

Ageas Bowl, Hampshire

Flood and Drainage Addendum

A Flood Risk Assessment (FRA) for the proposed development of the site at Ageas Bowl (planning reference number F/22/93194) was provided by Andy Clay Consulting (ACC) in August 2022.

The FRA included drainage design input from Tumu Consulting Ltd and also flood modelling input by Thomas Mackay Ltd.

The LLFA are Hampshire County Council (HCC) and provided comment on the FRA dated October 2022, requesting the provision of some additional information and clarification of certain points.

LLFA Comment 1:

“Provide a simplistic catchment plan showing which areas currently drain to the various watercourses / ditches and the proposed connection points (including discharge rates) to allow the pre and post development proposals to be assessed. This should also show the current and proposed watercourse routing.”

ACC Comment 1:

A catchment plan has been included in **Appendix A** which provides the information per character area as requested.

LLFA Comment 2:

“It is difficult to see the current ditch location and extents. Can this be highlighted better on plans along with onward connectivity.”

ACC Comment 2:

The line type used on the drainage plan has been amended as requested to make them clearer. The existing drainage plans highlighting the current ditch are provided as **Appendix B**.

The drainage through and from the site is explained in paragraphs 3.36 to 3.43 of the FRA and also with Figure 3.5 in the FRA showing the drainage features (included below as **Figure 1**) and summarised as:

- The lower section of Telegraph Brook flows within a less natural channel. It has a very shallow gradient with the channel banks formed by wooden sleepers. This drains through the eastern part of the site.
- The watercourse then drains into an upper and lower lake separated by a weir at the edge of the site.
- The upper lake is connected to the lower lake via a weir, on the eastern side of the upper lake and which is on the western side of the lower lake.
- The lower lake then drains via another lake to the south-east, with this located outside of the site extent. It then drains to another culverted section under the M27 motorway.
- This culverted section is understood to continue under the retail estate to the east of the site, eventually draining into the River Hamble.
- There is also a drainage channel further to the north, close to the northern boundary of the site. This drainage channel currently conveys water from this part of the site, passing through vegetated areas and with a number of culverted sections for providing local access.

- The drainage channel drains east and then south-east into the woodland area that is to the east of the site, before then adjoining the drainage system upstream of the culverted section under the M27 motorway.

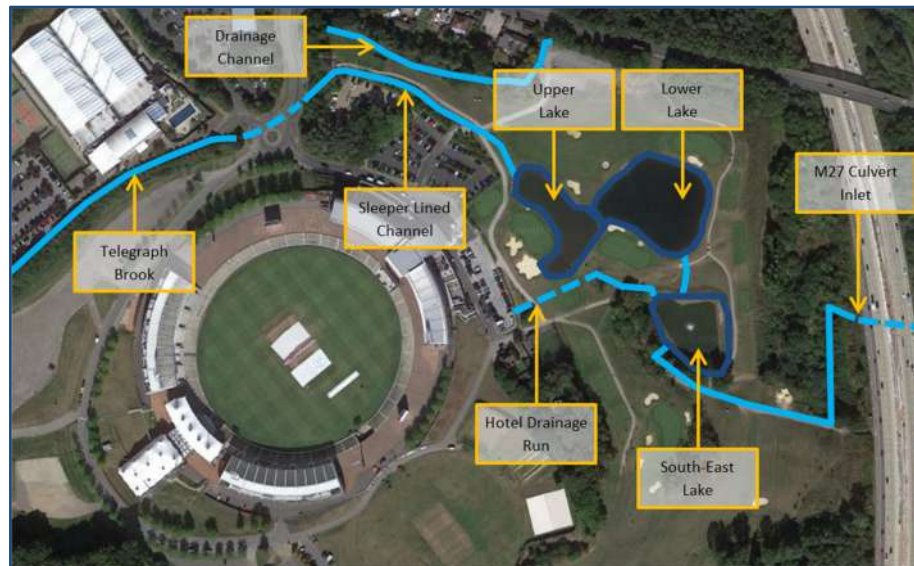


Figure 1 – Telegraph Brook lower Section and Lakes

LLFA Comment 3:

“The concept of de-culverting with 2 stage channel is supported but will require consent separately from the planning process. It is advised that a pre-app discussion is undertaken with the OWC team as this is fundamental to the planning proposals.”

ACC Comment 3:

The FRA included a summary of the baseline flood modelling study completed of the existing watercourse. It advised that the post-development flood modelling of the alterations proposed to the watercourse and lakes was not available at the time of writing. The post-development flood modelling has since been completed, and the summary note from Thomas Mackay is included as **Appendix D**.

The post-development flood modelling has provided "glass-walled" flood levels as they pass down through the site. This basically means that the channel is contained within a glass-wall (modelling terminology for a virtual barrier for flood flows) and with the flood model then run. This representation means flows are forced to be constrained to the channel without being able to spill over the banks into the floodplain.

The need for this is partly related to the lack of post-development levels of the land area adjacent to the channel at a sufficient level of detail for the flood model. The in-channel peak water elevation extracted from the modelled flood events will then be used to inform the bank top elevations that would be required along the watercourse to ensure water remains in channel for any given flood event.

The flood modelling will then show how high up the glass-wall the flood levels would get for key return period events. This approach has determined what depth the channel would need to be (or conversely, how high the channel banks would need to be) at different locations along its route to prevent bank overtopping for these key return period events.

Figure 2 below shows the node locations along the channel where flood level information has been provided by the flood model, with these flood levels for key return period events given in **Appendix D**.

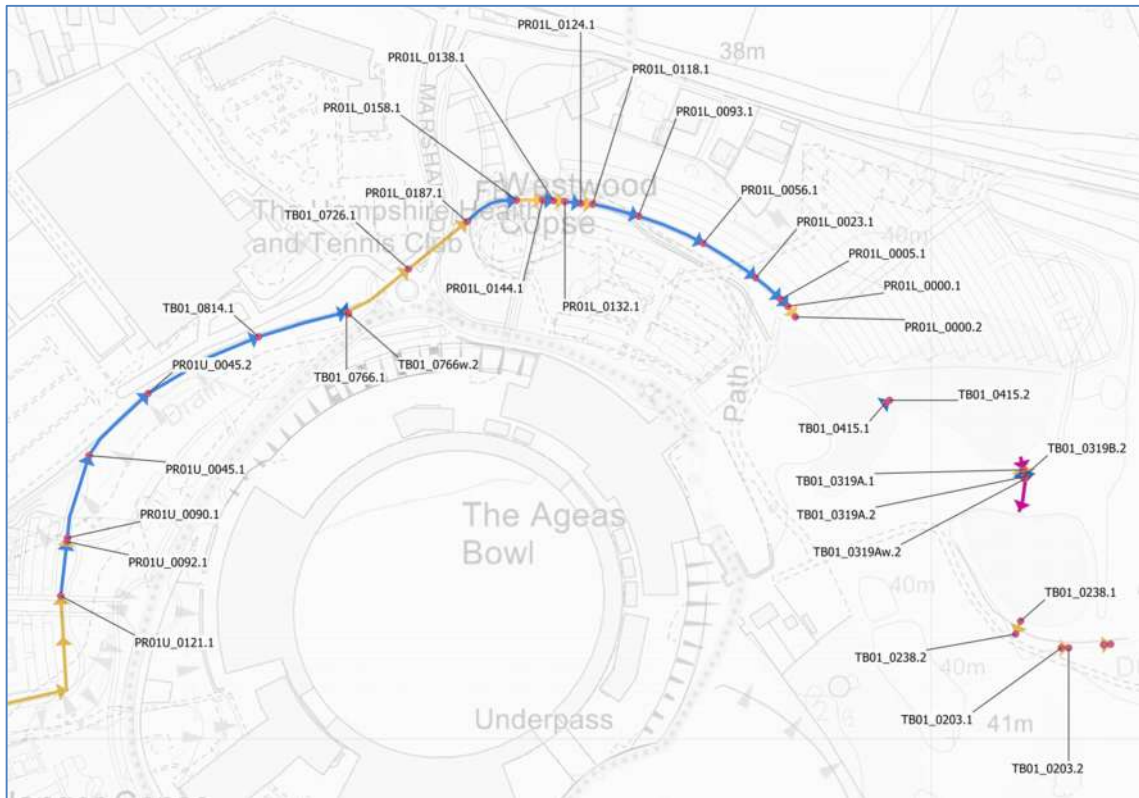


Figure 2 – Plan showing the Flood Modelling Node Locations for the Flood Levels

The baseline flood modelling included in the FRA indicated that flood water is shown to flow north-east, affecting bungalows located on Botley Road. In the 1 in 20-year event the flood water reaches across Botley Road. In the 1 in 100 and 1 in 1000-year events, the flood water reaches the western side of the M27 motorway.

This is therefore an existing flooding risk from the eastern section of Telegraph Brook, albeit assuming that the existing culvert inlet at the top of Telegraph Brook is not blocked. The FRA advised that the proposed development will aim to reduce and potentially remove this flood flow path, and therefore reduce flood risk overall.

The flood modelling node locations through the car park are between PR01L_0144.1 and PR01L_0005.1. Based on the post-development flood modelling, the required level of the channel top of bank as it passes through the car park in order to prevent channel overtopping are summarised in **Table 1**.

Although not a detailed design, the flood levels for the 1% AEP + 51% glass-walled scenario in the upper reach of Telegraph Brook as it passes through the residential area lower than the bank top elevations. In the lower reach of Telegraph Brook as it passes through the car park, the flood levels suggest that the bank top elevations would need to be elevated by approximately 0.2m to 0.3m and with an appropriate freeboard allowance to prevent channel overtopping.

This level of elevation along the bank is considered to be achievable either through ground re-profiling along the channel edge or an appropriate uplift again along the channel edge.

Model Node	2 Hour Storm Event						
	20% AEP	10% AEP	5% AEP	1% AEP	1% AEP CC 37%	1% AEP CC 51%	0.1% AEP
PR01L-0144.1	40.41	40.45	40.49	40.59	40.71	40.76	40.78
PR01L-0138.1	40.41	40.45	40.49	40.59	40.71	40.76	40.78
PR01L-0132.1	39.80	39.81	39.82	39.85	39.89	39.90	39.91
PR01L-0124.1	39.77	39.78	39.79	39.82	39.86	39.87	39.88
PR01L-0118.1	39.73	39.74	39.75	39.78	39.82	39.83	39.84
PR01L-0093.1	39.62	39.63	39.64	39.67	39.71	39.72	39.73
PR01L-0056.1	39.44	39.46	39.47	39.50	39.54	39.55	39.56
PR01L-0023.1	39.29	39.31	39.32	39.35	39.39	39.41	39.42
PR01L-0005.1	39.23	39.24	39.25	39.29	39.32	39.34	39.34

Table 1 – Summary of the Flood Levels at the Flood Modelling Node Locations**LLFA Comment 4:**

“There are concerns regarding small orifice sizes. Can these be changed to vortex systems to give larger aperture and lower maintenance burden. Diameters should be in excess of 50mm where possible to minimise blockage risk.”

ACC Comment 4:

We would be able to amend the areas of permeable pavement to have 50mm orifices at the outfall. However, we would not want to propose vortex systems at every outfall. The drainage strategy drains towards the de-culverted watercourse and ponds, which would also control the flow leaving the site by increasing interception from additional grassed and planted areas.

LLFA Comment 5:

“The water quality assessment not quite right as the worst case indices should be used and the access roads don’t seem to be taken into account. Given the presence of the ponds, this should address the majority of areas but more detail is needed on those elements going into the northern ditch which is not thought to connect to the ponds.”

ACC Comment 5:

There are a number of different flow paths passing through the site, and it would be difficult to complete a water quality assessment for each and every one of them. A generic assessment of water quality across the site was therefore provided in the FRA (Tables 6.2 and 6.3).

Table 6.2 assessed the pollution hazard indices and included residential roofs and individual property driveways (the description for this in the SuDS Manual also references low traffic roads). However, the LLFA have since requested for the access road to be included in the assessment.

In response, we have provided separate assessments of the pollution hazard indices for the two main areas of the site – the residential area to the west (Table 2a) and the car parking area to the east (Table 2b).

Land Use	Total Suspended Solids	Metals	Hydro-carbons
Residential Roofs	0.20	0.20	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	0.50	0.40	0.40
Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways	0.70	0.60	0.70
TOTAL	1.40	1.20	1.15

Table 2a – Pollution Hazard Indices for Residential Area (SuDS Manual)

Land Use	Total Suspended Solids	Metals	Hydro-carbons
Other Roofs	0.30	0.20	0.05
Commercial yard and delivery areas, non-residential car parking with frequent change, all roads except low traffic roads and trunk roads/motorways	0.70	0.60	0.70
TOTAL	1.00	0.80	0.75

Table 2a – Pollution Hazard Indices for Car Park Area (SuDS Manual)

In terms of the SuDS mitigation indices, the FRA made reference to the benefits from the permeable pavements and ponds. However, if we also provide separate assessments of the SuDS mitigation indices for the two main areas of the site then this would consider also the detention basins. We also suggest that the deculverted channel and drainage channel to the east should be considered and assessed as a swale. These are vegetated and low flow channels which are contained and which water within the site flows through. These would be managed as part of the SuDS Maintenance and Management Strategy.

Mitigation Measure	Total Suspended Solids	Metals	Hydro-carbons
Permeable Pavement	0.70	0.60	0.70
Detention Basin	0.25 *	0.25 *	0.30 *
Swale	0.25 *	0.30 *	0.30 *
Pond	0.35 *	0.35 *	0.25 *
TOTAL	1.55	1.50	1.55

Table 3a – SuDS Mitigation Indices for Residential Area (SuDS Manual)

Mitigation Measure	Total Suspended Solids	Metals	Hydro-carbons
Permeable Pavement	0.70	0.60	0.70
Swale	0.25 *	0.30 *	0.30 *
TOTAL	0.95	0.80	1.00

Table 3b – SuDS Mitigation Indices for Car Park Area (SuDS Manual)

As advised in the FRA, a factor of 0.5 has been applied to the SuDS mitigation values typically associated with certain features to account for the reduced performance of secondary or tertiary components associated with the already reduced inflow concentrations, as advised in the CIRIA SuDS Manual. This has been indicated in Tables 3a and 3b through the use of an asterisk (*).

The goal of the assessment is for the pollution hazard values (in Tables 2a and 2b) to be higher than the SuDS mitigation values (in Tables 3a and 3b) for all three of the assessed water quality parameters.

The assessment as above demonstrates that there is sufficient SuDS mitigation provided for the potential polluting effects (total suspended solids, metals and hydrocarbons) from the residential areas, and also that more than three levels of water quality treatment have been provided.

For the car park area, there is a sufficient level of SuDS mitigation for metals and hydrocarbons but there is slightly less than the required level for hydrocarbons, and also that less than three levels of treatment have been provided.

The water from the car park drains towards the drainage channel to the east. It is therefore suggested that an additional level of mitigation is included, in the form of an aco-interceptor (or similar) at the outfalls. These would be managed as part of the SuDS Maintenance and Management Strategy.

LLFA Comment 6:

“Not all surface water passes through a permeable paving element so these would require an alternative treatment feature. It is not clear whether there are 3 naturalised treatment forms proposed which is required by Eastleigh Borough Councils Local Plan policy.”

ACC Comment 6:

As indicated by the LLFA response, there are a number of different flow paths passing through the site. The drainage strategy includes a large amount of permeable pavement, and it also includes other features that were not included in the water quality assessment. These have been brought into separate assessments of the residential and car park areas, as summarised in the response as above.

LLFA Comment 7:

“Given the flooding downstream and the flow routes identified within the site, this needs to be marked onto the site layout to ensure no properties or critical access routes are within at risk areas.”

ACC Comment 7:

The FRA included the baseline flood modelling study that had been completed of the existing watercourse, and advised that the post-development flood modelling of the alterations proposed to the

watercourse and lakes was not available at the time of writing. The post-development flood modelling has since been completed, and the summary note from Thomas Mackay is included as **Appendix D**.

As described earlier, this provided "glass-walled" flood levels as they pass down through the site. This approach has determined what depth the channel would need to be (or conversely, how high the channel banks would need to be) at different locations along its route to prevent bank overtopping.

LLFA Comment 8:

"The source control calculations show one ½ drain time in excess of 1440mins at 1:100. This needs to be reviewed however if the 1:30 + climate change calculations are sufficient, this can be reviewed at a later date. The climate change values have changed recently and the calculations should be updated to take these into account."

ACC Comment 8:

We have re-run the drainage calculations for the 1 in 30 year plus climate change event, with these included as **Appendix C**. This confirmed that there would be no flooding during these events.

LLFA Comment 9:

"Please confirm which areas include urban creep allowances and what percentage has been used."

ACC Comment 9:

It is confirmed that a 10% allowance for urban creep was applied to the residential areas. It was assumed that roads and other roof types are fixed in their extent (i.e. there would be no urban creep).

ACC Summary:

Responses have been provided to each of the points raised by the LLFA, with the necessary additional information and clarification. Since submission of the FRA, the post-development flood modelling has been progressed and included within this note. The drainage strategy will be subject to further refinement at detailed design stage.

Appendix A

Drainage Catchment Areas

Appendix B

Existing Drainage Plan

Appendix C

Drainage Calculations with Climate Change

Appendix D

Flood Modelling Report