

Flood Risk Assessment

New Century Place 1



WB04333 - FR04

Studios Building (Reading) Ltd.

Report No: WB04333 – FR04	Date: August 2017
New Century Place 1 (NCP1), Queens Road, Reading FLOOD RISK ASSESSMENT	
Client: Studios Building (Reading) Ltd.	

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1. INTRODUCTION

1.1 Instruction

Clarkebond (UK) Ltd was commissioned by Studios Building (Reading) Ltd. in August 2017 to provide a Flood Risk Assessment (FRA) to support the conversion of the use of a multi-storey office building on Queen's Road in Reading under a permitted development planning application.

The report has been undertaken in accordance with policy contained within the National Planning Policy Framework (NPPF) and is informed by the Strategic Flood Risk Assessment (SFRA) for the wider area, as well as the Environment Agency (EA) Flood Maps and Product 4 data.

1.2 Site Location and Description

Appendix A shows the location plan of the building, referred to as New Century Place (NCP) 1. NCP1 is located by National Grid Reference SU 71851 73203 or postcode RG1 4QJ. The building is located on Queen's Road (A329) in Reading, and can be accessed either via Queen's Road to the north, or via East Street to the south. The building is elevated above the level of Queen's Road, with steps and ramped access to the building entrances (Refer to **Figure 1**).

Figure 2 shows the context of the site within the wider area. The periphery of Reading town centre, including Cote Brasserie and Vue, is approximately 75m west of the site, Reading University Campus is approximately 375m south-east and Reading Station is approximately 270m north-west. The River Kennet is located approximately 88m north of the site.

NCP1 covers an approximate area of 1540m² (0.154ha). Within this area is the building itself, areas of hardstanding and paving and a number of landscaped areas including planters, grassed areas and trees.

1.3 Proposed Development

The proposed development is for a change of use from offices to student accommodation (72 bedrooms over four floors). Floor plans for the ground floor and first floor are attached as **Appendix B**. The ground floor comprises 14 bedrooms along with various ancillary uses and a lift core / stairs to upper floors. The building entrance will remain the same as existing.

1.4 Objectives

The main objectives of this report as recommended in National Planning Policy Framework (NPPF) are:

- To assess the site suitability in terms of the Sequential Test and, if required, the Exception Test.
- To identify the probability of flooding at the development.
- To assess the compatibility of the development with the flood risk zone.
- To identify the consequence of flooding at the development and suitable mitigation measures if required.
- To assess the overall impacts of the development on flood risk elsewhere.

1.5 Limitations

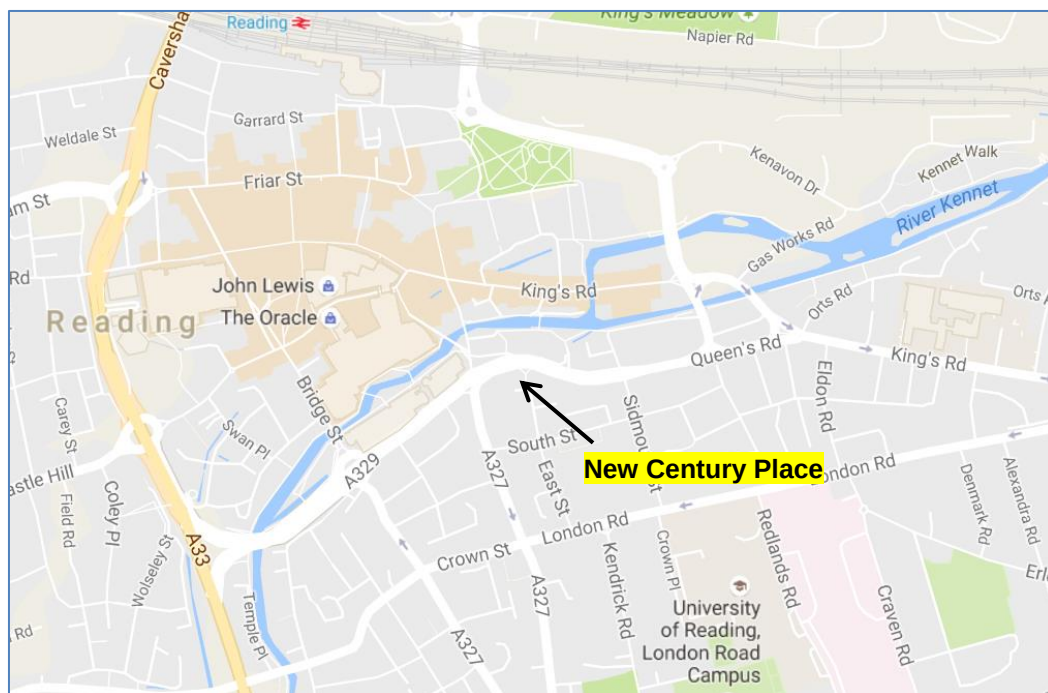
The information, views and conclusions drawn concerning the site are based, in part, on information supplied to Clarkebond by other parties. Clarkebond has proceeded in good faith on the assumption that this information is accurate. Clarkebond accepts no liability for any inaccurate conclusions, assumptions or actions taken resulting from any inaccurate information supplied to Clarkebond from others.

Figure 1: View of New Century Place 1 from Queen's Road



Source: Google Street View, 2015

Figure 2: Context of Site within the Wider Area



Source: Google Maps, 2016

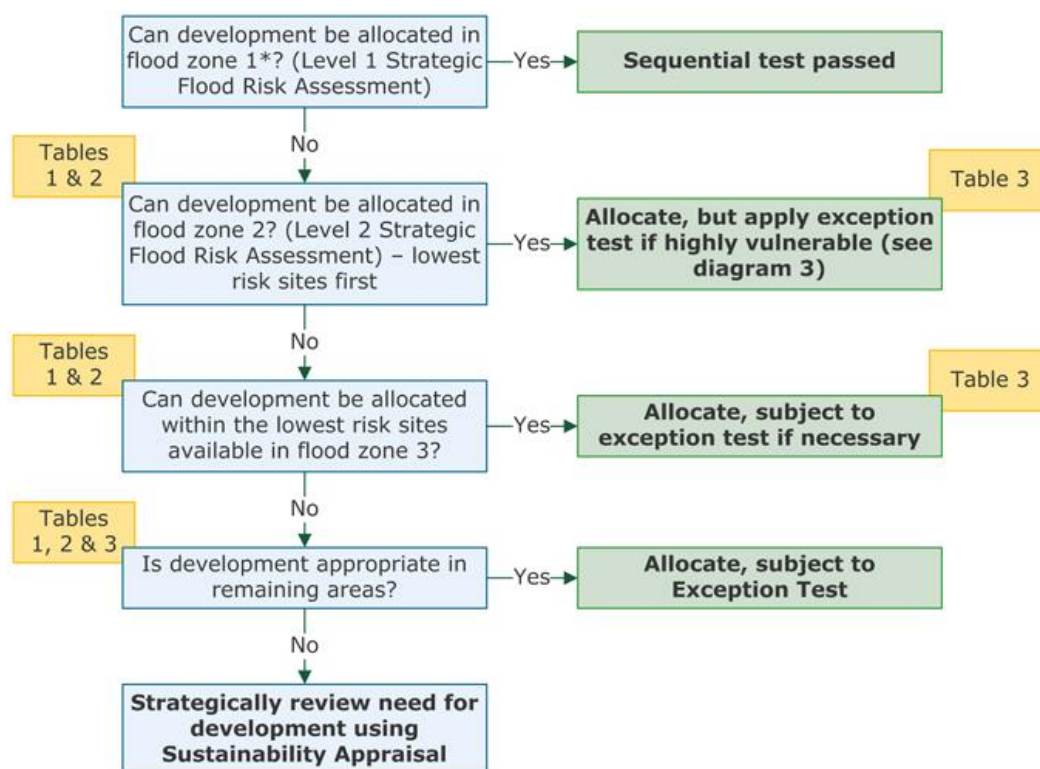
2. FLOOD RISK PLANNING POLICY

2.1 National Planning Policy Framework (NPPF)

National policy on flood risk is set out in paragraphs 100 to 104 of the NPPF which is also supplemented by Planning Practice Guidance (PPG) for flood risk and coastal change. The overarching aim of the PPG is to ensure inappropriate development in areas at risk of flooding are avoided, which is achieved via application of the Sequential Test. In summary this test aims to highlight the areas at lowest probability of flooding and steer new development to these areas. If the location of the low risk area is not suitable due to wider sustainability objectives then progressively higher risk areas can be considered provided the development will be suitably safe from flooding and does not increase flood risk to other areas.

The process for undertaking the Sequential Test is shown in **Figure 3**. This makes reference to Tables 1, 2 and 3 in PPG which will be discussed in further detail in the following sections of this report.

Figure3: Process of the Sequential Test



Development should only be permitted where a flood risk assessment can demonstrate that:

- Within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location
- Development is appropriately flood resilient and resistant, including safe access and escape routes where required and ensuring that any residual risk of flooding is safely managed. Priority is given to the use of Sustainable drainage systems (SuDS).

The Exception Test may be required for development which would not normally be suitable in the higher risk flood zones. For the Exception Test to be passed:

1. it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
2. a site-specific flood risk assessment must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Both elements of the Exception Test will have to be passed for development to be allocated or permitted. The purpose of an FRA is to satisfy the second part of the Exception Test only; further supporting information to demonstrate the first part of the Test is passed should be contained within the planning application.

2.2 Sequential Test Requirement for Change of Use

According to Paragraph 033 of PPG, the Sequential Test does not need to be applied for a change of use application, except for a change of use to a caravan, camping or chalet site, or to a mobile home or park home site. As this development is a change of use from offices to residential accommodation, the Sequential Test is not required.

2.3 Local Flood Risk Policy

The NPPF requires local planning authorities to review the variation in flood risk across their district and produce policy on flood risk management which is appropriate for the area. In certain areas, policy within the NPPF may not be suitable for informing development; for example, where surface water or groundwater flooding is of greater risk than flooding from rivers/sea, or where a large area is within a high risk flood zone. In such circumstances, local policy will take precedence over policy within the NPPF.

The site is within the administrative district of Reading Borough Council, where development planning is informed by the Local Development Framework, including the Reading Central Area Action Plan and Core Strategy report. Requirements in terms of flooding are detailed in Policy CS35 in the Core Strategy. This policy is generally in line with the NPPF, but of particular importance to this site, the policy states:

“Appropriate weight will be given to the redevelopment of land at risk of flooding that provides significant regeneration benefits on previously developed land.”

2.4 Strategic Flood Risk Assessment (SFRA)

The NPPF states in paragraph 100 that Local Plans should be supported by a Strategic Flood Risk Assessment (SFRA) which is produced by or on behalf of local councils in consultation with the EA.

A Level 1 SFRA was produced by Jacobs in 2009 for Reading Borough which provides a high level summary of all sources of flood risk in the area. This report has been used to inform this site-specific FRA.

2.5 Preliminary Flood Risk Assessment (PFRA)

PFRA's are completed by Lead Local Flood Authorities (LLFAs) providing an assessment of floods that have taken place in the past and floods that could take place in future in order to identify local areas at risk of flooding. They consider flooding from surface water runoff, groundwater and ordinary watercourses – Main Rivers are not assessed as these are under the jurisdiction of the EA.

A PFRA was completed for Reading Borough Council in June 2011 by Peter Brett Associates. Information from this report was used to inform this FRA.

2.6 The Design Flood Event

The NPPF and EA guidance specify that properties should be flood free during the 1 in 100 year (1%) fluvial flood and the 1 in 200 year (0.5%) tidal/coastal flood over the lifetime of the development (taking into account the effect of climate change on levels). These events can be termed the 'design flood event' as this is what the development design should be informed by.

The NPPF states that the lifetime of a residential development should be considered to be 100 years (up to 2116) unless there is specific justification for considering a shorter period. The lifetime for non-residential development is not specifically stated in the NPPF as it depends on the characteristics of the development. However, Section 4.6 of BS 8533:2011 'Assessing and managing flood risk in development – Code of practice' states that as a general rule, the lifetime of commercial development is considered to be 75 years.

2.7 Requirements of Site-specific FRAs

Footnote 20 of the NPPF states that a site-specific FRA is required for developments which:

- Are in Flood Zone 2 or 3
- Are more than 1 hectare (ha) in Flood Zone 1
- Are in an area which has critical drainage problems as notified by the Environment Agency
- could be affected by sources of flooding other than rivers and the sea (eg, surface water drains, reservoirs)

The EA provide Guidance Notes on what should be included in an FRA for each of these scenarios. The focus of FRAs for the higher risk zones is to fully assess the extent, depth and hazard of flood waters, detail the required mitigation to manage flood risk (e.g. floor levels and access, evacuation routes, compensatory storage) and outline a surface water management plan. FRAs for sites where the risk of flooding from rivers or the sea is classified as low (Flood Zone 1) will still need to assess all other sources of flood risk, but will have a strong focus on management of surface water runoff.

3. BACKGROUND INFORMATION

3.1 Hydrology

The site is located within an area hydrologically influenced by the River Kennet. The River Kennet rises as winterbournes above Avebury in Wiltshire and flows in an easterly direction through Wiltshire and Berkshire before discharging into the River Thames near Reading. The catchment is largely rural and is characterised by chalk uplands which give the river a strong baseflow component. It has several sections which have been divided to form the Kennet and Avon Canal, an artificial watercourse stretching from London to Bristol with levels controlled through locks and dams. The main tributaries of the river are the Lambourn, Dun and Enbourne.

Figure 4a shows the location of the site within the wider hydrological setting, and **Figure 4b** shows the local hydrological setting. The blue arrows indicate the direction of flow. This shows that the River Kennet flows in an easterly direction past the site, discharging into the River Thames approximately 1.4km downstream after passing below the railway line. This railway line acts as an informal defence, protecting the south of Reading from the Thames. There is a marina and a number of lakes downstream of the site alongside the Thames, as well as a number of large lakes upstream of the site, many of which feed into the Kennet.

The section of the River Kennet which passes the site forms part of the Kennet and Avon Canal, which is partly protected from flooding by the management of water levels with locks and weirs (although this is unlikely to be effective in more extreme floods).. The nearest waterbody to the site is a small section of open channel which was identified in the Groundsure report as River Gunter's. This feature is approximately 75m from the site – it is assumed that part of this watercourse is culverted upstream of this open channel section, although this culverted section is not identified in the Groundsure mapping (See **Appendix C**).

Figure 4a: Wider Hydrological Setting

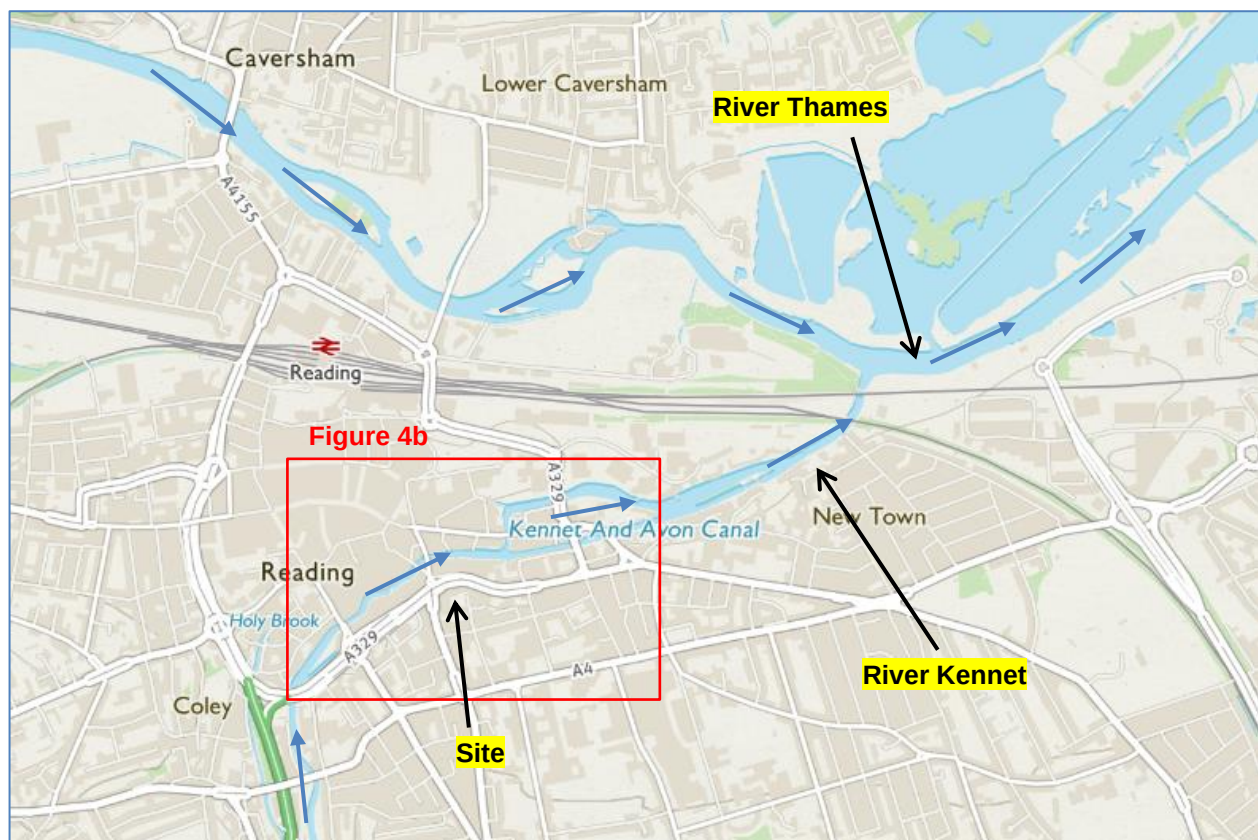
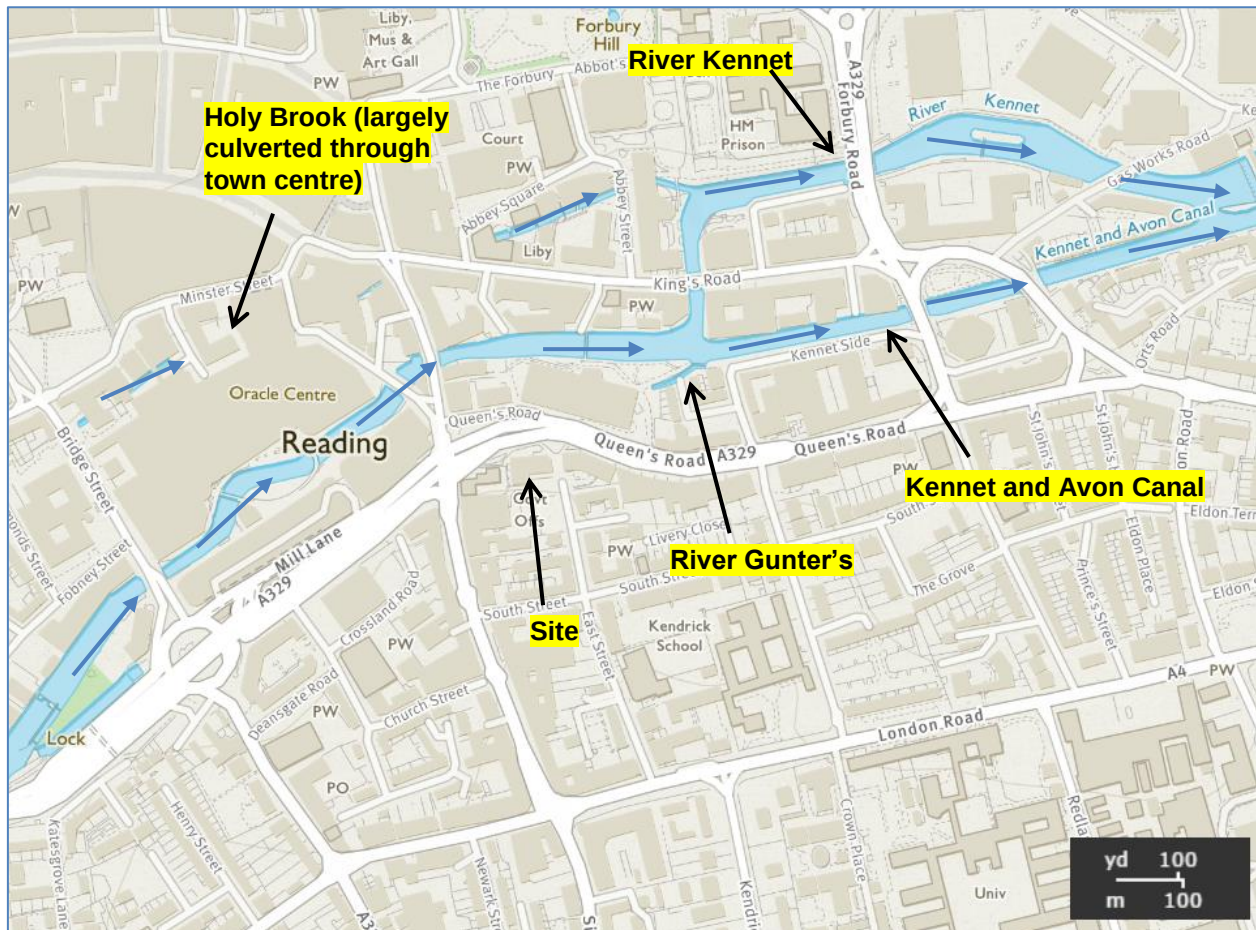


Figure 4b: Hydrological Setting Immediate to Site



3.2 Site Levels

The topographic survey of the New Century Place site is included as **Appendix D**.

The entrance of the building is located at 40.11m AOD and the level of the ground surrounding the building decreases marginally towards the west to a minimum level of around 39.93m AOD. The area of hard standing to the south of the building currently used for parking is at an average level of around 40.35m AOD.

The minimum level of the paved area outside the building entrance is 39.99m AOD, with levels gradually increasing southwards along East Street.

3.3 Geology and Hydrogeology

The British Geological Survey (BGS) map at (1:50,000 scale) indicates that the northern half of the NCP1 site is underlain by superficial deposits of 'Kempton Park Gravel Formation' over the solid bedrock geology of the Seaford Chalk Formation.

The BGS Lexicon describes the Kempton Park Gravel Formation as "Sand and gravel, locally with lenses of silt, clay or peat." The Seaford Chalk Formation is described as "Firm white chalk with conspicuous semi-continuous nodular and tabular flint seams. Hardgrounds and thin marls are known from the lowest beds. Some flint nodules are large to very large."

A previous geotechnical report was undertaken at the site, which was provided to CB by the client:

- *Geotechnical Report, Brewery Site Queens Road Reading Berkshire*, on behalf of Fenchurch Estates Limited. Dated August 1994, Ref: 11459.

The boreholes described in the report concur with the BGS mapping, showing Made Ground to depths of between 0.90m and 2.70m, below which was “Valley Gravel” (believed to be a previous term for the superficial gravels now known as the Kempton Park Formation and Taplow Gravel Member) (Refer to **Appendix E** for borehole data). The Valley Gravels were encountered beneath the Made Ground to depths of 3.8m in the borehole below building NCP1 (Borehole 1). A borehole sunk to the south-east of the building did not encounter any superficial gravel, which is concurrent with the BGS data. All exploratory holes encountered Upper Chalk (now known as the Seaford Chalk Formation) to proven depths of 20m.

According to the Geotechnical report, groundwater was encountered at depths of 3.8-5.8m within the chalk strata in in boreholes 1, 2 and 3. The boreholes were excavated in the summer months and it is expected that the groundwater level would be higher than this in winter.

According to Groundsure Mapping (**Appendix C**) the superficial deposits are classified as ‘Secondary ‘A’ aquifer’ and the Chalk bedrock is classified as a ‘Principal Aquifer’. The relevance of this in terms of groundwater flooding will be assessed in **Section 4**.

3.4 Previous Reports

Argyll Environmental produced a risk assessment report in May 2016 which covered the site and wider area. Flood mapping from this report has been used to inform this FRA.

4. FLOOD RISK ASSESSMENT

4.1 Vulnerability Classifications and Flood Zones 'Compatibility'

The Flood Zones refer to zones at risk of flooding from rivers and sea and are used as the primary indicator of whether the land is suitable for development. **Table 1** (taken from Table 1 of PPG) details the flood zones and their corresponding meaning in relation to flood risk.

Table 1: Definition of Flood Zones defined in the PPG

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding.
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or Land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding.
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding.
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. The Strategic Flood Risk Assessments should identify the areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

In order to ensure that a development is appropriate for the Flood Zone in which it is located, the vulnerability classification of the land use must be considered. The proposed residential development falls under the following description given in Table 2 'Flood Risk Vulnerability Classification' in the PPG:

"Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels."

Therefore it is considered to be 'More Vulnerable' development. **Table 2** shows that 'More Vulnerable' development is suitable in Flood Zones 1 and 2 and may be permitted in Flood Zone 3a subject to passing the Exception Test. This type of development is not allowed in Flood Zone 3b which is the functional floodplain, where water must be stored in times of flood.

Table 2: Flood Risk Vulnerability and Flood Zone 'Compatibility' (Extracted from Table 3 of PPG)

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zones	Zone 1	✓	✓	✓	✓	✓
	Zone 2	✓	✓	Exception Test required	✓	✓
	Zone 3a	Exception Test required	✓	X	Exception Test required	✓
	Zone 3b	Exception Test required	✓	X	X	X

Where ✓ means the development is appropriate and X means the development should not be permitted

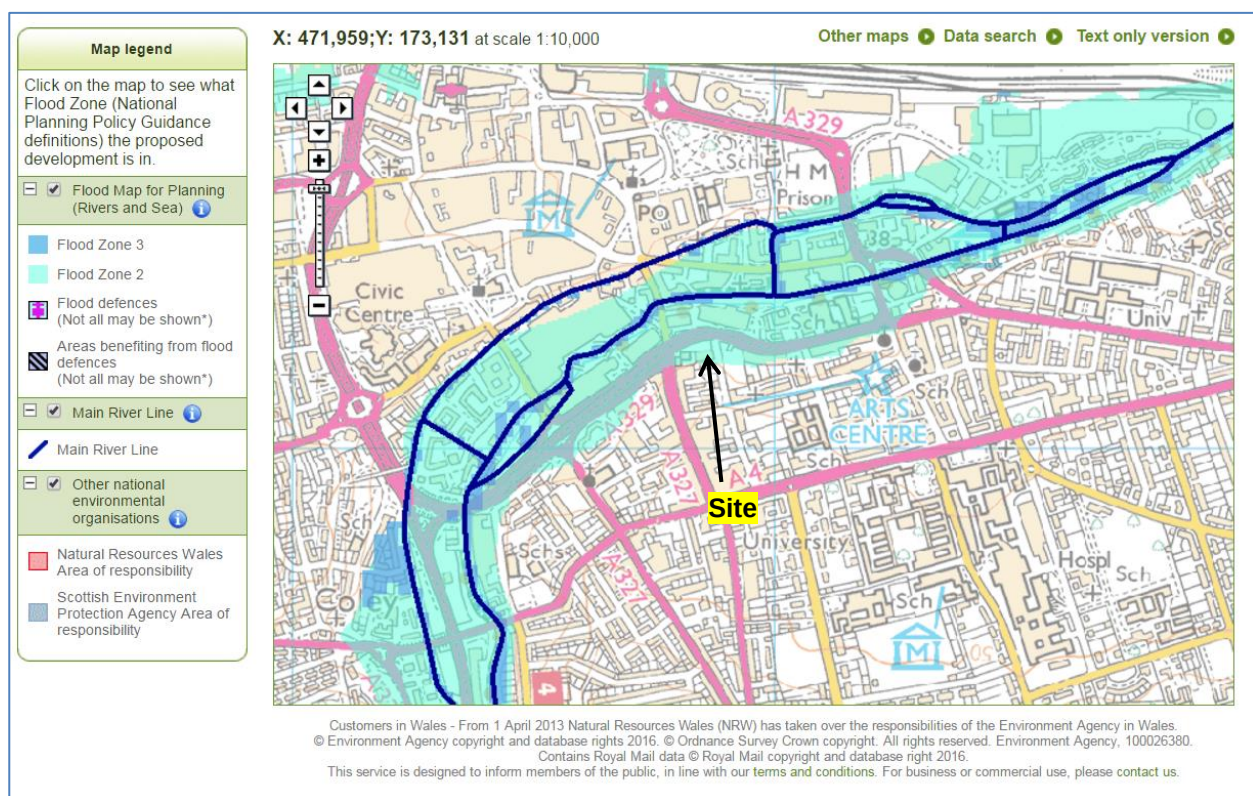
4.2 EA Flood Zone Map

The EA Flood Map for Planning was reviewed which shows the Flood Zones based on risk from both rivers and the sea, and relates to the Flood Zone definitions described in **Section 4.1**. **Figure 5** shows that the site is wholly within Flood Zone 2; as the site is far inland and there is no tidal influence on the rivers at this location, thus, the flood extent is only attributable to fluvial sources. This indicates that the site has between a 1 in 100 and 1 in 1000 chance of fluvial flooding each year.

The site is immediately adjacent to a large area of Flood Zone 1, which is of importance in relation to safe access and egress.

In accordance with Table 2 (Table 3 of PPG) Flood Zone 2 is suitable for the proposed development and the Exception Test is not required.

Figure 5: EA Flood Map for Planning Centered on New Century Place



4.3 SFRA Stipulations for Development in Flood Zone 2

The 2009 (Level 1) SFRA report includes various development control recommendations specific to Reading which should be followed in order to minimise flood risk. The measures for development in Flood Zone 2 are as follows:

- *For all sites within Zone 2 Medium Probability, a high level FRA should be prepared based upon readily available existing flooding information, sourced from the EA.*
- *It will be necessary to demonstrate that the residual risk of flooding to the property is effectively managed through, for example, the provision of raised floor levels (refer Section 6.6.2) and the provision of a planned evacuation route and/or safe haven.*

- *The risk of alternative sources of flooding (e.g. urban drainage and/or groundwater) must be considered, and sustainable urban drainage techniques must be employed to ensure no worsening to existing flooding problems elsewhere within the area.*
- *As part of the high level FRA, the developer must provide a clear and concise statement summarising how the proposed (re)development has contributed to a reduction in flood risk within the Borough, where this has been possible.*
- *Details of proposed sustainable drainage systems (SuDS) that will be implemented to ensure that runoff from the site (post redevelopment) does not exceed greenfield runoff rates. Any SuDS design must take due account of groundwater and geological conditions (refer Section 6.6.3).*
- *There are generally no other restrictions placed upon land use in these areas, however it is important to ensure that the developer takes account of possible climate change impacts to avoid a possible increase in the risk of flooding in future years (achieved through completion of a simple Flood Risk Assessment).*

Further requirements stipulated by the SFRA are included in the table included in **Appendix F** for reference.

4.4 Principle Source of Flood Risk

The 2009 SFRA states that the principle flood risk in the Borough of Reading comes from fluvial flooding from the River Thames and Kennet (in the case of this particular site, the risk is from the Kennet, as can be seen by **Figure 5**). The definition of risk is based on the likelihood of the flood occurring, as well as the extent of the impact if this type of flooding were to occur.

Appendix F includes a strategic overview map from the SFRA which identifies the fluvial flood extent (based on the hydraulic modelling undertaken in the SFRA) and highlights all other flooding issues within the site's locality. Also included in **Appendix F** is an overview map of Reading Borough taken from the Surface Water Management Plan (SWMP) produced in 2011. This shows various sources of flooding based on collation of a wide set of data.

Apart from fluvial flooding, there are no keys sources of flood risk indicated by these broad-scale maps. Therefore, the main focus of the assessment and mitigation measures will be on fluvial flood risk.

4.5 Historic Flooding

The 2011 PFRA includes local and national information on past floods. The most recent severe flood event recorded in the PFRA occurred in 2007, which was related to surface water flooding caused by exceptionally high rainfall leading to internal flooding of 139 residential properties. This was considered to be the only flooding event in Reading which was on a European scale of 'significant' consequence.

Two maps were produced which used local and national data on a number of past flood events to show the areas flooded and the flooding source (See **Appendix F**). For the national map, the historic surface water flood extents were based on EA records which date back to 1947, which were reduced to five significant incidents within in the last 10 years (6th Jan 2003 and 6th Dec 2000). The ground water and river flooding was obtained from the EA historic flood event records.

The maps indicate that there are only small, localised areas of the River Kennet which have come out-of-bank in historic flood events. There have been no recorded incidents of flooding from any source at the site according to both local and national records.

It should be noted that since the PFRA was produced, severe fluvial flooding took place in the 2013/2014 winter flooding which affected numerous areas in the UK. However, from review of publically available data, the extent of this floodplain could not be found.

4.6 Fluvial Flooding

4.6.1 Present Day

The EA Flood Zone map indicates that the site is flood free in the 1 in 100 year flood event in present day, but is likely to flood in an event with a magnitude of between 1 in 100 and 1 in 1000 years. This map does not take into account the influence of strategic flood defences or management of flood levels (which may help to reduce the level of risk).

The SFRA mentions that there are a number of culverted watercourses in Reading which are not represented in the EA Flood Zone outlines, but pose a fluvial flood risk either due to capacity issues or blockage. The closest culverted watercourse mentioned in the SFRA is the Holy Brook which flows below Reading town centre. However, this is not considered to pose a risk to the site as it is some distance away and this culvert does not carry significant flows during a flood event. River Gunter's (the nearest surface waterbody to the site) is assumed to not be a culverted watercourse which could pose a flood risk as it is not mentioned in the SFRA. Therefore the risk from this feature is considered to be low.

4.6.2 Climate Change

As previously mentioned, the NPPF requires new development to be flood free for the 1 in 100 year fluvial event accounting for the effects of climate change. The 1 in 100 year floodplain accounting for climate change is not shown in the EA Flood Map for Planning, but is shown on the SFRA map included in **Appendix F**, which indicates that the site (and Queen's Road) is flood free in this event.

Product 4 Flood Level data was also obtained from the EA to confirm the most recent model data for the 1 in 100 year plus climate change flood event (see **Appendix G**). The data is based on the Kennett (Tyle Mill to Thames Confluence) 2007 model which confirms that the SFRA mapping completed in 2009 is based on the latest modelling completed to date.

Flood Point 3 best represents the site which indicates a 1 in 100 year flood level of 37.58m AOD which is 2.35m below the lowest point on site. The 1 in 100 year plus climate change level is not given, but as the site is significantly above the 1 in 100 year level in present day it would not be effected by climate change. This is supported by the latest climate change supplementary guidance for the West Thames Area which suggests a maximum uplift of 1000mm to account for climate change (see **Appendix H**).

Overall, the risk from fluvial flooding is considered to be moderate as the site is shown to be safe in the 1 in 100 year event accounting for climate change, but is within the 1 in 1000 year floodplain.

4.7 Other Sources of Flooding

4.7.1 Surface Water Flooding

Under natural conditions, surface water flooding occurs either in high intensity rainfall events, where the intensity of rainfall exceeds the infiltration capacity of the ground, or when the ground is fully saturated. Lower lying areas and areas with impermeable geology are most at risk of surface water flooding. In urban areas, the risk of surface water flooding is increased due to artificial land cover of 100% impermeability, leading to high quantities of overland flow. Again, the areas worst affected are those which are low-lying and not served by adequate drainage systems.

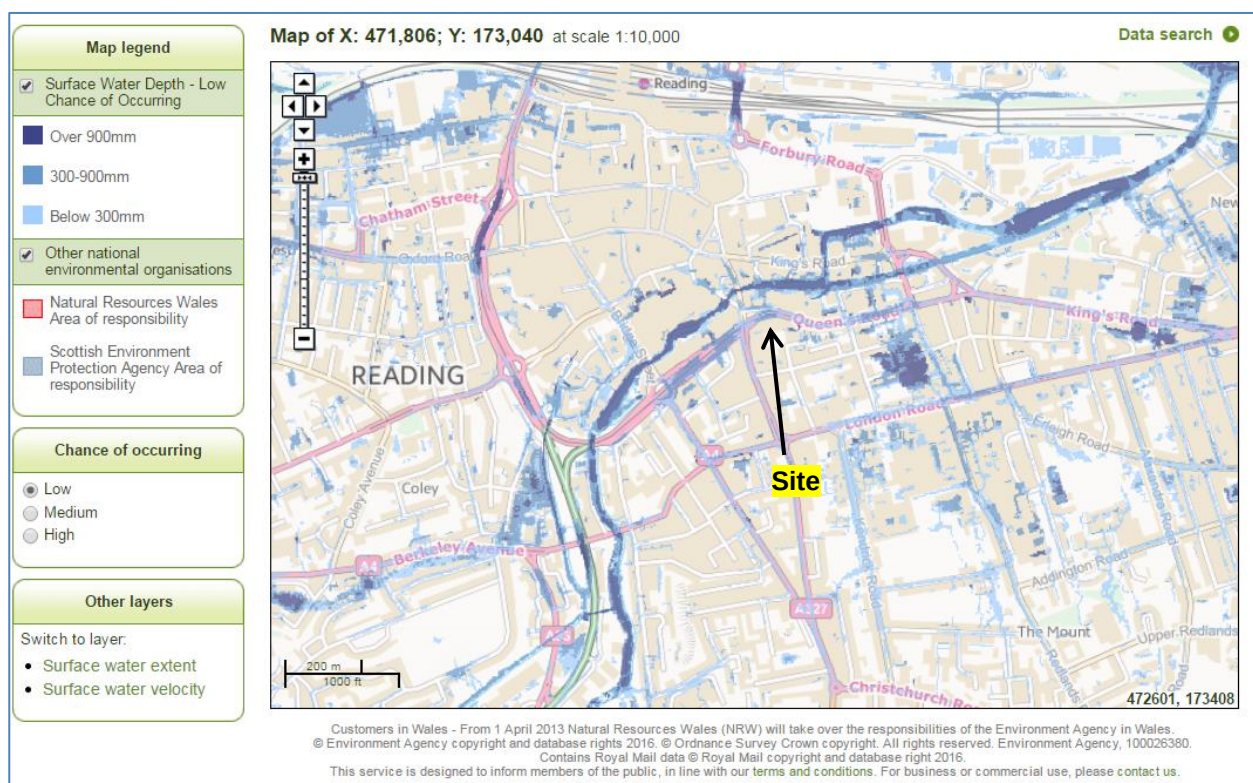
For the purpose of this report, surface water flooding is defined as flooding from runoff before the water can reach a recognised watercourse or sewer system. Although flooding caused by overwhelmed/blocked drainage

systems is often referred to as surface water flooding, this will be covered within **Section 4.7.2 'Sewer Flooding'**.

Figure 6 shows the EA map of surface water flood depth from a flooding event which has a 'Low' chance of occurring i.e. between 1 in 100 and 1 in 1000 chance. This shows that the site is flood free even in the most extreme event modelled.

As this map is based on a generalised flood model, the SFRA and SWMP were also reviewed. The SFRA states that no analysis has been undertaken of surface water flood risk areas. However, the report discusses that areas likely to be at high risk are along the path of culverted watercourses where the topography of the land will concentrate flows. The site is not located near any of these areas. The SWMP strategic overview map included as **Appendix F** confirms that the site is outside of the areas considered to be at risk of surface water flooding. Therefore, the risk from this source is considered to be low.

Figure 6: EA Surface Water Flood Risk Map



4.7.2 Sewer Flooding

Sewer flooding occurs when intense rainfall overloads the sewer system capacity (surface water, foul or combined), and/or when sewers cannot discharge properly to watercourses due to high water levels. Sewer flooding can also be caused by problems such as blockages, collapses or inadequate capacity of the sewerage system.

The majority of modern sewers are designed to manage runoff from a storm event of a size and intensity of 1 in 30 years as a minimum. Therefore, it is likely that the majority of the existing sewer systems will surcharge to some degree during storm events with a return period greater than 30 years. However, areas which have experienced significant expansion beyond the capacity of the sewers and areas served by older sewer systems are likely to experience flooding more regularly.

Thames Water is responsible for the public sewer systems within Reading and they maintain a register of historical sewer flooding events called the DG5 register. There is a strong correlation between historic events and future flood risk as issues are often contained within certain areas which have limited sewage capacity or sewage systems in need of repair. Therefore, if an area has not been highlighted as problematic then the risk is likely to be low.

The SFRA used records from Thames Water and the Council to identify all problem areas. The site is not shown to be in a problem area and so the risk is considered to be low under normal operating conditions.

4.7.3 Artificial sources

Artificial flood sources include raised channels, reservoirs, canals, aqueducts and storage features. Flooding from these sources occurs when they become overwhelmed or the structure fails. Whilst the likelihood of this occurring is very small, it is important to ensure an awareness of these risks.

The SFRA does not mention any artificial sources of flooding which could affect the site. The EA website also confirms that the site is not within an area which could be flooded due to reservoir failure.

4.7.4 Ground Water

Groundwater flooding occurs when water levels rise up above surface elevations from underlying rocks or springs. Typically, high permeability rocks such as chalk show some of the largest seasonal variations in groundwater level, and can lead to extensive groundwater flooding. Settlements at most risk of groundwater flooding are those that lie on river floodplains and those at the base of steep sided valleys where the groundwater table will naturally be closer to the ground surface.

The underlying chalk geology is classified as a 'Principal' aquifer, which is capable of supporting large quantities of groundwater and is highly productive. This means that the groundwater table is capable of rising significantly during periods of extended rainfall.

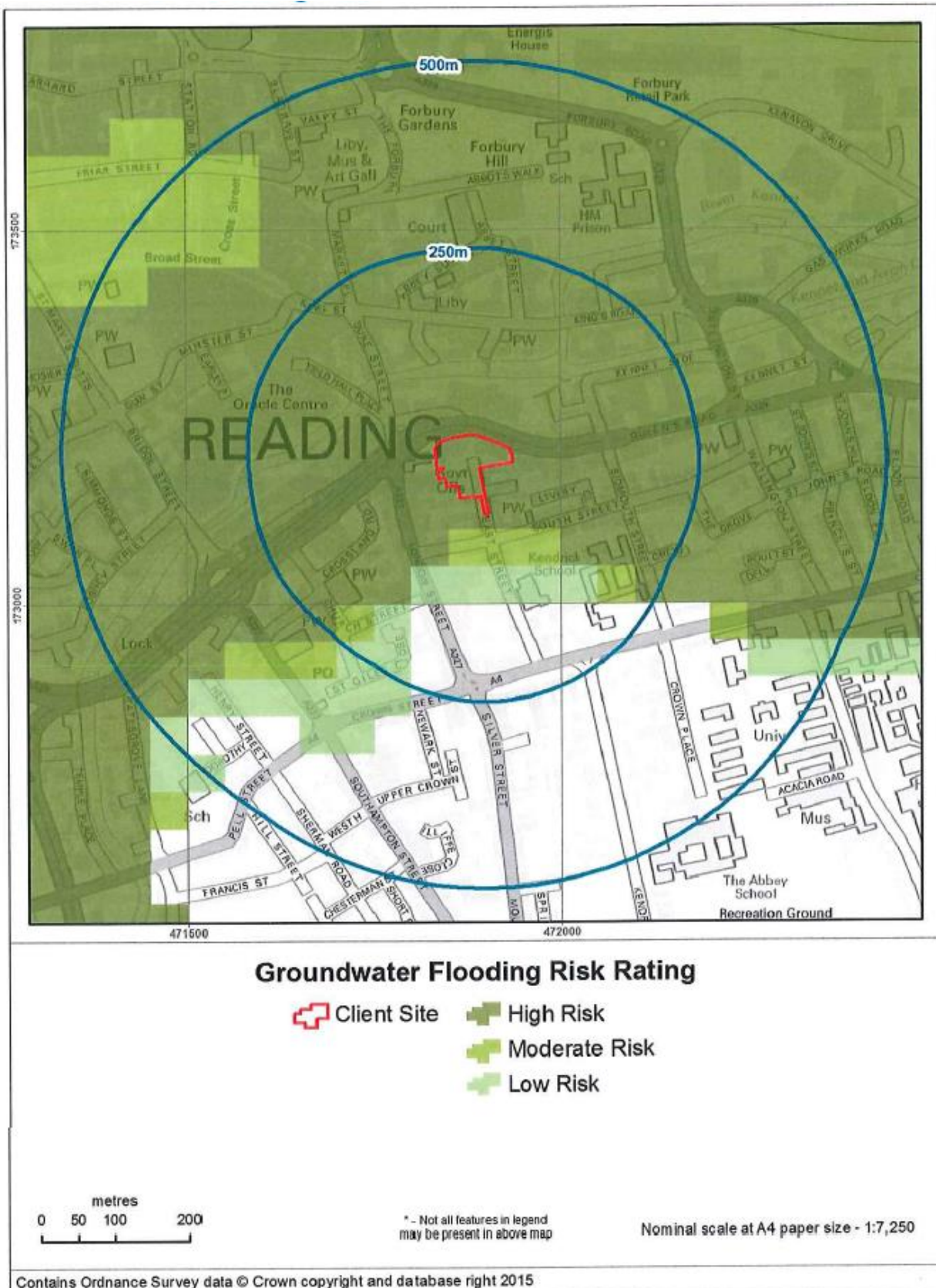
According to BGS data from the Groundsure report, the site is within an area susceptible to groundwater flooding at the surface based on the underlying geology. The groundwater flood risk map taken from the Argyll report also shows that there is a high risk of groundwater flooding with a return period of 1 in 100 years or more (See **Figure 7**). This map is based on ESI data which uses algorithms and calibrated predictions of the risk of groundwater flooding occurring in England and Wales.

As previously mentioned, the PFRA and SFRA do not mention any records of groundwater flooding at the site or nearby areas. Furthermore, the groundwater table recorded in the boreholes was some depth below the ground surface (at least 3.8m below ground level); rising of the water table by 3.8m to the ground surface is considered unlikely in an unconfined aquifer.

It should also be noted that the site is within a large urban area with paved surfaces and made ground which would prevent the emergence of groundwater at the surface. Groundwater emergence from nearby areas not covered by impermeable surfacing could occur, and in these instances, the water would follow the natural flow paths of surface water flows. As the development is not within an area at risk of surface water flooding, emerged groundwater for nearby areas would also not affect the site.

Based on the above, the risk of groundwater flooding is considered to be low.

Figure 7: Groundwater Flood Risk Map



5. FLOOD MITIGATION & WATERCOURSE MANAGEMENT

5.1 Outcome from FRA

The main flood risk to the site is from fluvial flooding from the River Kennet which was assessed as having a moderate risk. The risk from all other sources was considered to be low.

5.2 Proposed Mitigation Measures

5.2.1 Required Building Protection

The SFRA and EA guidance dictates that the Finished Floor Level (FFL) of the ground floor should be 300mm above the 1 in 100 year river flood level accounting for climate change. However, in the case of existing developments, demountable barriers can be used across all building entrances and windows which are below this level.

The development is over 300mm above the 1 in 100 year plus climate change flood level and so no building protection is required.

5.2.2 Safe access and egress

The SFRA (**Appendix F**) and NPPF stipulate that dry access is to be available in the 1 in 100 year event. For the more extreme 1 in 1000 year event, flood waters should not exceed 300mm of moving water.

The site is located alongside a large area of Flood Zone 1, with dry access/egress to and from the site to the wider road network via East Street during the 1 in 100 year flood event, and the more extreme 1 in 1000 year event. The surface water flood risk map also indicates that the site can also be accessed during an extreme surface water flooding event.

The site itself is located within Flood Zone 2, although flood levels would not be expected to exceed 300mm along the evacuation route as the level difference between the site entrance and the boundary of the floodplain does not exceed 300mm.

5.3 Predicted Impacts Elsewhere

As the application is for a change of use, there will be no impact on surface water flood risk to surrounding areas. Flood compensatory storage will also not be required as there will be no change in massing to the building, thus the capacity of the fluvial floodplain will not be reduced.

5.4 Foul Water Flows

Peak foul water flows will increase with the change of use from office to residential. Therefore, the private sewer network may need to be upgraded in order to accommodate the extra load. If there is an increased discharge rate into the public sewer, this will need to be agreed with Thames Water to ensure there is adequate capacity within the receiving network.

6. SUMMARY AND CONCLUSION

The proposal is for the conversion of the use of an existing multi-storey office building into residential accommodation under a permitted development planning application. The development does not require a Sequential Test as it is a change of use, and the FRA has demonstrated that the proposed land use is compatible with the flood risk zone in accordance with Table 3 of Planning Practice Guidance.

The site was assessed as being at a moderate risk of fluvial flooding; the risk from all other sources was considered to be low. The SFRA map shows the site is flood free in the 1 in 100 year floodplain accounting for climate change which is also confirmed by the EA flood level data and latest climate change guidance. Therefore, there is no requirement for flood protection measures.

In terms of access and egress, residential sites should have dry access and egress in the 1 in 100 year plus climate change event which is the case for the site. For the 1 in 1000 year event, the flood depth does not exceed 300mm depth and so the evacuation route would still be of low hazard for most. As such, a flood evacuation plan would not be required.

Appendix A – Site Location Plan



16033 1001 NCP1
LOCATION PLAN
1:500

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 3. Do not scale from this drawing - if in doubt ask.
 4. All dimensions to be checked on site prior to commencement of work or preparation of shop/ fabrication drawings.
 5. The contractor shall report any discrepancies in information in writing to the design team at the earliest opportunity.
 6. This drawing is to be read in conjunction with the following relevant information:
 - i) All architects, structural and service engineer's drawings and specifications.
 - ii) All CDM information including designers risk assessments.



APPLICATION SITE BOUNDARY

revision	PD ISSUE	P	2016.08.17	MB	
notes		status	date	author	reviewer

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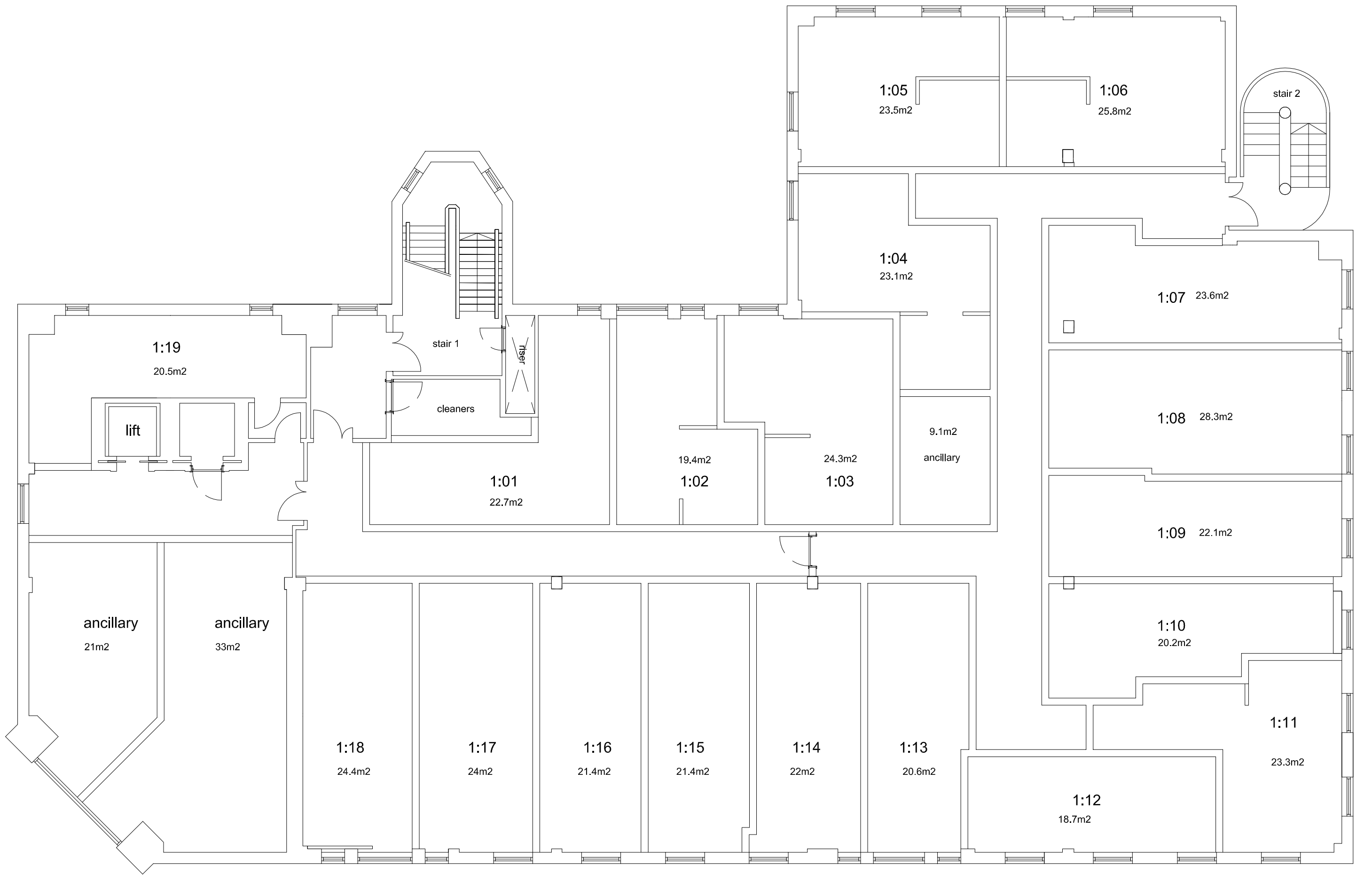
Project **New Century Place, Reading**

Drawing **NEW CENTURY PLACE 1
LOCATION PLAN
Red Line Boundary**

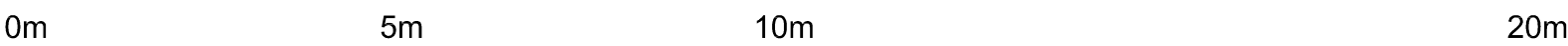
Scale 1:100	Job no. 16033	dwg no. 1001	Rev: -
at size A1	Status Preliminary		

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Appendix B – Proposed Development Ground and First Floor Plans



16033 1111 NCP1
PROPOSED LEVEL 1
1:100



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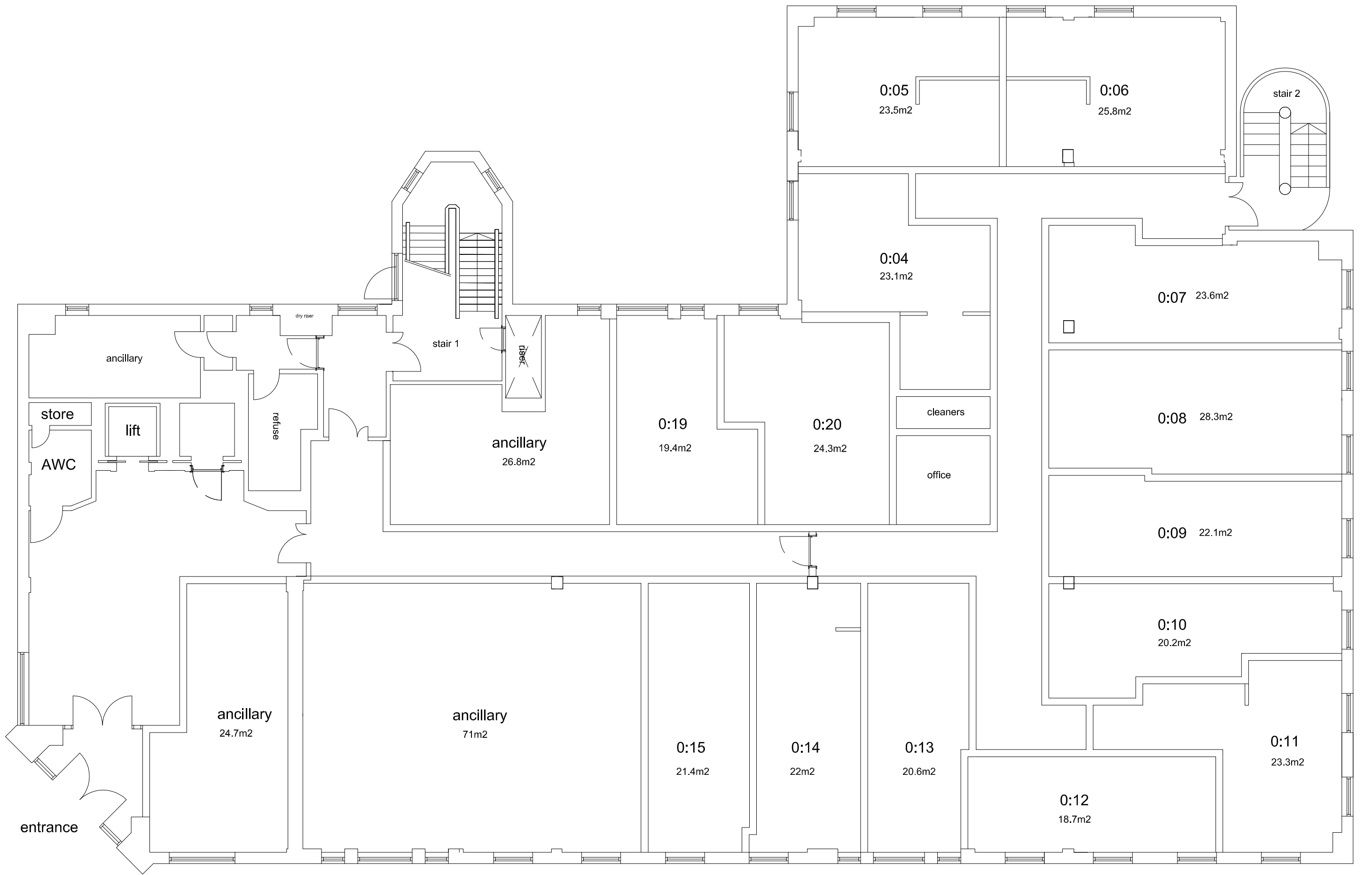
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Project **New Century Place, Reading**

Drawing **NEW CENTURY PLACE 1
PROPOSED PLAN
Level 1 - 19 units**

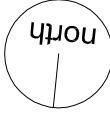
Scale 1:100	Job no. 16033	dwg no. 1111	Rev : -
at size A1	Status Preliminary		

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16033 1110 NCP1
PROPOSED LEVEL 0
1:100

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 5. The contractor shall report any discrepancies in information in writing to the design team at the earliest opportunity.
 6. This drawing is to be read in conjunction with the following relevant information:
 - i) All architects, structural and service engineer's drawings and specifications.
 - ii) All CDM information including designers risk assessments.



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Project **New Century Place, Reading**

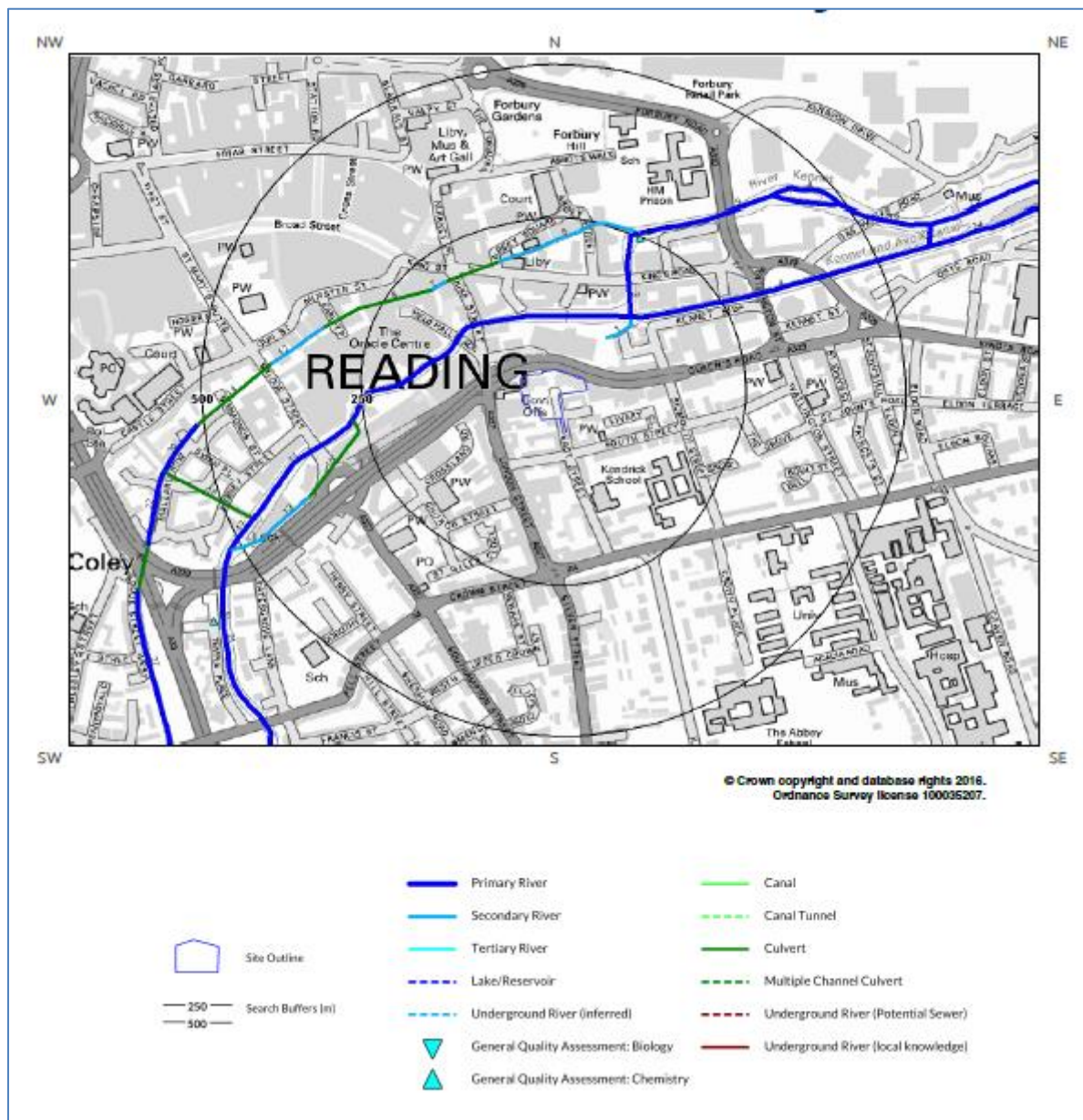
Drawing **NEW CENTURY PLACE 1
PROPOSED PLAN
Level 0 - 14 units**

Scale 1:100	Job no. 16033	dwg no. 1110	Rev : -
at size A1	Status Preliminary		

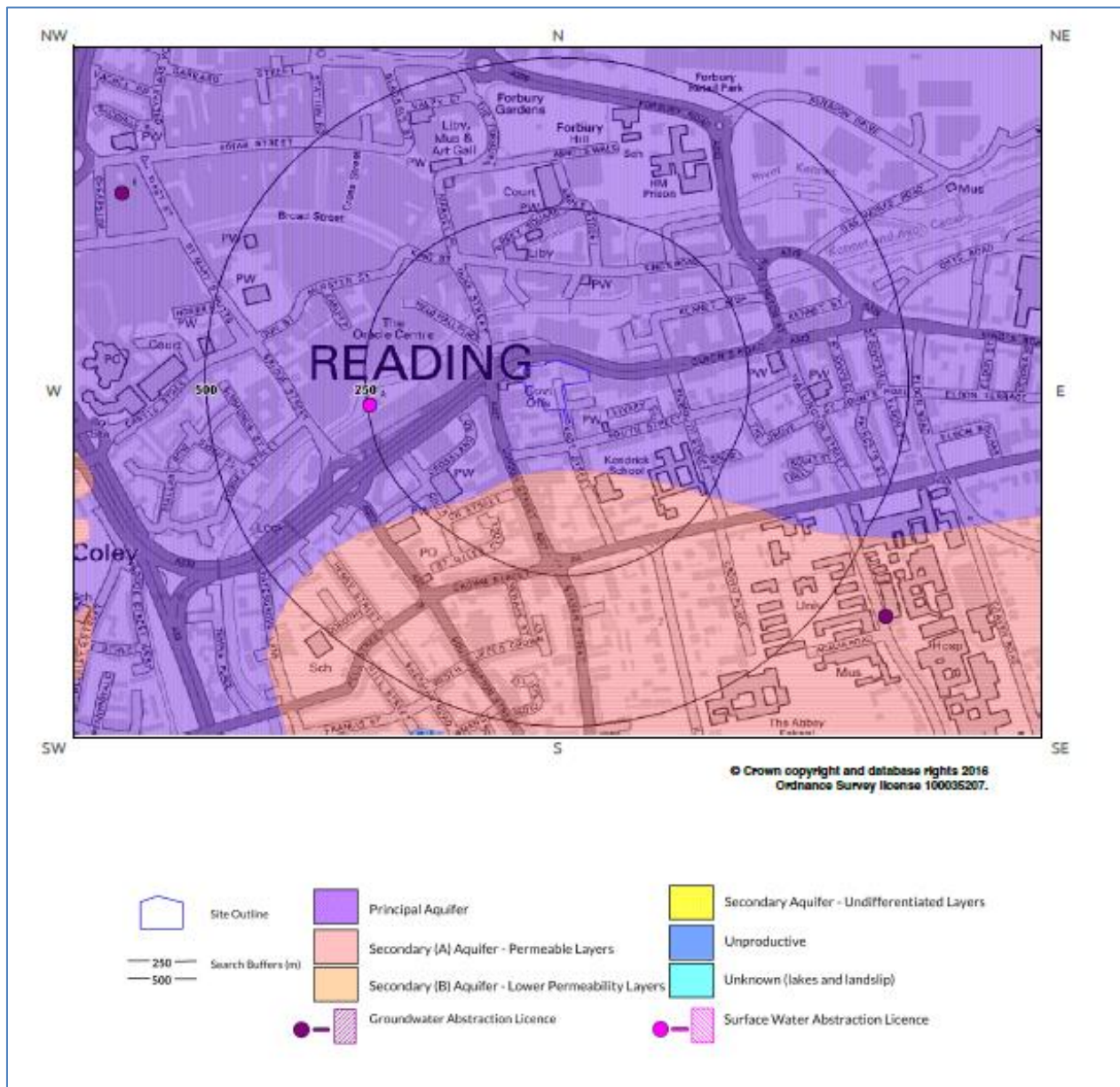
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Appendix C – Groundsure Mapping

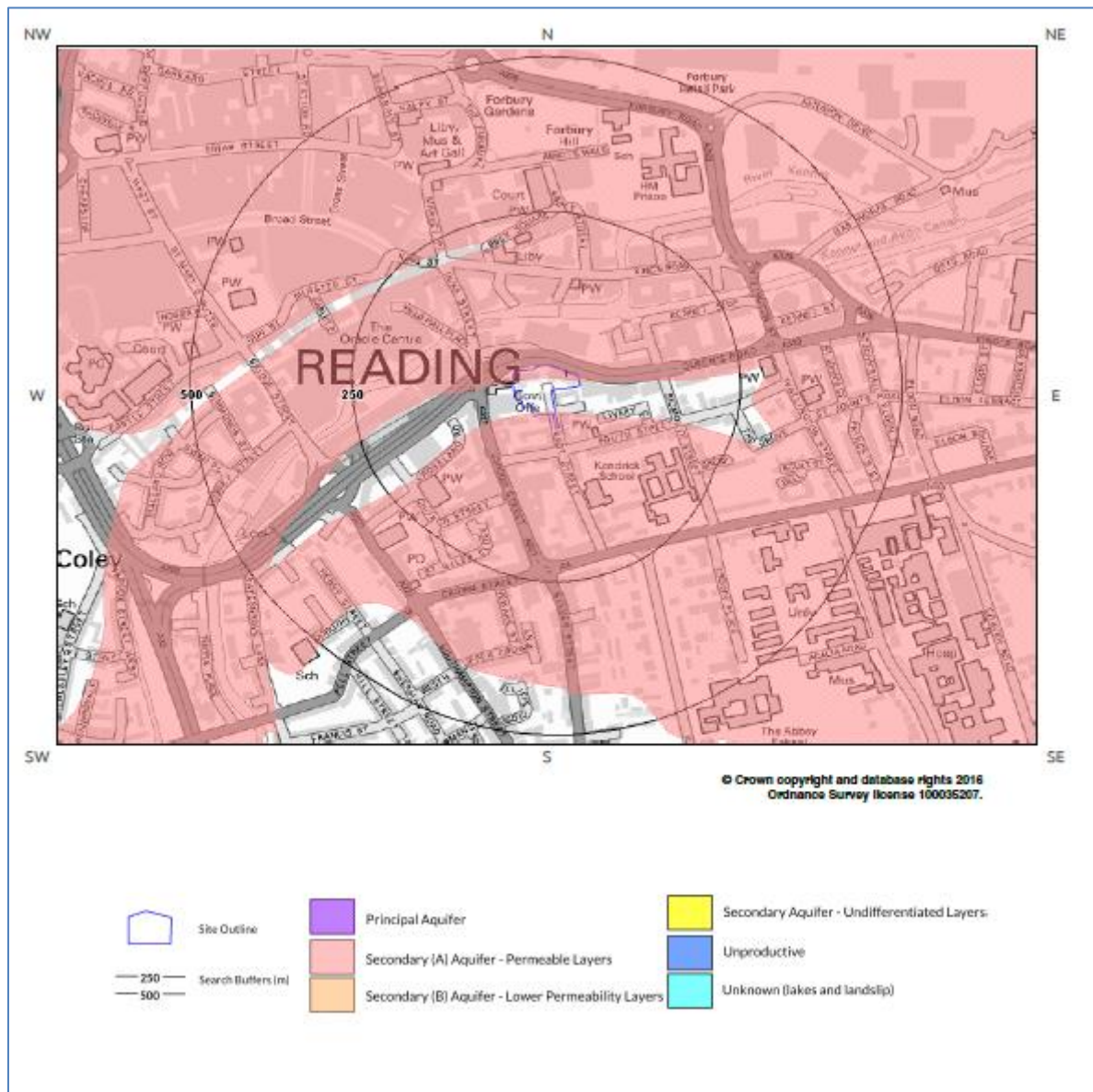
Map 1: Detailed River Network and River Quality



Map 2: Bedrock Aquifer Designations



Map 3: Superficial Deposits Aquifer Designations



Appendix D – Topographic Survey

Appendix E– Borehole Records (1994 report)

BOREHOLE AND TRIAL PIT RECORDS

SYMBOLS AND ABBREVIATIONS

Samples

U ()	Undisturbed - standard open drive (blows) - 100mm dia in boreholes 38mm dia in trial pits and hand auger bores
T	Undisturbed - thin wall open drive
P	Undisturbed - piston
Cm	Undisturbed - CBR mould
D	Disturbed - small
B	Disturbed - bulk
W	Water

In Situ Tests

S []	Standard Penetration Test - open shoe [N-Value] * denotes extrapolated value
C []	Standard Penetration Test - solid cone
V ()	Vane Test (c_u kPa)
P ()	Hand Penetrometer (c_u kPa)
Mx	Mexe Probe
Mc	Mackintosh Probe

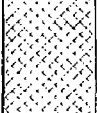
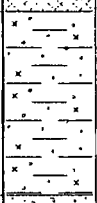
Water Levels

$\frac{2}{1}$	Depth and number of strike
$\frac{1}{1}$	Standing level related to strike number

Standpipes

	Simple Standpipe W denotes water monitoring G denotes gas monitoring
	Sealed Standpipe showing tip, upper and lower seals to scale

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 1 1/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
		(30/06/94)			TOPSOIL (0.40)		
D1	0.40			0.40			
D2	0.70						
C1 [31] B1	1.00 - 1.45 1.00 - 1.50	1.00			MADE GROUND; Dense dark brown to black silty clayey fine to coarse SAND with some flint gravel and some pieces of brick and ash. (0.90)		
				1.30			
					Firm dark brown silty sandy CLAY with much angular to rounded fine to coarse flint gravel and occasional brick pieces (Possible Made Ground) (1.30)		
U1 (85) D3	2.00 - 2.45 2.35	2.00					
				2.60			
C2 [19] B2	2.90 - 3.35 2.90 - 3.40	2.50			Medium dense orange brown clayey silty sandy angular to rounded fine to coarse flint GRAVEL. (1.20)		
W1	3.30						
				3.80			
					Yellowish white structureless CHALK with flints. (5.40)		
S3 [7]	4.20 - 4.65	4.00					
S4 [9]	5.00 - 5.45	4.50					
S5 [14]	6.50 - 6.95	6.00					
S6 [13]	8.00 - 8.45	7.50					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
4.00	3.30	SLOW	4.00	NO	30/06/94 30/06/94		20.00 20.00	19.50 0.00	14.70 3.80			0.15	19.50

Remarks Excavating from 0m to 1m for 1 hour.

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 1 2/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date) Casing	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m						
S7 [23]	9.50 - 9.95	9.00		9.20	Yellowish white structureless CHALK with flints.		
S8 [62]	11.00 - 11.45	10.50			Yellowish white rubbly CHALK with some putty chalk matrix and some flints (3.30)		
S9 [57]	12.50 - 12.95	12.00		12.50	White rubbly to blocky CHALK with flints (7.50)		
S10 [33]	14.00 - 14.45	13.50					
S11 [41]	15.50 - 15.95	15.00					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 1 3/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S12 [52]	17.00 - 17.45	16.50			White rubbly to blocky CHALK with flints		
S13 [43]	18.50 - 18.95	18.50					
S14 [53]	19.50 - 19.95	19.50					
		(30/06/94)		20.00	END OF BOREHOLE		

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 2 1/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
		(29/06/94)					
D1	0.30			0.20	MADE GROUND; Tarmac (0.20)		
D2	0.80				MADE GROUND; Loose dark grey to black clayey, silty, sandy angular to subrounded fine to coarse gravel with some brick, ash and clinker. (0.70)		
U1 (89)	1.00 - 1.45			0.90			
D3	1.45				White structureless CHALK with some brown pipe clay (2.90)		
D4	1.80						
U2 (91)	2.00 - 2.45	1.50					
D5	2.45				From 2.60m, with some flints		
D6	2.70						
U3 (81)	3.00 - 3.45	3.00					
W1	3.00						
D7	3.45						
				3.80	White structureless CHALK with some flints (5.50)		
S1 [6]	4.10 - 4.55	3.00					
S2 [17]	5.00 - 5.45	4.50					
S3 [7]	6.50 - 6.95	6.00					
S4 [11]	8.00 - 8.45	7.50					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
3.80	3.00	SLOW	3.00	NO	29/06/94		20.00	19.50	15.40	12.40-13.30		0.15	19.50
					19/06/94		20.00	0.00	3.90				

Remarks Chiselling to remove flint obstruction from 12.4m to 13.3m Excavating from 0m to 1m for 1 hour.
--

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 2 2/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S5 [47]	9.50 - 9.95	9.00		9.30	White structureless CHALK with some flints		
					White rubbly CHALK with some putty chalk matrix and some large flints (4.00)		
S6 [72]	11.00 - 11.45	10.50					
S7 [75]	12.50 - 12.95	12.00					
C8 [50] B1	14.00 - 14.45 14.00 - 14.50	13.50		13.30	White rubbly to blocky CHALK with some flints (6.70)		
S9 [40]	15.50 - 15.95	15.00					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 2 3/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
s10[40]	17.00 - 17.45	16.50			White rubbly to blocky CHALK with some flints		
s11[51]	18.50 - 18.95	18.00					
s12[62]	19.50 - 19.50	19.50					
		(29/06/94)		20.00	END OF BOREHOLE		

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water			Cased to	

Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 3 1/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
		(28/06/94)					
D1	0.50			0.30	TOPSOIL (0.30)		
U1 (50)	1.00 - 1.45	1.00			MADE GROUND; Firm dark brown to black silty sandy clay with some flint gravel and brick and ash pieces. (1.30)		
D2	1.45			1.60			
D3	1.80				Medium dense dark orange brown, mottled black, silty very sandy GRAVEL with occasional brick fragments (?) (Possible Made Ground). (1.10)		
C1 (26)	2.00 - 2.45	2.00					
B1	2.00 - 2.50						
				2.70	Stiff light brown gravelly CLAY (0.60)		
U2 (85)	3.10 - 3.55	3.00		3.30	White structureless CHALK with some flints and some brown clay (0.70)		
S2 (9)	4.00 - 4.45	4.00		4.00	Yellowish white structureless CHALK with flints (4.00)		
B2	4.00 - 4.50						
W1	4.80						
S3 (7)	5.00 - 5.45	5.00					
W2	4.40						
B3	5.00 - 5.50						
S4 (8)	6.50 - 6.95	6.00					
B4	6.50 - 7.00						
SS (15)	8.00 - 8.45	7.50		8.00			

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
5.80	4.80	RAPID	5.00	NO	28/06/94		10.00	10.00	7.40			0.15	19.50
					29/06/94		10.00	10.00	4.40				
					29/06/94		20.00	19.50	13.20				
					29/06/94		20.00	0.00	3.30				

Remarks Excavating from 0m to 1m for 1 hour. Waiting to gain access to the site for 3 hours.
--

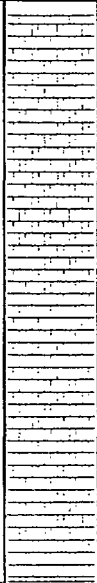
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Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S5	8.00 - 8.50				Yellowish white rubbly CHALK with some putty chalk matrix. (6.60)		
S6 [19]	9.50 - 9.95	9.00					
S6	9.50 - 10.00						
		(28/06/94)					
		(29/06/94)					
S7 [26]	11.00 - 11.45	10.50			White rubbly to blocky CHALK with some flints (5.40)		
S7	11.00 - 11.50						
S8 [8]	12.50 - 12.95	12.00					
S9 [11]	14.00 - 14.45	13.50					
				14.60			
S10 [41]	15.50 - 15.95	15.00					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks

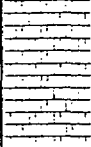
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Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S11[34]	17.00 - 17.45	16.50			White rubbly to blocky CHALK with some flints		
S12[49]	18.50 - 18.95	18.00					
S13[80]	19.50 - 19.95	19.50					
		(29/06/94)		20.00	END OF BOREHOLE		

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 4 1/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
		(01/07/94)		0.10	MADE GROUND; Tarmac (0.10) MADE GROUND; Brick rubble with some flint gravel and some ash. (1.70)		
C1 [15] B1	1.00 - 1.45 1.00 - 1.50	1.00		1.80	MADE GROUND; Soft dark brown silty sandy clay with some gravel and some ash. (0.90)		
U1 (55) D1	2.00 - 2.45 2.45	1.50		2.70	Medium dense brown, slightly clayey, silty sandy angular to rounded fine to coarse flint GRAVEL with occasional cobbles. (0.60)		
C2 [26] B2	3.00 - 3.45 3.00 - 3.50	3.00		3.30	Medium dense orange brown slightly sandy angular to rounded fine to coarse flint GRAVEL with occasional cobbles. (3.70)		
C3 [27] B3	4.00 - 4.45 4.00 - 4.50	4.00					
C4 [23] B4	5.00 - 5.45 5.00 - 5.50	5.00					
C5 [26] B5	6.50 - 6.95 6.50 - 7.00	6.00		7.00	From 6.50m, silty White rubbly CHALK with much putty chalk matrix and some flints (8.50)		
S6 [16]	8.00 - 8.45	7.50					

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				
11.80	11.20	SLOW	10.50	NO	01/07/94		20.00	19.50	16.20			0.15	19.50
					01/07/94		20.00	0.00	15.40				

Remarks Large flint cobble pushed from 9.4m to 10.1m Excavating from 0m to 1m for 1 hour. Water added from 3.5m to 7m.
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GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 4 2/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S7 [66]	9.50 - 9.95	9.00			White rubbly CHALK with much putty chalk matrix and some flints		
S8 [22]	11.00 - 11.45	10.50					
W1	11.20						
S9 [29]	12.50 - 12.95	12.00					
S10[14]	14.00 - 14.45	13.50					
S11[31]	15.50 - 15.95	15.00		15.50	White rubbly to blocky CHALK with some flints (4.50)		

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

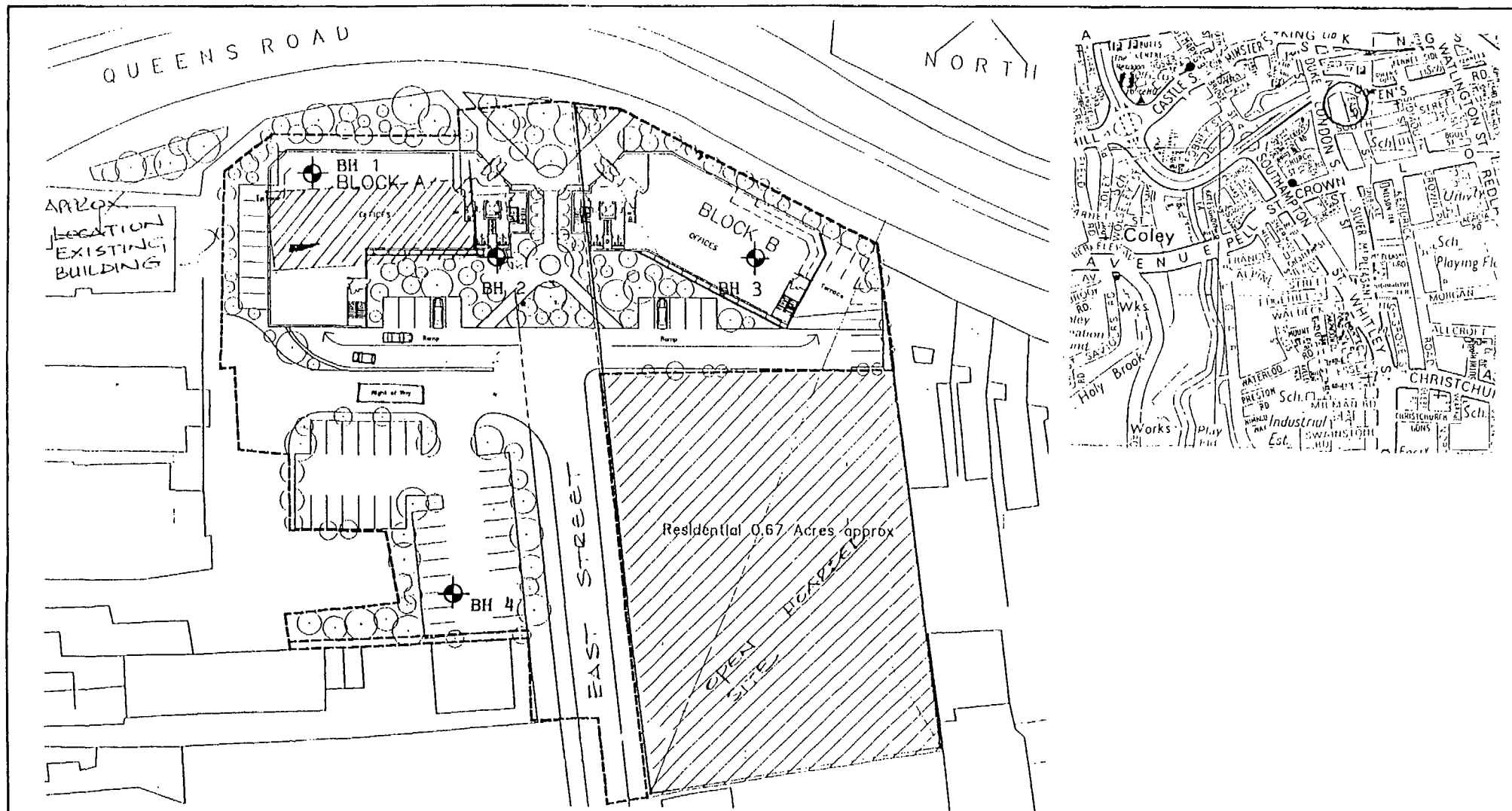
Remarks

GROUND EXPLORATIONS LTD Tel:0895 231718 Fax:0895 239624 		Project BREWERY SITE, QUEENS ROAD, READING	BOREHOLE BH 4 3/3
Co-ordinates 471800 E 173200 N		Client FENCHURCH ESTATES LTD	Project No. 11459
Scale 1:50		Agent SCOTT-WHITE AND HOOKINS	Ground Level

Samples / Tests		(Date)	Inst.	Depth	Description of Strata (thickness)	Legend	Level
Type	Depth m	Casing					
S12[45]	17.00 - 17.45	16.50			White rubbly to blocky CHALK with some flints		
S13[48]	18.50 - 18.95	18.00					
S14[49]	19.50 - 19.95	19.50					
		(01/07/94)		20.00	END OF BOREHOLE		

Groundwater Strikes					Groundwater Observations					Chiselling		Percussive Boring	
Depth					Date	Time	Depth			Depth	Hours	Dia	Cased to
Struck	Rose to	Rate	Cased	Sealed			Bore	Casing	Water				

Remarks



Not to Scale

BREWERY SITE, QUEENS ROAD READING

GROUND EXPLORATIONS LIMITED

SITE PLAN

Report No: 11459

TELEPHONE: (0895) 231718

Date: July 1994

Figure No: 4

Appendix F – Strategic Flood Maps

2009 Strategic Flood Risk Assessment:

Table – Spatial Planning and Development Control Recommendations

Map – Historical River Flooding

Map – City Centre Flood Zone Map

2011 Surface Water Management Plan:

Strategic Overview Map - Drawing No. 22806/001/001/RevB

2011 Preliminary Flood Risk Assessment:

Map – Local Information on Past

6.4.4 Spatial Planning & Development Control Recommendations

PPS25 Requirement	PPS25 Flood Zone				
	Zone 3b Functional Floodplain		Zone 3a High Probability	Zone 2 Medium Probability	Zone 1 Low Probability
	Developed Areas	Undeveloped Areas			
SPATIAL PLANNING RECOMMENDATIONS					
Important Considerations	It is important to recognise that, within Zone 3b Functional Floodplain, 'previously developed land' relates solely to <u>existing buildings</u> that are impermeable to flood water. The land surrounding these buildings are important flow paths and/or flood storage areas that must be retained.		Future development within Zone 3a High Probability can only be considered following application of the Sequential Test	Future development within Zone 2 Medium Probability can only be considered following application of the Sequential Test	It is important to recognise that sites within Zone 1 may be susceptible to flooding from other sources. Development may contribute to an increase in flood risk elsewhere if not carefully mitigated
	It should be recognised that property situated within Zone 3b Functional Floodplain will be subject to frequent flooding, on average, no less than once in every 20 years. There are clear sustainability implications to be considered in this regard, and it is highly questionable whether insurance against flooding related damages will be available in the longer term.				
Land Use (refer Table D2 of PPS25)	Proactively seek a reduction in risk by reducing the vulnerability of the existing land use	Land use should be restricted to Water Compatible development or Essential Infrastructure	Land use should be restricted to Water Compatible or Less Vulnerable development. More Vulnerable development may only be considered if Exception Test can be passed	Land use should be restricted to Water Compatible, Less Vulnerable or More Vulnerable development. Highly Vulnerable development may only be considered if Exception Test can be passed	No restrictions upon land use
DEVELOPMENT CONTROL RECOMMENDATIONS					
Detailed Flood Risk Assessment (FRA)	Required, in accordance with requirements set out in Section 6.6.1	Required, in accordance with requirements set out in Section 6.6.1	Required, in accordance with requirements set out in Section 6.6.1	Required, in accordance with requirements set out in Section 6.6.1	Required for all sites greater than 1ha in area. Recommend that all sites carry out an assessment of localised flood risks (including surface water and groundwater flooding)
Extensions, Outbuildings, Permitted Development & Property Subdivision	There should be a presumption against all building extensions (including out-buildings). Property subdivision may increase the population at risk, and should not be permitted		Building extensions (including out-buildings) should be discouraged to avoid raising flood levels elsewhere. Property subdivision may increase the intensity of development, and the population at risk, and should be discouraged	N/A	N/A
Floor Level	To be situated a minimum of 300mm above the 1 in 100 year river flood level, including climate change (refer Section 6.6.2)				No minimum level stipulated by PPS25
Site Access & Egress	For residential property, dry access is to be provided in the 1 in 100 year design event. For commercial property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321). Refer Appendix A.	Residential and/or commercial property is not appropriate within Zone 3b Functional Floodplain (undeveloped). Emergency evacuation procedures should be considered as an integral part of the design process.	For residential property, dry access is to be provided in the 1 in 100 year design event. For commercial property, access must be 'safe' in accordance with Defra "Flood Risk to People" (FD2320 & FD2321). Refer Appendix A.		No minimum level stipulated by PPS25
Basements	Not permitted	N/A	No sleeping accommodation permitted at basement level. All basements must have an access point that is above the 1 in 100 year river flood level, including climate change (refer Section 6.6.2)	No restrictions	No restrictions
Site Runoff	Implement SuDS to ensure that runoff from the site (post redevelopment) does not exceed greenfield runoff rates. Any SuDS design must take due account of groundwater and geological conditions (refer Section 6.6.3)				
Buffer Zone	A minimum 8m buffer zone must be provided to 'top of bank' within sites immediately adjoining a river corridor. This relates to both open waterways and culverted waterway corridors. Reference should be made to the Environment Agency's "Living on the Edge" guide (www.environment-agency.gov.uk) that discusses any development situated in, over, under or adjacent to rivers and/or streams				
Other	Ensure that the proposed development does not result in an increase in maximum flood levels within adjoining properties. This may be achieved by ensuring (for example) that the existing building footprint is not increased, that overland flow routes are not truncated by buildings and/or infrastructure, or hydraulically linked compensatory flood storage is provided within the site (or upstream)				
	As an integral part of the government's "Making Space for Water" agenda, the Environment Agency is actively seeking the renaturalisation of culverted watercourses as part of any future development. Realistic opportunities to reinstate the natural open waterway within existing culverted reaches of the river(s) should be promoted				