Intended for
**PV Projects Ltd**

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Date
**January 2022**

Project Number
**1620011365**

# MILTON PARK, OXFORDSHIRE FLOOD RISK ASSESSMENT

RAMBOLL

# MILTON PARK, OXFORDSHIRE
# FLOOD RISK ASSESSMENT

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| Project No. | **1620011365** |
| Issue No. | **2** |
| Date | **27/01/2022** |
| Made by | **Christopher Day** |
| Checked by | **Christopher Day** |
| Approved by | **Simon Gaskell** |

| | |
|---|---|
| Made by: |  |
| Checked/Approved by: |  |



**Version Control Log**

| Revision | Date | Made by | Checked by | Approved by | Description |
|---|---|---|---|---|---|
| 2 | 27/01/2021 | CD | SG | SG | Revised Draft for Client Review |

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# APPENDICES

# 1. INTRODUCTION

## 1.1 Background

Ramboll UK Limited (Ramboll) has been instructed by PV Projects Ltd (Pro Vision) on behalf of MEPC Ltd (MEPC, the Client) to undertake a Flood Risk Assessment (FRA) for Milton Park, Oxford. The FRA has been prepared for the benefit of MEPC Limited; and the combined services of South Oxfordshire and Vale of White Horse District Councils. The review is intended to assist in the development of an extension to the existing Local Development Order (LDO) for the Milton Park Business Park (Milton Park LDO 2).

The Milton Park LDO is a partnership between South Oxfordshire and Vale of White Horse District Councils as the local planning authority, and MEPC as the landowner. PV Projects Ltd has been instructed by MEPC to help coordinate the LDO process. The purpose of the Milton Park LDO is to enable a vibrant business area, promoting employment-generating uses at the business park, to maximise the success of the Science Vale UK Enterprise Zone and give greater confidence to business to invest in Milton Park. It is being prepared in accordance with the Town and Country Planning (Development Management Procedure) (England) Order 2010.

The Milton Park LDO will simplify planning control to give greater flexibility for businesses to develop new premises and facilities or adapt existing premises, whilst maintaining a successful and diverse mix of employment generating uses. Development will only be permitted where the local authority is satisfied that it is in accordance with the permitted uses and development parameters set out in the Order. Development proposals not in accordance with the provisions of the Order will be determined by a planning application.

The LDO has been designed to be effective for a period of 15 years to reflect the typical timescale of business leases and give greater certainty for potential investors.

## 1.2 Objectives

Ramboll's overall approach is to assess potential flood risk constraints and sensitivities with respect to the on-going use of the site as a business park in order to inform the development of the LDO. The site is shown in Environment Agency (EA) mapping[1] to be located predominantly in Flood Zone 1 (Low Probability) as described further within this report. The site is greater than 1 hectare (ha) in area meaning that there is considerable scope for site runoff to impact on flood risks both on-site and elsewhere.

The objective of the FRA is to evaluate how flood risk would be managed now and over the development's lifetime, taking climate change into account, and with regard to the vulnerability of its users.

A baseline desk-based assessment has been undertaken which has included a review of hydrology, flood risk and drainage, as well as topographic data, online regulatory flood mapping and local requirements/strategies as developed by the EA and Lead Local Flood Authority which, in this case, is Oxfordshire County Council.

## 1.3 General Limitations and Reliance

This report has been prepared by Ramboll UK Limited exclusively for the intended use by the Client in accordance with the agreement (proposal reference number 1620011365, dated January 2021) between Ramboll and the client defining, among others, the purpose, the scope and the terms and conditions for the services. No other warranty, expressed or implied, is made as to the professional advice included in this report or in respect of any matters outside the agreed scope of the services or the purpose for which the report and the associated agreed scope were intended or any other services provided by Ramboll.

[1] UK Government, 2020. Flood map for planning [online]. Available at: https://flood-map-for-planning.service.gov.uk/

In preparation of the report and performance of any other services, Ramboll has relied upon publicly available information, information provided by the client and information provided by third parties. Accordingly, the conclusions in this report are valid only to the extent that the information provided to Ramboll was accurate, complete and available to Ramboll within the reporting schedule.

Ramboll's services are not intended as legal advice, nor an exhaustive review of site conditions and/or compliance. This report and accompanying documents are initial and intended solely for the use and benefit of the client for this purpose only and may not be used by or disclosed to, in whole or in part, any other person without the express written consent of Ramboll. Ramboll neither owes nor accepts any duty to any third party, unless formally agreed by Ramboll through that party entering into, at Ramboll's sole discretion, a written reliance agreement.

# 2. POLICY FRAMEWORK

## 2.1 Local Development Order

LDOs+ provide permitted development rights for specified types of development in defined locations. They are flexible and locally determined tools that Local Planning Authorities can use to help accelerate the delivery of development in certain circumstances. LDOs only grant planning permission and do not remove the need to comply with other relevant legislation.

## 2.2 National Policy

### 2.2.1 National Planning Policy Framework, 2019

The 2012 NPPF was most recently updated in June 2019, with flood risk remaining primarily regulated through planning policy. The NPPF requires that an FRA should be submitted with planning applications for all development sites within Flood Zones 2 and 3; and all development sites over one ha in area to determine the risks of flooding from all sources including rivers, the sea, sewers and groundwater. The NPPF sets out that flood risk should be defined according to Flood Zone 3 (High Probability), Flood Zone 2 (Medium Probability) and Flood Zone 1 (Low Probability).

Flood Zone 3 represents land that the EA consider could be affected by flooding:

- from the sea by an event with a 0.5% (1 in 200) or greater chance of occurring each year; or
- from a river by an event with a 1% (1 in 100) or greater chance of occurring each year.

Flood Zone 2 represents land that the EA considers could be affected by flooding from rivers or the sea with up to a 0.1% (1 in 1,000) chance of occurring each year.

Flood Zone 1 represents land assessed as having less than a 1 in 1,000 (0.1%) annual probability of flooding from rivers or the sea. In terms of flood risk, the NPPF classifies land uses according to vulnerability as follows:

- Essential infrastructure;
- Highly vulnerable;
- More vulnerable;
- Less vulnerable; and
- Water-compatible development.

### 2.2.2 Planning Practice Guidance

The Planning Practice Guidance (PPG)[2] is an online resource which was first launched in March 2014 and is continuously updated. The 'Flood Risk and Coastal Change' part of the PPG provides further information on the requirements for sustainable drainage systems (SUDS). Surface water drainage for a proposed development should aim to discharge as high up the following hierarchy of options as reasonably practicable:

1. into the ground (infiltration);
2. to a surface water body;
3. to a surface water sewer, highway drain, or another drainage system; and
4. to a combined sewer.

The PPG also sets out that clear arrangements should be put in place for ongoing maintenance of any SUDS and drainage measures. However, it is acknowledged in the PPG that it is unlikely to be reasonably practical to expect compliance with the technical standards if these are more expensive than complying with building regulations.

[2] Ministry of Housing, Communities and Local Government, 2019. Planning practice guidance available from: https://www.gov.uk/government/collections/planning-practice-guidance

2.2.3 The Town and Country Planning (Development Management Procedure) Order, 2015

The Government has strengthened planning policy on the provision of sustainable drainage for 'major' planning applications as from 6 April 2015. Decisions about the suitability of sustainable drainage provision are made by the local planning authority (i.e. the LBH in this case); however, under The Town and Country Planning (Development Management Procedure) Order 2015[3], Lead Local Flood Authorities (LLFA) are now statutory consultees for all major applications. Oxfordshire County Council is the LLFA for the area of Milton Park.

2.2.4 The Buildings Regulations – Part H (December 2010)

Part H of the Buildings Regulations: Drainage and Waste Disposal, establishes a hierarchy for surface water disposal, which encourages a SuDS approach. This hierarchy is that surface runoff must be discharged to one or more of the following in order of priority:

- an adequate soakaway or some other adequate infiltration system;

or, where not reasonably practicable,

- a watercourse;

or, where not reasonably practicable,

- a sewer

## 2.3 Local Policy

2.3.1 Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire

The LLFA has prepared standards and guidance for major development in Oxfordshire via an online guide[4]. All major development is required to use Sustainable Drainage Systems (SuDS) for the management of surface water run-off. Where site-specific Flood Risk Assessments are required in association with development proposals, they should be used to design appropriate systems and determine how SuDS can be used on particular sites.

All major development is required to use SuDS for the management of surface water run-off. Where site specific Flood Risk Assessments are required in association with development proposals, they should be used to design appropriate systems and determine how SuDS can be used on particular sites.

2.3.2 Vale of White Horse District Council Strategic Flood Risk Assessment (SFRA)

The Vale of White Horse District Council (VoWHDC) Level 1 and Level 2 SFRA (June 2009) provides further assessment of flood risk information, taking into account all sources of flooding and the impacts of climate change.

The SFRA requires developments on sites in Flood Zone 1, which have known drainage problems or have experienced flooding from other sources, to prepare an FRA if:

- site uses will change, moving the site to a higher vulnerability class; or
- (for residential development) additional dwellings will be created by the proposed development;

The SFRA contains maps which indicate whether sites have been identified at risk of historic flooding, surface water flooding or groundwater flooding.

2.3.3 VoWHDC Policy DC13 - Flood Risk and Water Run-off

This states that, where a risk from flooding is identified, new development including intensification of existing development or proposals to raise the level of the land will not be permitted unless:

[3] Secretary of State, 2015. Statutory Instruments 2015, No. 596, Town and Country Planning, England, The Town and Country Planning (General Permitted Development) (England) Order 2015.
[4] https://www.oxfordshirefloodtoolkit.com/planning/surface-water-drainage/

- an adequate assessment has been made of that risk including whether the proposed development would increase the risk of flooding elsewhere;
- flood risk to and from the development in terms of flood flows, flood storage capacity and run-off implications are acceptable; and
- any mitigation measures proposed to deal with these effects and risks are adequate, effective and acceptable and, as appropriate, maintain or enhance the biodiversity value of any associated land.

2.3.4 VoWHDC Policy DC14 - Flood Risk and Water Run-off

Development generating surface water run-off likely to result in adverse effects, such as an increased risk of flooding, changes in groundwater levels, river channel instability and/or damage to habitats, will not be permitted unless:

- the development's surface water management system accords with sustainable drainage principles and has been designed as an integral part of the development layout; and
- the system will effectively control and adequately mitigate or attenuate any adverse effects from surface water run-off on people, habitats of acknowledged importance and property.

2.3.5 VoWHDC Policy E5 - Milton Park

Within Milton Park, new business development and the redevelopment of land for business purposes will be permitted for B1, B2 and B8 uses.

## 2.4 Consultation Responses

Consultations have been undertaken with the EA, Oxfordshire County Council, South Oxfordshire and VoWHDC and Thames Water. To date, only South Oxfordshire and VoWHDC have provided a formal response as summarised below:

*"We would welcome the de-culverting of ordinary watercourses that currently pass through Milton Park. Any reduction in flood risk to Milton Village as a result of proposals would also be welcome. Otherwise strategy details should generally be in accordance with the Local Standards and Guidance for Surface Water Drainage on Major Development in Oxfordshire."*

*"There are two ordinary watercourses that pass under the railway roughly in the position marked as drain on the below plan. These then make their way through a variety of open channels and culverts to connect with the Moor Ditch running along the northern boundary. Alterations would potentially require land drainage consent from engineering.services@southandvale.gov.uk"*

*"The aim should be to reduce to greenfield runoff rates as per the [Oxfordshire County Council] guidance."*

*"The aim should be for on the surface type SUDS such as swales, basins, rain gardens etc. that combine to also offer biodiversity and amenity benefits."*

Subsequent to the submission of the Draft Milton Park Local Development Order Review (reference: P21/V3337/PEJ), within which submission a previous iteration of this FRA was included, comments were received from VoWHDC on flood risk and drainage. Relevant excerpts from this response are as follows:

*"Flood Risk – Pembroke Lane Pembroke Lane bordering with the northern edge of Milton Park has experienced flooding in the past. There is a shallow watercourse running adjacent to the Lane* [Moor Ditch]*, which has previously exceeded the bank capacity."*

*"It is noted that the Planning Policy Framework confirms that plans should "manage any residual risk, by...*

*"b) safeguarding land from development that is required, or likely to be required, for current or future flood management;*

*c) using opportunities provided by new development to reduce the causes and impacts of flooding (where appropriate through the use of natural flood management techniques)"*

*"In this instance, it is considered that there is opportunity if redeveloping the land on Milton Park adjacent to incorporate a flood alleviation scheme to benefit this area. With* [sic] *perhaps an overflow linked from the watercourse under the road to a parallel swale within the proposed landscape buffer and / or an overflow linked from upstream of Old Moor Bridge to swales or an expanded pond in the landscape area to the south of Manor Farm."*

*"It is also noted that the pond appears to partially fall within the development area on the plan and the landscape zone should be expanded in this area to include a suitable buffer around the pond and space for any potential scheme".*

*"It is also considered that further consideration should be given to flood risk from a watercourse running through the south east section of Milton Park."*

*"This watercourse has a reasonable catchment and has been modelled as part of the proposal to develop land to the south of the site (application P14/V2873/O). The model indicates that flow is restricted by the culvert under the road and railway, however we understand that Milton Park experienced flooding of yard areas at the lower point to the east of 187 previously from this source. We are aware that this watercourse is partially culverted through the park before it flows into the Moor Ditch and with reference to the below plan currently takes three routes through the park to the Moor ditch, with a route linking to a lagoon to the west, a culvert going under 184 to the north and a route linking to a small pond past 187 before heading north alongside the road."*

*"As this area is shown to be potentially redeveloped as part of the masterplan, the Flood Risk Assessment should be expanded to consider potential flood mitigation options and options to open-up the watercourse through proposed landscaped areas. It is considered that careful landscape and level design could provide a dual use area with mitigation incorporated to reduce risk."*

# 3. DATA SOURCES

## 3.1 Environment Agency Mapping

The EA 'Flood Map for Planning' sets out areas of Flood Zones 1, 2 and 3 as defined in the NPPF, and described in Section 2.1 of this report. It also indicates the presence of flood defences though the EA specifically state that the flood zones show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

The EA 'Flood Map for Surface Water'[5] delineates risk from pluvial sources (i.e. flooding caused by rainwater exceeding the capacity of drainage systems) into the following four categories:

- Very Low – each year, this area has a chance of flooding of less than 1 in 1,000 (<0.1 %);
- Low – each year, this area has a chance of flooding of between 1 in 1,000 (0.1 %) and 1 in 100 (1 %);
- Medium – each year, this area has a chance of flooding of between 1 in 100 (1 %) and 1 in 30 (3.3 %); and
- High – each year, this area has a chance of flooding of greater than 1 in 30 (3.3 %).

The EA mapping also includes flood risks associated with breaches in reservoirs. Such mapping represents a 'worst-case' scenario assuming that a reservoir would release all the water it contains were it to fail.

## 3.2 British Geological Society Online Data

The British Geological Society (BGS) publishes online mapping[6] of superficial and bedrock geology at 1:625,000 and 1:50,000 scales. The BGS also publishes records of historical borehole investigations[7]. These datasets have been used to determine the likely geology beneath the site and associated factors relating to groundwater depth and potential for groundwater emergence.

## 3.3 Strategic Flood Risk Assessment

The Vale of White Horse District Council (VoWHDC) Level 1 and Level 2 SFRA (June 2009) provides further assessment of flood risk information, taking into account all sources of flooding and the impacts of climate change.

## 3.4 Topographical Survey

LiDAR (Light Detection and Ranging) aerial topographic survey data has been acquired from DEFRA[8] for the site and its surrounds.

[5] UK Government, 2019. Long term flood risk assessment for locations in England [online]. Available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk
[6] British Geological Survey, 2020. Geology of Britain Viewer [online]. Available at: http://mapapps.bgs.ac.uk/geologyofbritain/home.html
[7] British Geological Survey, 2019. Geology of Britain Viewer [online]. Available at: https://www.bgs.ac.uk/data/boreholescans/home.html
[8] DEFRA GIS Data Services Platform [online]. Available at: https://environment.data.gov.uk/

# 4. DATA REVIEW

## 4.1 Topography

The site is split into three areas. LiDAR data indicates that ground levels within the largest area range from approximately 55.5 mAOD (Above Ordnance Datum) to 61 mAOD. Elevations for the smallest area, in the south, range between approximately 65 mAOD and 71 mAOD. Middle area elevations range between approximately 59 mAOD and 64 mAOD.

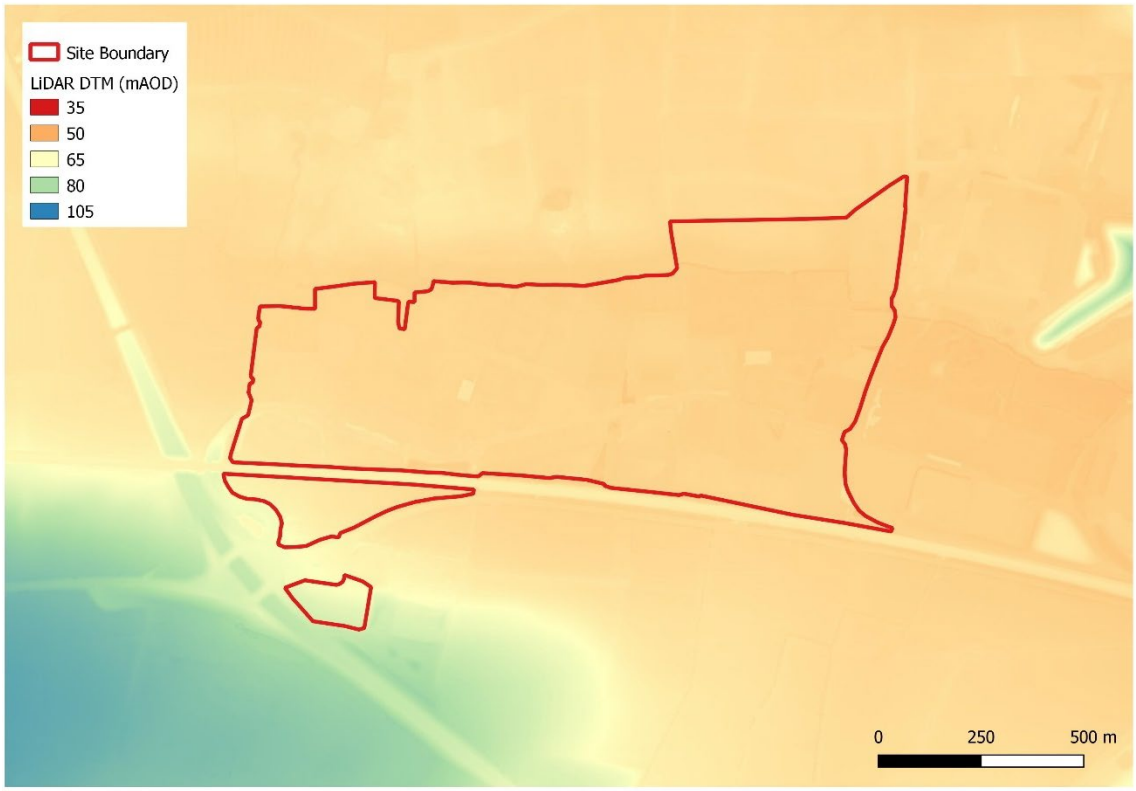


**Figure 4.1: LiDAR Topographic Data (1m DTM)**

## 4.2 Surface Water Features

There are various ordinary watercourses running through the site and these are shown on the Milton Park site drainage plans available from MEPC (Figure 4.2). There are two ordinary watercourses that pass under the railway. These then make their way through a variety of open channels and culverts to connect with the Moor Ditch running along the northern boundary of the site. There are also a number of 'lagoons' shown in the same figure which form part of a sustainable drainage strategy for the existing site.

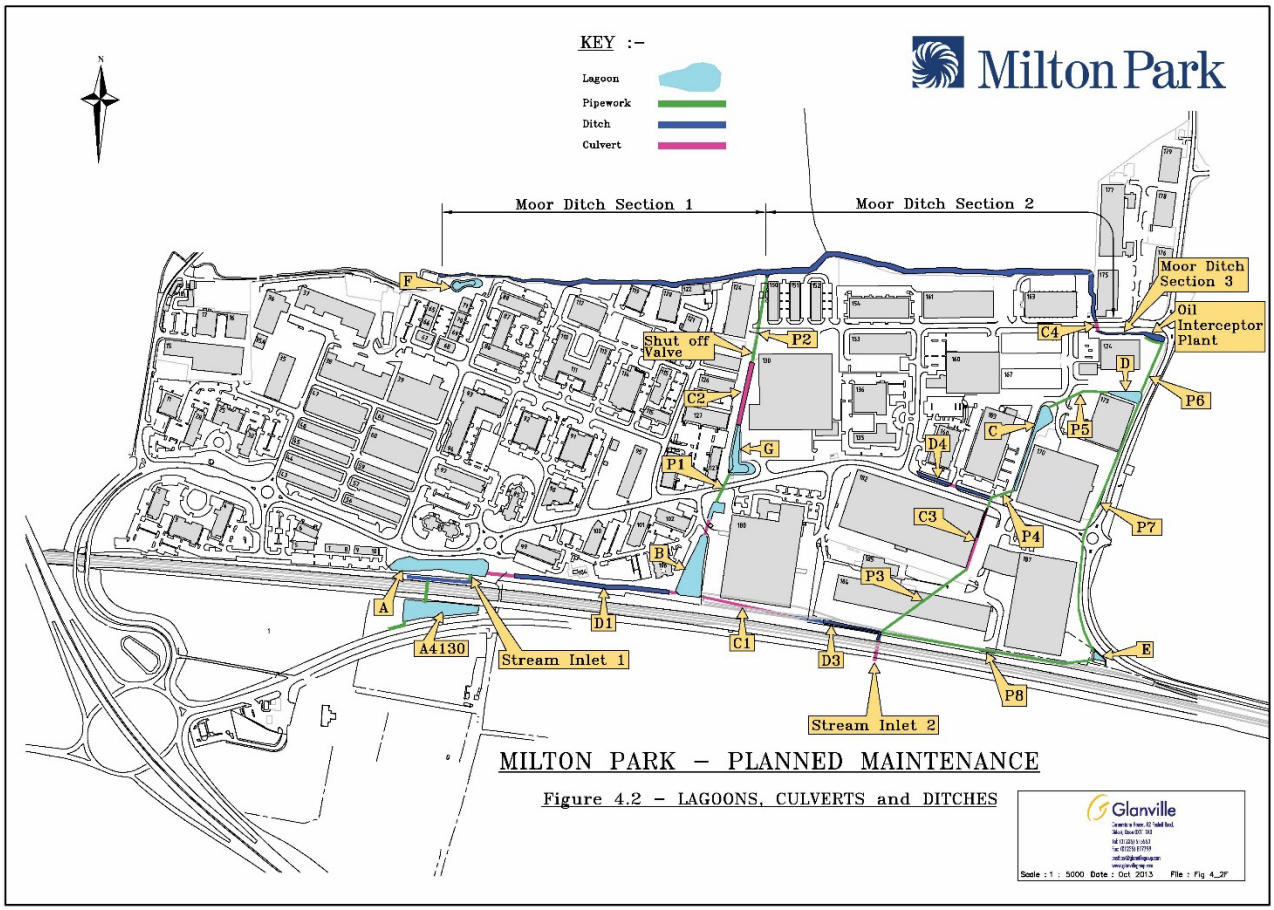


**Figure 4.2: Surface Water Features**

## 4.3 Flood Zone Classification

The entire site is located within Flood Zone 1 (Low probability) which represents land with less than a 1 in 1,000 (0.1%) annual probability of flooding from rivers or the sea as presented in Figure 4.3.

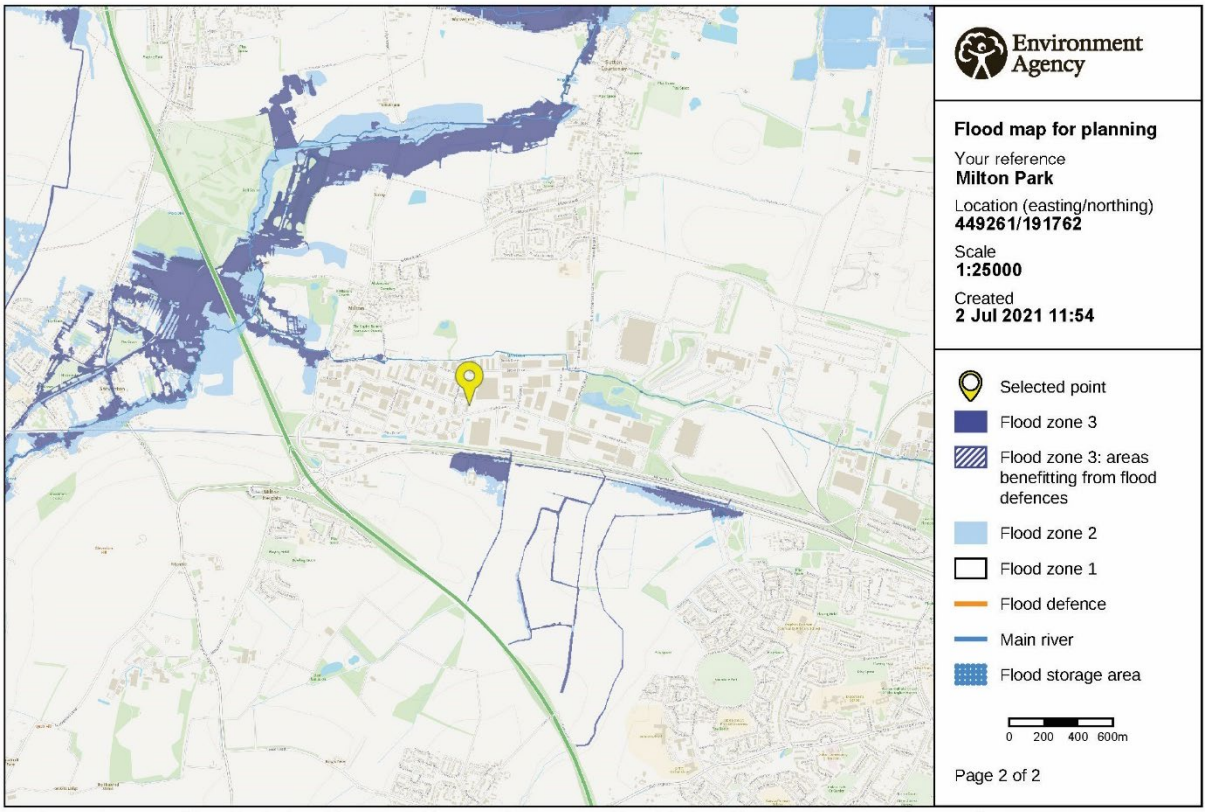




**Figure 4.3: EA Flood Zone Extents**

## 4.4 Historic Flood Records

The EA hold no records of historic flooding within the site boundary but there are records shown to the east and west. In their consultation response, South Oxfordshire and Vale of White Horse District Councils stated the following:

*"We have records of flooding on Pembroke Lane and High Street, Milton associated with flooding from the Moor Ditch. There are also records associated with flooding from the Ginge Brook in Steventon and ponding on the Milton Interchange roundabout close to the Wantage turn."*

The VoWHDC SFRA Sewer Flooding Map indicates two incidents of foul water sewer flooding in the wider OX14 4 post code area between the years of 1997 and 2007. It should be noted that the OX14 4 contains several villages as well as Milton Park. There is no more detailed information available on these incidents.

VoWHDC in consultation responses has also stated that Milton Park experienced flooding of yard areas in the past but no details on the precise locations, the dates, the extent, depths and velocities of this flooding has been provided. It is not clear why these records were not included in the SFRA.

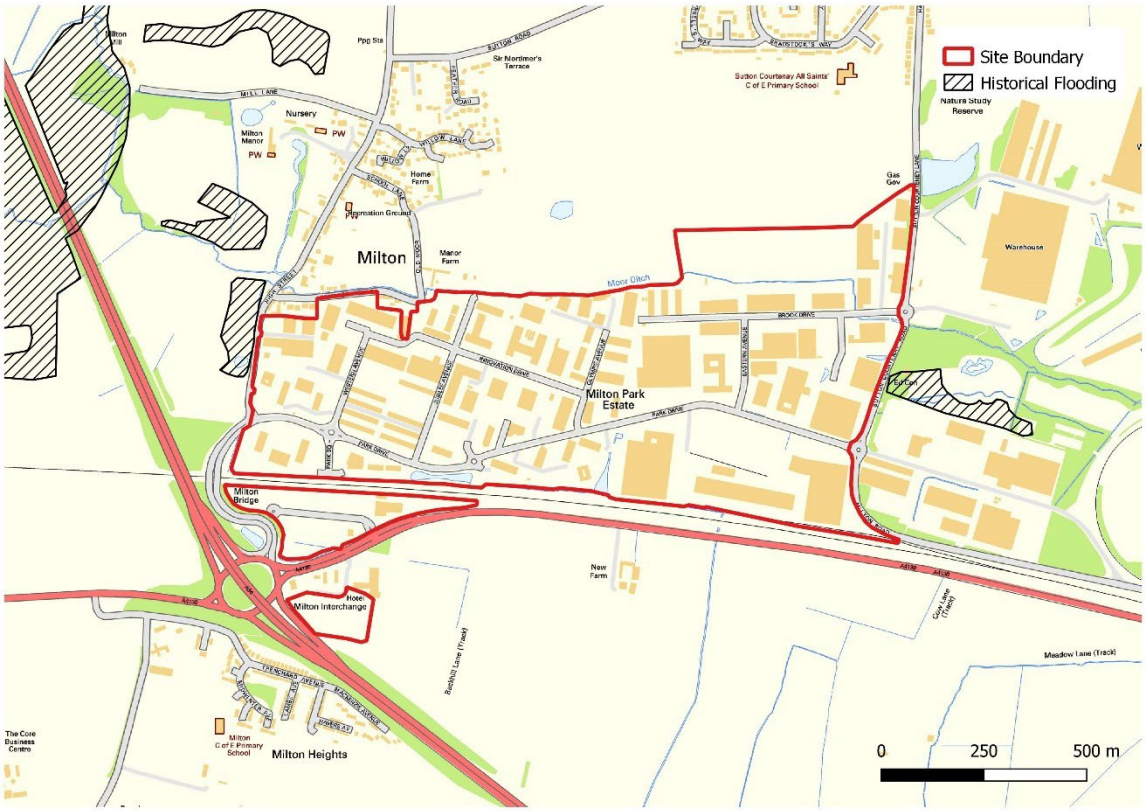


**Figure 4.4: Historic Flood Records**

## 4.5 EA Flood Map for Surface Water

As presented in Figure 4.5, the majority of land within the site boundary is at Very Low or Low risk of surface water flooding according to EA data. There are areas at medium risk of flooding, however, these would be areas incorporated within the drainage network for the redevelopment at which time risks from surface water would be addressed.

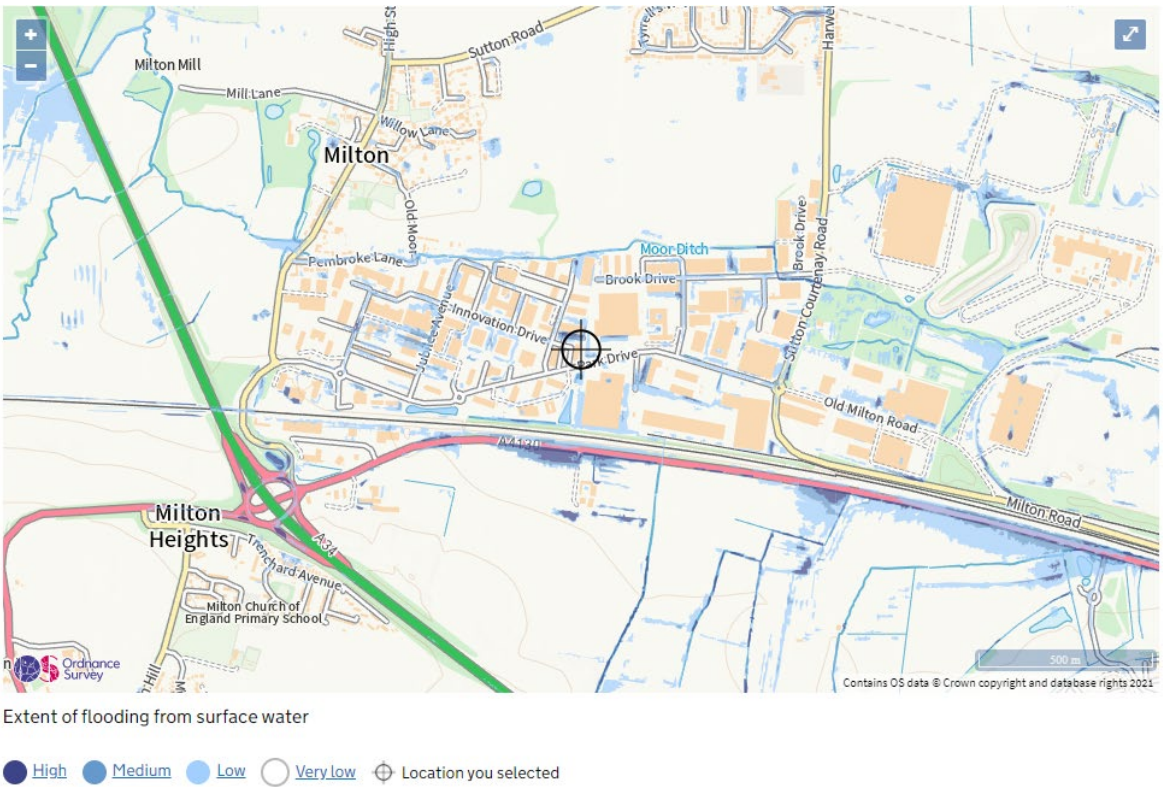


**Figure 4.5: Risk of Flooding from Surface Water**

## 4.6 Environment Agency Flood Map for Reservoirs

The site is not shown on EA mapping[9] to be at risk of flooding in the event of a reservoir failure.

## 4.7 Existing Surface Water Drainage

MEPC has provided drawings of drainage assets as presented in Figure 4.2. In particular, there are a number of lagoons on-site for the regulation of surface runoff. Inflows and outflows, lagoon dimensions and depths vary greatly or are not known. Thames Water plans are presented in Appendix 1.

[9] EA Long Term Flood Risk Mapping [Online] Available at: https://flood-warning-information.service.gov.uk/long-term-flood-risk

# 5. FLOOD RISK ASSESSMENT

## 5.1 Flooding Mechanisms

### 5.1.1 Tidal and Fluvial

The entire site is located within Flood Zone 1 (Low probability). VoWHDC has stated that historical flooding of the site has occurred in the past but has not provided sufficient detail in respect of these events to enable a full assessment of such risks. Although the data that has been reviewed would indicate the risk of flooding to be low, in order to take a precautionary approach, it is understood that mitigations measures have been requested by VoWHDC. Further details are provided in Section 5.2.

### 5.1.2 Pluvial (Surface Water)

The majority of the site is shown to be at Very Low risk of surface water flooding with some areas of Low and Medium risk. However, the EA's surface water flood risk does not take detailed account of existing surface water drainage assets which would be expected to reduce such risks. The proposed development would also be served by a surface water drainage network which would be designed to manage surface water flood risks.

## 5.2 Site Safety and Mitigation

Despite the lack of detailed evidence on historical flooding and the low probability of flooding identified from modelling, VoWHDC has requested that measures are implemented to safeguard against perceived risks that could occur in the future.

At this stage, the precise details of how the LDO would be implemented in terms of specific development areas and designs have not yet been designed. VoWHDC has stated that, where redeveloping land adjacent to Moor Ditch to the north of the site, an allowance for increasing the capacity/attenuation associated with this watercourse should be made to reduce local flood risks. VoWHDC goes on to suggest that overflow linked from Moor Ditch to a parallel swale within the proposed landscape buffer and/or an overflow linked from upstream of Old Moor Bridge to swales or an expanded pond in the landscape area to the south of Manor Farm are options.

Similarly, VoWHDC request that a "suitable buffer" be made around a pond to the south of Manor Farm. This is one of the lagoons incorporated within the site's existing sustainable drainage network.

The above concepts would need to be explored as part of the development of detailed designs for this area of the site. It would be necessary for any development to take suitable account of the site's existing and proposed drainage network (see Section 5.3) and identified flood risks. Without the detail of how potentially impacted plots are to be developed, it is impossible to assess flood risks to them nor commit to specific mitigation. However, the need for such measures would be identified and incorporated into designs as necessary, taking account of the overall balance of associated environmental risks e.g. avoiding significant excavation work, potentially exposing contaminated land issues, waste generation/disposal, noise, odour and carbon emissions where these are disproportionate.

The surface water drainage network (Section 5.3) which would be designed to serve the proposed development would ensure that there is no increased flood risk to the site or to surrounding land.

## 5.3 Surface Water Drainage Strategy

At present, the development layout has not been designed and details of potential impermeable/permeable areas are not available. Surface water drainage strategies will need to be developed to ensure surface water runoff meets the requirements of the LLFA. This is likely to entail ensuring post-development runoff is equivalent to greenfield rates and the use of SuDS to be incorporated. All SuDS would need to be designed to accommodate runoff from all events up to and including the 1 in 100 year rainfall event, including an allowance for climate change which is understood to be 40%.

Any new surface water drainage strategy would need to account for potential flood risks from watercourses entering the site from outside including that running through the south east section of Milton Park. Similarly the strategy would have to allow for buffers around lagoons, historical incidences of flooding on-site, previous capacity issues and the opening up of underground culverts where possible and appropriate.

# APPENDIX 1
# THAMES WATER PLANS