



St Johns Nursery, Clacton on Sea

Flood Risk Assessment & Drainage Management Strategy

For Kelsworth Limited

Date: 14 May 2021

Doc ref: 10898-HYD-XX-XX-RP-D-001

DOCUMENT CONTROL SHEET

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| 6 | | 10/05/2021 | Appendices updated to suit latest site layout |

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|---|-------|------------|---|
| 7 | Final | 14/05/2021 | Appendices updated to suit latest site layout |
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Executive Summary

The proposal is for a new residential development and associated infrastructure to be located on land east of Earls Hall Drive, Clacton-on-Sea, CO16 8BP. The total area is approximately 7.5 ha. The proposals include for the demolition of the existing commercial plant centre, the site is therefore considered to be brownfield and existing connections will be investigated and utilised with betterment on existing brownfield rates.

Flood Risk

This report has considered the flood risk posed to the site from all sources, in accordance with the NPPF and the local Strategic Flood Risk Assessment (SFRA). The site is located within Flood Zone 1 i.e. land defined as having an annual probability of fluvial flooding less than 1 in 1000 (0.1%) in any year and is considered to be at 'low' risk of fluvial flooding.

The development proposals are considered to be 'More Vulnerable' which is appropriate for Flood Zone 1 (NPPF). The development passes the requirements of the Sequential Test and the Exception Test is not required.

The site is at low risk of flooding from all sources, including fluvial, pluvial, groundwater related, sewer related and from artificial sources. The risk from each is discussed further in Section 4.

Surface Water Drainage Strategy

The drainage hierarchy has been considered to form the drainage strategy.

An infiltration rate of 5.6×10^{-6} has been derived from historical data of a closely neighbouring site. Infiltration tests should be carried out prior to detailed design to inform the drainage strategy.

Based on a survey of the existing data, there appears to be an ordinary watercourse located along the western site boundary. Further investigation will be required as to the current outfalls of the brownfield site, the outfall pipe sizes, their capacity as well as their condition. This will be carried out prior to detailed design.

Correspondence with Essex County Council (LLFA) has been received that highlights despite the brownfield nature of the development, they expect to see a restriction of run-off rates to the **1 in 1-year greenfield event**, and to attenuate at this rate for **all storm events up to and including the 1 in 100 year plus 20% climate change**. This level of attenuation can only be feasibly considered by multi-purposing areas of public open space to become open attenuation during the peak events. See Appendix E for the pre-development (not existing) greenfield runoff rates and Appendix F for the outline drainage strategy layout.

The use of Sustainable Drainage Systems (SuDS) will be implemented in the form of above ground conveyance and storage systems such as swales & ponds. A detailed review of the proposed site layout, existing and proposed levels will be required to inform a full drainage strategy and SuDS design.

Foul flows will outfall at an unrestricted rate to nearest public foul sewer. A pumped solution may be required. An agreement in principle will be carried out with Anglian Water at detailed design, when more site-specific information will be available.

1. INTRODUCTION

1.1 Development Context

1.1.1 This report has been prepared by Hydrock Consultants Limited (Hydrock) on behalf of Kelsworth Limited to support the planning application for a new residential development and associated infrastructure to be located on land east of Earls Hall Drive, Clacton-on-Sea, CO16 8BP.

1.1.2 The proposals include for the demolition of existing commercial units. The site is therefore considered to be 'brownfield'.

1.2 FRA requirements

1.1.3 Local Planning Authorities are advised by the Government's National Planning Policy Framework (NPPF) to consult the Environment Agency (EA) and Lead Local Flood Authority (LLFA) on development proposals in areas at risk of flooding and/or for sites greater than 1 hectare in area.

1.1.4 This report has been prepared to assess the requirements of NPPF by:

- Providing an assessment of whether the site is likely to be affected by flooding and whether it would increase flood risk elsewhere,
- Assessing whether the proposed development is appropriate in the suggested location,
- Detailing any measures necessary to mitigate any flood risk identified, to ensure that the proposed development and occupants would be safe, and that flood risk would not be increased elsewhere.

1.1.5 The report considers the requirements for undertaking a Flood Risk Assessment as stipulated in NPPF. Only those requirements that are appropriate to a development of this nature have been considered in the compilation of this report.

1.1.6 This report has been prepared in accordance with current EA and LLFA policy. Pre-planning consultation is not included in this report. The EA is no longer a statutory consultee for developments in Flood Zone 1. A pre-development enquiry with Anglian Water will be carried out at detailed design. The Essex County Council outline drainage design checklist will be carried out at the full application stage, where more site details are known (i.e. infiltration testing, existing infrastructure surveys etc).

2. DEVELOPMENT DESCRIPTION AND LOCATION

2.1 Site Location

2.1.1 The site is referenced in Table 1, and a location plan is provided in Figure 1.

| Site Referencing Information | |
|-------------------------------|--|
| Site Name | St Johns Nursery, Clacton-on-Sea, CO16 8BP |
| Site Address & Location | Land east of Earls Hall Drive, Clacton-on-Sea, CO16 8BP |
| Council Area | Essex County Council |
| Approximate Grid Reference | 614539E, 216191N |
| Site Area | The total site area is approximately 7.5 ha. |
| Boundaries & Surrounding Land | Agricultural land forms the northern and eastern boundaries. Existing residential properties off St Johns Road form the southern boundary. Earls Hall Drive forms the western boundary. |
| Existing Land Use and Access | The site is currently occupied by existing commercial buildings which will be demolished as part of the proposals. Access is currently via Earls Hall drive on the Western boundary, the proposals include for an additional access to be made in place of an existing residential property off St Johns Road to the south. See Appendix A for site plans. |
| Elevation and Topography | A review of the topo shows the land generally slopes south-west. |
| Development Proposals | The proposed development is for the construction of a residential estate and associated infrastructure. |

Table 1: Site referencing information



Figure 1: Site location

3. PLANNING POLICY AND CONSULTATION

3.1 National Planning Policy Framework (NPPF)

3.1.1 The flood maps provided by the Environment Agency (EA) locate the site within Flood Zone 1, i.e. land defined as having an annual probability of fluvial flooding of less than 1 in 1000 (0.1%) in any year. As a requirement of the NPPF, the proposed development has to satisfy the requirements of the Sequential Test and, where applicable, the Exception Test.

3.1.2 Under the NPPF, Flood Zone 1 is defined as low probability flood risk. The proposal is residential, which, in line with Table 2 of the technical guidance document is classed as 'More Vulnerable'. Thus, according to the criteria in Table 3 (Flood Risk Vulnerability and Flood Zone 'Compatibility'), the development is considered to be 'appropriate'.

3.1.3 In light of this, the Exception test is not required. Table 2 and Table 3, referred to above, can be found in the Technical Guidance to NPPF.

3.2 Strategic Flood Risk Assessment (SFRA)

3.2.1 SFRA's assess the risk associated with all types of flooding and provide the information required to identify the amount of development permitted in an area, how drainage systems in the area should function and how risks in vulnerable areas can be reduced and/or mitigated. The NPPF states that regional planning bodies (RPB's) or local planning authorities should prepare SFRA's in consultation with the EA.

3.2.2 The Essex County Council Local Flood Risk Management Strategy (2013) points to the Tendring District Council SFRA (2015), which will be assessed below. The purpose of the SFRA is to collate and analyse the most up to date flood risk information for all sources to provide an overview of flood risk issues.

3.2.3 A summary of the main elements from the SFRA are detailed below. The full report can be obtained from the Tendring District Council Website.

- The SFRA provides a detailed understanding of flood risk across all areas and from all sources.
- Full Sequential and Exception tests to be carried out (where applicable).
- The SFRA is mostly concerned with tidal flooding and overtopping of existing defences, the implications of which do not affect this site.

3.3 Statutory Authority Correspondence

3.3.1 The Environment Agency is no longer a statutory consultee for sites within Flood Zone 1.

3.3.2 The Essex County Council outline drainage design checklist will be carried out at the full application stage, where more site details are known (i.e. infiltration testing, existing infrastructure surveys etc).

3.3.3 Anglian Water will be contacted as part of the detailed design works, when more site-specific information is made available.

4. DEFINITION OF FLOOD HAZARD

4.1 Sources of Information

4.1.1 NPPF requires the developer to consider the impact of runoff generated by the proposed development onto the downstream catchment, and to assess the risk of runoff from the surrounding district impacting on the development footprint. This report is to consider flood risk from all sources. The following section defines the flood risk receptors and anticipated flood risk which has been assessed using the Environment Agency Flood Risk Maps, the SFRA and Anglian Water sewer records.

4.2 Tidal flood risk

4.2.1 The site is not near a coastline or tidally influenced river. Therefore, the risk of flooding from tidal sources is low.

4.3 Fluvial flood risk

4.3.1 Figure 2 shows the site on the Environment Agency's indicative flood map. The site is located within Flood Zone 1 (i.e. land assessed as having less than 1 in 1000 (0.1%) probability of river flooding in any year).

4.3.2 Therefore, flood risk from fluvial sources is considered to be low.

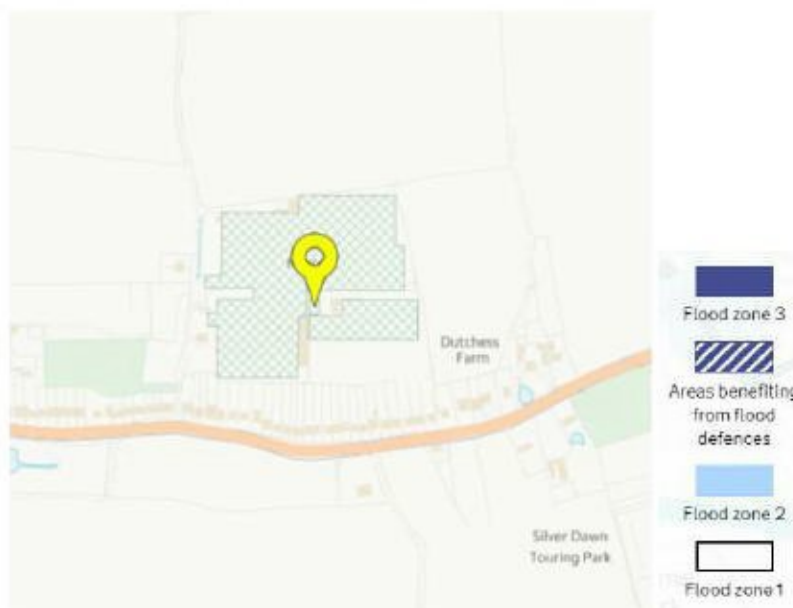


Figure 2: Extract of EA fluvial flood risk map

4.3.3 There will be no increase in flood risk as a result of the development due to the restriction of run-off rates. The development will provide betterment to the downstream flood risk, as in accordance with the LLFA, existing run-off rates will be reduced to mimic the 1 in 1 year greenfield event.

4.4 Surface Water flood risk (Pluvial)

4.4.1 A review of the Environment Agency Surface Water Flood map indicates that the site is predominantly at 'Very low' risk of surface water flooding (Fig 3) with some patches of Low risk within the site and along the eastern boundary.

4.4.2 The overall risk of pluvial flooding is therefore considered to be low.



Figure 3: Extract of EA surface water flood risk map

4.5 Flooding from Groundwater

4.5.1 A review of the geotechnical desk study will be carried out as part of the drainage assessment.

4.5.2 The encroachment of groundwater at ground level is not expected due to the impermeable nature of the below clayey soils and likelihood of extensive made ground throughout the site.

4.5.3 Overall the groundwater flood risk is considered to be low.

4.6 Flooding from sewers/highway drains

4.6.1 A review of the sewer records is pending.

4.6.2 Overall, flood risk from sewers/highway drains is considered to be low.

4.7 Flooding from artificial sources

4.7.1 A review of the EA online flood maps indicates no flood risk from reservoir breach.

4.7.2 Overall flood risk from artificial sources is considered to be low.

5. DRAINAGE STRATEGY

5.1 Existing surface water runoff

- 5.1.1 The site is brownfield, therefore an assessment of the existing drainage network will be required.
- 5.1.2 For a total site of 7.5 ha, based on aerial photography approximately 75% of this area is under cover (i.e. impermeable), this yields an estimated Impermeable Area: 75% of 7.5 ha = 5.625 ha.
- 5.1.3 The brownfield run-off based on a standard rainfall intensity of 50mm/hr ($50 \times 2.78 \times 5.625$) is 782 l/s.
- 5.1.4 For the purpose of design, the LLFA have requested that despite this being a brownfield site, the greenfield rate for the 1 in 1 year event should be applied. For a total site area of 7.5 ha, the greenfield run-off rate is 8.8 l/s for the 1 year event.
- 5.1.5 Surface water discharge into the stream network at a reduced rate (significant betterment in accordance with brownfield design principles).

5.2 Infiltration

- 5.2.1 An infiltration rate of 5.6×10^{-6} has been derived from historical data of a closely neighbouring site. Infiltration tests should be carried out prior to detailed design to inform the drainage strategy.

5.3 Sustainable Drainage Systems (SuDS)

- 5.3.1 Sustainable drainage developed in line with the ideals of sustainable development is collectively referred to as Sustainable Drainage Systems (SuDS). At a particular site, these systems are designed to manage both the environmental risks resulting from the urban runoff and to contribute, wherever possible, to environmental enhancement. Therefore, SuDS objectives are to minimise the impacts from the development on the quantity and quality of the runoff and maximise amenity and biodiversity opportunities (CIRIA C753, 2015).
- 5.3.2 A strong design theme is essential if maximum aesthetic benefits are to be gained from the SuDS approach. At a more local scale SuDS should link with the individual plot structure, planting and amenity areas, gaining multiple benefits from a limited area of land.
- 5.3.3 The 'Management Train Approach' should be central to the surface water drainage strategy of a proposed site. The main objective is the treatment and control of runoff as near to source as possible, thus protecting downstream habitats and further enhancing the amenity value of the site. This concept uses a hierarchy of drainage techniques to incrementally reduce pollution, flow rates and volumes of storm water discharge from the site, and is as follows:
- Prevention – The use of good site design and housekeeping measures to prevent runoff and pollution (e.g. rainwater re-use).
 - Source Controls – Control of runoff at source or as close to source as possible (e.g. soakaways, green roofs, pervious pavements).
 - Site Control – Management of water in a local area (e.g. ground storage/attenuation, detention ponds/basins).
 - Regional Control – Management of water from a site or various sites (e.g. wetlands, balancing ponds).

- 5.3.4 The SuDS philosophy for a development site is the promotion of Pollution Prevention and Site Control Techniques. The following design philosophy is proposed:
- Surface water treatment using the 'Management Train' approach to remove and isolate contamination at all SuDS facilities prior to conveyance.
 - Surface water discharge into the stream network at a reduced rate (significant betterment in accordance with brownfield design principles).
 - Prevention measures in the form of reducing the overall impermeable area of the site (tbc).
 - Site Control features (attenuation) to accommodate the additional surface water runoff generated by the development site.
 - Provision of suitable pollution prevention measures, such as catchpit chambers, for the removal of silt prior to outfall.

5.3.5 It is proposed that the development site has at least two levels of treatment. Prevention is considered as the first level of treatment due to the significant decrease in impermeable area and site control in the form of an attenuation or infiltration (tbc) basing as the second level.

5.4 Surface Water Drainage Strategy

5.4.1 Surface Water Drainage Strategies must follow the drainage hierarchy in the following order;

- **Infiltration** - Infiltration tests will be carried out prior to detailed design.
- **Watercourse** - Should infiltration prove inviable, further investigation works will be carried out regarding the existing outfall scenario of the current site. This strategy is subject to further surveys of the existing drainage infrastructure. This will be carried out prior to detailed design.
- **Sewer** - Due to the proximity of the ordinary watercourse and likelihood of existing outfall infrastructure, a connection to the public sewer network is not a preferred option.

5.4.2 Surface water runoff from the roofs and external areas will be directed to the below ground gravity pipe network and conveyed to an on-site storm-water attenuation pond (with detention basin for exceedance events) prior to outfall at a restricted rate of 8.8 l/s.

5.4.3 Run-off is considered to be generally clean with limited contamination and may be discharged directly to the existing drainage infrastructure and new SuDS Facilities. The proposed attenuation pond alongside the on-site storage within the surface water drainage pipe network will account for the additional surface water runoff generated by the site and prevent increased discharge for the extreme events.

5.4.4 A hydraulic model will be created using drainage design software as part of the future preliminary drainage design, which will define pipe sizes and attenuation volumes. It is noted that these rates and volumes are preliminary and are likely to change at detailed design when more site-specific information is available.

5.4.5 The outline attenuation volumes in Table 2 have been derived using Micro-Drainage Source control software. These are estimates only and are subject to change following further review of the site topography and existing drainage infrastructure. The proposed impermeable area has been estimated as 60% of the overall site area.

| Proposed Impermeable Area | Proposed Rate | Approximate Attenuation Volumes | | |
|---------------------------|-----------------------|---------------------------------|---------------------------|-------------------------------|
| | | 1 year storm event | 30 year storm event | 100 year storm event + 20% cc |
| 4.16 ha | 8.8 l/s run-off | 537 - 841m ³ | 1503 - 2081m ³ | 2587 - 3449m ³ |
| | 0.02 m/s infiltration | 351 - 1038m ³ | 829 - 2031m ³ | 1308 - 3067m ³ |

Table 2: Approximate attenuation volumes

5.4.6 As this site is high vulnerability and has a 100-year design life, no part of it should flood for the 1 in 100-year storm event plus 20% climate change. An assessment of the upper tolerance of 40% climate change will be carried out at detailed design. This assessment may generate storm-water volumes in excess of the attenuation volumes as shown above. This is classed as exceedance flooding and will be directed away from the buildings, to collect in the detention basin surrounding the the attenuation pond and drain into the surface water infrastructure as water levels recede.

5.4.7 The infiltration rate of 5.6×10^{-6} has been derived from historical data of a closely neighbouring site. Infiltration tests should be carried out prior to detailed design to inform the drainage strategy.

5.4.8 The proposed drainage layout will be designed in accordance with building regulations. SuDS guidance will be taken from Ciria C753.

5.4.9 As part of the drainage strategy, we are proposing the following

- The proposed drainage system will be a managed gravity system with a flow control set at a permissible discharge rate of 8.8 l/s.
- On-site storage will consist of a gravity pipe network, attenuation pond and a dry pond/detention basin (only to be used for extreme events).
- The catchment areas will drain from the gravity network into an on-site attenuation pond. The storage within the gravity drainage system and the attenuation pond will accommodate frequent events i.e., 1 in 1 year, 1 in 5 year return periods. Any extreme and infrequent events up to and including 1 in 100 plus 20% climate change will be held in the detention basin surrounding the attenuation pond and drain into the surface water network as water levels recede.
- During the design process, the proposed network has been simulated by the industry standard drainage design computer software, Microdrainage.

5.5 Foul Drainage Strategy

- 5.5.1 Foul flows will outfall at an unrestricted rate to nearest public foul sewer. An assessment of the Anglian water sewer records is forthcoming. An agreement in principle will be carried out with Anglian Water at detailed design, when more site-specific information is required.

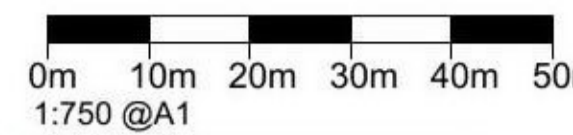
5.6 Management, maintenance and residual risk

- 5.6.1 The proposed drainage layout will be designed in accordance with building regulations. SuDS guidance will be taken from Ciria C753.
- 5.6.2 Run-off from roofs is considered to be generally clean with limited contamination, and may be discharged directly to the existing drainage infrastructure and new SuDS Facilities. Silt is to be prevented from entering the drainage system by the use of trapped gullies, catch-pit inspection chambers or by the use of sustainable drainage techniques.
- 5.6.3 A private management company will maintain the drainage infrastructure as part of a site-wide management and maintenance schedule.
- 5.6.4 Access and egress arrangements to and from the new development, should exceedance flooding occur, will be via St Johns Road to the south.
- 5.6.5 Flood risk to people and property can be managed but it can never be completely removed. Residual risk remains after flood management or mitigation measures have been put in place. This relates to a rainfall event beyond what can be fully quantified.

Appendix A - Site Plans



NOTES:
 Copyright Chetwoods (London) Limited. No implied licence exists.
 Contractors must verify all dimensions on site before commencing any work or shop drawings. This drawing is not to be scaled. Use figured dimensions only.
 Building areas are liable to adjustment over the course of the design process due to the ongoing construction detailing developments.
 Subject to statutory approvals and survey.
 Please note the information contained within this drawing is solely for the benefit of the employer and should not be relied upon by third parties.
 The CDM hazard management procedures for the Chetwoods aspects of the design of this project are to be found on the "Chetwoods - Hazard Analysis and Design Risk Assessment" and/or drawings. The full project design team's comprehensive set of hazard management procedures are available from the Principle Designer appointed for the project.



APPLICATION RED LINE

| | hectares |
|---|---------------------|
| SITE AREA | 7.490 |
| PUBLIC OPEN SPACE | 1.323 |
| RESIDUAL LAND FOR RESIDENTIAL DEVELOPMENT | 6.167 |
| DWELLINGS DENSITY | 29.05 dwellings / h |

| DWELLINGS | | | 180 |
|-------------------|-------|---------------------------|-----|
| HOUSES | | | |
| TYPE 2A | 2 BED | 2 storey | 10 |
| TYPE 3A | 3 BED | 2 storey | 3 |
| TYPE 3B | 3 BED | 2 storey | 42 |
| TYPE 3C | 3 BED | 3 storey | 10 |
| TYPE 3D | 3 BED | 2.5 storey | 22 |
| TYPE 3E | 3 BED | 3 storey | 6 |
| TYPE 4A | 4 BED | 3 storey | 20 |
| TYPE 4B | 4 BED | 2 storey | 4 |
| TYPE 5A | 5 BED | 2 storey | 7 |
| TYPE 5B | 5 BED | 3 storey | 8 |
| APARTMENTS | | | |
| BLOCK A | | 3 storey | |
| TYPE APT-1A | 1 BED | | 3 |
| TYPE APT-2A | 2 BED | | 3 |
| BLOCK B | | 3 storey | |
| TYPE APT-1A | 1 BED | | 3 |
| TYPE APT-2A | 2 BED | | 3 |
| BLOCK C | | 3 storey (inc undercroft) | |
| TYPE APT-1B | 1 BED | | 4 |
| TYPE APT-2B | 2 BED | | 4 |
| TYPE APT-2C | 2 BED | | 4 |
| BLOCK D | | 3 storey | |
| TYPE APT-1A | 1 BED | | 3 |
| TYPE APT-2A | 2 BED | | 3 |
| BLOCK E | | 3 storey | |
| TYPE APT-1A | 1 BED | | 3 |
| TYPE APT-2A | 2 BED | | 3 |

| COMMERCIAL | | |
|--------------------------|----------|----------|
| TYPE LWA | 3 storey | 1064 sqm |
| 133 GIA (ground & first) | | |
| 2 BED APARTMENT (first) | | 8 |

| DEVELOPMENT PARKING | | 435 |
|--|--|-----|
| refer to drawing 1050 for detail of break down | | |

- N - update to schedule for 10.5.21 rh/dt
 openspace and density figures
- M - visitor parking to apart block C updated 26.04.21 rh/dt
- L submitted as new planning application 25.02.21 rh/dt
 - dwellings omitted to northern boundary to create landscape buffer
 - house types to inner north edge amended to 2 storey
 - house types amended to east boundary
 - main apartment block reduced to 3 storey and private amenity added
 - apartment blocks D & E added
 - open amenity space amended
 - drainage strategy amended
- K - pond extents revised / pitch markings 20.12.19 dt
 omitted
- J - updated further to team comments 29.11.19 dt
 - trees to north boundary revised
 - heights to entrance wall noted
 - correction to rev note below - total dwellings 195



PLANNING
 12-13 Clerkenwell Green
 London EC1R 0DJ



Project
**ST JOHNS NURSERY
 CLACTON ON SEA**

Client

Drawing Title
**PROPOSED SITE PLAN
 OPTION - POST APPEAL**

| Scale | Size | Drawn | Checked | Date |
|-------|------|-------|---------|---------|
| 1:750 | A1 | dt | dt | 23/3/18 |

| Project | Originator | Zone | Level | Type | Rate | Number | Rev. |
|---------|------------|------|-------|------|------|---------|------|
| 4424 | CA | | | | | PL 1000 | N |

Appendix B - Topographical Survey

