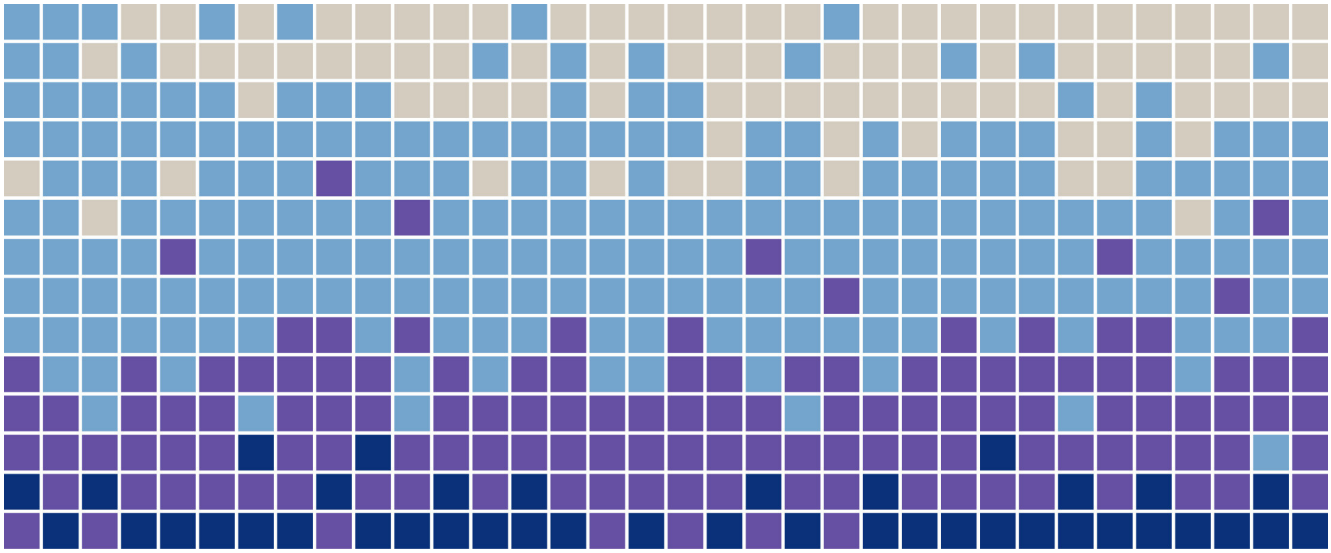

Land at Dyer's Road, Stanway

Flood Risk Assessment & Drainage Strategy

Taylor Wimpey UK Ltd

January 2008

QM

Issue/revision	Issue 1	Revision 1	Revision 2	Revision 3
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Contents

Executive Summary

EXECUTIVE SUMMARY

	Item	Comment	Reference
1	Development Description	Residential	Section 1
2	Location X Y Postcode	 595235 223370 C03 0LH	Appendix A
3	Scale of Development	8.7ha Major > 1 ha	
4	Land Use – Current Proposed	 Greenfield 250 Unit Residential	Section 1 & 2
5	Type of Application	Colchester Borough Council-Local Development Framework	Section 1
6	Planning Status	Supporting LDF	Section 1
7	History of Flooding	Nil	
8	EA Flood Zone Classification	Zone 1	Appendix C
9	EA Modelled Flood Level	N/A	N/A
10	Site Level	30-37m AOD	Section 2
11	Flood Volume Displaced	Nil	
12	Impact on Flood Plain	None	
13	Safe Access and Egress	N/A	Section 6
14	Drainage Strategy	Mimic existing situation whereby runoff drains to ground. SUDS will be utilised in line with the SUDS hierarchy	Section 5

1 Context

1.1 INTRODUCTION

1.1.1 WSP are acting on behalf of Taylor Wimpey UK Ltd, in respect of approximately 8.7 ha greenfield site in Stanway, Essex. A site location plan and photographs are contained in Appendix A.

1.1.2 The development proposals are to build a 250 unit residential development, including associated parking areas and access (see Appendix B); the area of the proposed development is 8.7ha.

1.1.3 A requirement of the Department of Communities and Local Government – "Planning Policy Statement 25: "Development and Flood Risk" (PPS25) published in December 2006 is that developers, making planning applications on sites that are potentially at risk from flooding, or at risk of exacerbating existing flooding problems, should consult with the Environment Agency (EA) and produce a Flood Risk Assessment (FRA) for their proposals.

1.1.4 This FRA has been commissioned to assess the issues of flooding affecting the site in relation to the EA's indicative flood maps as shown on the EA's website. According to these maps, the entire site lies in Flood Zone 1 'low annual probability of fluvial flooding'.

1.2 PLANNING STATUS

1.2.1 This FRA is to support a submission for the proposed development in relation to Colchester Borough Council's Local Development Framework (LDF).

1.3 CLASSIFICATION (VULNERABILITY)

1.3.1 The EA have published Flood Zone Maps (FZM), which show areas potentially deemed to be at risk of flooding. The FZMs have been produced using appropriate good quality mapping and modelling data, where available, supplemented with data derived from national generalised modelling and appropriate good quality local data which conforms to the EA's acceptable criterion. The nationally generalised modelling utilises a Digital Terrain Model (DTM) which excludes the presence of man made features such as flood defences and road and railway embankments. Fluvial flood zone outlines were produced using a 2D raster floodplain model (Jflow) and show the probability of flooding without the presence of defences. Whilst the modelling methodology used to produce FZMs excludes the presence of flood defences, (in order to ensure that the extent of the functional floodplain is delineated, the FZM also show the area of benefit provided by modern flood defences (less than 5 years old) where they are present.

1.3.2 The FZM shows that the site lies entirely within Flood Zone 1 and is therefore classified as 'low annual probability of fluvial flooding'.

1.3.3 PPS25 has a number of tables to show the categories and vulnerability classifications that development falls within. Table D.2 defines residential buildings as 'More Vulnerable' and it is appropriate for residential development to be built in Flood Zone 1 by reference to Table D.1 of PPS25.

1.4 PURPOSE OF REPORT

1.4.1 The EA has a matrix that provides statutory advice in relation to flood risk for planning applications. The extent of the flood risk study required to accompany a planning application is dependent upon the area (in hectares) and location in relation to

the EA's Flood Zone Map (FZM) of the proposed application site and potential sources of flooding.

1.4.2 While the site lies entirely in Flood Zone 1, the development site area is greater than 1 ha (refer to PPS 25, paragraph E9). A FRA is therefore required to be submitted to accompany the Local Development Framework application site in accordance with PPS25 and EA guidance notes, to consider whether the development may increase the risk of flooding elsewhere.

1.4.3 The FRA will predominately focus on the proposed drainage regime to demonstrate that the development will not increase the risk of flooding upstream or downstream of the site.

1.5 APPROPRIATENESS OF DEVELOPMENT PROPOSALS

1.5.1 According to PPS25, sites located in Flood Zone 1, are deemed suitable for all types of development. (Refer to Table 1 below, shaded Green, which is a reproduction of Table D.3 of PPS 25.)

Table 1: Flood risk vulnerability and flood zone 'compatibility' table taken from Table D.3 of PPS25

Flood Risk Vulnerability classification (see Table D2)		Essential Infrastructure	Water compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone (See Table D1)	Zone 1	✔	✔	✔	✔	✔
	Zone 2	✔	✔	Exception Test required	✔	✔
	Zone 3a	Exception Test required	✔	**X**	Exception Test required	✔
	Zone 3b 'Functional Floodplain'	Exception Test required	✔	**X**	**X**	**X**

Note: ✔ Development is appropriate

1.6 SEQUENTIAL TEST/EXCEPTION TEST

1.6.1 According to PPS25 the Sequential Test gives preference to locating new development in Flood Zone 1. The site does not need to be considered in relation to the PPS25 Sequential Test or Exception Test for the location of new development with respect to flood risk, as it is located in Flood Zone 1.

2 Background

2.1 SITE LOCATION AND DESCRIPTION

2.1.1 The site is located approximately 3 km south west of Colchester town centre and to the south of the settlement of Stanway; the surrounding area to the south, east and west is predominately Greenfield while large sand and gravel pits are located 300m to the south of the site. The site is centred on national grid reference (595235, 223370). A location plan and site photographs are provided in Appendix A.

2.1.2 The site predominantly comprises undulating 'soft landscape', though there are buildings comprising a kennel and cattery in the north west part of the site, adjacent to Warren Lane. The land on the southern part of the site is arable (see Photo 1), whilst the central and northern areas comprise grassland and woodland (Photo 2). The wooded area to the north, adjacent to Dyers Road, is currently being used as a motorcycle 'scramble' track (see Photo 3).

2.1.3 The total site is approximately 8.7 ha in area. The surface cover (see Appendix B) of the existing site is summarised below:

- Roof area/car parking / hardstanding: 0.38 ha
- Permeable / landscaping: 8.32 ha

2.2 SETTING IN RELATION TO WATERCOURSES

2.2.1 There are no watercourses within the vicinity of the site. The closest watercourse is the Roman River which is 1.3 km to the south.

2.2.2 The entire site is shown to lie outside the extreme flood event from the EA's FZMs and therefore not deemed to be at risk of fluvial flooding.

2.3 GEOLOGY AND HYDROGEOLOGY CONDITIONS

2.3.1 According to British Geological survey maps the site is situated on Glacial Sand and Gravel.

2.3.2 Based upon the EA's Groundwater Source Protection Zone (SPZ) Map, the site is not shown to be located in a Source Protection Zone area. (Refer to Appendix C).

2.4 EXISTING SITE LEVELS

2.4.1 The existing site levels range from approximately 30m to 37m AOD. The southern part of the site is comprised of an arable field that has a low point running through the centre of it, which extends into the field in the northern part of the site (see Photo 4); this topographical low area can also be seen to extend across Dyers Road (see Photo 5). The two areas within the northern part of the site that are situated adjacent to the residential estate are flatter than the southern parts of the site. The field adjacent to the northern part of Dyers Road, where the motorcycle track is located, is at a lower elevation compared to the surrounding land.

2.4.2 For the purposes of this report, a topographical survey has not been undertaken; topographical information has been obtained from Ordnance Survey base mapping, sewer records and from on site observations.

2.5 DEFENCES

2.5.1 Since the site is in Flood Zone 1, there are no defences to record.

2.6 HYDRAULIC STRUCTURES

2.6.1 The site is entirely situated in Flood Zone 1 and there are no hydraulic structures that are likely to influence the site.

2.7 DEVELOPMENT PROPOSALS

2.7.1 The current development proposals are to build a 250 unit residential development. The proposed site will occupy an area of approximately 8.7 ha. Refer to Appendix B for the proposed development plan.

2.7.2 The surface cover of the proposed development is summarised below based on 75% of the development being impermeable:

- Roof area/car parking/ hardstanding: 2.62 ha
- Permeable / landscaping: 6.08 ha

2.7.3 This represents a 2.24 ha increase in gross impermeable area namely:

- Proposed impermeable area 2.62 ha
- Existing impermeable area 0.38 ha
- Proposed increase in impermeable area 2.24 ha

3 Potential Sources Of Flooding

3.1 INTRODUCTION

3.1.1 The following sections consider all the forms of potential flooding to the site and the combination of sources where appropriate.

3.2 FLUVIAL FLOODING

3.2.1 The site lies within Flood Zone 1 of the Environment Agency's Flood Zone Map. Therefore, it is considered to be a 'low annual probability of fluvial flooding' as there are no watercourses within the immediate vicinity of the site.

3.2.2 The nearest watercourse is the Roman River which is 1.3 km to the south.

3.3 SEWER FLOODING

3.3.1 Inspection of the Anglian Water Sewer records (Appendix F) shows that there is a public network of foul gravity sewers in the residential area surrounding Egremont Way to the north of the site (Photo 6). Additionally, a mixture of surface water and foul gravity sewers are located in the residential area to the west of Warren Lane.

SURFACE WATER

3.3.2 There are no surface water sewers within the proposed development area. A network of surface water sewers exists in the residential area to the north west of the site.

FOUL

3.3.3 There are no public foul sewers located within the proposed development area. There are foul sewers located in the residential areas to the west and north of the site.

3.3.4 The most likely overland flow routes for any excess floodwater from surcharged surface water or foul gravity sewers would be for it to flow away from the proposed development site and be intercepted by existing highway drainage along Warren Lane and in the residential area to the north. The site is therefore not deemed to be at risk of sewer flooding.

ON-SITE

3.3.5 There are no surface water or foul sewers on the site that could pose a flooding risk.

3.4 INFRASTRUCTURE FAILURE

3.4.1 The existing site will potentially contain a network of small bore private water mains in its north western area relating to the existing kennels and cattery; these will be replaced as part of the development proposals. There is a potential flood risk if potable water mains fail within the site. However, the risk is deemed minimal since any surface flow as a result of burst water mains will tend to follow overland flow routes and be intercepted by highway drainage.

3.4.2 There are no surface water or foul sewers on the existing site that have the potential to fail.

3.4.3 A water main runs in a north to south direction along Warren Lane adjacent to the western perimeter of the site. Water from a broken main would flow down Warren Lane in a southerly direction or pond in the topographical low area close to the kennels and cattery (see photo 7), and pose no risk of flooding to the proposed development site.

3.5 GROUNDWATER FLOODING

3.5.1 According to the EA there is no history or indication of groundwater flooding in the area.

3.6 OVERLAND FLOWS

3.6.1 The design of the proposed development will ensure that any overland flow generated on the site (for example from a greater storm than the 1 % annual probability storm) will be directed away from the buildings, towards low impact areas (public open space, communal parking etc). Runoff from the undeveloped areas of the site will tend to follow the site topography.

3.7 CLIMATE CHANGE

3.7.1 PPS25 requires that the developer take into account the impacts that climate change may have over the lifetime of the development.

3.7.2 Since the site is situated entirely within Flood Zone 1 and there are no watercourses within the immediate vicinity, the impacts of climate change are deemed to be negligible.

3.8 FLOOD DEFENCE BREACH

3.8.1 The site is not situated within an area that is defended.

3.9 SECONDARY FLOOD DEFENCES

3.9.1 No secondary flood defences have been identified as part of this study.

4 Flood Levels

4.1 TECHNICAL ASSESSMENT

4.1.1 The site is situated within Flood Zone 1 and is not in the vicinity of any watercourses; it is therefore not deemed to be at risk of fluvial flooding.

5 Proposed Development Drainage

5.1 GENERAL PRINCIPLES

5.1.1 At present, no definitive masterplan exists for the site and any outline proposals are subject to change during the LDF process (see Appendix B). However, this section sets out the principles to be embodied within the development proposals.

5.1.2 The proposed development will result in an estimated 2.24ha increase in impermeable area compared to the existing situation; therefore, it will be necessary to attenuate and control runoff generated from the site. It is important to note that a 75% impermeable area for a site, is fairly typical for a residential development.

5.1.3 Sustainable Drainage Systems (SUDS), to control runoff at source, will be implemented throughout this development scheme. These will take the form of infiltration drainage systems, where subsoil and groundwater conditions allow, and attenuated positive drainage systems, where not possible.

5.1.4 The drainage system will be designed to attenuate surface water runoff rates for up to and including the 1 in 100 year critical duration storm event and take into account the impacts of climate change.

5.2 EXISTING DRAINAGE ARRANGEMENT

SURFACE WATER

5.2.1 From topographic data and examination of sewer records no surface water outfalls were identified from the existing site to the Anglian Water (AW) public sewer network. A network of surface water sewers exists in the residential area to the north west of the site.

5.2.2 The majority of the existing off site sewerage system consists of separate foul and surface water gravity sewers that connect to the Anglian Water network.

5.2.3 The northwest corner of the site is currently developed with hard standings and roof areas, the majority of runoff generated potentially drains via overland flows into permeable areas within the proposed development site to the east and the south of the hardstandings. Soakaways may also be used to drain runoff generated by the kennels and cattery.

5.2.4 Anglian Water have stated (see Appendix F), that there are no public surface water sewers within the vicinity of the site with the available capacity to accommodate flows from the proposed development; therefore alternative methods will need to be investigated for the disposal of surface water runoff, namely, through the use of infiltration methods. There is the potential for the private surface water sewer in the residential area to the north west of the site to accommodate surface water flows from the proposed development; discharge consent would need to be sought from the current owner if this method of disposal of surface water is to be pursued.

FOUL SEWERS

5.2.5 There are no foul water sewers located within the boundary of the proposed development. As stated in section 3.3.3 above, foul sewers are located in the residential areas to the north and to the west. The existing buildings in the north west corner of the site, potentially connect to this network via private foul sewers.

5.3 SUSTAINABLE DRAINAGE SYSTEMS

5.3.1 Sustainable Drainage Systems (SUDS), to control runoff at source, will be implemented throughout this development scheme. A SUDS hierarchy will be followed, which encourages the use of 'soft' engineering solutions which seek to mimic natural drainage regimes. This hierarchy promotes the use of techniques such as green roofs, basins and ponds, and infiltration systems; if theses measures are not feasible then tanked systems such as geo-cellular boxes or underground tanks can be applied.

5.3.2 The SUDS hierarchy rationale can be summarised below:

SUDS technique	Viability	Reason
Green roofs	x/✓	Dependant on site layout and loading capacity of the building roofs
Basins and Ponds	x/✓	The proposed site layout would need to incorporate these features into the design where possible
Filter strips and swales	✓	The proposed site layout will need to accommodate these features in its design. Dependent on ground conditions
Infiltration techniques	x/✓	Infiltration techniques could be utilised. Further site investigation is required
Permeable surfaces and filter drains	x/✓	If required these techniques could be used in parking areas. Further site investigation is required to assess the suitability of the underlying strata
Rainwater Harvesting	✓	If required these techniques could be used to attenuate run-off created by the building roofs
Tanked Systems	✓	Oversized pipes or geo-cellular storage units can be incorporated beneath road areas to attenuate runoff if required.

5.3.3 The application of the use of SUDS on the proposed development will take the form of infiltration drainage systems; these should be promoted wherever possible where subsoil and groundwater conditions allow. Attenuated positive drainage systems, will be used where infiltration systems are not possible. The drainage system, as stated in section 5.1.4 above, will be designed to attenuate surface water runoff to Greenfield rates for up to and including the 1 in 100 year critical duration storm event.

5.3.4 As described in section 2.3, the underlying ground conditions comprise glacial sands and gravels which are considered to be suitable for infiltration to a varying degree.

5.3.5 At a later stage within the planning and design process, it will be necessary for soakaway tests to be undertaken in accordance with BRE Digest 365, to confirm whether the use of infiltration techniques are possible and, whether the infiltration parameters to use in the design are feasible. An investigation will also need to be undertaken to assess the depth of the groundwater table within the site boundary, to ensure there is a sufficient unsaturated zone remaining above the water table and below the infiltration system.

5.4 PROPOSED DEVELOPMENT DRAINAGE STRATEGY

5.4.1 The proposed drainage arrangement will be designed to mimic the existing natural drainage regime whereby surface water run-off is likely to drain directly to the underlying permeable subsoil.

5.4.2 The geology of the site has been described in section 2.3 and indicates that the site is underlain by sands and gravels. It is not possible to say at this stage conclusively whether or not infiltration of surface water will be possible and to what extent if at all achievable. However, the underlying geology indicates that infiltration will potentially be possible. SUDS in the form of infiltration techniques such as soakaways, infiltration trenches, grassed swales and permeable pavements are therefore proposed to be implemented within the development proposals; green roofs may also be used depending on the proposed site layout.

5.4.3 A typical infiltration value from CIRIA Guide 156 for sands and gravels is between 0.1 and 100 m/hr. In advance of soakaway tests being undertaken across the site it is proposed to assess storage volumes and system performance using a value of 0.1m/hr which represents a lower bound (conservative) value.

5.4.4 If infiltration is determined as feasible then infiltration SUDS methods should be promoted throughout the proposed development; it is proposed that roof areas will discharge to ground via lined soakaways and/ or infiltration trenches, hardstanding and car park areas via porous paving and geo-celluar infiltration box storage systems.

5.4.5 If infiltration rates are deemed insufficient to dispose of all surface water generated to the ground then supplementary underground and above ground storage may be required to enable runoff to be held on site for up to and including the 1 in 100 year event with an outfall to the public sewerage system.

5.4.6 If in the event that infiltration is not deemed feasible porous paving as sealed systems, oversized and / or geo-celluar tanks will be utilised under car park areas. These measures should only be adopted if onsite geology inhibits the use of infiltration methods.

At this stage the surface water strategy assumes that a positive outfall will also be required to dispose of surface water. Anglian Water have stated that there is the potential to discharge into the private surface water sewer system adjacent to the site in the north west area around Sandmartin Close and Wren Close (see Appendix E). Consent would need to be obtained from the private sewer owner for approval of any proposed connections and there would also need to be the available capacity.

5.4.7 Surface water discharge rates will be restricted to the existing 'Greenfield' run-off rate for the site for up to and including the 1 in 100 year critical storm event. Calculations using the methodology given by the Institute of Hydrology (IH) 124 have been provided in Appendix D for the 1 in 1, 1 in 30, 1 in 100 year return period events and the mean annual flood (QBar) are summarised below (see Appendix D);

1 in 1 year	25.5 l/s		
QBar (1 in 2 year)	26.4 l/s	or	7.5 l/s ha
1 in 30 year	67.9.0 l/s		
1 in 100 year	95.6 l/s	or	27.3 l/s ha

5.4.8 Consent would be required from the private sewer owner who may dictate the rates of discharge as it would be a new connection; it is important to note that the allowable discharge rate would probably be in the region of the QBar value.

5.4.9 On-site sewers will be designed in accordance with Sewers for Adoption 6th Edition, Building Regulations Part H 2002 edition and best practice procedures. Any on-site drainage system will incorporate appropriate pollution control measures such as petrol interceptors and interceptor catch pit manholes upstream of storage areas to minimise the risk of diffuse and point source pollution entering existing public surface water sewers.

5.4.10 In accordance with PPS 25 and the 'living draft' Practice Guide Companion of PPS25, it is proposed to route water away from vulnerable areas and ensure no flooding of property should occur for the 1in 100year event.

5.4.11 The quick storage estimation function within the WinDes drainage modelling suite has been employed to determine the approximate volume of attenuation required for the proposed site, which is summarised in the table below as a 'worst case' estimate. The calculations assume an allowable discharge of 5 l/s/ ha which may be the restriction imposed on a new connection; refer to Windes calculations in Appendix D.

Catchment	1 in 30 year storage no infiltration (m^3)	1 in 100 year storage no infiltration (m^3)	1 in 30 year storage with infiltration (m^3)	1 in 100 year storage with infiltration (m^3)
A	1215	1610	810	1055

5.4.12 A SUDS methodology will be followed in relation to the site, whereby it is proposed that the predicted storage required for the 1 in 30 year event will be stored below ground in SUDS features as described in section 5.4.6. For events exceeding the 1 in 30 and for up to and including the 1 in 100 year event overflows will be provided in above ground areas such as infiltration basins or similar areas.

5.4.13 Based on the table above, a conservative storage volume for the 1 in 100 year plus climate change event (1 in 100 plus a 30% in rainfall intensity) would be approximately 2,000m^3; this assumes that infiltration would not be feasible. If infiltration is feasible then approximately 1,400m^3 of storage would be required. Assuming a depth of one metre storage, the approximate area required to provide for the (1 in 100 plus 30%) volume would be 2,000m^2. This on site storage could be provided within wet or dry ponds, swales, wetlands or landscaped areas within the development boundary; reference should be made to the SUDS hierarchy described in section 5.3.2 above.

5.4.14 Once infiltration rates have been established then a decision can be made as to how much of the indicated climate change volume can be infiltrated. A detailed site investigation will need to be undertaken in order to determine the ground conditions and the suitability of the proposed SUDS techniques.

5.4.15 In addition, car parks and open space areas will also be designed to provide above ground storage for events that exceed the 1 in 30 year return period and for short intense storms where runoff exceeds the entrance capacity of the drainage systems. Above ground storage will be contained within the height of the kerbs in order to contain the water to a maximum flooded depth of 125mm; this will keep footpaths dry.

5.4.16 Unless the drainage system is to be privately maintained the attenuation and SUDS storage systems, will be offered for adoption under a maintenance agreement by the Local Drainage Authority or by a maintenance company set up by the developers who will assume responsibility for them.

5.4.17 Full design details for the disposal of surface water from the development site have not been provided as part of this FRA as they will be provided at a later date during the detailed design. Anglian Water have stated that they will be unable to provide additional information in relation to capacity and the potential upgrading of offsite foul water sewers, unless the site has been allocated under the Local Development Framework.

5.5 CLIMATE CHANGE IMPACT

5.5.1 During detailed design, the impacts of climate change on the receiving surface water sewer system, will be assessed and taken into account to ensure that the development will not be unduly affected.

5.5.2 The impact of climate change on peak rainfall will be assessed with an increase in rainfall of 30% (in line with the requirements of PPS25 table B.2 for up to the year 2115).

5.5.3 It is proposed that flow routes will be incorporated into the overall masterplan that will direct any overland flows associated with higher intensity storms away from moderate and high vulnerability uses and into above ground retention areas.

5.6 FOUL WATER

5.6.1 There are no foul water sewers located within the boundary of the proposed development. As stated in section 3.3.3 foul sewers are located in the residential areas to the north and to the west. It is intended to allow foul flows to drain by gravity or to be pumped to the existing foul network to the west of the site.

5.6.2 Based on Sewers for Adoption 6th Edition criteria, the design foul water flows from the residential development (approximately 250 residential units) would be in the order of 11.5 l/s.

5.6.3 Details of all proposals for the disposal of foul water from the development site can be defined at a later date as part of detailed design. This is not normally covered within an FRA that is being submitted with a Local Development Framework.

6 Mitigation Proposals

6.1 BACKGROUND

6.1.1 All sources of flooding have been shown to have little or no impact upon the site and therefore mitigation measures are likely to be minor with respect to flood risk.

6.2 FLOOR LEVELS

6.2.1 The site is not deemed to be at risk of fluvial flooding therefore it is not necessary to define minimum finished floor levels. Finished floor levels, however, will be set at least 150 mm above typical ground levels (to comply with Building Regulations).

6.2.2 Due to the undulating topography, proposed site levels may be levelled off so as to give the site a more uniform appearance. Some ground levels may be dictated by surface water drainage requirements.

6.3 FREEBOARD

6.3.1 The site is not deemed to be at risk of fluvial flooding therefore it is not necessary to define freeboard for the site.

6.4 VOIDS

6.4.1 This is not a consideration for this site.

6.5 FLOOD COMPENSATION

6.5.1 The proposed development is situated outside both the 1 in 100 and 1 in 1000 annual probability floodplains. It will therefore not displace any flood waters. Therefore no flood compensation is required.

6.6 FLOOD PROGRESS

6.6.1 The site does not hinder flood flows. Overland flow paths through the site will be maintained and no mitigation is deemed necessary.

6.7 FLOOD WARNING/EVACUATION PLAN/ FLOOD PROOFING

6.7.1 Flood warning measures, evacuation plans and flood proofing measures are not required for this site.

6.8 SAFE ACCESS

6.8.1 The site lies within Flood Zone 1 therefore no mitigation is required as safe access is readily achievable, even taking into consideration the impacts of climate change.

7 Residual Risk Assessment

7.1 INTRODUCTION

7.1.1 Given the scale, location and nature of the development proposals there are a minor number of potential residual risks to the site. These have been considered below.

7.2 EXTREME EVENTS

7.2.1 The major residual risk considered to remain for the proposed development is for rainfall events greater than the drainage design criteria affecting the proposed drainage system. On-site sewers and attenuation structures shall be designed in accordance with Building Regulations, Anglian Water's requirements or Sewers for Adoption 6th Edition criteria, and CIRIA publications as appropriate; to take account of overland flood flow routes and to divert any excess floodwater around and away from the proposed buildings.

7.2.2 There is a residual risk of flooding as a result of surcharging from the Anglian Water sewer in Warren Lane along the western perimeter of the site. As described in Section 3.4.3, given the local topography, it is deemed a very low risk with respect to people or property on the proposed site.

7.3 FLOOD DEFENCE BREACH

7.3.1 The site is not situated in an area benefiting from defences. Therefore this does not need to be considered.

7.4 CONSEQUENCES OF THE FAILURE OF INFRASTRUCTURE

7.4.1 The residual risk and the consequences of a failure of local infrastructure, such as sewers and potable water supply, have been considered in Section 3.4 and do not need to be mitigated against.

7.5 FLOOD EVACUATION PLAN

7.5.1 Safe access, as stated in Section 6.8, can be achieved; therefore a flood evacuation plan will not be required for this site.

8 Conclusion

8.1 SUMMARY

8.1.1 This Flood Risk Assessment report, which has been prepared to support the development of the site through the Local Development Framework process, sets out that the site can be delivered within the land under its control and identifies some points of detail that need to be considered as part of the detailed design and detailed planning process.

8.1.2 The site lies within Flood Zone 1 as defined on the EA Flood Zone Map and, in accordance with PPS25 Table D3, the site is suitable for residential development.

8.1.3 The site passes the Sequential Test, therefore the Exception Test will not be required as the site falls in Flood Zone 1.

8.1.4 Flood risks to the proposed development site from sources such as groundwater, sewers, and water mains are deemed to be negligible. There are no watercourses within the vicinity of the site that would pose a significant flood risk.

8.1.5 The proposed development will seek to utilise sustainable drainage techniques (SUDS) in the form of infiltration techniques; implementation of these shall be further investigated as part of the detailed design stage.

8.1.6 Surface water runoff will be attenuated onsite for up to and including the 1 in 100 year annual probability event including climate change. There is sufficient land available within the development layout to provide the volume of attenuation storage required to achieve this.

8.1.7 The site is presented as sustainable in terms of flood risk and compliant with the criteria set out in PPS25.

Appendices, Figures & Tables

Appendix A Site Location Plan and Photographs

Appendix B Aerial Photograph, Ordnance Survey map and Proposed Development Outline

Appendix C Environment Agency Flood Map and Ground Water Source Protection Zone Map

Appendix D WINDES Storage Estimate Calculations

Appendix E Sewer Records

Appendix F Environment Agency/Anglian Water Correspondence