

I. Flood risk screening assessment

I.1 Site area 1

Topographic levels

- I.1.1 The site has an area of approximately 68Ha. Topographic levels on site vary between approximately 7.53mAOD and 11.49mAOD, with an average of 10.11mAOD (according to Environment Agency 2m LiDAR data). Lowest topographic levels are present to the south-east of site. Highest topographic levels are associated with a public footpath, Mere Way, which transects the site.

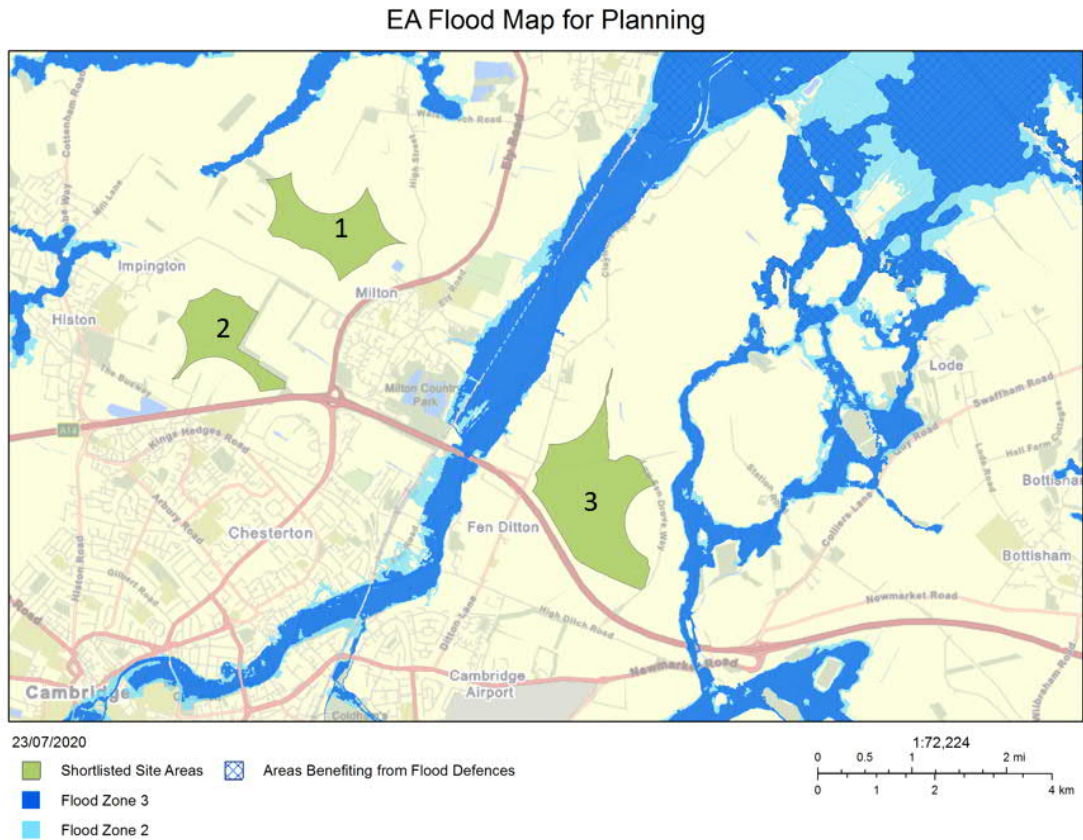
Vulnerability Classification

- I.1.2 The existing site is greenfield, which is unclassified for flood risk vulnerability with respect to the National Planning Policy Framework (NPPF). Post development, the proposed Waste Water Treatment Plant would be considered “Water Compatible” and therefore the NPPF vulnerability of the site would be increased compared to the existing situation.

Fluvial/Tidal

- I.1.3 Site 1 is located entirely within Environment Agency (EA) Flood Zone 1, with a less than 1 in 1000 (0.1%) annual chance of flooding from rivers or sea. The site is a minimum of 1.7km north-west of the River Cam, which is an EA main river, and is a minimum of 3.7km south-east of the Great Ouse, which is also an EA main river (Figure I.2).
- I.1.4 The site is not located in an area that is considered to benefit from EA defences to a 1 in 100-year standard of protection.
- I.1.5 There are numerous ordinary watercourses/drains both onsite and within its near vicinity. A review of the Internal Drainage Boards (IDB) map for Cambridgeshire indicates that approximately 1km north of site, drainage is managed by the Old West IDB. However, the site itself falls outside all designated IDB boundaries and is be assumed to be under riparian ownership. Confirmation of drain management would be sought with Old West IDB if this site area is selected.
- I.1.6 The closest EA Flood Zone 2 and 3 areas are located approximately 360m north west of site, associated with the ordinary watercourses/drain network which drains to the River Great Ouse.
- I.1.7 The present-day fluvial/tidal risk to site is considered to be low.

Figure I.2: EA Flood Map for Planning



Source: Environmental Constraints: ©Environment Agency and/or database right 2020, Basemapping: Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS | OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

Peak river flow climate change considerations

- I.1.8 The site is currently located entirely within EA Flood Zone 1. EA guidance states that “Water Compatible” developments which are currently located within Flood Zone 1 but may be in Flood Zones 2 or 3 in the future, should apply the Central Allowance for peak river flow. In the Anglian catchment, the Central peak river flow allowance is 25%.
- I.1.9 The EA has further confirmed that the site is outside the modelled flood extent of the Cam Urban model. The FEH webservice indicates that the site is located on the watershed of the River Cam catchment and the Great Ouse catchment. Taking this in to consideration, and given that the site is located entirely within Flood Zone 1, the future fluvial/tidal flood risk to site is considered to be low.

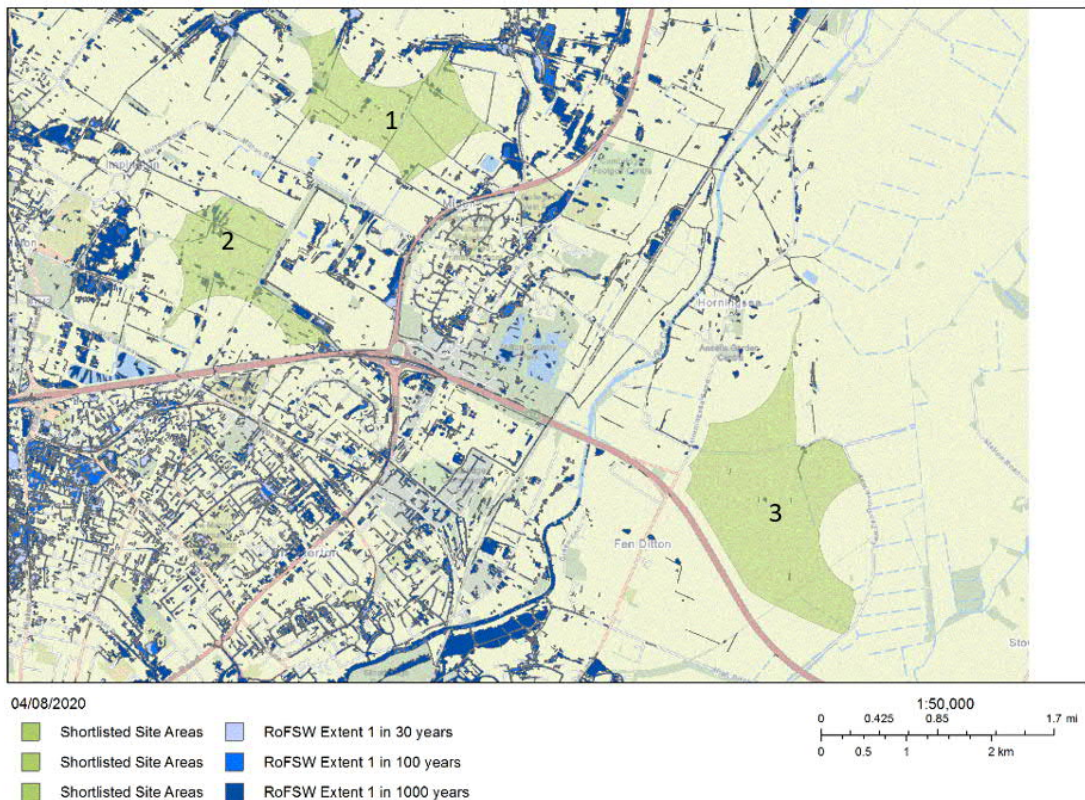
Surface Water

- I.1.10 According to the EA Risk of Flooding from Surface Water (RoFSW) extents maps, the risk of surface water flooding on site is considered to be “Very Low” to “Low”. Areas identified to be at “Very Low” risk have a less than 1 in 1,000-year (0.1%) annual risk of flooding from surface water sources. Those identified at “Low” risk have between a 1 in 1,000-year to 1 in 100-year (0.1% to 1%) annual risk of flooding.

- I.1.11 In a “Low” risk surface water flooding event, additional water would predominantly accumulate within and discharge from existing onsite drainage channels. Some minor ponding may occur at areas of marginally lower topographic elevation. The average surface water flood depth in affected drainage channels in this event would be 0.15m to 0.3m.
- I.1.12 As there is no evidence of overland flow routes across the site, it is considered likely that additional future rainfall, in the event of climate change, could be adequately managed by onsite drainage (subject to verification of greenfield runoff rates according to the CIRIA 753 guidance).
- I.1.13 The risk of flooding from surface water sources is considered to be low.

Figure I.3: Risk of flooding from surface water (RoFSW) extents

Risk of Flooding from Surface Water extents

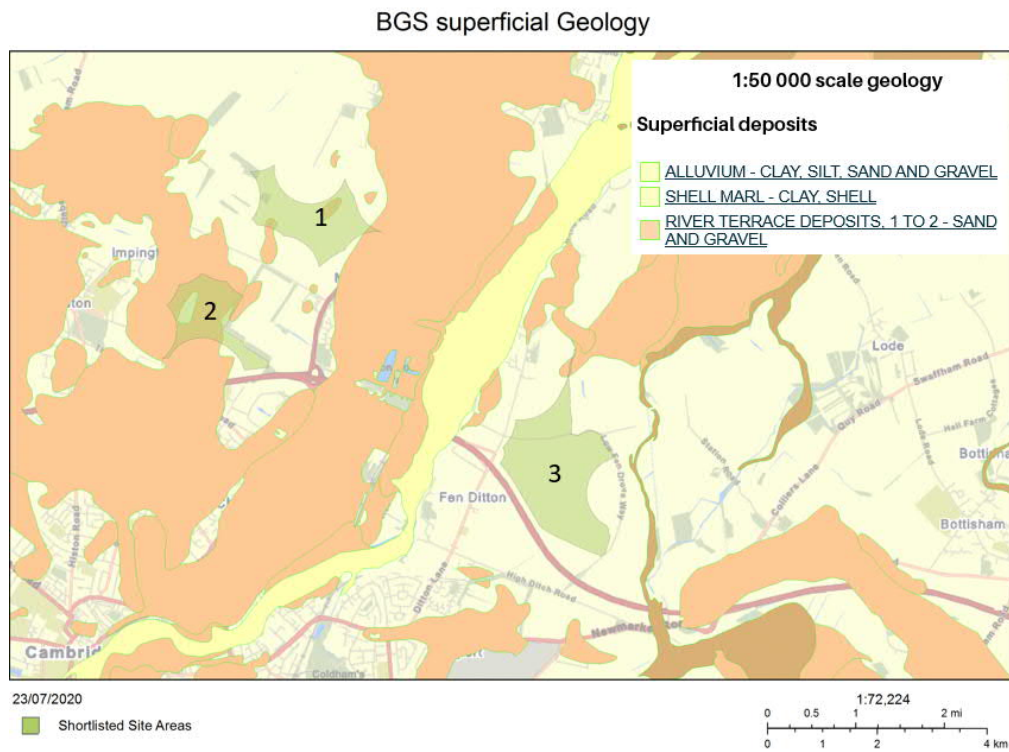


Source: Environmental Constraints: ©Environment Agency and/or database right 2020, Basemapping: Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS | OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

Geology

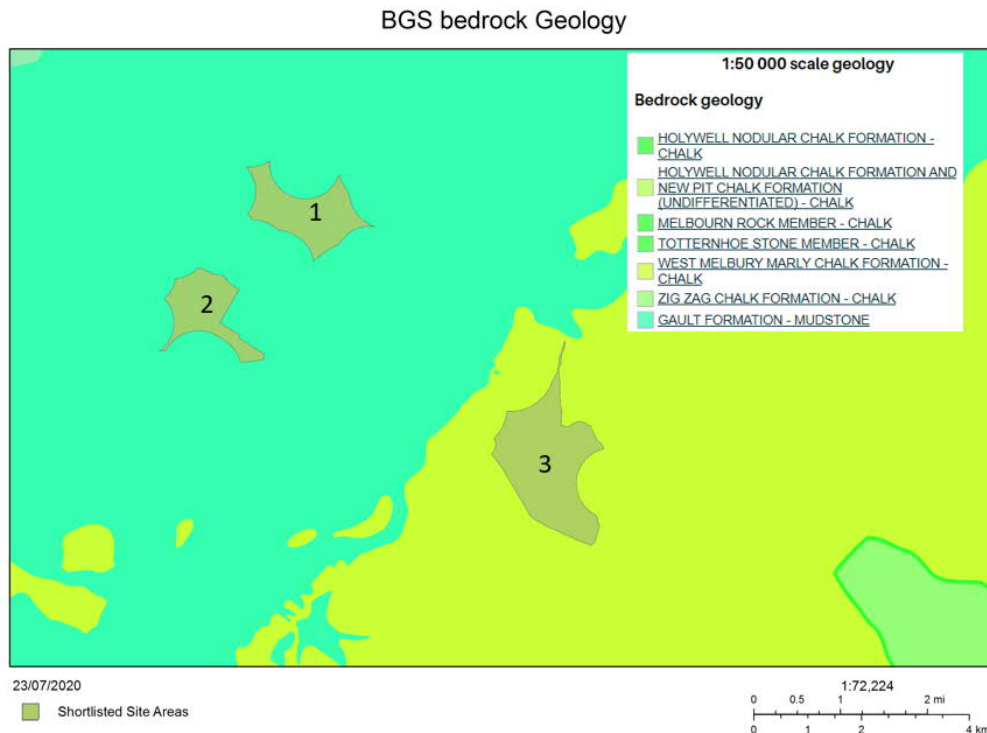
- I.1.14 According to the British Geological Survey, superficial deposits are largely absent from site, with two small pockets of River Terrace Deposits (sand and gravel) occupying approximately 6% of the site area. Site investigation is recommended to confirm the BGS 1:50,000 scale designation of superficial deposits
- I.1.15 The BGS maps demonstrate that the bedrock underlying the site is the Gault Formation (mudstone).

Figure I.4: BGS superficial geology (1:50,000)



Source: Superficial geology: Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved. Basemapping: Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS | OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS

Figure I.5: BGS bedrock geology (1:50,000)



Source: Bedrock geology: Reproduced with the permission of the British Geological Survey ©UKRI. All rights Reserved.

Groundwater

- I.1.16 The BGS Hydrogeology 1:625,000 maps consider the bedrock in this area to have essentially no groundwater. The site is not located within an EA groundwater Source Protection Zone.
- I.1.17 The superficial River Terrace deposits, where present on site, are considered a Secondary “A” aquifer, whereas the bedrock mudstone is not considered an aquifer, according to BGS/MagicMap designations.
- I.1.18 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) states that groundwater flooding has occurred within the district, at Barrington, Bassingbourn, south east Cambridge, Fulbourn, Great Eversden, Little Eversden, Madingley, Stow Cum Quy, Thriplow and Waterbeach. There is no indication however that the west of Milton has previously been affected by groundwater flooding.
- I.1.19 The risk of flooding from groundwater is considered to be low.

Infiltration Potential

- I.1.20 Superficial gravel deposits occupy approximately 6% of the site area and may be suitable for infiltration (pending infiltration tests). Appendix C of the Cambridge City Council SFRA (2010), indicates that there is a likelihood of impeded drainage associated with the mudstone bedrock.

Sewer

- I.1.21 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of sewer flooding on site, based on information provided by the Highways Agency, parish councils and Anglian Water Services DG5 register.
- I.1.22 The risk of flooding from sewer sources is considered to be low.

Historic

- I.1.23 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of historical flooding from fluvial, groundwater, surface water or sewer sources on site in the years preceding 2010.
- I.1.24 The EA hold historic records of fluvial flooding in the district, which indicate fluvial flooding in 1947 and 2001, approximately 1.5km south-east of site, due to exceedance of channel capacity on the River Cam.

Residual Risk

- I.1.25 The site is located entirely within EA Flood Zone 1 and is not located with an area that is considered to benefit from EA defences to a 1 in 100-year standard of protection. Therefore, the risk to site in the event of a breach of defences is considered to be low.
- I.1.26 The EA has further confirmed that the site is outside the flooding extent from the Cam Urban model and that defence-breach hazard mapping is not available for site (as of August 2020). It would appear therefore that the EA does not consider the site to be at significant risk in the event of a breach of defences.
- I.1.27 The EA Risk of Flooding from Reservoirs map demonstrates that the site is not located within an area considered to be at risk in the event of reservoir failure.

I.2 Site area 2

Topographic levels

- I.2.1 The site has an area of approximately 53Ha. Topographic levels on site vary between 10.82mAOD and 13.28mAOD, with an average of 11.97mAOD (according to Environment Agency 2m LiDAR data). The site is relatively flat, with lowest elevations towards the north-west of site.

Vulnerability Classification

- I.2.2 The existing site is greenfield, which is unclassified for flood risk vulnerability with respect to the National Planning Policy Framework (NPPF). Post development, the proposed Waste Water Treatment Plant would be considered "Water Compatible" and therefore the NPPF vulnerability of the site would be increased compared to the existing situation.

Fluvial/Tidal

- I.2.3 Site 2 is located entirely within Environment Agency (EA) Flood Zone 1, with a less than 1 in 1000 (0.1%) annual chance of flooding from rivers or sea. The site is a minimum of 2.1km north-west of the River Cam, which is an EA main river, and is a minimum of 2.8km south-east of the Great Ouse, which is also an EA main river.

- I.2.4 The site is not located in an area that is considered to benefit from EA defences to a 1 in 100-year standard of protection.
- I.2.5 There is an ordinary watercourse/drain along the north-eastern boundary of site. A review of the Internal Drainage Boards (IDB) map for Cambridgeshire indicates that approximately 1km north of site, drainage is managed by the Old West IDB. However, the site itself falls outside all designated IDB boundaries and might be assumed to be under riparian ownership. Confirmation of drain management would be sought with Old West IDB if this site area is selected.
- I.2.6 The closest EA Flood Zone 2 and 3 areas are approximately 1km north-west of site, associated with a public drain, which in turn drains to the Great Ouse.
- I.2.7 The present-day fluvial/tidal risk to site may is considered to be low.

Peak River Flow Climate Change Considerations

- I.2.8 The site is currently located entirely within EA Flood Zone 1 (Figure L.1). EA guidance states that “Water Compatible” developments which are currently located within Flood Zone 1 but may be in Flood Zones 2 or 3 in the future, should apply the Central Allowance for peak river flow. In the Anglian catchment, the Central peak river flow allowance is 25%.
- I.2.9 The EA has further confirmed that the site is outside the modelled flood extent of the Cam Urban model. The FEH webservice indicates that the site is located on the watershed of the River Cam catchment and the Great Ouse catchment. Taking this into consideration, and given that the site is located entirely within Flood Zone 1, the future fluvial/tidal flood risk to site is considered to be low.

Surface Water

- I.2.10 According to the EA Risk of Flooding from Surface Water (RoFSW) maps, the risk of surface water flooding on site is on average considered to be “Very Low” (Figure L.2). Areas identified to be at “Very Low” risk have a less than 1 in 1,000-year (0.1%) annual risk of flooding from surface water sources.
- I.2.11 Areas at marginally lower topographic elevation on site have a variable risk (“Low”, “Medium” and “High”) of surface water flooding. Those identified at “Low” risk have between a 1 in 1,000-year and 1 in 100-year (0.1% to 1%) annual risk of flooding, those at “Medium” risk have a 1 in 100-year to 1 in 33-year (1% to 3.3%) annual risk of flooding, and those at “High” risk have a greater than 1 in 33-year (3.3%) annual risk of flooding.
- I.2.12 In “Low” and “Medium” and “High” risk surface water flooding events, average surface water flood depths from ponding at low topographic elevation areas, would be 0.15m to 0.3m. Surface water would largely accumulate and discharge via the existing onsite drainage channels.
- I.2.13 As there is no evidence of overland flow routes across the site, it is considered likely that additional future rainfall, in the event of climate change, could be adequately managed by onsite drainage (subject to verification of greenfield runoff rates according to the CIRIA 753 guidance).
- I.2.14 The risk of flooding from surface water sources is considered to be low.

Geology

- I.2.15 According to the British Geological Survey Superficial Geology mapping, River Terrace Deposits (sand and gravel) are present to the west of site. Site investigation is recommended to confirm the BGS 1:50,000 scale designation of superficial deposits. There are no recorded superficial deposits to the east of site.

- I.2.16 The BGS maps demonstrate that the bedrock underlying the site is the Gault Formation (mudstone).

Groundwater

- I.2.17 The BGS Hydrogeology 1:625,000 maps consider the bedrock in this area to have essentially no groundwater. The site is not located within an EA groundwater Source Protection Zone.
- I.2.18 The superficial River Terrace deposits, where present on site, are considered a Secondary “A” aquifer, whereas the bedrock mudstone is not considered an aquifer, according to BGS/MagicMap designations.
- I.2.19 Cambridge City Council Strategic Flood Risk Assessment (SFRA) (2010) states that groundwater flooding has occurred within the district, at Barrington, Bassingbourn, south east Cambridge, Fulbourn, Great Eversden, Little Eversden, Madingley, Stow Cum Quy, Thriplow and Waterbeach. There is no indication however that the vicinity of Milton has previously been affected by groundwater flooding.
- I.2.20 The risk of flooding from groundwater is considered to be low.

Infiltration Potential

- I.2.21 Superficial gravel deposits are present to the west of site and this area may be suitable for infiltration (pending infiltration tests). Appendix C of the South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010), indicates that there is a likelihood of impeded drainage associated with the mudstone bedrock.

Sewer

- I.2.22 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of sewer flooding on site, based on information provided by the Highways Agency, parish councils and Anglian Water Services DG5 register.
- I.2.23 The risk of flooding from sewer sources is considered to be low.

Historic

- I.2.24 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of historical flooding from fluvial, groundwater, surface water or sewer sources on site in the years preceding 2010.
- I.2.25 The EA hold historic records of fluvial flooding in the district, which indicate fluvial flooding in 1947 and 2001, approximately 1.7km south-east of site, due to exceedance of channel capacity on the River Cam.

Residual Risk

- I.2.26 The site is located entirely within EA Flood Zone 1 and is not located with an area that is considered to benefit from EA defences to a 1 in 100-year standard of protection. Therefore, the risk to the site in the event of a breach of defences is considered to be low.
- I.2.27 The EA has further confirmed that the site is outside the flooding extent from the Cam Urban model and that defence-breach hazard mapping is not available for the site (as of August 2020).

It would appear therefore that the EA does not consider the site to be at significant risk in the event of a breach of defences.

- I.2.28 The EA Risk of Flooding from Reservoirs map demonstrates that the site is not located within an area considered at risk in the event of reservoir failure.

I.3 Site area 3

Topographic levels

- I.3.1 The site is approximately 127Ha. Topographic levels on site vary between 4.41mAOD and 14.09mAOD, with an average of 9.07mAOD (according to Environment Agency 2m LiDAR data). Highest topographic levels are to the south west of site, and lowest topographic levels are to the east. The site generally slopes to the east.

Vulnerability Classification

- I.3.2 The existing site is greenfield, which is unclassified for flood risk vulnerability with respect to the National Planning Policy Framework (NPPF). Post development, the proposed Waste Water Treatment Plant would be considered “Water Compatible” and therefore the NPPF vulnerability of the site would be increased compared to the existing situation.

Fluvial/Tidal

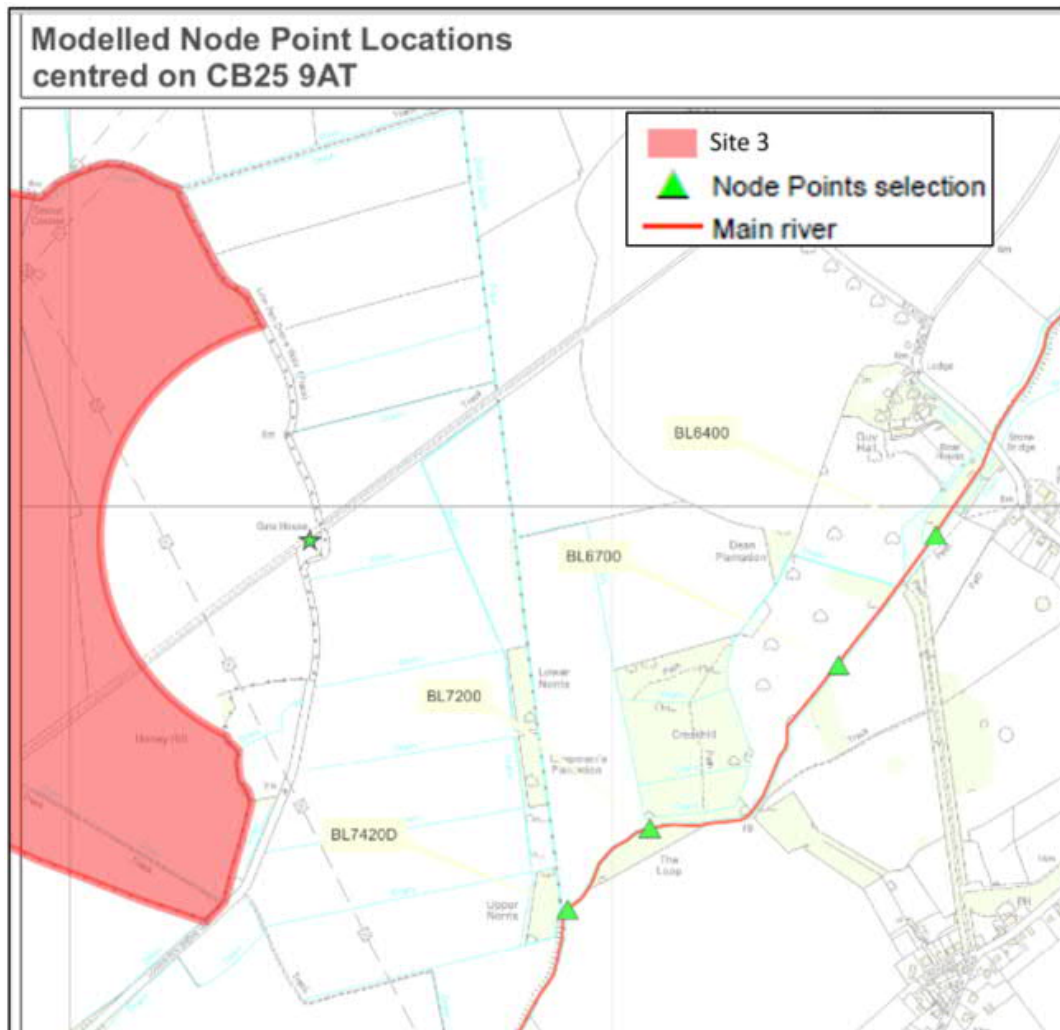
- I.3.3 Site 3 is located entirely within Environment Agency (EA) Flood Zone 1 (Figure L.1), with a less than 1 in 1000 (0.1%) annual chance of flooding from rivers or sea. The site is a minimum of 430m west of Quy Water, a tributary of the River Cam. Both Quy Water and the River Cam are main EA rivers. The site is a minimum of 600m south-east of the River Cam.
- I.3.4 The site is not located in an area that is considered to benefit from EA defences to a 1 in 100 year standard of protection.
- I.3.5 There are several drains present on site. The site is largely located within an area managed by Swaffam IDB. Confirmation of drain management would be sought with Swaffam IDB if this site area is selected.
- I.3.6 The closest EA Flood Zone 2 and 3 areas are approximately 450m north-west of the site, associated with the River Cam and 200m east of site, associated with Quy Water.
- I.3.7 The EA has further confirmed that the site is outside the modelled flood extent of the Cam Urban model. The present-day fluvial/tidal risk to site is considered to be low.

Peak River Flow Climate Change Considerations

- I.3.8 The site is currently located entirely within EA Flood Zone 1. EA guidance states that “Water Compatible” developments which are currently located within Flood Zone 1 but may be in Flood Zones 2 or 3 in the future, should apply the Central Allowance for peak river flow. In the Anglian catchment, the Central peak river flow allowance is 25%.
- I.3.9 The EA has supplied the modelled flood extents for the 1% Annual Exceedance Probability (AEP) including a 20% Climate Change (CC) peak river flow allowance. The supplied data is from the Cam Urban model, which includes a blanket 20% climate change peak river flow allowance. Modelled flood extents and depths for the Central Allowance (25%) are not currently available from the EA (August 2020). The 1%AEP+20%CC flood extent is considered indicative only of potential flooding in the 1%AEP+25%CC event.

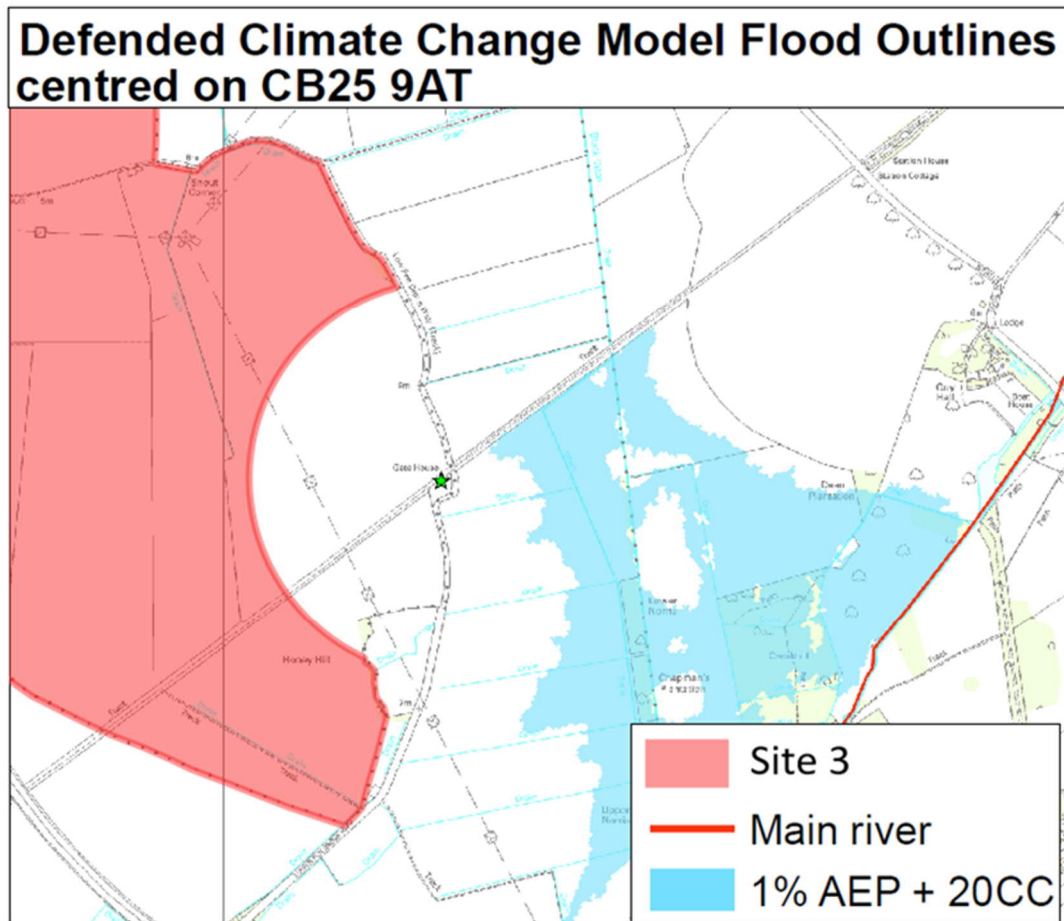
- I.3.10 In a 1%AEP+20%CC event, the modelled flood level at the closest modelled upstream node to site (BL7420D) would be 6.42m AOD (Figure L.6). The average elevation on site is 9.07m AOD (according to Environment Agency 2m LiDAR data). EA modelled flood extents for the 1%AEP+20%CC event demonstrates that the site would not be inundated in this event.
- I.3.11 Confirmation of 1%AEP+25%CC flood levels, flows and extents should be sought where possible, availing of EA JFlow models, prior to development on this site.
- I.3.12 As the Cam Urban model demonstrates the site not to be inundated in the 1%AEP+20%CC event, the fluvial /tidal risk to site in the future is considered to be low.

Figure I.6: EA Modelled Node Locations in relation to the eastern portion of site 3.



Source: Environmental Data: ©Environment Agency and/or database right 2020, Basemapping: Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS | OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS Contains OS data © Crown Copyright and database right 2020

Figure I.7: EA 1%AEP+20%CC flood extents in relation to the eastern portion of site 3.



Source: Environmental Data: ©Environment Agency and/or database right 2020, Basemapping: Esri, Intermap, NASA, NGA, USGS | Esri UK, Esri, HERE, Garmin, INCREMENT P, METI/NASA, USGS | OS, Esri, HERE, Garmin, INCREMENT P, NGA, USGS Contains OS data © Crown Copyright and database right 2020

Surface water

- I.3.13 According to the EA Risk of Flooding from Surface Water (RoFSW) maps, the risk of surface water flooding on site is considered to be “Very Low”. Areas identified to be at “Very Low” risk have a less than 1 in 1,000-year (0.1%) annual risk of flooding from surface water sources.
- I.3.14 In a “Low” risk (1 in 1,1000-year to 1 in 100-year) surface water flooding event, the site would largely be unaffected. Maximum flood depths of 0.6m to 0.9m may occur in a “Low Risk” event along the track at Snouts Corner, north-east of site.
- I.3.15 As there is no evidence of overland flow routes across the site, it is considered likely that additional future rainfall, in the event of climate change, could be adequately managed by onsite drainage (subject to verification of greenfield runoff rates according to the CIRIA 753 guidance).
- I.3.16 The risk of flooding from surface water sources is considered to be low.

Geology

- I.3.17 According to the British Geological Survey Superficial Geology mapping, there are no records of superficial deposits across most of the site. The northern spoke of site does however appear to

intersect superficial River Terrace Deposits (sand and gravel). Site investigation is recommended to confirm the BGS 1:50,000 scale designation of superficial deposits.

- I.3.18 The BGS maps demonstrate that the bedrock underlying the site is the West Melbury Marly Chalk Formation.

Groundwater

- I.3.19 The BGS Hydrogeology 1:625,000 maps consider the chalk bedrock in this area to be a highly productive aquifer. The chalk bedrock is considered a Principal aquifer according to BGS/MagicMap designations. However, in this area, important aquifer horizons are absent in chalk.
- I.3.20 The superficial River Terrace deposits, where present on the northern spoke of site, are considered a Secondary "A" aquifer, according to BGS/MagicMap designations.
- I.3.21 The site is not located within an EA groundwater Source Protection Zone.
- I.3.22 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) states that groundwater flooding has occurred within the district, at Barrington, Bassingbourn, south east Cambridge, Fulbourn, Great Eversden, Little Eversden, Madingley, Stow Cum Quy, Thriplow and Waterbeach. The closest recorded incident of groundwater flooding occurred approximately 1km east of site (Appendix B, South Cambridgeshire and Cambridge City SFRA).
- I.3.23 The risk of flooding from groundwater is considered to be low.

Infiltration Potential

- I.3.24 Superficial gravel deposits may be present on the northern spoke of site and this area may be suitable for infiltration (pending infiltration tests).
- I.3.25 Chalk bedrock might be assumed to have high infiltration potential. However, Appendix C of the South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there is a likelihood of impeded drainage at site. Infiltration testing will be carried out on site.

Sewer

- I.3.26 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of sewer flooding on site, based on information provided by the Highways Agency, parish councils and Anglian Water Services DG5 register.
- I.3.27 The risk of flooding from sewer sources is considered to be low.

Historic

- I.3.28 The South Cambridgeshire and Cambridge City SFRA (South Cambridgeshire District Council & Cambridge City Council, 2010) indicates that there have been no recorded incidents of historical flooding from fluvial, groundwater, surface water or sewer sources on site in the years preceding 2010.
- I.3.29 The EA hold historic records of fluvial flooding in the district, which indicate fluvial flooding in 1947 and 2001, approximately 300m west of site, due to exceedance of channel capacity on the River Cam.

Residual Risk

- I.3.30 The site is located entirely within EA Flood Zone 1 and is not located with an area that is considered to benefit from EA defences to a 1 in 100-year standard of protection. Therefore, the risk to site in the event of a breach of defences is considered to be low.
- I.3.31 The EA Risk of Flooding from Reservoirs map demonstrates that the site is not located within an area considered at risk in the event of reservoir failure.