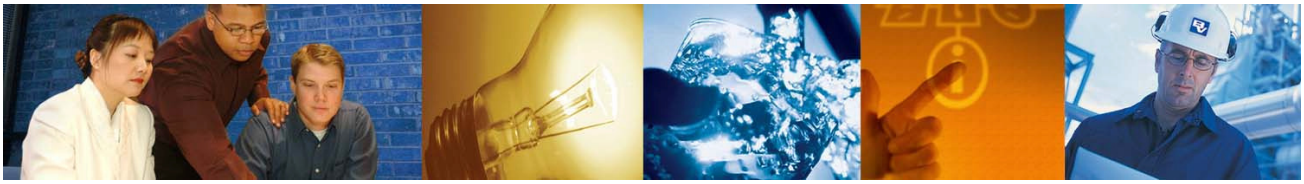
Appendix 1: Flood Risk Assessment

SPELTHORNE
BOROUGH COUNCIL



Bridge Street Car Park
Flood Risk Assessment

January 2006

BLACK & VEATCH

BRIDGE STREET CAR PARK, STAINES
FLOOD RISK ASSESSMENT

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1. INTRODUCTION

1.1 Black & Veatch Ltd have been commissioned by Spelthorne Borough Council to prepare a flood risk assessment of a site adjacent to Staines Bridge in Staines (OS grid reference TQ 503 171). The site is presently a two level car park and is situated on the left bank of the River Thames, directly next to the approach road to Staines Bridge. (Refer to Figure 1 Location Plan).

1.2 The River Thames flows from north east to south west past the site. Just downstream of the bridge lies the confluence of the River Colne which conveys flow from a catchment that extends as far north as Watford.

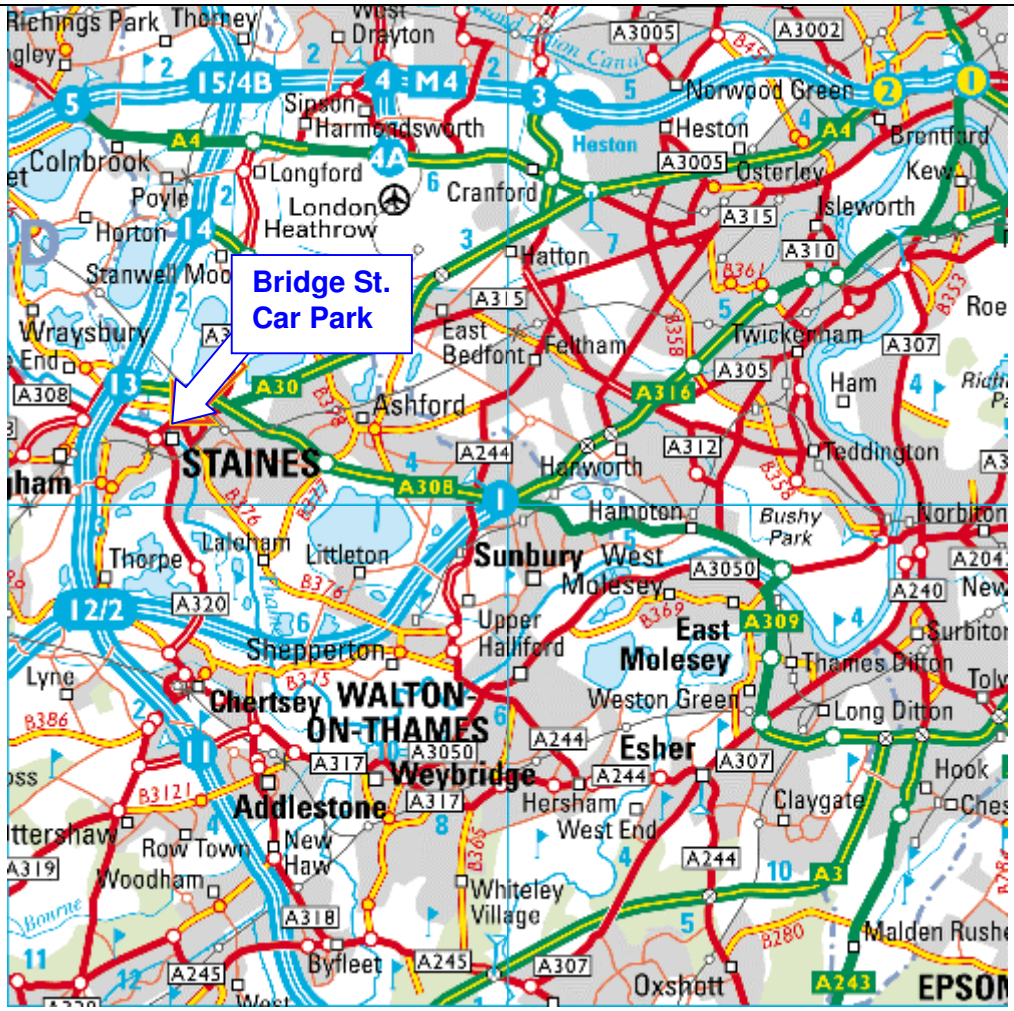

Figure 1 Location Plan of Site

2. DEVELOPMENT PROPOSAL

2.1 The development proposal is still in its early stages and consequently there are no firm building outlines to present with this report. It is Spelthorne BC's intention to examine a number of opportunities for the site but they recognise the importance of ensuring the development meets the requirements of PPG 25 and as such want to be able to agree the flood risk strategy for the site in principle before embarking on finalising their proposals.

2.2 Drg 3092/003 shows the proposed development boundary. The principle of the development is to maintain a car park at ground floor level of a construction that is broadly in line with the present open arrangement. Refer photographs below. Upper levels could be either residential, commercial, or leisure use. An existing sea cadet building is contained within the site extent and this may or may not form part of the new proposals.

Plate 1: View along Thames side path, Car Park on right. The sea cadet building can be seen at the end of the path.

Plate 2: View towards River Thames, Bridge Street on left, car park on right.

Plate 3: View through Car Park, ground floor

Plate 4: General view showing upper and lower decks

3. FLOOD RISK INFORMATION

3.1 The site is shown to lie at the edge of the Environment Agency Indicative Flood Plain (IFP) adjacent to a dry stretch of land within the flood plain. The IFP is understood to be based on flood extents from the 1947 and 1968 flood events on the River Thames and River Colne. In the most recent flood event in January 2003 river levels lapped the top of the bank and partially flooded the site.

3.2 The River Thames is the main source of flood risk to the site with a quoted 1 in 100 year flood level of 15.74 mOD. Including the 20% allowance for climate change the level increases to 16.06 mOD. *(Refer Appendix A Environment Agency Correspondence).*

3.3 The flooding pattern indicates that the River Thames overtops both left and right banks upstream of Staines Bridge. The bridge in conjunction with the elevated Bridge Street approach acts as a constriction to flood flow on the left bank creating an area of storage within which the site lies. Flood flow on the right bank is similarly constricted and also has to pass through the bridge.

3.4 The River Colne is also shown to flood parts of the central and eastern parts of Staines in a 1 in 100 year event, although the joint probability of the peak occurring at the same time as the River Thames peak would be rare. For instance, during the January 2003 event the peak flow in the River Colne occurred on 2nd January whilst the River Thames flow did not peak until the 6th January. In this event the peak flow in the River Colne was 24.4 m^3/s but had dropped to 17.4m^3/s by the time the River Thames peak occurred.

Figure 2 Environment Agency Indicative Flood Plain Map (Lower Thames Flood Risk Model)

Extent of 1 in 100 yr flood plain

4. FLOOD LEVELS

4.1 The site has been levelled with reference to a GPS Station located on the A30 road bridge over the River Colne (OS Grid Ref TQ0354 7232 – altitude 18.32 mOD), and the site levels range from 14.60 mOD adjacent to the towpath to 15.30 mOD at the rear of the car park. Bridge Close rises to a level of 15.85 mOD at the junction with Bridge Street.
(Refer Drg. 3092/001 in Appendix B Drawings)

4.2 The flood levels for the site, as obtained from the Environment Agency's Lower Thames Flood Study Model *(Refer Appendix A)*, is as follows**:**

Table 4.1 Flood Levels (EA Node 21.062.2)

Return Period (yrs)	Flood Level (mOD)
1 in 5	14.72
1 in 20	15.26
1 in 50	15.50
1 in 100	15.74
1 in 100 (+20%)	16.06

4.3 From this data it would appear that the site is inundated in a 1 in 100 year event with flooding part way across the site in a 1 in 20 yr event. The 1 in 5 yr event only floods part of the towpath and reaches the edge of the present car park building. The ground levels within the site, however, are higher than the 1 in 5 yr event flood level.
(Refer in Appendix B to Drg 3092/002)

5. SITE FLOOD ZONE CHARACTERISATION

5.1 The site has been assessed as lying within Zone 3 which is defined in PPG 25 as 'an area where the annual probability of flooding is 1.0% (i.e. a 1 in 100 chance) or greater'. PPG25 also outlines three possible categories within this zone:

a) ***Developed Areas*** - an area that may be suitable for commercial, residential and industrial development provided the appropriate minimum standard of flood defence (including suitable warning and evacuation procedures) can be maintained for the lifetime of the development
b) ***Undeveloped and sparsely developed areas*** – areas that are generally not suitable for residential, commercial and industrial use unless a particular location is essential eg navigation and water based recreation use
c) ***Functional Flood Plain*** - defined by Environment Agency Thames Region as any area within the flood plain that has a 10% annual probability (1 in 10 chance) of flooding

5.2 Previously this site was categorised as a Zone 3a as previous flood level information had indicated the car park lies outside the 1 in 10 year flood envelope. Recent modifications to the Lower Thames Flood Risk Model (LTFRM) has resulted in an increase in these predicted levels and as a result the site lies partially within Zone 3c.

6. COMPENSATORY STORAGE

6.1 It is Spelthorne BC's intention that any future proposal will at least maintain existing flood plain storage with an objective to provide more storage if at all possible. The open (undercroft) style of the car park will be preserved in any new development and it is the intention that ground levels within the undercroft will be reduced. There may also be an opportunity to relocate the adjacent Sea Cadet Building to a new location out of the flood plain. It should be noted that the Agency would normally object to undercroft style parking in the floodplain for new developments but this should not be the case here as the proposals are intended to improve the 'inherited' situation.

6.2 The present car park building occupies a volume of storage of 36.1 m^3 within the 1 in 100 year event measured from a level of 14.60mOD (the level at which the undercroft begins to flood). *(Refer table below).*

6.3 The Sea Cadet building occupies 104.9 m^3 between the same levels and as such provides a possible source of flood storage compensation on site throughout the range of flood levels.

6.4 It is the intention that the ground, which presently rises by 0.5m away from the river, will be levelled across the site to 14.60mOD. This would provide additional flood storage in the 1 in 100 yr event of up to 1,415.0 m^3.

6.5 An assessment has also been carried out in bands of 0.2m depth in order to investigate the impact on storage for rising flood levels up to the 1 in 100yr event. *(Refer Table 6.1 below).*

Table 6.1 Volumes presently occupied within floodplain

Band depths (m)	Volume presently occupied (m^3)		
	Car Park Building	Sea Cadet Building	Ground above 14.6m
14.6 – 14.8	0.7	0.0	743.0
14.8 – 15.0	2.0	3.1	492.0
15.0 – 15.2	3.2	19.0	138.0
15.2 – 15.4	7.4	27.6	30.0
15.4 – 15.6	11.4	27.6	12
15.6 – 15.8	11.4	27.6	0
Total volume	**36.1**	**104.9**	**1,415.0**

6.6 In terms of providing scope for increasing building mass at the undercroft level, e.g. increasing pier sizes, the potential is determined by the volume presently occupied by the Sea Cadet Building (Floor area 138m^2). Whilst ground lowering provides additional compensatory flood storage up to a flood level of 15.6mOD, it provides nothing in the higher band. Consequently, any increase in building mass would be limited to a cummulative floor plan area that equates to the floor area of the Sea Cadet Building.

6.7 At lower bands there is far more available compensatory storage where the volume occupied by the ground above 14.6m OD is of greater magnitude. It is unlikely though that this would be fully used by a new development on the site leading to a net gain in storage overall.

6.8 In view of this proposed approach it is considered that more than adequate compensatory storage can be provided, giving some scope for increasing building mass within the area at risk of flooding.

7. DRY ESCAPE

7.1 As explained previously the site lies at the edge of the IFP and such there is direct access to dry land and a potential escape route across Staines Bridge and then along the Causeway which also remains dry in a 1 in 100 year event. The route is shown on Drg 3092/000/0005 and has been accepted by the Environment Agency as a valid dry escape route. (Refer Appendix A)

7.2 Any future development will ensure there is dry direct access from the occupied levels of the development to Bridge Street.

7.3 It is considered that such a dry escape meets the requirements of PPG 25.

8. FLOOD WARNING

8.1 The site lies within the Flood Warning Area 'River Thames, Bell Weir Lock to Shepperton Lock'.

8.2 The Environment Agency operates on Automated Voice Messaging (AVM) system which is available to all residential and commercial properties located within the flood plain. This system will be incorporated into a Flood Management Plan for any future development and though there is unlikely to be any accommodation at ground level (except possibly the existing Sea Cadet building) it will be used to ensure any cars parked in the undercroft are moved to higher ground safely.

9. OTHER ISSUES REQUIRED TO BE ADDRESSED BY PPG 25, APPENDIX F

9.1 Existing Flood Defences

9.1.1 There are no existing flood defences on the present site. The proposed development will make use of upper level accommodation to prevent inundation of habitable areas. Whilst this approach is generally deemed by the Environment Agency to be unacceptable for new developments there is precedence with the present use of the site.

9.2 Speed of Water

9.2.1 The site is situated adjacent to the Bridge Street approach to the bridge and as such is likely to sit within a slow moving part of the flood plain flow. There is a possibility that parts of the development adjacent to the river bank may experience faster flows and consequently it would be the intention that there would not be an increase in obstructions to flow along the riverward edge of the development.

9.3 **Social, Economic and Environmental Impacts**

9.3.1 Spelthorne BC will consider the social, economic and environmental impacts at the time of any future planning application though considering the present use of the site, any impacts are unlikely to be significant. During the construction phase care will be taken to avoid unnecessary polluted run-off entering local drains and sewers.

9.4 **Assessment of hydraulics of Drains/Sewers During Floods**

9.4.1 This has not been addressed at this stage though it is likely that the foul drainage from the site will need to be in a sealed pumped system.

9.5 **Impact on fluvial morphology, long term stability and sustainability**

9.5.1 There are none.

9.6 **Residual Risk Assessment**

9.6.1 PPG 25 requires consideration of the long term effects of global warming and suggests in the Thames Valley area flows could increase by 20% for any given return period. Whilst it is not possible to be definitive due to the lack of data provided it is arguable that global warming may increase the flooding at this site. The accommodation level however is set above the 1 in 100 year flood level + 20%.

10. CONCLUSION

- The existing use of the site lies partially within the functional flood plain but is predicted to start being inundated above the 1 in 5 yr return period. The site is consequently classified as Zone 3c
- The proposed development will not reduce flood plain storage and should in fact provide more.
- Dry access is available to a dry escape route over Staines Bridge and along the Causeway. This access will be provided from the first floor level which will be set above the 1 in 100 year level.
- A Flood Management Plan should be produced that makes use of existing flood warning measures to ensure safe removal of cars from the car park during a flood event.
- A future development broadly configured to maintain the spatial characteristics of the existing site should meet the requirements of PPG 25.

I K Simpson, January 2006