

STEPHEN DAYKIN CONSULTING LTD

A Civil Engineering Design Consultancy for The Development Industry

31A Longacre Bingham Nottinghamshire NG13 8AF

Switchboard: 01949838831 | Mobile: 07970179911 | Email: sean@sdccivils.com

Company Registration No. 5143278 | VAT Registration No. 842 2486 28

PROPOSED 72 BED RESIDENTIAL CARE HOME DEVELOPMENT AT LEICESTER ROAD MARKFIELD FOR

CHARTERPOINT (LE67) LIMITED

FLOOD RISK ASSESSMENT



EXECUTIVE SUMMARY

- The site is at no quantifiable potential risk of flooding from tidal events or main river systems
- The site is at no risk of flooding from the cross site stream systems due to its proposed elevation
- The site is at no quantifiable risk of flooding from groundwater sources or overland flow routes
- The site is at no quantifiable risk of flooding from artificial sources
- The site is unsuitable for plot specific infiltration style drainage systems due to, prevailing geology
- The site is at no quantifiable risk of flooding from existing sewerage systems upstream of the development site
- The site is at negligible risk of flooding from its own internal sewer systems (as is any development site), but this can be mitigated by small scale engineering considerations
- The site will drain its surface water to new balancing facilities located beneath the car park or building itself, with attenuated discharges to adjacent watercourses
Development flows will be attenuated to the 1 in 100 year event plus a 40% allowance for climate change, and carry forward flows will be restricted to pre development levels of run off

Appendices

APPENDIX A	Correspondence with Leicestershire County Council as Lead Local Flood Authority- no response to date
APPENDIX B	Correspondence with Charnwood Borough as Land Drainage Authority- no response to date
APPENDIX C	Correspondence with Severn Trent Water as Sewerage Authority

Document issue history

STATUS	REVISION	DATE	RECIPIENT
Draft	V1	22-9-23	Chris Oakden of Charterpoint
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Report Author

Stephen W Daykin I.Eng MICE MCiHT

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1.00 SITE LOCATION

The development site is located to the north west of the Village of Markfield immediately to the South of the A50 and adjacent to the Field Head roundabout.

The site comprises some 1.1Ha centred on Ordnance Survey National Grid Reference 449432E,310274N The site is set as an existing paddock with mature grassland. The site is bounded to the north by the A50, to the east by the roundabout and by existing housing to the south and west.

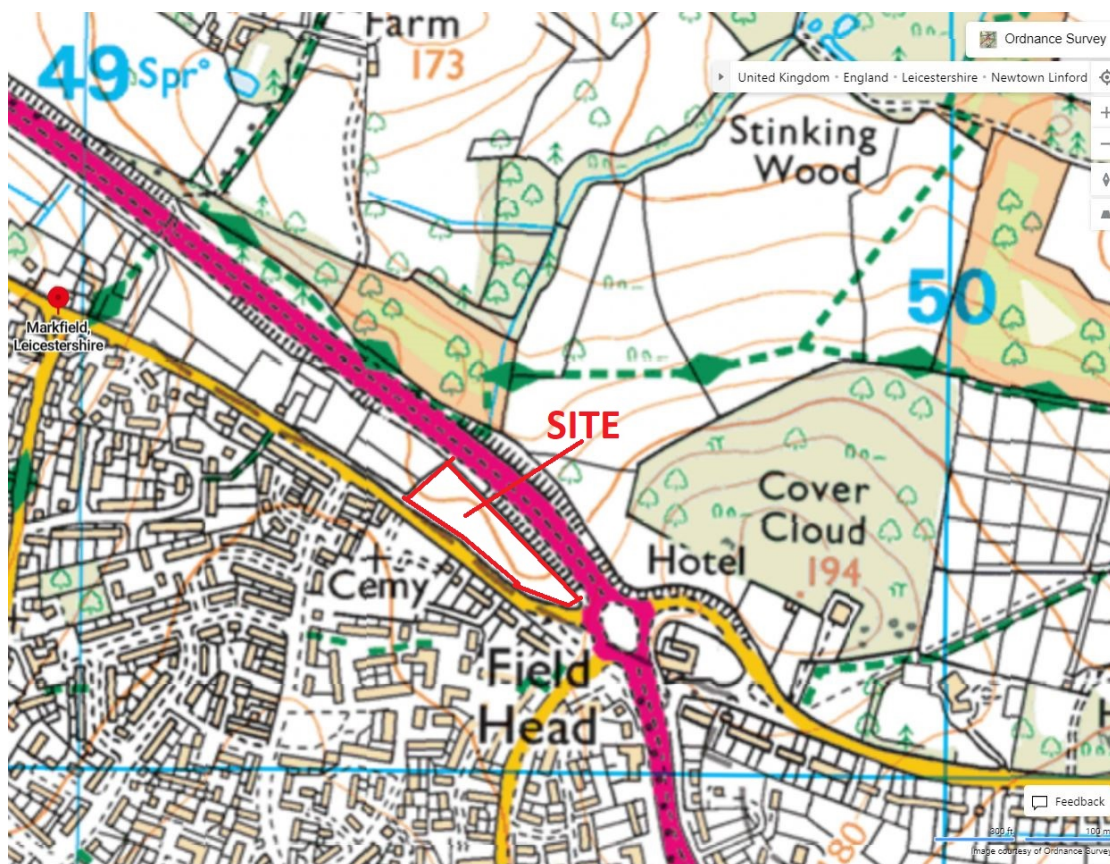


Figure 1 site location plan

1.01 SITE DESCRIPTION

- The site lies in the greater catchment of the River Soar but is geographically remote from the main river
- The site has an elevational range of 6m, being 177 in the south and locally 171m in the north adjacent to the A50.
- The site is perceptively steep with gradients up to 1 in 8 locally from south to north.
- The site has an existing minor watercourse along its western boundary (Stream A) which originates along its highway boundary with Leicester Road. The ditch passes under the A50 in culvert to continue as an un-named watercourse. Its route is via Stinking Wood with a confluence therein with the Quorn Brook, to then flow through Ulverscroft Mill and Newton Linford to Outfall at Cropston Reservoir. The stream is in its upland phase and forms part of the headwaters of this catchment
- The site is further crossed by a second watercourse (Stream B) which heads from the SE extent of the site and crosses to the centre of the northern boundary where it passes beneath the A50 in culvert becoming open section north of the A50 and heading west to confluence with stream A.

1.02 CORRESPONDENCE

The following bodies have been contacted in respect of the above development proposal and where appropriate, their responses have been appended in full to this report

APPENDIX A Correspondence with the Leicestershire County Council as LLFA

APPENDIX B Correspondence with Charnwood Borough Council as Land
Drainage Authority

APPENDIX C Correspondence with Severn Trent Water

There are no relevant Internal drainage boards affected by this proposal

1.03

DEVELOPMENT PROPOSAL

It is proposed to redevelop the existing site into a 72 bed residential care home with associated access, parking and amenities. The development area occupies approximately 50% of the total site area with the balance retained as open grasslands



Figure 2 – Indicative Site Layout

2.00 SOURCE OF REFERENCE AND PLANNING CONTEXT

Guidance on flood risk assessment is provided in the government publication National Planning Policy Framework document and its Technical Guidance. The site exceeds 1Ha in size

- The National Planning Practice Guidance (NPPG) identifies how land use and vulnerability to flooding are assessed. Flood zones are identified in table 1

Table 1: Flood zones

(Note: These flood zones refer to the probability of river and sea flooding, ignoring the presence of defences)

Zone 1 - low probability

Definition

This zone comprises land assessed as having a less than 1 in 1,000 annual probability of river or sea flooding (<0.1%).

Appropriate uses

All uses of land are appropriate in this zone.

Flood risk assessment requirements

For development proposals on sites comprising one hectare or above the vulnerability to flooding from other sources as well as from river and sea flooding, and the potential to increase flood risk elsewhere through the addition of hard surfaces and the effect of the new development on surface water run-off, should be incorporated in a flood risk assessment. This need only be brief unless the factors above or other local considerations require particular attention.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area and beyond through the layout and form of the development, and the appropriate application of sustainable drainage systems².

Zone 2 - medium probability

Definition

This zone comprises land assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year.

Appropriate uses

Essential infrastructure and the water-compatible, less vulnerable and more vulnerable uses, as set out in table 2, are appropriate in this zone. The highly vulnerable uses are *only* appropriate in this zone if the Exception Test is passed.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to reduce the overall level of flood risk in the area through the layout and form of the development, and the appropriate application of sustainable drainage systems.

Zone 3a - high probability

Definition

This zone comprises 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 flooding from the sea (>0.5%) in any year.

Appropriate uses

The water-compatible and less vulnerable uses of land (table 2) are appropriate in this zone. The highly vulnerable uses should not be permitted in this zone.

The more vulnerable uses and essential infrastructure should only be permitted in this zone if the Exception Test is passed. Essential infrastructure permitted in this zone should be designed and constructed to remain operational and safe for users in times of flood.

Flood risk assessment requirements

All development proposals in this zone should be accompanied by a flood risk assessment.

Policy aims

In this zone, developers and local authorities should seek opportunities to:

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;

- Flood Risk Vulnerability Classification is given in NPPG table 2.

Table 2: Flood risk vulnerability classification

Essential infrastructure • Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk. • Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood. • Wind turbines.
Highly vulnerable • Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding. • Emergency dispersal points. • Basement dwellings. • Caravans, mobile homes and park homes intended for permanent residential use³. • Installations requiring hazardous substances consent⁴. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as "essential infrastructure")⁵.
More vulnerable • Hospitals. • Residential institutions such as residential care homes, children's homes, social services homes, prisons and hostels. • Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels. • Non-residential uses for health services, nurseries and educational establishments. • Landfill and sites used for waste management facilities for hazardous waste⁶. • Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i>⁷
Less vulnerable • Police, ambulance and fire stations which are <i>not</i> required to be operational during flooding. • Buildings used for shops, financial, professional and other services,

restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in "more vulnerable", and assembly and leisure.

- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do *not* need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development

- Flood control infrastructure.
- Water transmission infrastructure and pumping stations.
- Sewage transmission infrastructure and pumping stations.
- Sand and gravel working.
- Docks, marinas and wharves.
- Navigation facilities.
- Ministry of Defence defence installations.
- Ship building, repairing and dismantling, dockside fish processing and refrigeration and compatible activities requiring a waterside location.
- Water-based recreation (excluding sleeping accommodation).
- Lifeguard and coastguard stations.
- Amenity open space, nature conservation and biodiversity, outdoor sports and recreation and essential facilities such as changing rooms.
- Essential ancillary sleeping or residential accommodation for staff required by uses in this category, *subject to a specific warning and evacuation plan*.

- Flood risk vulnerability and land use classification is given in NPPG Table 3:

Table 3: Flood risk vulnerability and flood zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see table 1)	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	×	Exception Test required	✓
	Zone 3b functional floodplain	Exception Test required	✓	×	×	×

Key: ✓ Development is appropriate.
 × Development should not be permitted.

In this instance reference to on line EA mapping confirms the site is in Flood Zone 1

Reference to table 2 confirms that land use as a residential care home is classified as “ more vulnerable”

Reference to table 3 confirms that development of this nature in flood zone 1 is appropriate and therefore negates the need for either a sequential test or an exception test

The assessment has been prepared using our best engineering judgement but there are levels of uncertainty implicit in the historical data and methods of analysis, especially those used to determine flood plain outlines. In part, this report is dependent on data obtained from third party sources for which no guarantee can be offered.

2.01 FLOODING DUE TO COASTAL OR TIDAL EFFECTS

The site has an elevational range of 177m to 171m above sea level. The site is geographically remote from any coastal areas.

The site lies in the greater catchment of the River Soar, which itself, is a tributary of the River Trent.

The site is both horizontally and vertically remote from coastal areas and as such, is free from the risk of coastal or tidal flooding, having some 160m vertical freeboard to such events

2.02 FLOODING DUE TO FLUVIAL EVENTS

MAJOR RIVER SYSTEMS

The site lies in the greater catchment of the River Soar but is comprehensively remote from the main river system and its flood plain, in fact being close to the topographic watershed of the catchment.

The extent of flooding on main rivers is indicated on an Environment Agency web site. The areas of dark blue show areas with a flooding probability of 1% (1 in 100 year), and the light blue areas are areas of extreme flood between the 1% (1 in 100) and 0.1% (1 in 1000) probability. The anticipated extents of flooding from the main rivers are identified on the following extract from the Environment Agency Web site.

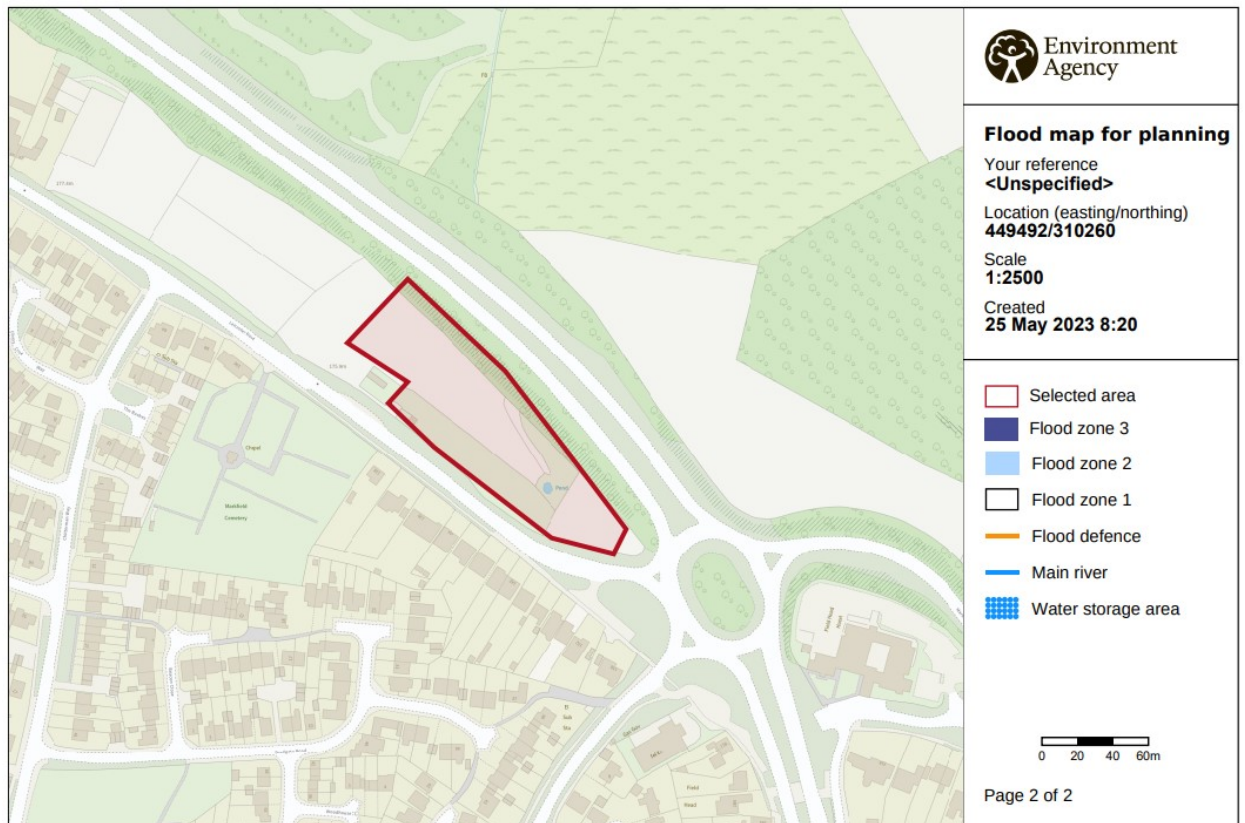


Figure 3 Extract from Environment Agency on line flood map showing the site remote from mapped flood outlines

MINOR WATERCOURSE SYSTEMS

A minor watercourse is located on the western boundary of the site referred to as stream A. It crosses beneath the A50 in culvert before reverting back to open section and heading via Stinking Wood where there is a confluence with Quorn Brook, flowing then through Ulverscroft Mill and Newton Linford to discharge into Cropston Reservoir.

A second minor watercourse crosses from its south east corner to again pass beneath the A50 in culvert beneath the A50 to then head west in open section and confluence with Stream A.

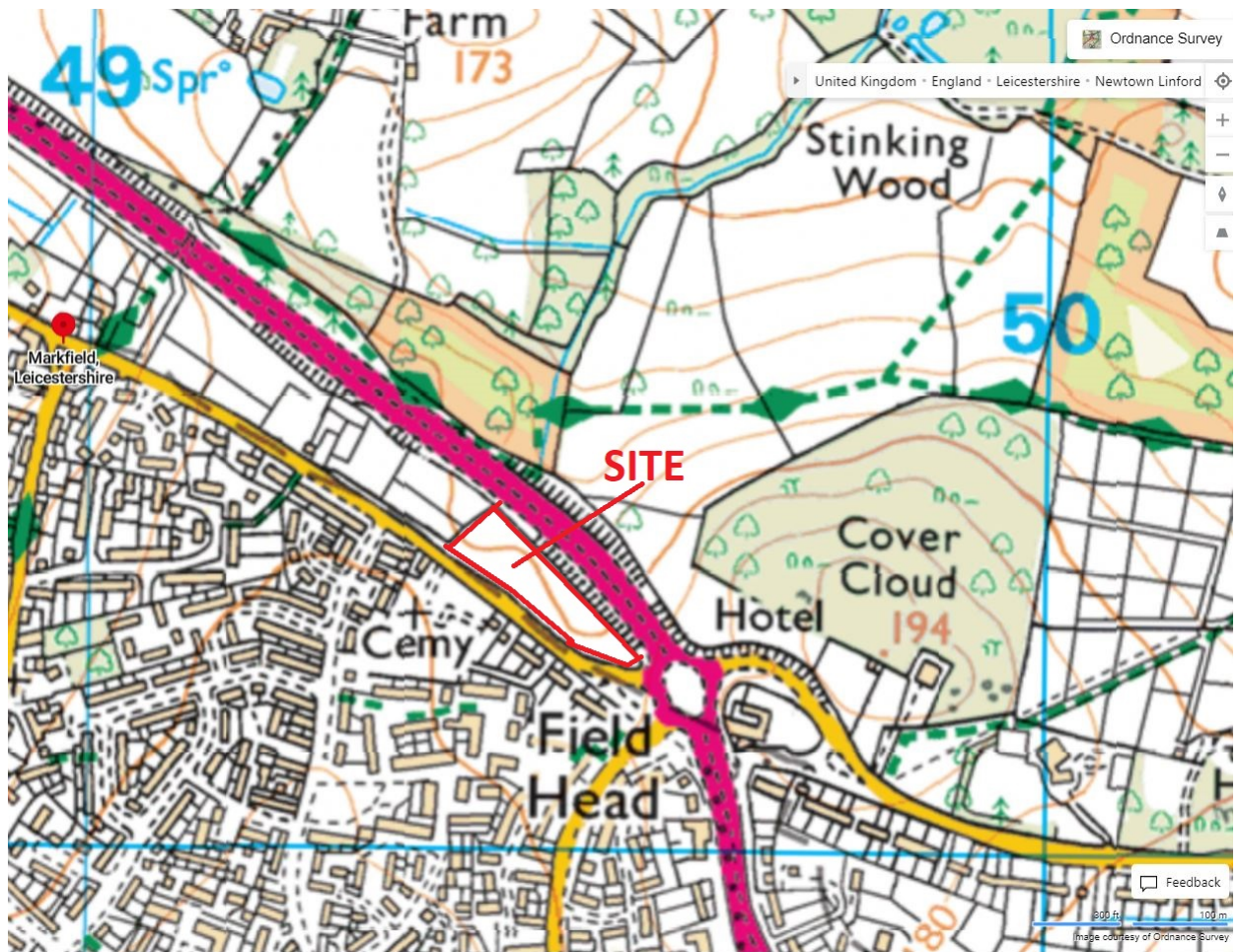


Figure 4 Ordnance survey mapping of watercourse



Figure 5 Location of minor watercourses

Reference to on line Environment Agency data for surface water flooding confirms the following:

The site is free from the risk of surface water flooding with the exception of the northern boundary adjacent to the A50. At this point water levels can rise if the pipes under the A50 block and the mapping represents this. It can only however, rise to a level of the top of bank at which point flows would pool and route overland to the other stream. The possibility of both culverts beneath the A50 failing simultaneously is considered remote, Land to the south of Leicester Road falls to the south so it is likely that both streams A and B have limited catchment areas associated with local highway drainage and therefore finite run off potential. An initial assessment of the site and its approaches suggests that the residential home would

have a floor level of 175m or thereabouts, comprehensively above the 170m level present on the northern boundary. Beyond the A50 the stream system has the potential for some escapes but these are topographically lower than the site so pose no risk. The stream line is in its upland phase with steep bed gradients and valley sides with escape potential confirmed generally to the immediate over bank areas.

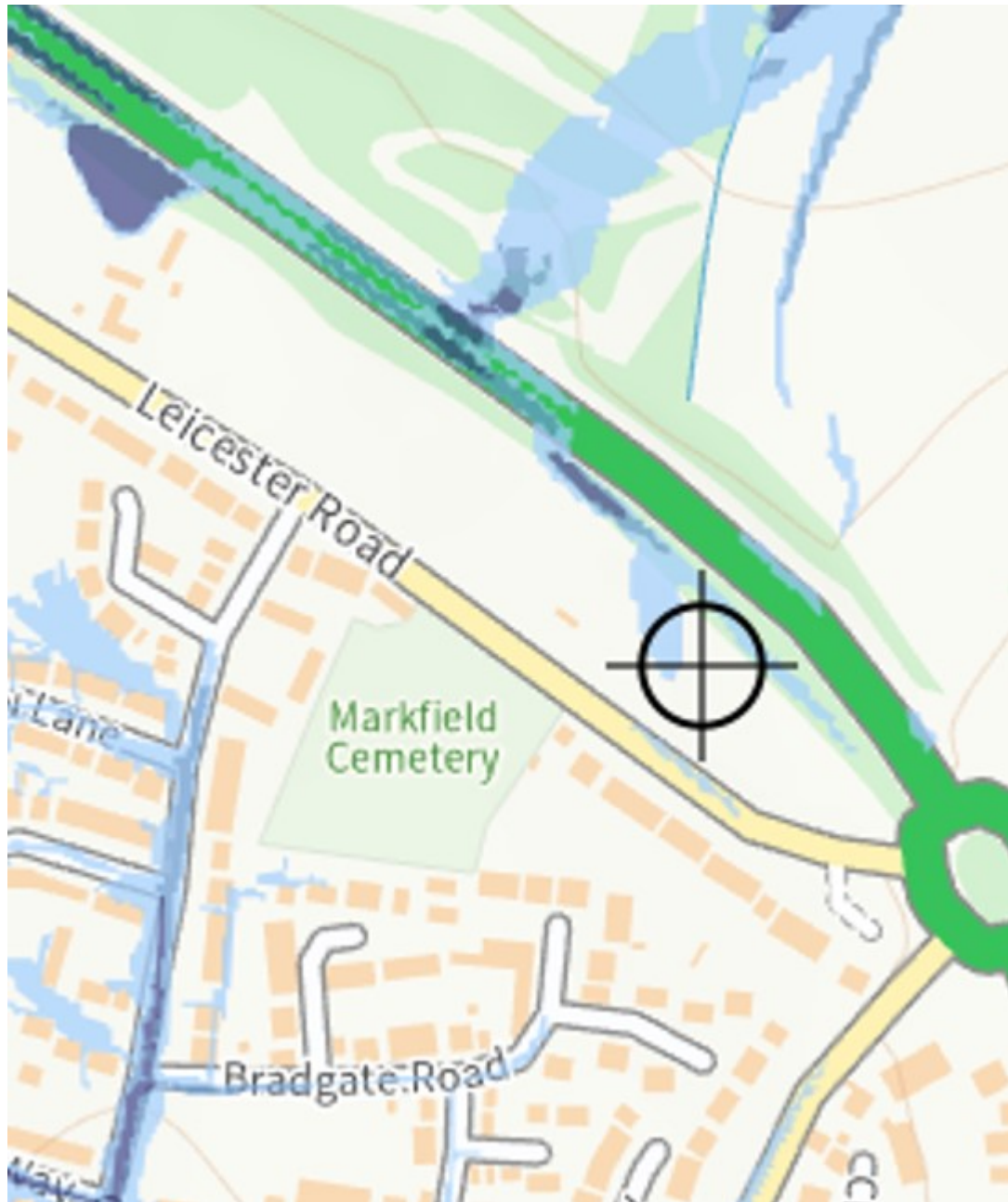


Figure 6 Environment Agency map of surface water flow routes

2.03 STRATEGIC FLOOD RISK ASSESSMENT

Due account has been taken of the Charnwood District Council Level 2 Strategic Flood Risk Assessment dated 2021: The site is not given in any of the SFRA listed development sites

2.04 FLOODING DUE TO GROUNDWATER

Enquiries were made of the LLFA in respect of groundwater levels. There has been no response to date.

The site is underlain by the Oadby Member Clays and the Gunthorpe Member Clays which are largely impermeable.

The site sits across the top of a hill

There is no history of ground water flooding

The external works of the complex can be set to remove any such risk of flooding by falling paved areas initially away from the building and routing overland through the car parking

The site is not considered at risk of groundwater flooding

2.05 FLOODING DUE TO OVERLAND RUN OFF FROM ADJACENT AGRICULTURAL LAND AND HIGHWAYS

Agricultural land exists to the north and east of the site and is slightly lower than the development site with drainage vectors away from the site.

Leicester Road itself has two distinct low points fronting the site. In the event of a complete failure of the highway drainage system or exceedance event water could pond in the highway low points and then attempt to route overland. However, the flows would be intercepted by the road side ditch system whose locations correlate well with the highway low points. In any event, small scale engineering considerations including providing external levels to route water away from the building can completely negate this risk.

2.06 FLOODING DUE TO EXISTING SEWERAGE

The public sewer system in Markfield is located largely to the south of the site and the sewer systems flow generally in a south westerly direction away from the site.

A highway drainage system is present along Leicester Road and is believed to be the only contributing catchment to the two minor watercourse systems, Stream A and Stream B. The consequences of any potential failure is as given in paragraph 2.05 above.

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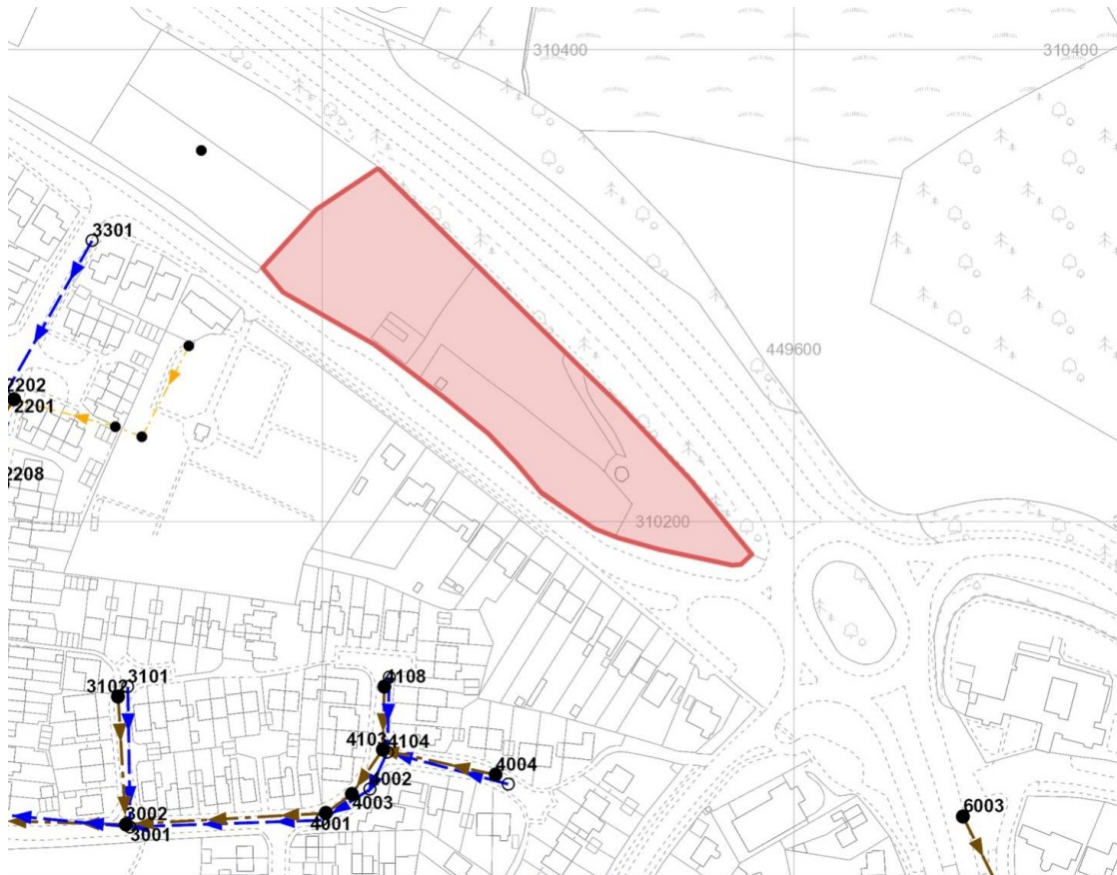


Figure 7 Sewer records

2.07 FLOODING FROM ARTIFICIAL SOURCES

An examination of map work suggests that there are no above ground artificial sources of risk that directly affect the site. Primarily, and because the site is bounded by a catchment watershed, the local watercourse to the site (Stream A) is free from risk.

EA mapping confirms that there is no risk of flooding from reservoir failure and there are no canal systems near the site. Existing water supply reservoirs are located at Cropston which is geographically lower than the development site

As such the site appears to be free from the risk of flooding from artificial sources.

2.08 CULVERT BLOCKAGE SCENARIO

There are two small culverts that cross beneath the A50. Stream A on the western boundary is a 225mm diameter pipe and Stream B in the centre of the sites northern boundary is a 300mm diameter pipe.

In the event that either should block water could pond as the down slope of the site gradient is then impounded by the embankment slope of the A50. The two stream catchments are divided by a low ridge on the northern boundary at a level of 171.40 and water could fill to this level, after which point flows would escape from one stream catchment to the other

The likelihood of both blocking simultaneously is considered remote

The upstream catchments to the watercourses systems appear to relate to highway drainage only, and are limited in scale with land south of Leicester Road all falling towards the south. As such, the volume and duration of escape flow is considered finite and limited

In theory the area could fill to the breach level on the A50 itself set at 172.5 at a low point in the road before flowing across and down back into the stream line. Provided the lowest dwelling level is set to this limit there remains no flood risk to property.

We have no evidence to suggest such an event has ever taken place

2.09 FLOOD PLAIN IMPACT AND VOLUMETRIC CHANGE

There is no impact on flood plain storage volumes in this instance

3.00 DRY ESCAPE

Dry escape will be available for pedestrian and vehicular use via the access drive to the building up the slope to Leicester Road

4.00 DEVELOPMENT DRAINAGE

Part H Building Regulations suggests that surface water be disposed of, in preferential hierarchical order as follows:

- To soakaways
- To watercourse
- To sewerage as a last resort

NPPF and Building Regulations provide guidance as to the types of sustainable drainage techniques (SUDS) which are suitable for development of this nature.

There are a number of practical constraints on the use of plot specific SUDS techniques, (primarily infiltration based) and these can include:

1. Poor and unsuitable ground conditions- applicable in this case
2. Slope considerations- applicable in this case.

As both of these conditions apply, it is considered that soakage will not be the primary means of disposal. There are no surface water sewers available to the development at a suitable level so the only practical solution is to **drain to watercourse systems**.

Development can increase both the speed and rate of run off, and attenuation systems provide a means to regulate the rate of flow to mimic levels of pre-development run off, whilst connecting directly to a watercourse or sewerage system.

For this site, a single attenuation facility will be provided which will manage run off from the site to pre-development levels of runoff. This is likely to be a buried storage system in this instance as extreme site slopes would adversely impact the geometry of

a surface pond and adversely affect the proposed retention of as much species rich grassland as possible. This is a requirement to enable the development to achieve a biodiversity net gain. Augmenting the landscape of the existing stream corridor and a pond is proposed in preference to the creation of an additional pond feature in this instance.

The development area of the site is some 0.454Ha with an impermeable area of 0.4085Ha. The balance of the site continues to drain direct to the watercourse system.

The allowable run off has been calculated using The Institute of Hydrology Report 124 methodology as modified by the interim code of practice for Suds. The following calculation applies has been undertaken using MICRODRAINAGE proprietary drainage software.

Rural Runoff Calculator

ICP SUDS

ICP SUDS Input (FSR Method)

Return Period (Years): 100

Area (ha): 0.454

SAAR (mm): 700

Soil: 0.450

Growth Curve: (None)

Partly Urbanised Catchment (QBAR)

Urban: 0.000

Region: Region 4

Results

QBAR rural (l/s): 2.0

QBAR urban (l/s): 2.0

Return Period Flood

Region	QBAR (l/s)	Q (100yrs) (l/s)	Q (1 yrs) (l/s)	Q (30 yrs) (l/s)	Q (100 yrs) (l/s)
Region 1	2.0	4.9	1.7	3.8	4.9
Region 2	2.0	5.2	1.7	3.8	5.2
Region 3	2.0	4.1	1.7	3.5	4.1
Region 4	2.0	5.1	1.7	3.9	5.1
Region 5	2.0	7.1	1.7	4.8	7.1
Region 6/Region 7	2.0	6.4	1.7	4.5	6.4
Region 8	2.0	4.8	1.6	3.8	4.8
Region 9	2.0	4.3	1.8	3.5	4.3
Region 10	2.0	4.1	1.7	3.4	4.1

OK Cancel Help

Enter Return Period between 1 and 1000

The outfall is proposed to the eastern outfall stream A. It is noted that it is impractical to attenuate down to 2l/sec as this would result in an inadequate control diameter, rendering it liable to blockage. As such, it is proposed to increase the allowable run off to 5l/sec for all events.

The storage area design parameters have been determined using the MICRODRAINAGE proprietary modelling package with the following summary results.

Stephen Daykin Consulting Ltd		Page 3																																				
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<u>Rainfall Details</u> <table><tr><td>Rainfall Model</td><td>FSR</td><td>Winter Storms</td><td>Yes</td></tr><tr><td>Return Period (years)</td><td>100</td><td>Cv (Summer)</td><td>0.750</td></tr><tr><td>Region</td><td>England and Wales</td><td>Cv (Winter)</td><td>0.840</td></tr><tr><td>M5-60 (mm)</td><td>20.600</td><td>Shortest Storm (mins)</td><td>15</td></tr><tr><td>Ratio R</td><td>0.400</td><td>Longest Storm (mins)</td><td>10080</td></tr><tr><td>Summer Storms</td><td>Yes</td><td>Climate Change %</td><td>+40</td></tr></table> <u>Time Area Diagram</u> Total Area (ha) 0.409 <table><tr><th>Time (mins)</th><th>Area</th><th>Time (mins)</th><th>Area</th></tr><tr><th>From:</th><th>To: (ha)</th><th>From:</th><th>To: (ha)</th></tr><tr><td>0</td><td>4 0.204</td><td>4</td><td>8 0.205</td></tr></table>			Rainfall Model	FSR	Winter Storms	Yes	Return Period (years)	100	Cv (Summer)	0.750	Region	England and Wales	Cv (Winter)	0.840	M5-60 (mm)	20.600	Shortest Storm (mins)	15	Ratio R	0.400	Longest Storm (mins)	10080	Summer Storms	Yes	Climate Change %	+40	Time (mins)	Area	Time (mins)	Area	From:	To: (ha)	From:	To: (ha)	0	4 0.204	4	8 0.205
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<u>Model Details</u> Storage is Online Cover Level (m) 171.000 <u>Tank or Pond Structure</u> Invert Level (m) 169.300 <table><tr><th>Depth (m)</th><th>Area (m²)</th><th>Depth (m)</th><th>Area (m²)</th></tr><tr><td>0.000</td><td>250.0</td><td>1.000</td><td>250.0</td></tr></table> <u>Hydro-Brake® Optimum Outflow Control</u> <table><tr><td>Unit Reference</td><td>MD-SHE-0105-5000-1000-5000</td></tr><tr><td>Design Head (m)</td><td>1.000</td></tr><tr><td>Design Flow (l/s)</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>Calculated</td></tr><tr><td>Objective</td><td>Minimise upstream storage</td></tr><tr><td>Application</td><td>Surface</td></tr><tr><td>Sump Available</td><td>Yes</td></tr><tr><td>Diameter (mm)</td><td>105</td></tr><tr><td>Invert Level (m)</td><td>169.300</td></tr><tr><td>Minimum Outlet Pipe Diameter (mm)</td><td>150</td></tr><tr><td>Suggested Manhole Diameter (mm)</td><td>1200</td></tr></table> <table><tr><th>Control Points</th><th>Head (m)</th><th>Flow (l/s)</th></tr><tr><td>Design Point (Calculated)</td><td>1.000</td><td>5.0</td></tr><tr><td>Flush-Flo™</td><td>0.296</td><td>5.0</td></tr><tr><td>Kick-Flo®</td><td>0.637</td><td>4.1</td></tr><tr><td>Mean Flow over Head Range</td><td>-</td><td>4.3</td></tr></table> The hydrological calculations have been based on the Head/Discharge relationship for the Hydro-Brake® Optimum as specified. Should another type of control device other than a Hydro-Brake Optimum® be utilised then these storage routing calculations will be invalidated <table><tr><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th><th>Depth (m)</th><th>Flow (l/s)</th></tr><tr><td>0.100</td><td>3.6</td><td>1.200</td><td>5.4</td><td>3.000</td><td>8.4</td><td>7.000</td><td>12.5</td></tr><tr><td>0.200</td><td>4.8</td><td>1.400</td><td>5.8</td><td>3.500</td><td>9.0</td><td>7.500</td><td>12.9</td></tr><tr><td>0.300</td><td>5.0</td><td>1.600</td><td>6.2</td><td>4.000</td><td>9.6</td><td>8.000</td><td>13.3</td></tr><tr><td>0.400</td><td>4.9</td><td>1.800</td><td>6.6</td><td>4.500</td><td>10.1</td><td>8.500</td><td>13.7</td></tr><tr><td>0.500</td><td>4.7</td><td>2.000</td><td>6.9</td><td>5.000</td><td>10.6</td><td>9.000</td><td>14.1</td></tr><tr><td>0.600</td><td>4.3</td><td>2.200</td><td>7.2</td><td>5.500</td><td>11.1</td><td>9.500</td><td>14.5</td></tr><tr><td>0.800</td><td>4.5</td><td>2.400</td><td>7.5</td><td>6.000</td><td>11.6</td><td></td><td></td></tr><tr><td>1.000</td><td>5.0</td><td>2.600</td><td>7.8</td><td>6.500</td><td>12.1</td><td></td><td></td></tr></table>			Depth (m)	Area (m²)	Depth (m)	Area (m²)	0.000	250.0	1.000	250.0	Unit Reference	MD-SHE-0105-5000-1000-5000	Design Head (m)	1.000	Design Flow (l/s)	5.0	Flush-Flo™	Calculated	Objective	Minimise upstream storage	Application	Surface	Sump Available	Yes	Diameter (mm)	105	Invert Level (m)	169.300	Minimum Outlet Pipe Diameter (mm)	150	Suggested Manhole Diameter (mm)	1200	Control Points	Head (m)	Flow (l/s)	Design Point (Calculated)	1.000	5.0	Flush-Flo™	0.296	5.0	Kick-Flo®	0.637	4.1	Mean Flow over Head Range	-	4.3	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	0.100	3.6	1.200	5.4	3.000	8.4	7.000	12.5	0.200	4.8	1.400	5.8	3.500	9.0	7.500	12.9	0.300	5.0	1.600	6.2	4.000	9.6	8.000	13.3	0.400	4.9	1.800	6.6	4.500	10.1	8.500	13.7	0.500	4.7	2.000	6.9	5.000	10.6	9.000	14.1	0.600	4.3	2.200	7.2	5.500	11.1	9.500	14.5	0.800	4.5	2.400	7.5	6.000	11.6			1.000	5.0	2.600	7.8	6.500	12.1		
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Stephen Daykin Consulting Ltd				Page 2	
33 Beaumaris Drive Gedling Nottingham NG4 2RA					
Date 21/09/2023 11:48		Designed by SteveDaykin			
File prelim crate storage.SRCX		Checked by			
Innovyze		Source Control 2018.1.1			
<u>Summary of Results for 100 year Return Period (+40%)</u>					
Storm Event	Max Level (m)	Max Depth (m)	Max Control (l/s)	Max Volume (m³)	Status
60 min Winter	170.050	0.750	5.0	187.5	O K
120 min Winter	170.161	0.861	5.0	215.4	O K
180 min Winter	170.203	0.903	5.0	225.9	O K
240 min Winter	170.216	0.916	5.0	229.0	O K
360 min Winter	170.213	0.913	5.0	228.3	O K
480 min Winter	170.189	0.889	5.0	222.2	O K
600 min Winter	170.162	0.862	5.0	215.5	O K
720 min Winter	170.135	0.835	5.0	208.8	O K
960 min Winter	170.076	0.776	5.0	194.0	O K
1440 min Winter	169.945	0.645	5.0	161.3	O K
2160 min Winter	169.738	0.438	5.0	109.6	O K
2880 min Winter	169.593	0.293	5.0	73.1	O K
4320 min Winter	169.444	0.144	4.6	35.9	O K
5760 min Winter	169.407	0.107	3.8	26.7	O K
7200 min Winter	169.391	0.091	3.2	22.7	O K
8640 min Winter	169.381	0.081	2.8	20.4	O K
10080 min Winter	169.375	0.075	2.4	18.7	O K
Storm Event	Rain (mm/hr)	Flooded Volume (m³)	Discharge Volume (m³)	Time-Peak (mins)	
60 min Winter	58.456	0.0	200.1	64	
120 min Winter	35.213	0.0	241.1	122	
180 min Winter	25.807	0.0	265.1	180	
240 min Winter	20.567	0.0	281.7	236	
360 min Winter	14.959	0.0	307.4	346	
480 min Winter	11.918	0.0	326.5	448	
600 min Winter	9.984	0.0	341.9	480	
720 min Winter	8.635	0.0	354.9	556	
960 min Winter	6.862	0.0	376.0	714	
1440 min Winter	4.956	0.0	407.2	1024	
2160 min Winter	3.574	0.0	441.5	1388	
2880 min Winter	2.831	0.0	466.2	1732	
4320 min Winter	2.035	0.0	502.4	2336	
5760 min Winter	1.609	0.0	530.4	2992	
7200 min Winter	1.340	0.0	552.1	3680	
8640 min Winter	1.154	0.0	570.2	4408	
10080 min Winter	1.016	0.0	585.6	5136	

It is proposed that the attenuation storage be provided either in cellular storage beneath the car parking areas to the North East of the site or within a specifically designed unit beneath the building itself.

The use of additional SUDS devices has been considered as follows:

Suitability of SUDS techniques

SUDS Group	Technique	Suitability	Notes
Source Control	Rainwater Harvesting	N	Scheme specific concerns in relation to potable cross contamination with a high risk health vulnerable occupancy
	Permeable paving	Y	Suitable for water quality improvement for both paved and roof discharges
	Green roofs	N	Adverse structural and maintenance implications
Infiltration Devices	Infiltration trenches and basins	N	Infiltration not suitable due to prevailing ground conditions
	Soakaways	N	As above
Filtration	Open Swales	N	Land hungry option which replicates action of permeable paving and would be destructive to existing species rich retained grasslands
	Filter Strips	N	Not necessary- duplicates action of permeable paving
Retention/ Detention	Basins and ponds	Y	Landscape augmentation of existing natural features proposed in preference to new artificial feature due to ground slope issues and loss of existing grassland habitat
	Piped storage systems	Y	Conventional and maintainable systems controlling discharges to watercourse. Contained underground to minimise loss of existing habitat

FOUL DRAINAGE

It is proposed to discharge foul drainage from the site to an existing public foul sewer in Chitterman Way via a pumped connection

4.01 FLOOD RISK FROM PROPOSED DRAINAGE SYSTEM

There is a low level risk with any sewerage system that a blockage may occur, and that this may pose a residual flooding risk. Means that can be taken to avoid this risk form basic good practice and include:

- General routing of sewers downhill with topographic slopes
- Setting of minimum finished floor levels above adjacent manhole cover levels
- Provision of overflow arrangements within sewer storage systems

All of the above will be incorporated in the proposed surface water sewer system for the above development in order to minimise risk.

The drainage system is designed in accordance with “Sewers for Adoption 6th Edition to a 1 in 30 year no flood scenario. Attenuation will store up to the 1 in 100 year event plus a 40%allowance for climate change at topography restricts opportunities to retain flows elsewhere on the site

We conclude that a properly designed development sewerage system together with adequate consideration of over land flow routing should mitigate any risk from flooding due to the failure of the development sewerage system.

5.0 CONCLUSIONS

- The site is at no quantifiable potential risk of flooding from tidal events or main river systems
- The site is at no risk of flooding from the cross site stream systems due to its proposed elevation
- The site is at no quantifiable risk of flooding from groundwater sources or overland flow routes
- The site is at no quantifiable risk of flooding from artificial sources
- The site is unsuitable for plot specific infiltration style drainage systems due to, prevailing geology
- The site is at no quantifiable risk of flooding from existing sewerage systems upstream of the development site
- The site is at negligible risk of flooding from its own internal sewer systems (as is any), but this can be mitigated by small scale engineering considerations
- The site will drain its surface water to new balancing facilities located within the car park area or beneath the building itself, with attenuated discharges to adjacent watercourses Development flows will be attenuated to the 1 in 100 year event plus a 40% allowance for climate change, and carry forward flows will be restricted to pre development levels of run off

All opinions expressed herein, including any conclusions are based on the Information openly available to the author at the date of this report. The conclusions drawn from this information could therefore differ if the information is found to be inaccurate, or otherwise incomplete or out of date. The author can therefore accept no liability should this prove to be the case.

The process of fluvial flooding is complex, and data supplied by the Environment Agency contains significant caveats regarding its origin and accuracy. The user's attention is therefore drawn to the limitations of the data supplied by the Agency as the same limitations, by definition, apply to the reporting of the same.

This report has been prepared for the benefit of the client listed on the front page of this document and any relevant Statutory Authority which may require reference in relation to the granting of statutory approvals. The author therefore does not grant or imply any duty of care to any other third party who may use the data in this report and if so used, the information shall be deemed to have been so used at the reader's own risk. Stephen Daykin Consulting Ltd accepts no liability whatsoever for the relevance and accuracy of any data so used by a third party or any consequential losses or damage howsoever caused in relation thereto without the report having been formally assigned to said third party.

APPENDIX A
CORRESPONDENCE WITH THE LEICESTERSHIRE COUNTY COUNCIL AS LEAD LOCAL
FLOOD AUTHORITY

Our ref E873/SWD

Date: 24 May 2023

Leicestershire County Council Lead Local Flood Authority
Planning & Transportation Department
County Hall
Glenfield
Leicester
LE3 8RJ

Dear Sirs

**RE;FLOOD RISK ASSESMENT FOR A PROSPECTIVE RESIDENTIAL CARE HOME FACILITY,
LEICESTER ROAD ,MARKFIELD LEICS LE67 9RE
449432, 310274**

A planning application is being considered for the construction of a 70 bed residential care home at Leicester Road Markfield. The site comprises 1.094Ha and is located between Leicester Road and the A50 next to Field Head Roundabout. The site is located within flood zone 1.

In order for us to complete a flood risk assessment for the development I would be grateful if you would:

Confirm any history of flooding on the site, either from main river or local watercourse systems. Advise on any frequency or inundation depth data that is available

Confirm if the site has been subject to flooding from the failure of any highway drainage systems that sit in Leicester Road at a higher elevation than the site

Confirm if the site has been subject to flooding from the failure of any highway drainage systems that are located within the A50 corridor

Advise of any known ground water flooding incidents in the vicinity of the site.

Advise of any critical culverts within a 500m radius of the site

Advise on any enforcement action taken under Section 23LDA or Section 109 WRA within 500m of the site

It is proposed that run off from this site will be passed through a Suds treatment train and attenuated to agricultural levels prior to discharge into the existing land drainage system. This largely replicates the existing situation. Discharges to soakaways are unlikely to be viable due to prevailing ground conditions.

I trust that the forgoing meets with your approval. Please do not hesitate to contact me if you wish to discuss matters in any further detail or require any fees to be paid in advance of a response.

Yours faithfully

For and on behalf of Stephen Daykin Consulting Ltd

**Stephen W Daykin I.Eng AMICE MCIHT
Managing Director**

APPENDIX B
CORRESPONDENCE WITH CHARNWOOD BOROUGH COUNCIL AS LAND DRAINAGE
AUTHORITY

Our ref E873/SWD

Date: 24-5-23

Land Drainage Engineers
Charnwood Borough Council
Southfield Road
Loughborough
Leicestershire
LE11 2TN

Dear Sirs

**RE;FLOOD RISK ASSESMENT FOR A PROSPECTIVE RESIDENTIAL CARE HOME FACILITY,
LEICESTER ROAD ,MARKFIELD LEICS LE67 9RE
449432, 310274**

A planning application is being considered for the construction of a 70 bed residential care home at Leicester Road Markfield. The site comprises 1.094Ha and is located between Leicester Road and the A50 next to Field Head Roundabout. The site is located within flood zone 1.

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Advise of any known ground water flooding incidents in the vicinity of the site.

Advise of any critical culverts within a 500m radius of the site

Advise on any enforcement action taken under Section 23LDA or Section 109 WRA within 500m of the site

It is proposed that run off from this site will be passed through a Suds treatment train and attenuated to agricultural levels prior to discharge into the existing land drainage system. This largely replicates the existing situation. Discharges to soakaways are unlikely to be viable due to prevailing ground conditions.

I trust that the forgoing meets with your approval. Please do not hesitate to contact me if you wish to discuss matters in any further detail or require any fees to be paid in advance of a response.

Yours faithfully

For and on behalf of Stephen Daykin Consulting Ltd

**Stephen W Daykin I.Eng AMICE MCIHT
Managing Director**

APPENDIX C

CORRESPONDENCE WITH SEVERN TRENT WATER AS SEWERAGE AUTHORITY

Charterpoint Developments Limited
7 Wheatcroft Business Park
Landmere Lane
Edwalton
Nottingham
NG12 4DG

F.A.O: chris.oakden@charterpointgroup.co.uk

Severn Trent Water Ltd
Leicester Water Centre
Gorse Hill
Anstey
Leicester
LE7 7GU

Tel: 07976 449091
www.stwater.co.uk

Email:
Network.Solutions@SevernTrent.co.uk

Our ref: 1054930

Dear Chris,

**Proposed Development: 70 bed care homes at Leicester Road,
Markfield, Leicestershire**

X: 449460 / Y: 310288

I refer to your 'Development Enquiry Request' in respect of the above named site. Please find enclosed the sewer records that are included in the fee together with the Supplementary Guidance Notes (SGN) which refer to surface water disposal from development sites.

Protective Strip

Having viewed our statutory sewer records, they demonstrate there are no public sewers within the site.

Due to a change in legislation on 1 October 2011, there may be former private sewers on the site which have transferred to the responsibility of Severn Trent Water Ltd, which are not shown on the statutory sewer records, but are located in your client's land. These sewers would also have protective strips that we will not allow to be built over. If such sewers are identified to be present on the site, please contact us for further guidance.

A protected strip is an area, over and to either side of the sewer on which no buildings or other permanent or temporary structures are permitted. The minimum dimension of a protected strip is 5 metres (2.5 metres either side of the centre line of the sewer) but will be wider for larger/deeper sewers. Dimensions of protected strips are given in Sewer Sector Guidance, and you may be required to obtain

easements on our behalf. Please note, we will also take into account whether Building Regulations have been observed.

Foul Water Drainage

The sewer records show that the closest point of connection for the foul flows is the 225mm foul sewer on Leicester Road, to the Southeast of the site, at manhole SK49106003. However, to connect to this network would require a pumped connection and work within an A road, therefore this should not be considered.

Pumped solution will only be accepted upon substantiation that a gravity system is not viable which is not the case for this development as gravity might be achieved to either west of the site or east via sewer requisition if necessary. As stipulated in Design Construction Guidance, the foul sewage pumping stations or pumped systems should only be used where their whole-life cost is less than conventional gravity systems over a period of 40 years.

The 300mm foul water sewer on Chitterman Way is located 171m away from the site and has an approximate invert level of 172.84m. As most of the site is located at or above 175m elevation it may be possible to establish a gravity connection into this sewer at manhole SK49102201.

It is anticipated that 70 care rooms could use this connection point and the estimated foul flows from those properties would be 0.3 l/s (at 2 x DWF).

Surface Water Drainage

Under the terms of Section H of the Building Regulations 2000, the disposal of surface water by means of soakaways should be considered as the primary method. If these are found to be unsuitable, satisfactory evidence will need to be submitted. The evidence should be either percolation test results or by the submission of a statement from the SI consultant (extract or a supplementary letter).

Subject to above Severn Trent Water expects all surface water from the development to be drained in a sustainable way to the nearest watercourse or land drainage channel, subject to the developer discussing all aspects of the developments surface water drainage with the Local Lead Flood Authority (LLFA). Any discharge rate to a watercourse or drainage ditch will be determined by the LLFA / EA.

Should soakaways prove not to be viable then a direct connection to a watercourse or ditch course should be explored. A desktop assessment of the site suggests that there is a ditch course surrounding the southern and eastern boundary of the site.

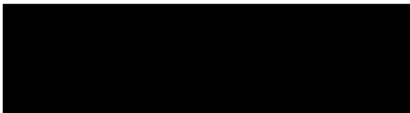
The surface water network on Leicester Rd, heading downstream onto on to Chitterman Way, suffers from flooding during the 1 in 10 year storm period and as a new connection to this network would prove prejudicial then a connection here should not be explored.

New Connections

For any new connections (including the re-use of existing connections) to the public sewerage system, the developer will need to submit a Section 106 application form. Our Developer Services department are responsible for handling all new connections enquiries and applications. To contact them for an application form and associated guidance notes please call 0800 7076600 or download from www.stwater.co.uk.

Please quote the above reference in any future correspondence (including e-mails) with STW Limited. Please note that Developer Enquiry responses are only valid for 6 months from the date of this letter.

Yours sincerely,



Pierce Meguer
Network Solutions
Developer Services