

FLOOD RISK ASSESSMENT
and
PRELIMINARY DRAINAGE STRATEGY

for
MIKE LEARY

PROPOSED RESIDENTIAL DEVELOPMENT
at

FOXHILL FARM
FOXHILL LANE, HALEWOOD, LIVERPOOL, L26 4XG

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REFORD

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1. INTRODUCTION

- 1.1 This flood risk assessment and preliminary drainage strategy has been produced on behalf of Mike Leary in support of a planning application for a residential development at Foxhill Farm, Foxhill Lane, Halewood, Liverpool, L26 4XG. A location plan is included within Appendix A.
- 1.2 The Flood Risk Assessment (FRA) is compliant with the requirements set out in the National Planning Policy Framework (NPPF) and the Planning Practice Guidance (NPPG) in relation to Flood Risk and Coastal Change, and describes the existing site conditions and proposed development. It assesses the potential sources of flooding to the site from tidal, fluvial, groundwater, surface water and other sources, taking a risk based approach in accordance with National Policy.
- 1.3 The preliminary drainage strategy describes the existing site conditions and proposed development. It assesses the potential impact of proposals on existing drainage and includes a proposed strategy for the provision of new drainage to serve the proposed development.

Site summary

Site Name	Foxhill Farm
Location	Foxhill Lane, Halewood, Liverpool, L26 4XG
NGR (approx.)	SJ450868
Application site area	0.24 ha approx.
Development type	Residential
Vulnerability	More Vulnerable
Indicative Flood Zone	Flood Zone 1
Local Planning Authority	Knowsley MBC

2. DESCRIPTION OF THE SITE

Existing site

- 2.1 The proposal relates to land (approx. 0.24ha) that lies at Foxhill Farm, Foxhill Lane, Halewood, Liverpool, L26 4XG. The development site comprises existing buildings and hardstanding areas of Foxhill Farm.
- 2.2 The site is situated to the north of Halewood, Liverpool and is a brownfield site comprising farm buildings.
- 2.3 The northern part of Foxhill Farm has obtained outline planning approval from Knowsley Council, reference 20/00470, for a residential development of 7no. dwellings.
- 2.4 Access to the site is taken from Gerrards Lane and Foxhill Lane.
- 2.5 There are two drainage ditches that lie adjacent to the site. One lies at the site's southwestern corner and flows to the northwest. The other lies to the site's north-eastern corner and flows to the northeast. Both drains discharge into the Mill Brook and ultimately the Netherley Brook that lies approx. 500m to the northeast of the site.
- 2.6 Another watercourse lies alongside Cartbridge Lane approx. 300m to the southeast of the site. This watercourse also discharges into the Netherley Brook.
- 2.7 Surface water runoff from the development site discharges into the drainage ditches.

Proposed development

- 2.8 It is proposed that the development will comprise 5no. residential properties. The indicative site layout plan is shown on the proposed site plan GL432A- /02 accompanying the planning application.
- 2.9 It is proposed that the access into the development site will be from the existing access from Foxhill Lane.

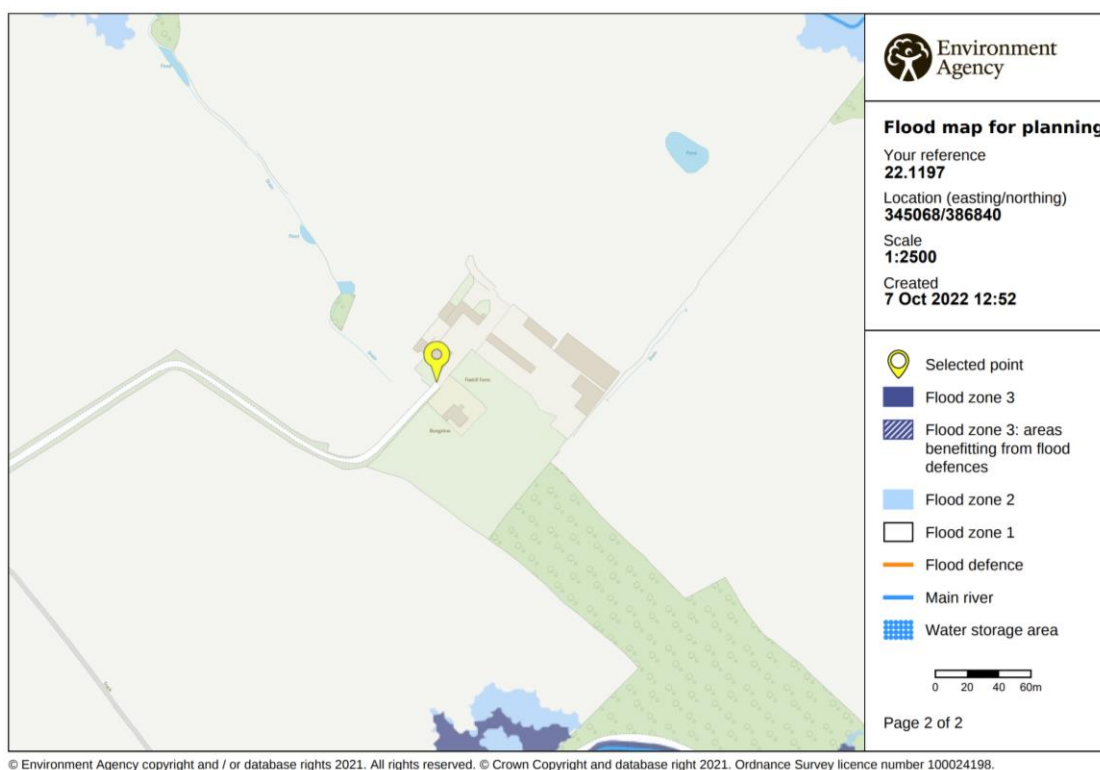
3. SCOPE OF THE ASSESSMENT

Flood risk planning policy

- 3.1 The National Planning Policy Framework (NPPF) sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. Supporting Planning Practice Guidance (PPG) is also available.
- 3.2 The NPPF sets out the vulnerability to flooding of different land uses. It encourages development to be located away from areas at highest risk (whether existing or future), and states that where development is necessary in such areas, the development should be made safe for its lifetime. It also stresses the importance of preventing increases in flood risk offsite to the wider catchment area.
- 3.3 The NPPF also states that alternative sources of flooding, other than fluvial (river flooding), should also be considered when preparing a Flood Risk Assessment.
- 3.4 As set out in NPPF, local planning authorities should only consider development in flood risk areas appropriate where informed by a site specific Flood Risk Assessment. This document will identify and assess the risk associated with all forms of flooding to and from the development. Where necessary it will demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.
- 3.5 This Flood Risk Assessment is written in accordance with the NPPF and the Planning Practice Guidance in relation to Flood Risk and Coastal Change.

Flood zones

- 3.6 In investigating the flood risk relating to the site, the Environment Agency flood zone mapping identifies the proposed development site lies within Flood Zone 1. Flood Zone 1 is the lowest risk and is identified as land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).
- 3.7 An extract from the Environment Agency's Flood Zone Map for Planning is shown below.



Strategic Flood Risk Assessment

3.8 A number of documents for the purposes of assessing local flood risk have been produced for Knowsley MBC. They are:

- A Level 1 Strategic Flood Risk Assessment, 2009.
- A Preliminary Flood Risk Assessment, 2011. This was reviewed in June 2017 and no changes were identified.
- A Level 2 Strategic Flood Risk Assessment, 2012.
- A Local Flood Risk Management Strategy and supporting summary document, 2017.

3.9 The combined risk matrix map within the SFRA identifies that the site is not at risk from any form of flooding.

Sequential Test

3.10 A requirement of NPPF is that all plans should apply a sequential, risk-based approach to the location of development, taking into account the current and future impacts of climate change so as to avoid, where possible, flood risk to people and property. The

aim of the sequential test is to steer new development to areas with the lowest risk of flooding.

- 3.11 Strategic Flood Risk Assessments (SFRA) refine information on the probability of flooding, taking other sources of flooding and the impacts of climate change into account. They provide the basis for applying the Sequential Test, on the basis of the flood zones in NPPG Table 1.
- 3.12 The flood zones are the starting point for this sequential approach. As already stated, the Environment Agency's flood mapping identifies the site as lying within Flood Zone 1, the lowest risk.
- 3.13 With reference to NPPF, Environment Agency Flood Maps and the SFRA, the site lies within an area identified as being potentially developable and following the sequential approach, all of the development is located within Flood Zone 1.
- 3.14 The current development proposals are classified as "More Vulnerable" for residential development. Table 3 within NPPG indicates Flood Risk Vulnerability and Flood Zone 'compatibility'. Using Zone 1 and the "More Vulnerable" classification for residential use, NPPG considers that a development of this type would be deemed appropriate for development within Flood Zone 1.
- 3.15 Subject to the suitable assessment of flood risk, the development would be considered sequentially preferable in this location.

4. CONSULTATIONS AND DATA ACQUISITIONS

Environment Agency

- 4.1 The Environment Agency's flood zone mapping confirms that the site lies within an area of Flood Zone 1, the lowest risk. There is no record of any historic fluvial flooding occurring at the site.

United Utilities

- 4.2 There are no public sewers within the vicinity of the site.

Existing watercourses

- 4.3 There are two drainage ditches that lie adjacent to the site. One lies at the site's southwestern corner and flows to the northwest. The other lies to the site's north-eastern corner and flows to the northeast. Both drains discharge into the Mill Brook and ultimately the Netherley Brook that lies approx. 500m to the northeast of the site.
- 4.4 Another watercourse lies alongside Cartbridge Lane approx. 300m to the southeast of the site. This watercourse also discharges into the Netherley Brook.
- 4.5 Surface water runoff from the development site discharges into the drainage ditches.

Topographical Survey

- 4.6 A topographical survey has not been carried out for this site.

Site Investigation

- 4.7 The online Soilscales Viewer has identified the site lying in a region characterised by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage.

5. SOURCES OF FLOOD RISK

Potential Sources of Flood Risk

- 5.1 Potential sources of flood risk to the site are identified below. The significance of these sources is investigated further into Section 6.

Fluvial flooding

- 5.2 The site to be developed is identified as lying within Flood Zone 1 on the Environment Agency's flood maps, land assessed as having an annual probability of flooding of less than 1 in 1000 (<0.1%).
- 5.3 There are two drainage ditches that lie adjacent to the site. One lies at the site's southwestern corner and flows to the northwest. The other lies to the site's north-eastern corner and flows to the northeast. Both drains discharge into the Mill Brook and ultimately the Netherley Brook that lies approx. 500m to the northeast of the site.
- 5.4 Another watercourse lies alongside Cartbridge Lane approx. 300m to the southeast of the site. This watercourse also discharges into the Netherley Brook.

Tidal flooding

- 5.5 The site is a significant distance from the nearest tidal estuary and is, therefore, not at risk of flooding from the sea. The site is not identified as being at risk of flooding from the sea by any Environment Agency Flood Zone maps or within the SFRA for the area. As such, coastal and tidal flooding is not considered further within this assessment.

Canals, reservoirs and other artificial sources

- 5.6 There are no canals or other artificial sources local to the site.
- 5.7 The Environment Agency risk of flooding from reservoirs map identifies the site is not at risk.

Groundwater

5.8 Groundwater flooding tends to occur after much longer periods of sustained high rainfall. The areas that are at risk tend to be those low-lying areas where the water table is shallow. Flooding tends to occur in areas that are underlain by major aquifers, although groundwater flooding is also noted in localised floodplain sands and gravels. The main causes of groundwater flooding are:

- Natural groundwater rising due to tidal influence, or exceptionally wet periods leading to rapid recharge;
- Groundwater rebound due to cessation of abstraction and mine dewatering;
- Existence of confined aquifers and springs.

5.9 There are no recorded incidents of flooding associated with groundwater levels within the site.

Sewers

5.10 Flooding from a drainage system occurs when flow entering a system exceeds its discharge capacity, the system becomes blocked or, in the case of surface water sewers, it cannot discharge due to high water level in the receiving watercourse. Sewer flooding is often caused by surface water discharging into the combined sewerage system, sewer capacity is exceeded in large rainfall events causing backing up of flood waters within properties or discharging through manholes.

5.11 There are no public sewers within the vicinity of the site.

Pluvial runoff

5.12 The Environment Agency Risk of Flooding from Surface Water map indicates the site is at a very low risk of surface water flooding except for an area within the north eastern part of the site adjacent existing buildings which is at high risk. A very low risk means that each year, this area has a chance of flooding of less than 1 in 1000 (<0.1%). A high risk means that this area has a chance of flooding of greater than 3.3% each year.

- 5.13 It should be noted that surface water flooding can be difficult to predict, much more so than river or sea flooding as it is hard to forecast exactly where or how much rain will fall in any storm. In addition, local features can greatly affect the chance and severity of flooding.

Development drainage

- 5.14 Surface water (including the risk of sewers and culverted watercourses surcharging) poses the highest risk of more frequent flooding. Surface water drainage from new developments is critical in reducing the risk of localised flooding.
- 5.15 If surface water runoff is not managed appropriately, there may be an increased risk presented elsewhere from development drainage, and the aim should be to implement appropriate sustainable drainage systems (SuDS) to treat and contain flows and mimic the existing conditions.
- 5.16 Where possible the preference for dealing with surface water runoff from the developed site is for it to infiltrate back into the ground or alternatively to a waterbody or watercourse. Only if it is not possible for either of these options is surface water from the development to be allowed into public sewers.
- 5.17 As the proposed development will not increase the area of impermeable hardstanding on site, the surface water runoff regime of the site is not likely to alter and will therefore not have an adverse effect on flood risk elsewhere in the wider catchment.

6. FLOOD RISK ASSESSMENT

- 6.1 This section of the Flood Risk Assessment looks at the flood risk to the site before any mitigation measures are put into place and hence identifies where mitigation will be required. Section 7 continues to explain the mitigation measures proposed and the residual risk following implementation of any proposed mitigation.

Risk of Flooding to Proposed Development

Fluvial Flood Risk

- 6.2 The site to be developed is identified as lying within Flood Zone 1 on the Environment Agency's flood maps, the lowest risk.
- 6.3 There is no fluvial flood risk to the site.
- 6.4 The risk of fluvial flooding to the proposed development is therefore very low.

Canals, reservoirs and other artificial sources

- 6.5 There are no canals or artificial sources that are local to or affect the site.
- 6.6 The Environment Agency risk of flooding from reservoirs map identifies the site is not at risk.
- 6.7 As such the risk of flooding from canals, reservoirs and other artificial sources is low.

Groundwater

- 6.8 The combined risk matrix map within the SFRA identifies that the site is not at risk from groundwater flooding.
- 6.9 There are no recorded incidents of flooding associated with groundwater levels within the site. The flood risk from groundwater is therefore low.

Sewer Flooding and Pluvial Runoff

- 6.10 There are no public sewers within the vicinity of the site.

- 6.11 The Environment Agency Risk of Flooding from Surface Water map indicates the site is at a very low risk of surface water flooding except for an area within the north eastern part of the site adjacent existing buildings which is at high risk.
- 6.12 Due to the nature and topography of the adjoining areas there is only limited potential for pluvial runoff from heavy rainfall events to be conveyed towards the site as surface water runoff will be collected by the local drains and watercourses.
- 6.13 Development of the site will remove the risk of surface water flooding within the site. To further mitigate against the risk of surface water flooding it is proposed that finished floor levels of the proposed dwellings are set at 300mm above the finished ground level.
- 6.14 As such the risk is low from sewer flooding and pluvial runoff.

Effect of the Development on the Wider Catchment

Development Drainage

- 6.15 As the proposed development will not increase the area of impermeable hardstanding on site, the surface water runoff regime of the site is not likely to alter and will therefore not have an adverse effect on flood risk elsewhere in the wider catchment.
- 6.16 Surface water runoff from the development site discharges into the drainage ditches.
- 6.17 Infiltration of surface water runoff into the ground is not a viable solution for this site.
- 6.18 It is intended that new surface water drainage will be constructed, appropriately sized to take all surface water runoff from the new roofs and hardstanding areas, to discharge into the drainage ditch that lies at the site's southwestern corner and flows to the northwest.
- 6.19 As the surface water runoff from the development will be attenuated, there will be no change to the flood risk upstream or downstream of this location.
- 6.20 Outline surface water requirements have been prepared and are discussed in Sections 7 and 8 of this document. As a result of the mitigation measures, the risk of flooding from the development drainage is low.

7. PREDICTED IMPACTS AND MITIGATION

- 7.1 This section of the FRA sets out the mitigation measures recommended to reduce the risk of flooding to the proposed development and outlines any residual impacts.

Site arrangements

Access / Egress

- 7.2 The access to the site during an extreme event will be from Gerrards Lane and Foxhill Lane, which lie within Flood Zone 1, providing clear uninterrupted pedestrian and vehicle access from the site.

Finished levels

- 7.3 The Environment Agency Risk of Flooding from Surface Water map indicates the site is at a very low risk of surface water flooding except for an area within the north eastern part of the site adjacent existing buildings which is at high risk. Development of the site will remove the risk of surface water flooding within the site. To further mitigate against the risk of surface water flooding it is proposed that finished floor levels of the proposed dwellings are set at 300mm above the finished ground level.

Upstream and downstream effects

- 7.4 There is no material effect on the floodplain due to the proposed development.
- 7.5 It is intended that surface water attenuation will be provided within the development site. Attenuation will be provided by underground storage and a controlled discharge made into the drainage ditches that lie adjacent to the site. The proposals will be designed so as to mimic the existing situation and therefore there will be no additional risk to upstream or downstream properties.

8. DRAINAGE STRATEGY

Surface water drainage

- 8.1 Guidance for the disposal of surface water from a development site is for soakaways to be considered as the primary solution. If this is not practical, discharge to a waterbody or watercourse is to be considered as the next available alternative. Only if neither of these options is available, and other sustainable drainage methods not possible, should the use of the public sewerage system be considered.
- 8.2 The online Soilsmap Viewer has identified the site lying in a region characterised by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage. Infiltration of surface water runoff into the ground is therefore not a viable solution for this site.
- 8.3 Surface water runoff from the development site discharges into the drainage ditches.
- 8.4 The flow from the development site will be controlled such that the peak surface water runoff will not exceed the brownfield pre-development Q_{bar} runoff rate allowing surface water runoff generated by all rainfall events up to the 100 year critical rain storm plus 45% on stored volumes to discharge into the drainage ditch that lies at the site's southwestern corner and flows to the northwest.
- 8.5 The development site comprises existing buildings and hardstanding areas of Foxhill Farm and is of an area 0.24 ha. The existing hardstanding areas and roofs within the development site have been measured as approx. 900m²; the existing roofs being of an area 500m².
- 8.6 The brownfield pre-development Q_{bar} surface water runoff rate from the site has been calculated using the 'Causeway Flow' programme for the area of the site to be developed, i.e. 0.24 ha, and gives a rate of 6.2 l/s.
- 8.7 Preliminary calculations have been carried out to identify the size of the attenuation required for the development. The calculations are based upon the area of the

proposed development that is to be impermeable at the completion of the development.

- 8.8 The area of new roofs and hardstanding areas at the completion of the development has been measured as 855m² comprising the proposed roof area of 425m² and proposed hardstanding areas of 430m².
- 8.9 Attenuation will be provided under hardstanding areas within the development site.
- 8.10 Attenuation in the order of 25m³ to 41m³ is required for the 1 in 100 year storm event plus 45% added for climate change.
- 8.11 Preliminary calculations are included within Appendix B.

Foul water drainage

- 8.12 There are no public sewers within the area. A connection to the public sewer system for the discharge of foul water from the site is therefore not available.
- 8.13 It is therefore intended that foul sewage from the developed site will be to a packaged sewage treatment plant with the effluent discharging into the drainage ditch that lies at the site's southwestern corner and flows to the northwest.

9. CONCLUSIONS

- 9.1 This flood risk assessment and preliminary drainage strategy has been produced on behalf of Mike Leary in support of a planning application for a residential development at Foxhill Farm, Foxhill Lane, Halewood, Liverpool, L26 4XG.

Flood risk assessment

- 9.2 The Site lies within Flood Zone 1, the lowest risk which is identified as land assessed as having a less than 1 in 1000 annual probability of river or sea flooding (<0.1%).
- 9.3 The Environment Agency Risk of Flooding from Surface Water map indicates the site is at a very low risk of surface water flooding except for an area within the north eastern part of the site adjacent existing buildings which is at high risk. Development of the site will remove the risk of surface water flooding within the site. To further mitigate against the risk of surface water flooding it is proposed that finished floor levels of the proposed dwellings are set at 300mm above the finished ground level.
- 9.4 The risk of fluvial flooding is very low.
- 9.5 The risk of flooding from canals, reservoirs and other artificial sources is low.
- 9.6 The flood risk from groundwater is low.
- 9.7 The risk from sewer flooding and pluvial runoff is low.
- 9.8 The risk of flooding from the development drainage is low.

Drainage strategy

- 9.9 The online Soilsmap Viewer has identified the site lying in a region characterised by slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils with impeded drainage. Infiltration of surface water runoff into the ground is therefore not a viable solution for this site.

- 9.10 It is intended that new surface water drainage will be constructed, appropriately sized to take all surface water runoff from the new roofs and hardstanding areas, to discharge into the drainage ditch that lies at the site's southwestern corner and flows to the northwest.
- 9.11 Foul sewage from the developed site will be to a packaged sewage treatment plant with the effluent discharging into the drainage ditch that lies at the site's southwestern corner and flows to the northwest.

APPENDIX A



LOCATION PLAN

APPENDIX B

Pre-development discharge

Site Makeup	Brownfield ▾
Brownfield Method	Greenfield ▾
Greenfield Method	IH124 ▾
Positively Drained Area (ha)	0.840
SAAR (mm)	801
Soil Index	5 ▾
SPR	0.53
Region	10 ▾
Betterment (%)	0
	Calc
QBar (l/s)	6.2

Return Period (years)	Growth Factor	Q (l/s)
1	0.87	5.4
30	1.70	10.5
100	2.08	12.8

Storage Estimate

Return Period (years)	100
Climate Change (%)	45
Impermeable Area (ha)	0.090
Peak Discharge (l/s)	6.200
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	
Required Storage (m³)	Calc
from	25
to	41
With infiltration (m³)	
from	
to	