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Flood Risk Assessment and Drainage Strategy – Revision A – Vol. 2 of 8

APPENDIX G

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1D 2D Hydraulic Modelling Report – Revision A

FLOUR MILL, ASHFORD
1D 2D Hydraulic Modelling Report

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Date: December 2021

FLOUR MILL, ASHFORD
1D 2D Hydraulic Modelling Report – Revision A

FLOUR MILL, ASHFORD
1D 2D Hydraulic Modelling Report
Revision A

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Revision and Date	Amendment Details	Revision Prepared By	Revision Approved By
Rev A 22.04.2022	Amended post submission to overcome EA 'Flood Risk' objection.	JJ	GS

1.0 INTRODUCTION

Brief

1.1 Create Consulting Engineers Ltd have been instructed by Mulberry Tree Holdings Ltd to undertake a flood modelling exercise for their Site located at Flour Mill, Ashford, TN24 8PA. The Site is located at Ordnance Survey Grid Reference 601540E, 142783N and comprises existing buildings associated with the disused Pledges Flour Mill and is subdivided by the Great and East Stour as shown in Figure 1.1 at the rear of the report.

1.2 The client proposes to redevelop the existing Site with 53 residential dwellings and associated access and infrastructure. After conversations with the Environment Agency (EA) it was confirmed that hydraulic modelling would be required as this scheme was seen as a 'more vulnerable' development. This report summarises that modelling exercise.

1.3 A modelling brief was submitted to the EA on the 7th May 2021 and on the 3rd June it was confirmed by them that this was acceptable. The modelling brief has been used to steer the modelling work undertaken.

Site Location

1.4 The Site is located in central Ashford, Kent approximately 0.5km from Ashford International train station. The site is located at ordnance Survey grid reference 601540E, 142783N. The Site lies within the administrative area of Ashford Borough Council (ABC). The Site comprises approximately 0.3 ha of brownfield land, and the Great and East stour subdividing the site. The site is bound by Mace Lane to the East and East hill to the Northwest.

Description of Site and Surroundings

1.5 The Site is irregularly shaped and is covered mainly by existing disused buildings, car parking and associated infrastructure.

1.6 The Topographic Survey, included with this report on Drawing B20061/1 – 2, summarises elevations in the area of the Site. The Site generally falls to the South. Levels generally fall from 35.6 mAOD to 34.5 mAOD with a few slightly higher sections (38.2 mAOD) on the Eastern extent of the site.

Finished Floor Levels

1.7 The ground floor of the proposed buildings will be set at 35.80 mAOD which is generally close to the existing level of the Site (as shown on Drawing 120 Proposed Section A). The floor level of Block A and Block B will be retained as the existing Block A level (36.04 mAOD).

1.8 All accommodation will be provided on the first floor and above. The lowest first floor level on Site is set at 38.83 m AOD, which means that the first-floor level will be 2.51 m above the 1 in 100 plus 45% climate change event.

Project Context

1.9 After consultation with the EA it was confirmed that hydraulic modelling would be required as this scheme was seen as a major 'more vulnerable' development and to assess the impact of any flood compensatory requirements.

Aims and Objectives

1.10 The aim of the exercise is as follows:

- To undertake a modelling exercise using the latest modelling standards and available information, where possible, to assess the impact of new development proposals at the Site to ensure the occupiers are safe from flooding and that the development does not increase flood risk elsewhere.

1.11 To achieve the aim of this exercise the following objectives were undertaken:

- Update the existing EA model to the latest versions of TUFLOW and Flood Modeller and adjust the model accordingly.
- Retain as many of the original modelling parameters to allow for calibration with the previous results to increase confidence in the modelling. This includes:
  - Manning's 'n' roughness coefficients
  - Hydrology
  - Any structures (bridges/culverts etc.)
  - The original grid cells size (10.0 m)
  - Topography
- Rerun the model with the latest development proposals and any flood compensation requirements.
- Run the model for the following return periods: 1 in 20 year and 1 in 100 year with 45% climate change (design flood event).

Constraints and Limitations

1.12

1.13 Create Consulting Engineers Ltd accepts no responsibility whatsoever to other parties to whom this report, or any part thereof, is made known. Any such other parties rely upon the report at their own risk.

1.14 The 1D 2D Hydraulic Modelling Report addresses the fluvial flood risk posed to the proposed development, the extent of which is shown by the Site boundary, as indicated by Figure 1.1. The model used within this assessment is the Environment Agency Thames Updated South Ashford 2D Modelling Study (Mott Mcdonald 2010/2012 and Environment Agency Thames Updated South Ashford 2D Modelling Study – Climate Change Updates (JBA, 2016/2017). Which has been provided under the Environment Agency's Conditional License. It is assumed that the information provided within the original EA model is reflective of the conditions within the catchment and is fit for purpose.

1.15 This report has been undertaken with the assumption that the Site will be developed in accordance with the above proposals without significant change. The conclusions resulting from this study are not necessarily indicative of future conditions or operating practices at, or adjacent to, the Site.

1.16 Create Consulting Engineers Ltd has endeavoured to assess all information provided to them during this appraisal. The report summarises information from a number of external sources and cannot offer any guarantees or warranties for the completeness or accuracy or information relied upon. Information from third parties has not been verified by Create Consulting Engineers Ltd unless otherwise stated in this report.

2.0 SOURCES OF INFORMATION

2.1 The information contained in this report is based on a review of existing information and consultation with interested parties, where applicable.

Records Review

2.2 Key reports and websites reviewed as part of this study are listed in Table 2.1 below.

Document/Website	Publisher	Date
Architect layout plans	Hollaway	November 2021
Existing Site Layout (Topographic Survey) Drawing: B20061_Flour_01-Sheet_01/02	RL Surveys	May, 2015
TUFLOW User Manual (Build 2018-03-AD)	TUFLOW	2018
TUFLOW Wiki	TUFLOW	December 2021
Flood Modeller Manual (Build v5.0)	Flood Modeller	Accessed December 2021
Environment Agency Thames Updated South Ashford 2D Modelling Study	Mott Macdonald	2010/2012
Environment Agency Thames Updated South Ashford 2D Modelling Study – Climate Change Updates	JBA	2016/2017
Environment Agency - 1m DTM LiDAR	EA	Accessed December 2021
Aerial Imagery (177707-1_RGB)	Bluesky	December 2021

Table 2.1: Records Reviewed

Consultation

2.3 The agencies and individuals consulted as part of this exercise to obtain records or seek input to the proposals as part of this surface water modelling exercise are listed in Table 2.2 and key records are included in the appendices.

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
Customers and Engagement Team, Environment Agency.	Email request for Products 4-7 (model report, outputs, and inputs).	A request for Products 5-7 (model report, outputs, and inputs) was submitted on the 12th September 2020 and a response with the requested data was received via hard drive in October 2020.
	Email	A request for modelling scope approval was submitted on 7th May 2021 and was approved on the 3rd June 2021 (Appendix A).
Environment Agency Jenny Wilson, East Kent Planning Specialist Mike Wilkinson and Dave Rich, PSO – Planning & Permitting	Pre Application Meeting	A meeting was held on 14th April 2021 to discuss the development proposals at the Site. A few key points from the meeting are summarised as follows: • The EA confirmed they were happy with the idea of lowering the East Stour River Path. • The key Finished Floor Level (FFL) requirements is to raise living accommodation 600 mm above the design flood event. • Due to the type of development proposals on Site a level-for-level basis would likely not be achievable and therefore over compensation at lower levels would be acceptable. • Safe access should be considered, but the EA confirmed if this could not be achieved, as there was no residential accommodation on the ground floor, it was unlikely to be a reason for objection. Meeting minutes have been included within Appendix B.
Environment Agency Jenny Wilson, East Kent Planning Specialist Dave Rich and Linda Winberg, PSO – Planning & Permitting		An objection notice (dated 12th January 2022) was received from the EA which objected in principle to the development due to the presence of Flood Zone 3b (1 in 20 year event) on Site. During a meeting held on 22nd February 2022 to discuss this further it was agreed that the objection would be removed if the 1 in 20 year extent could be moved away from the development areas on the Site by both raising the development above the 1 in 20 year event flood level and lowering the river corridor further to provide adequate flood compensation (including for the 1 in 100 year plus climate change event). It was agreed during the meeting and further correspondence that whilst Block A will still remain within the 1 in 20 year extent that this would be acceptable as it's being retained as existing.

Consultee	Form of Consultation	Topics Discussed and Actions Agreed
		During additional correspondence with the EA an issue was raised that the 2D results for the 1 in 20 year event the model was showing unintuitive results. With this in mind the EA were asked on the 21st March 2022: "Providing we can demonstrate that the buildings will remain dry during the 1 in 20 year event, either because they are higher than the 1D flood level or because they are protected by defences/river walls, and that sufficient flood compensatory storage is available during the 1 in 100 year + climate change event, can you confirm that you are would be happy with this approach?" A response dated 22nd March confirmed that the EA were happy with this approach. See Appendix B for correspondence.

Table 2.2: List of Parties Consulted

Site Walkover

2.4 A site walkover was undertaken by Create Consulting Engineers Ltd on the 10th March 2021. A visual examination of the Site as well as an assessment its hydrological context within the surrounding area were carried out.

3.0 HYDRAULIC MODELLING

Existing EA Hydraulic Modelling

3.1 The EA strategic model for the region is the 'Updated South Ashford 2D Modelling Study' undertaken by Mott Mcdonald in 2010. The model is a 1D/2D model (ISIS/TUFLOW). This was then updated in 2012 and then again updated in 2016/2017 to consider updated EA climate change allowances (35%, 45%, and 105%) by JBA. The 2012 EA strategic model was originally run using ISIS version 3.5.1 and TUFLOW version 2011-09-AF-w32. The software used was updated to ISIS versions 3.7.2 and TUFLOW version 2013-12-AE for the new climate change allowance runs in 2016/2017. The model extent is shown in Figure 3.1.

Modelling Methodology

3.2 To ensure the new development is safe from flooding it was agreed with the EA that a modelling exercise would be undertaken utilising the existing South Ashford 2D Modelling Study whilst updating it to the latest software versions and to assess the impact of the development proposals.

3.3 The following sections step through the methodology undertaken to achieve this task.

Model Version

3.4 The model version for TUFLOW and Flood Modeller was updated from TUFLOW version 2006-06-BF and ISIS version 2.5 to the latest versions of each software; 2020-10-AB and Flood Modeller 5.0.

Timestep

3.5 The timestep remains unchanged from the original model runs which is 1 second for the 1D elements and 2 seconds for the 2D elements.

Manning's 'n' Roughness

3.6 The original model Manning's 'n' roughness coefficients were still seen as being appropriate when considered against the current site conditions and modern modelling approaches.

3.7 The existing building was reflected within the Material files within shapefile '2d_mat_BUILDINGS4_TR0042'. This was adjusted to suit the new layout of the building within the developed case runs.

Grid Size

3.8 The original grid cell size (i.e. 10.0 m) was still seen as being appropriate for this modelling exercise as well as aiding the process of calibration with the previous results.

Hydrology and Climate Change

3.9 The hydrology from the original model was still seen as being applicable and therefore, was reused for all modelled events.

3.10 The existing modelling exercise was updated in 2016/2017 to include the pre July 2021 climate change allowances for the South East which were 35% (Central) 45% (Higher Central) and 105% (Upper End).

3.11 The revised July 2021 climate change allowances splits up each river basin district into smaller catchments and now requires the 'Central' allowance to be applied for 'More Vulnerable' developments instead. Given the revised climate change allowance within the 'Stour Management Catchment' for the 2080's is 38% (Central) the 45% pre July 2021 (Higher Central) climate change allowance has been used within the modelling exercise as a worst case.

1D Network and Structures

3.12 For the existing case runs the 1D river cross sections and structures (bridges/culverts etc.) have been retained from the original model. There have been no adjustments to the original parameters.

3.13 For the developed case runs the western bank of the East Stour within the 1D nodes (AE_04 and AE_04d) were lowered by 1.3 m to tie into the lowered river corridor.

Topography

3.14 Given the resolution of the model (10.0 m grid) it was deemed that the original model topography still provided a good reflection of the actual ground levels at the Site, so this was retained unaltered.

Defences

3.15 The defended runs have been used as a basis for this assessment, as opposed to the undefended version, as being a more realistic representation of the actual situation.

Development and Floodplain Compensation Requirements

3.16 The development scenario includes Block C and D and associated car parking area set at a level of 35.80 mAOD (using a zsh file), Blocks A and B retained as the same as existing, and the subsequently required flood compensation requirements for Flood Zone 3a (1 in 100 year plus 45% climate change event).

3.17 The total volume that will be lost from the floodplain as a result of the development has been calculated as 312.0 m^3.

3.18 To compensate for this loss of floodplain storage an area adjacent to the East Stour will be lowered and will form part of a new landscaped river corridor. This has been accounted for in the model by a zsh file that partially lowers ground levels within the 2D and also within the lowered bank sides within the 1D. The area will step down from the existing ground level to 1.3 m lower than existing and will integrate back into the existing riverbank. Two areas (either side of the existing combined sewer manhole) totalling 550.0 m^2 will be lowered by on average 0.6 m. equates to a total of 330.0 m^3 of additional floodplain storage provided, which provides full compensation for the area that has been lost plus a net gain of 18.0 m^3 of flood storage provided to provide betterment downstream.

3.19 This is considered a conservative evaluation of the storage requirements that should be provided given this is for the 1 in 100 plus 45% climate change event and the design flood event is the 1 in 100 plus 38% climate change event.

Sensitivity

3.20 Sensitivity testing was carried out on the Reduced Model. This included the increase in flow percentage (in the form of climate change allowances) and +/- 20% Manning's 'n' coefficient.

3.21 The results of this sensitivity testing are discussed in Section 4.0.

Calibration

3.22 The flood levels were compared against the original EA modelling results for the 1 in 100 Year plus 45% climate change event– see Section 4.0.

4.0 SUMMARY OF RESULTS

4.1 The model was run for the following return periods;

- 1 in 20 Year
- 1 in 100 Year (plus an allowance for 45% climate change – Design Flood Event, used as a proxy for the 38% event as detailed above)

4.2 The 1D flood levels from the flood modelling exercise for each modelled return period are shown below in Table 4.1 for the existing scenario and in Table 4.2 for the developed case scenario. 1D Nodes AG_03 – AG_05 (East Stour) and AG_09 and AG_11 (Great Stour) were selected due to their close proximity to the Site, on both adjacent watercourses, and these in channel nodes are shown on Figure 4.1.

1D Node	Flood Levels (m AOD)	
	1 in 20 Year	1 in 100 Year (+45%CC)
AG_03 (East Stour)	35.51	36.26
AG_04 (East Stour)	35.55	36.32
AG_05 (East Stour)	35.57	36.32
AG_09 (Great Stour)	35.42	36.03
AG_11 (Great Stour)	36.15	36.33

Table 4.1. 1D in Channel Flood Levels for the Existing Scenario for five nodes in proximity to the Site

1D Node	Flood Levels (m AOD)	
	1 in 20 Year	1 in 100 Year (+45%CC)
AG_03 (East Stour)	35.34	35.90
AG_04 (East Stour)	35.39	35.94
AG_05 (East Stour)	35.42	35.98
AG_09 (Great Stour)	35.42	36.03
AG_11 (Great Stour)	35.97	36.31

Table 4.2. 1D in Channel Flood Levels for the Developed Scenario for five nodes in proximity to the Site

4.3 When comparing the existing and proposed 1D in channel flood levels shown above the proposed results are equal or lower (0 – 180 mm) for the 1 in 20 year event and (0 – 380 mm) for the 1 in 100 year event plus 45% climate change event. It can therefore be concluded that the addition of the development proposals does not increase the risk of flooding at the Site and surrounding area.

4.4 When reviewing the 1 in 20 year flood extents it was apparent that for the western watercourse (the Great Stour) flooding occurred within the 2D even though when inspecting the 1D network and levels it is evident that flooding does not get out of bank. It was also

evident that flooding in this part of the Site was not from the easternmost watercourse either (the East Stour) as flood levels are between 300 to 600 mm lower within this channel (Table 4.2).

4.5 This was tested by raising the buildings significantly higher than the 1D flood levels, however flooding was still being shown in the 2D.

4.6 As a result the 2D flood map for the 1 in 20 year event has been omitted from this report and the 1D levels used to assess the extent of the 1 in 20 year event as the 2D results are unrealistic. It is assumed that this is due to an instability within the modelling in this area potentially due to the two in connecting watercourses. This approach was agreed with the EA (see Appendix B)

4.7 When reviewing levels on the Site it is evident that the water does not get out of bank for both the East and Great Stour for the 1 in 20 year event with the flood mitigation measures incorporated within the developed case scenario. As a result, it can be concluded that the Site post development remains dry within the 1 in 20 year event thus out of the Flood Zone 3b extent.

4.8 The 2D flood extents for the 1 in 100 year plus 45% climate change event of the modelled return periods are shown in Figures 4.2 to 4.5.

4.9 When comparing the existing case and developed case extents for the 1 in 100 year event the results are very similar, with slight differences shown in the western part of the Site and to the south of the Site.

4.10 Flood levels from the 2D flood plain for a series of nodes (labelled in the same manner as the EA's Product 4) are detailed in Table's 4.3 below, for the 1 in 100 year plus 45% climate change event.

Flood Node	X	Y	Existing Case Flood Level (mAOD)	Developed Case Flood Level (mAOD)	Difference (m)
1	601533	142818	No Flood	No Flood	n/a
6	601548	142807	36.13	36.13	0.00
8	601535	142766	36.28	36.28	0.00
10	601547	142749	36.27	36.27	0.00
11	601524	142740	36.30	36.30	0.00
14	601528	142705	36.31	36.32	0.01
18	601569	142795	36.19	36.19	0.00

Table 4.3. 2D Floodplain Flood Levels for the Developed Scenario across the Site for the 1 in 100 year plus 45% climate change flood event

4.11 When comparing the existing and proposed 2D floodplain flood levels shown above the results again are very similar, with any difference within 1 mm. It can therefore be concluded that the addition of the development proposals does not increase the risk of flooding at the Site across the floodplain, as a result of added floodplain compensatory storage (as detailed below).

4.12 Based on the ground floor Finished Floor Level (FFL) of blocks C and D (35.80 mAOD) and Node 11, as the worst case flood level for this event within the central development area, flood depths for the 1 in 100 year plus 45% climate change event could be up to 520 mm. For Blocks A and B the ground floor FFL's are 36.04 mAOD flood depths for the 1 in 100 year plus 45% climate change event could be up to 280 mm.

Downstream Impact

4.13 The existing and proposed water level 2D outputs were compared for the 1 in 100 year plus 45% climate change event to assess the impact of the development proposals upstream and downstream. The results are shown in Figure 4.6.

4.14 The results show that there is no impact downstream as a result of the development.

Sensitivity Testing

4.15 In order to test the sensitivity of the model against key hydraulic parameters, simulations were undertaken using the design 1 in 100 year plus 45% climate change event. The hydraulic parameters to be assessed, as agreed with the EA included:

- Mannings 'n' roughness coefficients;
- Increase in flow (climate change allowances); and

Manning's 'n' roughness coefficients

4.16 Two sensitivity tests were undertaken with a 20% increase and 20% decrease in 2D floodplain Mannings 'n' values. The 2D results are shown in Table 4.5. A 20% decrease led to a flood level equal or higher (between 0-10 mm) whilst a increase in the Mannings 'n' value resulted in ain flood level either equal or lower (between 0-10 mm). The results suggests that the changes in the Manning's n' values do not have a significant impact on the results for this modelling exercise.

Node	Flood Levels (m AOD)		
	Developed Case 1 in 100 + 45% cc	Plus 20% Manning's 'n'	Minus 20% Manning's 'n'
1	No Flood	No Flood	No Flood
6	36.13	36.13	36.12
8	36.28	36.29	36.27
10	36.27	36.28	36.27
11	36.30	36.31	36.29
14	36.32	36.33	36.32
18	36.19	36.20	36.18

Table 4.5. 2D Flood Levels for Manning's 'n' Sensitivity Test

Increase in Flow

4.17 An additional climate change run was undertaken as a part of this exercise which increased the 1 in 100 Year event flows by 105%. As expected, the flood levels increased within the 8 2D nodes across the Site by approximately 410 – 530 mm. First Floor Levels remain at least 2.09 m above this level.

Calibration

4.18 The original EA model results were compared against the existing case runs for both the 1 in 20 year event and the 1 in 100 plus 45% climate change events and the differences between the 2D results are summarised in Table 4.3. The results show differences between 0-40 mm for the 1 in 20 year event, and differences between 10-20 mm for the 1 in 100 plus 45% climate change event which are not deemed to be significant.

4.19 There have been no significant changes made to the model other than updating to the model versions, and therefore it is likely the improvement between model versions is the cause of the slight difference in results. The 1 in 20 year output has the greater differences and is dated 2012, whereas the 1 in 100 plus 45% climate change event is dated 2017.

Node	Flood Levels (m AOD)					
	Original 1 in 20 Year	Reduced 1 in 20 Year	Difference in Level	Original 1 in 100 Year	Reduced 1 in 100 Year	Difference in Level
1	No Flood	No Flood	n/a	No Flood	No Flood	n/a
6	35.75	35.71	-0.04	36.15	36.13	-0.02
8	No Flood	No Flood	n/a	36.30	36.29	-0.01
10	35.52	35.51	0.00	36.28	36.27	-0.01
11	35.51	35.51	0.00	36.32	36.30	-0.02
14	35.59	35.60	0.01	36.34	36.32	-0.01
18	No Flood	No Flood	n/a	36.20	36.19	-0.01

Table 4.6. 1D Flood Levels for the Original vs Reduced Assessment

5.0 CONCLUSIONS

5.1 This report provides a summary of a 1D - 2D modelling exercise that was carried out by Create Consulting Engineers Ltd on behalf of Mulberry Tree Holdings Ltd for land at Flour Mill, Ashford, TN24 8PA. to address the EA's requirement for detailed fluvial modelling.

5.2 The Site is located in central Ashford, Kent approximately 0.5 km from Ashford International train station. The client proposes to redevelop the existing Site with 58 residential dwellings and an associated access and infrastructure.

5.3 To ensure the new development is safe from flooding it was agreed with the EA that a modelling exercise would be undertaken utilising the existing South Ashford 2D Modelling Study whilst updating it to the latest software versions and to assess the impact of the development proposals.

5.4 The model was run for the following return periods 1 in 20 Year and 1 in 100 Year plus an allowance for 45% climate change. Whilst the revised climate change allowance within the 'Stour Management Catchment' for the 2080's is 38% (Central) the 45% climate change allowance has been used within the modelling exercise as a worst case. The 1 in 100 Year plus an allowance for 105% climate change was also rerun as a sensitivity test.

5.5 Whilst a total of 312.0 m^3 of flood storage will be lost as a result of the development an area adjacent to the East Stour will be lowered and will form part of a new landscaped river corridor which will provide a total of 330.0 m^3 of additional floodplain storage, which includes a net gain of 18.0 m^3 of flood storage provided.

5.6 When reviewing the 1D levels on the Site it is evident that the water does not get out of bank for both the East and Great Stour for the 1 in 20 year event with the flood mitigation measures incorporated within the developed case scenario. As a result, it can be concluded that the Site post development remains dry within the 1 in 20 year event thus out of the Flood Zone 3b extent. The 2D modelled flood extents were not used due to unrealistic results and this approach was agreed with the EA (see Appendix B).

5.7 When assessing the results, both the 1D flood levels and 2D flood demonstrate that the development with this area of flood compensatory storage does not increase flood risk downstream of the development and the flood levels are within 1mm, when comparing between existing and proposed.

5.8 The ground floor of the proposed buildings will be set at 35.70 mAOD which is generally close to the existing level of the Site (as shown on Drawing 120 Proposed Section MM). The floor level of Block A and B will be retained as the same level as the existing Block A (36.04 mAOD)

5.9 All accommodation will be provided on the first floor and above. The lowest first floor level on Site is set at 38.83 m AOD, which means that the first-floor level will be 2.51 m above the 1 in 100 plus 45% climate change event.

5.10 Appropriate flood mitigation measures have been included within Table 7.1 of the Flood Risk Assessment (report reference: GB_P20-2206_01).

6.0 REFERENCES

i. Environment Agency Thames Updated South Ashford 2D Modelling Study (Mott Mcdonald, 2012).

ii. Environment Agency Thames Updated South Ashford 2D Modelling Study – Climate Change Updates (JBA, 2017).

iii. TUFLOW. (2016). TUFLOW User Manual: Build 2018-03-AE.

iv. TUFLOW. (2016). TUFLOW Wiki. Available at: http://wiki.tuflow.com/index.php?title=Main_Page (Accessed December 2021).

v. Flood Modeller Manual. Available at: http://help.floodmodeller.com/floodmodeller/#t=General_Introduction.htm) (Accessed December 2021).

FIGURES

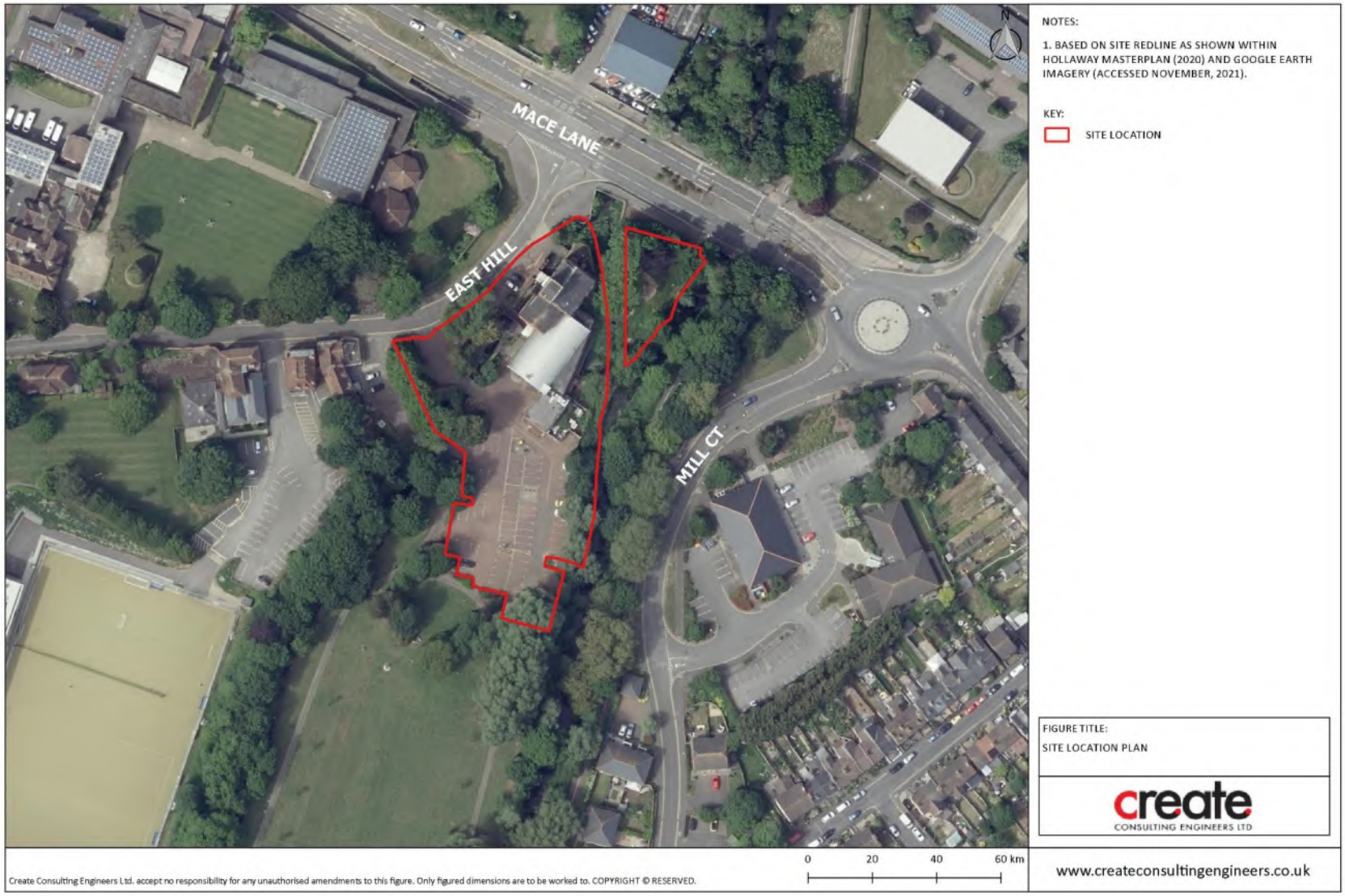


Figure 1.1 Site Location

Source: Google Earth Mapping (2021)

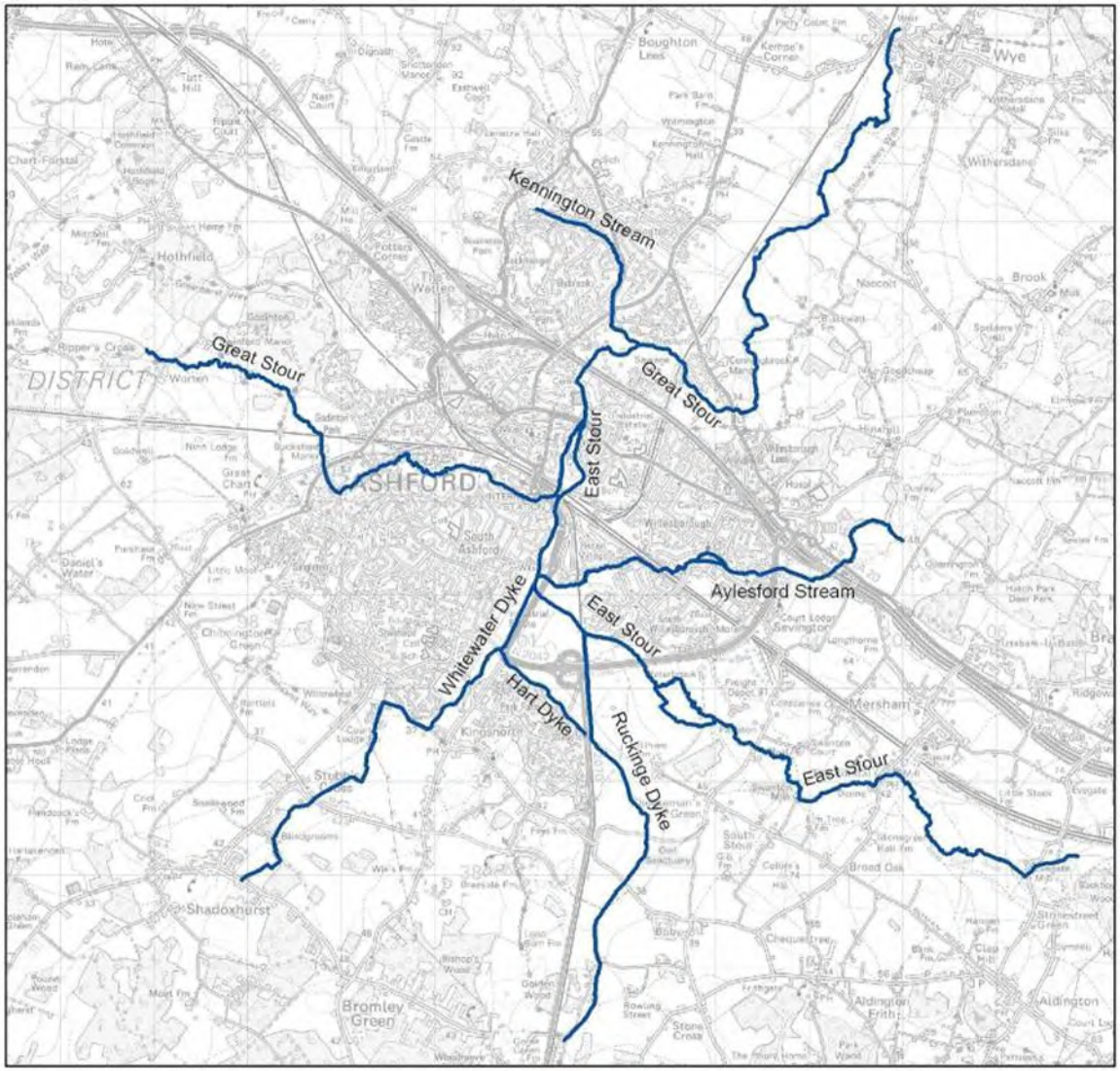


Figure 3.1: Extent of EA's Hydraulic Model (Mott Macdonald, 2012)

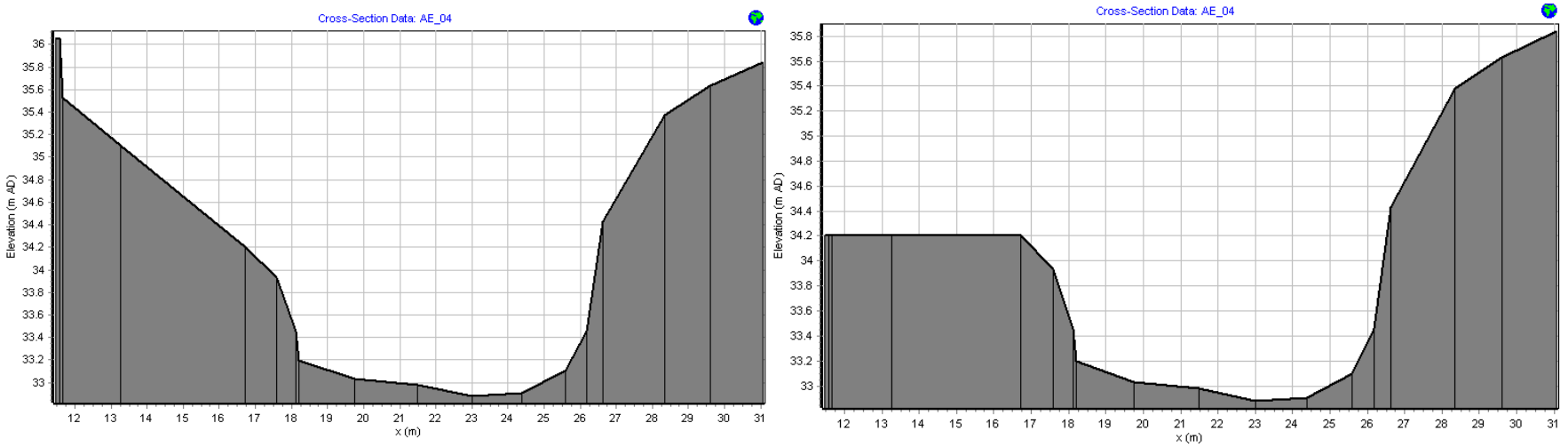


Figure 3.2: Existing and proposed 1D Flood Modeller Node AE_04

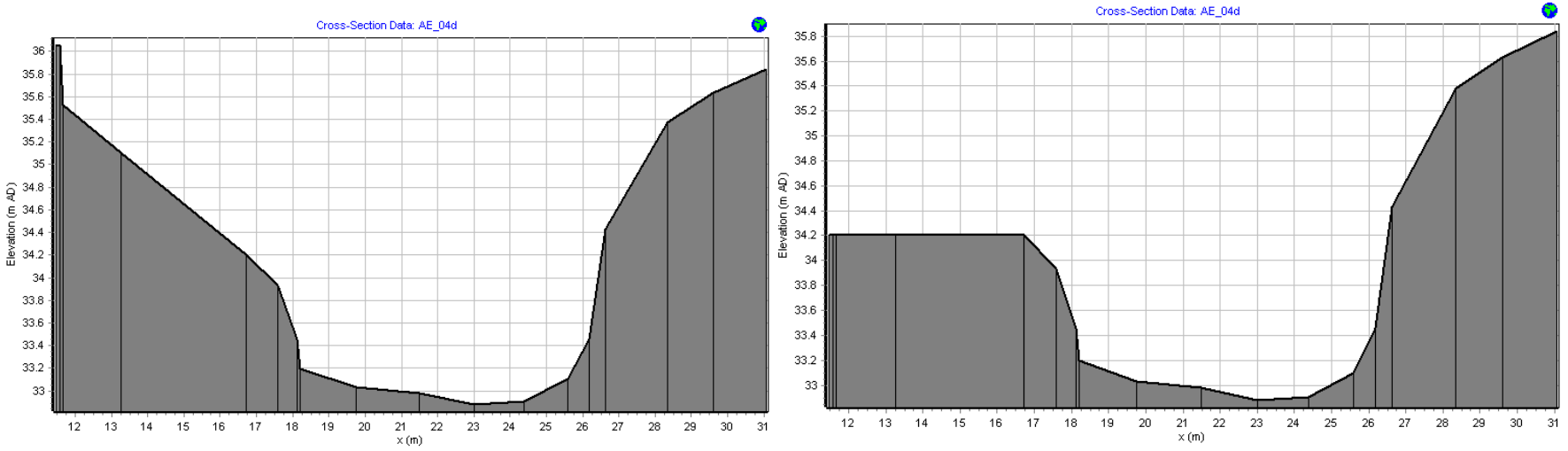


Figure 3.3: Existing and proposed 1D Flood Modeller Node AE_04d

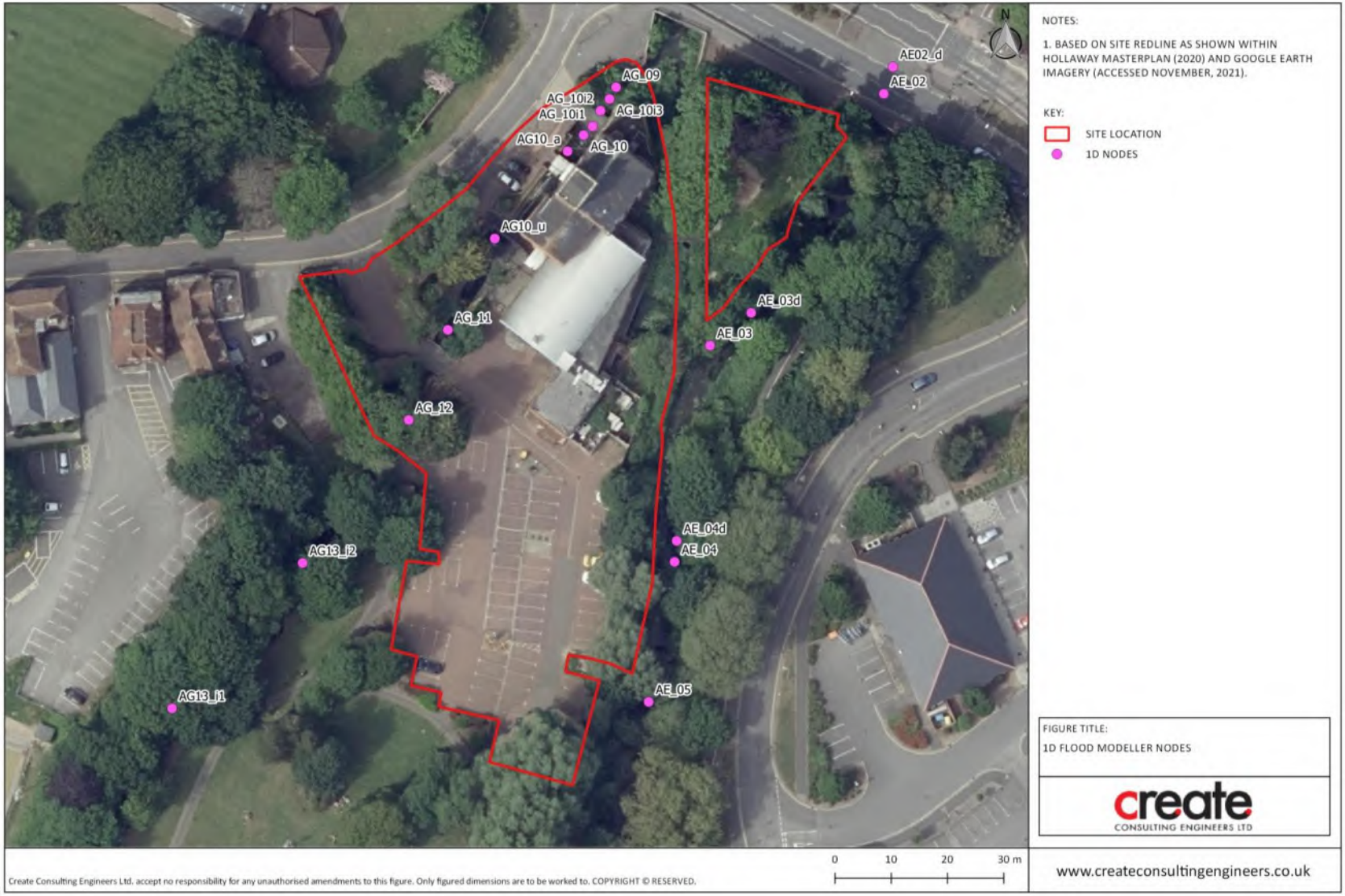


Figure 4.1: 1D Flood Modeller Nodes

Source: Google Earth Mapping (2021)

Figure 4.2: Existing Case Modelled 1 in 100 Year plus 45% Climate Change Flood Extent

Source: Google Earth Mapping (2021)

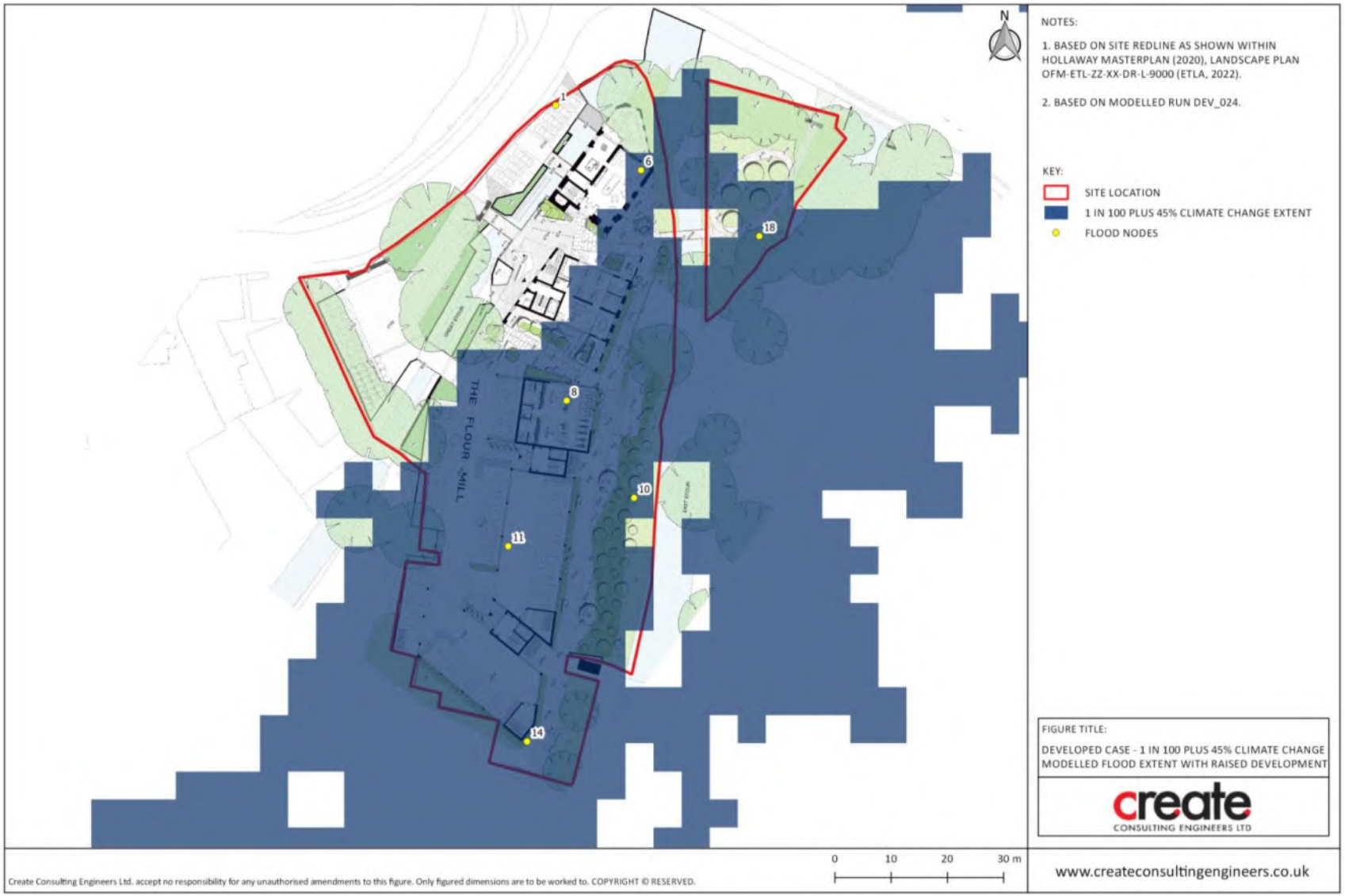


Figure 4.3: Developed Case Modelled 1 in 100 Year plus 45% Climate Change Flood Extent

Figure 4.4: Existing Case Modelled 1 in 100 Year plus 105% Climate Change Flood Extent

Source: Google Earth Mapping (2021)

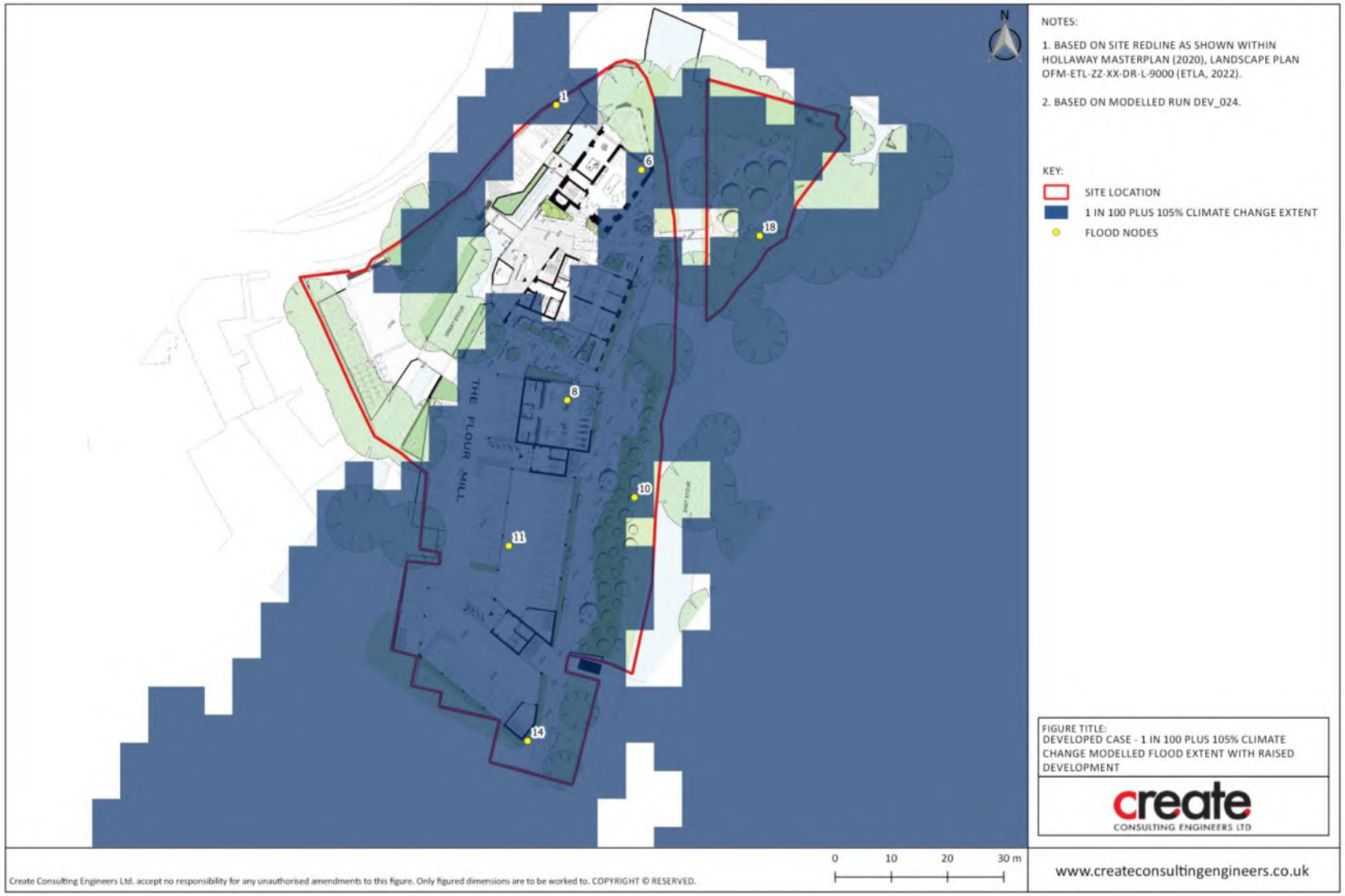


Figure 4.5: Developed Case Modelled 1 in 100 Year plus 105% Climate Change Flood Extent

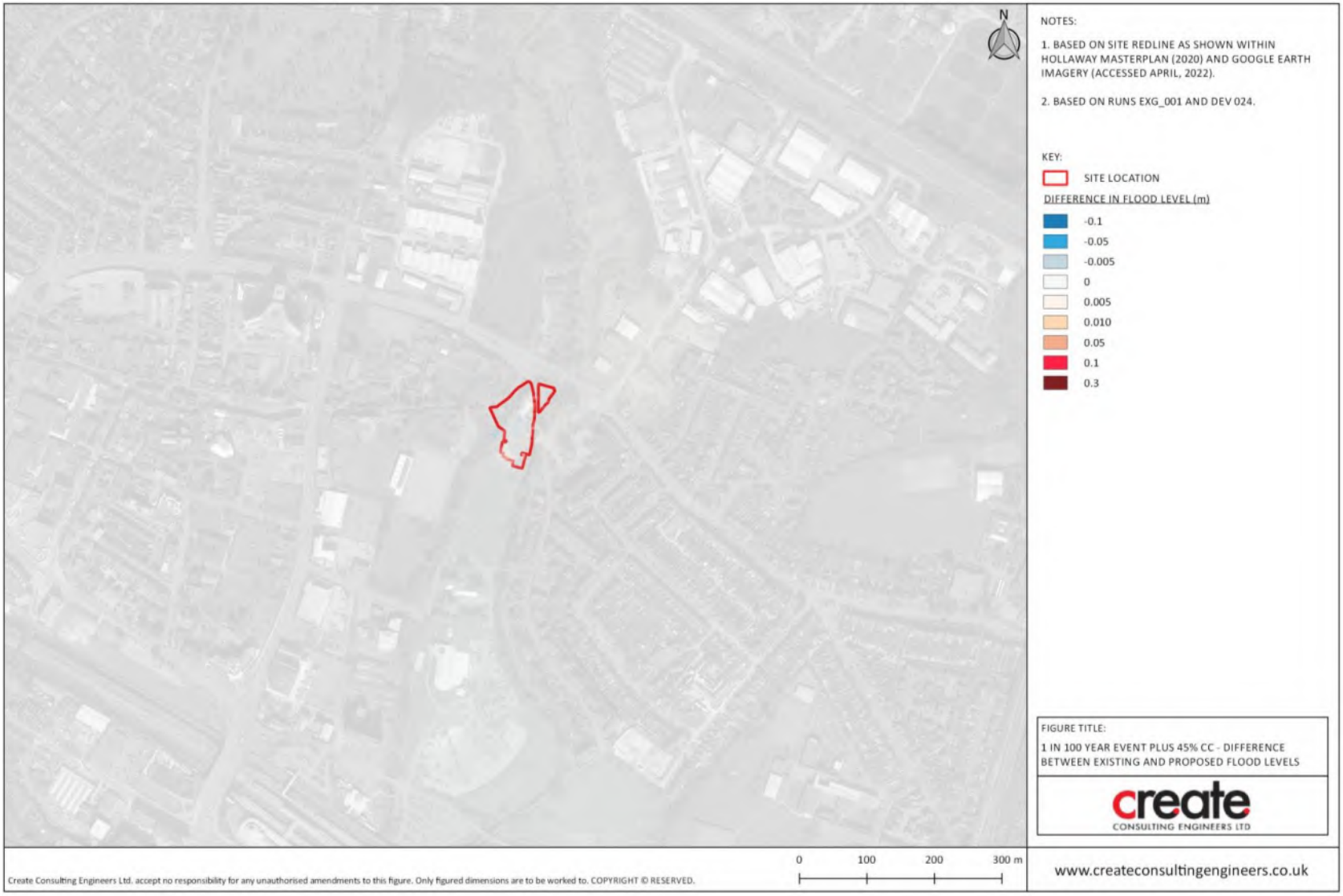


Figure 4.6: Difference between existing case and developed case flood levels for the Modelled 1 in 100 Year plus 45% Climate Change Flood Event

Source: Google Earth Mapping (2022)

APPENDICES

APPENDIX A

1. PROJECT CONTEXT

Create Consulting Engineers Ltd have been instructed by Mulberry Tree Holdings Ltd to undertake a flood modelling exercise for their Site located at Flour Mill, Ashford, TN24 8PA. The Site is located at Ordnance Survey Grid Reference 601540E, 142783N and comprises existing buildings associated with the disused Pledges Flour Mill and is subdivided by the Great and East Stour as shown in Figure 1.

The client proposes to redevelop the existing Site with 58 residential dwellings and an associated access and infrastructure.

After conversations with the Environment Agency (EA) it was confirmed that hydraulic modelling would be required as this scheme was seen as a major 'more vulnerable' development. This exercise will include consideration of flood compensation requirements to account for any increases in building footprint(Figure 2) and will attempt to move as much of Flood Zone 3b away from the developable areas on the Site.

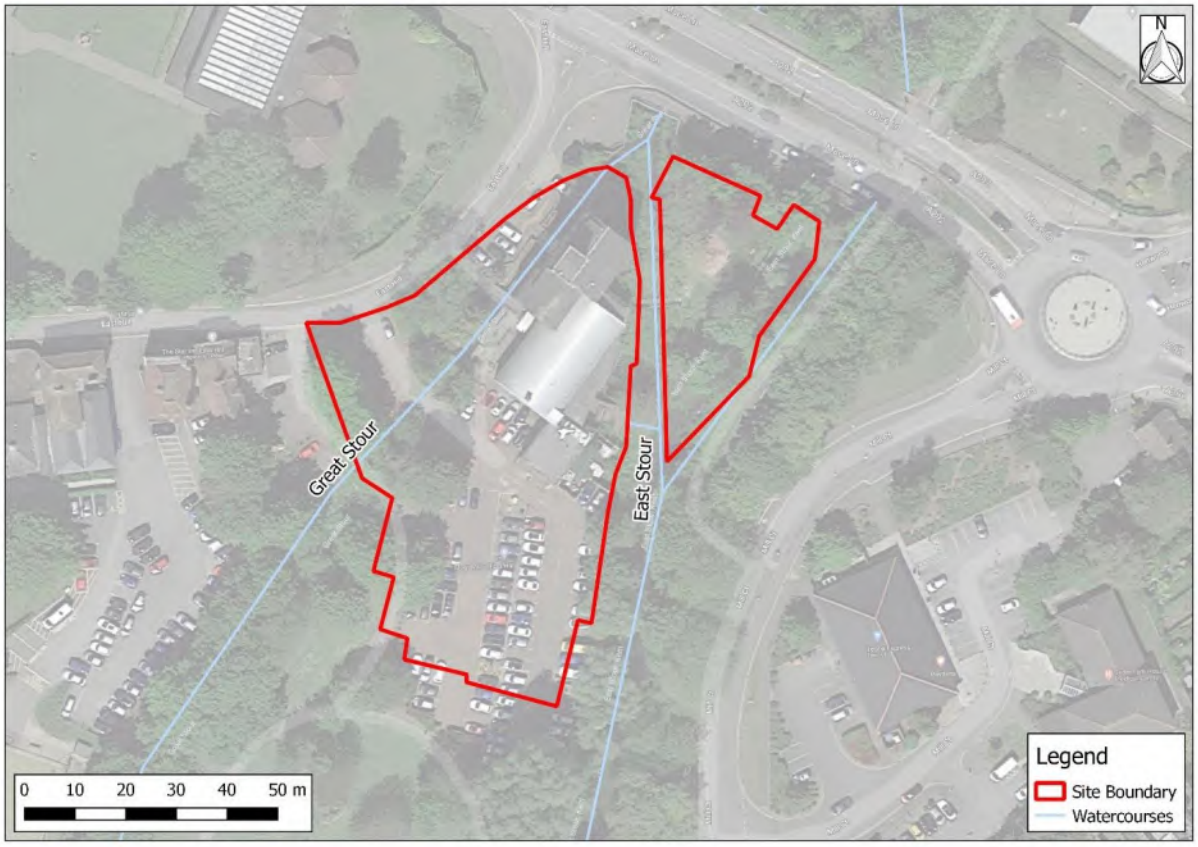


Figure 1: Site Location Plan

Figure 2: Currently Proposed Site Development Layout

2. LATEST HYDRAULIC MODELLING

The EA strategic model for the region is the 'Updated South Ashford 2D Modelling Study' undertaken by Mott Mcdonald in 2010. The model is a 1D/2D model (ISIS/TUFLOW). This was then updated in 2012 and then again updated in 2016/2017 to consider updated EA climate change allowances (35%, 45%, and 105%) by JBA. The 2012 EA strategic model was originally run using ISIS version 3.5.1 and TUFLOW version 2011-09-AF-w32. The software used was updated to ISIS versions 3.7.2 and TUFLOW version 2013-12-AE for the new climate change allowance runs in 2016/2017. The model extent is shown in Figure 3.

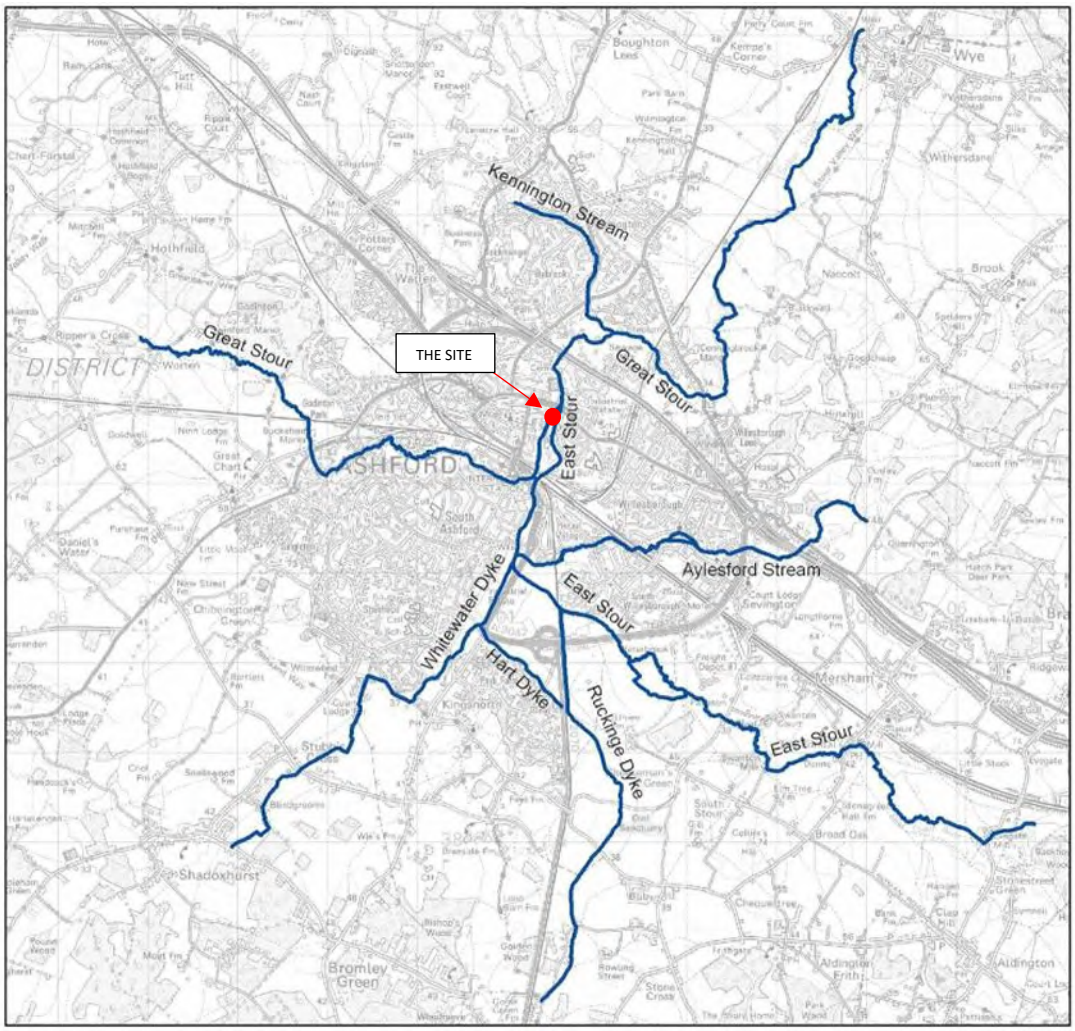


Figure 2: Extent of Hydraulic Model

3. AIM

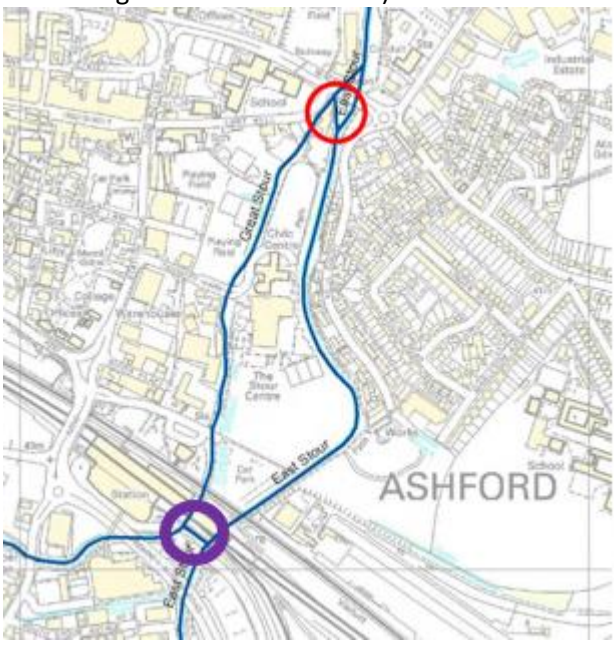
To undertake a modelling exercise using the latest modelling standards and available information, where possible, to ensure the new development is safe from flooding whilst also considering any flood compensation requirements to account for any increases in footprint of the new buildings. Additionally, attempt to move as much of Flood Zone 3b away from the developable areas on the Site.

4. METHODOLOGY

To achieve the aim of this exercise the following methodology will be undertaken:

- The model version for TUFLOW and Flood Modeller will be updated to as later version as possible.
- A clear file naming convention will be adopted for the model output files.
- The hydrology from the original model will be reused.

- The model will be run for the following return periods: 1 in 20 year, 1 in 100 year with the latest climate change allowances.
- The defended runs will be used as a basis for this assessment, as opposed to the undefended runs. The undefended runs do not include the two reservoirs (Hothfield on the Great Stour and Aldington on the East Stour) nor the southernmost link channel (circled in purple below).



- The Manning's 'n' roughness coefficients from the original modelling assessment will be used. The material files however will be updated in the developed case run to account for the new proposed hardstanding areas/buildings on the Site.
- The original grid cell size (10 m) will be used.
- Any structures (bridges/culverts etc.) from the 1D network will be retained from the original model.
- An assessment of the original topographical data in the vicinity of the Site will be undertaken against the latest topographical survey data and updated if required.
- The original river cross sections from the 1D network will be retained from the original model. However, these may be adjusted slightly in the vicinity of the Site to tie into the updated topographical information.

5. SENSITIVTY TESTING AND CALIBRATION

The model and results will then be tested and calibrated where possible, this will include but not be limited to the following:

- Compare stage, flow, and velocity in a number of locations from the EA's original modelling exercise to the latest runs.
- Sensitivity testing of key parameters (i.e. channel and floodplain Manning's n' roughness coefficient, and increase in flow using climate change results) – if required;
- Compare flood extents to the flood extents shown in the Updated South Ashford 2D Modelling Study runs from 2012 and additional climate change runs in 2016/2017.

6. REPORTING

A model report will be prepared. This will include:

- Details of the modelling approach taken with explanation of the key decisions. This will be done in enough detail so the steps can be replicated.
- We will confirm what model software version has been used. Following best practice we will aim to use the latest version.
- Appended to, or submitted with, the report will be:
    - Surveys related to any changes to the existing model or used for the new model.
    - All model files and the model itself.
    - Flood outlines for all return periods modelled.
    - Model log - to track any changes and updates.
    - Details of any sensitivity testing such as changes to inflow, roughness, downstream boundary, structure coefficients, etc.

7. PROGRAMME

Based on the current modelling delivery programme, assuming that there are no major modelling issues, we would hope to issue the modelling report and model to the EA about the middle of July 2021.

Model Scope By: Jessica Jordan, BSc (Hons), MSc, MCIWEM

Approved By: Chris Downs, BEng, MEng, CEng, MICE, MCIWEM

APPENDIX B

MEETING NOTES

Meeting Title:	EA – Pre-App Advice – Initial Meeting	
Attendees:	Jenny Wilson (JW) Mike Wilkinson (MK) David Rich (DR) Chris Downs (CD)	EA – East Kent Planning Specialist EA – PSO – Planning & Permitting EA – PSO – Planning & Permitting Create – Technical Director for Water
Date of Meeting:	5th March 21	Apologies: none
Project Ref:	CD/ P20-2206/EA-M1-Rev1	cc: Ben Ludlow
Date of Notes:	14th April 21	Revision: Rev 1 (Final)

Notes: Actions:

1.0 Introduction

1.1 CD provided an introduction to the proposed scheme as shown in the pre meeting issued proposed development plan (20.068_Flour Mill_Revised Option (Overlay)) and he confirmed the following:

i. It is a flat based residential development, with Blocks A&B being the existing building and Block C&D are new build.

ii. Residential accommodation will start on the first floor, with commercial on ground floor, e.g. café.

iii. It is being proposed to lower the eastern side of the Site to provide a naturalized river path close to the water. This will also reduce the amount of flooding of the Site and compensate for the building.

1.2 MW advised the EA's view of the Site based on discussions with the catchment engineer Barrie Neaves:

i. The Site is bordered by both the Great Stour (GS) and East Stour (ES).

ii. The GS water level is at a higher level by up to 2m depending on flooding than the ES as it was the leat for the old mill.

iii. The characteristics of the water courses are not easy to simplify. Model reports are available for the Mott McDonald 2010 South Ashford 2D Modelling Study and the JBA Consulting 2012 Model Update. The former can provide details of the construction of the model and analysis of the results.

iv. There is an outlet from the GS mill leat to ES via an old mill channel, which is controlled by sluices and these are open. This therefore help level out the water between the two watercourses. This channel needed to be

maintained and kept in a good condition by the site owner as the riparian owner.

v. Some 8 years ago the weir was lowered and a fish pass was added as well as gabion baskets. At the same time the channel below the mill building was also refurbished. The EA led on the refurbishment of the channel and the School on the mill leat.

vi. There is also a sewer across the GS U/S (upstream) end of the Site which causes the river to weir of it and make flood locally worse. As part of the scheme this was to be lowered, but it was not. The EA would be keen for the developer to do this. This was previously costed at £30k.

2.0 Site Flood Risk

2.1 From discussion it was agreed generally that the west side of the Site was defended, probably due to the U/S storage areas. The rest of the Site was mainly in Flood Zone (FZ) 3a, while there was a small area of FZ3b on the east side.

2.2 MW said he was happy with the idea of lowering the ES river path to move FZ3b off the site to be developed.

2.3 It was agreed that that climate change increase for the design flood was 45%, but a resilience check was also required for the 105% to show that it had been considered and taken account of.

2.4 MW stated that for commercial development the free board was 300mm to be added on top of the climate change increase and for living accommodation this was 600mm.

2.5 He said the aim should be to have commercial floor levels above the 1 in 20 years flood level. (NB: BN had commented that that the existing building had not flooded during events up to 1 in 50 years.)

2.6 Safe access should be considered, but MW said if this could not be achieved, as there was no residential accommodation on the ground floor, unlikely to be a reason for objection. They would need to consult with the Council's Emergency Planner about this. CD said that this might be in part provided via elevated paths to the building entrances from the defended areas of the Site. MW said his initial concern with this was that they would need to be compensated for and not block flood conveyance from the GS to ES.

3.0 Sequential and Exceptions Tests

3.1 JW advised that the Sequential Test was a matter for the Council and not the EA. MW confirmed that if they saw a site that was inappropriate for a development they would only then make a comment. He said this was not such a case as the Site is already developed, therefore, it would mean this and other evidence could be referenced in the Flood Risk Assessment (FRA) to satisfy this test.

3.2 MW advised that for the Exception Test the FRA would need to show that those occupying the development were safe and flood risk did not increase elsewhere. MW clarified after the meeting that the EA would need to see the exception test, but the Local Planning Authority might also require evidence that the

sustainability benefits of the development to the community outweigh the flood risk.

4.0 Modelling

4.1 CD said Create had already run the model and there had been some issues, but these should be resolved with the completion of the initial model review. This would consider how the Site was handled in the model and if there was a need to modify it to better represent the Site.

4.2 CD asked if there were any notified issues with the model that Create would need to take account of when modelling. MW said none had been flagged and it had been reported internally that the Ashford model was a reasonable model.

4.3 DR said that U/S near the railway station there was another link between the GS and ES, which was controlled by a weir. CD said this will be checked to see if it is in the model, but it was not proposed to do any off-site alterations to the model.

4.4 MW advised that ideally there needed to be level-for-level compensation of flood storage lost by the development, e.g. 100% lost need to 100% compensated. However, he realised that it would not be possible to cover for the loss of flood storage due to the columns on a level-for-level basis so over compensation at lower levels would be acceptable. As well as modelling the loss of compensation and showing this had been address by the river path ground lowering, a compensation table also needed to be provided.

4.5 CD said as he understood it the material excavated to form the lower river path would be removed from site. JW advised that this would need a registered waste carrier to remove this material to a suitably authorised site.

4.6 CD said Create would produce a modelling brief to be commented on by the EA modelling team as they start the modelling process. Once the modelling work had been completed, that a modelling report and outputs would be submitted for review and acceptance by the EA.

5.0 Nutrient Neutral Development

5.1 JW introduced the issue of this development in its location needing to be nutrient neutral due to the concerns about the Stodmarsh Nature Reserve the other side of Canterbury.

5.2 CD advised that he had raised this issue with the architect – Hollaways who were currently leading on the development. They had confirmed this was known about and was being addressed. However, CD confirmed he would flag this again now the EA had mentioned it.

6.0 Flood Risk Activity Permit (FRAP)

6.1 DR said yes this would be required and he would be the contact for this. It was confirmed that a FRAP would be required for the lower river path as this was work within 8m of the watercourse.

6.2 DR also advised any modification to the bridges over the watercourse would also likely to need a FRAP.

6.3 DR advised early involvement with him about this was useful. CD said it might be worthwhile starting this during the design process so where possible modification that did not impact the development could be made to aid or even remove the need for some of the FRAPs.

7.0 Riparian Responsibilities

7.1 MW said that the site owner is the riparian owner and is responsible for the maintenance of both watercourses running along the boundary of the Site, the fish pass, gabions and the channel beneath the mill.

7.2 CD asked if the EA was aware of any issue with the maintenance of the existing river related assets which the site owner needed to be aware of and address. MW said he was not, but he recommended that they had them surveyed to confirm their condition and to make sure that there were no issues.

8.0 Ecology

8.1 CD said he assumed a Water Framework Directive Assessment was not required for the FRAPs. JW said this would need further consideration before an answer could be given. WFD Assessment may be required but depends on the proposal(s).

8.2 JW said that the works could not have a negative impact on the water course (water quality/ecology) and therefore, a base line survey was needed. This should then be used to inform an early consultation process with the EA's Biodiversity Team, to stop issues being raised at a later stage. It was confirmed that the GS was a wildlife site.

8.3 The idea of notifying the East Kent Catchment Improvement Partnership was mentioned by CD to see if they had advice on how the ecological improvements along the river path corridor could be made to best enhance its ecological value.

9.0 EA Advice Agreement

9.1 JW advised that the current agreement only covered this initial meeting. That the Model Brief and Report Review by the EA modelling team would need an addendum to the current agreement. It was discussed that as the EA budget figure for a report review was £5k the developer should be approached for their agreement to an increase in the budget by this amount to cover the modelling stage.

9.2 JW advised while this seemed a large figure it was only a estimate and they would only be charged for the actual time taken.

9.3 CD confirmed he would recommend to the developer that he approved this increase in the budget and would then let JW know so an agreement addendum could be prepared, so that that there was no interruption in their inputs.

Vicky Luck

From: Wilson, Jennifer <jennifer.wilson@environment-agency.gov.uk>
Sent: 09 June 2021 16:53
To: Chris Downs
Subject: FW: P20-2206 - Flour Mill: Modelling Scope - KT/2021/128067/02-L01
Attachments: JJ_CD_P20-2206_TN1 - Modelling Scope.pdf

Hi Chris

Got your message.

Here is the email, below.
Jen

From: Wilson, Jennifer
Sent: 03 June 2021 14:31
To: 'Chris Downs' <Chris.Downs@createconsultingengineers.co.uk>
Subject: RE: P20-2206 - Flour Mill: Modelling Scope - KT/2021/128067/02-L01

Good afternoon Chris

Apologies for the delay.

We have the following comments to make.

We are happy with the P20-2206 - Flour Mill modelling scope.

Two points:
Has consideration been given to modelling the impact of the sewer across the Great Stour at the upstream end of the site, which causes the river to weir over it and can worsen flooding? As stated in the minutes of our meeting of 5/3/2021, we would be keen for this sewer to be lowered.

The model may be reviewed when the application is submitted by the EA.

If you have any queries, please come back to us.

Kind Regards,

Jennifer Wilson
Planning Specialist
Sustainable Places – Kent and South London

kslplanning@environment-agency.gov.uk

From: Chris Downs [mailto:Chris.Downs@createconsultingengineers.co.uk]
Sent: 07 May 2021 17:59
To: KSLPlanning <KSLPLANNING@environment-agency.gov.uk>
Cc: Wilson, Jennifer <jennifer.wilson@environment-agency.gov.uk>; Jessica Jordan <Jessica.Jordan@createconsultingengineers.co.uk>
Subject: P20-2206 - Flour Mill: Modelling Scope

Dear Jenny

Please find attached the scope for the river modelling work we are currently progressing.

We are issuing this to you so your modelling team can review to see they are happy with our approach and to inform them of the type of modelling report they are likely to receive for their review, which will hopefully be mid July 21.

Cheers

Chris

Chris Downs
Technical Director | Water
Create Consulting Engineers Ltd
109-112 Temple Chambers | 3-7 Temple Avenue | London | EC4Y 0HP
M 07469 118 531
T 020 7822 2300

Vicky Luck

From: Winberg, Linda <Linda.Winberg@environment-agency.gov.uk>
Sent: 22 March 2022 13:05
To: Jessica Jordan
Cc: Rich, David; Alister Hume; 'Oliver Davis (Mulberry Tree Holdings Ltd T/A Oliver Davis Homes (Kent))'; Rory Brace
Subject: RE: P20-2206 - Flour Mill - Flood Modelling

Hi Jessica,

Apologies for late response – to confirm, we are happy for you to progress using this approach.

Are you otherwise satisfied with the modelling (so far)? No other instabilities? Could you let us know what checks you performed so that we can review when we next update the catchment model.

Kind regards,

Linda

From: Jessica Jordan <Jessica.Jordan@createconsultingengineers.co.uk>
Sent: 21 March 2022 14:26
To: Winberg, Linda <Linda.Winberg@environment-agency.gov.uk>
Cc: Rich, David <david.rich@environment-agency.gov.uk>; Alister Hume <alister.hume@humeplanning.co.uk>; 'Oliver Davis (Mulberry Tree Holdings Ltd T/A Oliver Davis Homes (Kent))' <oliver@oliverdavishomes.com>; Rory Brace <rory@oliverdavishomes.com>
Subject: P20-2206 - Flour Mill - Flood Modelling

Hi Linda,

Thank you for the call. As discussed, we are finding that for the western watercourse (the Great Stour) flooding occurs within the 2D even though when inspecting the 1D network it is evident that flooding does not get out of bank. It is clear that flooding in this part of the Site is not from the easternmost watercourse either (the East Stour) as flood levels are approximately 0.6m lower within this channel. Even when we raise the buildings significantly higher than the 1D flood levels we are seeing flooding shown in this area. With this in mind we propose to use the 1D levels as proxy, as the 2D extent for the 1 in 20 year event does not seem to be providing realistic results.

Providing we can demonstrate that the buildings will remain dry during the 1 in 20 year event, either because they are higher than the 1D flood level or because they are protected by defences/river walls, and that sufficient flood compensatory storage is available during the 1 in 100 year + climate change event, can you confirm that you are would be happy with this approach?

Kind regards,

Jessica Jordan
Principal Hydrology and Water Consultant

Create Consulting Engineers Ltd
109-112 Temple Chambers|3-7 Temple Avenue|London|EC4Y 0HP
T 020 7822 2300
M 078 5020 9761

PLANS

Existing Site Layout Plan
Scale 1:200

0 1 2 4 6 8 10M

A PLANNING SUBMISSION BL 21.12.09

Hollaway

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Kent | The Tramway Stables | Rampart Road | Hythe | Kent | CT21 5BG
T +44 (0)1303 260 515 | **E** kent@hollawaystudio.co.uk | **W** www.hollawaystudio.co.uk

Project | FLOUR MILL
ASHFORD

Client | OLIVER DAVIS HOMES

Title | EXISTING SITE LAYOUT PLAN

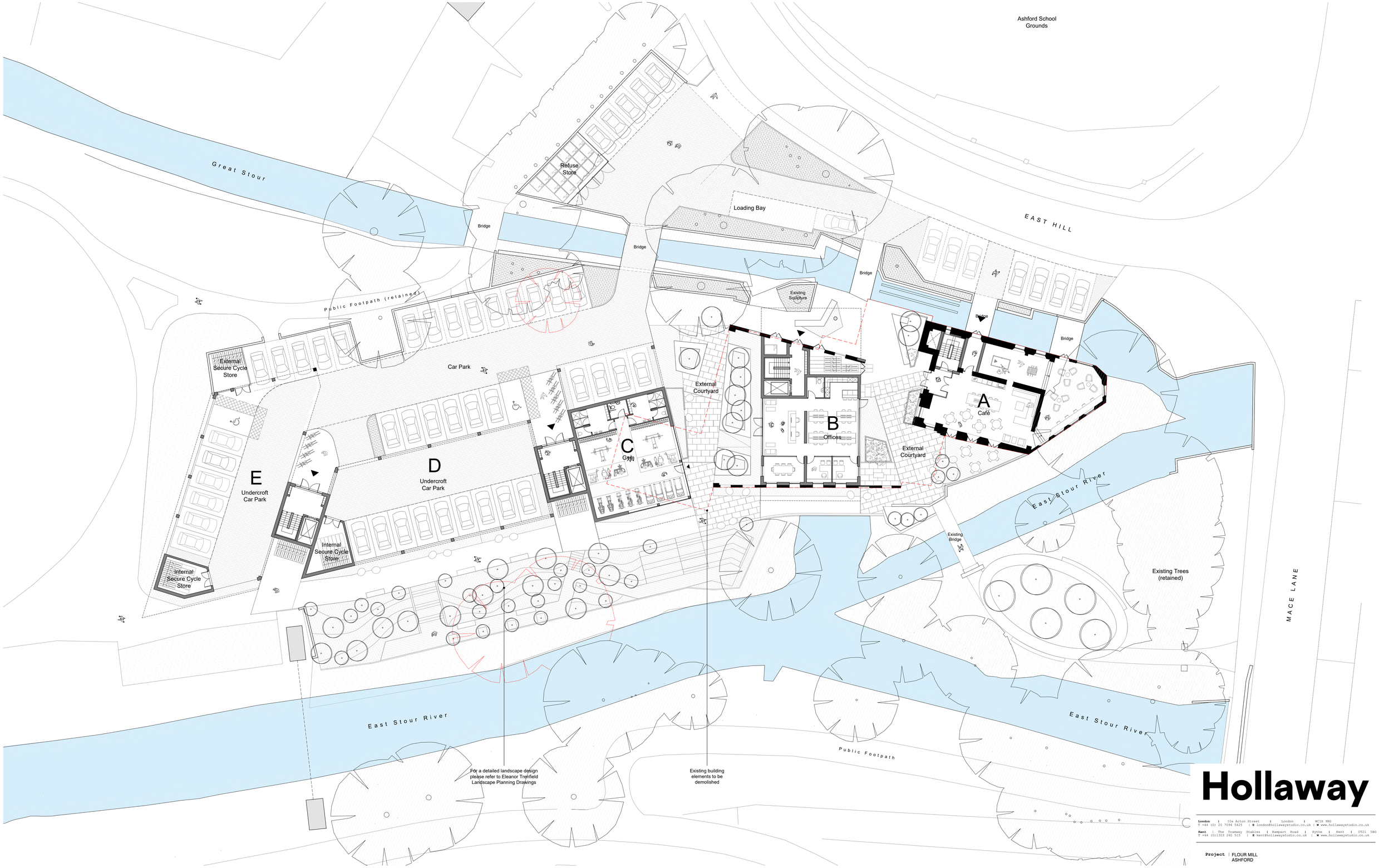
Status | PLANNING

Scale@A1 | 1:200 **Date** | NOV 2021 **Drawn** | RT **Chk'd** | BL

Project Number
20.068
Birn Number

Drawing Number
003

Revision
A



Proposed Site Layout Plan

Scale 1:200

0 1 2 4 6 8 10M

A	PLANNING SUBMISSION	BL 21.12.09
B	UPDATES TO LANDSCAPING & LEVELS	BL 22.04.14

Hollaway

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Project | FLOUR MILL
ASHFORD

Client | OLIVER DAVIS HOMES

Title | PROPOSED SITE LAYOUT PLAN

Status | PLANNING

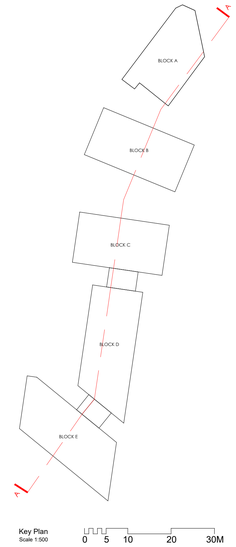
Scale@A1 | 1:200 **Date** | NOV 2021 **Drawn** | RT **Chk'd** | BL

Project Number
20.068

Drawing Number
101

Revision
B

Bim Number



Key Plan
Scale 1:500

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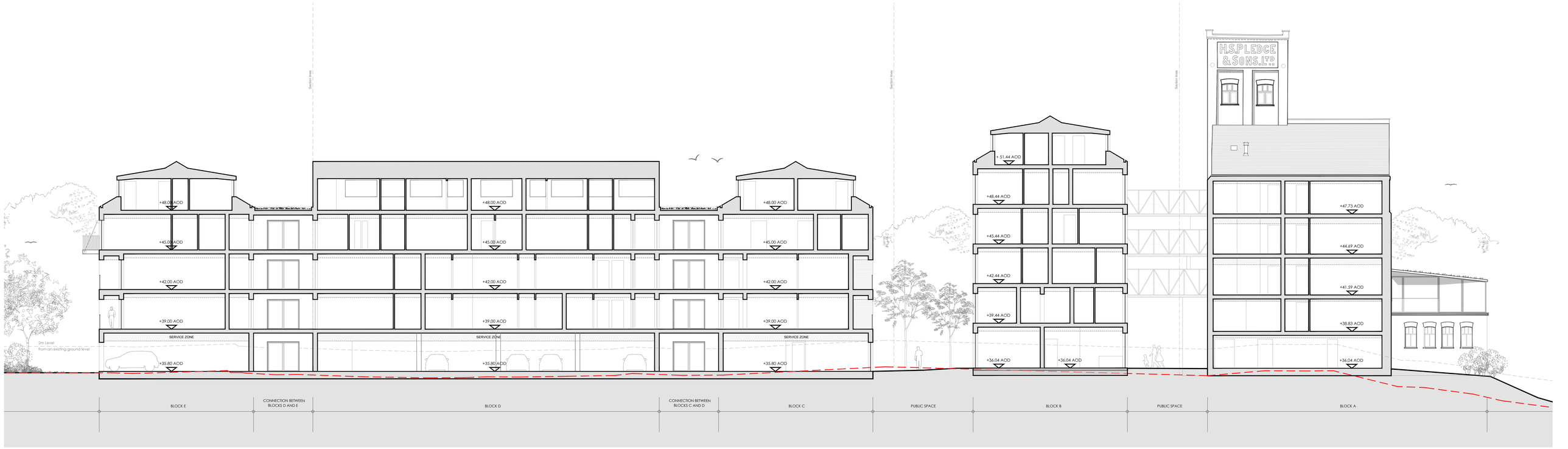

Existing ground level

Proposed Section M-M
Scale 1:100

0 1 2 3 4 5M

A	PLANNING SUBMISSION	BL 21.12.09
B	MINOR ADJUSTMENTS TO FINISHED FLOOR LEVELS & ASSOCIATED AMENDMENTS	BL 22.04.14

NOTE: For a detailed landscape design please refer to Eleanor Trenfield Landscape Planning Drawings

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Project | FLOUR MILL
ASHFORD

Client | OLIVER DAVIS HOMES

Title | PROPOSED SECTION MM

Status | PLANNING

Scale@A0 | 1:100 **Date** | NOV 2021 **Drawn** | AL **Chk'd** | BL

Project Number
20.068
Bim Number

Drawing Number
120

Revision
B

SHEET 01

142860mN

142840mN

142820mN

142800mN

142780mN

601480mE

601500mE

601520mE

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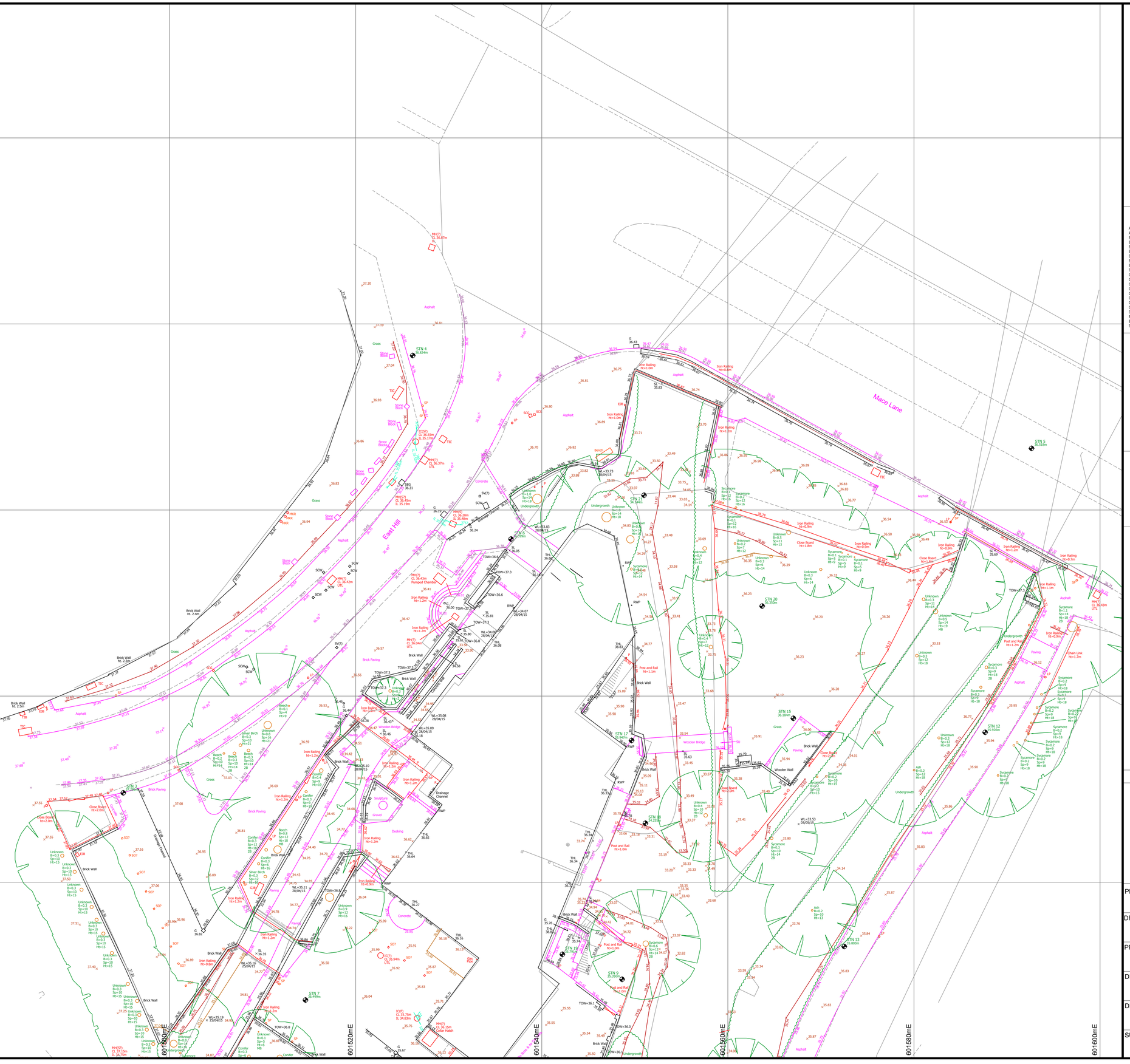

SETTING THE BENCHMARK IN GEOMATICS

- TOPOGRAPHICAL SURVEYS
- MEASURED BUILDING SURVEYS
- 3D LASER SCANNING
- BOUNDARY DEMARCATION & SUB-DIVISION
- BOUNDARY DISPUTES
- GPS SURVEYS
- VOLUMETRIC SURVEYS
- SETTING OUT
- BUILDING INFORMATION MODELLING

LEGEND

A	ASPHALT	ER	EARTHING ROD	RE	RODDING EYE
AC	AIR CONDITIONING	F	FOUL WATER MH	RL	RIDGE LEVEL
B	BOLLARD	FB	FLOWER BED	RU	RAMP UP
BIN	LITTER BIN	FE	FENCE	RWP	RAIN WATER PIPE
BL	BED LEVEL	FH	FIRE HYDRANT	SC	STOP COCK
BM	BENCH-MARK	G	GAS IC	SEG	SIDE ENTRY GULLY
BN	BENCH / SEAT	GP	GATE POST	STN	SURVEY STATION
BP	BLOCK PAVIORS	GR	GRATING	SGY	STRIP GULLY
BT	TELECOM MH	GV	GAS VALVE	SP	SIGN POST
T	TELECOM IC	GY	GULLY	STN	SURVEY STATION
C	CONCRETE	H	HIGH/HEIGHT	SU	STEPS UP
CH	CHAIN LINK	IC	INSPECTION COVER	TJB	TELECOM JUNCTION BOX
CIP	CABLE INSPECTION POINT	IR	IRON RAILING	TK	TANK
CL	COVER LEVEL	KO	KERB OUTLET	TOW	TOP OF WALL
COL	COLUMN	LB	LETTER BOX	TP	TELEGRAPH POLE
CP	CABLE TELEVISION POINT	LP	LAMP POST	TS	TRAFFIC SIGNAL
CS	CABLE STAY	MB	MULTI BOLE	VP	VENT PIPE
CT	CABLE TELEVISION IC	MH	MANHOLE	WI	WIRE MESH
DP	DOWN PIPE	MP	MARKER POST	WL	WATER LEVEL
E	ELECTRICITY IC	P	POST / POLE	WM	WATER METER
EL	EAVES LEVEL	PW	POST & WIRE	WO	WASH OUT
TP	ELECTRICITY POLE			WV	WATER VALVE

FEATURES

TREE (Species, D=Bole Diameter, Sp=Spread, Ht = Height)

- GATE - GATES
- FENCE
- BUILDING
- OVERHEAD BUILDING LINE
- FACE OF WALL
- RETAINING WALL
- CHANGE OF SURFACE
- CHANNEL
- DROP KERB
- TOP OF BANK
- BOTTOM OF BANK
- TREE LINE
- OHW E T T OVER HEAD WIRE
- EDGE OF UNDERGROWTH

STATUTORY UNDERTAKERS

- VIRGIN MEDIA
- SOUTHERN WATER - FOUL
- SOUTHERN WATER - SURFACE
- SOUTHERN WATER - COMBINED
- BT
- SOUTH EAST WATER - MAINS
- UK POWER NETWORKS - HV/LV
- GAS - LP MAIN
- GAS - MP MAIN

SURVEY NOTES

CONTROL

- ALL LEVELS ARE STATED IN METRES.
- ALL LEVELS ARE RELATED TO ORDNANCE SURVEY DATUM USING THE ACTIVE GPS NETWORK.
- ALL COORDINATES ARE RELATED TO NATIONAL GRID USING THE ACTIVE GPS NETWORK.

SERVICES

- PIPE DIAMETERS, INVERT LEVELS, & DRAINAGE TYPES HAVE ALL BEEN GUAGED FROM THE SURFACE, AS SUCH WE CANNOT GUARANTEE THE ACCURACY OF THIS INFORMATION, PRIOR TO ANY GROUNDWORKS WE WOULD ADVISE CONFIRMING THE INFORMATION PROVIDED.
- NO RESPONSIBILITY CAN BE TAKEN FOR THE ACCURACY OF PLANS SUPPLIED BY STATUTORY AUTHORITIES.
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TREES

- EVERY EFFORT HAS BEEN TAKEN TO IDENTIFY TREE SPECIES, BUT WE TAKE NO RESPONSIBILITY AS TO THE ACCURACY OF THIS INFORMATION.
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FEATURES

- UNLESS OTHERWISE INDICATED LEVELS TAKEN AT KERB LINES ARE CHANNEL LEVELS.

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Revision -	Plans Reassigned	23/06/20

SURVEYED & DRAWN BY

RL Surveys

www.rlsurveys.co.uk

working on behalf of

Mulberry Tree Holdings Ltd

PROJECT TITLE:

Flour Mills, East Hill,
Ashford, Kent. TN24 8PA

DRAWING DESCRIPTION:

Topographical Survey

PROJECT REFERENCE:

B20/062

DRAWING REFERENCE:

B20062_Flour_01.dwg

DRAWING SCALE:

1:200

N

SURVEY DATE:

05/2015

SHEET:

A1

REVISION:

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SHEET 02

142780mN

142760mN

142740mN

142720mN

142700mN

601480mE

601500mE

601520mE

601540mE

601560mE

601580mE

SETTING THE BENCHMARK IN GEOMATICS

- TOPOGRAPHICAL SURVEYS
- MEASURED BUILDING SURVEYS
- 3D LASER SCANNING
- BOUNDARY DEMARCATION & SUB-DIVISION
- BOUNDARY DISPUTES
- GPS SURVEYS
- VOLUMETRIC SURVEYS
- SETTING OUT
- BUILDING INFORMATION MODELLING

LEGEND

A	ASPHALT	ER	EARTHING ROD	RE	RODDING EYE
A/C	AIR CONDITIONING	F	FOUL WATER MH	RL	RIDGE LEVEL
B	BOLLARD	FB	FLOWER BED	RU	RAMP UP
BIN	LITTER BIN	FE	FENCE	RWP	RAIN WATER PIPE
BL	BED LEVEL	FH	FIRE HYDRANT	SC	STOP COCK
BM	BENCH-MARK	G	GAS IC	SEG	SIDE ENTRY GULLY
BN	BENCH / SEAT	GP	GATE POST	STN	SURVEY STATION
BP	BLOCK PAVIORS	GR	GRATING	SGY	STRIP GULLY
BT	TELECOM MH	GV	GAS VALVE	SP	SIGN POST
T	TELECOM IC	GY	GULLY	STN	SURVEY STATION
C	CONCRETE	H	HIGH/HEIGHT	SU	STEPS UP
CH	CHAIN LINK	IC	INSPECTION COVER	TJB	TELECOM JUNCTION BOX
CIP	CABLE INSPECTION POINT	IR	IRON RAILING	TK	TANK
CL	COVER LEVEL	KO	KERB OUTLET	TOW	TOP OF WALL
COL	COLUMN	LB	LETTER BOX	TP	TELEGRAPH POLE
CP	CABLE TELEVISION POINT	LP	LAMP POST	TS	TRAFFIC SIGNAL
CS	CABLE STAY	MB	MULTI BOLE	VP	VENT PIPE
CT	CABLE TELEVISION IC	MH	MANHOLE	WI	WIRE MESH
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