SITE-SPECIFIC FLOOD RISK ASSESSMENT REPORT

Land East of Holt Road, Horsford, Norfolk NR10 3ED

David Wilson Homes (Eastern)

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1. **Introduction**

1.1. Richard Jackson Ltd has been commissioned by David Wilson Homes (Eastern) to undertake a Site-Specific Flood Risk Assessment (SSFRA) report to support the development of a residential site on land east of Holt Road, Horsford, Norfolk.

1.2. This report will follow the guidance set out in Department for Communities & Local Government’s Planning Practice Guidance (PPG) and CIRIA (2015) C753 – The SuDS Manual.

2. **Development Description and Site Location**

2.1. The site is located in the north of Horsford. The site is bounded by Green Lane to the north, open fields to the east, existing residential development from the previous phase of this scheme and undeveloped land off Holt Road to the south and residential properties on Holt Road, Olive Crescent and The Shrublands to the west. A site location plan is included in Appendix A. The grid reference of the site is TG 18797 17398 and the postcode is NR10 3ED. Site proposals are included in Appendix B.

2.2. The site falls generally from north to south, from approximately 36.76m Above Ordnance Datum (A.O.D.) to 35.35m A.O.D.

3. **Definition of the Flood Hazard**

3.1. There are several sources of flooding that have the potential to affect development and therefore must be assessed for their potential to flood the development and to increase the risk of flooding to others. The sources of flooding that need to be considered are detailed below and supporting documentation from the Environment Agency (EA) website is included in Appendix C.
Fluvial and Tidal Flooding

3.2. According to the EA mapping for “Flood Risk from Rivers and Sea”, the site is not at risk from fluvial or tidal flooding.

Ground Water Flooding

3.3. A review of the British Geological Survey’s (BGS) online mapping describes this area as “Wroxham Crag Formation” sand and gravel sedimentary bedrock with “Glaciofluvial Deposits, Mid Pleistocene” sand and gravel superficial deposits. Any groundwater found in this geology is likely to be perched within the superficial deposits.

3.4. An environmental site investigation was undertaken in April 2016, the results of which are included in Appendix D. The trial pits and windowless sampler borehole locations confirm the BGS findings. Groundwater seepage occurred in a trial pit dug in the southern, lower part of the site at 3.4m in depth in the superficial deposits. Water was similarly discovered in the windowless sampler boreholes between 3.0m and 3.5m in depth, above the clay layer, confirming that this is likely to be perched in the superficial deposits.

Reservoir and Other Manmade Flooding

3.5. According to the EA mapping for “Flood Risk from Reservoirs”, the site is not at risk from reservoir flooding.

3.6. The failure of sewers and water mains located close to the site is always possible. These events do not produce significant volumes of water however when compared to fluvial or tidal events and the risk is therefore considered to be low.

Surface Water Flooding

3.7. According to the EA mapping for “Flood Risk from Surface Water”, the site encompasses some localised pockets at risk from surface water flooding. The risk of these events occurring varies between 1 in 30 (3.3%) and 1 in 1,000 (0.1%) and the associated mapping showing the extents and velocity of
flooding for high, medium and low chances of occurring have been included in Appendix C.

3.8. The site is not at risk in the high chance of occurring event. The medium chance of occurring event produces a small, isolated area below 300mm in depth on the northern boundary, adjacent to North Farm. In the low chance of occurring event this area expands and becomes deeper in parts, to between 300mm and 900mm. This appears to be a localised low spot which flows out into Green Lane.

4. **Probability**

4.1. This site is located in an area which is subject to flood risk from a combination of flood sources. All of these risks are managed in some way and the risk for each is determined in Table 4.1 below for the current time.

<table>
<thead>
<tr>
<th>Flood Source</th>
<th>Risk Level</th>
<th>Flood Zone</th>
<th>Comment</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluvial/Tidal</td>
<td>Low</td>
<td>1</td>
<td>Not considered at risk.</td>
</tr>
<tr>
<td>Ground Water</td>
<td>Low</td>
<td>1</td>
<td>Low risk from perched water.</td>
</tr>
<tr>
<td>Reservoir</td>
<td>Low</td>
<td>-</td>
<td>Not considered at risk.</td>
</tr>
<tr>
<td>Surface Water</td>
<td>Low</td>
<td>1</td>
<td>Low risk on north eastern site boundary.</td>
</tr>
</tbody>
</table>

4.2. The site is considered to be at low risk from surface water flooding.

5. **Climate Change**

5.1. Climate change is predicted to raise sea levels and increase rainfall duration and intensity.

5.2. Recently published guidance on climate change by the EA has altered the amount of climate change for peak river flow, peak rainfall and sea level
allowances to be assessed, based upon the location under investigation and, for river basin districts, the type of development being considered. This however is only applicable for sites outside of flood zone 1, and is not therefore required to be assessed formally as part of this report. Table 5.1 gives an indication of the increased risk that climate change may pose to the site.

Table 5.1 – Flood Risk Levels with Climate Change

<table>
<thead>
<tr>
<th>Flood Source</th>
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<td>Surface Water</td>
<td>Low</td>
<td>1</td>
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</tbody>
</table>

5.3. The site will be at increased risk from rainfall events in the future and thus in accordance with advice from the EA, a factor of 40% should be added to rainfall events for the proposed drainage system serving this site.

6. **Detailed Development Proposals**

6.1. The proposals for the site are for the erection of 259 dwellings and associated open space, landscaping, highways and drainage infrastructure works.

6.2. A "Foul Sewage & Utilities Assessment“ report has been produced for this site which should be read in conjunction with this report.

6.3. The proposed foul and surface water drainage layout has been included in Appendix E for reference.

**Foul Water**

6.4. It is proposed to fall the site foul drainage by gravity to a pumping station in the north east of the site, with a rising main extending north to Green Lane and then west, then south on Holt Road to a new manhole constructed...
adjacent to the existing public sewer. From here, a connection is proposed into existing manhole number 6201.

**Surface Water**

6.5. The SuDS Manual requires surface water from impermeable areas to be attenuated to minimise the risks of downstream flooding, as well as undergoing treatment prior to outfall to improve water quality.

6.6. Individual building plots are proposed to have surface water from their roof and impermeable areas disposed of via permeable paving and individual soakaways.

6.7. In accordance with Table 26.2 of the SuDS Manual, different types of land use have varying pollution hazard indices. Table 6.1 below details the land use and the pollution hazards for this proposal.

<table>
<thead>
<tr>
<th>Land Use</th>
<th>Pollution Hazard Level</th>
<th>Total Suspended Solids</th>
<th>Metals</th>
<th>Hydrocarbons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Residential Roofs</td>
<td>Very Low</td>
<td>0.2</td>
<td>0.2</td>
<td>0.05</td>
</tr>
<tr>
<td>Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. &lt; 300 traffic movements/day</td>
<td>Low</td>
<td>0.5</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>0.7</strong></td>
<td><strong>0.6</strong></td>
<td><strong>0.45</strong></td>
</tr>
</tbody>
</table>

6.8. The requirement set out is for the “total SuDS mitigation index” to be equal to or greater than the “pollution hazard index”. The SuDS mitigation index for a permeable pavement, as described in Table 26.3, is set out below.
Table 6.2 – SuDS Mitigation Indices

<table>
<thead>
<tr>
<th>Type of SuDS Component</th>
<th>Total Suspended Solids</th>
<th>Metals</th>
<th>Hydrocarbons</th>
</tr>
</thead>
<tbody>
<tr>
<td>Permeable Pavement</td>
<td>0.7</td>
<td>0.6</td>
<td>0.7</td>
</tr>
</tbody>
</table>

6.9. From this table it can be seen that the permeable paving is an appropriate treatment for the combination of the building roofs and car parking areas.

6.10. It is proposed that the highway surface water is disposed of via pipes in the highway areas which outfall into three separate soakaways across the site in areas of public open space, in accordance with the requirements for adoption by Norfolk County Council.

6.11. Calculations to support the type and size of the surface water attenuation features have been included in Appendix F, which describe the effect of different duration storms on the proposals for 1 in 100 year return period events, with a climate change factor of 40% applied in accordance with the PPG.

Building Design

6.12. To protect the proposed buildings from any overland flow caused by saturated ground conditions or damaged infrastructure, it is proposed to raise the Finished Floor Level (F.F.L.) 150mm above the existing ground levels, to prevent ingress into the building.

7. Flood Risk Management Measures

7.1. As the site is not at risk from fluvial, tidal or reservoir flooding and measures to prevent the ingress of overland flow into the dwellings have been proposed, no further flood risk management measures are proposed for this site.

8. Residual Risks

8.1. The residual risks at the site are as follows:
• Extreme rainfall events which exceed the capacity of the drainage system – there is no management for this type of event. The dwellings have been raised above the surrounding landscape to prevent water from entering the ground floor.

• Water main or sewer failure – this will be managed by the residents if privately run infrastructure or by the water or sewer company if adopted infrastructure.
Appendix B