SHEPHERD NEAME, FAVERSHAM

FLOOD RISK ASSESSMENT AND DRAINAGE STRATEGY
ON BEHALF OF MILLIKEN AND COMPANY CHARTERED SURVEYORS AND TOWN PLANNERS

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APPENDICES

1.0 INTRODUCTION

1.1 Odyssey has been commissioned by Milliken and Company Chartered Surveyors and Town Planners to provide a Flood Risk Assessment and Drainage Strategy with respect to a proposed barn conversion at a site on Water Lane, Faversham.

1.2 The site currently comprises of 0.3-hectares of disused agricultural barns. The development proposal is to convert these barns into three residential dwellings, with an associated garage parking area.

1.3 This report comprises of the following elements:

- Summary of relevant planning policy;
- Review of existing site conditions including the hydrology, geology and existing drainage regime of the site;
- Assessment of the existing flood risk to the site; and,
- Proposed surface water management and foul drainage strategies

2.0 PLANNING POLICY

2.1 Flood and Water Management Act (2010)

2.1.1 The Flood and Water Management Act (FWMA) was introduced on 8th April 2010. It was intended to implement Sir Michael Pitt's recommendations following the widespread summer 2007 floods. Guidance and information notes are published online by Defra to address a range of different aspects concerning the act.

2.1.2 The FWMA encourages the use of Sustainable Drainage Systems (SuDS) on development sites by removing the automatic right to connect to sewers.

2.1.3 The development proposals for this site will adhere to the FWMA through the provision of SuDS as a fundamental component of the surface water drainage scheme.

2.2 National Planning Policy Framework (2019)

2.2.1 The National Planning Policy Framework (NPPF) sets out the Government's planning policies for England, and how these policies should be applied. Planning Practice Guidance is available online and provides additional guidance to the NPPF, as well as links to relevant current detail documents. Please refer to Section 2.3.

2.2.2 Paragraph 155 of the NPPF states that *'inappropriate development in areas at risk of flooding should be avoided by directing development away from areas of highest risk (whether existing or future). Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere'*.

2.2.3 Paragraph 163 states that *'when determining planning applications, Local Planning Authorities (LPAs) should ensure that flood risk is not increased elsewhere. Development should only be allowed in areas at risk of flooding where, in the light of this assessment (and the sequential and exception tests, as applicable) it can be demonstrated that:*

- *Within the Site, the most vulnerable development is located in areas of lowest flood risk unless there are overriding reasons to prefer a different location;*
- *The development is appropriately flood resistant and resilient;*
- *It incorporates Sustainable Drainage Systems, unless there is clear evidence that this would be inappropriate;*

- *Any residual risk can be safely managed; and,*
- *Safe access and escape routes are included where appropriate, as part of an agreed emergency plan.'*

2.2.4 In accordance with the NPPF, a site-specific Flood Risk Assessment (FRA) is required for:

- Proposals of 1 hectare or greater in Flood Zone 1;
- All proposals for development in Flood Zones 2 or 3;
- An area within Flood Zone 1 which has critical drainage problems; and
- Development or change of use to a more vulnerable class that may be subject to other sources of flooding.

2.3 Planning Practice Guidance (2019)

2.3.1 The Planning Practice Guidance (PPG) provides additional direction to the NPPF, and details each section to provide information on how to conform to the NPPF.

2.3.2 All land in England is classified into three main Flood Zones which refer to the probability of river or sea flooding, ignoring the existence of defences. The PPG identifies and describes the Environment Agency (EA) flood zones as:

- Flood Zone 1: Low probability, land assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Flood Zone 2: Medium probability, land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% - 0.1%);
- Flood Zone 3: High probability, land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%), or a 1 in 200 or greater annual probability of sea flooding (≥0.5%); and,
- Flood Zone 3b: The Functional Floodplain, land where water has to flow or be stored in times of flood (as identified by the LPAs in the Strategic Flood Risk Assessments).

2.3.3 The PPG sets out the following drainage hierarchy that the discharge of surface water runoff should adhere to, as follows:

- Into the ground (infiltration);
- To a surface water body;
- To a surface water sewer, highway drain, or another drainage system; and
- To a combined sewer.

2.3.4 This FRA shall address the above hierarchy, and assess the options available at the Site in question.

2.4 Non-Statutory Technical Standards for Sustainable Drainage Systems (2015)

2.4.1 The Non-Statutory Technical Standards for Sustainable Drainage Systems was published by the Department for Environment, Food and Rural Affairs (DEFRA) in March 2015.

2.4.2 The standards are to be used in order to manage surface water runoff in accordance with Schedule 3 of the FWMA.

2.4.3 The document provides guidance on runoff destination, peak flow rate, volume and control of water quality and function.

2.4.4 The LPA may set local requirements for planning permission that have the effect of more stringent requirements than those of the standards.

2.5 Kent County Council Local Flood Risk Management Strategy (2017)

2.5.1 The Local Flood Risk Management Strategy (LFRMS) sets out a countywide strategy for managing the risks of flooding, by coordinating the work of Risk Management Authorities (RMAs), ensure that organisations work together to provide effective solutions to problems, and by improving public understanding of flood risk management in Kent.

2.5.2 Section 5.6 discusses *'SuDS Adoption and Maintenance'* and states that Kent County Council will *'identify any opportunities to improve the uptake of open SuDS and promote the wider benefits'*.

2.5.3 Chapter 6 covers the *'Objectives and Actions'* of the LFRMS, and contains a 4-part action plan, detailing each objective and how it shall be delivered. Objective 3 is *'Resilient Planning'* and states an ambition that *'development and spatial planning in Kent takes account of flood risk issues and plans to effectively manage any impacts'*.

2.6 Swale Borough Council Surface Water Management Plan (2012)

2.6.1 The Surface Water Management Plan (SWMP) was produced by Kent County Council, and aims at *'effectively understanding and managing flood risks that arise from local flooding, which is defined by the Flood and Water Management Act 2010 as flooding from surface runoff, groundwater and ordinary watercourses.'*

2.6.2 The plan is split into four phases – *'Phase 1. Preparation'*, *'Phase 2. Risk Assessment'*, *'Phase 3 & 4 – Options and Action Plan'*. Phase 4 presents an action plan, written by Kent County Council, that divides up ownership of various flood risk management responsibilities, and attributes a '*Lead Action Owner'* and '*Supporting Action Owner(s)*' to each.

2.7 Swale Borough Council Strategic Flood Risk Assessment (2009)

2.7.1 The Strategic Flood Risk Assessment (SFRA) provides an overview of the planning context in the county, and presents available data on flood risk in the Swale Borough. Within the SFRA there are also general policy recommendations, as well as a series of useful maps and figures.

2.7.2 Section 8.3 discusses 'Drainage Design Parameters', and states that *'for sites where the pre-development condition is a brownfield site, the general guidance is that runoff need only maintain the brownfield situation'*.

2.7.3 Section 8.5 mentions that the expectation is that *'the initial assumption of any drainage design would be to include infiltration methods where possible.'* It is then stated that *'locations within Swale Borough where infiltration techniques may not be viable include areas over clay, which is relatively impermeable, or areas in the marshes where the water table may be too high. Infiltration may also be restricted near to groundwater protection zones, designated conservation areas or water abstraction points.'*

2.8 Swale Borough Council Local Plan (2017)

2.8.1 The Local Plan sets out the vision and overall strategy for development in the area, and how it will be achieved for the period 2014 – 2031, with regards to national planning policy and guidance.

2.8.2 Paragraph 7.6.40 states that *'drainage must be considered at the earliest stages of the development process to ensure that the most sustainable option can be delivered in all cases'*.

2.8.3 Point no.2 of Policy DM21 states that proposals will *'avoid inappropriate development in areas at risk of flooding and where development would increase flood risk elsewhere'.*

2.8.4 Point no.4 of Policy DM21 states that proposals will *'include, where possible, sustainable drainage systems to restrict runoff to an appropriate discharge rate, maintain or improve the quality of the receiving watercourse, to enhance biodiversity and amenity and increase potential for grey water recycling. Drainage strategies (including surface water management schemes) for major developments should be carried out to the satisfaction of the Lead Local Flood Authority.'*

3.0 EXISTING SITE CONDITIONS

3.1 Location

3.1.1 The site is located east of Water Lane, within the Swale Borough of Kent. The co-ordinates for the centre of the site are 600161E, 160488N, and the nearest postcode is ME13 8TZ. A site location plan can be found in **Appendix A**.

3.1.2 The site currently comprises of 0.3-hectares of disused agricultural barns. The development proposal is to convert these barns into three residential dwellings, with an associated garage parking area.. An indicative masterplan can be seen in **Appendix B**.

3.2 Topography

3.2.1 A topographical survey was produced by Omega Geomatics in July 2018, which shows the levels across the site. It can be seen from the survey that levels vary by around 2m, with the highest point being 14.79mAOD in the south-west of the site, and the lowest being 12.17mAOD in the eastern corner of the site. The topographical survey can be seen in **Appendix C**.

3.3 Hydrology

3.3.1 The nearest EA main river is the Faversham Creek, which is situated approximately 1.5km north-east of the site. EA records can be seen in **Appendix D**.

3.4 Geology and Hydrogeology

3.4.1 British Geological Survey mapping (accessed November 2019) indicates that the bedrock geology of the site consists of Seaford Chalk Formation; described as *'sedimentary bedrock formed approximately 84 to 90 millions years ago in the Cretaceous Period.'* There are superficial deposits of Alluvium – clay, silt, sand and gravel, and Head – gravel, sand, silt and clay over the site. Refer to **Appendix E** for British Geological Survey records.

3.4.2 There are three borehole scans that were taken near the site location, which can provide a useful insight into the geology of the site. A short description of each is provided below.

3.4.3 Borehole scan TR06SW44 was taken approximately 450m north-east of the Site, and shows a topsoil layer extending down 0.4m below ground level (bgl), before a layer of *'soft to fine brown silty slightly sandy Clay'* extends down a further 1.2m bgl, and a layer of *'very light grey remoulded chalk'* extends a further 0.6m bgl. From there, a layer of *'soft dark-grey brown slightly sandy Clay'* extends for a further 0.7m bgl, before a layer of *'flint gravel with firm brown silty Clay'* extends for a further 2.8m bgl. Finally, a layer of *'white rock Chalk with some remoulded Chalk'* then extends down a further 4.3m bgl to the bottom of the borehole at a depth of 10.0m bgl.

3.4.4 Borehole TR06SW45 was taken approximately 450m north-east of the Site, and shows a layer of *'dark silty topsoil'* extending for 0.7m bgl, before a layer of *'coarse flint gravel and coarse sand with some clay'* extends a further 4.8m bgl. A layer of *'flint gravel'* is present for a further 0.3m, before a layer of *'white rock chalk fragments with remoulded chalk'* extends down for a further 1.0m, and a layer of *'white rock chalk with some remoulded chalk'* extends a further 3.2m bgl to the bottom of the borehole at a depth of 10.0m bgl.

3.4.5 Borehole TQ95NE19 was taken approximately 780m south-west of the Site, and shows a layer of *'soft dark brown clay'* extending down 2.0m bgl, before flint gravel extends down a further 1.1m. After this, moderately fissured white chalk extends a further 3.4m bgl to reach the bottom of the borehole at 6.0m bgl.

3.4.6 These scans can be seen in **Appendix E**.

3.4.7 British Geological Survey hydrogeological mapping shows that the site lies within the White Chalk Subgroup, described as a *'highly productive aquifer'* where the flow is *'virtually all through fractures and other discontinuities'*.

3.4.8 The site is not in any of the EA's Source Groundwater Protection Zones. However, the development shall still adhere to the EA's 'Approach to Groundwater Protection' guidance to ensure that groundwater quality is maintained and improved across the Site.

3.4.9 It should be noted that borehole scan TQ95NE19 first encountered groundwater at a depth of 2.4m bgl, while scans TR06SW44 and TR06SW45 struck groundwater at 5.0m bgl.

3.5 Existing Drainage Regime

3.5.1 The site is currently in a brownfield state, and considering the underlying geology, it is therefore anticipated that in its current state, surface water from the site either infiltrates directly into the ground at source, or runs off to the lowest point on the site, as discussed in section 3.2.1, in the eastern corner, and infiltrates there instead.

3.5.2 According to Southern Water records, there are no surface water sewers in the immediate vicinity of the site. It is therefore anticipated that surface water currently naturally infiltrates into the ground.

3.5.3 Southern Water records also show an existing foul water sewer running along Water Lane. This sewer is a 150mm system, running from the south of the site along Water Lane and up to the junction between Water Lane and Mutton Lane, where it increases to a 175mm system. The flows then head in a northerly direction up Water Lane towards its junction with London Road.

3.5.4 Refer to **Appendix F** for Southern Water records.

3.5.5 The developable area for this site is less than 50ha, meaning that the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method was used to estimate greenfield peak flow rates. This methodology is approved in the EA's Rainfall Runoff Management for Developments Report, and the parameters of the calculation can be seen below in **Table 3.1**.

Table 3.1: ICP SuDS Parameters

PARAMETER	VALUE	UNIT
SAAR	708	mm
Soil Index	0.150	-
Region	7	-
Urban	0.000	-

3.5.6 **Table 3.2** summarises the estimated current greenfield discharge rates for the site.

Table 3.2 Existing Surface Water Discharge Rates

Return Period	Total Existing Greenfield Discharge Rates (l/s)	Existing Greenfield Discharge Rates (l/s/ha)
QBAR	0.1	0.4
Q_{30}	0.3	0.9
Q_{100}	0.5	1.3

3.5.7 The existing runoff volume calculations for a 1 in 100-year, 6-hour rainfall event have been calculated and can be found in **Appendix I**.

4.0 SOURCES OF FLOOD RISK

4.1 Fluvial Flooding

4.1.1 Fluvial flooding occurs when excessive rainfall over a period of time causes a river to exceed its capacity.

4.1.2 The EA Flood Map for Planning (accessed November 2019) shows that most of the site is in Flood Zone 3 defined as *'land assessed as having a 1 in 100 or greater annual probability of river flooding (≥1%), or a 1 in 200 or greater annual probability of sea flooding (≥0.5%)'.* However, the Environment Agency also confirmed that their current online flood maps are not detailed and accurate enough to inform a site-specific Flood Risk Assessment.

4.1.3 Odyssey therefore carried out detailed hydrological and hydraulic modelling in the vicinity of the site in 2016 to better refine the flood maps. This was conducted using site specific data such as channel surveys of all the ditches and culverts, including hydraulically significant structures upstream of the site such as the M2 culvert 700m to the south of the site and the nearby Vicarage Lane crossing. The Environment Agency online flood maps do have the same level of detail.

4.1.4 The results of the modelling study showed a significant reduction of the floodplain and places all the existing barns in Flood Zone 1, except for the proposed garages which will be kept to existing ground levels and made floodable. This modelling study has been approved by the Environment Agency and now replaces the current online flood maps.

4.1.5 Correspondence was received from the EA in June 2016 stating that they *'do not hold any detailed modelling of the watercourse affecting this site. Therefore, we accept the submitted model outputs as the best available information for this proposed development. We are satisfied with the methodology used and the results produced.'* Refer to **Appendix G** for the Environment Agency correspondence and the full modelling report.

4.1.6 The following model results can be seen in **Figures 4.1 – 4.3** below:

Figure 4.1: 1 in 100 Year Extent

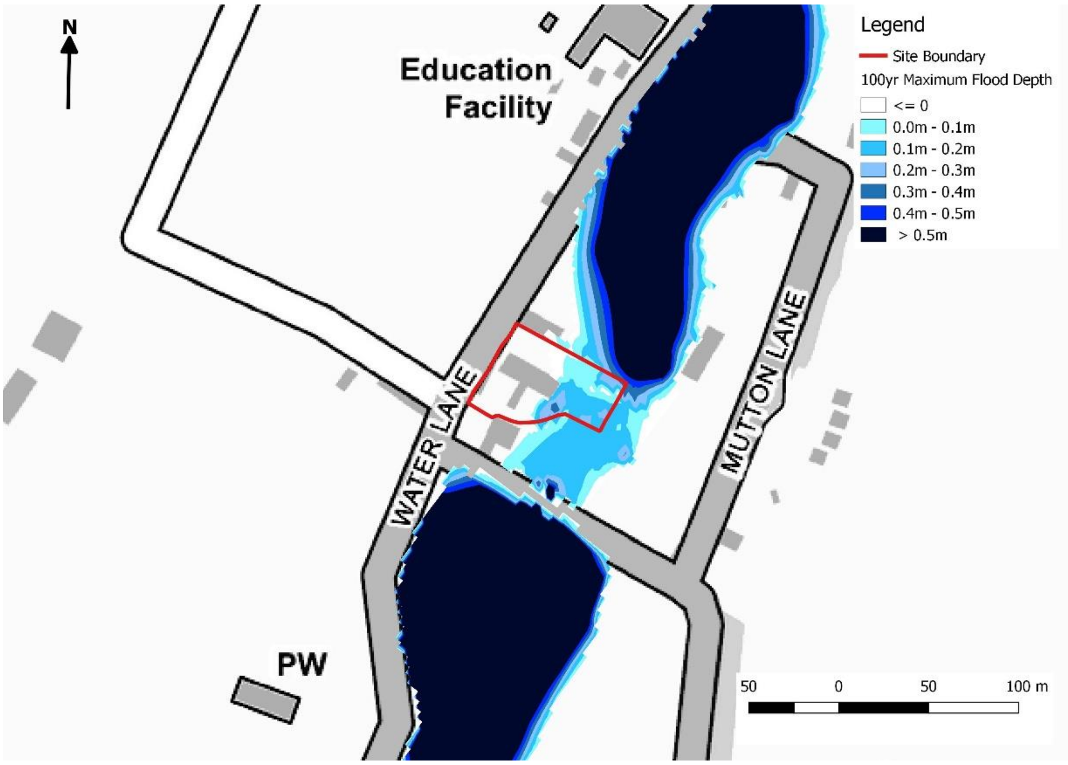


Figure 4.2: 1 in 1000 Year Extent

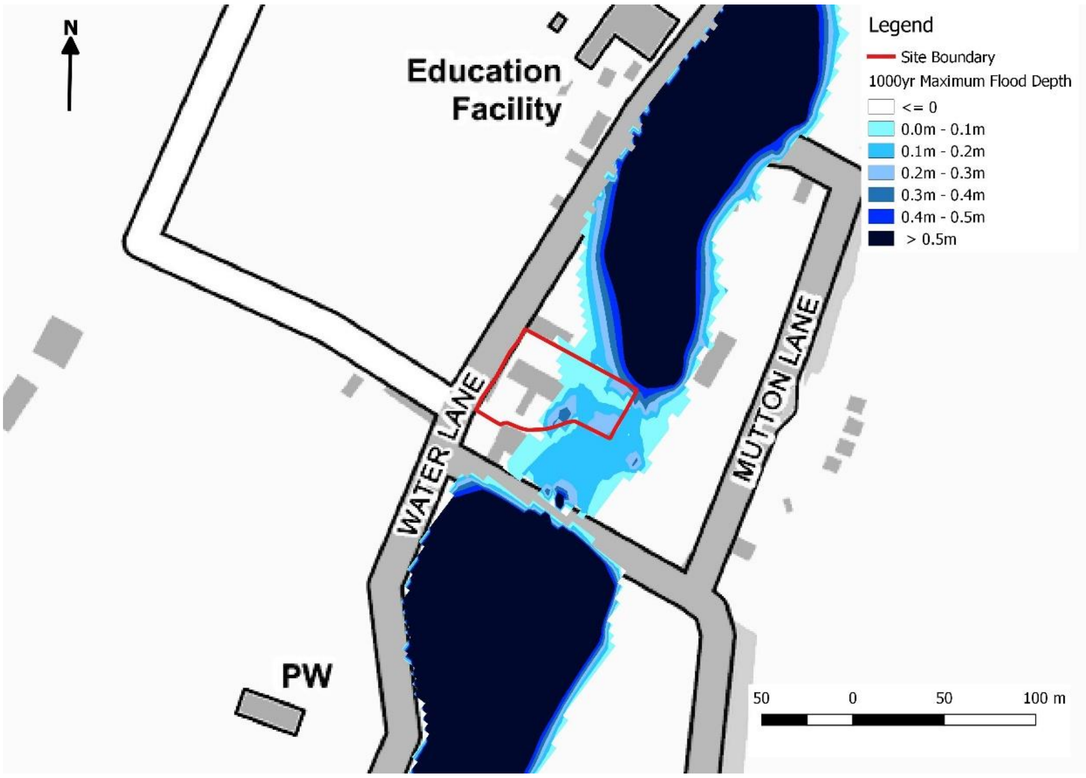
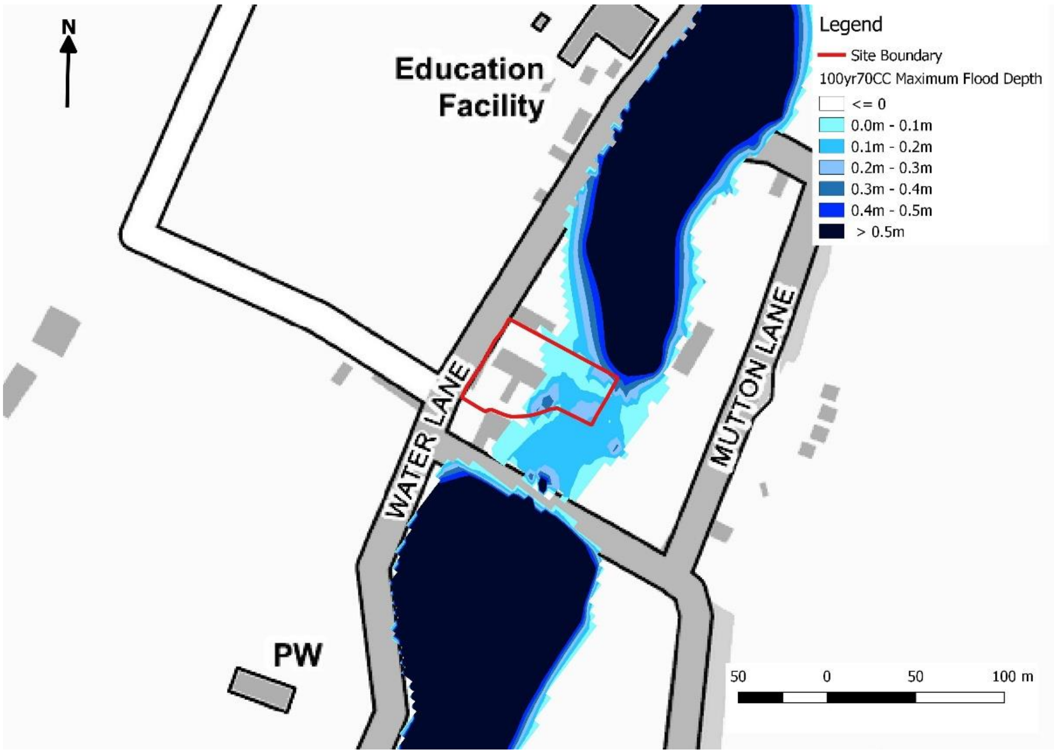


Figure 4.3: 1 in 100 Year + 70% Climate Change Extent



4.1.7 Based on this modelling, the following flood levels were produced for various flood events, as can be seen in **Table 4.1**.

Table 4.1 Maximum Modelled Flood Levels

Flood Event (AEP)	Maximum Modelled Flood Level (mAOD)
1%	12.742
1% + 25 CC Allowance	12.749
1% + 35 CC Allowance	12.753
1% + 70 CC Allowance	12.768
0.1%	12.774

4.1.8 Based on these flood levels, Finished Floor Levels (FFLs) in flood risk areas shall be raised by 300mm above the modelled flood levels, to ensure the development is suitably flood resilient.

4.1.9 The flood risk vulnerability classification of residential dwellings is 'more vulnerable'. In accordance with the PPG, development of this nature in Flood Zone 1 is acceptable.

4.1.10 Only the garages shall be situated in Flood Zone 2. However, these garages are classified as 'less vulnerable' and therefore, in accordance with the PPG, development of this nature is permitted in Flood Zone 2. These garages shall be kept to existing levels and will be made floodable.

4.1.11 The nearest record of historic fluvial flooding, as identified in the Swale Borough SFRA was along the Faversham Creek in January 1978. No residential or business properties were indicated as being flooded in this event, however. Refer to **Appendix H** for Swale Borough Council extracts.

4.1.12 Section 7.6 of the Swale Borough Local Plan discusses *'Meeting the challenges of climate change, flooding and coastal change'*. Map 7.6.2 shows areas at risk from in Swale, that are in the EA Flood Zone 3. It can be seen from the map that the area of the site discussed in this FRA is in Flood Zone 3. For Swale Borough Council Extracts please refer to **Appendix H**.

4.2 Surface Water Flooding

4.2.1 Surface water (pluvial) flooding usually occurs during high intensity rainfall, when the excess water cannot be absorbed into the ground. However, it can also occur with low intensity rainfall in areas where the land has a low permeability.

4.2.2 The EA Risk of Flooding from Surface Water mapping (accessed November 2019) shows that a section along the eastern boundary of the site is at 'low' risk of surface water flooding, with a small section of the south of the site being at 'medium risk'. The main barn is deemed to be at 'very low' risk of pluvial flooding.

4.2.3 An intermediate risk assessment was carried out to identify hotspot locations based on knowledge gained as part of the strategic risk assessment, local knowledge taken from the SWMP partners and flooding incident records. Figure 3.1 of the Swale Borough Council SWMP identifies the study site in area no.10 on the map, and is deemed at *'no significant risk'* of surface water flooding. Swale Borough Council extracts can be found in **Appendix H**.

4.2.4 It is therefore considered that the site is at low risk of surface water flooding.

4.3 Tidal Flooding

4.3.1 Tidal flood sources include the sea and estuaries, and tidal flooding is often caused by high tides with meteorological and storm events. Tidal flooding can be extremely rapid and its effects severe; deep fast-flowing water can create an extreme hazard.

4.3.2 The most significant recorded flood events primarily caused by tidal flooding in the Swale Borough occurred in 1953, 1978 and 2013. The event on the 6th December 2013 was the largest tidal surge in 60 years and resulted in the internal flooding of 30 homes and businesses. There is no specific reference to the site being affected by this flood event, however.

4.3.3 The EA is working in partnership with Swale Borough Council, Kent County Council, Faversham Town Council and Southern Water to develop a tidal defence scheme for the area, to protect low-lying properties.

4.3.4 No historic tidal flooding has been recorded on the site, however. It is therefore assumed that the risk to the site is low.

4.4 Groundwater Flooding

4.4.1 Groundwater flooding occurs when periods of abnormally high rainfall result in the emergence of groundwater at the surface, often flooding basements and causing damage to property and infrastructure.

4.4.2 It is noted that in the Kent County Council-produced document ‘Flood Risk to Communities: Swale’, it discusses that *‘there is anecdotal and photographic evidence of historic groundwater emergence, notably around the Water Lane area of Ospringe. It is possible that groundwater levels may be generally close to the surface.’* It is therefore inferred that there is a groundwater flood risk facing this site.

4.5 Sewer Flooding

4.5.1 Flooding can occur due to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity or foreign matter causes blockages, overflow to the surface can occur leading to flooding.

4.5.2 There are a number of records of sewer flooding in Faversham town centre, mostly attributed to blockages or insufficient capacity within the drainage network. However, there are no records of the site being affected by sewer flooding; therefore, the risk is deemed to be low.

5.0 THE SEQUENTIAL AND EXCEPTION TESTS

5.1 In accordance with paragraph 155 of the NPPF, '*inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk'*. The aim of the sequential test is to steer new development to areas with the lowest risk of flooding. Development should not be allocated or permitted if there are reasonably available sites appropriate for the proposed development in areas with a lower risk of flooding. The sequential test should be used in areas known to be at risk now or in the future from any form of flooding.

5.2 The Sequential Test must be conducted if both of the following apply:

- The development is in Flood Zone 2 or 3; and
- A Sequential Test hasn't already been done for a development of the type planned to be carried out on the proposed site.

5.3 However, the Sequential Test does not need to be carried out if either of the following apply:

- The development is a minor development; or,
- The development involves a change of use (eg from commercial to residential) unless the development is a caravan, camping chalet mobile home or park home site.

5.4 As previously mentioned, detailed hydrological and hydraulic was conducted by Odyssey in 2016, which greater clarified the extent of the fluvial flood plain. The results of this modelling confirmed that all residential development on site would be situated in Flood Zone 1. Therefore, in accordance with the guidance set out as part of the Sequential Test, this will not need to be applied to the site.

5.5 The Exception Test will have to be carried out if the vulnerability classification of the development is:

- Highly vulnerable and in Flood Zone 2;
- Essential infrastructure and in Flood Zone 3a or 3b; or
- More vulnerable in Flood Zone 3a.

5.6 The site does not need to undergo the Sequential Test; therefore the Exception Test does not need to be applied either.

6.0 SURFACE WATER DRAINAGE STRATEGY

6.1 Surface Water Drainage Strategy Requirements

6.1.1 Any surface water drainage strategy must demonstrate that the proposed development can be drained in a sustainable manner, commensurate with local and national policy. The NPPF requires that flood risk to land and property is not increased as a result of new development.

6.1.2 A fundamental principle of sustainable development in terms of flood risk is the reduction of surface water runoff from new developments.

6.2 Proposed Drainage Strategy

6.2.1 The proposed surface water management strategy described below is outlined in Drawing 18-120/001. Refer to **Appendix I.**

6.2.2 Adopting a combination of source control and site control techniques will provide additional ecological and water quality benefits, whilst adopting the principles of a SuDS management train.

6.2.3 The most preferred method of surface water discharge as per the drainage hierarchy in the NPPF is *'infiltration into the ground'*. According to BGS mapping, the underlying geology on the site is Seaford Chalk Formation – Chalk. It is known that chalk is a permeable bedrock, and alongside the absence of any surface water sewer network in the area, it has been determined that infiltration is a suitable method of surface water discharge on this site.

6.2.4 The site shall incorporate SuDS features into the site by sending surface water flows via a surface water sewer to two strategically located sections of permeable paving, situated at relative low points in the site. These sections of permeable paving have been designed to then infiltrate the surface water generated by the proposed development into the ground.

6.2.5 This follows the most-preferred option of the drainage hierarchy, and also follows the principles laid out in the Kent County Council LFRMS and the Swale Borough Council SFRA. Furthermore, as the surface water shall be infiltrated and kept on site, there shall be no surface water runoff leaving the proposed development. This shall provide betterment to downstream areas from the site by reducing their surface water flood risk.

6.2.6 The sections of permeable paving have been designed to accommodate surface water from all rainfall events up to the 1 in 100 year plus 40% climate change storm.

6.2.7 Urban creep has been accounted for in the drainage calculations by adding 10% of the roof areas to the total impermeable area for the various proposed SuDS features.

6.2.8 In the event of exceedance, it is anticipated that surface water shall pool at the low point on site, and shall subsequently flow to the permeable paving structure and infiltrate into the ground.

6.2.9 As previously mentioned, Odyssey has completed a modelling study to predict the flood levels for the area. Based on the flood levels predicted in this modelling study, FFLs in flood risk areas shall be raised by 300mm above the modelled flood levels, to ensure the development is suitably flood resilient.

6.2.10 MicroDrainage calculations and the Preliminary Drainage Strategy can be found in **Appendix I**.

6.3 Water Quality

6.3.1 Water quality is a key component of a SuDS system. Steps shall be taken to ensure that water quality on site and leaving the site is not negatively impacted by the proposed development. **Table 6.1** details the Pollution Hazard Indices of the different land use classifications of the site, in accordance with the CIRIA SuDS Manual (2015) C753.

Table 6.1: Pollution Hazard Indices for Proposed Development

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4

6.3.2 The pollution hazard level for the proposed development is therefore 'low'. All surface water generated by the proposed development shall pass through a permeable paving structure before discharging from the site via infiltration. The indicative SuDS mitigation indices for permeable paving can be seen in **Table 6.2** below.

Table 6.2: SuDS Mitigation Indices for Proposed SuDS Features

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7

6.3.3 As can be seen, the proposed SuDS features for the site provide adequate water quality, in accordance with the indices set out in the CIRIA SuDS Manual (2015) C753.

6.3.4 As previously mentioned, the site does not sit in any of the EA Groundwater Source Protection Zones, however the surrounding area has suffered from historic groundwater flooding. However, with the water quality treatment provided to the surface water generated by the proposed development, it is anticipated that there will be no issues with groundwater on the site.

6.4 SuDS Maintenance Requirements

6.4.1 Maintenance of the drainage system and of any implemented SuDS features will be carried out in accordance with the manufacturer guidance to minimise the residual flood risk of drainage system blockage and failure.

6.4.2 This maintenance shall be the responsibility of the developer to assign, but for clarity in this FRA, the tables below set out what maintenance measures need to be taken for permeable paving. **Tables 6.3** is based on information taken from the CIRIA SuDS Manual (2015) C753.

Table 6.3 Permeable Paving Maintenance Requirements

Maintenance Category	Maintenance Activity	Comments	Frequency	Responsible Body
Routine Maintenance	Visual inspection of paving.	Ensure joints are kept fully filled.	Monthly (depending on local environment).	Private maintenance contractor, as identified by developer
	Paving should be agitated (e.g. brushed, vacuumed, etc.).	To ensure no vegetation of any sort is allowed to grow and develop in the joints.	Six monthly or as required (Spring and Autumn seasons).	Private maintenance contractor, as identified by developer
	Paving should be inspected after any heavy precipitations.	Ensure no displacement of any organic matter into the surface of the pavement.	As required.	Private maintenance contractor, as identified by developer
Corrective Maintenance	Inspection of outfall should be undertaken.	Non-infiltration systems to have outfall checked for debris and blockages.	Six monthly or as required.	Private maintenance contractor, as identified by developer
	Removal of weeds.	To ensure weeds are killed effectively they should be actively growing so that the glyphosate will go down to the roots. Glysophate based weed killers in Roundup and Tumbleweed.	As required.	Private maintenance contractor, as identified by developer
	Laying material may require cleaning and/or replacing.	Depending on the environment the permeable pavement has received and been exposed to.	25 to 30-year period.	Private maintenance contractor, as identified by developer

7.0 FOUL WATER DRAINAGE STRATEGY

7.1 Peak design discharges for residential dwellings will be calculated based on Sewers for Adoption 8th Edition:

Residential domestic flow = 4000 litres/dwelling/day (peak)

7.2 It is proposed that foul flows from the development (0.2l/s) will be discharged into the existing Southern Water foul network that runs along the western boundary of the site. Subject to discussions with Southern Water, a Section 106 connection will be made in accordance with the Water Industries Act to seek approval to connect to the public sewer.

7.3 In order to connect to the existing Southern Water system, a pumping station main must be installed on site, as the flows will be going against the natural topography. This shall be a Type 1 pumping station, which will be located underground and be private. Maintenance of the pumping station shall be the responsibility of the developer to assign.

7.4 If infrastructure upgrades to the existing network are required in order to accommodate the foul flows from the proposed development, a network reinforcement charge as part of the Southern Water charging scheme will cover the cost of these upgrades.

8.0 SUMMARY AND CONCLUSIONS

8.1 Odyssey has been commissioned by Milliken and Company Chartered Surveyors and Town Planners to provide a Flood Risk Assessment and Drainage Strategy with respect to a proposed barn conversion at a site on Water Lane, Faversham.

8.2 EA mapping (accessed November 2019) shows that the site lies in Flood Zone 3 for fluvial flooding. Detailed modelling completed by Odyssey has refined the extent of the fluvial flood plain in the surrounding area.

8.3 This modelling can be used to confirm that all residential development shall be situated within Flood Zone 1 as part of this application. Correspondence was received from the EA stated that they *'do not hold any detailed modelling of the watercourse affecting this site. Therefore we accept the submitted model outputs as the best available information for this proposed development. We are satisfied with the methodology used and the results produced.'* Therefore, it is concluded that the modelling provides a suitable base to work from, and demonstrates that the site shall be safe from fluvial flooding. Refer to **Appendix G**.

8.4 A preliminary drainage strategy has been produced, refer to **Appendix I**, which incorporates relevant SuDS features and demonstrates that the site can be drained in a sustainable manner, commensurate with local and national policy. Maintenance and management regimes have been set out in this FRA, with responsibility being the task of the developer to assign.

8.4.1 Fluvial modelling was conducted by Odyssey in 2016 to refine the flood plain for the area. Flood levels for events from the 20%, 5%, 1%, 1% + climate change and 0.1% AEP were predicted. Based on the levels predicted in this modelling study, FFLs in flood risk areas shall be raised by 300mm above the modelled flood levels, to ensure the development is suitably flood resilient.

8.5 It is proposed that the foul flows generated by the proposed development shall be sent via gravity to a private packaged pumping station, which shall transfer them to the existing Southern Water network along Water Lane via a rising main, and connect in at a new manhole, subject to necessary Southern Water charges.

8.6 This FRA has demonstrated that the proposed development is fully compliant with the requirements of the NPPF. Issues relating to flood risk and drainage do not represent an obstruction to the proposals, and therefore should not hinder an approval for planning permission of the proposed development.