run suggesting that the model is suitably stable.

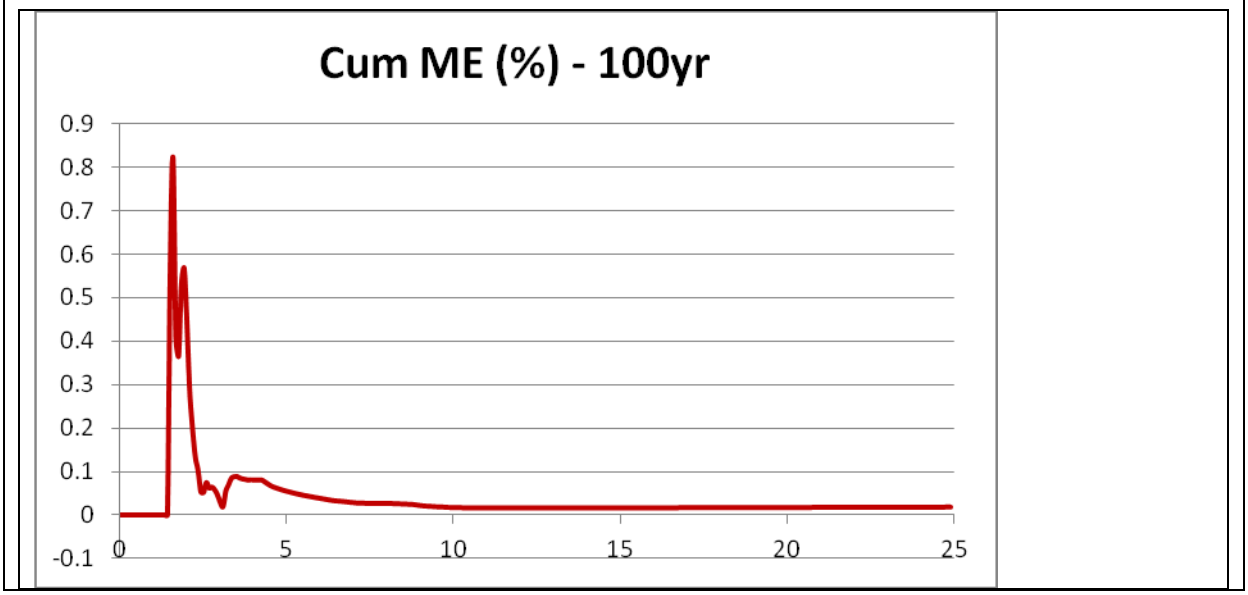
Figure 2 dVol plots for model scenarios

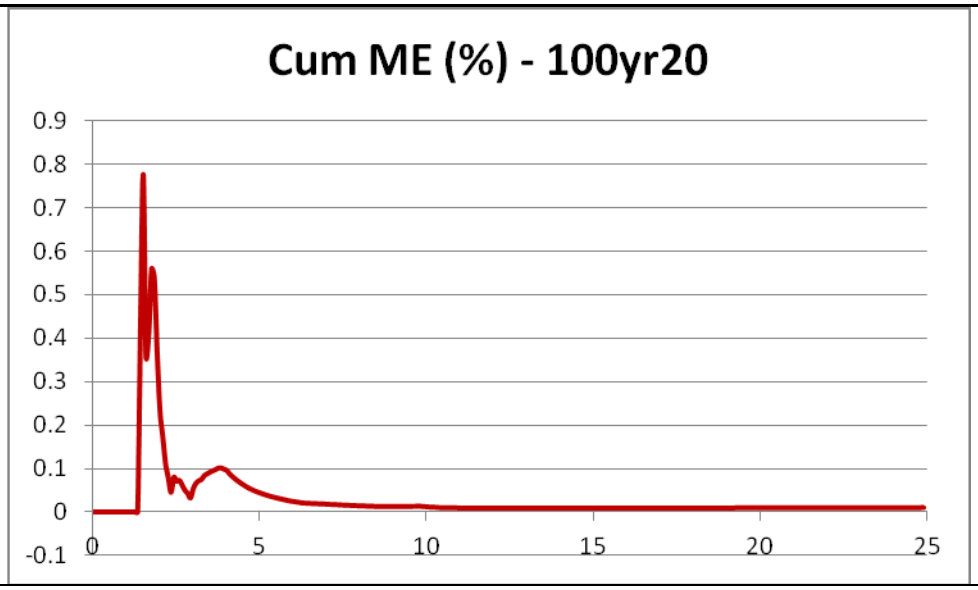




7-3 Checks have been made on the mass balance outputs for the model runs. These give a good indication of model stability and accuracy. Figure 4 show the mass balance errors (CUM ME) for the 100yr and 100yr20 event model runs. Both runs remain within the range of +/- 1%, which is normal for a healthy model.

Figure 3 Cum ME (%) plots for model scenarios





8. *Checks & Messages*

8-1 A series of checks and messages occur in the 100YR & 100YR02 events.

- "CHECK 2231 - No ZP points snapped to HX line. HX line not used to modify Zpts." (repeated twice)
- "CHECK 2099 - Ignored repeat application of boundary to 2D cell."
- "WARNING 2991 - Negative V depth at [047;129]." (repeated twice)
- "WARNING 2991 - Negative U depth at [048;127]."
- "WARNING 2991 - Negative U depth at [048;128]."
- "WARNING 2991 - Negative V depth at [052;128]."

These negative depth warnings are located away from the site and are not expected to affect results.

REVIEW ACTIONS

- No actions are required following this model review.

In response to the Environment Agency's general comments:

1. **Is the modelling methodology used appropriate for the scale of development, plans for development and level of flood risk to the site?**
   The modelling methodology is appropriate for the development, it employs the best available data and include detailed modelling of the planned site and surrounding area

2. **Is the model fit for the purposes of Flood Risk Assessment?**
   Yes, the model inculdes a detailed simulation of the planned development at the site and appropriately demonstrates no further flood risk as a result of the development.

In response to the Environment Agency's specific comments:

3. **Confirm that the appropriate debris factor has been used in hazard mapping.**
   The "UK Hazard Land Use == CONSERVATIVE" command has been used. This uses a debris factor of 1. This is appropriate for a site like this as it provides the worst case estimate of hazard.

4. **Does the model show whether the proposed development causes any increases in flood risk offsite (anywhere within the modelled area)?**
   There is a slight increase in the flood extent during for the 100yr HCT model run (shown in red) compared with the baseline extent (shown in blue) in the northern section of the model as

shown below. Further analysis of the depth grid shows that the depths between the baseline and HCT model are insignificant (<0.001m) and are within the errors of the software.

Figure 5 increased flood extent in the HCT model (100yr)