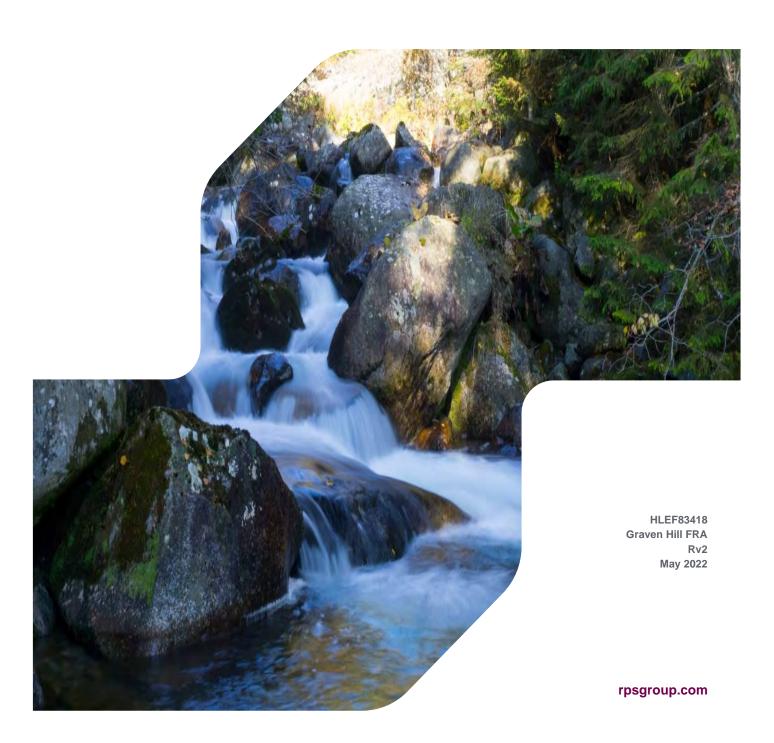


GRAVEN HILL, D1 SITE, BICESTER

Flood Risk Assessment Report



REPORT

Quality Management							
Version	Status	Authored by	Reviewed by	Approved by	Review date		
1	Draft	Anna Velkov	Jonathan Morley	Jonathan Morley	16/05/2022		

© Copyright RPS Group Plc. All rights reserved.

The report has been prepared for the exclusive use of our client and unless otherwise agreed in writing by RPS Group Plc, any of its subsidiaries, or a related entity (collectively 'RPS'), no other party may use, make use of, or rely on the contents of this report. The report has been compiled using the resources agreed with the client and in accordance with the scope of work agreed with the client. No liability is accepted by RPS for any use of this report, other than the purpose for which it was prepared. The report does not account for any changes relating to the subject matter of the report, or any legislative or regulatory changes that have occurred since the report was produced and that may affect the report. RPS does not accept any responsibility or liability for loss whatsoever to any third party caused by, related to or arising out of any use or reliance on the report.

RPS accepts no responsibility for any documents or information supplied to RPS by others and no legal liability arising from the use by others of opinions or data contained in this report. It is expressly stated that no independent verification of any documents or information supplied by others has been made. RPS has used reasonable skill, care and diligence in compiling this report and no warranty is provided as to the report's accuracy. No part of this report may be copied or reproduced, by any means, without the prior written consent of RPS.

Prepared by:	Prepared for:
RPS Consulting Services Ltd	Graven Hill Purchaser Ltd
20 Farringdon Street London, EC4A 4AB	

Contents

1	INTRODUCTION	1
2	PLANNING POLICY CONTEXT	2
3	SITE DESCRIPTION	5
4	PROPOSED DEVELOPMENT	8
5	CONSULTATIONS AND REGULATORY INFORMATION	9
6	FLOOD RISK AND MITIGATION	
7	SEQUENTIAL TEST	17
8	SUMMARY AND CONCLUSIONS	18
Tab		
Table	e 1. Vulnerability of Proposed Uses	8
Table	e 1. Proposed mitigation	18

Appendices

Appendix A Topographical Survey

Appendix B LPA Response

Appendix C Development Plans

Appendix D Hydraulic Modelling Report (provided separately)

1 INTRODUCTION

- 1.1 RPS was commissioned to prepare a Flood Risk Assessment to support the planning application for a demolition of existing buildings, development of B8 'Storage or Distribution' use comprising up to 104,008 sq. m (GIA), creation of open space and associated highway works, ground works, sustainable drainage systems, services infrastructure and associated works at land parcel located at the former Ministry of Defence (MoD) site at Graven Hill, Bicester.
- 1.2 It is noted that the site benefits from Outline Planning Permission (ref: 11/01494/OUT), which was Granted on 8th August 2014 (as well as subsequent consents).
- 1.3 The aim of this assessment is to outline the potential flood risk issues affecting the site and the implications for future development. The feasibility of the proposed use is assessed, and potential mitigation measures or requirements for additional work are identified, where appropriate.
- 1.4 The report has been produced in accordance with the guidance detailed in the National Planning Policy Framework (NPPF) and the associated Planning Practice Guidance (PPG). Reference has also been made to the CIRIA SuDS manual (C753), and the Cherwell District Council Strategic Flood Risk Assessment (SFRA).
- 1.5 This report has been produced in consultation with the Environment Agency (EA), Cherwell District Council (CDC) as Local Planning Authority (LPA) and Oxfordshire Council as Lead Local Flood Authority (LLFA). The site is not located within an Internal Drainage Board (IDB) District.
- 1.6 The desk study was undertaken by reference to information provided / published by the following bodies:
 - Environment Agency (EA);
 - Local Planning Authority (LPA);
 - British Geological Survey (BGS);
 - Ordnance Survey (OS); and
 - Thames Water (TW).

HLEF83418 | Rv2 | Graven Hill | May 2022

2 PLANNING POLICY CONTEXT

National Planning Policy

- 2.1 The National Planning Policy Framework (NPPF) was released in March 2012 and was updated in July 2021. The document advises of the requirements for a site-specific Flood Risk Assessment (FRA) for any of the following cases (Planning and Flood Risk paragraph 167 (footnote 55)):
 - All proposals (including minor development and change of use) located within the EA designated floodplain, recognised as either Flood Zone 2 (medium probability) or Flood Zone 3 (high probability);
 - All proposals of 1 hectare (ha) or greater in an area located in Flood Zone 1 (low probability);
 - All proposals within an area which has critical drainage problems (as notified to the Local Planning Authority by the EA);
 - Land identified in a strategic flood risk assessment as being at increased flood risk in future;
 and
 - Where proposed development may be subject to other sources of flooding, where its development would introduce a more vulnerable use.
- 2.2 Paragraph 169 of the updated NPPF identifies that major developments (developments of 10 homes or more and to major commercial development) should incorporate Sustainable Drainage Systems unless there is clear evidence that this would be inappropriate. The systems used should:
 - Take account of advice from the Lead Local Flood Authority;
 - b. Have appropriate proposed minimum operational standards;
 - c. Have maintenance arrangements in place to ensure an acceptable standard of operation for the lifetime of the development; and
 - d. Where possible, provide multifunctional benefits.
- 2.3 Defra published their 'Non-statutory technical standards for sustainable drainage systems' in March 2015. The document sets out non-statutory technical standards for sustainable drainage systems and should be read in conjunction with the revised NPPF. The non-statutory technical standards advise the following:

Flood Risk Outside the Development

S1 Where the drainage system discharges to a surface water body that can accommodate uncontrolled surface water discharges without any impact on flood risk from that surface water body (e.g. the sea or a large estuary) the peak flow control standards (S2¹ and S3 below) and volume control technical standards (S4 and S6) need not apply.

Peak Flow Control

S3 For developments which were previously developed, the peak runoff rate from the development to any drain, sewer or surface water body for the 1 in 1 year rainfall event and the 1 in 100 year rainfall event must be as close as reasonably practicable to the greenfield runoff rate from the development for the same rainfall event, but should never exceed the rate of discharge from the development prior to redevelopment for that event.

-

HLEF83418 | Rv2 | Graven Hill | May 2022

¹ SE2, SE4 and SE6 relate to greenfield developments

Volume Control

S5 Where reasonably practicable, for developments which have been previously developed, the runoff volume from the development to any highway drain, sewer or surface water body in the 1 in 100 year, 6 hour rainfall event must be constrained to a value as close as is reasonably practicable to the greenfield runoff volume for the same event, but should never exceed the runoff volume from the development site prior to redevelopment for that event.

Flood Risk within the Development

S7 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur on any part of the site for a 1 in 30 year rainfall event.

S8 The drainage system must be designed so that, unless an area is designated to hold and/or convey water as part of the design, flooding does not occur during a 1 in 100 year rainfall event in any part of: a building (including a basement); or in any utility plant susceptible to water (e.g. pumping station or electricity substation) within the development.

S9 The design of the site must ensure that, so far as is reasonably practicable, flows resulting from rainfall in excess of a 1 in 100 year rainfall event are managed in exceedance routes that minimise the risks to people and property.

Local Planning Policy

- As part of the Oxfordshire Housing and Growth Deal agreement with the Government, the six Oxfordshire authorities Cherwell District Council, Oxford City Council, Oxfordshire County Council, South Oxfordshire District Council, Vale of White Horse District Council and West Oxfordshire District Council have committed to producing a joint statutory spatial plan (JSSP), known as the Oxfordshire Plan 2050.
- 2.5 The Adopted Cherwell Local Plan 2011-2031 (Part 1) contains strategic planning policies for development and the use of land. It forms part of the statutory Development Plan for Cherwell to which regard must be given in the determination of planning applications. The Plan was formally adopted by the Council on 20 July 2015. Policy Bicester 13 was re-adopted on 19 December 2016.
- 2.6 Cherwell Local Plan contains the following Policies relating to flood risk and drainage:

Policy ESD 6:

Sustainable Flood Risk Management: The Council will manage and reduce flood risk in the District through using a sequential approach to development; locating vulnerable developments in areas at lower risk of flooding. Development proposals will be assessed according to the sequential approach and where necessary the exceptions test as set out in the NPPF and NPPG. Development will only be permitted in areas of flood risk when there are no reasonably available sites in areas of lower flood risk and the benefits of the development outweigh the risks from flooding.

Site specific flood risk assessments will be required to accompany development proposals in the following situations:

- All development proposals located in flood zones 2 or 3
- Development proposals of 1 hectare or more located in flood zone 1
- Development sites located in an area known to have experienced flooding problems
- Development sites located within 9m of any watercourses

Policy ESD 7:

Sustainable Drainage Systems (SuDS) All development will be required to use sustainable drainage systems (SuDS) for the management of surface water run-off.

2.7 The Cherwell District Council Level 1 Updated SFRA (May 2017) identifies and maps flood risk from sources at a district-wide scale as well as providing guidance on producing site specific FRAs. Relevant information from the SFRA has been referenced throughout this flood risk scoping report.

3 SITE DESCRIPTION

Site Description

3.1 The redline boundary of the site including parts D1 and EL1 is delineated in the map below. The site is irregular in shape, centred on National Grid Reference SP 59318 19645 and occupies an area of approximately 30.5 hectares (ha). The site is located approximately 3.5km south of Bicester Town Centre and 1 km to the north west of Ambrosden Centre and Sites D1 & EL1 are located to the south of Graven Hill. Site D1 constitutes the majority of the land and Site EL1 represents a much smaller parcel of land at the northeast corner. The site location is presented in Figure 1.



© Crown copyright and database rights 2020 OS 100024198. Use of the address and mapping data is subject to the terms and conditions.

Figure 1. Site Location

- 3.2 The site was previously occupied by the Ministry of Defence (MoD). Currently the site comprises five large vacant warehouses (Unit D1, Unit D2, Unit D4, Unit D7, Unit D10 & D20, the latter being the sub-station). and associated hardstanding areas for vehicles.
- 3.3 Existing vehicular access to the site is from Anniversary Avenue / Pioneer Road via an internal access road.
- 3.4 It appears that the site is currently occupied by approximately 60% soft landscaping (landscaped grassland) and 40% hardstanding and building footprint.

Surrounding Land Uses

3.5 The site is surrounded by agricultural land to the south east and south west. A solar panel farm is situated immediately to the south of the site, and the Graven Hill Woods are to the north of the site.

Topography

A topographical survey of the site was undertaken in May 2020. The survey indicates that ground levels along Anniversary Avenue to the north of the site are between 69m AOD and 71m AOD. The site is sloping southwards with an elevation of approximately 65m AOD in the centre of the site, dropping down to 61.5m AOD in the south corner of the site. An indicative OS mapping is presented in Figure 2 below, and the topographical survey is in Appendix A

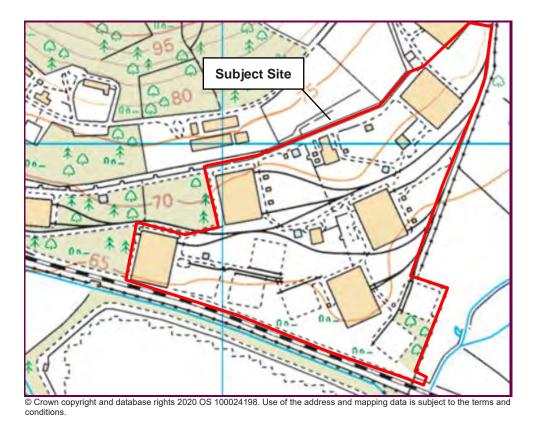


Figure 2. OS Map

Hydrological Setting

- 3.7 Reference to OS Mapping indicates that the nearest surface water feature is Langford Brook (Including Gagle Brook) which flows in southerly direction at about 800m to the west of the site. The Brook is classified as 'Main River' (regulated by the Environment Agency).
- 3.8 There are few drains/watercourses located to the south of the site. One of the drains is flowing along the south west boundary of the site. Another one is parallel to the south east border of the site, situated at a distance of about 200m in the north east and getting closer, at about 60m towards the south corner of the site. These drains are classed as 'Ordinary Watercourses' (regulated by the Local Authority). This was confirmed by the Building Control Manager of Cherwell District Council Tony Brummell, who stated that "I can confirm that the ditches you have marked in blue are Ordinary Watercourses and thus fall under the control of the Local Authority." The full response is presented in Appendix B.
- 3.9 A small pond is present approximately 500 m to the south east of the site.
- 3.10 No significant artificial watercourses (e.g. canals) have been identified within 1 km of the site.

Hydrogeological Setting

- 3.11 British Geological Survey (BGS) online mapping (1:50,000 scale) has no records of the Superficial deposits under the site. The areas surrounding the site have superficial deposits of Alluvium Clay, Silt, Sand and Gravel. The site is underlined by bedrock of Peterborough Member Mudstone, Sedimentary Bedrock.
- 3.12 BGS Borehole data records (SP52SE72 and SP52SE73) indicates the following:
 - Dark brown topsoil with silty clay beneath;
 - Water entry between 1.7m and 2.40m.
- 3.13 The soils are described as 'Slowly permeable seasonally wet slightly acid but base-rich loamy and clayey soils' by the National Soils Research Institute.
- 3.14 The bedrock beneath the superficial deposits are characterised as being unproductive strata defined as soluble rock.
- 3.15 EA online groundwater Source Protection Zone (SPZ) mapping indicates that the site is not located within a groundwater SPZ.

Environmental Setting

3.16 There are no designated sensitive areas (e.g. Special Area of Conservation (SAC), or Special Protection Area (SPA) within close proximity to the site. Two Sites of Special Scientific Interest (SSSI) are located at 1.5km south east and 3.5km south west of the site respectively.

HLEF83418 | Rv2 | Graven Hill | May 2022

4 PROPOSED DEVELOPMENT

- 4.1 The proposal comprises development totalling approx. 104,008 sq. m (GIA) of logistics-led floorspace (1,119,529 sq. ft) at the site. The indicative Masterplan (provided in Appendix C) demonstrates how this floorspace could be provided across 9 separate units (Units 1-9). Approximately 902 parking spaces would be provided, including HGV parking yards associated with the Logistics Units as well as disabled parking. These could be arranged in a variety of layouts to best respond to market demand as well as site constraints. This will also include the associated access roads, loading areas, infrastructure and tertiary buildings on the vacant brownfield site.
- The total site area is approximately 30.5 ha. The proposed impermeable area of approximately 23.9 ha comprises 10.4 ha of roofed area and 13.5 ha of paved area.
- 4.3 The site will be accessed from Anniversary Avenue to the north. Buildings within the site will be accessed from an internal network of roads.
- 4.4 The vulnerability classifications (in accordance with the PPG) of the proposed uses are provided in Table 1 below.

Table 1. Vulnerability of Proposed Uses

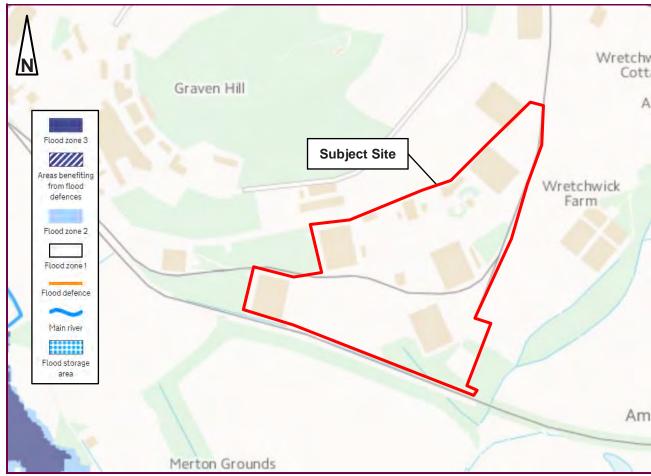
Proposed Use	Vulnerability		
Employment Land/Logistics Use	Less vulnerable		
Green Space	Water compatible		

HLEF83418 | Rv2 | Graven Hill | May 2022

5 CONSULTATIONS AND REGULATORY INFORMATION

Fluvial / Tidal Flood Risk Classification

5.1 The EA Flood Map for Planning, which is available online, indicates that the site is located within Flood Zone 1, whereby the annual probability of flooding from fluvial or tidal sources is classified as less than 1 in 1,000. The EA Flood Map for Planning is provided in Figure 3.



© Crown copyright and database rights 2020 OS 100024198. Use of the address and mapping data is subject to the terms and conditions.

Figure 3. EA Flood Map for Planning

5.2 Although the site is located within Flood Zone 1, the EA has been contacted with request for information for the flood history in the area and any other flood related issues at the site. In their response from 16.11.2020 the EA have confirmed that they do not have any detailed flood risk modelling in this location and therefore they are unable to provide modelled flood levels and extents for the site.

EA Flood Warning Area

- 5.3 The EA defines a Flood Warning Area as "geographical areas where we expect flooding to occur and where we provide a Flood Warning Service. They generally contain properties that are expected to flood from rivers or the sea and in some areas, from groundwater."
- 5.4 The site is not located in a Flood Warning Area.

rpsgroup.com

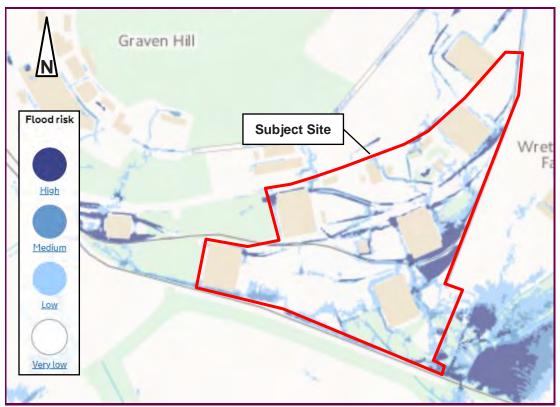
Flood Modelling

- As mentioned above, there are two watercourses/drains designated as Ordinary Watercourses which flow along the south west and south east boundary of the site, and join upstream the culvert under the railway near the south corner of the site. The LLFA was consulted, and they have confirmed that the watercourse should be hydrologically modelled in order to assess the risk of flooding to the site from this source. RPS has undertaken hydrological modelling of the two watercourses, which is detailed in full in the Graven Hill hydraulic modelling report reference HLEF82585 (see Appendix D).
- 5.6 The model was run for the 1 in 20, 1 in 100 and 1 in 100 year fluvial event plus 15% climate change allowances, which is the required climate change allowance for the Cherwell and Ray Management Catchment in the River Thames Basin District.
- 5.7 The modelling results indicate that for all modelled return periods the water in the south- west ditch remains within banks. Whilst the capacity of the culverts along the ditch is exceeded, the water overtopping the culverts still remains within the extent of the channel profile.
- With regards to the watercourse running to the south-east of the site, the results indicate that water overtops the riverbanks along a 180m stretch of the stream upstream the railway culvert and the maximum predicted water levels for the 1 in 100 and 1 in 100 +CC flood events are 62.4m AOD and 62.3m AOD respectively. However, it is noted that these are in-channel water levels resulting from a 1D model. The model doesn't take into account the loss of momentum and volume of water once it spills into the floodplain. In reality the flood level into the floodplain will be considerably lower, the flooding will be shallow and is not expected that it will extend much and reach the site boundary which is 60m to the north west of the watercourse.
- In order to demonstrate the above, a quick estimate was performed for the volume of water, during the 1 in 100+CC event, above the bank level between the cross section RS20 (the location where the flow starts to overflow the banks) and RS22, just upstream of the culvert. This volume was estimated to be approximately 400m³. Considering that it will spill over both banks, the volume spilling onto the floodplain between the watercourse and the Site is expected to be approximately 200m³. The area enclosed between this river reach and the site was measured to be approximately 8,300m². Such an area can accommodate 200m³ volume at 0.02m depth. Considering that the flood depth would be bigger near the watercourse, it could be concluded that the floodplain is big enough to accommodate the water overtopping the banks of the watercourse, without reaching the site boundaries. 2D hydraulic modelling will be performed at the design stage to further demonstrate that the development site is not at risk of fluvial flooding from this source.
- 5.10 In addition, it was noted during the site visit that when joining upstream of the culvert the watercourses form a small pond which to some extent will accommodate the excess water resulting from the insufficient capacity of the culvert. This is illustrated in the photographs below.
- 5.11 Based on the above, it could be concluded that whilst the capacity of the culvert under the railway will be exceeded during the modelled flood events and it will create a backup effect upstream the watercourse, it is not expected that the floodplain will reach the site boundary and flood the site.
- The long section profiles of the watercourses and the predicted water levels for the different events are presented into the modelling report (Appendix D).



Surface Water Flood Risk Classification

- 5.13 The EA's updated Flood Map for Surface Water, which is available online, indicates that a large area in the south east of the site is at high risk of surface water flooding. In addition, there are several localised linear areas, associated with existing rail tracks within the site, which are at low to high risk of flooding from surface water.
- During a 1 in 100 year rainfall event, the majority of the site would be unaffected by surface water flooding and the linear areas across the site which are at risk of flooding will be flooded with depth of approximately 300mm. However, the area in the south east of the site will be flooded with depth of between 300mm and 900mm and at places exceeding 900mm. During a 1 in 1000 year event (which can be considered as a proxy for the 1 in 100 year plus climate change event) the flood outline is slightly wider, but the flood depths remain in the same magnitude for the respective areas. The updated Flood Map for Surface Water is presented in Figure 4.



© Crown copyright and database rights 2020 OS 100024198. Use of the address and mapping data is subject to the terms and conditions.

Figure 4. Updated Flood Map for Surface Water

5.15 It is noted that there is a large area to the south east and outside the site boundary, which is at 'high' risk of surface water flooding. This is associated with a defined flow path which follows the drain present at this location. The area at 'high' risk of flooding is in topographical low in comparison to the site and is separated from the site with raised strip of land. Therefore, it is not considered that it presents a flood risk to the site.

Reservoir Flood Risk Classification

5.16 EA mapping also indicates that the site is not located within an area potentially at risk from reservoir flooding.

Local Authority Flood Risk Assessment

- 5.17 The Cherwell District Council (CDC) Updated SFRA was published in May 2017. It provides an overview of flood risk from various sources within the District. Information relevant to this assessment is summarised below:
 - The predominant risk of flooding within the CDC boundary is from rivers (fluvial flooding).
 - The SFRA states that there has been a total of 973 flood incidents in the district related to pluvial flood sources reported; however, this does not denote the specific types of pluvial flooding (i.e. surface water, highway, and drainage). Notwithstanding the above RPS notes that none of the reported incidents are recorded at or in close proximity to the site. Extract of the historic flood map is presented in Figure 5 below. The areas with red contour represent the Level 1 SFRA Sites, and the areas in yellow indicate the EA historic flood.
 - One of the key issues with pluvial flooding is that even in areas with no history of surface water flooding, relatively small increases in usage of impermeable hard surfacing and surface gradients can cause flooding (garden loss and reuse of brownfield sites for example).

- The site is in an area with no reported historic flooding incidents by the EA of the Canal and River Trust.
- The site is located in an area with 5 to 10 sewer flooding incidents recorded by TW DG5 register². None of these incidents are recorded close to the site.
- The site is located within an area which is defined as being at >=50%,<75% susceptibility of groundwater flooding.

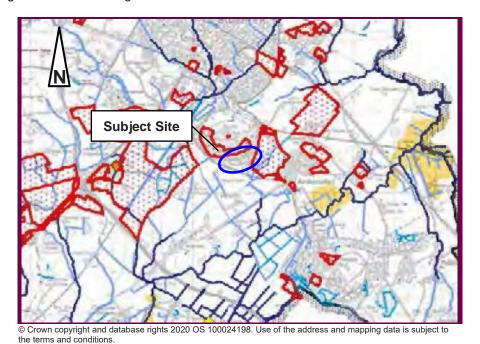


Figure 5 - Map of historic flood incidents

Lead Local Flood Authority / Local Planning Authority

- 5.18 The site is within the administrative boundary of Cherwell District Council. Consultation has been undertaken with the Council regarding surface water management schemes and acceptable surface water run-off rates. The Building Control Manager at Cherwell District Council, (Tony Brummell) has advised the following:
 - The ground in this locality is highly impermeable and there is clearly a surface water flood risk. When operating as a military establishment this risk was reduced by cutting deep wide drainage ditches. As far as the Council is aware these were generally well maintained by the military and they are not aware of any historic flooding. That said, Graven Hill was a restricted site and the Council would probably not have known if there had been flooding.
 - It is essential that these drainage ditches are retained, or if needing to be diverted, are replaced by ditches or culverts with no less conveyance capacity.
 - It is suggested that the flood risk assessment is approached on an incremental basis. A
 comparison of the proposed impermeable area with the existing at the site would inform the

.

²A water-company held register of properties which have experienced sewer flooding due to hydraulic overload

- approach to the Flood Risk Assessment. If impermeable area is increasing, the Council would expect attenuation to be provided according to the greenfield rate.
- The Council is not aware of any hydraulic modelling that has been done for this site, and they would expect one to support your Flood Risk Assessment.

Water Authority

- 5.19 The sewer network in the wider area surrounding the site is operated by Thames Water. Thames Water was consulted for any available flood history and drainage network information at the site. TW have confirmed that according to their flooding records there have been no incidents of flooding in the requested area as a result of surcharging public sewers.
- In addition, Drainage and Water search was undertaken by Farrer & Co in November 2020.

 According to the information provided by TW foul sewer trunk are running along the south west and south east periphery of the site. There are three connections from the buildings within the site to the foul sewer network. It is likely that the remaining buildings within the site boundary are served by a local drainage system but no drainage plans were available at the time of the assessment.

Internal Drainage Board

5.21 The site is not located within an IDB District.

FLOOD RISK AND MITIGATION 6

6.1 The key flood risk implications for the development are discussed below. Key recommendations are underlined for clarity.

Fluvial / Tidal Flooding

- 6.2 The EA Flood Map for Planning, as seen in Figure 2, indicates that the site is located within Flood Zone 1. The annual probability of flooding is classified as less than 1 in 1,000 in the absence of any defences.
- 6.3 Hydraulic modelling was undertaken for two ordinary watercourses running along the south-west boundary of the site and to the south east of the site respectively. The modelling results predict that the site would not be flooded from these watercourses during the 1 in 100 +15% CC allowance design flood event.
- 6.4 Overall, the proposed development is determined to be at low risk of flooding from fluvial sources.

Surface Water Flooding (Overland Flow)

- 6.5 This can occur during intense rainfall events, when water cannot soak into the ground or enter drainage systems.
- 6.6 According to the information outlined within Section 5, the surface water flood risk map shows that there is a large area in the south east part of the site, immediately to the south of one of the existing buildings, which is indicated to be at high risk of surface water flooding. This is not associated with any ordinary watercourse, but rather with water following the topography of the site and ponding in lower areas. Currently this area is not occupied, and it appears that the overland flow is blocked by the existing building to the north and the raised level of the rail embankments crossing the site. The predicted flood depth at this location at places exceeds 900mm during both 1 in 100 and 1 in 100 plus climate change storm events.
- 6.7 The linear areas throughout the site, which are also indicated to be at medium to high risk of surface water flooding also appear to be related to lower topography, where the overland flow is stopped by the railway embankments and ponds in these areas. The predicted depth of flooding at these locations is predominantly between 300mm and 900mm. However, providing that these areas are immediately surrounded by depth of up to 300mm, it is likely that overall, the depth is around the 300mm mark.
- 6.8 According to the information provided by the Cherwell District Council, the previous owners of the site (MoD) have cut deep wide drainage ditches across the site to mitigate the risk of surface water flooding. The Council are not aware of any historic flooding at the site; however, as military site, Graven Hill is a restricted site and it is possible that even if flooding had occurred in the past, this information has not been provided to the authorities.
- 6.9 It is noted that the provided indicative layout plan indicates that two buildings are proposed in the area at high risk of surface water flooding. However, the site will be levelled up during construction, and the lower topographic spots at this location, where the surface water runoff is ponding, will be eliminated. To compensate for the displaced flood volume, the drainage strategy (report ref "Draft ABA SuDS Note for Planning - 21-04-22") proposes, amongst the other SuDS features, several attenuation basins across the site which will provide sufficient volume to compensate for the displaced water and mitigate the risk of surface water flooding at the site. These measures will ensure that the proposed buildings will not be at risk of flooding, and do not increase the flood risk elsewhere.
- 6.10 With the exception of the linear areas along the railway tracks and the area in the south east corner of the site, the majority of the rest of the site is indicated to be at a 'very low' and 'low' surface water

flood risk, associated mainly with areas prone to ponding. As stated above, redevelopment of the site and the installation of the proposed surface water drainage scheme are likely to control this.

Flooding from Sewers

- 6.11 Sewer flooding can occur during periods of heavy rainfall when a sewer becomes blocked or is of inadequate capacity. The site is currently served by Thames Water, and they have advised that no record of sewer flooding have been recorded in the vicinity of the site. The SFRA also confirms that there are no sewer flooding records at or in the vicinity of the site.
- Overall the risk of sewer flooding at the site is considered to be low.

Groundwater Flooding

6.13 This can occur in low-lying areas when groundwater levels rise above surface levels, or within underground structures. The SFRA states that the site is located within an area which is defined as being at >=50%,<75% susceptibility of groundwater flooding. However, no basements are proposed at the site and the elevation of ground floor levels by 150mm is likely to mitigate the risk of groundwater flooding.

Other Sources of Flooding

- 6.14 There is a limited risk of flooding occurring as a result of a break in a water main. In the event of a burst in a water main, water is likely to follow the topography of the area and flow into the proposed attenuation basins and swales. The risk of flooding associated with reservoirs, canals and other artificial structures is considered to be low given the absence of any such structures in the site vicinity.
- 6.15 EA mapping indicates that the site is not located within an area potentially at risk from reservoir flooding.

Finished Floor Levels

6.16 In accordance with Building Regulations, it is generally considered good practice to raise the ground floor levels of all properties, even those located outside the flood risk areas, at least 150mm above external site levels and / or to ensure that external ground levels slope away from building thresholds.

rpsqroup.com

Page 16

7 SEQUENTIAL TEST

- 7.1 The NPPF requires the Local Authority to apply the Sequential Test in consideration of new development. The aim of the Test is to steer new development to areas at the lowest probability of flooding. The site is identified as being within the wider 'Policy Bicester 2: Graven Hill' from the Adopted Cherwell Local Plan 2011-2031, and therefore it is identified as a strategic or allocated site.
- 7.2 In addition, the proposed development is in Flood Zone 1 and is at low risk of fluvial flooding. There is identified localised risk of surface water flooding at the site. However, as the surface water flood is mainly related to ponding in lower topography points, redeveloping of the site would help alleviate the flood risk in these areas as result of on-site surface water attenuation.
- 7.3 No significant risks have been identified in relation to other sources of flooding.
- 7.4 The development is classified as "Less vulnerable" and according to "flood risk vulnerability and flood zone 'compatibility' (NPPF, Table 3), "Less vulnerable" developments are permitted in all zones (Except Zone 3b) without a requirement for Exception Test. The development is therefore considered to meet the requirements of the Sequential Test.

8 SUMMARY AND CONCLUSIONS

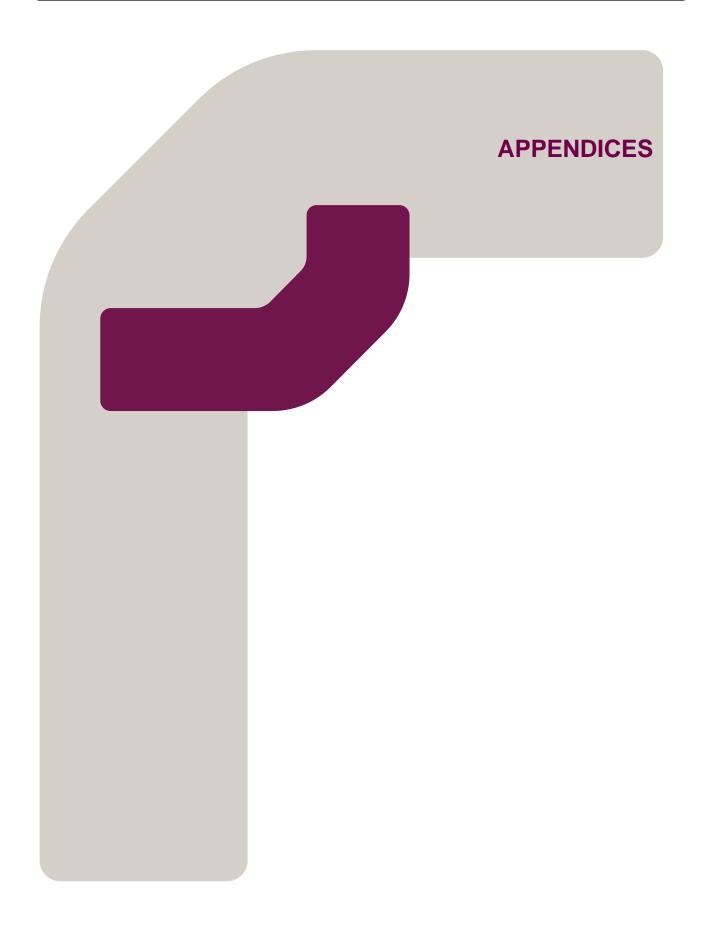
- 8.1 The aim of the FRA is to outline the potential for the site to be impacted by flooding, the potential impacts of the development on flooding both onsite and in the vicinity, and the proposed measures which can be incorporated into the development to mitigate the identified risks. The report has been produced in accordance with the guidance detailed in the NPPF. Reference has also been made to the CIRIA SUDS manual (C753), the SFRA and the PFRA and following consultation with the LLFA.
- The potential flood risks to the site, and the measures proposed to mitigate the identified risks, are summarised in Table 1.

Table 2. Proposed mitigation

Source of Flooding	lden	tified	Risk	Mitigation Proposed	Residual Risk		
	L	M	Н	·	L	М	Н
Fluvial	✓			None considered to be required	✓		
Tidal (actual)	✓				✓		
Sewers	~				✓		
Surface Water		✓		Installation of a surface water drainage scheme and raising the floors by 150mm above ground	✓		
Groundwater	~			None considered to be required			
Other Sources (e.g. reservoirs, water mains)	✓						

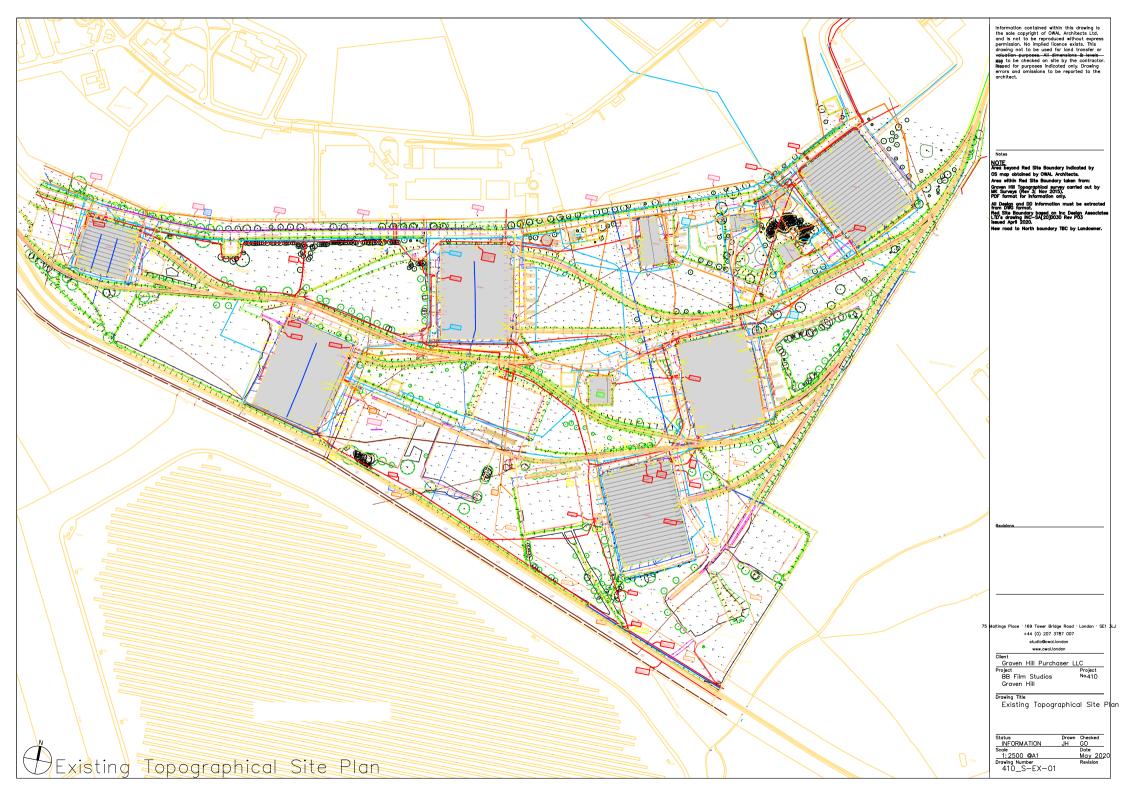
- 8.3 The site is located in Flood Zone 1 which corresponds with an annual risk of fluvial/tidal flooding that is less than 1 in 1000. The surface water flood mapping indicates that parts of the site are at risk of surface water flooding. However, the areas indicated to be at risk of flooding are associated with water ponding in lower topographical spots, and redevelopment of the site including the installation of the proposed surface water drainage scheme will alleviate this.
- 8.4 No flood risk has been identified from any of the other sources assessed.
- 8.5 It has been demonstrated that the development meets the Sequential Tests imposed under the NPPF.
- 8.6 Overall, it has been demonstrated that the development would be safe, without increasing flood risk elsewhere.

HLEF83418 | Rv2 | Graven Hill | May 2022



Appendix A

Topographical Survey



Appendix B

LPA Response

Anna Velkov

From: Tony Brummell <Tony.Brummell@Cherwell-DC.gov.uk>

Sent: 26 October 2020 07:04

To: Anna Velkov

Subject: Land at Graven Hill Bicester

Follow Up Flag: Follow up Flag Status: Flagged

CAUTION: This email originated from outside of RPS.

I have received your enquiry of 14 October.

I agree that the site is in Flood Zone 1. However, the ground in this locality is highly impermeable and there is clearly a surface water flood risk. When operating as a military establishment this risk was reduced by cutting deep wide drainage ditches. So far as we are aware these were generally well maintained by the military and we are not aware of any historic flooding. That said, Graven Hill was a restricted site and we would probably not have known if there had been flooding.

It is essential that these drainage ditches are retained, or if needing to be diverted, are replaced by ditches or culverts with no less conveyance capacity.

I would suggest you approach assessing flood risk on an incremental basis. Are you able to compare your proposed impermeable area with the existing at the site? That would inform your approach to the Flood Risk Assessment. If increasing, we would expect attenuation to be provided according to the greenfield rate.

I am not aware of any hydraulic modelling that has been done for this site. I would expect one to support your Flood Risk Assessment.

Tony Brummell MSc CEng FICE FCIWEM MCIHT MCMI Building Control Manager

Cherwell Building Control Service
Place and Growth Directorate
Cherwell District Council

Direct Dial: 01295 221909

tony.brummell@cherwell-dc.gov.uk

www.cherwell.gov.uk

www.facebook.com/cherwelldistrictcouncil

Twitter @Cherwellcouncil

Coronavirus (COVID-19): In response to the latest Government guidance and until further notice, the Building Control Service has been set up to work remotely from home. Customers are asked not to come to Bodicote House but instead to phone or email the Building Control Service on 01295 227006: building.control@cherwell-dc.gov.uk. For the latest information about how the Building Control Service is impacted by COVID-19, please check the website: www.cherwell-dc.gov.uk

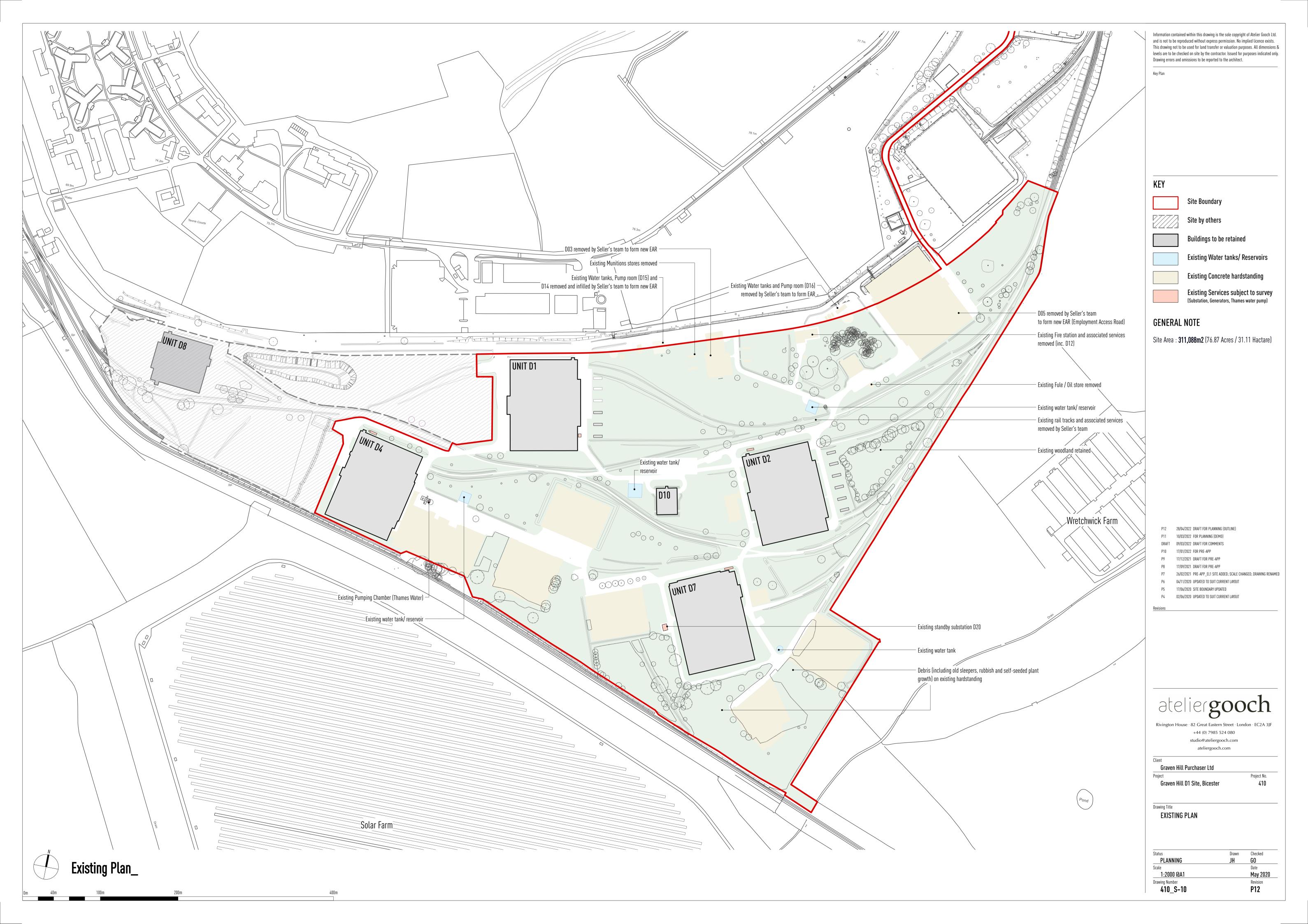
This e-mail (including any attachments) may be confidential and may contain legally privileged information. You should not disclose its contents to any other person. If you are not the intended recipient, please notify the sender immediately.

Whilst the Council has taken every reasonable precaution to minimise the risk of computer software viruses, it cannot accept liability for any damage which you may sustain as a result of such viruses. You should carry out your own virus checks before opening the e-mail(and/or any attachments).

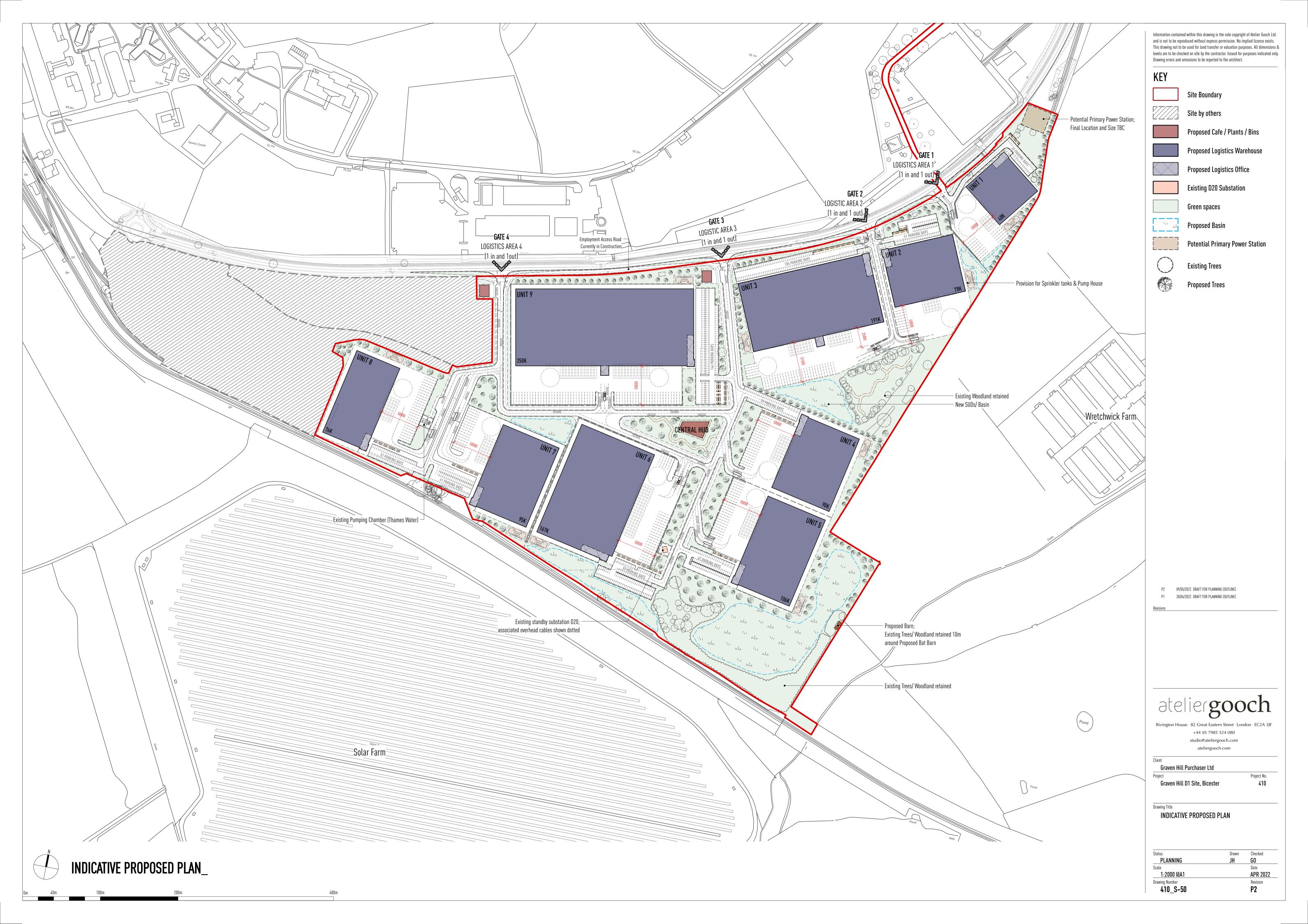
Unless expressly stated otherwise, the contents of this e-mail represent only the views of the sender and does not impose any legal obligation upon the Council or commit the Council to any course of action..

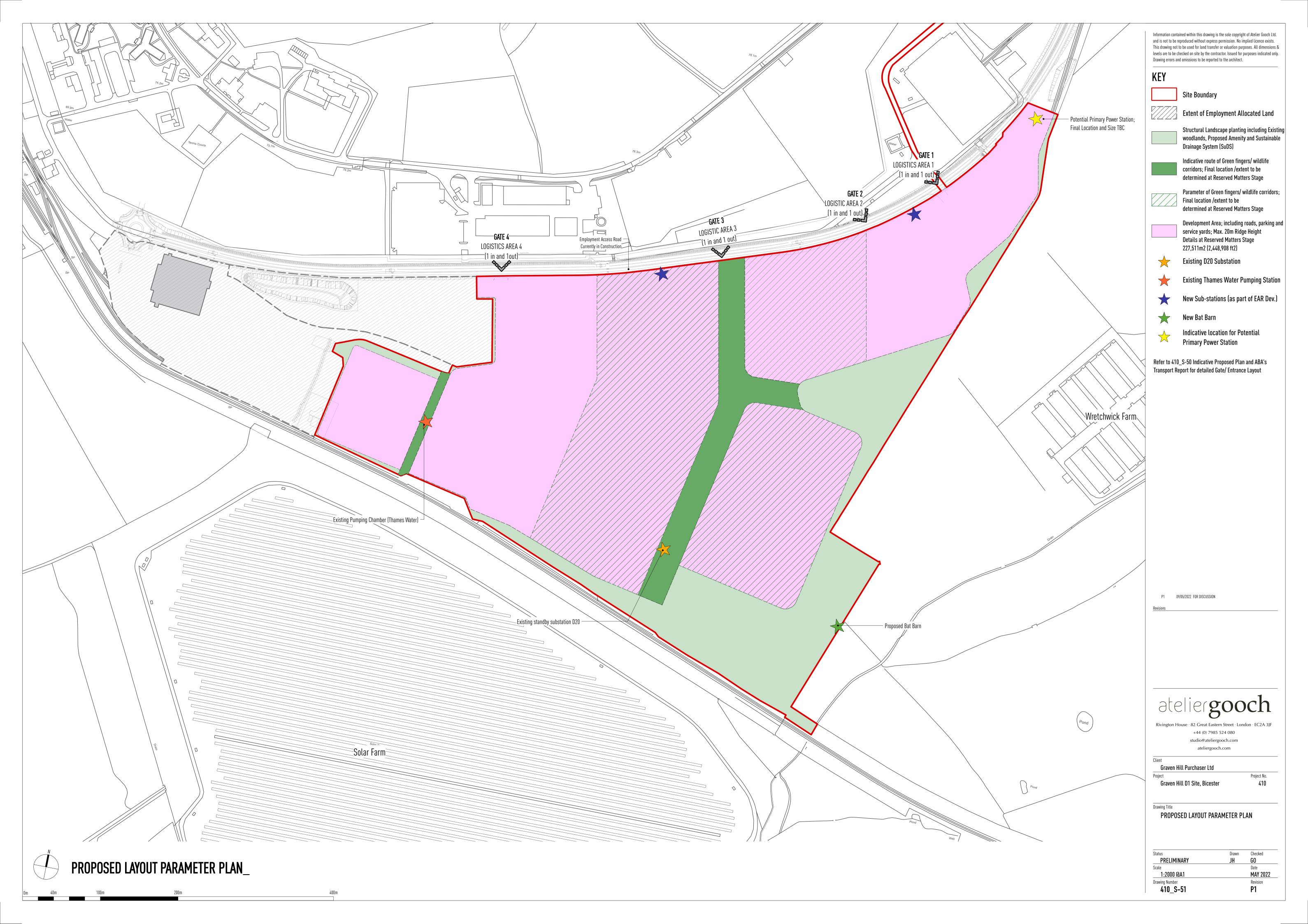
Appendix C

Development Plans









Appendix D

Hydraulic Modelling Report (provided separately)