

Mead Realisations Ltd

Lynchmead Farm, Weston-super-Mare

Flood Risk Assessment

184199

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1 INTRODUCTION

Authorisation

- 1.1 Following the instruction on behalf of Mead Realisations Ltd, a Flood Risk Assessment (FRA) has been undertaken by Vectos to support the outline planning application for the proposed residential scheme at Lynchmead Farm, Weston-super-Mare.

Background

- 1.2 According to the Flood Map for Planning, the proposed development site is located in the defended Flood Zone 3 and is almost 5 hectares (ha) in size. Consequently, an FRA is required to support the outline planning application. This FRA has been undertaken in accordance with the guidelines set out in the “National Planning Policy Framework” (NPPF).

Aims and Objectives

- 1.3 The aim of this FRA is to demonstrate that the site can be developed for residential purposes safely, without exposing it to an unacceptable degree of flood risk or increasing the flood risk to third parties. The objectives of this FRA are to:
- Consult with key stakeholders to allow their input prior to the planning submission.
 - Undertake a desk based review of the available flood risk data for the site to assess current and past flood risk issues.
 - Review the relevant planning policy and guidance documents to ensure that the development proposals are in accordance with these.
 - Identify the key sources of flood risk to the site and surrounding area.
 - Identify flood mitigation requirements, to ensure the development is safe from flooding.
 - Use the Lead Local Flood Authority (LLFA, North Somerset Council) guidance on Sustainable Drainage Systems (SuDS) to inform the general principles of surface water management on site.
 - Assess whether the development will result in an increase of surface water runoff and demonstrate how this will be mitigated through the incorporation of SuDS into the proposed scheme.

Development Proposals

- 1.4 The illustrative masterplan plan is enclosed in Appendix A. It shows a development comprising 75 residential dwellings, with two points of access from Ebdon Road, parking, private gardens and extensive areas of open space.

Limitations

- 1.5 The general limitations of this assessment are that:
- A number of sources have been used to compile this document, whilst Vectos believe them to be trustworthy; Vectos is unable to guarantee the accuracy of the information that has been provided by others.
 - This report is based on information available at the time of preparation. Consequently, there is potential for further information to become available. These changes may lead to future alteration to the conclusions drawn in this report for which Vectos cannot be held responsible.

2 CONSULTATION

- 2.1 As part of this FRA we have undertaken consultation with all key stakeholders. This has included the Environment Agency (EA), the LLFA and the North Somerset Levels Internal Drainage Board (IDB). A brief summary is outlined below.

Environment Agency

- 2.2 A Product 4 dataset was obtained from the EA. This included a series of fluvial and tidal flood levels, which are discussed in Section 4. Given the flood risk constraints, further consultation was required with the EA to agree the key principles of flood risk management. This information is enclosed in Appendix B and has been used to inform the FRA.

Lead Local Flood Authority

- 2.3 Pre-application scoping advice for the proposed development was received from North Somerset Council in January 2018. This included input from the LLFA.
- 2.4 We attempted to consult with the LLFA with respect to some of their comments, but we were unable to obtain a response. However, in general, the various points raised by the LLFA have been considered in this FRA. A number of the comments raised relate to more detailed drainage design requirements, which are not applicable at this outline planning stage.

North Somerset Levels Internal Drainage Board

- 2.5 The IDB identified the following requirements:
- Discharge should be at 2 l/s/ha or QBAR, whichever is the higher.
 - A viable discharge location should be found above the summer pen level, and improvements may be required offsite to ensure there is a viable route to either a Main River or one of the Board's viewed rhynes.
 - For maintenance strips and ecological buffers, we would be looking for a minimum of 6 m clear from any of the rhynes.
- 2.6 The IDB subsequently confirmed that the downstream structure pens the water at 4.86 m AOD in this area. It was also confirmed that 6 m wide maintenance strips on either side of a particular ryhne was not essential.



2.7 Further details are enclosed in Appendix C of this report. These requirements have been used to inform this FRA.

3 SITE DESCRIPTION

- 3.1 The site is located to the north of Ebdon Road, Weston-super-Mare, North Somerset. The site is predominantly used for agriculture and includes numerous ryhnes at existing field boundaries. The site has an approximate area of almost 5 ha and is centred at OS grid reference of ST358643 (see Figure 1)



Figure 1: Site Location Plan

Site Topography

- 3.2 A topographical survey is enclosed in Appendix D. It shows that ground levels are very flat. Although, there is a general, shallow slope from south to north. Ground levels fall from a maximum of approximately 6.7 m AOD, in the south part of the site, to approximately 6.0 m AOD, alongside the northern boundary.
- 3.3 The topographic survey includes some details of the ryhne network. It can be seen that the bed levels of the various ryhnes on site are generally in excess of 5 m AOD. This is above the IDB summer pen level, as discussed in Section 2.

Geology and Hydrogeology

- 3.4 The 1 in 50,000 scale British Geological Survey (BGS) online mapping shows that the solid geology beneath the site consists Blue Lias Formation – Mudstone and Limestone, Interbedded. The online mapping indicates that Tidal Flat Superficial deposits – Clay, Silt and Sand, overlie the bedrock at the site.
- 3.5 The Soilscales website indicates that the soil underlying the site is of loamy and clayey composition, from coastal flats with naturally high groundwater.
- 3.6 This desktop geological and soil information does not infer that the site will be conducive for the use of infiltration as a means of surface water management.
- 3.7 A groundwater monitoring exercise was undertaken by Geo Consulting Engineering Ltd in 2019. This investigated the groundwater level at 4 boreholes across the site. The results of this study are identified in Table 1 and Table 2. The location of these boreholes are identified in Appendix E.

Table 1: Groundwater Depths

	Depth to Base (mbgl)	27/02/2019	07/03/2019	11/03/2019	26/06/2019
D1	2.51	0.64	0.43	0.39	0.85
D2	2.7	2.28	1.68	1.42	0.81
D3	2.71	DAB	2.25	1.95	0.78
D4	2.79	2	1.27	1.02	0.81

Table 2: Groundwater Levels

	Piezo (m AOD)	27/02/2019	07/03/2019	11/03/2019	26/06/2019
D1	6.346	5.706	5.916	5.956	5.496
D2	6.034	3.754	4.354	4.614	5.224
D3	6.066	3.356	3.816	4.116	5.286
D4	5.973	3.973	4.703	4.953	5.163

- 3.8 It can be seen that groundwater levels vary from as little as 0.39 m below ground level (mbgl) to over 2.78 mbgl. The shallow groundwater provides some further evidence that infiltration is unlikely to be a practical means of surface water management.

Hydrology

- 3.9 There are numerous rhyes within the site and along its boundary, most of which drain to the River Banwell, which is located approximately 600 m to the east. River Banwell is classed as a Main River, which means that the Environment Agency have statutory powers to carry out flood defence works on the watercourse.
- 3.10 As discussed in Section 2, the rhyes within the vicinity of the site are subject to a summer pen level of 4.86 m AOD, which could in turn influence groundwater levels.
- 3.11 The topographic survey shows that the bed levels of the rhyes on site are generally in excess of this summer pen level.

Existing Drainage

- 3.12 The existing runoff regime at the site is believed to rely on natural drainage processes – water that is unable to infiltrate will runoff towards the rhyne network, and subsequently drain towards the River Banwell.
- 3.13 Public sewer records were obtained from Wessex Water and are enclosed in Appendix F. These records show a foul sewer and a surface water sewer is located in Ebdon Road, to the south of the site. Both of these sewer systems convey flow in a west to east direction. These sewers accommodate waste water from the residential area immediately south of the site.

4 ASSESSMENT OF FLOOD RISK

National Planning Policy Framework

- 4.1 The revised NPPF was published in July 2018 and updated in February 2019 and sets out the Government's national policies for flood risk management in a land use planning context within England and how these are expected to be applied. This revised Framework replaces the previous NPPF that was published in March 2012.
- 4.2 The NPPF states that developers and local authorities should try to relocate existing development to land in zones with the lowest probability of flooding.
- 4.3 This should be achieved by application of the Sequential Test, which aims to ensure that a sequential approach is followed to steer new development to areas with the lowest probability of flooding.
- 4.4 The aim is to steer new development to Flood Zone 1 (areas with a low probability of river or sea flooding). Where there are no reasonably available sites in Flood Zone 1, local planning authorities in their decision making should take into account the flood risk vulnerability of land uses and consider reasonably available sites in Flood Zone 2 (areas with a medium probability of river or sea flooding), applying the Exception Test if required. Only where there are no reasonably available sites in Flood Zones 1 or 2 should the suitability of sites in Flood Zone 3 (areas with a high probability of river or sea flooding) be considered, taking into account the flood risk vulnerability of land uses and applying the Exception Test if required.
- 4.5 This sequential risk-based approach to determining the suitability of land for development in flood risk areas is central to the policy statement and should be applied at all levels of the planning process.
- 4.6 The Planning Practice Guidance (PPG) provides guidance and outlines the approaches that should be taken to meet with the NPPF. In accordance with Table 2 of PPG, the proposed development (i.e. residential) is classified as More Vulnerable development.
- 4.7 Table 3 of PPG sets out the 'compatibility' of the vulnerability classification with the identified Flood Zones. The site has been designated by the Environment Agency as Flood Zone 3 and therefore locating More Vulnerable development here must be subject to the

Sequential Test. This is discussed in Planning Statement, as prepared by Walsingham Planning.

- 4.8 According to Table 3 of the PPG, the Exception Test is also required for the proposed development. Essentially, the Exception Test has two parts, the first must demonstrate how the proposed development will provide wider sustainability benefits to the community that outweigh flood risk; the second must demonstrate that the development will be safe for its lifetime, without increasing flood risk elsewhere and where possible reduce flood risk overall.
- 4.9 The first part of the Exception Test is also discussed in the Planning Statement, as prepared by Walsingham Planning. The second part is discussed throughout this report.

Local Development and Flood Risk Policy

- 4.10 The North Somerset Core Strategy (NSCS) was adopted in April 2012. It serves as the council's main planning policy document. Specific flooding policy is detailed in section CS3 of the NSCS and refers to the use of the Sequential Test and Exceptions Test to determine appropriate locations for development. The relevant policy to this FRA has been extracted below as Figure 2. The North Somerset Council Development Management Policies document was adopted in July 2016. This presents policy DM1, which is replicated subsequently (Figure 3).

Living within environmental limits

CS3: Environmental impacts and flood risk assessment

Development that, on its own or cumulatively, would result in air, water or other environmental pollution or harm to amenity, health or safety will only be permitted if the potential adverse effects would be mitigated to an acceptable level by other control regimes, or by measures included in the proposals, by the imposition of planning conditions or through a planning obligation.

Development in zones 2 and 3 of the Environment Agency Flood Map will only be permitted where it is demonstrated that it complies with the sequential test set out in the National Planning Policy Framework and associated technical guidance and, where applicable, the Exception Test, unless it is:

- development of a category for which **National Planning Policy Framework and associated technical guidance** makes specific alternative provision; or
- development of the same or a similar character and scale as that for which the site is allocated, subject to demonstrating that it will be safe from flooding, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

For the purposes of the Sequential Test:

1. The area of search for alternative sites will be North Somerset-wide unless:

- It can be demonstrated with evidence that there is a specific need within a specific area; or
- The site is located within the settlement boundaries of Weston (including the new development areas), Clevedon, Nailsea and Portishead, where the area of search will be limited to the town within which the site is located.

Other Local Development Documents may define more specific requirements.

2. A site is considered to be 'reasonably available' if all of the following criteria are met:

- The site is within the agreed area of search.
- The site can accommodate the requirements of the proposed development.
- The site is either:
 - a) owned by the applicant;
 - b) for sale at a fair market value; or
 - c) is publicly-owned land that has been formally declared to be surplus and available for purchase by private treaty.

Sites are excluded where they have a valid planning permission for development of a similar character and scale and which is likely to be implemented.

Figure 2: NCS Policy CS3

Policy DM1

All development must consider its vulnerability to flooding, taking account of all sources of flood risk and the impacts of climate change, up to 100 years ahead on residential or mixed use sites and 60 years ahead on non-residential sites. Exceptions to national policy on flood risk (as elaborated in national technical guidance and in Policy CS3 of the North Somerset Core Strategy) will not be permitted.

All development that would increase the rate of discharge of surface water from the site must consider its implications for the wider area, including revised or amended proposals. Sustainable drainage systems are expected for all major developments; alternatives will only be permitted where sustainable drainage is impractical or would compromise the viability of the scheme and the alternative does not conflict with national or local planning policy. If discharge of surface water to a public sewer is proposed, the applicant must demonstrate that capacity exists, otherwise, how excess surface water will be managed into the long-term. Essential flood prevention and drainage works for developments that include new housing must be completed at the latest prior to first residential occupation, except in the case of phased developments where alternative arrangements are agreed.

Open areas, including highways, within developments must be designed to optimise drainage and reduce run-off, while protecting groundwater and surface water resources and quality.

Land is safeguarded for a strategic flood solution at the former Weston Airfield and to the south of the Cross Rhyne, and for flood management infrastructure along the River Banwell as shown on the Policies Map.

Figure 3: Policy DM1

4.11 From a flood and surface water drainage context, the proposed development is considered to meet with these local planning policies because:

- The site is considered to pass the Sequential Test, as outlined in the Planning Statement, prepared by Walsingham Planning;
- Surface water runoff will be managed on-site through the inclusion of SuDS, which will ensure that there is no increase with respect to water quantity discharged from the site; and
- The impacts of climate change have been allowed for as part of the flood risk management and the SuDS design.

Historical Flooding

- 4.12 The North Somerset Local Flood Risk Management Strategy (LFRMS, 2008) does not identify any records of flooding within the site boundary. The LFRMS includes a map based on the Environment Agency’s Historic Flood Mapping dataset, which shows some local flooding incidents approximately 550 m to the east of the site.
- 4.13 The EA’s product 4 data response letter describes there being no history of flooding from Main Rivers or the sea in the proximity of the site.

Fluvial Flood Risk

- 4.14 The Environment Agency Flood Map for Planning locates the entire site within the defended Flood Zone 3 (see Figure 4 and Appendix B). Land and property in this flood zone would have a high probability of flooding, if the local flood defences were not in place. With respect to the site, these defences protect it against a flood from the sea. Therefore, the defended Flood Zone 3 shown on the Flood Map for Planning relates to tidal flooding, which is discussed in the following section.

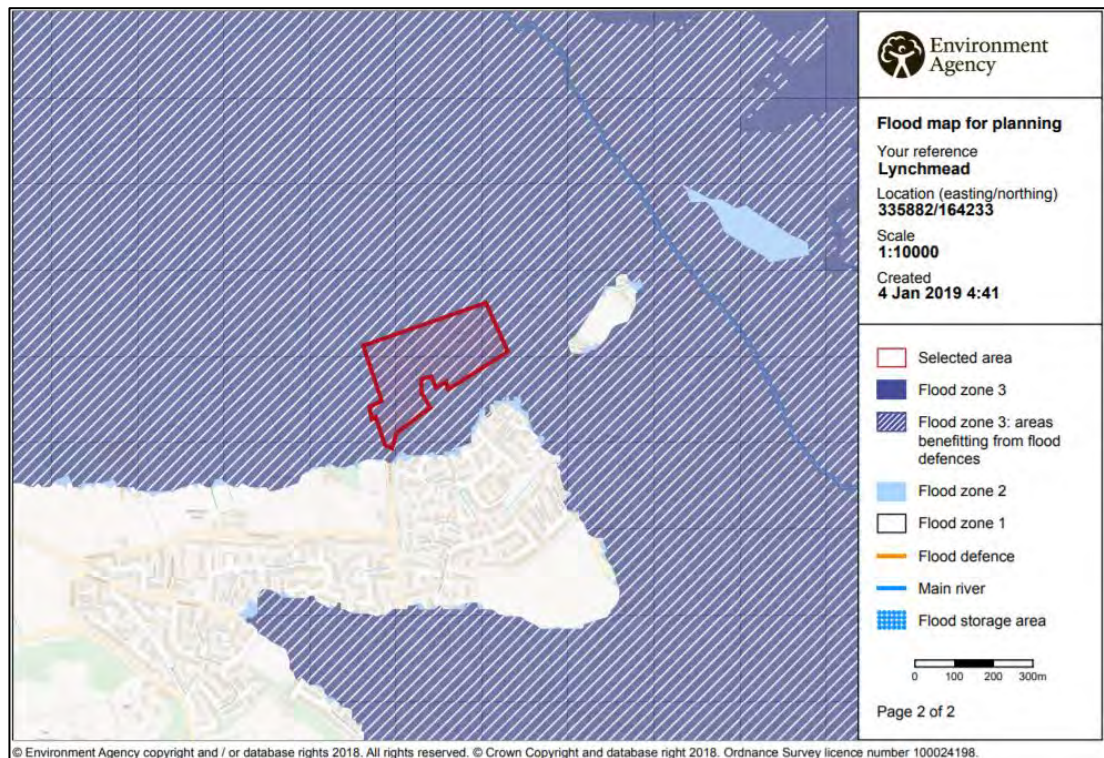


Figure 4: Flood Map for Planning

4.15 However, as part of the Product 4 dataset (see Appendix B) provided by the EA, a series of fluvial flood levels were provided from the Western Villages flood model (2012). The fluvial levels for the 1 in 1000 year event were plotted in GIS to create a flood extents using LiDAR topographic data, see Figure 5. This shows that even for the most extreme modelled event (i.e. the 1 in 1000 year event), the site is 300 m away from the fluvial floodplain. Therefore, it is considered that the site is at a low risk of fluvial flooding.



Figure 5: 1 in 1000 year Fluvial Extent

Coastal/Tidal Flood Risk

4.16 As discussed above, the Environment Agency Flood Map for Planning locates the entire site within the defended Flood Zone 3. Land and property in this flood zone would have a high probability of flooding without the local flood defences in place. These defences protect the site and wider area against a flood from the sea.

4.17 The open coast tidal still water level for the 1 in 200 year event is 8.82 m AOD in the proximity of the site. For the 1 in 1000 year event this is 9.14 m AOD.

4.18 In 2012, the EA, as part of the Wessex North Coast Model, used these still water levels to estimate the inland flood extents and flood level data. This essentially models the volume of

water spilling over the existing coastal defences and simulates the propagation of that water inland. This data was obtained from the EA and includes a series of flood maps and flood levels, for both the defended and undefended scenarios. These peak flood levels are presented in Table 3 and Table 4. The associated flood maps are enclosed in Appendix B.

Table 3: Defended Scenario Tidal Model Results

AEP	Maximum Depth (m)	Maximum Level (mAOD)
1 in 200 year (0.5% AEP)	0.00	0.00

Table 4: Undefended Scenario Tidal Model Results

AEP	Maximum Depth (m)	Maximum Level (mAOD)
1 in 200 year (0.5% AEP)	3.13	8.51
1 in 1000 year (0.1% AEP)	3.58	8.97

4.19 Only the 1 in 200 year event was modelled for the defended scenario. This shows that, when the benefit offered by the flood defences is incorporated into the model, no floodwater inundates the site. Inland flood inundation is observed, but it does not reach the site. The associated flood map is enclosed in Appendix B.

4.20 The open coast tidal still water level for the 1 in 1000 year event is only 0.32 m above the 1 in 200 year event. The 1 in 1000 year defended scenario has not been modelled by the EA. Considering the small difference in water level between these two events, had the 1 in 1000 year event been modelled by the EA it is unlikely that this would impact the site.

4.21 The undefended flood levels identified in Table 4, are estimates of flooding if the defences were removed. This is a conservative approach and is intended to identify the worst-case tidal flood risk. If a breach was to occur, and it was found to affect the site, flooding would be expected to be significantly less than the levels identified in Table 4. In order to protect the proposed development against this residual flood risk and ensure that the development is safe from flooding, flood mitigation measures are required. These have been informed through consultation with the EA and are discussed in Section 5.

Surface Water Flood Risk

4.22 Surface water flooding is a result of overland flow that can follow a rainfall event, before the runoff enters a watercourse or sewer. This form of flooding is usually associated with high

intensity rainfall events but can also occur with lower intensity rainfall or melting snow where the ground is saturated, frozen, developed or otherwise has a low permeability.

- 4.23 The flood risk relates to both the conveyance of waters to the site by overland flow from areas outside the site and also areas within the site itself, and the ponding of these waters in depressions in the topography.
- 4.24 The Risk of Flooding from Surface Water map is available online. An extract from this map is provided in Figure 6. It shows the majority of the site to be unaffected by surface water flooding, which is defined as a very low risk and means that each year, this area has a chance of flooding of less than 1 in 1000. However, in topographic low points such as the rhyes and adjacent areas, there are some localised shallow areas at a high risk of surface water flooding.
- 4.25 Furthermore, in their pre-application scoping advice the LLFA advise that a surface water flow route crosses the site, which is not shown on surface water maps. The LLFA suggest that development in this area will need to accommodate the flow route and not cause any detriment to existing properties. The LLFA were unavailable to provide further comment on this matter so the precise location of this potential flow path is unknown. Nevertheless, possible flood mitigation is discussed in Section 5 of this report.
- 4.26 The two site access locations are also subject to some surface water flooding. However, this is very localised and only impacts a short length of the existing highway.
- 4.27 It should be noted that the methodology used to derive the risk of flooding from surface water maps is not accurate at the site scale and does not account for the presence of existing local drainage systems, such as gullies, sewers and culverts, nor does it account for the full channel conveyance capacity. These inaccuracies can cause significant variance on the actual extent of surface water flood risk to an area and the mapping tends to overestimates the impacts. Nevertheless, certain flood mitigation requirements have been identified and are discussed in Section 5.

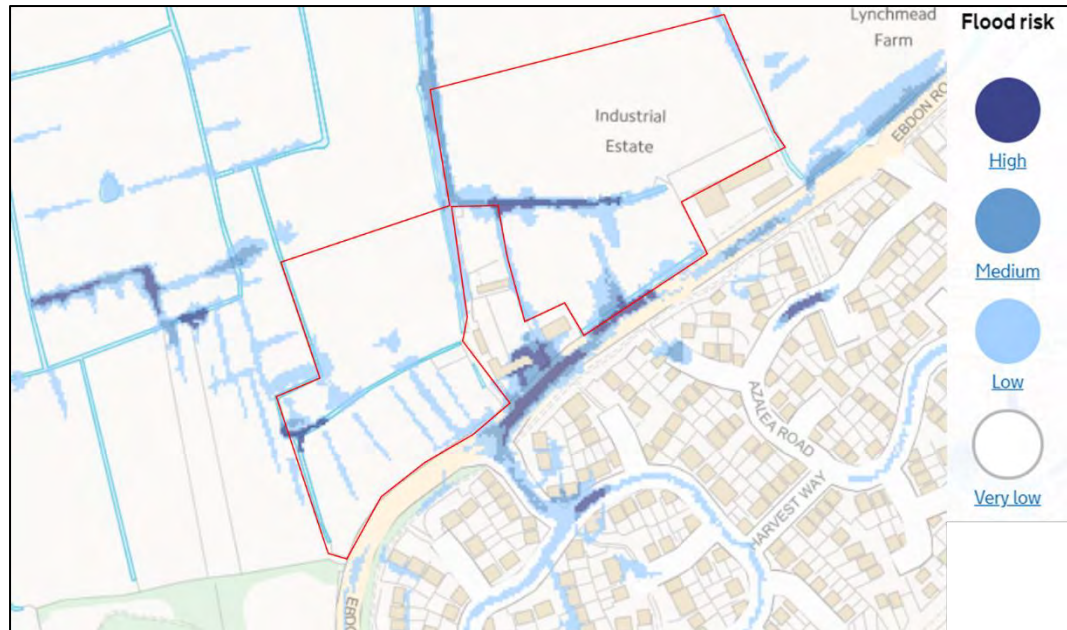


Figure 6: Risk of Flooding from Surface Water Map

Sewer Flood Risk

- 4.28 This source of flooding occurs when sewerage systems are overwhelmed and result in flooding, which may occur alone or be combined with other flood sources (e.g. fluvial or surface water).
- 4.29 Wessex Water have confirmed there are no recorded incidents of sewer flooding in the proximity of the site (see Appendix F). However, this does not necessarily infer that this source of flooding would not occur in the future.
- 4.30 A network of public sewerage infrastructure is present to the south of Ebdon Road. If these were to flood, it is anticipated that water would flood onto Ebdon Road and drain into the ryhne network rather than onto the site.
- 4.31 Given the information above, this risk of flooding from this source is considered to be low.

Groundwater Flood Risk

- 4.32 The North Somerset Council Level 1 Strategic Flood Risk Assessment (SFRA) does not identify any historic groundwater flood events in the vicinity of the site. Additionally, based on historic evidence from a variety of sources the NSC Level 1 SFRA identified limited evidence of potential groundwater flooding.

Other Sources of Flood Risk

- 4.33 Non-natural or artificial sources of flooding can include reservoirs, lakes, canals etc.
- 4.34 There are no canals or reservoirs located within the vicinity of the site. Therefore, flood risk associated with this source is considered to be negligible.
- 4.35 A review of online mapping sources was undertaken to check for other possible sources of flood risk. The review did not show there to be any other significant sources of artificial flooding in areas that are at a greater elevation than the ground levels of site.

5 FLOOD MITIGATION

- 5.1 The majority of potential flood sources have been assessed to represent a low or negligible risk and as such, flood mitigation measures for these are not required. The site is not considered to be at risk from present day tidal flooding due to the benefit offered by the existing coastal defences. However, a residual risk remains, should climate change materialise and experience overtopping, or should the flood defences fail through a breach. Therefore, flood mitigation is required to protect the site from this potential residual risk.
- 5.2 A series of key flood mitigation requirements have been agreed with the EA to protect the site from this residual risk, which are summarised below. Further details can be found enclosed in Appendix B.

Safe Refuge

- 5.3 A safe refuge on an upper floor or roof space, accessible through a permanent staircase will be provided. This safe refuge will be large enough to accommodate all those within the dwelling for a number of hours and will include electricity and lighting. Nothing will preclude the use of this area as a place of safe refuge, and it will be maintained as such for the lifetime of the development.
- 5.4 The finished floor level of the safe refuge should be a minimum of the 1 in 200 year (0.5% AEP) undefended tidal flood level plus climate change, or 300 mm to allow for climate change. This equates to a level of 8.81 m AOD (i.e. 8.51 m AOD + 300 mm).

Ground Floor Levels

- 5.5 The EA have indicated that ground floor finished floor levels should be set a minimum of 300 mm above existing levels.

Flood Evacuation Plan

- 5.6 A Flood Evacuation Plan should be prepared once planning has been granted and is assumed that this would be the subject of a condition. This plan should be prepared based on a number of principles, as outlined below:
- Awareness should be raised to the local flood risk issues;

- Residents should sign up to the free Environment Agency Flood Warning Service, so appropriate steps can be undertaken in the event of a flood warning.
- In the event of a warning, it may be necessary to evacuate to areas outside of the floodplain and gather at a muster area. Safe access/egress routes should be identified;
- If a flood was to occur that prevented people safely evacuating, residents would instead be able to evacuate to the upper floors, via an internal staircase;
- A flood kit should be stored in an appropriate location;
- Actions and procedures required post evacuation and post flooding should be identified.

Surface Water Flooding

- 5.7 The LLFA have identified the location of a surface water flow path through the site. However, the precise location is unknown at this stage. It is anticipated that this can be captured within a cut off drain and redirected into one of the existing rhynes. This can be confirmed at a more detailed stage of design.
- 5.8 Improvements to the capacity of the rhyne adjacent to the two proposed access locations, or elsewhere, could be increased to reduce the impacts on the highway, should it be necessary. This could help to minimise surface water flooding.
- 5.9 The raised finished floor levels identified above will also help to ensure that any localised shallow surface water flooding does not impact the development proposals.

6 SURFACE WATER DRAINAGE STRATEGY

Overview

- 6.1 It is well understood that one of the effects of development is typically to reduce the permeability of the site and consequently to change its response to rainfall. Therefore, a suitable surface water drainage strategy is required to ensure that the surface water runoff regime is managed appropriately so that there would be no increase flood risk to third parties.
- 6.2 The NPPF states that flood risk to land and property must not be increased as a result of development. The associated Planning Practice Guidance (PPG) states that flood risk should not increase for events up to and including a 1 in 100 year return period, with appropriate allowance for climate change.
- 6.3 A fundamental principle of sustainable development in terms of flood defence is the reduction of surface water run-off from new developments. Surface water drainage arrangements for any development site must ensure that volumes and peak discharge rates, leaving the site, are no greater than those for the site prior to development. Any increase in surface water run-off above the pre-development volumes must be controlled on site.
- 6.4 The proposed surface water management strategy has been derived based upon the principles of SuDS, in accordance with NPPF and the West of England Sustainable Drainage Developer Guide.

Proposed Receptor of Site Runoff

- 6.5 SuDS guidance refers to what is often described as the sustainable drainage hierarchy. An example of this drainage hierarchy is presented below.

Generally, the aim should be to discharge surface runoff as high up the following hierarchy of drainage options as possible:

- i) into the ground by infiltration;
- ii) into a surface water body such as a river, ditch, pond or stream;
- iii) to a surface water sewer;

- iv) to a combined sewer.
- 6.6 As discussed in Section 3, ground conditions are unlikely to be suitable for infiltration as a means of surface water management.
- 6.7 There is a network of rhynes surrounding the site. A connection to these features will therefore be retained as part of the surface water drainage strategy.

Existing Runoff and Allowable Discharge Rates

- 6.8 The ICP SuDS Method has been used within MicroDrainage to calculate the existing greenfield runoff rates. This has been undertaken for 1 ha of developable land. The parameters used are detailed in Table 5, whereas the calculated rates are presented in Table 6. The summary sheet is included in Appendix G.

Table 5: ICP SuDS Parameters

Parameter	Value	Unit
Area	1	ha
SAAR	800	mm
Soil class	0.300	
Region	8	
Urban	0	%

Table 6: ICP SuDS Results

Return Period	Peak Greenfield Discharge (l/s)
QBAR	2.1
Q1	1.7
Q30	4.1
Q100	5.2

- 6.9 The North Somerset Levels IDB have advised that surface water should be discharged at a rate of 2.0 l/s/ha or QBAR, whichever is the higher. In this case, the calculated QBAR rate of 2.1 l/s/ha is higher and has been adopted in this surface water drainage strategy.

Proposed Surface Water Drainage Strategy

- 6.10 SuDS will be utilised to manage surface water runoff from the entire site. The SuDS Manual (CIRIA C753, 2015) has been considered during the preparation of this surface water drainage strategy for the development site.
- 6.11 The concept of sustainable drainage is that environmental and social factors such as the quantity and quality of runoff and amenity value of surface water in the urban or developed environment are considered when making decisions about drainage. SuDS can be used to compliment or replace conventional piped urban drainage to recreate the natural water cycle.
- 6.12 This process can be used in certain locations to reduce or even eliminate the existing problems associated with such conventional piped systems, which can include the risk of flooding, the potential of pollution or poor water quality and damage to the natural environment.

Topography

- 6.13 As discussed in Section 3.2, the topography of the site is very flat. It is therefore likely that some land raising will be required to facilitate a gravity-based surface water drainage network.
- 6.14 Whilst this will be considered at a more detailed stage of design, the various SuDS features proposed across the site will help to minimise land raising because they can be laid relatively flat. This includes areas of permeable paving, which may or may not be linked to linear attenuation features, by a rill network. These linear attenuation features, will consist of oversized swales, and will help to reduce the drainage path and the likely extent of ground raising required.

Attenuation Storage

- 6.15 As discussed above, the surface water drainage strategy has been based on discharge of surface water runoff from the site into the adjacent rhine network. This will be restricted to the QBAR greenfield runoff rate of 2.1 l/s/ha, which will be achieved using a hydrobrake (or similar).

- 6.16 This restricted rate has meant that space across the site is required for the provision of attenuation storage. This will be achieved in a series of oversized swales and beneath permeable paving located throughout the proposed development.
- 6.17 A MicroDrainage quick storage estimate was undertaken based on the parameters identified in Table 7. This has identified the amount of attenuation storage that would be required to accommodate surface water runoff from the developed part of the site for all events up to and including a 1 in 100-year plus climate change event (40% increase in peak rainfall intensity). This indicates that an attenuation storage volume of approximately 1,047 m³ would be required to restrict runoff rates to the greenfield QBAR rate during the 1 in 100 year rainfall plus climate change event, for every 1 ha of impermeable area.

Table 7: Attenuation Storage Parameters

Parameter	Value	Unit
Impermeable area	1.0	ha
Discharge rate	2.1	l/s
Infiltration rate	0	m/hr
Climate change provision	40	%

Development Parcels

- 6.18 The site is split into four separate development parcels of land by virtue of the existing network of rhyes. The reason for this is so that each development parcel will have its own outfall into one of the rhyes. This will avoid the need of surface water drainage infrastructure beneath the rhyne network.
- 6.19 Consequently, each development parcel must provide sufficient attenuation storage. The separate development parcels and the existing rhyne network are shown in Figure 7.



Figure 7: Development Parcels and Existing Rhyne Network

6.20 Table 8 includes a series of key parameters which have been used to estimate the attenuation storage requirements for each parcel. The impermeable area of each development parcel has been calculated based upon a 60% impermeable ratio (i.e. that 60% of the developed area would have an impermeable cover).

6.21 The amount of attenuation required is dependent upon the impermeable area of the particular parcel. The attenuation per ha (calculated based on the parameters in Table 3) has been multiplied by the impermeable area to give the volume of storage required for each parcel.

Table 8: Attenuation Storage Parameters

Catchment	Developable Area (ha)	Impermeable area (ha)	Attenuation storage (m ³)	Discharge rate (l/s)
1	0.53	0.32	335	0.67
2	0.64	0.38	398	0.80
3	0.42	0.25	262	0.53
4	1.17	0.70	733	1.47

6.22 It is noted above that the discharge rates in Table 8 are particularly small and could be susceptible to blockage at the control chamber. This is a result of the small extent of

impermeable area across each development parcel. As part of a more detailed stage of design it is recommended that a minimum discharge rate is agreed with the LLFA and the IDB. This may allow the volume of attenuation storage required on site to be reduced somewhat.

- 6.23 As discussed above, the attenuation requirement will be achieved using combination of oversized swales and permeable paving.
- 6.24 The permeable paving will be provided in private parking areas within each development parcel, the extent of these are shown in Figure 8. In order to estimate the volume of attenuation storage available, the area of permeable paving has been multiplied by the proposed depth. An industry standard 30% void ratio has also been applied on the basis that a stone attenuation medium will be provided beneath the permeable paving (e.g. $100 \text{ m}^2 \times 0.3 \text{ m} \times 0.3 = 9 \text{ m}^3$).
- 6.25 The width of the oversized swales was defined to ensure that a sufficient volume of attenuation storage was available. At this stage, the swales have been limited to a depth of 0.5 m to minimise the potential impact of groundwater. All side slopes are based on 1 in 3 gradients. This allowed the estimation of attenuation storage per linear metre, which was converted into a volume for each swale (based on the length proposed). This is also summarised on Figure 8.
- 6.26 Each development parcel is discussed in turn below. It includes a summary of the volume of attenuation storage available in the permeable paving and oversized swales. The illustrative masterplan enclosed in Appendix A is has been based on the requirements outlined below.



Figure 8: Location of Permeable Paving and Swales

Parcel 1

6.27 A summary of the attenuation storage proposed for parcel 1 is outlined detailed in Table 9.

Table 9: Development parcel storage breakdown

Swale Volume (m ³)	Permeable Paving Area (m ²)	Permeable Paving Depth (m)	Permeable Paving Volume (m ³)	Total Attenuation Volume (m ³)
222	730	0.5	110	332

6.28 As noted in Table 8, an attenuation volume of 335 m³ is required in parcel 1. The majority of this volume is proposed with three swales positioned towards the east part of the parcel alongside an existing rhyne.

Parcel 2

6.29 A summary of the attenuation storage proposed for parcel 2 is outlined detailed in Table 10.

Table 10: Development parcel storage breakdown

Swale Volume (m ³)	Permeable Paving Area (m ²)	Permeable Paving Depth (m)	Permeable Paving Volume (m ³)	Total Attenuation Volume (m ³)
326	930	0.3	84	410

6.30 As noted in Table 8, an attenuation volume of 398 m³ is required in parcel 2. The majority of this volume is proposed within one swale positioned towards the north part of the parcel alongside existing rhynes. However, there are there additional swales in parcel 2, which can provide further storage should it be needed.

Parcel 3

6.31 A summary of the attenuation storage proposed for parcel 3 is outlined detailed in Table 11.

Table 11: Development parcel storage breakdown

Swale Volume (m ³)	Permeable Paving Area (m ²)	Permeable Paving Depth (m)	Permeable Paving Volume (m ³)	Total Attenuation Volume (m ³)
183	540	0.5	81	264

6.32 As noted in Table 8, an attenuation volume of 262 m³ is required in parcel 3. The majority of this volume is proposed with three swales positioned towards the east part of the parcel alongside an existing rhyne.

Parcel 4

6.33 A summary of the attenuation storage proposed for parcel 4 is outlined detailed in Table 12.

Table 12: Development parcel storage breakdown

Swale Volume (m ³)	Permeable Paving Area (m ²)	Permeable Paving Depth (m)	Permeable Paving Volume (m ³)	Total Attenuation Volume (m ³)
610	1,160	0.35	122	732

6.34 As noted in Table 8, an attenuation volume of 733 m³ is required in parcel 4. The majority of this volume is proposed with three swales positioned towards the south part of the parcel alongside an existing rhyne.

Outfalls

6.35 The IDB have stipulated that the outfalls from higher than the summer penning level, which is 4.86 m AOD. The bed levels of the rhyne network are in excess of this summer penning level and therefore this requirement will be easily achieved.

6.36 Given that the rhyne network surrounds each development parcel numerous locations are available for each outfall position. The precise location can be confirmed at a more detailed stage of design.

Groundwater

6.37 The groundwater monitoring (see Section 3.7) identified variable depths of groundwater beneath the site. The depth of the various attenuation features proposed is generally no greater than 0.5 m. This will help to minimise the impact on groundwater. If groundwater is found to be very shallow, the particular feature may need to be lined.

6.38 As previously discussed, some ground level raising is likely to be required across the site to facilitate a gravity-based surface water drainage arrangement. Whilst this is subject to a more detailed stage of design, this likely requirement may remove or reduce the potential impact of groundwater seepage into attenuation features.

Operation and Maintenance

6.39 It is anticipated that the various swales and areas of permeable paving would be maintained by a private company. Maintenance requirements will be agreed as part of the site wide maintenance regime that will include all green areas, including SuDS, play areas and public open space.

6.40 The wider drainage network will be offered for adoption to Wessex Water and must therefore be designed to adoptable standards at a more detailed stage of design.

6.41 Figure 9 and Figure 10 outline the maintenance requirements for swales and permeable paving, respectively. These have been extracted from the CIRIA SuDS Manual.

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Remove litter and debris	Monthly, or as required
	Cut grass – to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial actions	Repair erosion or other damage by re-turfing or reseeded	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Figure 9: Maintenance requirements for swales (CIRIA SuDS Manual)

Maintenance schedule	Required action	Typical frequency
Regular maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying	As required – once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth –if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Figure 10. Maintenance requirements for pervious pavements (CIRIA SuDS Manual)

Water Quality, Bio-diversity and Recreation

- 6.42 The implementation of well-designed SuDS allows multiple benefits to be realised in addition to reducing downstream flood risk, including water quality, bio-diversity and recreation.
- 6.43 Protecting water quality is an important part of sustainable surface water management. Typical urban pollutants need to be filtered out prior to runoff entering the local watercourse systems. The combination of various SuDS techniques can be used to create a system that treats the water effectively prior to discharge (a *'treatment train'*). The detailed drainage design will be developed in accordance with guidance on the *'treatment train'* and the required number of treatment processes. However, the information demonstrates how this can be achieved easily on site.
- 6.44 In accordance with The SuDS Manual (CIRIA C753), SuDS components must have a total pollution index that equals or exceeds the pollution hazard index for different land use classifications. It is considered that the SuDS provided as part of the surface water drainage strategy would offer more than sufficient mitigation for the land use classification as demonstrated in Table 13 and Table 14.
- 6.45 The bio-diversity benefits of SuDS can be maximised by creating continuous areas of habitat that connect outlying undeveloped areas with an extensive open green network within the development. Planting within these areas should consider the target habitats that are desirable given the local setting and likely hydrological regime. The series of swales across the site offer significant opportunities for bio-diversity gain compared to the existing conditions.
- 6.46 SuDS can have many potential recreational benefits. They should provide opportunities for interaction with the water environment and wider areas of green space. The use of hard engineering such as concrete headwalls, which can detract from the natural appearance of SuDS, should be minimised. Careful selection of planting, such as wildflower mixes can greatly increase recreational value whilst also providing ecological benefits.

Table 13: Pollution Hazard Indices for the Proposed Development (Source The SuDS Manual)

Land Use	Pollution hazard indices for different land use classifications		
	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Residential Roofs	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads and non-residential car parking with infrequent change	0.5	0.4	0.4
Total	0.7	0.6	0.45

Table 14: SuDS mitigation indices for the Proposed Development (Source The SuDS Manual)

Type of SuDS	Mitigation Indices		
	TSS	Metals	Hydrocarbons
Permeable paving	0.7	0.6	0.7
Swales ¹	0.25	0.3	0.3
Total	0.95	0.9	1.0

Summary

- 6.47 The conceptual surface water drainage strategy has been prepared to demonstrate the proposed development can meet national and local requirements, which will be achieved through the provision of SuDS designed to restrict runoff to the QBAR greenfield runoff rate.
- 6.48 The restriction of runoff to the QBAR rate will ensure that the long-term storage volume has been accommodated so that the volume of surface water that is discharged from the site (as well as the rate that it is discharged) has also been managed.
- 6.49 Whilst outline design considerations have been completed with the location and sizing of the swales and permeable paving, further, more detailed design works for the surface water drainage strategy will be necessary once planning permission has been granted and this would be dealt with at the Reserved Matters stage.

¹ As per the SuDs Manual (2015), where the mitigation index of an individual component is insufficient, two components (or more) will be required. However, a factor of 0.5 is used to account for the secondary or tertiary components associated with the already reduced inflow concentrations.

7 MASTERPLAN CONSIDERATIONS

- 7.1 The masterplan has been conceived with 6 m maintenance strips and ecological buffers. This has been applied to both sides of the particular rhynes, where they pass through the development (as opposed to on the site boundary).

- 7.2 Maintenance access will also be required for the proposed oversized swale features incorporated into the surface water drainage strategy. In some cases, these may be shared with the existing IBD rhynes, or will be available from areas of public open space across the development.

8 CONCLUSIONS & RECOMMENDATIONS

- 8.1 This Flood Risk Assessment (FRA) has been undertaken by Vectos to support the outline planning application for the proposed residential scheme at Lynchmead Farm, Weston-super-Mare.
- 8.2 This report has been prepared by Vectos on behalf of Mead Realisations Ltd. in accordance with the guidelines set out in the National Planning Policy Framework (Department for Communities and Local Government, 2019).
- 8.3 The site is located in the defended tidal Flood Zone 3. This means that the site is protected from flooding. However, a residual risk remains, if the defences were to become overtopped, or if the breaches were to fail from a breach. In order to protect the proposed development against this residual risk and ensure that the development is safe from flooding, flood mitigation measures have been agreed with the Environment Agency. This has included the creation of a safe refuge on an upper floor or roof space.
- 8.4 The majority of the site to be unaffected by surface water flooding, which is defined as a very low risk. However, some minor areas are susceptible to a greater risk from this source of flooding, including the local rhyne network. Any major flow paths associated with this source of flooding will be accommodated in the site layout plan.
- 8.5 All other sources of flood risk have been assessed to be low.
- 8.6 An attenuation led surface water drainage strategy has been proposed to manage the impact of the development on surface water runoff. The storage will be provided by appropriately sized and located swales and areas of permeable paving throughout the development, discharging into existing rhynes.
- 8.7 The surface water drainage strategy has been designed to accommodate the 1 in 100 year rainfall event including climate change (40% increase in peak rainfall intensity) and has been based on the principles of Sustainable Drainage Systems (SuDS). It has been designed to restrict discharge to the QBAR rate, which will help to mimic the existing drainage regime.

APPENDIX A PROPOSED SITE LAYOUT

Existing Agricultural Pasture Land

Existing Drainage Gulleys

Ebdon

4.99ha

Ebdon Road

Wheatfield Drive

Existing Industrial Units

The Cornfields

To Worle

Weston-super-Mare Crematorium

Legend

- Application boundary - 4.99ha
- Primary road network
- Secondary road network
- Proposed bridge/ access
- Proposed site entrance
- Area also under client
- Proposed pedestrian routes
- Existing trees retained
- Proposed trees

Landscape Intervention

- Village green/Wetland Meadow
- Integrated Swale systems (Sustainable Urban Drainage)
- Vehicular free green corridor
- Areas of designated woodland/ecological buffering
- Proposed area of attenuation
- Green infrastructure connection

Net Developable Area

Net Developable Area - 2.91ha

Public Open Space - 2.09ha

Density	No.
25-7dph	75



Lynchmead Farm, Weston-Super-Mare
 Illustrative Masterplan
 180809 L 02 02
 1:1000 / A1
 February 2019

CliftonEmerydesign

Studio 04, 133 Cumberland Rd, Bristol BS1 6JX
 T: 01392 368896 W: www.cliftonemerydesign.co.uk E: mail@cliftonemerydesign.co.uk

Drawing Status DRAFT Planning

CONTRACTORS MUST CHECK ALL DIMENSIONS ON SITE. ONLY FIGURED DIMENSIONS ARE TO BE WORKED FROM. © THIS DRAWING IS COPYRIGHT.

APPENDIX B ENVIRONMENT AGENCY CONSULTATION

Alex Brennan
Vectos
Alex.Brennan@vectos.co.uk

Our ref: 109160-WX
Your ref:
Date: 31 December 2018

Dear Alex

Thank you for your enquiry which was received on 29 November 2018.

Abstract

Name	Product 4
Description	Detailed Flood Risk Assessment Map for Lynchmead Farm, Ebdon Road, Weston-super-Mare
Information Warnings	<i>The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply.</i>
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2017 Ordnance Survey 100024198.

Flood Map for Planning

A Flood Map for Planning (Rivers and the Sea) is attached for spatial planning purposes. This map contains Flood Zones that show the areas of natural floodplain that would flood if there were no raised flood defences. Please be aware this information is also available for download on the following link.

Flooding history

We have no record of flooding from main rivers or the sea in this area.

Open Data

Please note these and the following Environment Agency published datasets are now available on the weblink below as part of the Government's 'Open Data' project and are available for you to download free of charge. Environment Agency published datasets:

<https://data.gov.uk/data/search?publisher=environment-agency&unpublished=false>

You will need to search and select the name of the following datasets to take you directly to the weblink to enable you to download the data:

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Phone: 02030 250 376
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

- Flood Map for Planning (Rivers and the Sea) – Flood Zones 2 and 3
- Flood Map for Planning (Rivers and Sea) – Areas Benefiting from Defences
- Flood Map for Planning (Rivers and Sea) Spatial Flood Defences
- Flood Map for Planning (Rivers and Sea) Flood Storage Areas
- Risk of Flooding (Rivers and Sea)
- Recorded Flood Outlines
- Historic Flood Map
- Risk of Flooding from Surface Water Extent for:
 - 3 percent annual chance
 - 1 percent annual chance
 - 0.1 percent annual chance

If you have requested this information to help inform a development proposal, then you should also note the detail in the attached advisory text on the use of Environment Agency Information and Further Guidance for FRAs.

Strategic Flood Risk Assessment (SFRA)

When preparing a FRA to support a development proposal in this location you should refer to North Somerset's Council's SFRA website, which is available via the following link:

<http://www.n-somerset.gov.uk/my-services/planning-building-control/planningpolicy/supplementary-planning-advice/guidance/strategic-flood-risk-assessment/>

Planning

If you have questions regarding the planning nature of your enquiry, or require advice on floor levels, please contact our Sustainable Places team on NWX.SP@environment-agency.gov.uk. Please be aware that we now charge for planning advice when consulted on pre-application enquiries. This new approach provides advice to developers in two ways. Firstly there is the provision of 'free' advice available to everyone where we give a preliminary opinion on a proposed development. This sets out the environmental constraints together with any issues this raises for us. Should you wish us to review in detail any of these issues then we can do this through a chargeable scheme aimed at recovering our costs.

Flood Levels

Fluvial flood levels and depths

The attached map contains a set of modelled fluvial flood level node locations/unique identifiers, for the main river Banwell, taken from our Weston Villages Strategic Flood Solution (2012) NSC model. A sheet is also attached providing the associated flood levels, NGRs and further information for the river channel relating to each of these nodes. Please note that the labels annotated to the Node Location Map are unique node identifiers and not the associated flood levels.

Node type information:

- 1D_fluvial
 - In channel nodes, no 2D element to the modelling
- 2D_fluvial
 - In channel nodes, 2D data available from the modelling
- Interpolated sections
 - Calculated weighted averages of the river or conduit section properties upstream and downstream to produce a hybrid section according to the location of the interpolated section. They are used to ensure a smooth gradation or transition between cross sections to avoid sudden variations which can cause instability in a model. This may be where the distance between surveyed cross sections is large and there is a steep gradient to the channel or other distinct changes between the two sections.
- Replicate sections

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 Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

- Used to copy the preceding river or conduit section at a distance further along the reach and at a lower level. The Replicated Section is a quick method for adding a cross-section which has exactly the same dimensions as the cross-section immediately upstream.
- Reservoir
 - Modelled measurements outside the boundary of the river channel

Interpolated and Replicate sections are not surveyed sections, however they are based on surveyed section data and the results from them can be used as long as their limitations are understood.

Please be aware that we have provided you with 20% climate change flood flow model results. This climate change allowance has been applied to the current day 1%AEP (1 in 100 year) flood flow estimates used in our Weston Villages Strategic Flood Solution (2012) North Somerset Council model.

If you intend undertaking a FRA for a planning application using climate change flood level information supplied in this letter, you should consider whether it is appropriate in light of a range of potential allowances for fluvial flood flow now advised in current planning guidance on 'Flood risk assessments: climate change allowances'. The relevant guidance is available at the following website address: <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances>

We have included a briefing note that refers to the 2018 Climate Change projections. Our Sustainable places team would be happy to discuss the issues around Climate Change and how this should be used.

Coastal/tidal flood levels and depths

The tables below show the maximum modelled tidal flood levels and depths for defended (actual situation) and undefended (natural floodplain) scenarios taken from our 2012 Wessex North Coast Model. For the undefended scenarios the 0.5% (1 in 200 year return period) and 0.1% (1 in 1000 year return period) annual exceedance probability (AEP) is given. Only the 0.5% (1 in 200 year) AEP is available for the defended scenario.

Defended

AEP	Maximum depth (in metres)	Maximum level (mAOD)
0.5%	0.00	0.00

Undefended

AEP	Maximum depth (in metres)	Maximum level (mAoD)
0.5%	3.13	8.51
0.1%	3.58	8.97

Levels and depths have been extracted based upon the site boundary plan provided.

Flood Defences

Please find enclosed details of Flood Defences within the vicinity of the site boundary. This information has been taken from our Asset Information Management System database(AIMS). This includes the target condition of the natural river embankment.

We are developing a long term Strategy for the Sand Bay and Woodspring area.

Further Information

We advise that you also contact the Flood Risk Department, floodrisk@n-somerset.gov.uk, telephone 01275 888802, at North Somerset Council, Walliscote Grove Road, Weston-super-Mare, BS23 1UJ as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for FRAs:

<https://www.gov.uk/planning-applications-assessing-flood-risk>

<https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion>

We hope you find this information helpful and it is provided subject to the guidance below, which we strongly recommend you read.

Yours sincerely

Corinne Moyse

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Telephone number: 02030 250 376
Email: wessexenquiries@environment-agency.gov.uk

Enc: Use of Environment Agency Information for Flood Risk Assessments (below)
UKCP18 Climate Change Briefing Note
109160-WX Node Location Map
109160-WX Node Data
109160-WX Flood Map for Planning
109160-WX Defence Map
109160-WX Defence Data

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VAT No: 662 4901 34

Alex Brennan
Vectos
Alex.Brennan@vectos.co.uk

Our ref: 109160-WX
Your ref:
Date: 15 January 2019

Dear Alex

Information request for **Modelled Flood Outlines - Lynchmead Farm, Ebdon Road, Weston-super-Mare**

Thank you for your enquiry which was received on 2 January 2019.

Please find enclosed:

- A map showing the modelled tidal flood outlines for the 0.5% (1 in 200) and 0.1% (1 in 1000) AEP for the undefended flooding scenario.
- A map showing the modelled tidal flood outline for the 0.5% (1 in 200) AEP for the defended flooding scenario

We do not hold modelled fluvial flood outlines for the River Banwell. Only the river channel was modelled and we have provided you with the flood level data in our previous correspondence.

Further details about the Environment Agency information supplied can be found on the following website: <https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather>

We hope you find this information helpful.

Yours sincerely



Chris Doyle

Customer & Engagement, Wessex

Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS

Email: wessexenquiries@environment-agency.gov.uk

Telephone number: 03708 506 506

Enc:

109160-WX_2 Defended Tidal Model outline map

109160-WX_2 Undefended Tidal Model Outlines map

Mr A Brennan
Vectos
Broad Quay House
Broad Quay
Bristol
Avon
BS1 4DJ

Our ref: WX/2019/132522/01-L01
Your ref:
Date: 21 January 2019

Dear Mr Brennan

**PRELIMINARY OPINION - RESIDENTIAL DEVELOPMENT AT LYNCHMEAD FARM
EBDON ROAD, WESTON-SUPER-MARE, NORTH SOMERSET, BS22 9NY.**

Thank you for referring the above enquiry, which was received on 2 January 2019.

The Environment Agency can now make the following preliminary comments:

The above proposal falls within Tidal Flood Zone 3 which is an area with a high probability of flooding, where the indicative annual probability of flooding is 1 in 200 years or less from tidal/coastal sources (i.e. a 0.5% or greater chance in any given year).

Sand Bay beach and dunes plus Woodspring Bay defences reduce flood risk but risk will increase with climate change and sea level rise.

Residential development is classified as "More Vulnerable" within Table 3 of the National Planning Policy Framework. As it is within Flood Zone 3, this proposal would first need to pass the Sequential Test with the Local Planning Authority. If this can be passed then an Exception Test will be required. To pass this test the applicant must demonstrate that the development will be safe from flood risk over its lifetime.

A Flood Risk Assessment will be required and will need to assess flood risk from all sources including FD2320 assessment of risk and hazard.

A safe refuge on an upper floor or roof space accessed through a permanent staircase is required due to risk of overtopping or a breach. The finished floor level of the safe refuge should be a minimum of the 0.5% chance of occurring in any one year undefended tidal flood level plus climate change, or 300mm to allow for climate change. There would need to be adequate head room within the safe refuge and sufficient width

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Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS.
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www.gov.uk/environment-agency

Cont/d..

and length to accommodate all those within the dwelling for a number of hours. The dimensions will need to be included on the submitted drawings. The safe refuge area should include electricity and lighting. Nothing should preclude the use of this area as a place of safe refuge and it shall be maintained as such for the lifetime of development.

Floor levels on the ground floor should be set a minimum of 300mm above existing ground levels, but ideally above undefended levels through a combination of site raising and raised floor levels.

North Somerset Council Emergency Planners need to agree with the access and egress and flood evacuation plans. As a minimum the applicant should sign up to flood warning, an evacuation plan and flood resilience construction methods.

The North Somerset Council Flood Risk and Drainage Team should be consulted with regard to surface water drainage for the site.

There must be no interruption to the surface water drainage system of the surrounding land as a result of the operations on the site. Provisions must be made to ensure that all existing drainage systems continue to operate effectively and that riparian owners upstream and downstream of the site are not adversely affected.

The site is within the Internal Drainage Board's area. The North Somerset Levels Internal Drainage Board (01934 833388) should also be consulted on this proposal.

Please note that the views expressed in this letter is in response to an enquiry only and does not represent our final view in relation to any future planning application made in relation to this site. We reserve the right to review our position should new information be provided, or updates to guidance occur, in relation to any such application.

We now charge for pre-application advice, although we are pleased to give a preliminary opinion, if you require additional information please be aware there would normally be a cost of £100/hour plus VAT.

If you wish to discuss any of the above I can be contacted on 020302 50287.

Please quote the Agency's reference on any future correspondence regarding this matter.

Yours sincerely

Richard Bull
Sustainable Places - Planning Advisor

Direct dial 02030 250287
Direct fax 01278 452985
Direct e-mail nwx.sp@environment-agency.gov.uk

**Modelled Tidal Flood Outlines for the Defended
flooding scenario centred on The Runway,
Weston-super-Mare, 15/01/2019 [Request Ref 109160-WX/2]**



Scale: 1:10,000

- Legend**
- rivers_main_010k
 - 0.5% AEP Tidal Def Modelled Outline

Flood Map Areas (assuming no defences)

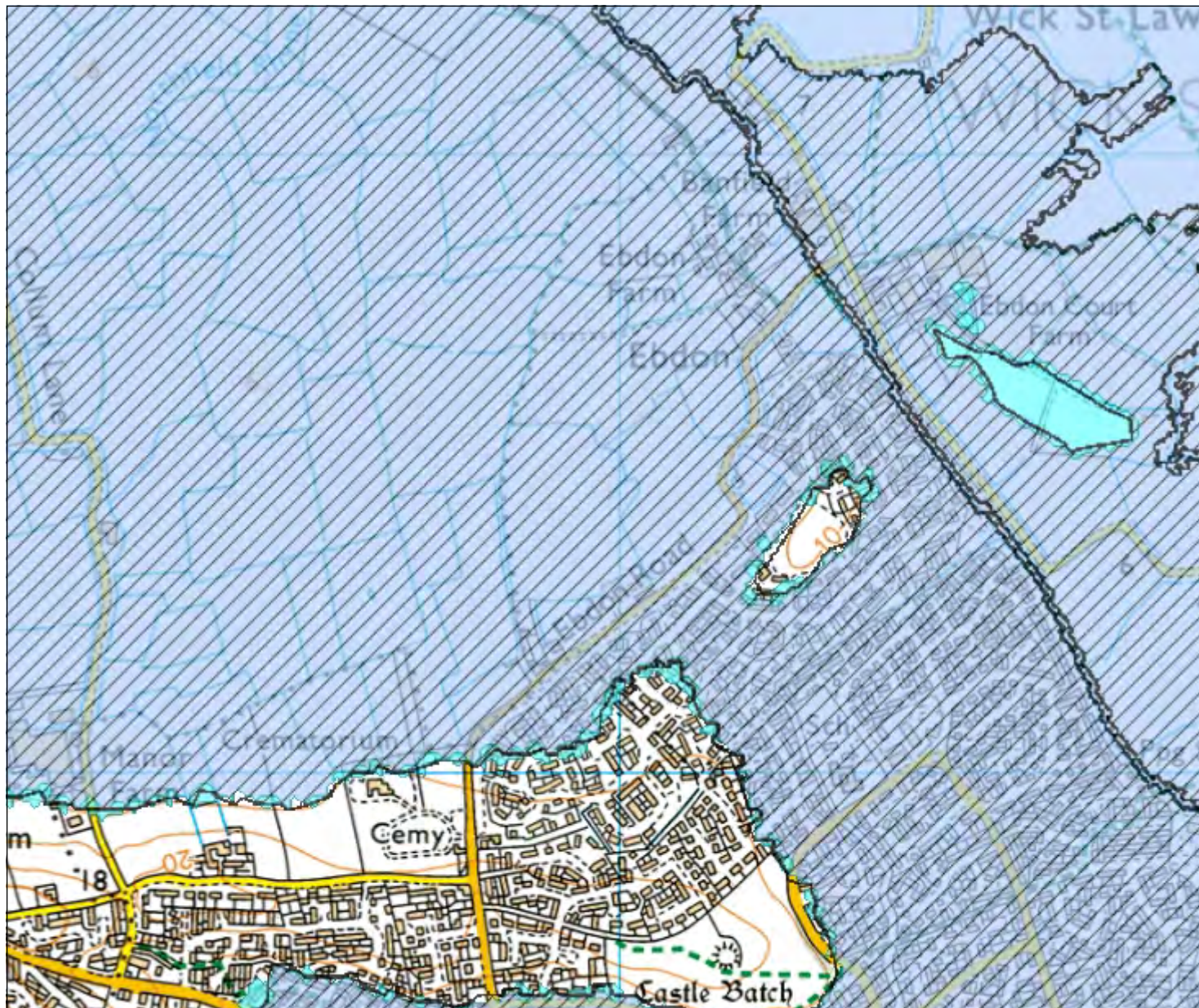
Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

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Flood map for planning - ST 35984 64425 20/12/2018 Ref: 109160-WX



Scale 1: 10,000



Flood Map for Planning (Rivers & Sea)

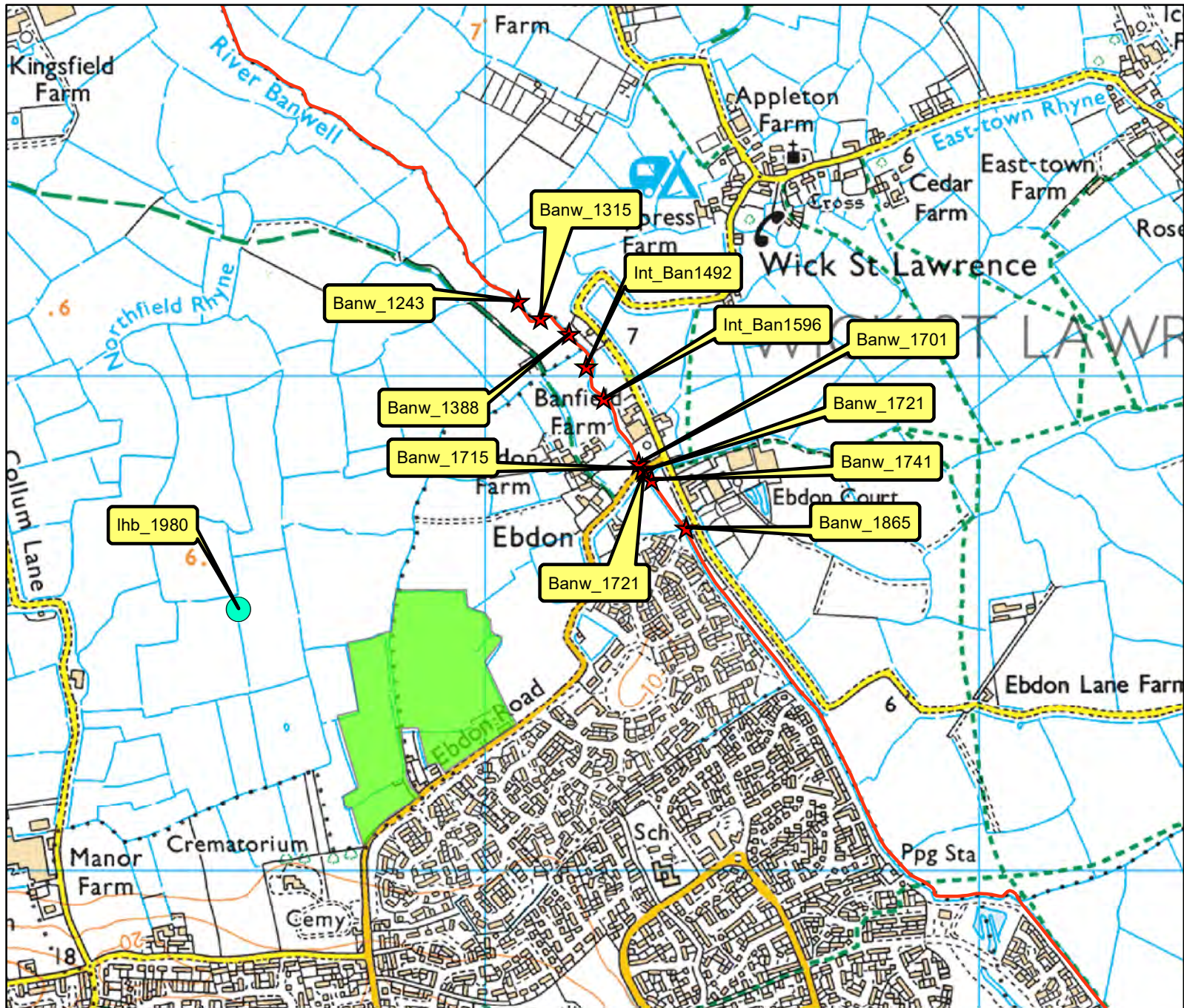
- Defences
- Flood Storage Areas
- Areas benefiting from flood defences
- Flood Zone 3
- Flood Zone 2

Flood Map Areas (assuming no defences)

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.



Scale: 1:11,341



Legend

109160-WX Selected Nodes

● <all other values>

M_TYPE

★ 1D_RiverSection

★ 2D_RiverSection

★ Interpolate

★ Replicate

● Reservoir

○ aaaaaaaaaaaaaaaaa

— rivers_main_010k

■ 109160-WX_site_plan

Modelled Flood Level Nodes

A table that references the node locations/unique identifiers is also attached, giving associated flood levels, NGRs and further information for the river channel and model.

Product 4 - AIMS Information

109160-WX

Date:

05/12/2018

Map Ref	Asset ID	Asset Type	Asset Description	Approx length (m)	Right or left bank	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
1	1287	high_ground	Natural Bank	620.51	right	5.76	+/->75cm	5.75	+/->75cm	DNR	DNR	ST3699463957	11/01/2018	3
2	1288	high_ground	Natural Bank	349.35	left	6.38	+/->75cm	6.40	+/->75cm	DNR	DNR	ST3706763952	11/01/2018	3
3	105188	high_ground	Natural Bank	126.15	right	6.08	+/->75cm	5.83	+/->75cm	DNR	DNR	ST3627664898	11/01/2018	3
4	114583	high_ground	Natural Bank	637.37	right	5.02	+/->75cm	5.76	+/->75cm	DNR	DNR	ST3644864625	11/01/2018	3
5	114584	high_ground	Natural Bank	540.26	left	5.35	+/->75cm	5.60	+/->75cm	DNR	DNR	ST3619465058	11/01/2018	3
6	114764	high_ground	Natural Bank	1014.09	left	5.41	+/->75cm	6.38	+/->75cm	DNR	DNR	ST3663164366	11/01/2018	4
7	1285	high_ground	Natural Bank	142.20	left	5.60	+/->75cm	5.41	+/->75cm	DNR	DNR	ST3633064792	11/01/2018	3

Notes

- * Overall Condition has been taken from the most recent inspection
- * Inspections are of a purely visual nature and do not necessarily reflect the true condition of the asset
- * Condition 1 = very good, Condition 2 = good, Condition 3 = fair, Condition 4 = poor, Condition 5 = very poor
- DNR = data not recorded

Current Flood Defences centred on ST 35984 64425, created 05/12/2018 Ref: WX_109160



Scale: 1:10,000



Legend

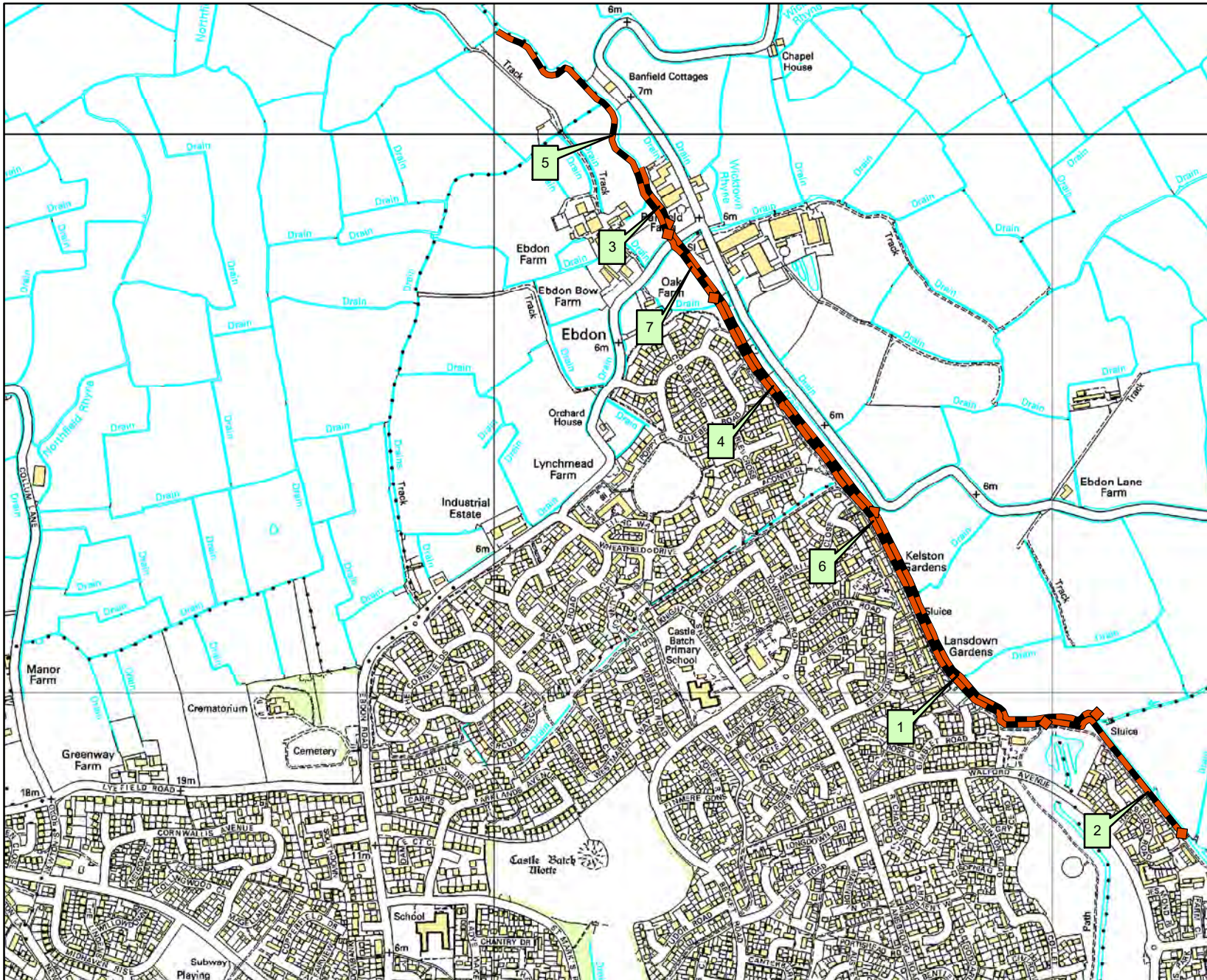
CHANNELS

- ◆ open_channel
- ◊ simple_culvert

DEFENCES

- ◆ bridge_abutment
- ◆ barrier_beach
- ◆ cliff
- ◆ demountable
- ◆ embankment
- ◆ flood_gate
- ◆ high_ground
- ◆ promenade
- ◆ quay
- ◆ wall
- ◆ beach
- ◆ dunes

This data has been extracted from the Asset Information Management System (AIMS) which was created to draw various data sources into one database and has been populated with information of varying quality.



TITLE **Weston Villages Strategic Flood Solution - Haskoning 2012**
 MODEL DATE **01/09/2012**
 SOFTWARE **ISIS**

SCENARIO **Baseline - Summer Penning Level at New Bow Sluice**

NODE	Banw_1243	Banw_1315	Banw_1388	Banw_1701	Banw_1715	Banw_1721	Banw_1741	Banw_1865	Int_Ban1492	Int_Ban1596	Ihb_1980
WATERCOURSE	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	Reservoir Unit
2YR Level	4.97	4.97	4.97	4.97	4.97	4.98	4.98	4.99	4.97	4.97	4.10
2YR Flow	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.29
5YR Level	5.11	5.12	5.12	5.12	5.12	5.13	5.13	5.13	5.12	5.12	4.10
5YR Flow	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.37
10YR Level	5.19	5.19	5.19	5.20	5.20	5.21	5.21	5.21	5.19	5.20	4.10
10YR Flow	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.41
20YR Level	5.27	5.27	5.27	5.28	5.28	5.29	5.29	5.29	5.28	5.28	4.10
20YR Flow	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.40
20YR 20%CC Level	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	4.10
20YR 20%CC Flow	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.29
25YR Level	5.30	5.30	5.30	5.30	5.30	5.31	5.31	5.31	5.30	5.30	4.10
25YR Flow	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.37
30YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
30YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
50YR Level	5.37	5.37	5.37	5.37	5.37	5.38	5.38	5.38	5.37	5.37	4.10
50YR Flow	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.37
75YR Level	5.40	5.40	5.40	5.40	5.41	5.41	5.41	5.41	5.40	5.40	4.10
75YR Flow	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.35
100YR Level	5.43	5.43	5.43	5.43	5.43	5.44	5.44	5.44	5.43	5.43	4.10
100YR Flow	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.34
100YR 20%CC Level	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	4.10
100YR 20%CC Flow	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.77	0.79	0.79	0.18
100YR 30%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 30%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 40%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 40%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 85%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 85%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR 20%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR 20%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
500YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD

109160-WX selected nodes data extract

500YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
1000YR Level	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	4.10
1000YR Flow	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.83	0.87	0.87	0.14
1000YR 20%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
1000YR 20%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
TIDE 200YR	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
TIDE 1000YR	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
Easting	336069	336114	336172	336313	336321	336324	336339	336409	336207	336242	335503
Northings	165152	165117	165085	164824	164813	164809	164790	164693	165020	164955	164529

109160-WX selected nodes data extract

SCENARIO

Baseline - Winter Penning Level at New Bow Sluice

NODE	Banw_1243	Banw_1315	Banw_1388	Banw_1701	Banw_1715	Banw_1721	Banw_1741	Banw_1865	Int_Ban1492	Int_Ban1596	Ihb_1980
WATERCOURSE	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	River Banwell	Reservoir Unit
2YR Level	4.89	4.90	4.90	4.90	4.90	4.91	4.91	4.92	4.90	4.90	4.10
2YR Flow	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.42	0.29
5YR Level	5.10	5.10	5.10	5.11	5.11	5.12	5.12	5.12	5.10	5.10	4.10
5YR Flow	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.48	0.37
10YR Level	5.18	5.18	5.19	5.19	5.19	5.20	5.20	5.20	5.19	5.19	4.10
10YR Flow	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.51	0.41
20YR Level	5.27	5.27	5.27	5.27	5.27	5.28	5.28	5.28	5.27	5.27	4.10
20YR Flow	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.56	0.40
20YR 20%CC Level	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	5.47	4.10
20YR 20%CC Flow	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.67	0.29
25YR Level	5.29	5.29	5.29	5.30	5.30	5.30	5.30	5.30	5.29	5.30	4.10
25YR Flow	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.57	0.38
30YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
30YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
50YR Level	5.36	5.36	5.36	5.37	5.37	5.37	5.37	5.37	5.36	5.37	4.10
50YR Flow	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.61	0.37
75YR Level	5.40	5.40	5.40	5.40	5.40	5.41	5.41	5.41	5.40	5.40	4.10
75YR Flow	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.64	0.35
100YR Level	5.43	5.43	5.43	5.43	5.43	5.43	5.43	5.44	5.43	5.43	4.10
100YR Flow	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.66	0.34
100YR 20%CC Level	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	5.64	4.10
100YR 20%CC Flow	0.79	0.79	0.79	0.79	0.79	0.79	0.79	0.77	0.79	0.79	0.20
100YR 30%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 30%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 40%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 40%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 85%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
100YR 85%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR 20%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
200YR 20%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
500YR Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
500YR Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
1000YR Level	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	5.69	4.10
1000YR Flow	0.87	0.87	0.87	0.87	0.87	0.87	0.87	0.83	0.87	0.87	0.12
1000YR 20%CC Level	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD

109160-WX selected nodes data extract

1000YR 20%CC Flow	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
TIDE 200YR	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
TIDE 1000YR	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD	NMD
Eastings	336069	336114	336172	336313	336321	336324	336339	336409	336207	336242	335503
Northings	165152	165117	165085	164824	164813	164809	164790	164693	165020	164955	164529

Level of confidence

Moderate

The model was produced to assess our flood risk management assets and the results are fit for this purpose. We have MODERATE confidence in its input data, and subsequently its results. The reason that we have MODERATE confidence in the model and its results is because the model requires verification against a known flood event. You will need to contact our Partnership and Strategic Overview Team to discuss whether the flood levels from this model are suitable for your FRA or whether they require you to carry out further work to update the modelling.

**NMD
UNITS**

No Modelled Data

LEVELS: mAOD

FLOW: cumecs

APPENDIX C INTERNAL DRAINAGE BOARD CONSULTATION

Nick Bosanko

Subject: RE: Lynchmead Farm, Weston-super-Mare

From: Simon Bunn <developmentcontrol@nslidb.org.uk>
Sent: 04 January 2019 12:56
To: Alex Brennan <Alex.Brennan@vectos.co.uk>
Cc: Nick Bosanko <Nick.Bosanko@vectos.co.uk>; Giles Oliver <theengineer@nslidb.org.uk>; Andrew Clay <Andrew.Clay@vectos.co.uk>
Subject: RE: Lynchmead Farm, Weston-super-Mare

Hi Alex,

The downstream structure pens the water at 4.86m AOD in this area.

With regards to the maintenance strip. The full 6m is needed for maintenance (1.5-2m stand-off, 3m machine width and 1m safety buffer), but it does depend on whether you have control over both sides of the watercourse, if there are any hedges, what sides they are on, how the maintenance strip will be accessed etc. So it is very rhyne and site-specific.

Kind regards,

Simon

Simon Bunn
Development Control Officer

North Somerset Levels IDB

The Cider House
The Grange Business Park
Hewish
Weston-super-Mare
N. Somerset
BS24 6RR

Tel: 01934 833388

Email: developmentcontrol@nslidb.org.uk

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From: Alex Brennan [<mailto:Alex.Brennan@vectos.co.uk>]
Sent: 02 January 2019 16:45
To: Simon Bunn <developmentcontrol@nslidb.org.uk>
Cc: Nick Bosanko <Nick.Bosanko@vectos.co.uk>; Giles Oliver <theengineer@nslidb.org.uk>; Andrew Clay <Andrew.Clay@vectos.co.uk>
Subject: Lynchmead Farm, Weston-super-Mare

Hi Simon,

Thanks for this information.

Just wanted to follow up with a few questions now things are beginning to progress.

Firstly, are you able to provide the summer pen level close to the site or advise on where this information is available?

Secondly, we would like to consider the construction of a swale within this buffer zone. Therefore, are you able to provide a breakdown of how much is needed for access and how much is needed as an ecological buffer? This will allow us to explore the feasibility of using ecologically sensitive swales adjacent to the rhyes within the site.

Kind regards,

Alex

From: Simon Bunn <developmentcontrol@nslidb.org.uk>
Sent: 11 December 2018 10:05
To: Alex Brennan <Alex.Brennan@vectos.co.uk>
Cc: Andrew Clay <Andrew.Clay@vectos.co.uk>; Giles Oliver <theengineer@nslidb.org.uk>
Subject: RE: Lynchmead Farm, Weston-super-Mare

Hello Alex,

The site falls within the Board's District, and therefore our byelaws apply, further information on this is attached.

Discharge should be at 2 l/s/ha or Qbar whichever is the higher.

A viable discharge location should be found above the summer pen level, and improvements may be required offsite to ensure there is a viable route to either main river or one of the Board's viewed rhyes.

For maintenance strips and ecological buffers, we would be looking for a minimum of 6m clear from any of the rhyes.

Kind regards,

Simon

Simon Bunn
Development Control Officer

North Somerset Levels IDB

The Cider House
The Grange Business Park
Hewish
Weston-super-Mare
N. Somerset
BS24 6RR

Tel: 01934 833388

Email: developmentcontrol@nslidb.org.uk

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From: Alex Brennan [<mailto:Alex.Brennan@vectos.co.uk>]
Sent: 29 November 2018 16:36
To: Giles Oliver <theengineer@nslidb.org.uk>; Kay White <admin@nslidb.org.uk>
Cc: Andrew Clay <Andrew.Clay@vectos.co.uk>
Subject: FW: Lynchmead Farm, Weston-super-Mare

Hello,

We have been appointed to do some preliminary scoping works for a site north of Weston-Super-Mare (location below). We wanted to consult with you early on in the planning phase as we understand the site is in flood zone 3 (tidal) and has some areas at risk of surface water flooding.

Could you please advise on the following queries:

- Can you confirm that the site is within the area you cover?
- What requirements would need to be met regarding the drainage of surface water runoff from this site?
- Are you able to advise on any easements adjacent to channels/rhynes in the vicinity of the site?

Postcode (nearest) - BS22 9NY
Grid Reference (centre) - ST 35984 64425



Many thanks,

Alex

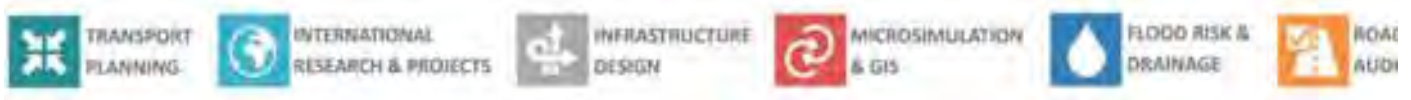
Alex Brennan
Assistant Hydrologist
Vectos
0117 905 8888 (T)
Broad Quay House, Prince Street, Bristol, BS1 4DJ

Alex Brennan
Assistant Hydrologist



0117 905 8888 (T)
Alex.Brennan@vectos.co.uk

Broad Quay House, Prince Street, Bristol, BS1 4DJ



Registered Address: Vectos (South) Limited, Network Building, 97 Tottenham Court Road, London W1T 4TP. Company No. 7591661

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From: Simon Bunn <developmentcontrol@nslidb.org.uk>
Sent: 11 December 2018 10:05
To: Alex Brennan <Alex.Brennan@vectos.co.uk>
Cc: Andrew Clay <Andrew.Clay@vectos.co.uk>; Giles Oliver <theengineer@nslidb.org.uk>
Subject: RE: Lynchmead Farm, Weston-super-Mare

Hello Alex,

The site falls within the Board's District, and therefore our byelaws apply, further information on this is attached.

Discharge should be at 2 l/s/ha or Qbar whichever is the higher.

A viable discharge location should be found above the summer pen level, and improvements may be required offsite to ensure there is a viable route to either main river or one of the Board's viewed rhynes.

For maintenance strips and ecological buffers, we would be looking for a minimum of 6m clear from any of the rhynes.

Kind regards,

Simon

Simon Bunn

Development Control Officer

North Somerset Levels IDB

The Cider House
The Grange Business Park
Hewish
Weston-super-Mare
N. Somerset
BS24 6RR

Tel: 01934 833388

Email: developmentcontrol@nslidb.org.uk

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From: Alex Brennan [<mailto:Alex.Brennan@vectos.co.uk>]
Sent: 29 November 2018 16:36
To: Giles Oliver <theengineer@nslidb.org.uk>; Kay White <admin@nslidb.org.uk>
Cc: Andrew Clay <Andrew.Clay@vectos.co.uk>
Subject: FW: Lynchmead Farm, Weston-super-Mare

Hello,

We have been appointed to do some preliminary scoping works for a site north of Weston-Super-Mare (location below). We wanted to consult with you early on in the planning phase as we understand the site is in flood zone 3 (tidal) and has some areas at risk of surface water flooding.

Could you please advise on the following queries:

- Can you confirm that the site is within the area you cover?
- What requirements would need to be met regarding the drainage of surface water runoff from this site?
- Are you able to advise on any easements adjacent to channels/rhynes in the vicinity of the site?

Postcode (nearest) - BS22 9NY

Grid Reference (centre) - ST 35984 64425



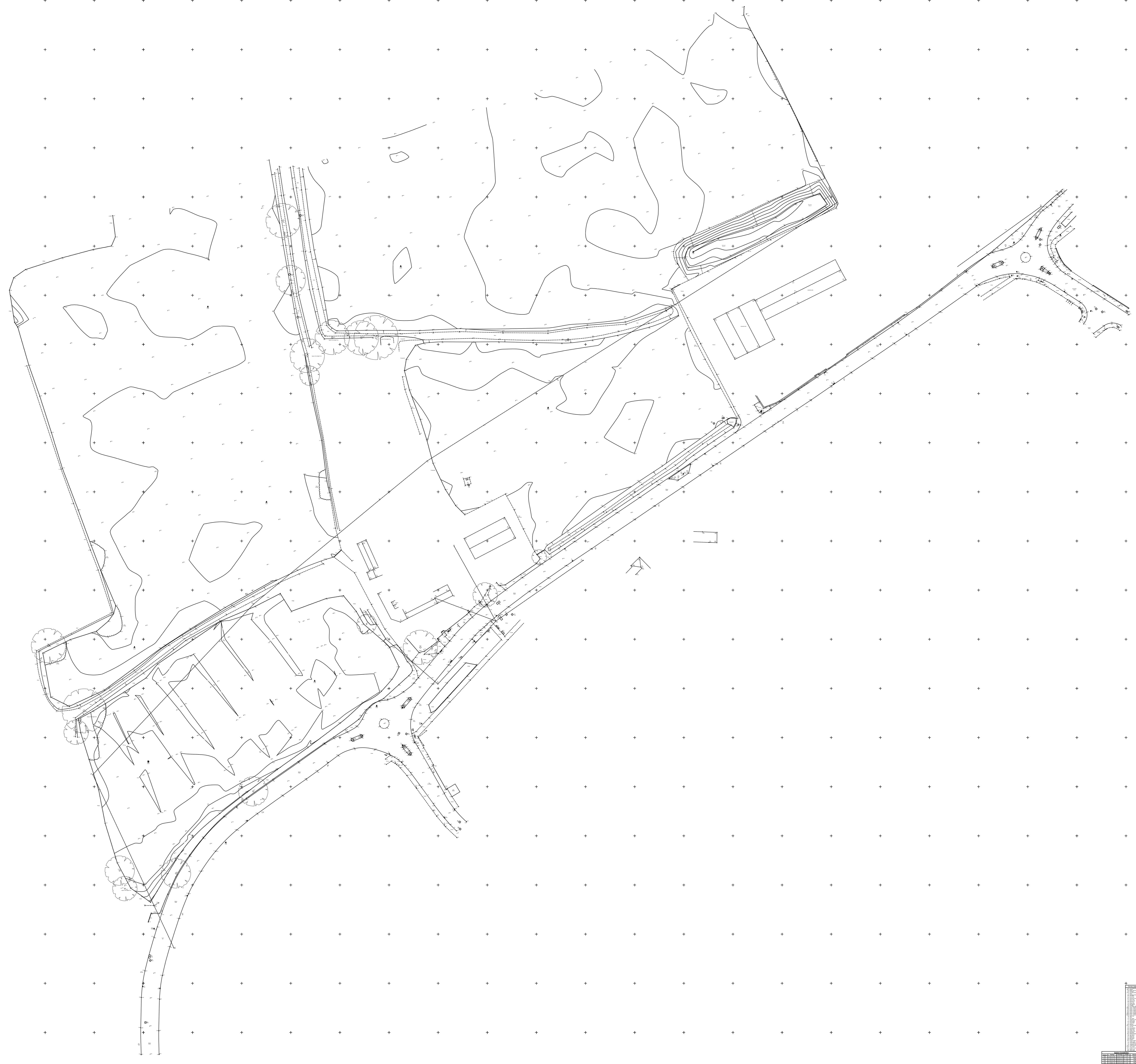
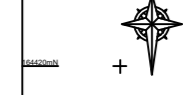
Many thanks,

Alex

Alex Brennan
Assistant Hydrologist
Vectos

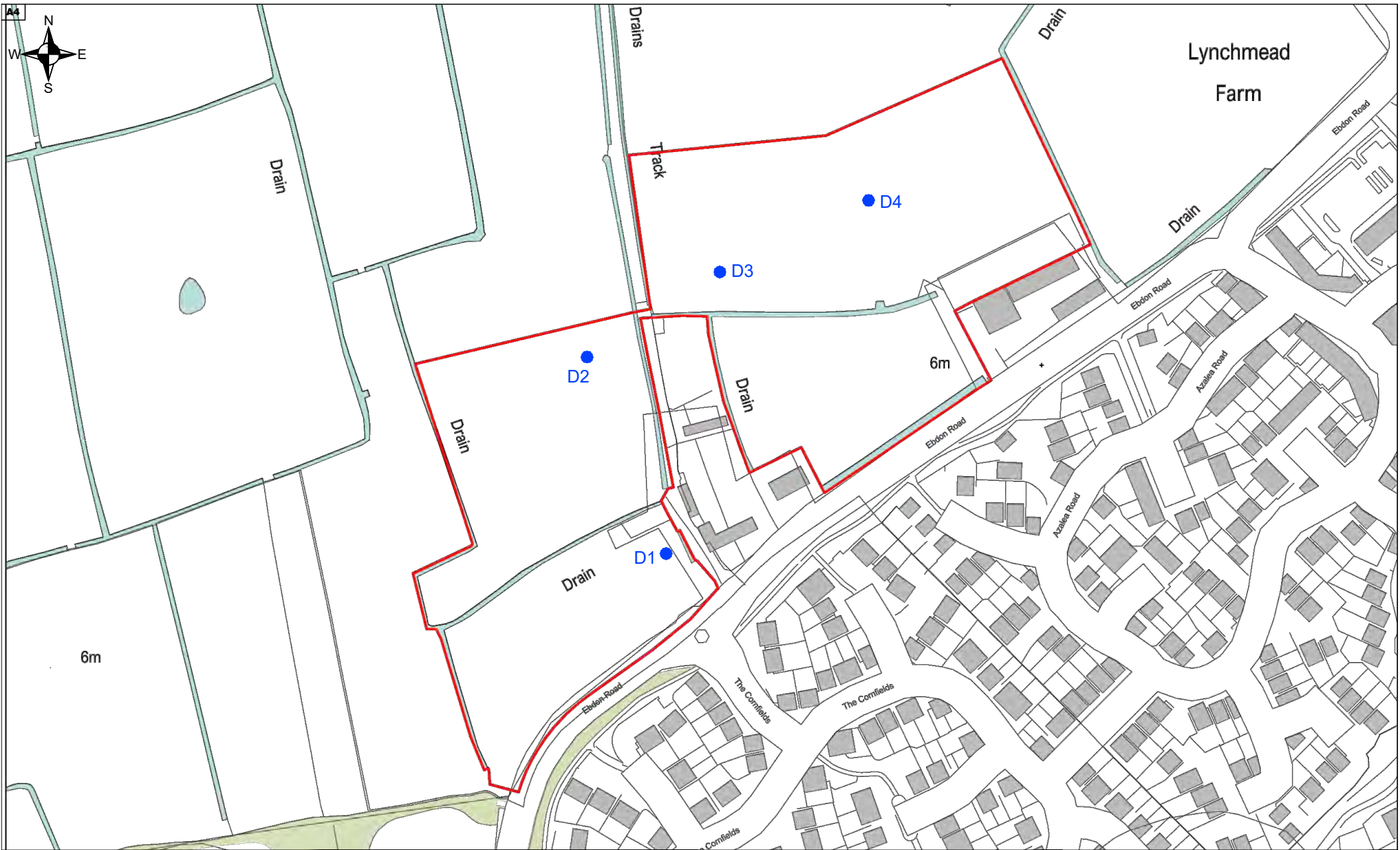
0117 905 8888 (T)
Broad Quay House, Prince Street, Bristol, BS1 4DJ

APPENDIX D TOPOGRAPHIC SURVEY



South Star Land Services Ltd.	
Project Name: [Illegible]	
Project Location: [Illegible]	
Scale: [Illegible]	
Date: [Illegible]	
Drawn by: [Illegible]	
Checked by: [Illegible]	
Approved by: [Illegible]	
Title: [Illegible]	
Drawing No: [Illegible]	
Revision: [Illegible]	
Sheet No: [Illegible]	
Total Sheets: [Illegible]	
Client: [Illegible]	
Contract No: [Illegible]	
Site No: [Illegible]	
Drawing No: [Illegible]	
Sheet No: [Illegible]	
Total Sheets: [Illegible]	
Client: [Illegible]	
Contract No: [Illegible]	
Site No: [Illegible]	
Drawing No: [Illegible]	
Sheet No: [Illegible]	
Total Sheets: [Illegible]	
Client: [Illegible]	
Contract No: [Illegible]	
Site No: [Illegible]	
Drawing No: [Illegible]	
Sheet No: [Illegible]	
Total Sheets: [Illegible]	

APPENDIX E GROUNDWATER MONITORING



Geo Consulting Engineering Ltd
The Studio, Woodmanton Barns,
Woodbury, Exeter, EX5 1HQ

T: 01395 239977
E: mail@geoconsultingeng.co.uk
W: www.geoconsultingeng.co.uk

Client:

Mead Realisations Ltd

Drawing Status

For Information

Job Title:

Lynchmead Farm
Ebdon Road
Weston Super Mare

Dwg Title:

Piezometer
Locations

Scale 1:2500 @ A4 Drawn LS

Date Feb 2019 Checked DLJ

Drawing no:
GCE00939/Fig3

Rev

APPENDIX F WESSEX WATER SEWER CONSULTATION

Nick Bosanko

From: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Sent: 06 March 2019 08:30
To: Nick Bosanko
Subject: RE: WW CAP RESP : NS/ST36SE/ 82 Pre-development enquiry - Lynchmead Farm, Weston-super-Mare
Attachments: wwmap.PDF
Follow Up Flag: Follow up
Flag Status: Flagged

Hello Nick,

Thank you for your email. Apologies for this; please see attached. I am happy to conclude no incidents of flooding in close proximity of the site.

Kind regards

Teddy Amuah

From: Nick Bosanko <Nick.Bosanko@vectos.co.uk>
Sent: 05 March 2019 15:58
To: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Subject: RE: WW CAP RESP : NS/ST36SE/ 82 Pre-development enquiry - Lynchmead Farm, Weston-super-Mare

Hi Teddy

Thanks for this. Are you able to provide the asset plans please (so I can identify the POC you refer to)?

Do you have any records of sewer flooding locally?

Thanks, Nick

Nick Bosanko
Associate Director
Vectos
0117 905 8888 (T) 07947 220 321 (M)
Broad Quay House, Prince Street, Bristol, BS1 4DJ

From: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Sent: 05 March 2019 14:53
To: Nick Bosanko <Nick.Bosanko@vectos.co.uk>
Subject: WW CAP RESP : NS/ST36SE/ 82 Pre-development enquiry - Lynchmead Farm, Weston-super-Mare

Good morning Nick,

Many thanks for your email. As requested, please review the comments below for your attention.

Foul disposal

- A separate system of draining the site will be required.
- Capacity is very limited downstream.

- A POC can be reviewed to the 225 mm dia foul sewers to the south of the site.
- Confirmation of a POC will be dependant on the developer confirming the sites topo as well as how a gravity connection can be achieved to this system. Where the local topography will not permit a gravity connection, A pumped connection can be reviewed with WW.
- WW will review the POC as the site progresses and additional information for the site become available.
- Foul flows gravitate to a public pumping station to the north east of the site. This appraisal confirms that additional engineering appraisals will be required as the site progresses through planning and details are finalised.

Surface water disposal

- There are no Surface water sewers in close proximity of the site.
- The site is predominantly green with no previous connections to our foul network. The LLFA is now a statutory consultee for surface water management and will normally agree and approve run – off rates with flood risk measures through the planning process.
- Land drainage run-off shall not be permitted to discharge either directly or indirectly to the public sewerage system.

I hope the above response answers your enquiry for now. Please review and let me know otherwise.

Kind regards

Teddy Amuah
Assistant Engineer
Wessex Water Planning Liaison

From: Georgia Turner
Sent: 18 February 2019 10:45
To: Teddy Takyi-Amuah <Teddy.Takyi-Amuah@wessexwater.co.uk>
Subject: NS/ST36SE/ 82 Pre-development enquiry - Lynchmead Farm, Weston-super-Mare

Hi Teddy,

Logged and polygon request sent (this one is in target)

Thanks

From: Matthew Addison
Sent: 15 February 2019 16:40
To: Planning Liaison <planning.liaison@wessexwater.co.uk>
Subject: FW: Pre-development enquiry - Lynchmead Farm, Weston-super-Mare

Hi Team

Please see below enquiry

From: Nick Bosanko <Nick.Bosanko@vectos.co.uk>
Sent: 12 February 2019 12:54
To: Developer Services <Developers.Services@wessexwater.co.uk>
Subject: Pre-development enquiry - Lynchmead Farm, Weston-super-Mare

Dear Wessex Water

We have been commissioned to consider the flood risk and drainage strategy for at Lynchmead Farm Ebdon Rd Weston-super-Mare. The site location is attached. The development will consist of up to 75 dwellings.

We are looking to obtain sewer records (as a pdf if possible) and to determine an appropriate point of connection for the proposed development for foul disposal.

It is likely that surface water will be discharged to the rhyme network, but if this is not appropriate, please can you confirm if the nearby sewer network has capacity to accommodate the proposed site.

Please can you also confirm if you have any records of sewer flooding in the vicinity of the site.

Many thanks, Nick

Nick Bosanko
Associate Director



0117 905 8888 (T) 07947 220 321 (M)
Nick.Bosanko@vectos.co.uk

Broad Quay House, Prince Street, Bristol, BS1 4DJ



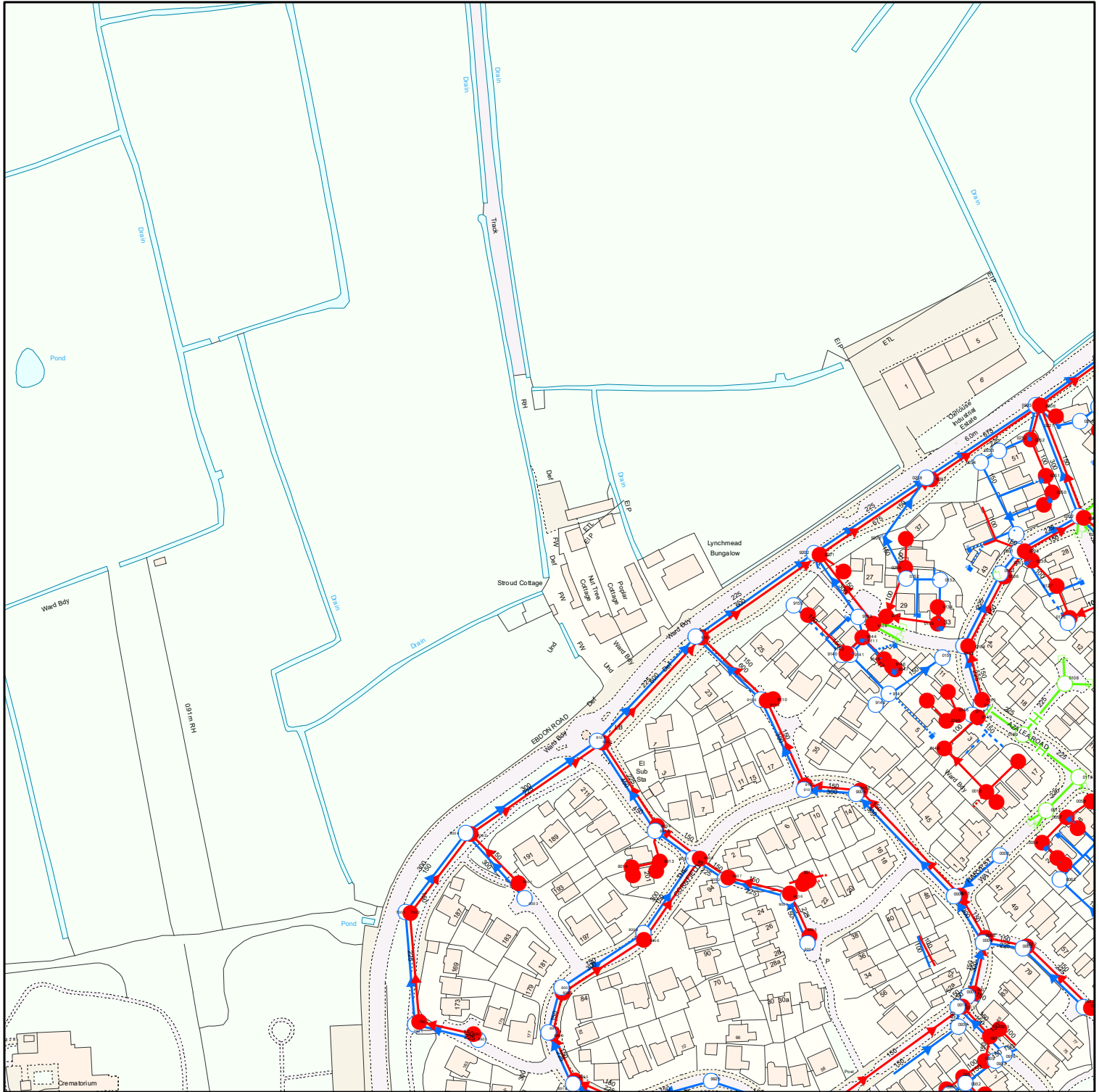
Registered Address: Vectos (South) Limited, Network Building, 97 Tottenham Court Road, London W1T 4TP. Company No. 7591661
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Wessex Water Services Limited, Registered in England No 2366648. Registered Office – Wessex Water Operations Centre, Claverton Down Road, Claverton Down, Bath, BA2 7WW

Wessex Water Web Map



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PUBLIC SEWERS		NON-PUBLIC SEWERS, DRAINS & PIPELINES		OTHER STRUCTURES	
	Foul Sewer		Private - Foul		Section 104 - Foul
	Surface Water Sewer		Private - Surface		Section 104 - Surface
	Combined Sewer		Private - Combined		Section 104 - Combined
	Rising Main		Highway Drain		Private Rising Main
	Syphon		Culverted Watercourse		Effluent Disposal Main
	Overflow		Abandoned Sewer		
	Use Unknown		Status Unknown		
STRUCTURES					
	Manhole - Foul		Bifurcation - Surface		Rodding Eye
	Manhole - Surface		Bifurcation - Combined		Flushing Chamber
	Manhole - Combined		Combined Sewage Overflow		Soakaway
	Outfall		Pumping Station - Surface		Non Return Valve
	Inlet		Pumping Stn - Foul/Combined		Air Valve
	Lamphole		Gully		Washout
	Bifurcation - Foul		Vent Column		Hatch Box
				<p>Colours generally indicate the use of the sewer/drain (i.e Red - Foul, Dark Blue - Surface, Magenta - Combined/Dual Use, Light Green - Highway Drain, Mid Green - Overflow) styles of line are shown on the key in sample/typical colours.</p>	

Wessex Water
a YTL company

Date: 06/03/2019

Scale: 1:2,500

Centre: 335,841 164,211

Information in this plan is provided for identification purposes only. No warranty as to accuracy is given or implied. The precise route of pipe work may not exactly match that shown. Wessex Water does not accept liability for inaccuracies. Sewers and lateral drains adopted by Wessex Water under the Water Industry (Schemes for Adoption of Private Sewers) Regulations 2011 are to be plotted over time and may not yet be shown. In carrying out any works, you accept liability for the cost of any repairs to Wessex Water apparatus damaged as a result of your works. You are advised to commence excavations using hand tools only. Mechanical digging equipment should not be used until pipe work has been precisely located. If you are considering any form of building works and pipe work is shown within the boundary of your property or a property to be purchased (or very close by) a surveyor should plot its exact position prior to commencing works or purchase. Building over or near Wessex Water's apparatus is not normally permitted.

APPENDIX G MICRODRAINAGE CALCULATIONS

Unit 704
The Paintworks
Bristol BS4 3EH

Lynchmead Farm
184199



Date 19/12/2018
File

Designed by AB
Checked by

XP Solutions

Source Control 2016.1.1

ICP SUDS Mean Annual Flood

Input

Return Period (years) 100 SAAR (mm) 800 Urban 0.000
Area (ha) 1.000 Soil 0.300 Region Number Region 8

Results 1/s

QBAR Rural 2.1

QBAR Urban 2.1

Q100 years 5.2

Q1 year 1.7

Q30 years 4.1

Q100 years 5.2

Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years)

Region

M5-60 (mm)

Ratio R

Cv (Summer)

Cv (Winter)

Impemeable Area (ha)

Maximum Allowable Discharge (l/s)

Infiltration Coefficient (m/hr)

Safety Factor

Climate Change (%)

Analyse OK Cancel Help

Select required region from the list

Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 882 m³ and 1213 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Select required region from the list