
Development at Lady Ann Road Soothill Batley

Flood Risk Assessment

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ABBREVIATIONS

AEP:	Annual exceedance probability
AOD:	Above Ordnance Datum
CCA:	Climate change allowance
FFL:	Finished floor level
FRA:	Flood risk assessment
PPG:	Planning Practice Guidance
REFH2:	Revitalised flood hydrograph model version 2.3
SFRA:	Strategic Flood Risk Assessment

1.0 INTRODUCTION

- 1.1. JOC Consultants Ltd is instructed by C. Noble Building and Civil Engineering Contractors (the Client), to prepare a site specific flood risk assessment (FRA) for a proposed housing development at Lady Ann Road, Soothill, Batley. The development is the subject of a planning application to Kirklees MBC. The planning application number is 2020/93071.
- 1.2. Changes to the text in this report since the previous revision are highlighted in grey for ease of reference.
- 1.3. Following the submission of revision 03 of this report, there has been further consultation with the Environment Agency in order to clarify various technical matters. A video meeting was held on 14th July 2021 at which it was agreed that a further revision of this FRA would be submitted in order to clarify and resolve the outstanding concerns of the Environment Agency. The notes of the meeting are provided in Appendix A.
- 1.4. References in this report to “the site” are references to the site to which the planning application applies. Specific references to sources of information used in the report are shown in square brackets and are listed in section 9. Figures 1 to 5 are presented immediately following page 23 and the appendices follow thereafter.
- 1.5. This report is prepared specifically for the Client for the purpose of the aforementioned planning application and the report may not be used for any purpose other than for the purpose for which it was commissioned, and it may not be assigned to any third party without our written permission.
- 1.6. In the preparation of this FRA, JOC Consultants Ltd has relied on information provided to us by statutory authorities and by the Client and accepts no liability for its accuracy or adequacy or for the consequences of any changes to or re-assessment of this data in the future.

2.0 OBJECTIVES

- 2.1. The objectives of this flood risk assessment are to:
 1. establish whether the proposed development is likely to be affected by current or future flooding from any source;
 2. establish whether the proposed development will increase flood risk elsewhere; and

3. recommend, as appropriate, measures for managing flood risk.

3.0 PLANNING POLICY ON FLOOD RISK

3.1 National Policy

- 3.1.1. National Planning Policy in relation to flood risk is set out in the National Planning Policy Framework (NPPF) [1].

3.2 Local Policy

- 3.2.1. Local policy is defined in the Kirklees Local Plan Strategy and Policies Document, adopted in February 2019 [2]. Policy LP 27 sets out the Council's policy on flood risk.
- 3.2.2. Local policy on development and flood risk is informed by the Calder Catchment SFRA [3]. Reference to the SFRA is made in subsequent sections of this report.
- 3.2.3. Policy LP 27 states that proposals within flood zone 3ai will be assessed in accordance with national policies relating to flood zone 3a but no new highly vulnerable or more vulnerable uses will be permitted. Flood zone 3ai is defined in the SFRA as:

'developed land within Flood Zone 3b where water would flow or be stored in times of flooding if not already constrained by development.'

- 3.2.4. More vulnerable development in flood zone 3a is not contrary to Policy LP 27, provided it passes the Sequential Test and Exception Test.

3.3 Planning Practice Guidance

- 3.3.1. In addition to national and local policy, the Planning Practice Guidance for Flood Risk and Coastal Change [4] provides advice to planning authorities to assist them when considering planning applications in areas at risk of flooding. The Environment Agency Standing Advice [5] also provides guidance to assist local planning authorities when considering planning applications in areas at risk of flooding.
- 3.3.2. This report has been prepared with reference to the Planning Practice Guidance and the Standing Advice.

4.0 LOCATION AND DESCRIPTION OF THE SITE

- 4.1. The site is situated in the Soothill area of Batley between Primrose Hill and Lady Ann Road, as shown outlined in red in Figure 1. The NGR coordinates at the approximate centre of the site are approximately 424980E, 424575N. The area of the site within the red line boundary in Figure 1 is approximately 3.23ha.
- 4.2. Access to the site is from Lady Ann Road.
- 4.3. The site is currently vacant land with a natural permeable surface. The topographical survey shows the land to slope steeply from west to east, having a gradient of approximately 1 in 7 and there are also secondary gradients towards the north-east and south-east. Ground levels in the range 71.40m to 57.09m AOD. The topographical survey plans are provided in [Appendix B](#).
- 4.4. At the north end of the site there is a raised earth bund, which is evident on the topographical survey plan. It is not clear when or why this was constructed.
- 4.5. The British Geological Survey database [6] shows:
- Superficial geology: None recorded;
 - Bedrock: Thornhill Rock – Sandstone.
- 4.6. The site is not within an Environment Agency Flood Warning Area.
- 4.7. Howley Beck flows south, adjacent to the eastern boundary of the site. The beck is an Ordinary Watercourse until it emerges at the west side of the railway culvert, south of the site, at which point it becomes a Main River. The site is not therefore, within 20m of a Main River.
- 4.8. The site is allocated for housing under reference HS74. The allocation details states:
- 'No residential development to take place in flood zone 3'*
- 4.9. This statement goes beyond what is stated in Policy LP 27, which precludes more vulnerable development only in flood zone 3ai.

5.0 THE PROPOSED DEVELOPMENT

- 5.1. A development of 71 houses is proposed, as shown on the site layout plan and the Constraints Site Plan in Appendix C. Proposed finished ground floor levels are shown on the Constraints Site Plan (in mm above ordnance datum).
- 5.2. Most of the development is within flood zone 1 but 15 housing plots are in flood zone 3 and 4 plots are in flood zone 2. Following development however, all plots will effectively be in flood zone 1, insofar as the annual probability of fluvial flooding will be reduced to less than 0.1%.
- 5.3. The development is classified as **More Vulnerable** in accordance with Table 2 of the NPPF Technical Guidance.
- 5.4. In addition to the housing, the development also includes landscaping works to improve habitat in the floodplain area. This includes the collection of water from an existing spring into the drainage system for the development and discharging it to a swale (described on the Constraints Site Plan as a 'new watercourse') in the wetland area in order to improve the habitat for water voles. The swale discharges to Howley Beck approximately opposite plot 63. The effect of this on flood risk is discussed in section 6.6.
- 5.5. It is also proposed to remove the raised earth bund as part of the site re-profiling works for the development.

6.0 FLOOD RISK

6.1 Assessment methodology

- 6.1.1. The risk of flooding to the development and the effect of the development on flood risk elsewhere has been assessed against the Design Flood, as defined in PPG paragraph 054 [4], taking into account existing flood defences.
- 6.1.2. Events which exceed the Design Flood and breach events are assessed as residual risks.

6.2 Flood data

- 6.2.1. Current flood data was requested from the Environment Agency and was received on 2nd July and 27th July 2020. Relevant extracts from the data are provided in [Appendix D](#).

6.3 Existing flood defences

- 6.3.1. There are no flood defences on Howley Beck upstream of the railway.

6.4 History of Flooding

- 6.4.1. The Environment Agency Flood History Map shows the site to have been unaffected by the flood event of November 2019 and the Environment Agency has no records of flooding at the site.

6.5 Risk to the development from fluvial flooding

- 6.5.1. The Calder Catchment SFRA Map EE confirms that no part of the site is in the Functional Floodplain, flood zone 3b.
- 6.5.2. The online Flood Map for Planning shows the extent of flooding associated with Howley Beck. It is evident from this map that overland flow progresses from the north and develops into two distinct streams when it crosses the northern boundary. The main stream follows the course of Howley Beck, but a separate stream crosses the northern boundary further to the west and flows overland through the northern part of the site. This is caused by restricted capacity in the watercourse where it flows beneath the lane adjacent to the northern boundary of the site. Water levels upstream of the lane will rise when the flow rate exceeds the capacity under the bridge and there will be flooding which spills over into the lane and enters the site. Examination of the topographical survey plan suggests that this occurs where the ground level is approximately 61.6m AOD.
- 6.5.3. This western flow path is prevented from immediately returning to the main channel of Howley Beck by a raised earth bund parallel to the beck, but this tapers out further south, allowing the overland flow to return to the beck.
- 6.5.4. The Environment Agency has provided flood data from its Batley Beck Model Study 2015, which is the most recent available data. Howley Beck was modelled past the site at 5 node points which are shown on the Node Point Map in Appendix D.
- 6.5.5. The 1% AEP and 0.1% AEP flood levels (representing the limits of flood zones 1 and 2 respectively) were compared at each node with the adjacent ground levels, or 'threshold levels', which would need to be exceeded by the flood before it could enter the site. This comparison is shown in Table 6.1 below.

Node	Threshold level m AOD	1% AEP flood level m AOD	Depth at overtopping m	0.1% AEP flood level m AOD	Depth at overtopping m
0846	61.00	61.06	0.06	61.15	0.15
0838	61.20	60.99	0.00	61.11	0.00
0837	61.00	60.81	0.00	61.01	0.01
0680	58.94	59.11	0.17	59.21	0.27
0424	57.20	56.23	0.00	57.66	0.46

- 6.5.6. It is evident from Table 6.1 that direct fluvial flooding of the site in its existing condition occurs only at nodes 0846 and 0680 in the 1% AEP event, and at these nodes plus nodes 0837 and 0424 in the 0.1% AEP event. It is of course possible that there may be some ingress into the site at points between nodes if there are low spots, but the data verifies that the flooding in the northern part of the site is shallow overland flow, from ingress at the northern boundary and at node 0846 which is approximately 80m south of the northern boundary.
- 6.5.7. The modelled flood depth maps in Appendix D indicate the separate overland flow path at the northern end of the site to have a depth in the range 0.0m to 0.25m in a 1% AEP event. This does not imply that a depth of 0.25m was achieved; it is merely a range within which the modelled depth occurs. At the northern limit of the site, the depth is likely to be just above 0.0m but it increases to around 170mm at the point where the eastern boundary turns due east.
- 6.5.8. The overlay of the site layout plan on the flood map is provided in **Appendix E**. This identifies the housing plots in flood zones 2 and 3, as shown in Table 6.2 below.

Table 6.2: Identification of plots in flood zones 2 and 3				
	Flood Zone 2	Total in Flood Zone 2	Flood Zone 3	Total in Flood Zone 3
Plot numbers	(48 to 49)*	2	36 to 45	10
	(63 to 64)*	2	(46 to 47)*	2
			50*	1
			(70 to 71)*	2
Totals:		4		15

* gardens only.

6.5.9. It is important to emphasise that the above assessment applies to the site in its *existing condition*. Following development, finished ground levels will exceed the 0.1% AEP flood level, as stated in paragraph 5.2 and indicated on the constraints site plan in [Appendix C](#).

6.6 Effect of the development on fluvial flood risk

6.6.1. Raising ground levels will obstruct the existing flood flow path which crosses the northern boundary and flows through the site. It will also result in a loss of floodplain storage. In order to assess the effect of the development on floodplain storage, the storage volume was calculated between eight cross sections across the site for the existing and proposed ground profiles. The cross sections were located between the northern boundary of the site and plot 71. The development to the south of plot 71 is in flood zone 1 and therefore there is no loss of floodplain in this area.

6.6.2. The cross sections were spaced at intervals of 25.0m and the mean of the cross sectional areas upstream and downstream was used to compute the volume between sections. The calculations [include](#) the floodplain volume in the overland flow path to the west of the [raised bund](#) which separates the flow path from the Howley Beck channel.

6.6.3. The original topographical survey was unable to determine ground levels in the northern part of the site where the vegetation was too dense to penetrate. LiDAR data was therefore used on a 1.0m grid, in order to provide sufficient ground level data for the purposes of this FRA.

- 6.6.4. The cross sections plan is provided in Appendix F and a comparison of the existing and post-development conditions is shown in Appendix G. The updated floodplain volume calculations are provided in Appendix H.
- 6.6.5. The calculations show that the development as proposed will result in a net loss of floodplain volume in the 1% AEP_50% CCA event¹ amounting to approximately 437m³. Mitigation of this loss can be achieved by reducing ground levels between the development and Howley Beck as indicated on the cross sections in Appendix G. This will result in a net gain in floodplain volume of approximately 62m³ as shown in the table in Appendix H.
- 6.6.6. The routing of the flow from the existing spring through the wetland area will have no effect on flood risk. The spring water currently flows into Howley Beck and there will not therefore, be any increase in the flow entering the beck from this source. The flow rate will in fact be attenuated as it passes through the piped drainage system upstream of the wetland. The Environment Agency states at section 4 of its notes of the video meeting on 14th July 2021, that:
- 'The FRA needs to demonstrate through calculations (and possibly modelling work) as per our last response that this does not alter the existing fluvial risk.'*
- 6.6.7. This requirement is clearly unnecessary. The flow from the existing spring enters Howley Beck approximately in the vicinity of cross section 6 near to plot 49. The proposal to convey the flow in a swale to a point source discharge opposite plot 63, downstream of cross section 8, where the floodplain is wider than at cross section 6, will obviously not increase flood risk. There will be no increase in the flow rate; it will in fact be attenuated; and transferring the point source input to a location where there is an increase width of floodplain will, if anything, have a beneficial effect on flood risk.
- 6.6.8. Removing the raised bund will restore the natural floodplain and will allow overland flow to follow its natural route to Howley Beck. It will also remove the obstacle to fluvial overspill at the north end of the site which currently prevents it from returning to the beck immediately downstream of the bridge at the northern boundary. The re-profiling of the site will create increased cross sectional area, as shown in the cross sections in Appendix G and this will ensure there will be no adverse effect to Howley Beck or increase in flood risk elsewhere.

¹ Climate change allowances in the Aire and Calder management catchment were reduced in the guidance updated on 27th July 2021, but calculations had already been prepared for the more onerous condition of a 50% CCA.

6.7 Risk of surface water flooding

Risk to the site in its existing condition

- 6.7.1. The Updated Surface Water Flood Map (see Appendix I), shows most of the site to be at a very low risk, but a high risk of surface water flooding is indicated in the eastern margin of the southern half of the site. Some isolated flooding also occurs in the northern part of the site. The likelihood of flooding in these areas is greater than once in 30 years and depths are mainly indicated to be in the range 300mm to 900mm. In the south east part of the site however, depths exceeding 900mm are indicated.
- 6.7.2. For rainfall events occurring on average between once in 30 years and once in 100 years, the extent of deep water flooding increases towards the north and west and in events occurring less than once in 100 years, depths exceeding 900mm are indicated along the eastern margin of the southern half of the site which, at the south, occupies the full width of the site. Approximately halfway between the northern and southern extents of the site, deep water flooding, exceeding 900mm is indicated to occupy approximately one third of the width of the site and the limit of the low risk flooding, where the depth is 0.0m, occurs approximately half way across the site.
- 6.7.3. Comparison of the surface water flood depth map with the topographical survey suggests that the deep water flooding which exceeds 900mm depth reaches the 59.0m contour. The limit of the low risk flooding approximately reaches the 60.0m contour. Following development however, surface water runoff will be managed in the drainage system for the development and in overland flow routes which will ensure that the houses are not at risk of flooding from surface water.

Effect of the proposed development on rapid-response run-off

- 6.7.4. Within the gross site area there will be undeveloped open space amounting to approximately 0.42ha, so the developed area is approximately 2.81ha. For the purposes of this FRA it is assumed that 50% of the developed area will have an impervious surface.
- 6.7.5. Surface water runoff rates and volumes have been estimated using the REFH2 model and FEH point data for the site and the results are provided in Appendix J.
- 6.7.6. The results show that the development will increase surface water runoff rates and volumes by an average of 62% and 57% respectively.

6.7 Risk of sewer flooding

- 6.8.1. There is a sewer easement shown on the constraints site plan in Appendix C, but there would be no risk of flooding from this source following development, due to the raised ground levels within the development.
- 6.8.2. The sewers for the new development may surcharge in rare events but any exceedance flows will be managed in the overland flow routes to which reference is made in paragraph 6.7.3 above.

6.8 Risk of groundwater flooding

- 6.9.1. Groundwater flooding occurs when the water table rises above the ground surface or enters basements. It is typically associated with highly permeable rock such as chalk and highly fissured limestone, but these conditions are not present at the site. At times of high saturation within the soil mass however, there could be some emergence of sub-surface water in the low lying ground at times when Howley Beck is at a high level. This is unlikely to affect the site following development which will be on raised ground in the lower parts of the site.

6.9 Risk of flooding from reservoirs and canals

- 6.10.1. The Environment Agency flood map for reservoirs shows the site is not within an area at risk from the uncontrolled release of water from reservoirs and the site is not at risk of flooding from canals.

6.10 Effects of climate change

- 6.11.1. The effects of climate change must be assessed over the lifetime of the development which, for residential development, a minimum of 100 years is recommended in paragraph 026 of the Planning Practice Guidance.
- 6.11.2. For the purposes of this assessment, climate change effects are considered up to the year 2120. Current guidance on climate change, updated on 27th July 2021, [7] provides the anticipated changes to peak river flow and rainfall intensity for different scenarios of carbon dioxide emissions over future epochs up to the 2080s. Climate change allowances are provided for each management catchment within the relevant river basin district in England.

Peak river flow allowances

6.11.3. For 'more vulnerable' developments in flood zones 2 or 3a, the central climate change allowance is recommended which, for the Aire and Calder management catchment is 23%. The Environment Agency has agreed that, for the purposes of this FRA, it is acceptable for the previous allowances of 30% and 50% to continue to be used in order to avoid unnecessary further re-calculation.

6.11.4. Climate change effects have been considered at each model node between 1085 and 0424 inclusive.

6.11.5. The Environment Agency data includes a 20% CCA on the 1% AEP flow rates and it is presumed that this was applied to the input hydrograph in the model at the upstream boundary. The flow rate will be attenuated as it passes downstream if there has been overtopping into the floodplain upstream, which may explain why the flow rates at the nodes increase by less than 20%. In order to estimate the effects of climate change when the allowances of 30% and 50% are applied, the flow rates are increased, pro-rata, based on the data at the respective nodes and the respective flood levels are determined from Figures 2 to 5. The results are shown in Table 6.3 and in Appendix K.

6.11.6. At node 0846, climate change effects are estimated to increase the 1% AEP flood level within the range 61.08m to 61.14m AOD, compared with the modelled level of 61.02m AOD. Flood levels are therefore estimated to increase by 60mm to 120mm based on the previous guidance.

Table 6.3: Effects of climate change allowances on flood levels				
Model Node	1% AEP level	1% AEP level 30% CCA	1% AEP level 50% CCA	1% AEP level 65% CCA
	m AOD			
1085	62.85	62.92	62.97	62.99
0846	61.02	61.08	61.12	61.14
0680	59.11	59.16	59.20	59.22
0424	56.23	56.80	57.10	57.40

6.11.7. At node 0680, climate change effects are estimated to increase the 1% AEP flood level within the range 59.16m to 59.22m AOD, compared with the modelled level of 59.11m AOD.

Flood levels are therefore estimated to increase by 50mm to 110mm based on the previous climate change allowances. It is worth noting that, in the most extreme climate change scenario of 65% CCA, the flood level exceeds the predicted 0.1% AEP flood level which is 59.21m AOD. The updated guidance for the Aire and Calder management catchment demonstrates that this was a gross over-estimate of potential climate change effects.

- 6.11.8. At node 0424, climate change effects are estimated to increase the 1% AEP flood level within the range 56.80m to 57.40m AOD, compared with the modelled level of 56.23m AOD. Flood levels are therefore estimated to increase by 570mm to 1170mm based on current climate change allowances.

Peak rainfall intensity

- 6.11.9. Current climate change guidance requires the Central and Upper End allowances to be used when assessing the effects of increases to peak rainfall intensities. The allowances apply across the whole of England and are shown in Table 6.4 for the period 2070 to 2115.

Allowance Category	Climate change effect
Central	20%
Upper end	40%

- 6.11.10. The REFH2 results in Appendix J show the 1% AEP peak runoff rates to increase in the range 76.69 l/s to 89.96 l/s, based on the above climate change allowances. The runoff volumes are in the range 962.70m³/s to 1,133.92m³/s.

- 6.11.11. The effects of climate change on surface water run-off should be taken into account in the detailed design of the drainage system for the development.

7.1 FLOOD RISK MANAGEMENT

7.1 Fluvial flood risk

- 7.1.1. Current Environment Agency Standing Advice states:

'Ground floor levels should be a minimum of whichever is higher of:

- 300 millimetres (mm) above the general ground level of the site
- 600mm above the estimated river or sea flood level.'

7.1.2. The Standing Advice also states:

'If you cannot raise floor levels above the estimated flood level, you need to consider extra flood resistance and resilience measures' and

'The estimated flood level is:

- a river flood level with a 1 in 100 or greater annual probability
- the tidal flood level with a 1 in 200 or greater annual probability
- plus an allowance for climate change.'

7.1.3. The estimated flood levels at each property are based on the modelled flood level at the upstream node and the distance downstream multiplied by the water surface gradient. The water surface gradient differs according to the event under consideration, as shown in Table L1 in Appendix L.

7.1.4. The interpolated flood levels at the dwellings adjacent to Howley Beck are shown in Table L2 in Appendix L, from which it is evident that the proposed FFL at all but plot numbers 36 to 40 have at least 600mm freeboard above the 1% AEP flood level including 30% CCA.

7.1.5. At plot numbers 36 to 40, the FFL needs to be increased by between 460mm and 20mm, as shown in Table L2.

7.1.6. In order to minimise the risk of obstruction caused by floating debris at the road bridge across Howley Beck, it is recommended that the soffit of the bridge is at least 600mm above the 1% AEP_30% CCA flood level which Table L2 shows to be 58.24m AOD. The soffit level of the bridge should therefore be at least 58.84m AOD in order to achieve 600mm of freeboard.

7.1.7. The residual risk of a 50% CCA is discussed in section 7.5 below.

7.2 Surface water flood risk

- 7.2.1. Provision needs to be made to accommodate the overland flow path through the development. This could be achieved by creating a designed route, such as the main spine road, to convey the surface water safely through the developed site.
- 7.2.2. The Building Regulations require surface water to be discharged according to the following preference hierarchy:
1. to ground by infiltration; or
 2. to a watercourse; or
 3. to a sewer, if options (1) and (2) are not reasonably practicable.
- 7.2.3. The underlying geology suggests that infiltration drainage may be feasible but, given the slope of the site, the risk of sub-surface water emerging further down the hill must be considered. Should this limit the use of infiltration drainage, surface water should be discharged to Howley Beck at a controlled rate not exceeding the mean annual greenfield runoff rate (Q_{bar}). From the REFH2 results, Q_{bar} is estimated to be 13.88 l/s, as shown in Appendix J.
- 7.2.4. The volume of runoff discharged from the site in a 1% AEP event should not exceed the greenfield runoff volume in the same event. This is usually achieved if the discharge rate is limited to 2 l/s per ha. As the site area is 3.23ha, the discharge rate may need to be limited to 6.5 l/s in order to achieve the required volume control.
- 7.2.5. Attenuation storage will be required and the form that this takes will need to be determined in the detailed design of the drainage system. The preliminary estimate of storage, assuming a discharge rate of 6.5 l/s is approximately 1,052m³ based on the REFH2 results. As a comparison, the UK SuDS storage estimate is 1,062m³.
- 7.2.6. It is recommended that a detailed drainage design is prepared for the development to ensure:
- no surface water flooding resulting from a rainfall event having an A.E.P. of 33% (1 in 30 years);
 - only “tolerable” flooding resulting from a rainfall event having an A.E.P. of 1% (1 in 100 years); and

- no increase in off-site flood risk. This will be achieved by complying with the technical standards for sustainable drainage.

7.2.7. Tolerable" flooding is flooding to a depth that does not result in flooding of buildings and which does not prevent safe access and egress to and from the site.

7.3 Sewer flooding risk

7.3.1. No flood risk management measures are necessary in respect of sewer flooding.

7.4 Groundwater flood risk

7.4.1. No flood risk management measures are necessary in respect of groundwater flooding.

7.5 Residual risks

7.5.1. Appendix L, Table L2 shows that a 50% CCA applied to the 1% AEP flood level would reduce the freeboard, based on the required FFL, to between 0.46m and 0.56m, depending on the location of the dwellings. This is considered to be acceptable for the 90th percentile flood level.

7.5.2. In a 0.1% AEP event, the freeboard, based on the required FFL, would be in the range 0.28m to 0.55m.

7.6 Safe access and egress

7.6.1. The recommended finished floor levels in Appendix L Table L2 demonstrate that dry access to the houses will be possible in all flood events, up to and including the 0.1% AEP event.

7.6.2. It is evident from the cross sections plan in Appendix F and the cross sections in Appendix G that the spine road through the development, to the west of plots 36 to 62 will be on high ground, well above the 1% AEP_50% CCA flood level. There will therefore dry access to the spine road.

7.6.3. The access road and private drive serving plots 71 to 63 runs along the edge of the outlines of flood zones 2 and 3. Table 7.1 shows the flood levels and the flood zones at locations along this road.

Plot No	Easting	Northing	GL m AOD	1%AEP 50%CCA mAOD	Freeboard	1%AEP 30%CCA mAOD	Freeboard	Flood Zone
71	425024	424572	59.18	59.07	0.11	59.01	0.17	3
69	425026	424561	58.92	58.94	-0.02	58.86	0.06	3
68	425027	424552	59.14	58.87	0.27	58.78	0.36	2
67	425028	424542	59.49	58.80	0.69	58.71	0.78	1
65	425030	424524	59.63	58.68	0.95	58.57	1.06	1
63	425038	424503	59.90	58.51	1.39	58.37	1.53	2

7.6.4. Although there is an apparent depth of 20mm opposite plot 69 in the 1% AEP_50% CCA event, it is evident from Table 7.1 that dry access is possible in the 1% AEP_30% CCA event, which of course exceeds the current recommendation for a 23% CCA.

7.6.5. It is also evident from Table 7.1 that, although the road opposite plots 71 to 69 is in flood zone 3, the modelled 30% CCA flood level is lower than the existing ground level, so there would be no loss of floodplain storage. This also is true opposite plots 68 and 63 where the road is in flood zone 2. Constructing the access road serving plots 71 to 63 would not therefore result in any loss of floodplain storage.

7.6.6. It is recommended that where the freeboard above the 1% AEP_30% CCA flood level shown in Table 7.1 is less than 0.30m, the finished road level should be constructed to achieve a freeboard of at least 0.30m.

8.0 CONCLUSIONS AND RECOMMENDATIONS

8.1 Conclusions

8.1.1. The development is classified as More Vulnerable major development. It is not within 20m of a Main River.

8.1.2. Most of the development of 71 dwellings is in flood zone 1, but 4 plots are in flood zone 2 and 15 plots are in flood zone 3. As it is proposed to raise ground levels in order to achieve the required finished floor levels, the annual probability of fluvial flooding would be reduced

to less than 0.1%. The annual probability of fluvial flooding would then be reduced to less than 0.1%.

- 8.1.3. The risk of fluvial flooding is from Howley Beck which enters the site at the northern and eastern boundaries. This results in overland flow towards the south of the site. Existing ground levels are generally above the estimated 1% AEP flood levels except at the northern end of the site between plot numbers 36 and 44 where overland flow occurs. This flow is prevented from returning to the beck by a raised earth bund in the northern part of the site. Removal of this bund will restore natural flow paths and will have no adverse effect on Howley Beck or on flood risk elsewhere.
- 8.1.4. The site has no recorded history of flooding, but given the proximity of Howley Beck and the topography, it is likely that there will have been flooding in the low lying eastern margin at several times in the past.
- 8.1.5. The site is at a generally very low risk of surface water flooding but there is a high risk in the eastern margin of the site and an overland flow path develops which reflects the path taken by fluvial flooding. This risk will be mitigated following development, by managing surface water in the drainage system and in safe exceedance flow paths through the site.
- 8.1.6. There is no risk to the site from the uncontrolled release of water from reservoirs or from canals and the risk from sewer flooding is low. There is a potential risk of groundwater emergence in the low lying parts of the site, but only when water levels in Howley Beck are high as, at other times, the beck will draw down the sub-surface water. This risk will be mitigated by the proposed raising of ground levels.
- 8.1.7. The development will result in a net gain in floodplain storage of approximately 62m³ based on the 1% AEP_50%CCA flood level. The current climate change guidance however is an allowance of 23%, so the proposed floodplain compensation will in fact result in a greater net gain in floodplain storage.
- 8.1.8. Conveying water from the existing spring through the drainage system for the development and into a swale which discharges to Howley Beck will attenuate peak flow rates and will improve the wetland habitat adjacent to Howley Beck. This will have no adverse effect on flood risk as there will be no increase in peak flow rates and the point of discharge to Howley Beck is at a location where there is a greater width of floodplain, compared with the existing location.

8.1.9. The development is estimated to increase surface water runoff rates and volumes, on average, by 62% and 57% respectively.

8.1.10. The effects of climate change have been assessed using the previous recommended allowances in the range 30% to 65%. The effects are most pronounced at the southern end of the site where the 1% AEP flood level is estimated to increase in the range 570mm to 1170mm.

8.1.11. The recommended flood risk management measures in section 7.0 of this report will ensure that dry access to the development will be possible in the design flood event and will minimise the risk of flooding to the development.

8.2 Recommendations

8.2.1. It is recommended that the flood risk management measures proposed in section 7.0 of this report are implemented in the design and construction of the development.

8.2.2. It is recommended that a sustainable surface water drainage scheme is prepared for the development and submitted to Kirklees MBC and Yorkshire Water for approval, prior to construction.

9.0 REFERENCES

1. National Planning Policy Framework. Department for Communities and Local Government. February 2019.
2. Kirklees Local Plan: Strategy and Policies - Adopted 27th February 2019.
3. Calder Catchment Strategic Flood Risk Assessment. July 2016.
4. Planning Practice Guidance: Flood Risk and Coastal Change. Updated 15th April 2015. Department for Communities and Local Government.
5. Environment Agency Standing Advice to local planning authorities. April 2015.
6. British Geological Survey Geology of Britain database.
7. Flood risk assessments: climate change allowances. Environment Agency, 19th February 2016, updated 27th July 2021.

Figure 2: Flow rate -v- flood level at HOW_1085

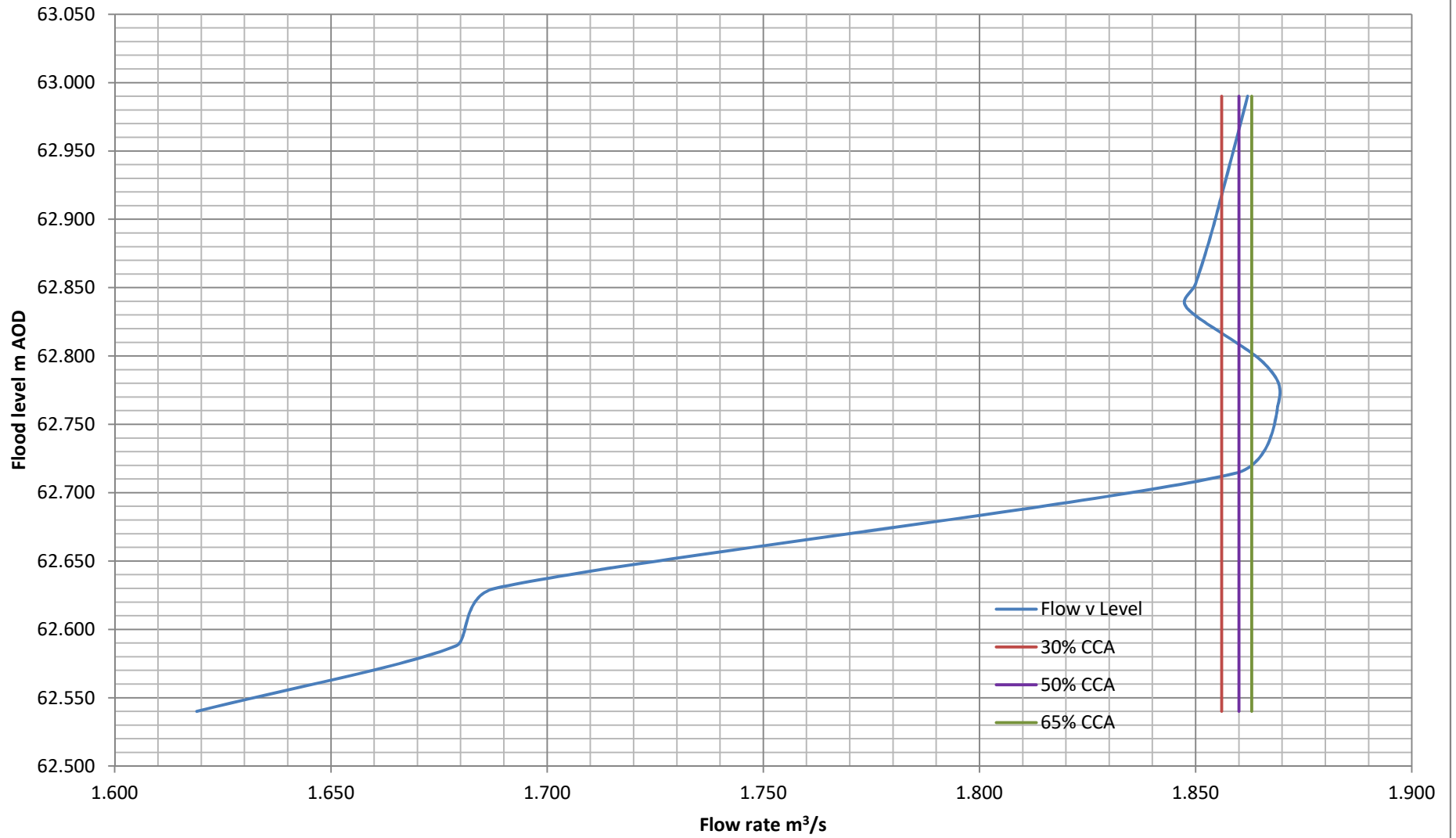


Figure 3: Flow rate -v- flood level at HOW_0846

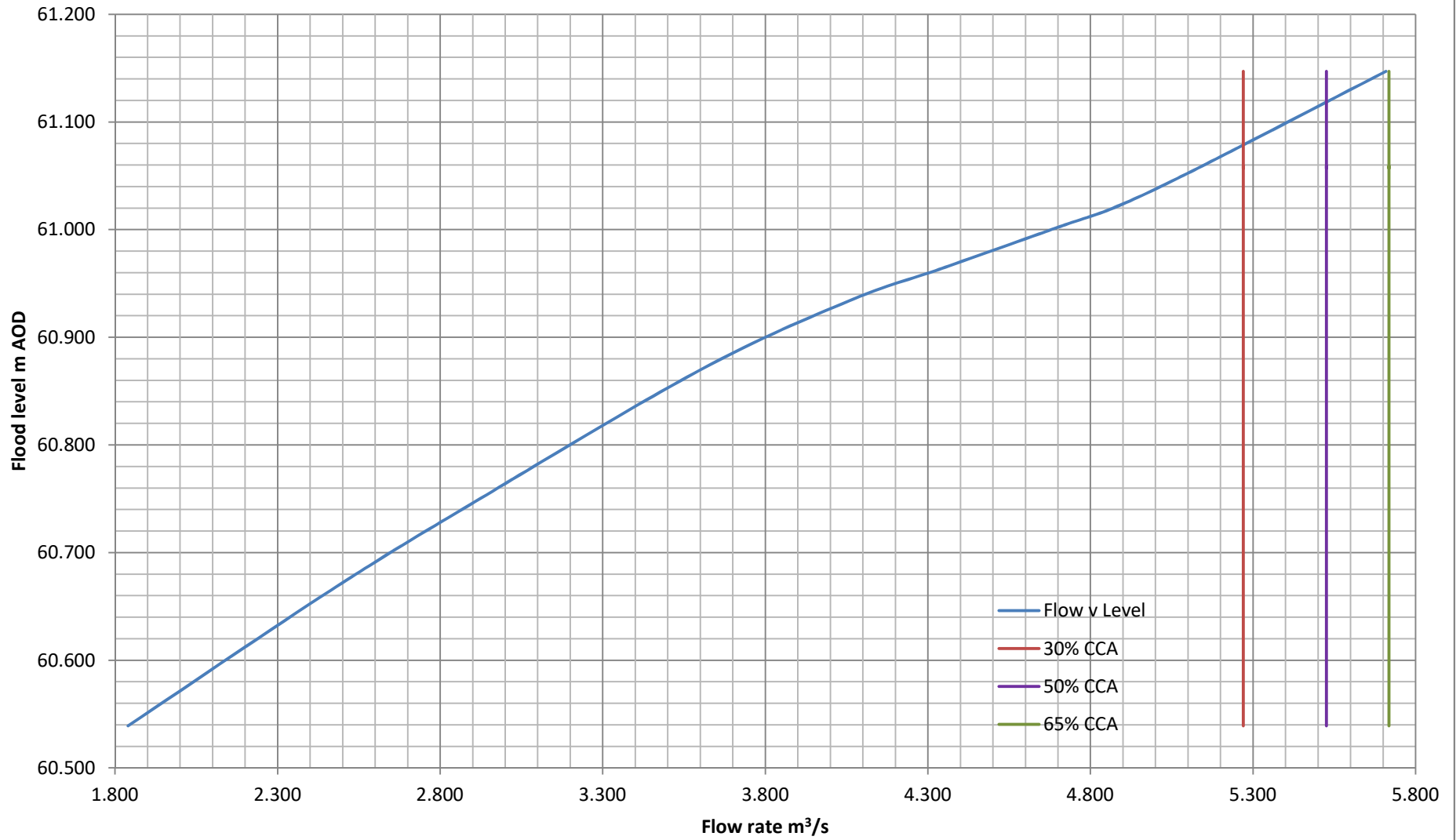


Figure 4: Flow rate -v- flood level at HOW_0680

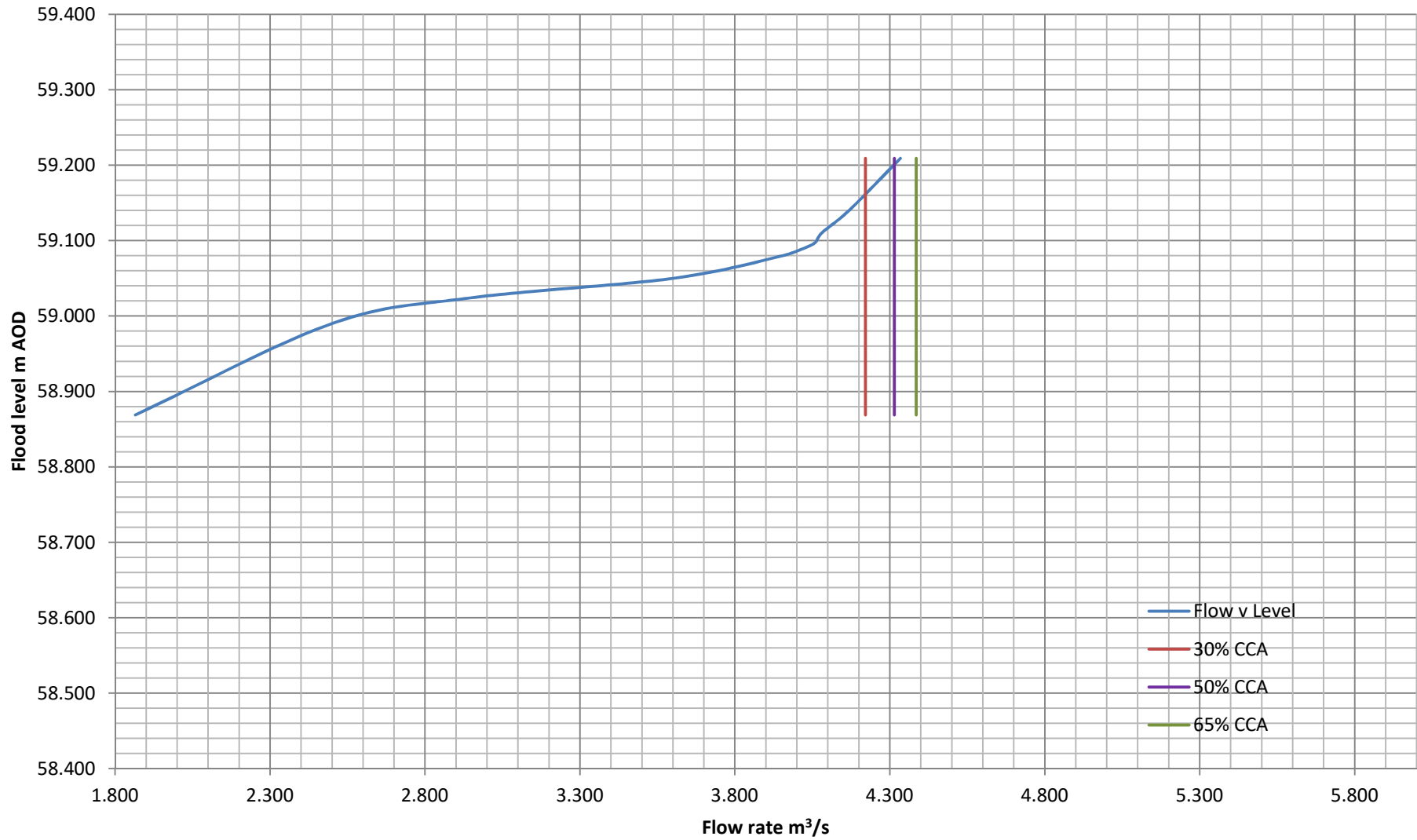
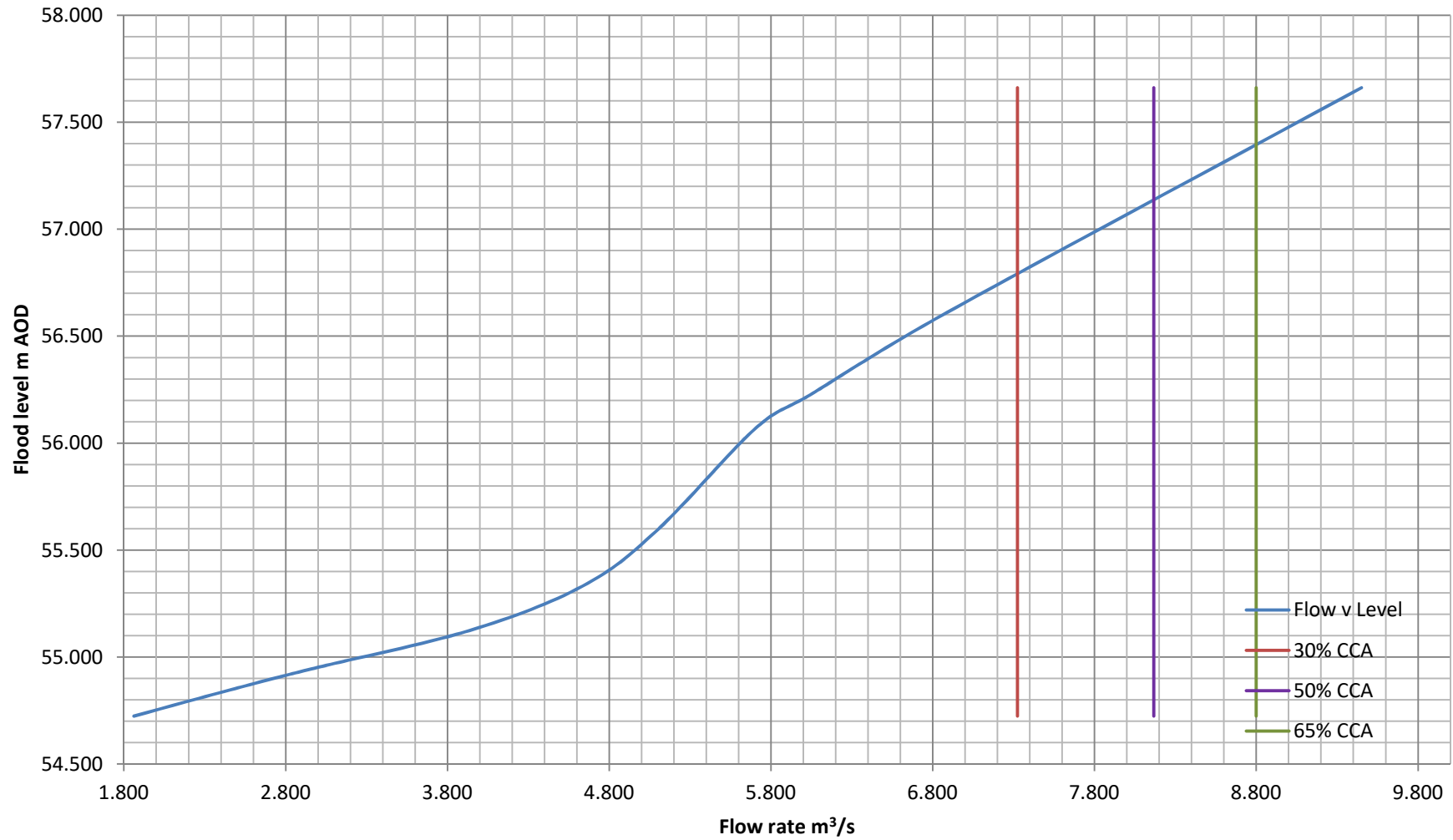


Figure 5: Flow rate -v- flood level at HOW_0424



APPENDIX A

Notes of meeting with the Environment Agency on 14th July 2021

NOTES OF VIRUTAL MEETING HELD ON 14/07/2021 AT 10:00

Attendees

Bev Lambert – Environment Agency Planning Advisor
Karen Robson – Environment Agency Flood Risk Advisor
Chris noble – Managing Director D Noble Ltd
Chris Vause – Technical Director D Noble Ltd
John O'Connor – JOC Consultants
Oliver Hardiman – Self Architects
Paul Farndale – Kirklees LLFA

Purpose of meeting

To discuss outstanding flood risk matters raised by the Environment Agency in response to planning application 2020/93071 for Erection of 71 dwellings with associated works including new access off Lady Ann Road, regrading works and landscaping – Land At Lady Ann Road, Soothill, Batley, WF17 0PY

Key points/actions

1. Climate change

KR: New CC allowances for peak river flow are being published on 20 July 2021. Moving to more catchment specific allowances and confirmed for most developments only the central allowance will apply - Kirklees = 23%. Advised applicant may choose to amend the FRA based on the new allowance, or stick with what's already been assessed – could affect FFLs and comp storage.
JOC: Assessed CC at 50% which is more conservative, so will stick to that. We recommend the new climate change allowances are checked on or after the 20/07/21 on the Gov.UK website climate change allowances

KR queried levels in Appendix J as they didn't tally with figures shown in the FRA. JOC clarified this is due to distance from Node point. At 50% comp storage is marginally more than necessary which would increase if using 23%, so satisfied this is sufficient.

KR queried level for level comp storage and indicated as water rises out of the river compensatory storage needs to be at the same level and at the same time as the existing storage to ensure water is not displaced off site. Further information needed on the level calculations (slice by slice in a table) and the location of the flood storage. Not discussed in the meeting but it would be useful to have a contour map showing the 1% cc level mapped on the site and where compensatory storage is required based on this – **JOC confirmed figures are based on level for level and agreed to forward calculations/workings out.** However removal of the bund will mean that the proposed storage is not as existing as it will be improved. KR said the FRA needs to demonstrate removal of the bund doesn't lead to any transfer of risk off site in the design event.

2. Sequential approach to layout

EA flood map discussed – KR confirmed it's based on the 2015 Batley Beck model. Applicant can challenge the maps formally if they wish. It would be useful having a map showing the flood zones and properties overlaid.

BL questioned ST – confirmed this was done in 2019. PF more appropriate to

use sequential layout given flood zones don't affect the whole site.

3. Discussion regarding 'bund' on site – unclear why/when it was constructed. PF confirmed he's happy for the bund to be removed from a flood risk/drainage viewpoint (although there might be ecology implications).
4. Surface water overland flow route and new watercourse
JOC: the bund prevents flow getting into beck and forces it south until it can naturally get into the channel.

KR questioned impact of bridge on Howley Street as the FRA indicates this causes a separate stream at the northern part of the site. JOC confirmed it's a pinch point as not enough headroom for high flows – water forced over track onto site. Removing bund will allow the water into the floodplain on the site and allow it back into the beck channel. This should also prevent off-site impacts to others.

Overland flow route from spring discussed. EA concern was about creating new watercourse – this was on plan from an earlier architect drawing. PF not considering it as a new watercourse, more formalising a route for the spring water to flow to reach beck. KR: need to demonstrate in the FRA that channelling of the surface water won't impact on fluvial storage/flood risk. PF: routing it through drainage will provide a degree of attenuation and slow flow back to beck. This area is being used to create habitat for water voles previously recorded on site – CN creating an island within the water feature to provide safe haven for water vole from domestic pets.

Note: Although the responsibility of the surface water design sits with the LLFA, there needs to be a demonstration of no impact on fluvial flood risk in the FRA and no transfer of flood risk to others. The FRA needs to make clear what the modifications are planned alongside Howley Beck ie altering the existing flow route/creating a new flow path within flood zone 3 with an amended site plan. The FRA needs to demonstrate through calculations (and possibly modelling work) as per our last response that this does not alter the existing fluvial risk.

5. Safe access and egress
JOC explained safe access/egress to properties not an issue as raised floor levels and freeboard will mean they are dry. Will review access routes once final scheme design agreed. Discussion about access for emergency vehicles, and location of plots 63-70. PF & JOC to discuss separately. KR indicated the requirement for safe access and egress in our previous responses refers to the FFL and access roads up to the design level (1% cc). Compensatory storage would be needed for any loss of storage from creating raised roads as well as FFL.

Note: KR not discussed in the meeting but any bridges crossing Howley Beck in flood zones need to be above the 1% plus climate change plus 600mm to allow for debris flow to ensure no alteration of the fluvial flood risk or loss of flood storage in the design event.

6. Final points
Discussion about whether to challenge flood maps – decision is for the applicant. As per our previous response assessment of the flood risk in the FRA does not automatically change the flood zones. Therefore there could be implications on the sale of properties and insurance if properties are still in FZ3 on our maps. EA

to provide guidance on evidence review request (ERR) process.

Note: Flood Map challenges take place through the ERR process. If you would like further advice on options of when and how to do this for example pre or post development and timescales please contact our data and evidence team yorks.pso.d&e.advice@environment-agency.gov.uk

Based on discussion at the meeting JOC to submit a further revised FRA.

Meeting ended 14:00.

20/013: Lady Ann Road, Batley

JOC Consultants Ltd

Note of Teams Meeting on 14th July 2021: 10:00 to 12:00

Present:

Beverley Lambert – Environment Agency – Sustainable Places Team

Karen Robson – EA – PSO team

Chris Noble: MD of Noble Homes Ltd

Chris Vause : Technical Manager – Noble homes

Oliver Hardiman – Self Architects

John O'Connor – JOC Consultants

Paul Farndale – Kirklees LLFA

JOC outlined the outstanding issues in his email to Bev Lambert dated 6th July 2021.

Climate change

KR said new CCA guidance will be issued on 20/7/21. The appropriate CCA for Kirklees area will be 23%. This will apply to the Aire and Calder catchments. The Central allowance applies to all vulnerable developments.

Different CCAs will be appropriate for the Ouse and the Wharfe catchments.

JOC said the FRA had considered 30% and 50% CCAs for FFLs and the recent reassessment of floodplain compensation had assumed 50% as the worst case. KR was happy for us to proceed on this basis, or we could revise the calculations based on 23%.

Table in Appendix J

JOC explained that the flood levels at each property were based on the modelled level at the upstream node and the distance downstream multiplied by the water surface gradient. JOC to clarify this in the next revision of the FRA.

Table in Appendix F

JOC corrected a mis-statement in his email of 6/7/21: there is in fact no loss of FP csa d/s of CS8. JOC had accidentally read the figure from the adjacent column. KR accepted that further cross sections would not therefore be required.

New watercourse

There was a discussion about the flow of water from the spring. Paul Farndale agreed that this could be routed through the land drainage system for the development. JOC explained that this would not

increase off site flood risk as there would be some attenuation through the drainage system before the discharge to the beck. JOC to explain this in the next FRA revision.

JOC explained that the 'new watercourse' is in fact a depression in the floodplain specified by the ecologist in order to create improved water vole habitat. JOC to provide explanation in next FRA revision.

Access/egress

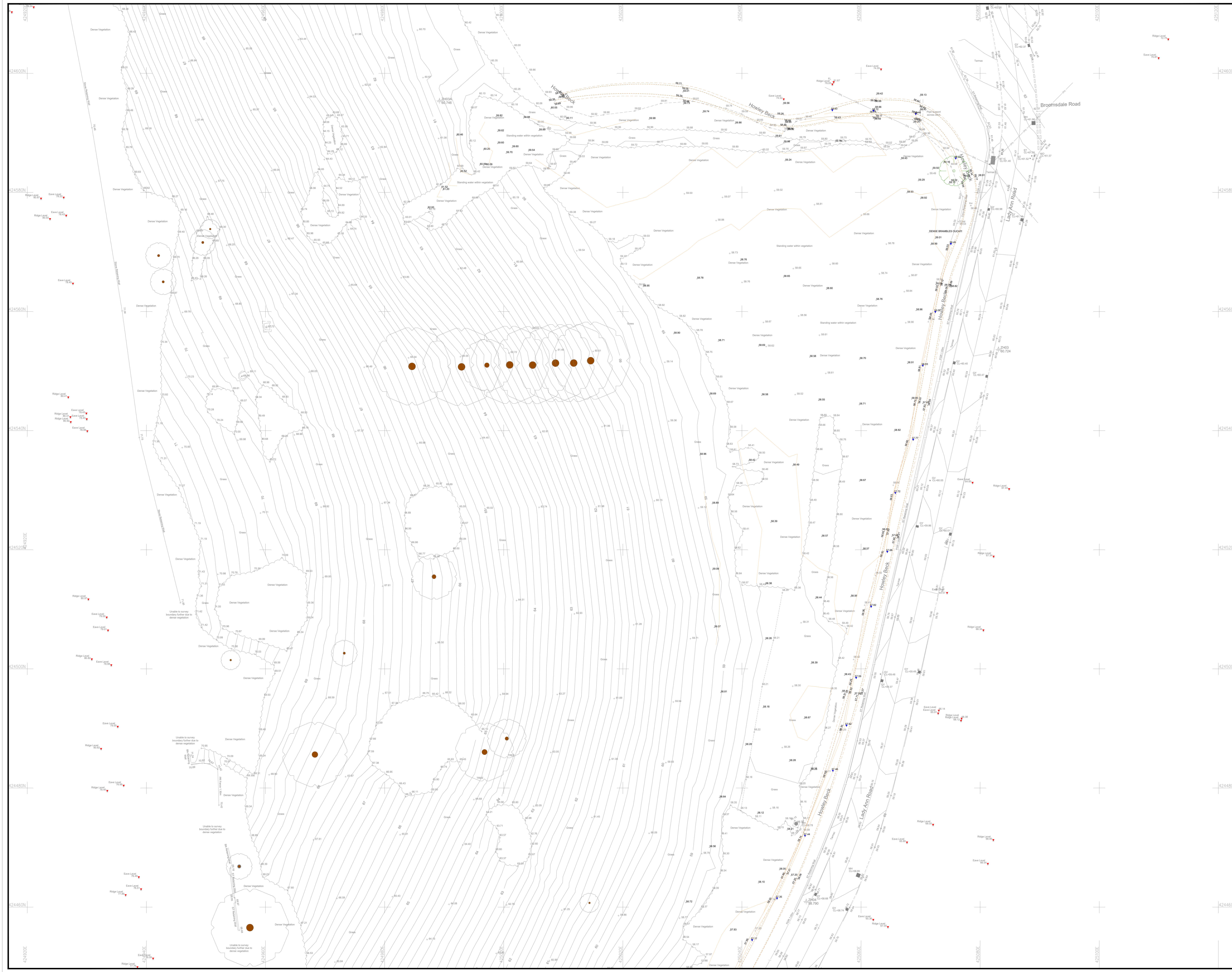
JOC explained the relative levels post development and showed that the road level would be above the 0.1% AEP flood level. KR was happy with this but requested that it be explained in the FRA (it already is!)

Plots 63 to 70 and the access road

JOC to discuss with Paul Farndale and to inform KR of outcome. PF is concerned that the access road is in FZ 3.

APPENDIX B

Topographical survey plan



↑
N
↓

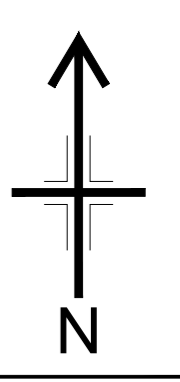
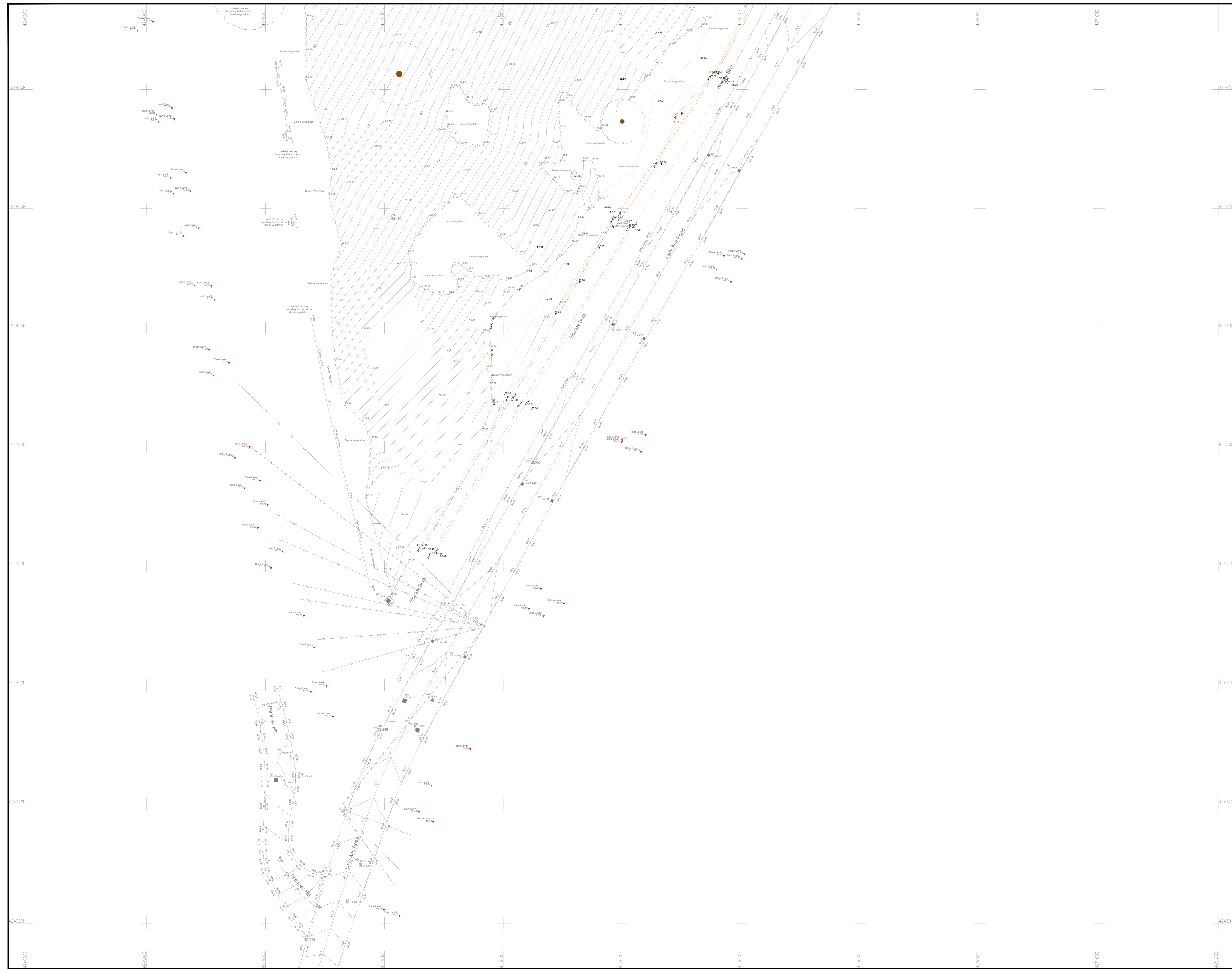
GRID: OS NATIONAL GRID
Using the OS GPS Network and applying OSTN15 Transformation and then removing the scale factor for true distances with a one-step transformation centred on ZH01
DATUM: OS LEVEL DATUM
Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections

- Topographic Legend**
- Bottom of Bank
 - Top of Banking
 - Building
 - Building Canopy
 - Concrete Base
 - Contour Major
 - Contour Minor
 - Fences
 - General
 - Kerb Bottom
 - Kerb Drop
 - Kerb Top
 - OH Electric
 - Railway Line
 - Road Centre
 - Road Markings
 - SC Hard/Hard
 - SC Hard/Soft
 - SC Soft/Soft
 - Steps
 - Tree Canopy
 - Vegetation
 - Visible Trench
 - Walls
 - Water Edge

- Topographic Abbreviations**
- | | | | |
|-------|-----------------------|-------|-------------------------|
| AV | Air Valve | PB | Pedestrian Beacon |
| BH | Borehole | PGR | Post Box |
| BO(L) | Bollard (Illuminated) | PM | Pedestrian Guard Rail |
| BS | Bus Stop | PO | Parking Meter |
| Cab | Cabinet | RE | Roading Eye |
| CL | Cover Level | RS(L) | Road Sign (Illuminated) |
| COL | Column | RWP | Rain Water Pipe |
| CONC | Concrete | SP(L) | Sign Post (Illuminated) |
| DC | Drainage Channel | SPCam | Speed Camera |
| DFBin | Dog Poul Bin | ST | Stop Tap |
| DP | Down Pipe | SV | Sluice Valve |
| EP | Electricity Pole | SVP | Soil Vent Pipe |
| ER | Earth Road | TBox | Telephone Box |
| FLL | Finished Floor Level | TL | Traffic Light |
| FL | Flag | TOP | Top of Fence Level |
| FP | Flag Pole | TOW | Top of Wall Level |
| GP | Gate Post | VP | Telecoms Pole |
| GV | Gas Valve | VP | Vent Pipe |
| GY | Gully | WB | Waste Bin |
| IC | Inspection Cover | WBM | Window Bottom Level |
| KO | Kerb Outlet | WM | Water Meter |
| LP | Lamp Post | W/O | Wash Out |
| MH | Manhole | WTT | Window Top Level |
| Mkz | Marker | WV | Water Valve |
| MP | Marker Post | MW | Monitoring Well |

Notes
THIS DRAWING SHOULD ONLY BE USED FOR ITS ORIGINAL PURPOSE. CENTARA LTD. ACCEPTS NO RESPONSIBILITY FOR THIS DRAWING IF SUPPLIED TO ANY PARTY OTHER THAN THE ORIGINAL CLIENT.
ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO CONSTRUCTION.
ALL HATCHING IS FOR PRESENTATIONAL PURPOSES ONLY.

Client	D NOBLE
Site Location:	LADY ANN ROAD BATLEY
Purpose of Drawing	TOPOGRAPHICAL SURVEY
Surveyed:	DH
Checked:	SH
Date:	23/11/20
Drawn:	DH
Authorised:	NB
Scale:	1:200@A0
Office 10, Ripley Drive, Normanton Business Park, Wakefield, WF6 1QT, info@centara-ld.com	
Project Number:	106180
Sheet Number:	1 of 2



GRID: OS NATIONAL GRID
 Using the OS GPS Network and applying OSTN15 Transformation and then removing the scale factor for true distances with a one-step transformation centred on ZHD
 DATUM: OS LEVEL DATUM
 Using the OS GPS Network and applying OSGM15 National Geoid Model to obtain local area corrections

Topographic Legend

- Bottom of Bank
- Top of Banking
- Building Canopy
- Concrete Base
- Contour Major
- Contour Minor
- Fences
- General
- Kerb Bottom
- Kerb Top
- Kerb Drop
- Walls
- OH Comms
- OH Electric
- Railway Line
- Road Centre
- Road Markings
- SC Hard/Hard
- SC Hard-Soft
- SC Soft-Soft
- Steps
- Tree Canopy
- Vegetation
- Visible Trench
- Walls
- Water Edge

Topographic Abbreviations

- | | | | |
|-------|-----------------------|-------|-------------------------|
| AV | Air Valve | PB | Pedestrian Beacon |
| BH | Borehole | PGR | Post Box |
| BO(L) | Bollard (Illuminated) | PM | Pedestrian Guard Rail |
| BS | Bus Stop | PO | Parking Meter |
| Cab | Cabinet | RE | Post |
| CL+ | Cover Level | RE | Rodding Eye |
| COL | Column | RS(L) | Road Sign (Illuminated) |
| Conc | Concrete | RWP | Rain Water Pipe |
| DC | Drainage Channel | SP(L) | Sign Post (Illuminated) |
| DFBin | Dog Foul Bin | SPCam | Speed Camera |
| DP | Down Pipe | ST | Stop Tap |
| EP | Electricity Pole | SV | Soil Vent Pipe |
| ER | Earth Rod | SVV | Sluice Valve |
| FFL | Finished Floor Level | TL | Traffic Light |
| FH | File Hydrant | TOP | Top of Fence Level |
| FP | Flag Pole | TOW | Top of Wall Level |
| GP | Gate Post | TP | Telecoms Pole |
| GV | Gas Valve | VP | Vent Pipe |
| GY | Gully | WB | Waste Bin |
| IC | Inspection Cover | WBM | Window Bottom Level |
| KO | Kerb Outlet | WM | Water Meter |
| LP | Lamp Post | WO | Wash Out |
| MH | Manhole | WTT | Window Top Level |
| Mkr | Marker | WV | Water Valve |
| MP | Marker Post | MW | Monitoring Well |

Notes

THIS DRAWING SHOULD ONLY BE USED FOR ITS ORIGINAL PURPOSE. CENTARA LTD. ACCEPTS NO RESPONSIBILITY FOR THIS DRAWING IF SUPPLIED TO ANY PARTY OTHER THAN THE ORIGINAL CLIENT.
 ALL DIMENSIONS SHOULD BE VERIFIED ON SITE PRIOR TO CONSTRUCTION.
 ALL HATCHING IS FOR PRESENTATIONAL PURPOSES ONLY.

Client	D NOBLE		
Site Location:	LADY ANN ROAD BATLEY		
Purpose of Drawing	TOPOGRAPHICAL SURVEY		
Surveyed:	DH	Drawn:	DH
Checked:	SH	Authorised:	NB
Date:	23/11/20	Scale:	1:200@A0
Scale 1:200 0 5 10 15			
Office 10, Ripley Drive, Normanton Business Park, Wakefield, WF6 1QT, info@centara-ltd.com			
Project Number:	106180		
Sheet Number:	2 of 2		

APPENDIX C

Site Layout Plan

Constraints Site Plan

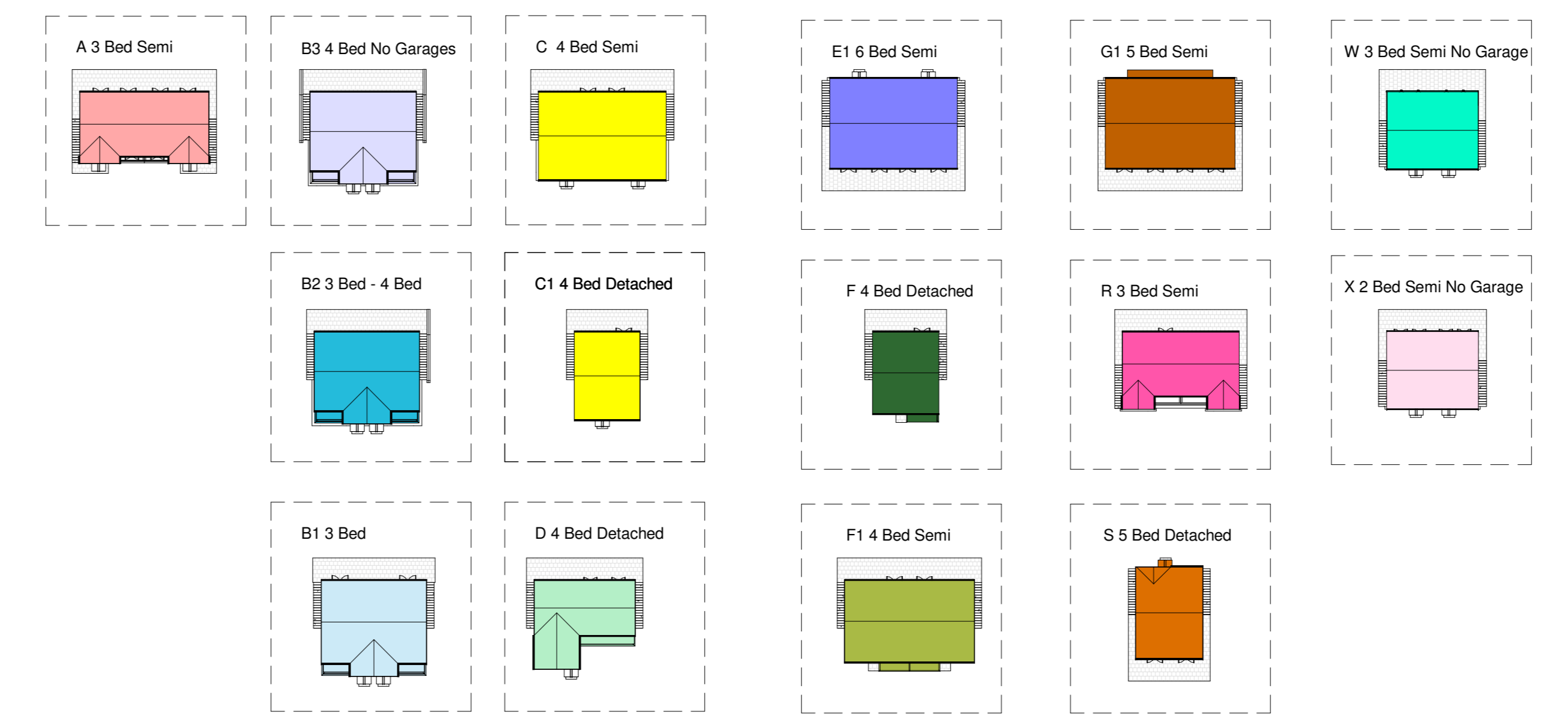


71 No. Total dwellings
 Approx. site area = 34,758m² (3.47 hectares) (8.58 acres)
 Density = 20.46 dwellings per hectare
 POS = 10160m² (Kirklees Requirements 2790m² (30m² per unit)
 (Wetland Area = 6180m² / Public Amenity Area =3980m²)
 175 No. Driveway / in plot spaces at min 2.5 x 5.0m
 10 No Visitor parking spaces at 2.0 x 5.0m. parallel to street.
 4 No Visitor parking spaces at 2.5 x 5.0m. perpendicular to street.

Property Schedule

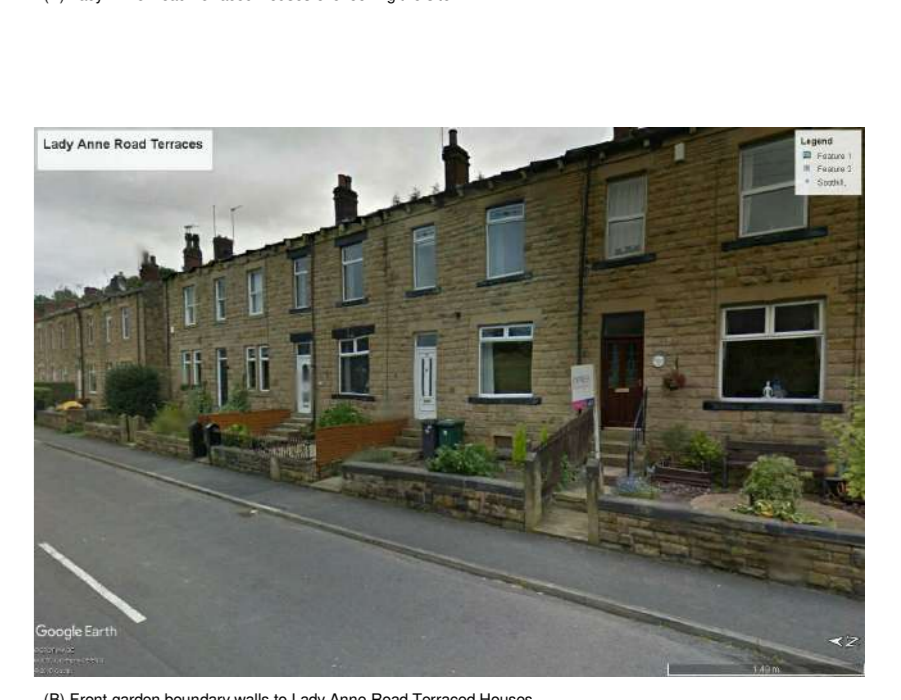
3 No - Type A - 2 x 3 bed semi detached (3 storey).	Gross internal area Plus garage area	109m ² / 1181 sqft 18 m ² / 190 sqft
2 No - Type B1 - 2 x 3 bed semi detached (3 storey).	Gross internal area Plus garage area	110 m ² / 1187 sqft 29m ² / 313 sqft
2 No - Type B2 - 1 x 3 bed semi detached (3 storey). 1 x 4 bed semi detached (3 storey).	Gross internal area Plus garage area	114 m ² / 1227 sqft 18 m ² / 191 sqft 134 m ² / 1442 sqft
2 No - Type B3 - 2 x 4 bed semi detached (3 storey).	Gross internal area	135 m ² / 1435 sqft
1 No - Type C - 2 x 4 bed semi detached (3 storey)	Gross internal area Plus Garage area	140m ² / 1506 sqft 26 m ² / 278 sqft
5 No - Type C1 - 1 x 4 bed detached (3 storey)	Gross internal area Plus Garage area	140m ² / 1506 sqft 26 m ² / 278 sqft
2 No - Type D - 1 x 4 bed detached (3 storey)	Gross internal area Plus Garage area	174 m ² / 1873 sqft 38 m ² / 408 sqft
2 No - Type E1 - 2 x 6 bed semi detached (3 storey)	Gross internal area	173 m ² / 1859 sqft
6 No - Type F - 1 x 4 bed detached (3 storey).	Gross internal area Plus Garage area	135 m ² / 1453 sqft 23 m ² / 244 sqft
4 No - Type F1 - 2 x 4 bed semi detached (3 storey).	Gross internal area Plus Garage area	135 m ² / 1571 sqft 23 m ² / 244 sqft
3 No - Type G1 - 2 x 5 bed semi detached (3 storey).	Gross internal area Plus Garage area	157 m ² / 1690 sqft 17 m ² / 188 sqft

5 No - Type R - 2 x 3 bed semi detached (3 storey).	Gross internal area Plus Garage area	101 m ² / 1082 sqft 18 m ² / 194 sqft
4 No - Type S - 4 x 5 bed detached (3 storey).	Gross internal area Plus Garage area	159 m ² / 1711 sqft 18 m ² / 199 sqft
1 No - Type W - 2 x 3 bed semi detached (3 storey).	Gross internal area	98 m ² / 1059 sqft
2 No - Type X - 2 x 3 bed semi detached (3 storey).	Gross internal area	98 m ² / 1060 sqft



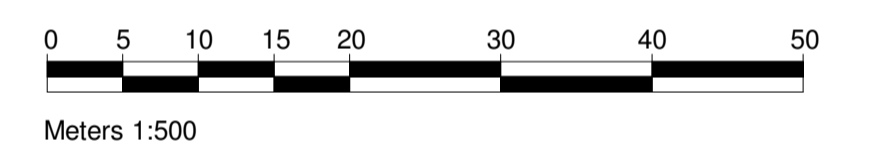
HouseType Key
1 : 500

Site Plan - Housing Layout - As Proposed
1 : 500



Rev	Date	Drawn	Description
A	06/07/2018	SL	Previous revisions to Rev. 7 Revised for Revd Issue
B	20/07/2018	AJB	C19 retaining wall and boundary retaining structure updated Plot B3-B4 changed to Unit Type R. Property schedule added and key updated and house types colour coded
C	27/07/2018	AJB	Site layout, plot types and locations revised as client instruction
D	16/08/2018	SL	House types and site layout revised for discussion with Client
E	21/08/2018	SL	House types and site layout updated with new and revised types as client instruction
F	21/08/2018	SL	Tracking for Particulate matter at request of planning officer.
G	23/08/2018	SL	House holden storage areas added to each plot
H	21/05/2019	SL	Road and FFI, revised as Walker Program Levels Drawing Rev C
I	21/05/2019	SL	Plots 62 - 70 revised from 2 storey to 3 storey types and plot 36 revised from 3 storey to 2 storey type M
J	26/05/2019	SL	Plot 62 revised to type D, and orientation revised to present frontage to Lady Ann Road.
K	30/05/2019	SL	Public footpath moved to boundary to allow longer private drive serving plots 36 and 36.
L	30/05/2019	SL	Plots 34 35 and 36 moved further away from boundary.
M	30/05/2019	SL	Children play area moved over extension tank and access paths / steps added
N	20/07/2019	SL	FFI to all plots approved to fall up or down from roof as client instruction
O	20/07/2019	SL	Bin storage added to each plot, boundary treatment modelled, house top rail between adjoining parking low hedges between parts of semi and front gardens, retaining walls and coping with planting in between used to give with lateral level changes between plots, visitor spaces added, home one / living street layout refined and planting grown to create street for people, embankment and railing refined to plots 63 - 71 with visitor parking added
P	20/07/2019	SL	Childrens play area, with pathe to specialist design with equipment and design on playhouse formed by construction added details to be confirmed
Q	22/07/2019	SL	Existing line of trees lining the back between Lady Ann industrial estate and the proposed development shown on site layout
R	25/10/2019	SL	Separation between plots 69 and 70 increased at request of planning. On street visitor parking increased to 14 spaces.

Client: D Noble Ltd
 Project: Lady Anne Road Batley
 Title: Proposed Site Layout
 Scale: 1:500
 Drawing no: 4206
 Rev: R
 SELF logo and contact information.



Rev	Date	Drawn	Description
A	20/07/2019	SL	FFL to all plots optimised to fall up or down from road as client instruction
B	20/07/2019	SL	Childrens play area, with paths to specialist design with equipment and design on plateaux formed by attenuation caded details to be confirmed.
C	22/10/2019	SL	FRA Zone 2 and 3 Shown on Constraints Plan
D	25/10/2019	SL	Separation between plots 69 and 70 increased of request of planning. On street visitor parking increased to 14 spaces.

PLANNING

Client: D Noble Ltd

Project: Lady Anne Road Batley

Title: Constraints Site Plan

Scales@A1: 1:500 | Drawn: SL | Date: 25/11/2019 14:21:18 | Checked: MS

Drawing no: 4206 | Rev: D | 271

Quayside House, Furnival Road, Sheffield, S4 7YA | 0114 226 0255 | selfarchitects.co.uk

Detailed Site Plan
1 : 500

APPENDIX D

Environment Agency flood data



Flood map for planning

Your reference
20/013

Location (easting/northing)
424978/424576

Created
10 Jun 2020 11:46

Your selected location is in flood zone 1, an area with a low probability of flooding.

This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.

The Open Government Licence sets out the terms and conditions for using government data.
<https://www.nationalarchives.gov.uk/doc/open-government-licence/version/3/>



Flood map for planning

Your reference

20/013

Location (easting/northing)









424978/424576

Scale

1:2500

Created

10 Jun 2020 11:46

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefiting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area



John O'Connor

From: France, Debbie [Debbie.France@environment-agency.gov.uk]
Sent: 02 July 2020 15:08
To: john@jocconsultants.co.uk
Subject: Your Enquiry: RFI/2020/171394
Attachments: Planning advice for developers.pdf; Supporting Information 171311.pdf

Our Ref: RFI/2020/171394

Dear John

**RE: Provision of Product 4 for Lady Ann Road, Batley
Request for information under the Freedom of Information Act 2000 (FOIA) / Environmental
Information Regulations 2004 (EIR)**

Thank you for your enquiry which was received on 20 May 2020. Apologies for the delay in responding

We respond to requests for recorded information that we hold under the Freedom of Information Act 2000 and the associated Environmental Information Regulations 2004.

The requested Product 4 data is too large to send by email but is available on the following link: <https://ea.sharefile.com/d-s6abf9a7fd1a4c64b> Please also see the attached 'Supporting Information' document which should be read in conjunction with this data.

Please note the above link will expire in 30 days so we strongly recommend downloading the files and saving these to your computer as soon as this email is received. Any request for a link to be remade after it has expired will be considered as a new enquiry and will be subject to a response within 20 working days.

I can also confirm that there are no planned defences in this area.

This information is provided subject to the Open Government Licence ([here](#)). Please read for details of permitted use.

If you are using our data to inform a development proposal, we encourage you to contact our Sustainable Places team for pre-application advice. Their advice can help you solve key environmental issues early, reduce the chance of an objection and help you design a more sustainable development. To take advantage of this service and gain further details, together with estimated costs, please email sp-yorkshire@environment-agency.gov.uk.

For general enquiries relating to your development or our role within the planning system, please refer to the attached 'Planning advice for developers' document.

I hope that we have correctly interpreted your request. If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

Yours sincerely

Debbie France
Customers and Engagement Team
Environment Agency | Lateral, 8 City Walk, Leeds, LS11 9AT

debbie.france@environment-agency.gov.uk
External: 0203 0254731 | Internal :54731

Enquiries Team Tel: 020 847 48174
Email: neyorkshire@environment-agency.gov.uk

Working days: Monday to Friday

CORONAVIRUS PROTECT YOURSELF & OTHERS	For the latest guidance: - INTRANET.EA.GOV - NHS.UK/coronavirus - GOV.UK/coronavirus	 Environment Agency
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Creating a better place
for people and wildlife



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The Flood Map for Planning

The Flood Map for Planning (Rivers and Sea) can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-map-for-planning.service.gov.uk> or downloaded in GIS format under an open data licence from the following address: <https://data.gov.uk/publisher/environment-agency>

Please type Flood Map for Planning in the search box.

What is the Flood Map for Planning?

The Flood Map for Planning provides information on flooding from rivers and the sea for England and Wales. The Flood Map also has information on flood defences and the areas benefiting from those flood defences.

The Flood Map for Planning shows the following:

1. Flood Zone 3 (dark blue area on the enclosed map): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences
 - For flooding from rivers the map indicates the extent of a flood with a 1% (1 in 100) chance of happening each year;
 - For flooding from the sea the map shows the extent of a flood with a 0.5% (1 in 200) chance of happening each year.
2. Flood Zone 2 (light blue area): natural flood plain area that could be affected by flooding from rivers and/or the sea – not taking into account the presence of any flood defences. Flood Zone 2:
 - indicates the extent of a flood with a 0.1% (1 in 1000) chance of happening each year.
 - and/or indicates the greatest recorded historic flood, whichever is greater.
3. Flood defences built in the last five years to protect against river floods with a 1% (1 in 100) chance of happening each year, together with some natural or constructed entities which retain, store or channel water and which may protect against smaller floods.
4. Areas benefiting from flood defences - areas that benefit from the flood defences shown, in the event of a river flood with a 1% (1 in 100) chance of happening each year, or a flood from the sea with a 0.5% (1 in 200) chance of happening each year. If the defences were not there, these areas would flood.

Flood History

To the best of our knowledge there is no known flood history for this site. However, in close proximity to this location we do have some flood history available (see enclosed map). The extent of flooding, and/or flood level information is only shown for those watercourses surveyed after the flood. Other flooding may have occurred which is not shown. This is the best information currently available.

Name	Start Date	End Date	Flood Source	Flood Cause	Source of data
2019 November Flood Incident	07/11/2019	08/11/2019	main river	channel capacity exceeded (no raised defences)	Visual

Water causing flooding can come from different places, for example from rivers or the sea; surface water (i.e. rainwater flowing over or accumulating on the ground before it is able to enter rivers or the drainage system); overflowing or backing up of sewers or drainage systems which have been overwhelmed or from groundwater rising up from underground aquifers.

Please note that this record doesn't include any flood extents that may have occurred since December 2019. Given the process of recording, verifying and updating our record from major floods is extensive and may take a considerable amount of time.

Assets

Asset Location Map

Please find attached asset map(s) showing location of all (Agency and non Agency maintained) flood defences and channels.

Description of Works

See attached table with description of the defences and structures shown on the above drawing, including condition ratings, upstream and downstream crest levels, where available.

Risk of Flooding – Environment Agency Defences

The risk of flooding in this area is now reduced by the presence of flood defences that we maintain, but there still is a residual risk of flooding if these were to breach or be overtopped by a flood greater than that for which they were designed.

Risk of Flooding – Privately Maintained Defences

You will see that the Environment Agency does not maintain any of those defences. However we undertake regular risk based visual inspections. We do not hold design levels and have no height information on these defences or structures.

Asset Condition Ratings

The performance of a flood defence asset is recorded as the condition of the asset. Our asset inspectors subjectively assess the conditions of assets (during visual inspection site visits) with reference to a national standard template. Each asset is given a rating between one and five with one being very good condition and five being very poor. A condition rating of 3, or 'fair' is the minimal acceptable standard for a critical asset, such as a defence wall that protects properties. We are striving to improve all assets below 'fair' to an acceptable standard.

Asset inspections are done on average every six months, although some critical assets are assessed on a more regular basis. It is possible that adjacent assets are inspected on different dates, which may result in two assets of a similar state of repair having different condition ratings.

Condition ratings of assets may also be affected by the time of year the surveys are conducted, as vegetation may obscure the asset in the summer months, or accessibility may be an issue during winter months. These factors would not usually affect the recorded condition rating of an asset unless the asset is on a borderline between two ratings.

Asset Standard of Protection

Please note that the provided Design Standard of Protection is an estimate and should not be relied on. Please note that where available the defended flood extents provide more reliable information relating to the protection offered by the defence (i.e. at which return period the water levels are likely to overtop the defence). If available and required the defended flood extents can be provided on request.

Modelling

Batley Beck model study 2015

A new study to improve our existing Flood Mapping in the area has been completed in 2015.

Modelled flood levels are available. Please find attached:

- Results for peak water levels and flows for the 0.1% (1 in 1000), 0.5% (1 in 200), 1% (1 in 100), 1.3% (1 in 75), 2% (1 in 50), 3.33% (1 in 30), 5% (1 in 20), 10% (1 in 10), 20% (1 in 5) and 50% (1 in 2) Annual Exceedance Probabilities (AEP) for the defended scenario.
- Results for peak water levels and flows for the 1% (1 in 100), 1.3% (1 in 75), 2% (1 in 50), 3.33% (1 in 30), 5% (1 in 20), 10% (1 in 10), 20% (1 in 5) and 50% (1 in 2) Annual Exceedance Probabilities (AEP) for the undefended scenario.
- Results for peak water levels and flows for the 1% (1 in 100) plus 20% climate change Annual Exceedance Probabilities (AEP), for both the defended and undefended scenarios.
- an associated map showing the location of the model node points.
- Defended depth grid maps (in PDF) format for the 1% (1 in 100), 1% (1 in 100) plus 20% Climate Change and 0.1% (1 in 1000) Annual Exceedance Probabilities (AEP)

There are defended depth grid maps (in PDF format) available for all the Annual Exceedance Probabilities (AEP). They can be provided on request. Please note the grids in ascii format are not currently available due to they are being investigated.

Climate Change

Updated guidance on how climate change could affect flood risk to new development - '[Flood risk assessments: climate change allowances](#)' was published on gov.uk on 19 February 2016. You should confirm the flood risk vulnerability classification and lifetime of your proposed development in line with NPPF and apply the appropriate climate change allowances.

Bespoke Flood Risk Assessment (FRA) advice:

If the pre-application advice is required with regards the preparation of a site-specific Flood Risk Assessment, this can be requested via the Yorkshire Sustainable Places team (email: sp-yorkshire@environment-agency.gov.uk). Charges may apply for any advice that is provided, this currently stands at £100 per hour per person. The [.gov.uk](#) pages provide a good starting point on what to include within a site-specific Flood Risk Assessment and can be accessed via <https://www.gov.uk/guidance/flood-risk-assessment-for-planning-applications>. A site-specific Flood Risk Assessment will need to consider flood risks from all sources, including those associated with defence failure (e.g. breach) and accounting for the predicted impacts as a result of climate change. Please contact the Sustainable Places team if you require advice on how to include these within a Flood Risk Assessment.

Other

Surface Water Map

Lead Local Flood Authorities (LLFA) are responsible for managing local flood risk from surface water flooding and groundwater flooding. You should check with the LLFA as they may have more up to date information regarding this type of flooding.

The Risk of Flooding from Surface Water Flood Map can be viewed and downloaded as a PDF file on GOV.UK by following this link: <https://flood-warning-information.service.gov.uk/long-term-flood-risk>

Surface Water Drainage

The Lead Local Flood Authority is the statutory consultee for planning matters relating to surface water drainage, therefore it is recommended they should be consulted separately regarding this.

Surface water discharge from new development should ideally 'mimic' the pre-development situation using a sustainable drainage system so that the flow and volume of water in watercourses is not increased.

A permit may be required, under the Environmental Permitting Regulations 2016 from the Environment Agency for any proposed works or structures in, under, over or within eight metres of a 'main river' (e.g. a new outfall). A permit is separate to and in addition to any planning permission granted. Further details and guidance are available on the GOV.UK website: <https://www.gov.uk/guidance/flood-risk-activities-environmental-permits>

Risk of Flooding from Reservoirs Map

Outlines and simplified depth and velocity maps can be viewed on our website:

<https://flood-warning-information.service.gov.uk/long-term-flood-risk/#x=438988&y=406600&scale=2>

Please, zoom into the location of interest, and then click on the inundated location for details. As a result a list of reservoirs will be provided with supporting information and a links to other data, such as estimated depths and speed of flooding, at the bottom of the result page.

A map showing the outlines can also be provided on request.

Flood Warning

The site is not covered by a Flood Warning.

LIDAR Data

Please note that our LiDAR data is now available free of charge (Open Data) from <http://environment.data.gov.uk/ds/survey/index.jsp#/survey> (once zoomed to the relevant location the available LiDAR products will be listed below the map).

Two LIDAR products are available:

1. Tiled LIDAR data - The full tiled dataset consists of historic LIDAR data which has been gathered since 1998. For some areas we have carried out repeat surveys and data is available in a range of resolutions.
2. Composite LIDAR data - The composite dataset is derived from a combination of our full tiled dataset which has been merged and re-sampled to give the best possible spatial coverage.

Light Detection and Ranging (LIDAR) is an airborne mapping technique, which uses a laser to measure the distance between the aircraft and the ground. This technique results in the production of an accurate, cost-effective terrain model suitable for assessing flood risk and other environmental applications.

The Environment Agency owns two LIDAR systems, which are installed in a survey aircraft along with its other operational remote sensing instruments.

The aircraft is positioned and navigated using Global Positioning System (GPS) corrected to known ground reference points. The aircraft typically flies at a height of about 800 metres above ground level and a scanning mirror allows a swath width of about 600 metres to be surveyed during a flight.

The Rights & Responsibilities of a Riverside Owner

The owner of property adjacent to a watercourse is usually deemed to be the riparian owner and, as such, has both riparian rights and responsibilities with regard to the watercourse within their ownership.

For more information on Rights and Responsibilities of a riverside owner, you can visit our website at:

<https://www.gov.uk/guidance/owning-a-watercourse>

Ordnance Survey Data

Under the terms of our licence agreement with the Ordnance Survey, we are unable to supply the OS data. Under this agreement we can only supply OS data to consultants/contractors carrying out work on our behalf.

Flood Portal

It's a new 'one-stop shop' web portal providing guidance and information on flood risk management in the UK. Arup have written and designed the site, in conjunction with CIRIA, the Local Government Association, the EA and Defra, primarily as a resource for local authority officers, flood risk management professionals, and others with an interest in flood risk. It's a part of the Capacity Building Strategy. <http://www.local.gov.uk/floodportal>

RFI/2020/171394 Flood History Map centred on Land off Lady Ann Road, Soothill, Batley, WF17 0QA.

Date created: 01/07/2020



www.environment-agency.gov.uk

Scale: 1:8,000

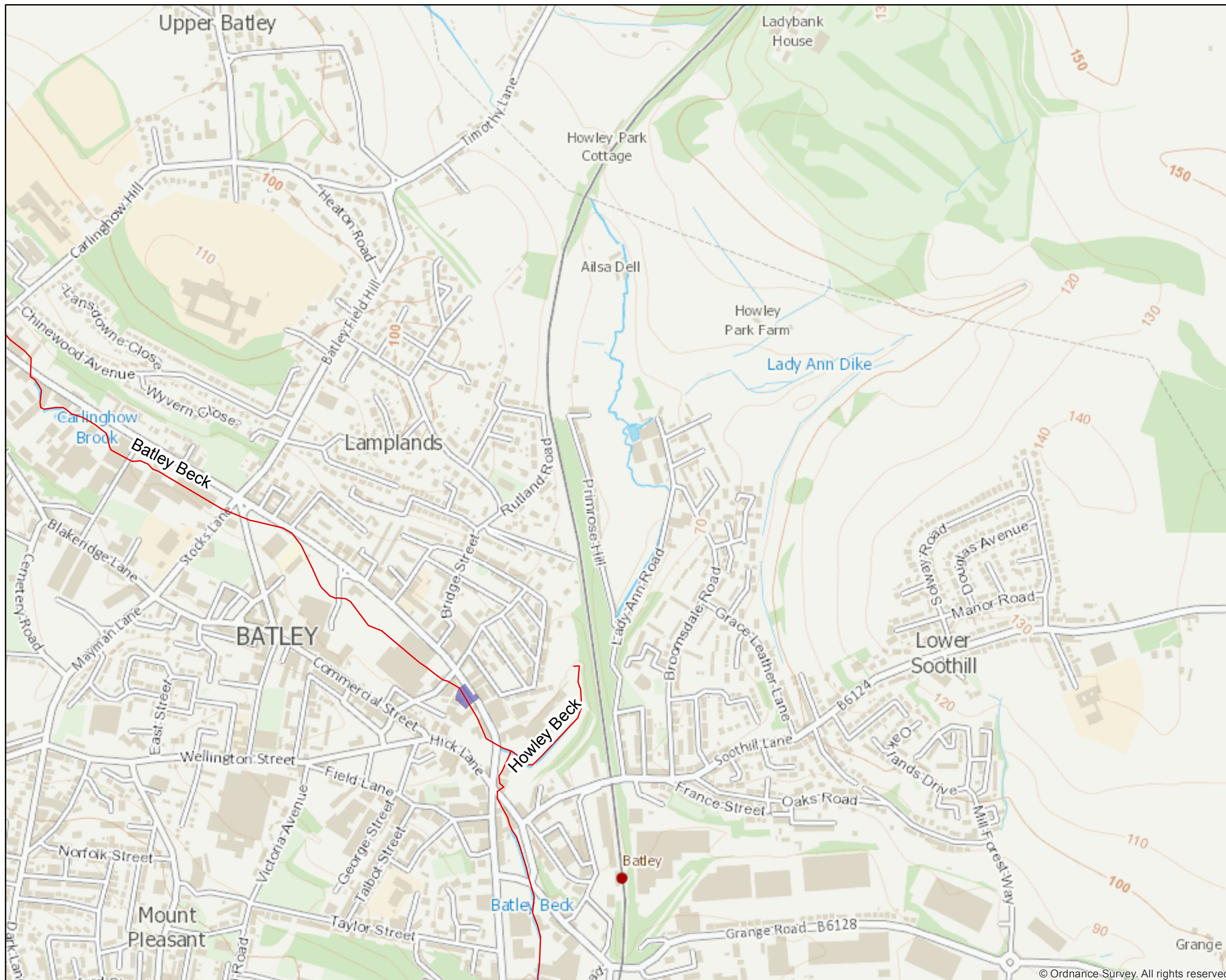


when reproduced @ A3



LEGEND

- Main River
- Recorded Flood Outlines**
- 2019 November Flood Incident



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RFI/2020/171394 Node Point Map centred on Land off Lady Ann Road, Soothill, Batley, WF17 0QA.

Date created: 01/07/2020



www.environment-agency.gov.uk

Scale: 1:8,000

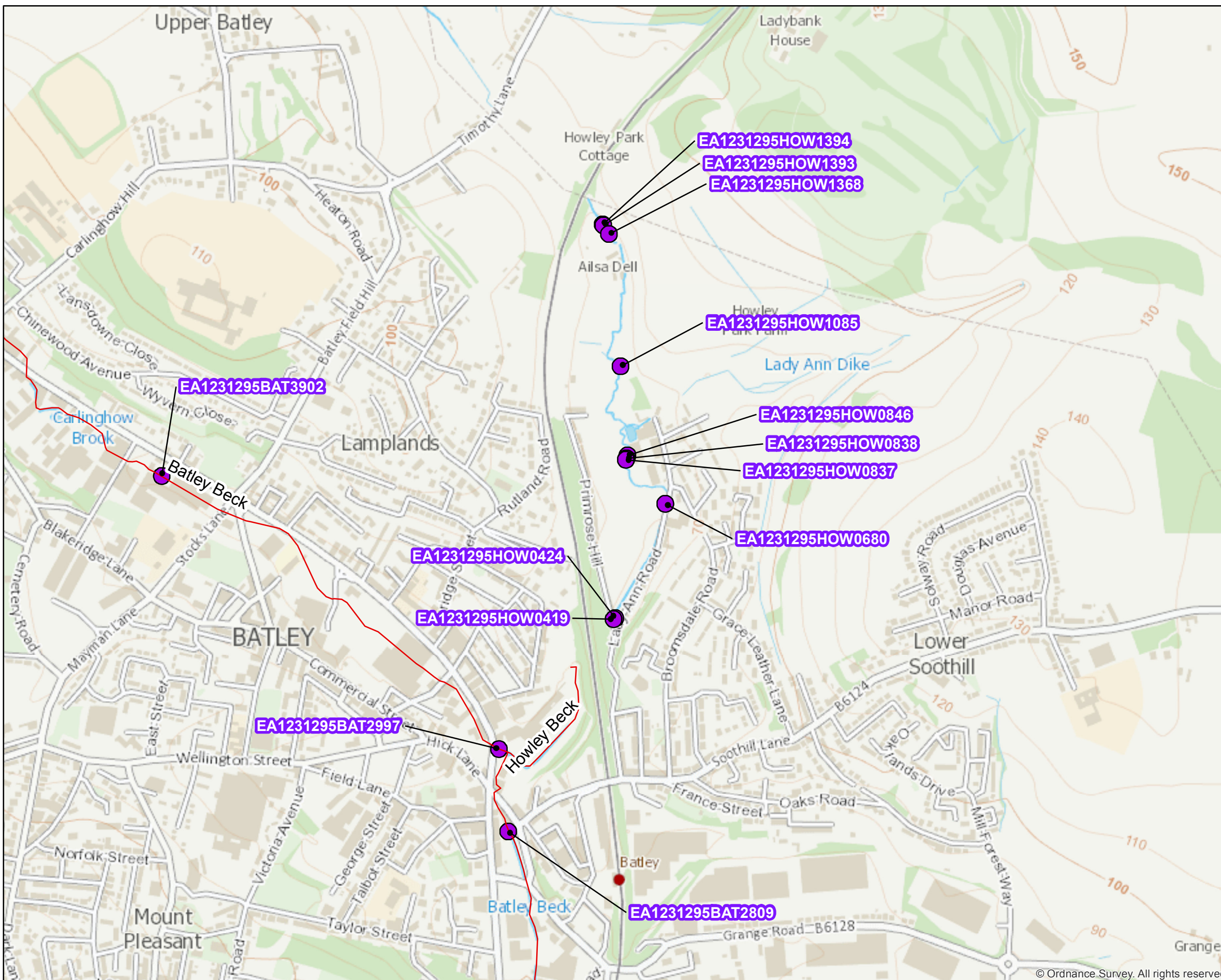


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LEGEND

- Main River
- 2015 Batley Beck Node Points



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2015 Batley Beck Model - Defended Scenario Results (Level - mAOD, Flow - m³/s)

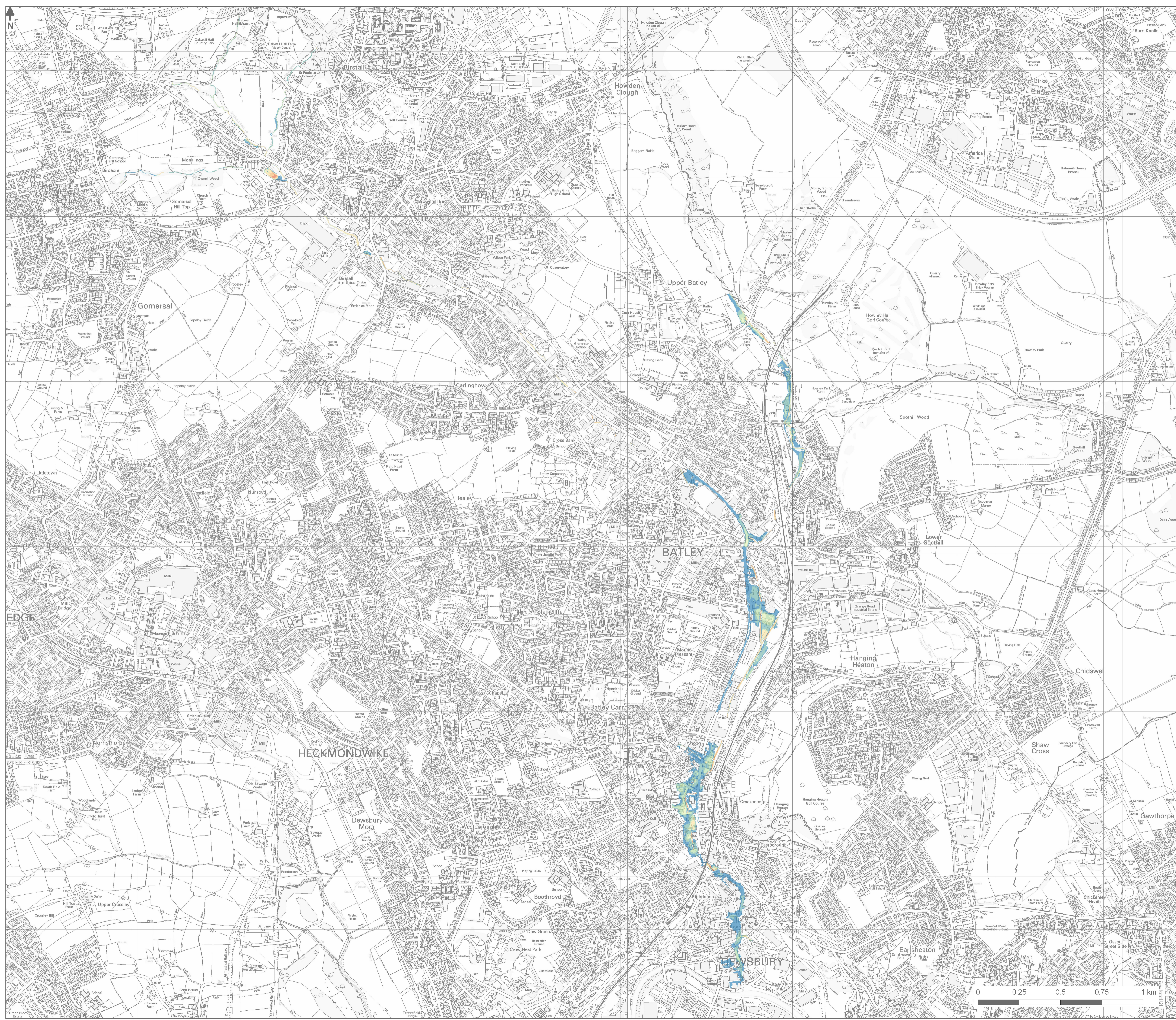
Node Point	Annual Exceedance Probability (AEP)											
	50% AEP (1 in 2)		20% AEP (1 in 5)		10% AEP (1 in 10)		5% AEP (1 in 20)		3.33% AEP (1 in 30)		2% AEP (1 in 50)	
	2		5		10		20		30		50	
	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow
EA1231295HOW1394	65.921	1.864	66.036	2.542	66.142	3.123	66.653	3.856	66.695	3.936	66.737	4.184
EA1231295HOW1393	65.842	1.864	65.947	2.542	66.062	3.123	66.291	3.856	66.327	3.936	66.357	4.184
EA1231295HOW1368	65.394	1.863	65.545	2.542	65.802	3.123	66.187	4.003	66.211	4.309	66.226	4.649
EA1231295HOW1085	62.54	1.619	62.588	1.679	62.63	1.688	62.714	1.859	62.764	1.869	62.794	1.866
EA1231295HOW0846	60.539	1.84	60.665	2.464	60.747	2.906	60.869	3.596	60.934	4.059	60.964	4.344
EA1231295HOW0838	60.512	1.839	60.642	2.464	60.726	2.938	60.842	3.844	60.904	4.453	60.931	4.821
EA1231295HOW0837	60.351	1.839	60.459	2.464	60.55	2.938	60.676	3.844	60.746	4.453	60.762	4.821
EA1231295HOW0680	58.869	1.865	58.99	2.499	59.024	2.945	59.05	3.601	59.08	3.954	59.088	4.011
EA1231295HOW0424	54.724	1.862	54.853	2.489	54.948	2.978	55.124	3.937	55.331	4.634	55.591	5.094
EA1231295HOW0419	54.737	1.862	54.87	2.489	54.967	2.978	55.147	3.937	55.352	4.633	55.607	5.093
EA1231295BAT3902	58.463	5.413	58.656	7.226	58.796	8.705	58.96	10.549	59.074	11.648	59.171	12.799
EA1231295BAT2997	51.908	5.785	52.23	7.721	52.476	9.316	52.764	11.367	52.944	12.58	53.121	14.182
EA1231295BAT2809	50.07	7.39	50.352	9.976	50.613	12.067	51.361	14.601	51.529	16.319	51.599	18.037

Node Point	Annual Exceedance Probability (AEP)									
	1.33% AEP (1 in 75)		1% AEP (1 in 100)		1% AEP (1 in 100)+ 20 % CC		0.5% AEP (1 in 200)		0.1% AEP (1 in 1000)	
	75		100		101		200		1000	
	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow
EA1231295HOW1394	66.784	4.449	66.803	4.559	66.844	4.826	66.843	4.813	66.955	5.819
EA1231295HOW1393	66.397	4.449	66.413	4.559	66.447	4.826	66.446	4.813	66.523	5.819
EA1231295HOW1368	66.242	5.064	66.249	5.234	66.268	5.596	66.267	5.582	66.297	6.639
EA1231295HOW1085	62.835	1.848	62.853	1.85	62.896	1.854	62.894	1.854	62.99	1.862
EA1231295HOW0846	61.002	4.699	61.022	4.886	61.059	5.142	61.057	5.13	61.147	5.709
EA1231295HOW0838	60.966	5.268	60.986	5.496	61.022	5.788	61.021	5.777	61.114	6.383
EA1231295HOW0837	60.792	5.268	60.812	5.496	60.864	5.788	60.862	5.777	61.005	6.383
EA1231295HOW0680	59.097	4.058	59.11	4.08	59.141	4.174	59.141	4.171	59.209	4.334
EA1231295HOW0424	56.071	5.708	56.233	6.059	56.617	6.902	56.612	6.892	57.661	9.451
EA1231295HOW0419	56.081	5.71	56.244	6.058	56.626	6.902	56.621	6.892	57.669	9.446
EA1231295BAT3902	59.278	14.235	59.355	15.331	59.447	16.757	59.445	16.714	59.523	18.008
EA1231295BAT2997	53.359	14.291	53.482	14.688	53.634	15.185	53.629	15.17	54.534	15.385
EA1231295BAT2809	51.647	19.2	51.675	19.681	51.705	20.521	51.705	20.479	51.821	23.322

2015 Batley Beck Model - Undefended Scenario Results (Level - mAOD, Flow - m³/s)

Node Point	Annual Exceedance Probability (AEP)											
	50% AEP (1 in 2)		20% AEP (1 in 5)		10% AEP (1 in 10)		5% AEP (1 in 20)		3.33% AEP (1 in 30)		2% AEP (1 in 50)	
	2		5		10		20		30		50	
	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow
EA1231295HOW1394	65.921	1.863	66.036	2.542	66.142	3.124	66.653	3.856	66.695	3.935	66.737	4.184
EA1231295HOW1393	65.842	1.863	65.947	2.542	66.062	3.124	66.291	3.856	66.327	3.936	66.357	4.184
EA1231295HOW1368	65.394	1.863	65.545	2.542	65.802	3.123	66.187	4.004	66.211	4.309	66.226	4.649
EA1231295HOW1085	62.54	1.619	62.588	1.679	62.63	1.688	62.714	1.859	62.764	1.869	62.794	1.866
EA1231295HOW0846	60.539	1.839	60.665	2.464	60.748	2.907	60.869	3.596	60.934	4.063	60.964	4.344
EA1231295HOW0838	60.512	1.839	60.642	2.464	60.726	2.939	60.842	3.844	60.904	4.453	60.931	4.821
EA1231295HOW0837	60.351	1.839	60.459	2.464	60.55	2.939	60.676	3.844	60.746	4.453	60.762	4.821
EA1231295HOW0680	58.869	1.865	58.99	2.499	59.024	2.946	59.05	3.601	59.084	3.959	59.088	4.014
EA1231295HOW0424	54.724	1.862	54.853	2.489	54.948	2.979	55.124	3.937	55.246	4.634	55.33	5.093
EA1231295HOW0419	54.737	1.862	54.87	2.489	54.967	2.979	55.147	3.937	55.271	4.634	55.356	5.093
EA1231295BAT3902	58.464	5.424	58.655	7.218	58.795	8.701	58.959	10.542	59.074	11.649	59.173	12.796
EA1231295BAT2997	51.909	5.793	52.23	7.713	52.477	9.308	52.759	11.358	52.914	12.596	53.104	13.787
EA1231295BAT2809	50.071	7.399	50.351	9.971	50.611	12.068	51.055	14.534	51.151	15.999	51.216	17.548

Node Point	Annual Exceedance Probability (AEP)					
	1.33% AEP (1 in 75)		1% AEP (1 in 100)		1% AEP (1 in 100)+ 20 % CC	
	75		100		101	
	Max Level	Max Flow	Max Level	Max Flow	Max Level	Max Flow
EA1231295HOW1394	66.784	4.449	66.803	4.559	66.844	4.827
EA1231295HOW1393	66.397	4.449	66.413	4.559	66.447	4.827
EA1231295HOW1368	66.242	5.064	66.249	5.234	66.268	5.596
EA1231295HOW1085	62.835	1.848	62.853	1.851	62.896	1.854
EA1231295HOW0846	61.002	4.699	61.022	4.886	61.059	5.142
EA1231295HOW0838	60.966	5.268	60.986	5.496	61.022	5.789
EA1231295HOW0837	60.792	5.268	60.813	5.496	60.864	5.789
EA1231295HOW0680	59.097	4.061	59.11	4.083	59.141	4.176
EA1231295HOW0424	55.506	5.709	55.612	6.06	55.961	6.904
EA1231295HOW0419	55.53	5.709	55.635	6.06	55.98	6.903
EA1231295BAT3902	59.272	14.054	59.343	15.114	59.47	17.137
EA1231295BAT2997	53.59	13.705	53.865	14.302	54.125	14.632
EA1231295BAT2809	51.303	20.087	51.341	21.224	51.413	22.51

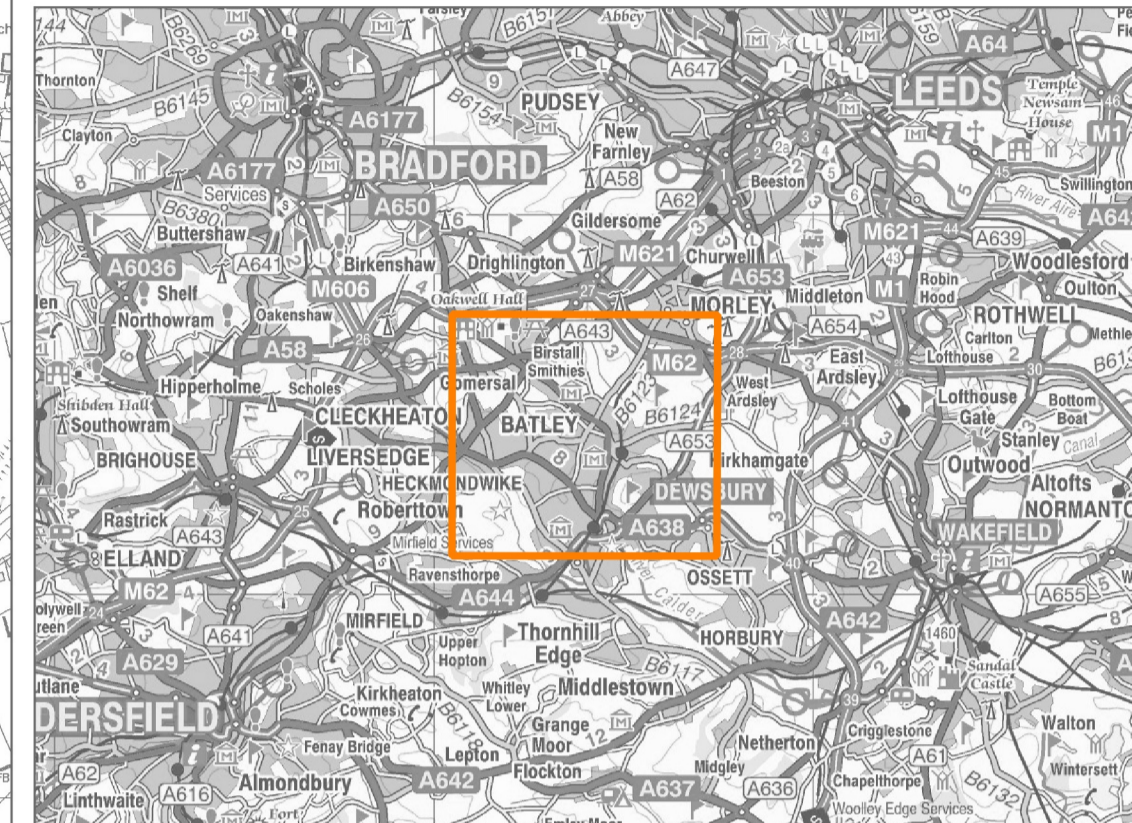


Legend

1.0% AEP Defended Maximum Depth

- 0.0 - 0.25 m
- 0.25 - 0.5 m
- 0.5 - 0.75 m
- 0.75 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 m +

Location



Batley Beck Flood Modelling Study

Defended Maximum Depth

1.0% AEP

Figure 12

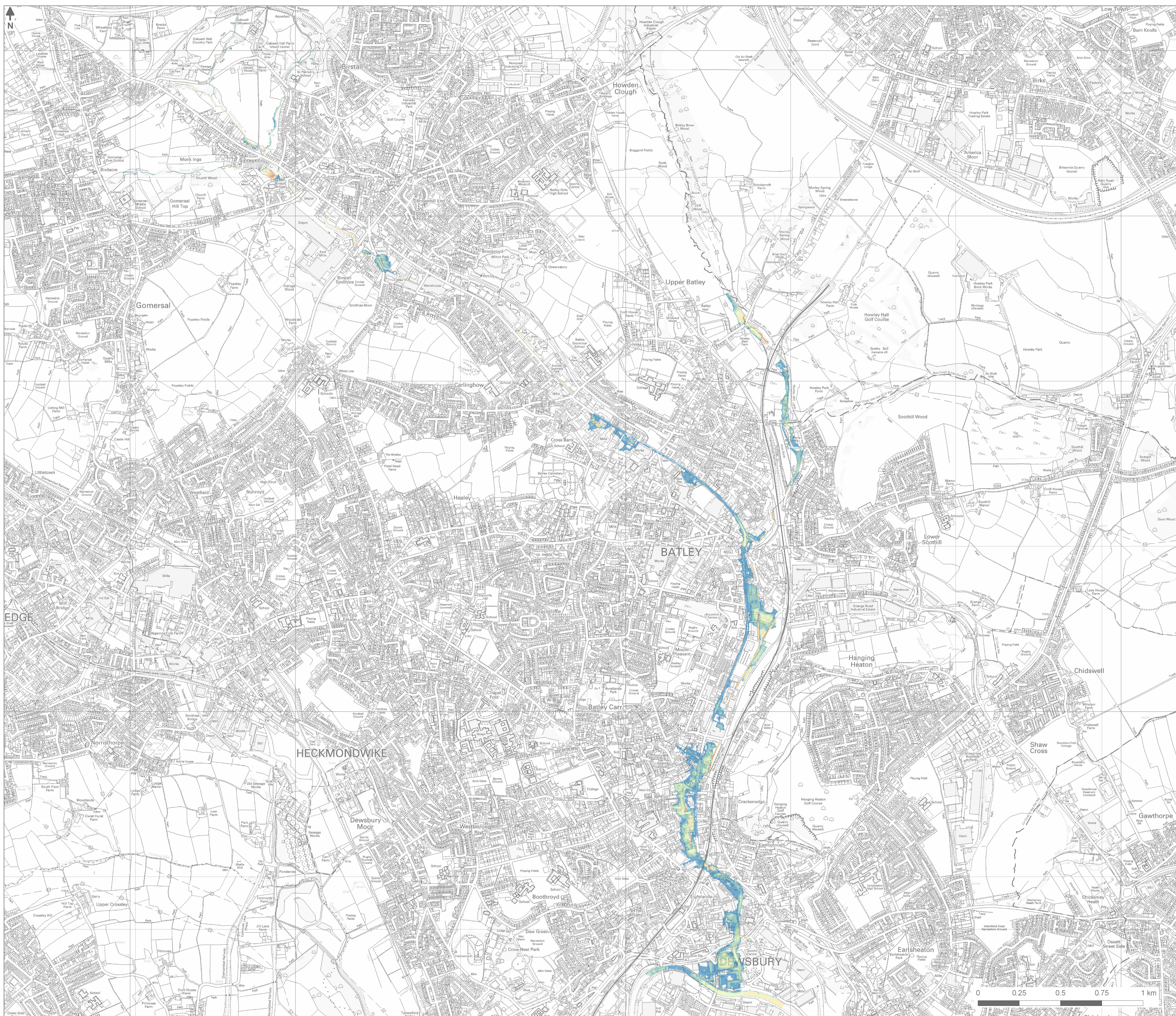
Modelled	Drawn	Checked	Approved	Date	Version
PC	ED	SJ	CH	20/11/2015	1-0

Geometry	Model
Defended	BAT01_v2-13_BL.dat

Drawing number: 14029_BatleyBeck_Figure12_MaxDepth_Q100_FINAL_v1-0

thomas mackay
environmental solutions
Kingwood House • 80 Richardshaw Lane
Leeds • LS29 8BN • 01138801422

Mott MacDonald
2 Brewery Wharfe • Kendall Street
Leeds • LS10 1JR • 01132411377

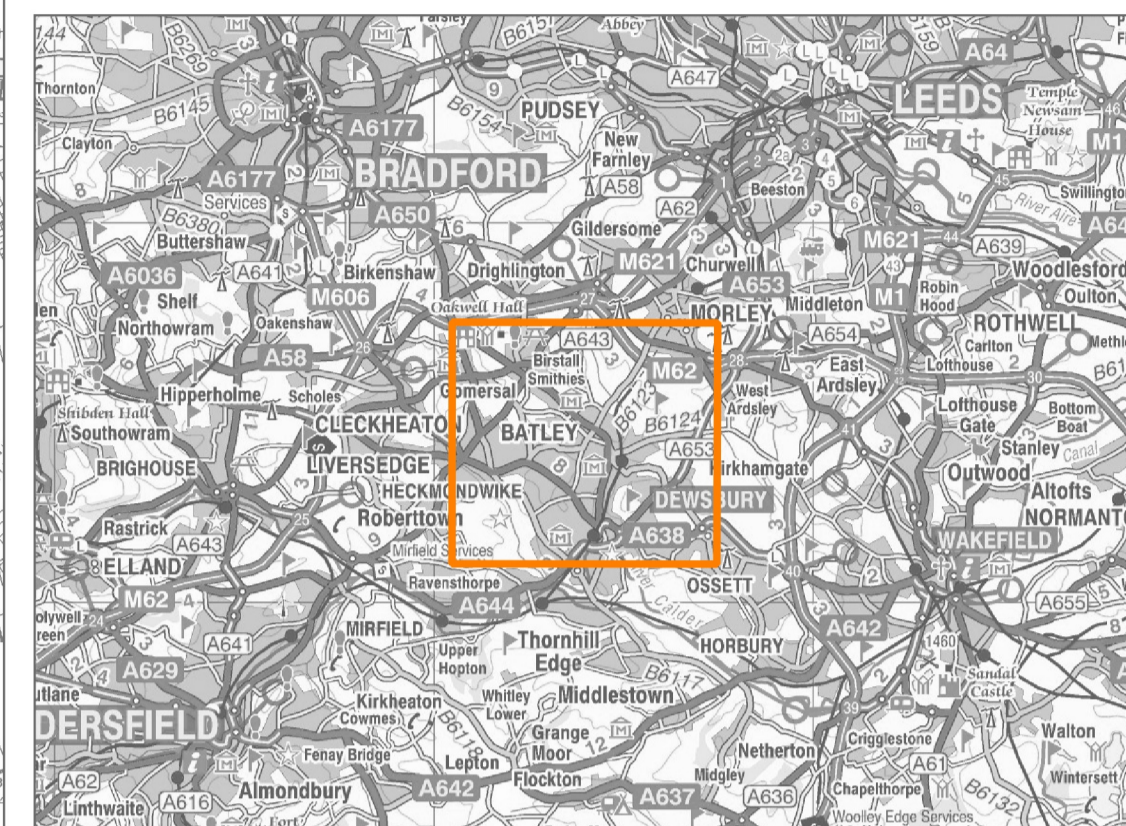


Legend

1.0% AEP Plus Climate Change Defended
Maximum Depth

- 0.0 - 0.25 m
- 0.25 - 0.5 m
- 0.5 - 0.75 m
- 0.75 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 m +

Location



Batley Beck Flood Modelling Study

Defended Maximum Depth

1.0% AEP Plus Climate Change

Figure 13

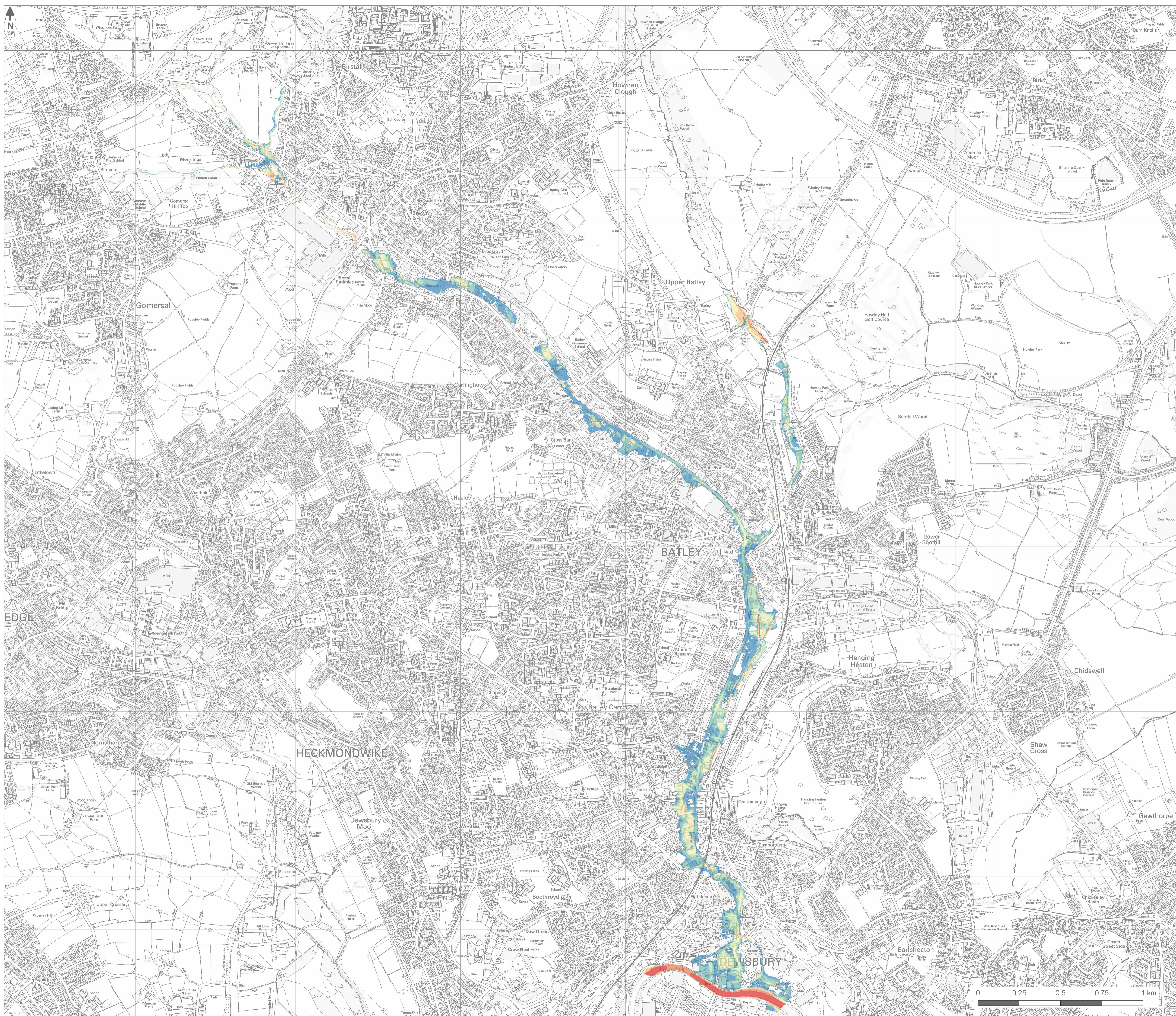
Modelled	Drawn	Checked	Approved	Date	Version
PC	ED	SJ	CH	20/11/2015	1-0

Geometry	Model
Defended	BAT01_v2-13_BL.dat

Drawing number: 14029_BatleyBeck_Figure13_MaxDepth_Q100CC_FINAL_v1-0

thomas mackay
environmental solutions
Kingwood House • 80 Richardshaw Lane
Leeds • LS28 8BN • 01138801422

Mott MacDonald
2 Brewery Wharfe • Kendall Street
Leeds • LS10 1JR • 01132441377

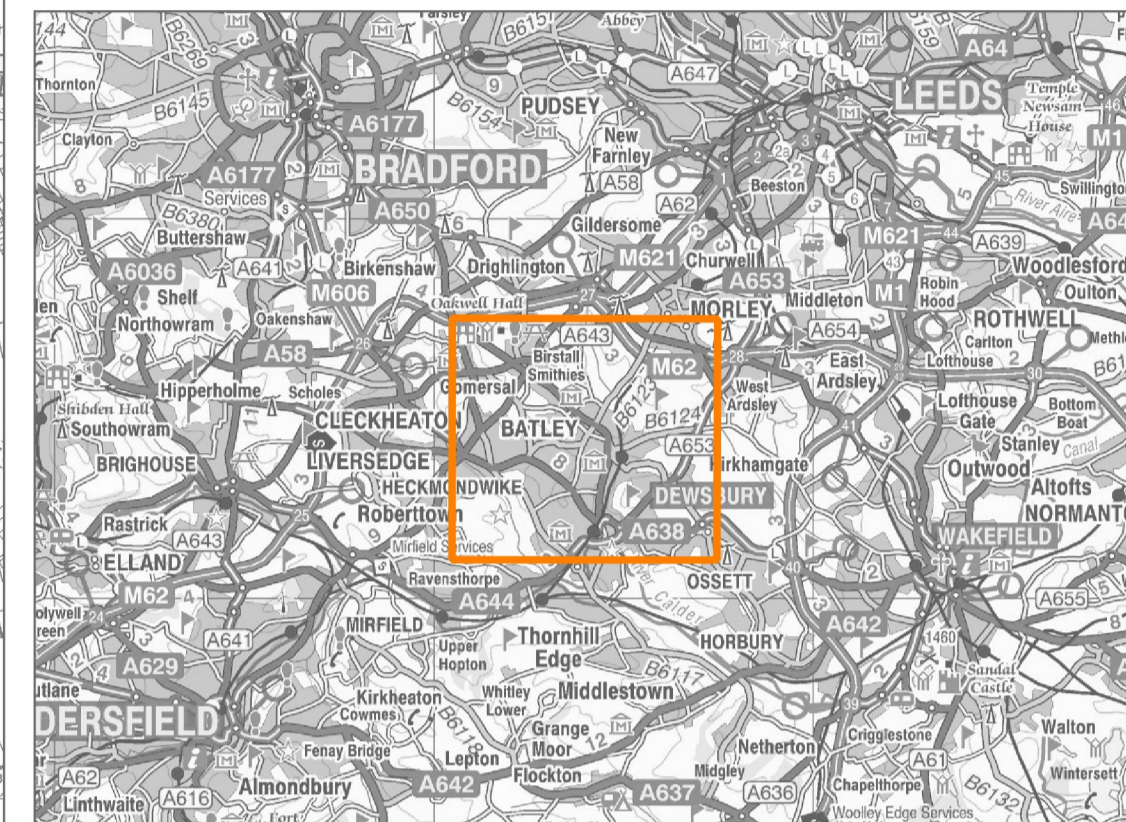


Legend

0.1% AEP Defended Maximum Depth

- 0.0 - 0.25 m
- 0.25 - 0.5 m
- 0.5 - 0.75 m
- 0.75 - 1.0 m
- 1.0 - 2.0 m
- 2.0 - 3.0 m
- 3.0 - 4.0 m
- 4.0 m +

Location



Batley Beck Flood Modelling Study

Defended Maximum Depth

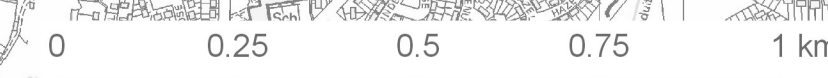
0.1% AEP

Figure 15

Modelled	Drawn	Checked	Approved	Date	Version
PC	ED	SJ	CH	20/11/2015	1-0

Geometry	Model
Defended	BAT01_v2-13_BL.dat

Drawing number: 14029_BatleyBeck_Figure15_MaxDepth_Q1000_FINAL_v1-0



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APPENDIX E

Flood map overlay

Flood map for planning

Your reference

20/013

Location (easting/northing)






424978/424576

Scale

1:2500

Created

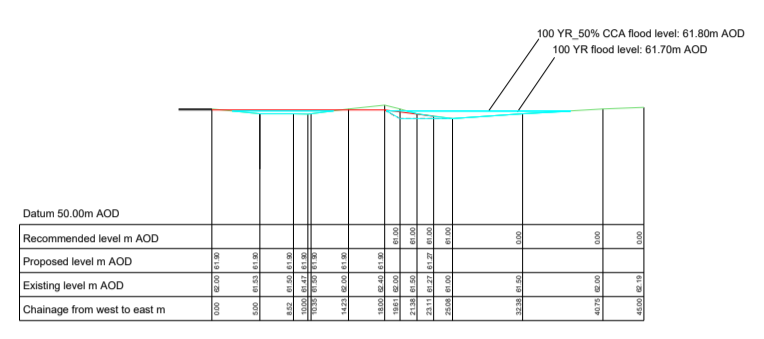
10 Jun 2020 11:46

-  Selected point
-  Flood zone 3
-  Flood zone 3: areas benefitting from flood defences
-  Flood zone 2
-  Flood zone 1
-  Flood defence
-  Main river
-  Flood storage area

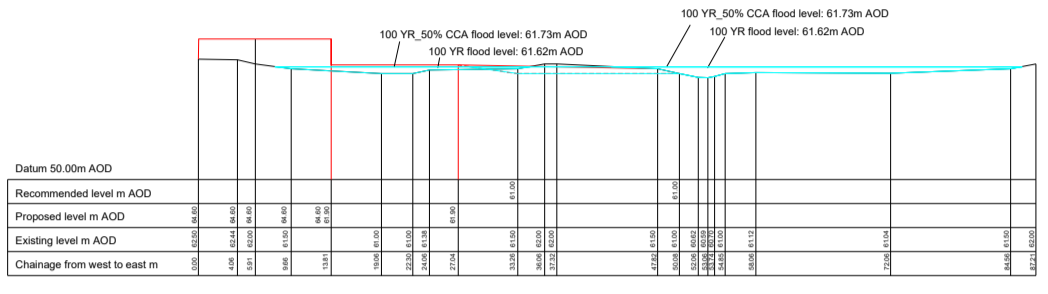


APPENDIX F

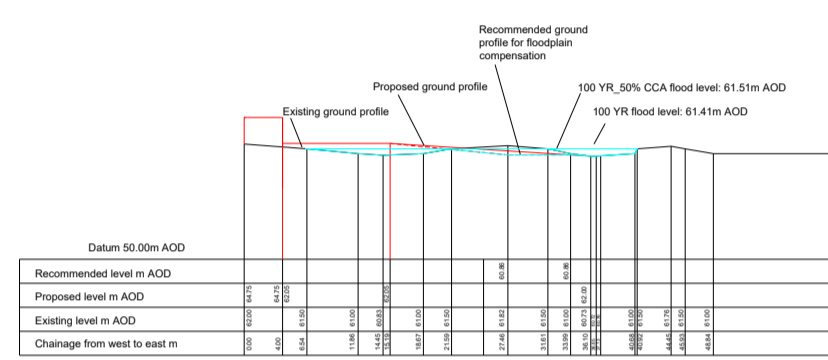
Plan of cross sections 1 to 8



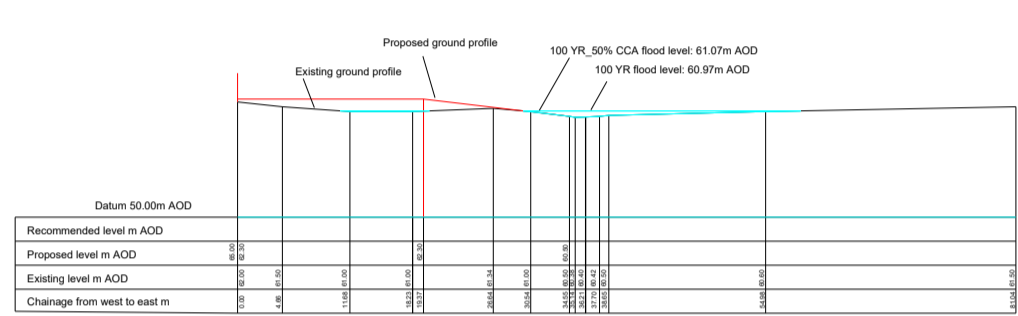
Cross section 1



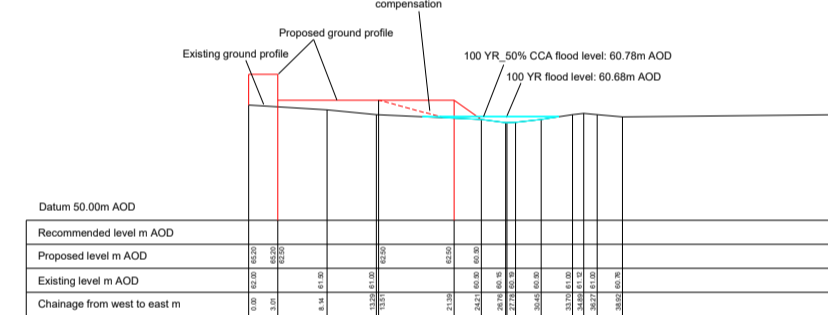
Cross section 2



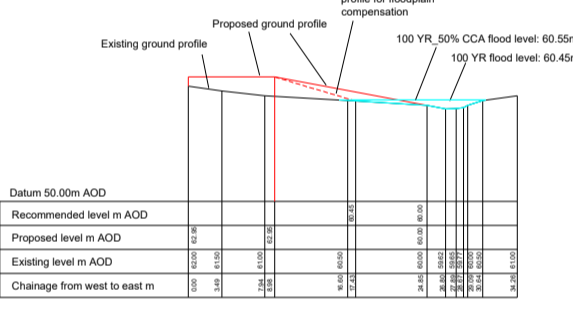
Cross section 3



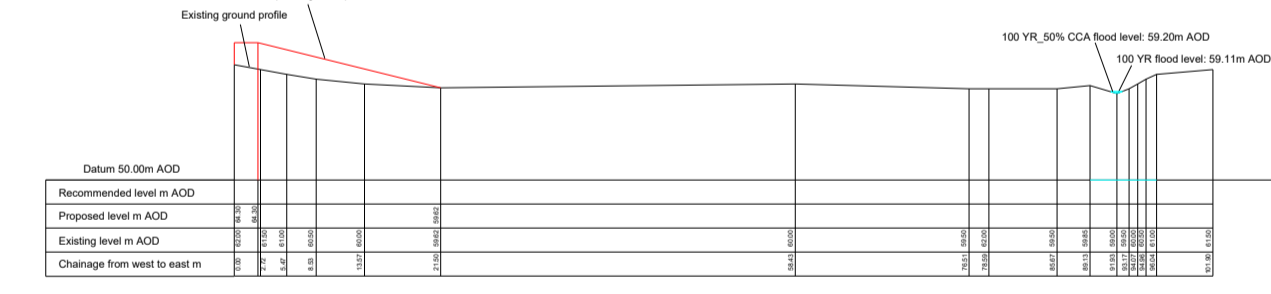
Cross section 4



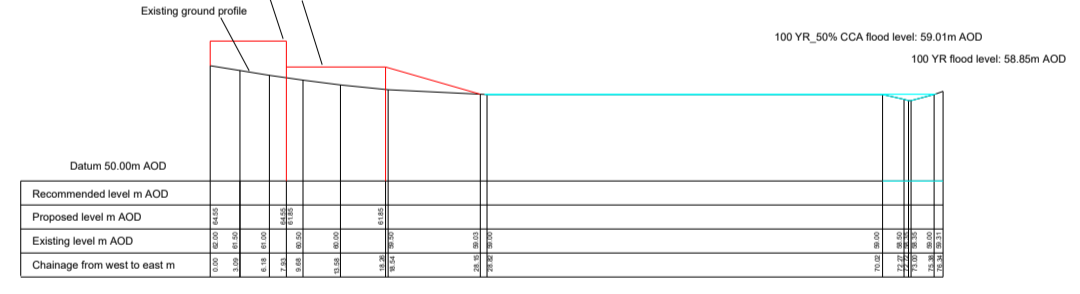
Cross section 5



Cross section 6



Cross section 7



Cross section 8



REV	DESCRIPTION	JOC	DATE
A	50% CCA flood levels added	JOC	10/08/21
STATUS: PLANNING			

Joc consultants Ltd
 Park Farm House
 Leathley Lane
 Leathley
 Oley
 LS21 2JU
 Tel/fax: 0113 284 2838
 www.jocconsultants.co.uk

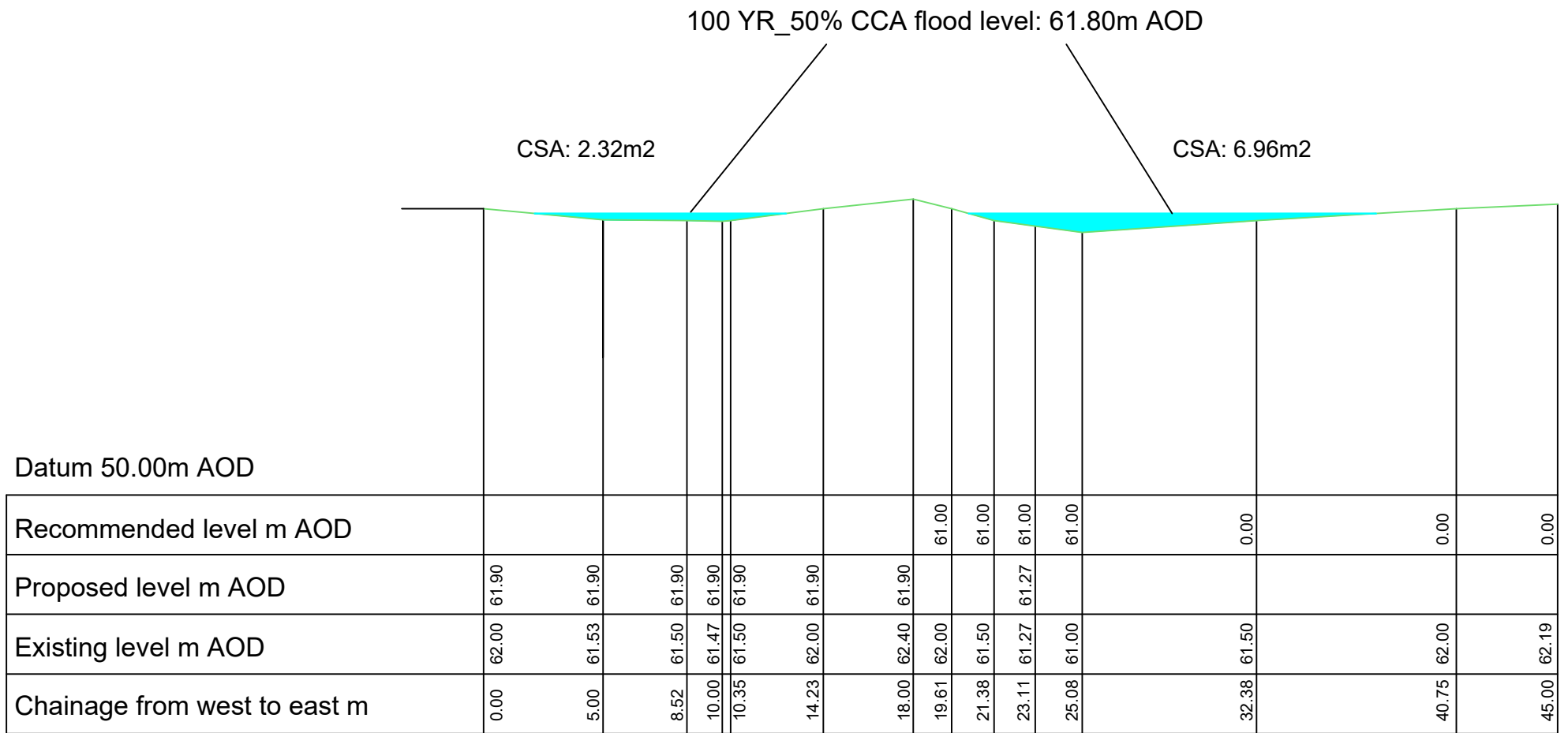
CLIENT:
 D. Noble Ltd

SITE:
 LADY ANN ROAD
 BATLEY

TITLE: CROSS SECTIONS 1 TO 8			
SCALE AT AS	DATE:	DRAWN:	CHECKED:
Not to scale	16-02-21	JOC	JOC
PROJECT NO:	DRAWING NO:	REVISION:	
20/013	20-013-001	A	

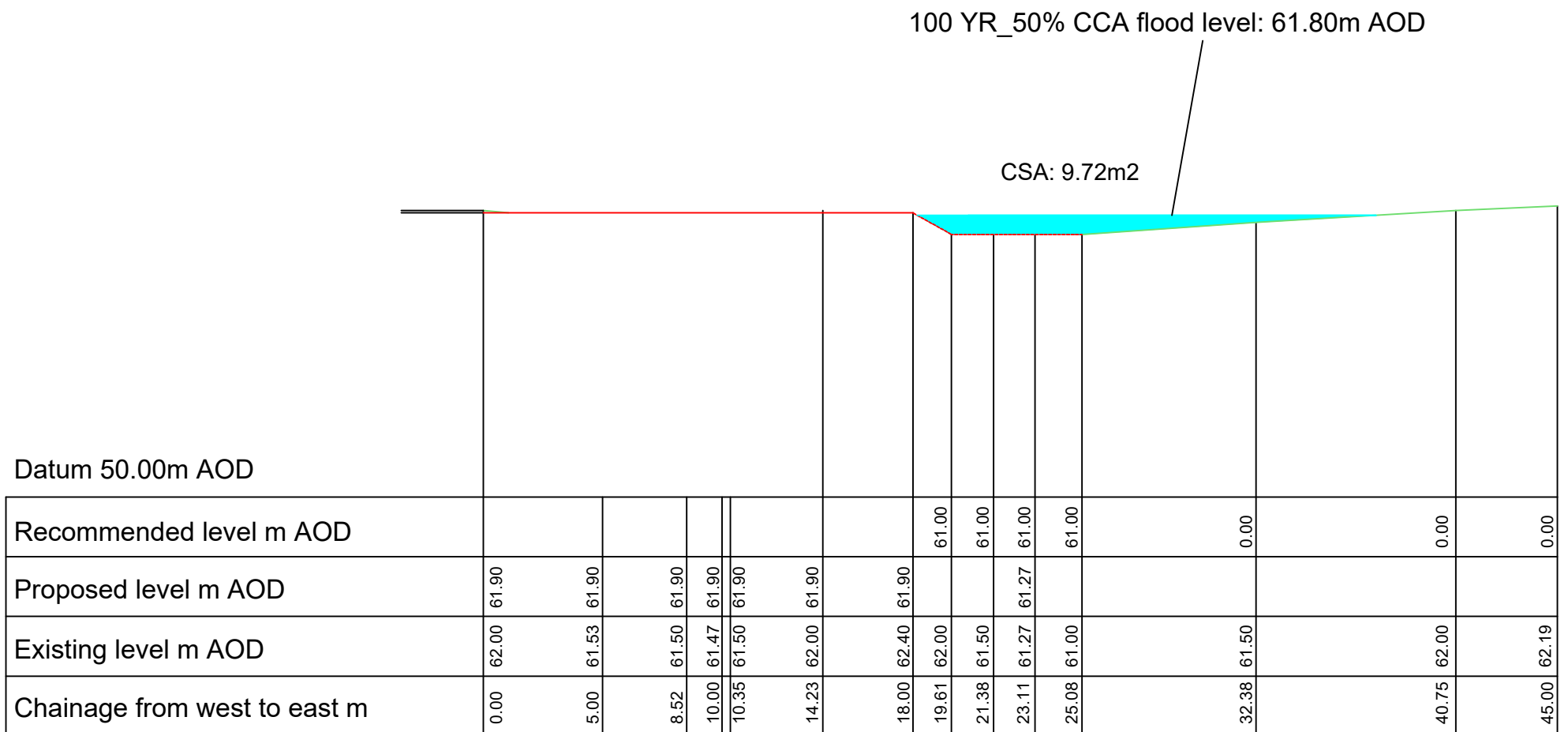
APPENDIX G

Cross sections 1 to 8: existing and post-development



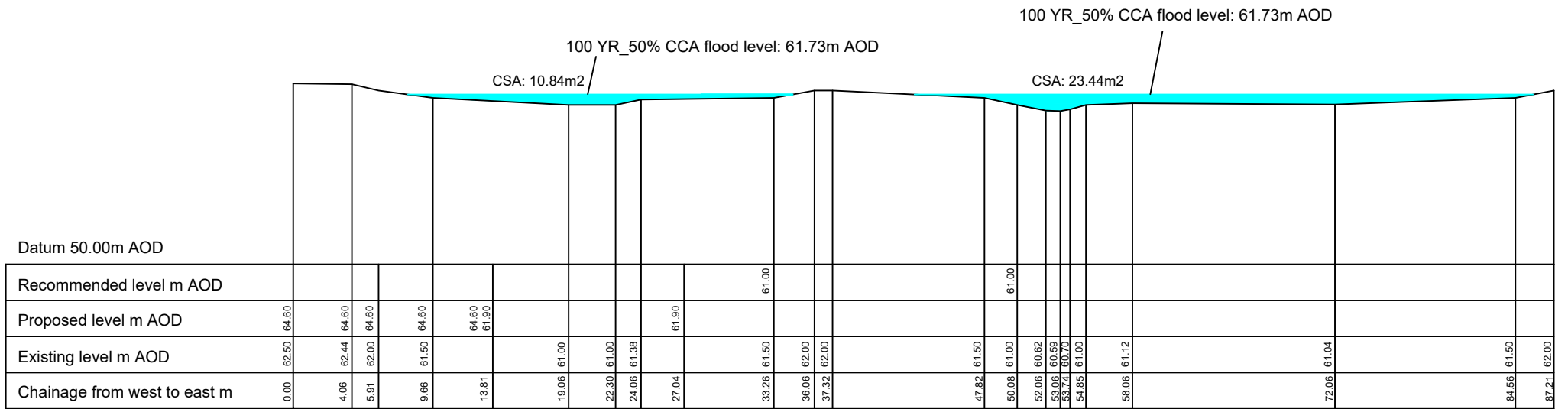
Cross section 1: Existing

Total CSA: 9.28m²

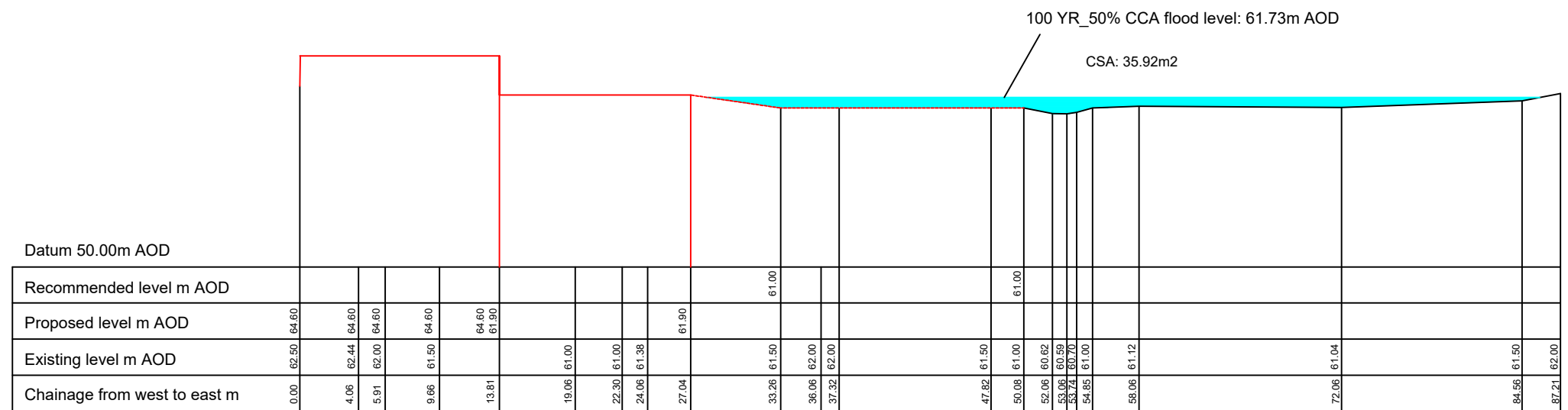


Cross section 1: Post-development

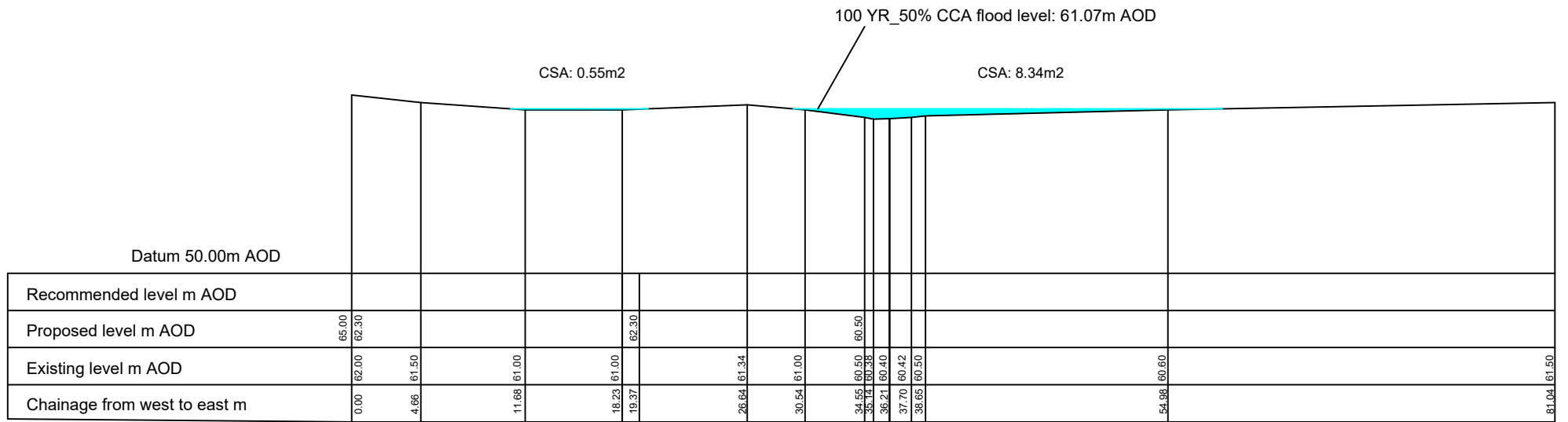
Total CSA: 9.72m²



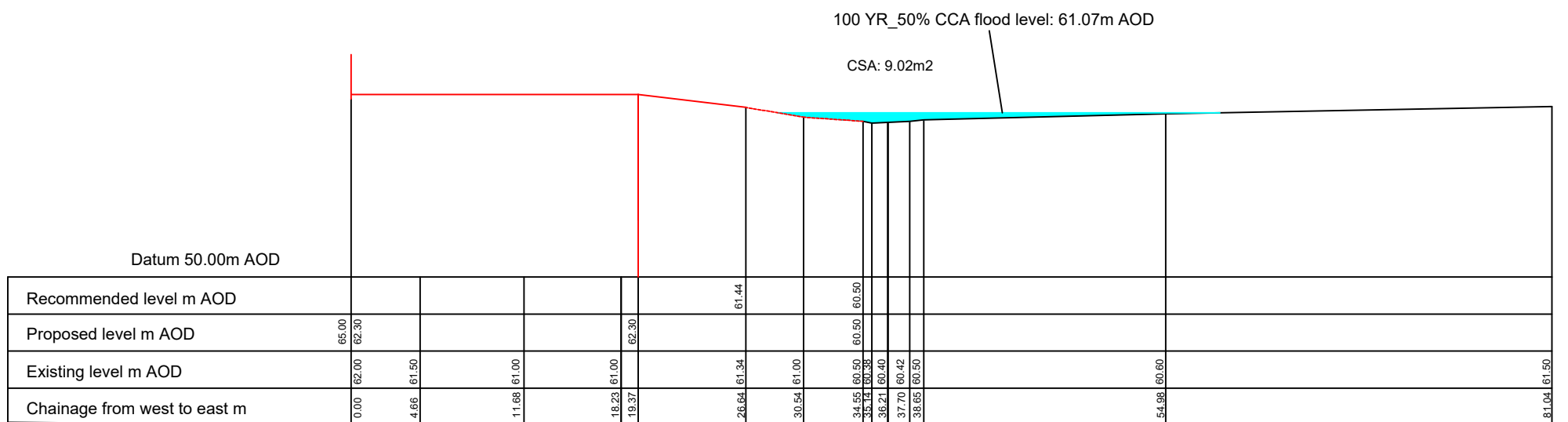
Cross section: 2 Existing
Total CSA: 34.28m2



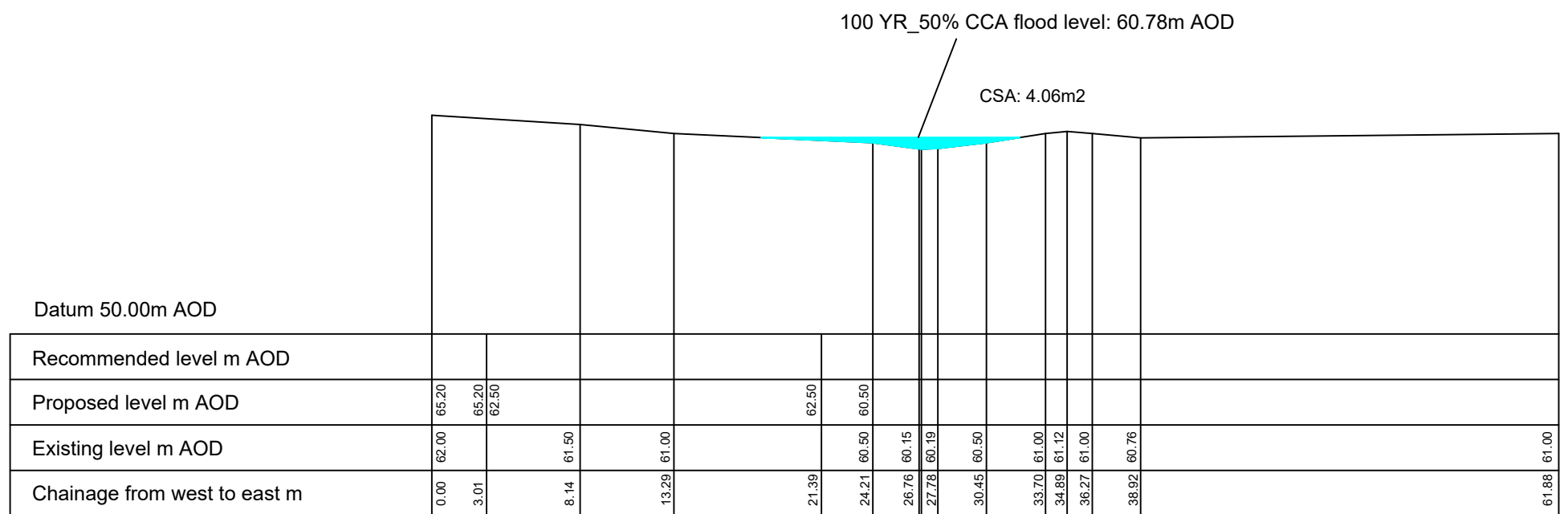
Cross section 2: Post-development
Total CSA: 35.92m2



Cross section 4: Existing
Total CSA: 8.89m2

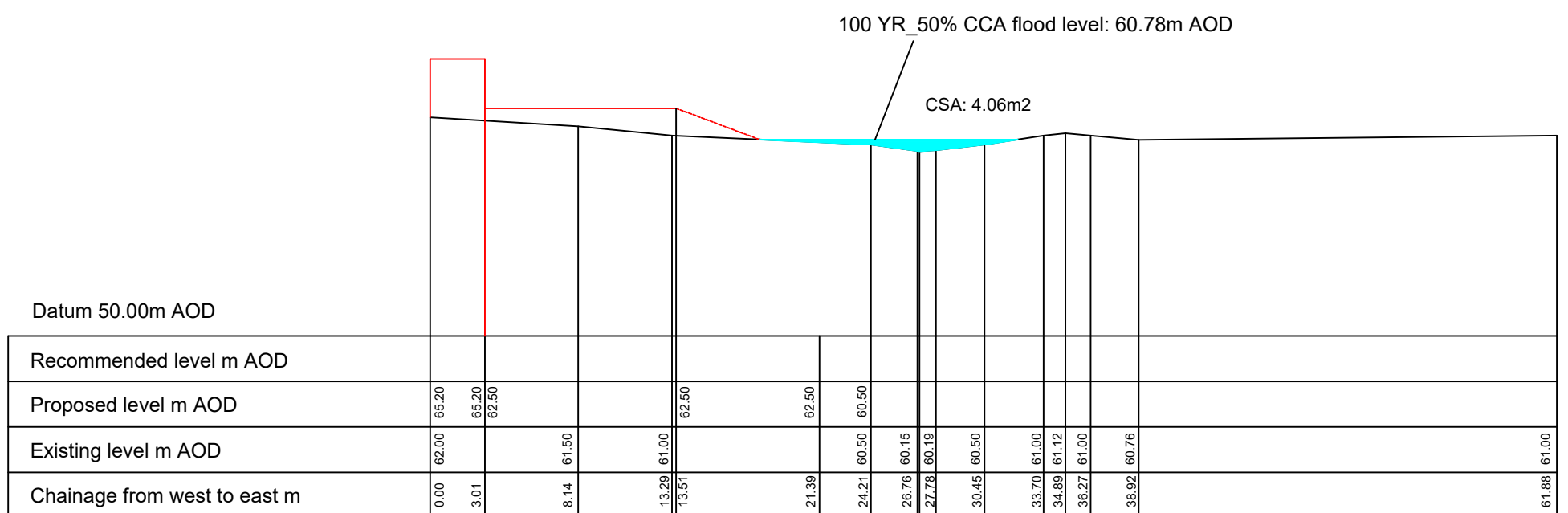


Cross section 4: Post-development
Total CSA: 9.02m2



Cross section 5: Existing

Total CSA: 4.06m²



Cross section 5: Post-development

Total CSA: 4.06m²

100 YR_50% CCA flood level: 60.55m AOD

CSA: 6.35m²

Datum 50.00m AOD

Recommended level m AOD					60.45			60.00											
Proposed level m AOD	62.95			62.95				60.00											
Existing level m AOD	62.00	61.50		61.00			60.50		60.00	59.62	59.65	59.77	60.00	60.50					61.00
Chainage from west to east m	0.00	3.49		7.94	8.98		16.60	17.43		24.85	26.80	27.89	28.67	29.09	30.64				34.26

Cross section 6: Existing

Total CSA: 6.35m²

100 YR_50% CCA flood level: 60.55m AOD

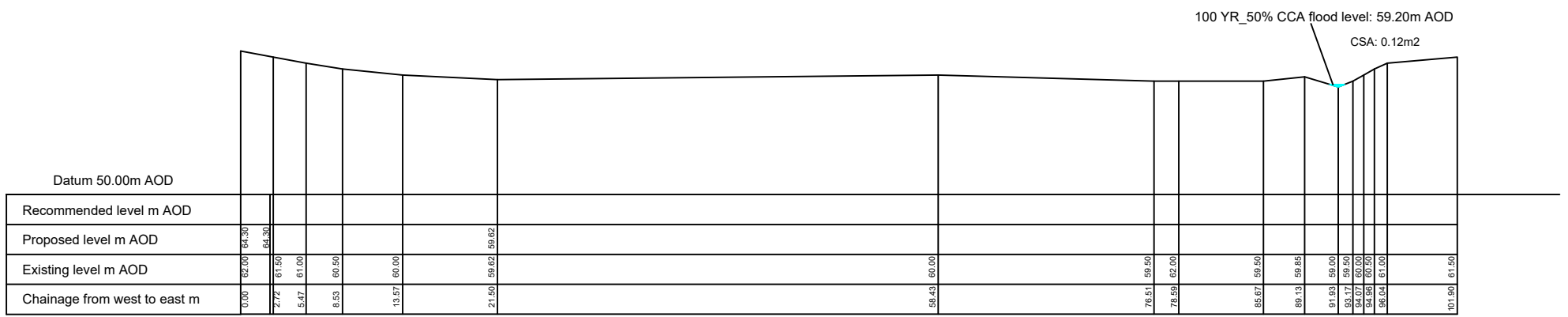
CSA: 6.35m²

Datum 50.00m AOD

Recommended level m AOD					60.45			60.00											
Proposed level m AOD	62.95			62.95				60.00											
Existing level m AOD	62.00	61.50		61.00				60.00	59.62	59.65	59.77	60.00	60.50						61.00
Chainage from west to east m	0.00	3.49		7.94	8.98		17.43		24.85	26.80	27.89	28.67	29.09	30.64					34.26

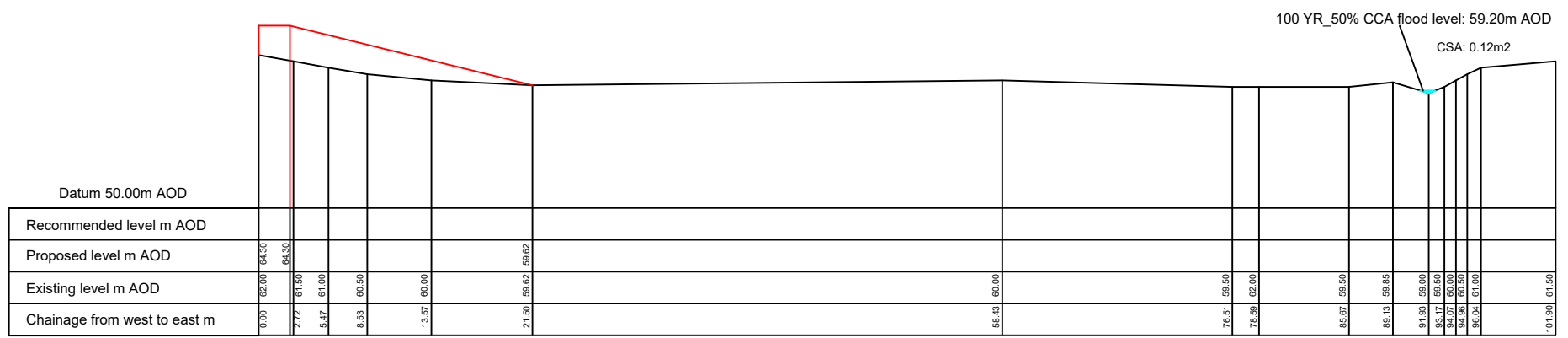
Cross section 6: Post-development

Total CSA: 6.35m²



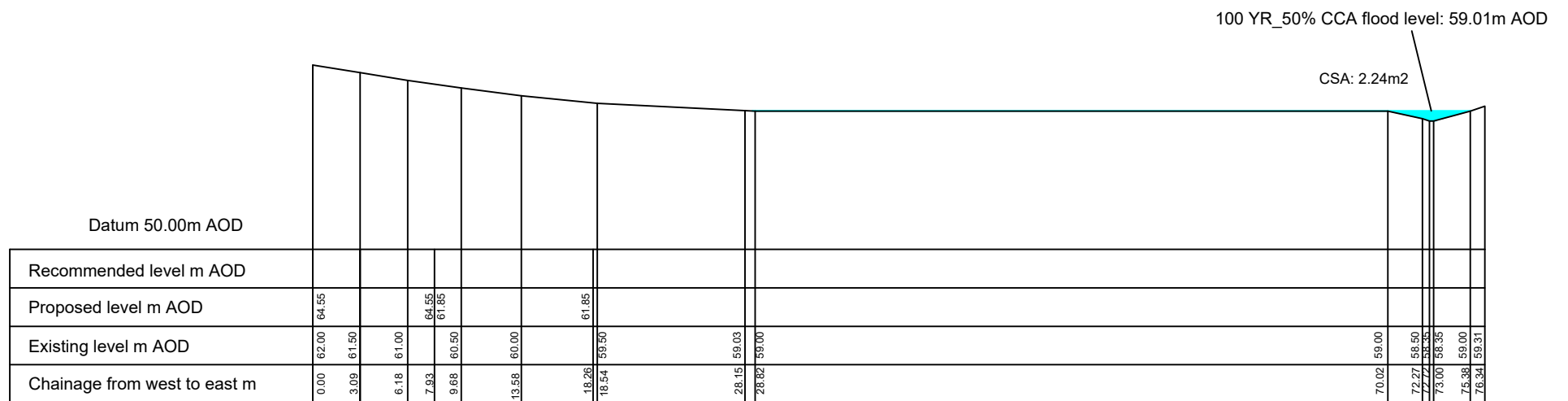
Cross section 7: Existing

Total CSA: 0.12m2



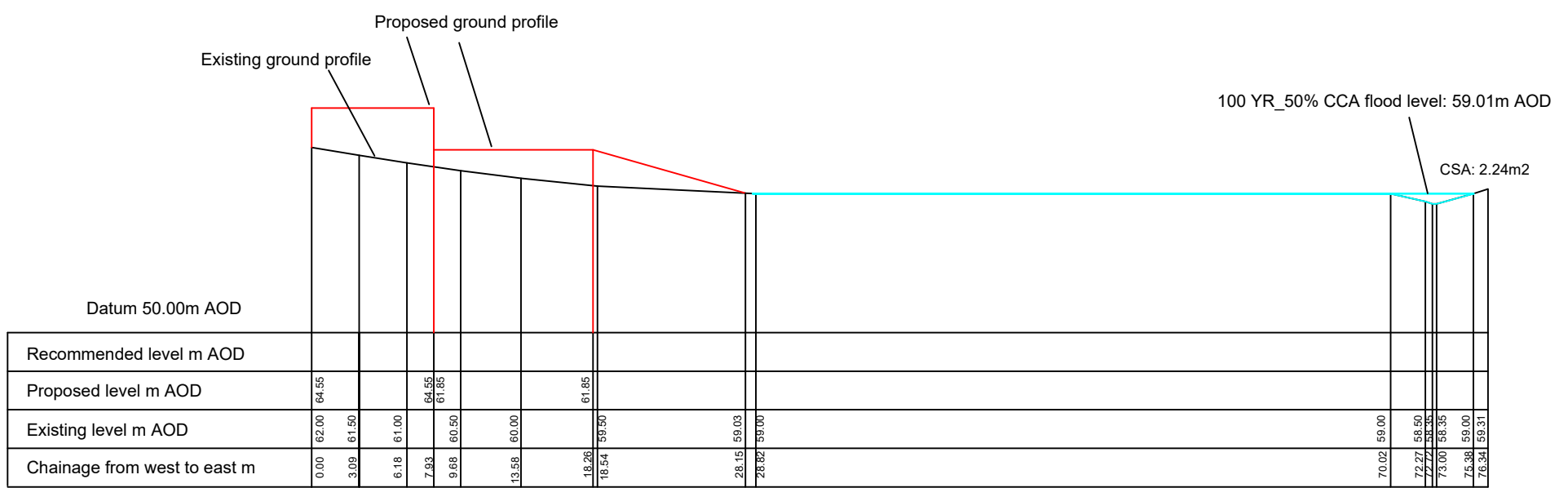
Cross section 7: Post-development

Total CSA: 0.12m2



Cross section 8: Existing

Total CSA: 2.24m2



Cross section 8: Post-development

Total CSA: 2.24m2

APPENDIX H

Floodplain volume calculations

APPENDIX H: Floodplain volume calculations: 1%AEP_50% CCA flood level

revised 9-Sep-21

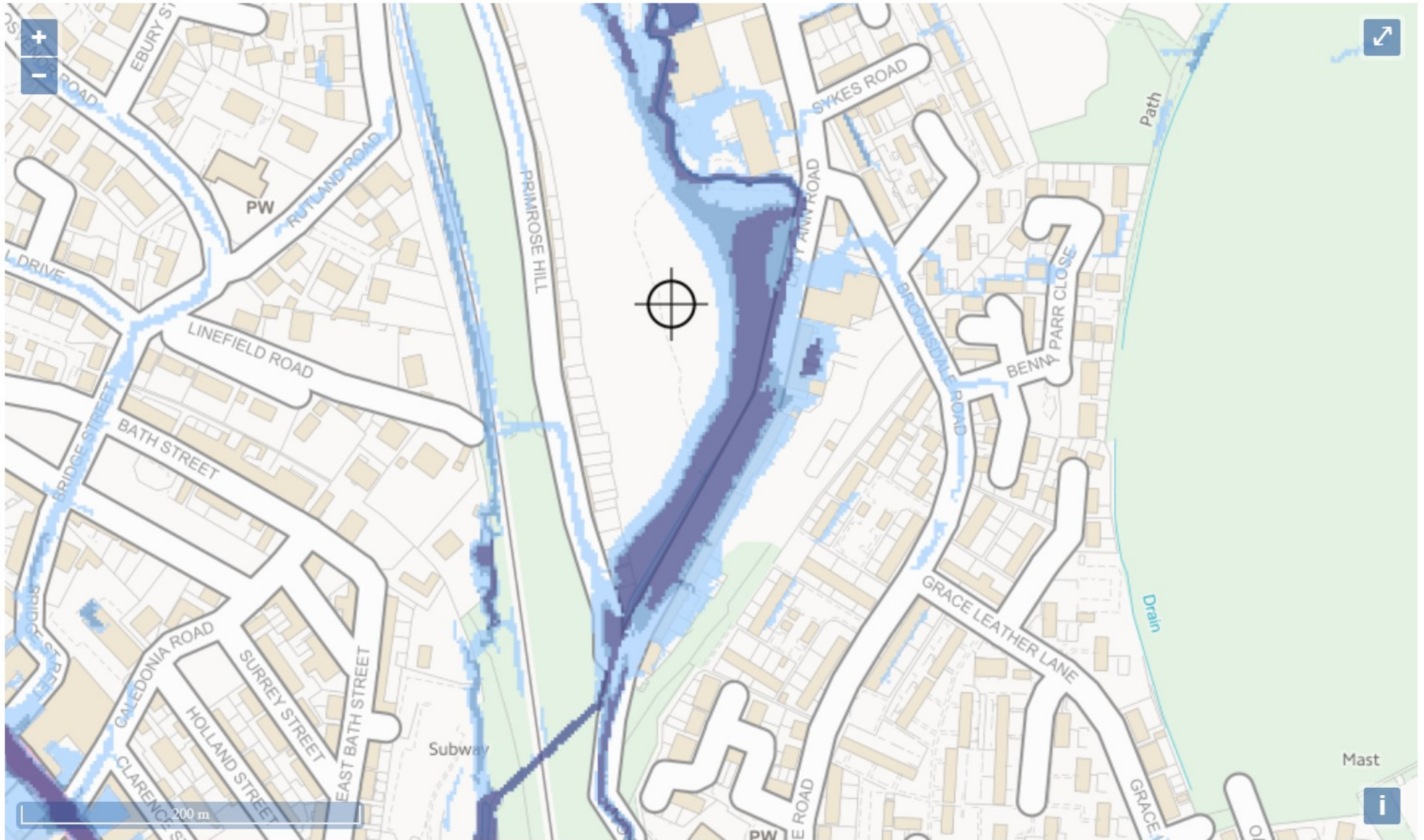
Cross section	Distance m	Existing CSA m ²	Mean CSA m ²	Proposed CSA m ²	Mean CSA m ²	Existing volume m ³	Proposed volume m ³	CSA loss m ²	Proposed CSA revised m ²	Revised CSA loss m ²	Revised mean CSA m ²	Revised proposed volume m ³
1	25.00	9.28	21.78	7.23	15.75	544.55	393.65	2.05	9.72	-0.44	22.82	570.49
2	25.00	34.28	22.78	24.26	16.04	569.51	401.03	10.02	35.92	-1.64	23.85	596.28
3	25.00	11.28	10.09	7.82	8.11	252.14	202.76	3.46	11.78	-0.50	10.40	259.99
4	25.00	8.89	6.48	8.40	5.83	161.95	145.81	0.49	9.02	-0.13	6.54	163.51
5	25.00	4.06	5.20	3.27	3.96	130.10	99.10	0.80	4.06	0.00	5.20	130.10
6	25.00	6.35	3.23	4.66	2.39	80.76	59.73	1.68	6.35	0.00	3.23	80.76
7	25.00	0.12	1.18	0.12	1.18	29.49	29.49	0.00	0.12	0.00	1.18	29.49
8		2.24		2.24				0.00	2.24	0.00		
						1,768.50	1,331.56					1,830.61
						Net loss:	436.94				Net gain:	62.11

APPENDIX I

Updated Surface Water Flood Maps

Extent of flooding

Enter a place or postcode



Extent of flooding from surface water

High Medium Low Very low Location you selected

High risk: depth

Enter a place or postcode



Surface water flood risk: water depth in a high risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

Flood risk

Location

Medium risk: depth

Enter a place or postcode



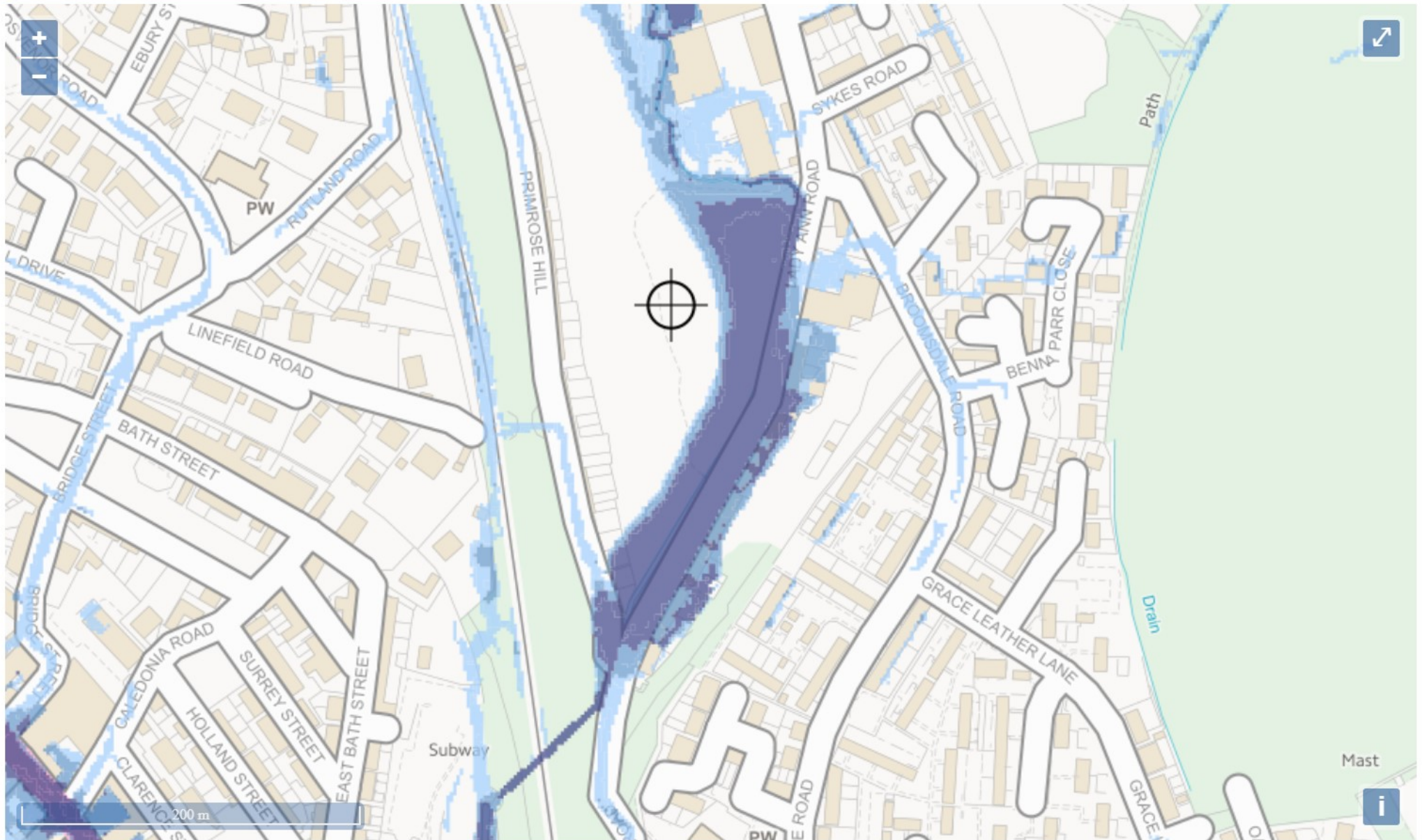
Surface water flood risk: water depth in a medium risk scenario

Flood depth (millimetres)

● Over 900mm ● 300 to 900mm ● Below 300mm ⊕ Location you selected

Low risk: depth

Enter a place or postcode



Surface water flood risk: water depth in a low risk scenario

Flood depth (millimetres)

Over 900mm 300 to 900mm Below 300mm Location you selected

APPENDIX J

REFH2 estimates of peak runoff rates and volumes

APPENDIX F: ReFH2 results

Gross area	3.23 ha
Impervious	1.405 ha
Hydrological area	3

Return period (yrs)	Urbanised peak flow (l/s)	Urbanised direct runoff (m ³)	As-rural peak flow (l/s)	As-rural direct runnof (m ³)	% increase in peak flow rate	% increase in volume
1	18.92	228.56	11.47	138.47	65%	65%
2	21.62	262.41	13.05	159.64	66%	64%
5	30.60	375.40	18.41	231.48	66%	62%
10	37.20	458.72	22.43	285.59	66%	61%
30	48.35	600.17	29.38	379.56	65%	58%
50	54.31	676.09	33.18	431.05	64%	57%
75	59.54	742.75	36.56	476.86	63%	56%
100	63.59	794.55	39.20	512.82	62%	55%
100_20% CCA	76.69	962.70	47.92	631.73	60%	52%
100_40% CCA	89.96	1133.92	57.01	756.09	58%	50%
200	75.05	941.63	46.82	616.65	60%	53%
1000	112.29	1423.91	72.84	973.76	54%	46%
				Average:	62%	57%

Q MED greenfield:	13.05 l/s
Growth curve factor	0.94 FSSR 14
Q bar	13.88 l/s

Estimate of attenuation storage

Proposed discharge rate	6.50 l/s
Storm duration	03:30:00
Duration in seconds	12600
Volume discharged m ³	81.90
20% CCA storage m ³	880.80
40% CCA storage m ³	1052.02

APPENDIX K

Estimated flood levels with CCAs

APPENDIX K: Flood levels with CCA

Node	1%_30%		1%_50%		1%_65%	
	Flow m ³ /s	Level m AOD	Flow m ³ /s	Level m AOD	Flow m ³ /s	Level m AOD
HOW_1085	1.856	62.92	1.860	62.97	1.863	62.99
HOW_0846	5.270	61.08	5.526	61.12	5.718	61.14
HOW_0680	4.221	59.16	4.315	59.20	4.386	59.22
HOW_0424	7.324	26.80	8.167	57.10	8.799	57.40

APPENDIX L

Tables L1 and L2:

Table L1 Water surface gradients

Table L2: Required finished floor levels

TABLE L1: Water surface gradients					
	Node	HOW_1085	HOW_0846	HOW_0680	HOW_0424
Distance			239	166	256
1% flood level mAOD		62.853	61.022	59.110	56.233
Gradient			0.008	0.012	0.011
1% flood level mAOD_ 30% CCA		62.920	61.080	59.160	56.800
Gradient			0.008	0.012	0.009
1% flood level mAOD_ 50% CCA		62.970	61.120	59.200	57.140
Gradient			0.008	0.012	0.008
0.1% flood level mAOD		62.990	61.147	59.209	57.661
Gradient			0.008	0.012	0.006

TABLE L2: Estimated flood levels through the site and proposed finished floor levels

Plot No	Node	Distance d/s of node	Proposed FFL	1% AEP FL	1% 30% CCA FL	Freeboard	Is Proposed FFL acceptable?	Required minimum freeboard	Required minimum FFL	Required increase	1% 50% CCA FL	Freeboard with required FFL	0.1% AEP FL	Freeboard with required FFL	Cross section
			m AOD	m AOD	m AOD	mm		m	m AOD	m	m AOD	m	m AOD	m	
36	1085	150.9	61.90	61.70	61.76	0.14	Too Low	0.60	62.36	0.46	61.80	0.56	61.83	0.53	CS 1
37	1085	160.8	61.90	61.62	61.68	0.22	Too Low	0.60	62.28	0.38	61.73	0.56	61.75	0.53	CS 2
38	1085	170.7	61.90	61.55	61.61	0.29	Too Low	0.60	62.21	0.31	61.65	0.56	61.67	0.53	
39	1085	181.3	62.05	61.46	61.52	0.53	Too Low	0.60	62.12	0.07	61.57	0.56	61.59	0.53	
40	1085	188.9	62.05	61.41	61.47	0.58	Too Low	0.60	62.07	0.02	61.51	0.56	61.53	0.53	CS 3
41	1085	190.7	62.15	61.39	61.45	0.70	OK	0.60	62.05	Nil	61.49	0.56	61.52	0.53	
42	1085	198.0	62.15	61.34	61.40	0.75	OK	0.60	62.00	Nil	61.44	0.56	61.46	0.53	
43	0846	4.5	62.30	60.97	61.03	1.27	OK	0.60	61.63	Nil	61.07	0.56	61.09	0.53	CS 4
44	0846	12.0	62.30	60.88	60.94	1.36	OK	0.60	61.54	Nil	60.98	0.56	61.01	0.53	
45	0846	23.1	62.50	60.76	60.81	1.69	OK	0.60	61.41	Nil	60.85	0.56	60.88	0.54	
46	0846	29.7	62.50	60.68	60.74	1.76	OK	0.60	61.34	Nil	60.78	0.56	60.80	0.54	CS 5
47	0846	41.9	62.95	60.54	60.60	2.35	OK	0.60	61.20	Nil	60.64	0.56	60.66	0.54	
48	0846	49.7	62.95	60.45	60.51	2.44	OK	0.60	61.11	Nil	60.55	0.56	60.57	0.54	CS 6
49	0846	65.7	63.60	60.27	60.32	3.28	OK	0.60	60.92	Nil	60.36	0.56	60.38	0.54	
50	0846	77.2	63.60	60.13	60.19	3.41	OK	0.60	60.79	Nil	60.23	0.56	60.25	0.54	
51	0680	0.0	64.30	59.11	59.16	5.14	OK	0.60	59.76	Nil	59.20	0.56	59.21	0.55	CS 7
52	0680	8.9	64.30	59.01	59.08	5.22	OK	0.60	59.68	Nil	59.13	0.55	59.16	0.52	
71	0680	16.6	64.55	58.92	59.01	5.54	OK	0.60	59.61	Nil	59.07	0.54	59.11	0.50	
70	0680	23.0	64.55	58.85	58.95	5.60	OK	0.60	59.55	Nil	59.01	0.53	59.07	0.48	CS 8
69	0680	32.8	61.70	58.74	58.86	2.84	OK	0.60	59.46	Nil	58.94	0.52	59.01	0.45	
68	0680	41.2	61.70	58.65	58.78	2.92	OK	0.60	59.38	Nil	58.87	0.51	58.96	0.42	
67	0680	49.3	61.40	58.56	58.71	2.69	OK	0.60	59.31	Nil	58.80	0.50	58.91	0.39	CS9
66	0680	55.6	61.40	58.49	58.65	2.75	OK	0.60	59.25	Nil	58.75	0.49	58.87	0.37	
65	0680	64.5	61.10	58.39	58.57	2.53	OK	0.60	59.17	Nil	58.68	0.48	58.82	0.35	
64	0680	76.3	60.80	58.25	58.46	2.34	OK	0.60	59.06	Nil	58.59	0.47	58.75	0.31	
63	0680	85.4	60.80	58.15	58.37	2.43	OK	0.60	58.97	Nil	58.51	0.46	58.69	0.28	
Access Road	0680	100.3		57.98	58.24			0.60	Required minimum soffit level m AOD 58.84		58.39	Freeboard with required minimum soffit level 0.44	58.60	Freeboard with required minimum soffit level 0.23	

End of Report