

CCG-C-17-10015

**FLOOD RISK ASSESSMENT REPORT FOR LAND AT THE
FORMER WHITEHOUSE CLUB, MIDDLETON ROAD,
CRUMPSALL, MANCHESTER, M8 4JZ**

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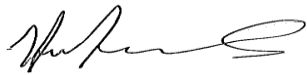
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1.0 INTRODUCTION

1.1 Purpose & Aims of the Assessment

CC GEOTECHNICAL LIMITED (CCG) was commissioned by **GRAYS ARCHITECTURE LIMITED** to prepare a Flood Risk Assessment (*FRA*) in connection with the proposed redevelopment of a parcel of land comprising at and immediately west of the former GMB Whitehouse Club, Middleton Road, Crumpsall, Manchester, M8 4JZ.

Following the demolition of the former Whitehouse Club and subsequent site clearance, it is proposed that the eastern section of the site be redeveloped by the construction of a replacement 2-storey social club constructed of traditional brick elevations under pitched roofing materials together with associated hard paved access/egress road and c.60nr off-road car parking bays and communal / beer garden.

It is further proposed that the land forming the remainder of the study site be developed for residential land use by the construction of 50nr residential dwelling comprising 32nr 2-storey, 18nr 2.5-storey structures and 2nr 3-storey apartment blocks forming 24nr residential units, each constructed of traditional brick elevations under pitched roofing materials together with associated hard paved access/egress roads and car parking facilities and areas of soft landscaping.

The existing and proposed layout of both schemes are as annotated on **GRAYS ARCHITECTURE LIMITED** architectural drawings contained herein.

The site is situated with the administrative jurisdiction of **MANCHESTER CITY COUNCIL**. A FRA was required by the client to submit as part of the planning application process.

This FRA was undertaken in accordance with the requirements of **MANCHESTER CITY, SALFORD CITY AND TRAFFORD COUNCILS 'Strategic Flood Risk Assessment: 2011' (SFRA)**, the *National Planning Policy Framework (NPPF)* and the *Planning Practice Guidance' (PPG: 2014)*

The principal objectives of the FRA were:

- To assess the potential for flooding on and within the vicinity of the site, following the proposed redevelopment
- To calculate the effects of climate change on likely future run off rates at the site
- To propose conceptual flood amelioration measures which can be practicably incorporated in the development infrastructure, to accommodate the 1 in 100-year flood event, corrected for climate change

2.0 SITE DATA

2.1 Site Location & Description

The overall comprises an irregularly shaped parcel of land located immediately to the west of Middleton Road, Crumpsall, Manchester, M8 4JZ as shown on **CCG** Drawing No. CCG-C-17-10015-1, and Aerial Plate No. CCG-C-17-10015-2 contained herein. The **ORDNANCE SURVEY** coordinates for the approximate overall site center are 383432, 403028. Its eastern boundary stands at an elevation of c.76.5ma Ordnance Datum (OD), with the western site boundary standing at c.81.5maOD.

2.1.2 Former Social Club Site

The land forming the eastern third of the overall site comprises a rectangular shaped parcel of land fronting on to Middleton Road. It extends to the approximate dimensions of c.88m x 48m, its long axis being on an east-west alignment. It occupies an area of c.3700m².

This section of the study site is bound to the east by public pavement extending along Middleton Road, and to the north and south by developments of residential properties fronting on to Whitehouse Avenue and Counthill Drive respectively.

Buildings occupying the study site comprise a square shaped single storey former social club constructed of traditional brick elevations under flat roofing materials.

The surface topography across the site is sensibly flat with cover comprising bituminous paving to the west with small areas of soft landscaping and concrete pedestrian paving extending around the periphery, with species poor grassed area (former bowling green) to the rear.

A few metal surface water drain covers were recorded within the permanent pavement cover.

2.1.2 Land Forming the Rear of the Site

Land forming the remainder of the site comprise an irregularly shaped parcel of land (*former football ground*) which extends to the approximate dimensions of 197m x 130m, its long axis being on an east-west alignment. It occupies an area estimated as 15972m². It is bound to the north and south by residential properties fronting on to Whitehouse Avenue, Cobb Lane, Windsor Crescent, and Counthill Drive respectively. Its western boundary is adjoined by gardens associated with private dwellings fronting on to Edenfield Road.

The surface topography across this section of the study site appears to rise from around 76.3maOD in the east to around 80.5maOD in the west, with surface cover comprising mixed perennial grasses and herb with stands of mixed scrubland species located around its periphery.

2.2 Existing and Proposed Development & PPG Classification

2.2.1 Replacement Social Club

By virtue of the proposed land use as *Commercial*, the development is classified as '*Less Vulnerable*', according to Table 3 of PPG (presented in Appendix C).

2.2.2 Proposed New Housing Development

By virtue of the proposed land use as *Residential*, the development is classified as '*More Vulnerable*', according to Table 3 of PPG (presented in Appendix C).

2.3 Access and Egress

The site is readily accessible via Middleton Road frontage to the east.

3.0 BACKGROUND AND APPLICATION OF PPS25

3.1 Introduction

The aim of PPG is to ensure that flood risk is taken into account at all stages in the planning process and, where relevant, that development is directed away from areas at highest risk of flooding. Where new development is planned in risk areas, then current policy aims are:

- To make the development safe from flooding
- To avoid increasing flood risk elsewhere as a consequence of the development
- To contribute to reducing flood risk overall

3.2 Sequential Test

3.2.1 Replacement Social Club & Proposed New Housing Development

The proposed developments were subjected to the Sequential Test as set out in Table 3 of PPG.

For assessment in accordance with the Test, the overall site was determined by reference to the **ENVIRONMENT AGENCY (EA)** Flood Map to be located in Flood Zone I, as defined by PPG. Since the proposed replacement social club is commercial in a brownfield regeneration area, a '*Less Vulnerable*' classification was assigned to it, and since the new housing development is residential in a brownfield regeneration area, a '*More Vulnerable*' classification was assigned to it.

Inputting these parameters into the Sequential Test matrix indicated that both development proposals are '*appropriate*' and as such the developments satisfies the Sequential Test as required by Table 3 of PPG.

4.0 SITE HYDROLOGY AND HYDROGEOLOGY

4.1 Watercourses & Bodies of Standing Water

EA mapping data indicates the site is situated within a designated Zone I and hence it is concluded that there is an insignificant risk of flooding associated with surface water features which could affect the proposed developments.

There are no documented watercourses within 200m of the study site, the nearest body of water being an un-named pond/reservoir c. 217m east of the study site beyond which lies The River Irk (c.330m northeast of the study site) and therefore it is considered that there is a '*Very*'

Low' risk of flooding from these features.

The **EA** does not have any flood modelling flood data at this site, nor does the **EA** have records pertaining to historical flood events on or within a 250m radius of the study site.

4.2 Geology, Hydrogeology and Groundwater Flooding

The geology of the site was researched by reference to the 1:50000 scale **BRITISH GEOLOGICAL SURVEY (BGS)** Sheet 085 Manchester (Solid and Drift Editions: 2010).

The **BGS** Solid and Drift map indicate the site is underlain with natural drift deposits comprising impermeable diamicton (boulder clay) of glacial origin (*Late-Quaternary – Devensian Sub Age*). The solid geology is documented as the Chester Formation (*formerly the Bunter Pebble Beds*) comprising aeolian and fluvial sandstones with sporadic conglomerates, particularly towards the base, and siltstones of the Early-Triassic Period (*Olenekian Age*).

There are no areas nearby which are utilised for flood storage and/or flood defences within 250m of the study site.

The appended **BGS** mapping data reports a '*Limited Potential*' for groundwater to flood at surface level - (*Clearwater Flooding*) – Low confidence rating.

4.3 Drainage (Pluvial) Flooding

The flood risk data discussed in the GroundSure Report (Report Reference No. CMAPS-AAG-672034-4165-221117, dated November 2017), presented in Appendix B shows a '*Low-to-Moderate*' risk of pluvial flooding along the south-eastern boundary of the study site at Counthill Drive and a '*Low-to-Highly Significant*' risk of pluvial flooding along the north-western site boundary.

4.4 Coastal Flooding

The site is located c.40km northwest from the River Mersey, and therefore the site is not at risk from coastal flooding

5.0 SURFACE WATER RUNOFF

5.1 Requirements for Surface Water Drainage at the Site

PPG requires that surface water arising from a developed site should, as far as is practicable, be managed in a sustainable manner to mimic the surface water flows arising from the site prior to development. Opportunities to reduce surface runoff, and the associated flood risk, should be identified and future effects of climate change should be taken into account. The relevant calculations are described in this section of the report.

5.2 Surface Water Runoff Rate at the Development Site

5.2.1 Proposed Replacement Social Club

This section of the report quantifies the impermeable and permeable areas of the site prior to, and following, the development. Hard paved areas (post redevelopment) were measured from architectural drawings (CAD) of the existing proposed development site configurations. These calculations have been prepared on the premise that the entire development will proceed as illustrated on the appended architectural drawings contained herein. Reference was also made to aerial photographs and **ORDNANCE SURVEY** mapping.

It was calculated that the proportion of impermeable surface will increase within the eastern section of the site following completion of the redevelopment of the replacement social club. Furthermore, PPG now requires that climate change be taken into account in predicting future runoff.

The changes to proportions of permeable/impermeable surfaces from the proposed development are summarised in Table 1 hereunder:

Table 1: Changes to Permeable/Impermeable Areas Post Development (Replacement Social Club)

	Prior to development site	Developed Site
Buildings/Roofs Hardstanding	2289m ²	2852m ²
Permeable areas	848m ²	1411m ²
Total	3700m²	3700m²

Using the Wallingford Procedure Runoff Equation, and the values contained in Volume 3 of the Wallingford procedure, a percentage runoff can be calculated for the current, and proposed, site configurations for the eastern section of the site.

$$PR (\%) = 0.829 \times PIMP (\%) + 25 \times SOIL + 0.078 \times UCWI - 20.7$$

$$SOIL = 0.45$$

$$UCWI = 138$$

$$PIMP \text{ Current site} = 62\%$$

$$PIMP \text{ Proposed Development} = 77\%$$

$$PR (\%) \text{ Current Site} = 53\%$$

$$PR (\%) \text{ Proposed development} = 65\%$$

It can be seen that the current PR(%) of 53% increases to 65% since the proposed social club redevelopment will contain more hard cover.

Using the Modified Rational Method, the runoff rate was calculated for a range of return periods. A time of concentration of 7.5 minutes was used, comprising a time of entry of 4 minutes and a time of flow of 3.5 minutes. A rainfall estimation calculation was also undertaken for 1, 5, 20 and 100year return period events. The calculated rainfall intensities are 34.3mm/hr, 55.2mm/hr, 77.7mm/hr, and 109mm/hr respectively. The runoff rates given by the Modified Rational method are:

$$Q = 2.78 \times C_v \times C_r \times \text{rainfall intensity} \times PIMP \times A$$

Table 2: Flow rates given by Modified Rational Method (Replacement Social Club)

Return Period	Runoff Rate (Q) Pre-Development	MCC SFRA Target Discharge Rate (= -50% Q)	Runoff Rate (Q) Post Development
1:1 Year	24l/s	14.9/s	29.9l/s
1: 5 Year	38.6l/s	24.1l/s	48.1l/s
1:20 Year	54.3l/s	33.8l/s	67.7l/s
1:100 Year	76.5l/s	47.4l/s	94.8l/s
1:100 Year + Climate Change	98.9l/s	61.5l/s	123l/s

For the 1:100y+climate change event, a runoff of 123l/s was calculated which exceeds the pre-redevelopment run-off rate by 24.1l/s. Subject to agreement with **UNITED UTILITIES**, this increase may be accommodated in the drainage network extending along Middleton Road frontage. However, it is possible that **UU** will not accept the full run-off rate. In these circumstances, it may be necessary that the developer considers incorporation of supplementary SUDS measures to attenuate runoff in storm conditions.

Notwithstanding this, given the strategic discharge target (-50%) set by **MANCHESTER CITY COUNCIL**, indicates that a requirement for surface water attenuation and/or SUDS measures may be required. With regards the adoption of soak-a-ways, the documented geology (impermeable diamicton) indicates a very low potential for soak-a-ways, and hence the solution must be one of attenuation storage. An overview of SUDS options is presented below, and those most likely to be appropriate for this site have been identified in Section 6.13 hereunder.

5.2.2 Proposed Housing Development

It was calculated that the proportion of impermeable surface will significantly increase within the remainder of the site following completion of the proposed housing development. Furthermore, PPG now requires that climate change be taken into account in predicting future runoff.

The changes to proportions of permeable/impermeable surfaces from the proposed development are summarised in Table 3 hereunder:

Table 3: Changes to Permeable/Impermeable Areas Post Development (Proposed Housing Development)

	Prior to development site	Developed Site
Buildings/Roofs Hardstanding	0m ²	10025m ²
Permeable areas	15972m ²	5947m ²
Total	15972m ²	15972m ²

Using the Wallingford Procedure Runoff Equation, and the values contained in Volume 3 of the Wallingford procedure, a percentage runoff can be calculated for the current, and proposed, site configurations for the remainder of the site.

$$PR (\%) = 0.829 \times PIMP (\%) + 25 \times SOIL + 0.078 \times UCWI - 20.7$$

$$SOIL = 0.45$$

$$UCWI = 138$$

$$PIMP \text{ Current site} = 0\%$$

$$PIMP \text{ Proposed Development} = 63\%$$

$$PR (\%) \text{ Current Site} = 1\%$$

$$PR (\%) \text{ Proposed development} = 53\%$$

It can be seen that the current PR(%) of 1% increases to 53% since the proposed new housing development and infrastructure will substantially increase hard cover.

Using the Modified Rational Method, the runoff rate was calculated for a range of return periods. A time of concentration of 7.5 minutes was used, comprising a time of entry of 4 minutes and a time of flow of 3.5 minutes. A rainfall estimation calculation was also undertaken for 1, 5, 20 and 100year return period events. The calculated rainfall intensities are 34.3mm/hr, 55.2mm/hr, 77.7mm/hr, and 109mm/hr respectively. The runoff rates given by the Modified Rational method are:

$$Q = 2.78 \times C_v \times C_r \times \text{rainfall intensity} \times PIMP \times A$$

Table 2: Flow rates given by Modified Rational Method (Proposed Housing Development)

Return Period	Runoff Rate (Q) Pre-Development	MCC SFRA Target Discharge Rate (= -50% Q)	Runoff Rate (Q) Post Development
1:1 Year	0.1l/s	56/s	105l/s
1:5 Year	0.2l/s	85l/s	169l/s
1:20 Year	0.2l/s	119l/s	238l/s
1:100 Year	8.28l/s	168l/s	335l/s
1:100 Year + Climate Change	0.4l/s	217l/s	433l/s

For the 1:100y+plus climate change event, a runoff of 433l/s was calculated. This exceeds the pre-redevelopment run-off rate by >400l/s. Subject to agreement with **United Utilities**, this increase may be directed/accommodated in the drainage network extending along Middleton Road frontage. However, it is likely that **UU** will not accept the full run-off rate. In these circumstances, it will be necessary that the developer considers incorporation of supplementary SUDS measures to attenuate runoff in storm conditions.

Notwithstanding this, given the strategic discharge target (-50%) set by **Manchester City Council**, a requirement for surface water attenuation and/or SUD's measures is highly be required. With regards to soakaway drains, the documented geology (impermeable diamicton) indicates a very low potential for these to be efficient, and hence the solution must be one of attenuation storage. An overview of SUDS options is presented below, and those most likely to be appropriate for this site have been identified in Section 6.13 hereunder.

6.0 SUDS OPTIONS

6.1 Approach to Selection of SUDS Techniques

The underlying ground conditions of a development site will often determine the type of SUDS approach used at development sites for the disposal of surface water runoff. This is determined through ground investigations carried out on-site. However, in the absence of this information an initial assessment of the sites suitability to the use of SUDS can be obtained from the review of the available soils/geological mapping.

The detailed design of any drainage system and SUDS approach, consideration should be given to site specific characteristics and where possible should be based on primary data from site investigations.

Further advice must also be sought in terms of water resources contaminated land, archaeology, ecology etc.

The initial appraisal of SUDS viability will help inform the developer/owner of the various options available for the development and may influence the final layout of the site.

6.2 Alternative SUDS Techniques Background

Traditionally, built developments have utilised piped drainage systems to manage storm water and convey surface water run-off away from developed areas as quickly as possible. Typically, these systems connect to the public sewer system for treatment and/or disposal to local watercourses. Whilst this approach rapidly transfers storm water from developed areas, the alteration of natural drainage processes can potentially impact on downstream areas by increasing flood risk and reducing water quality. Receiving watercourses are therefore much more sensitive to rainfall intensity, volume and catchment land uses after a catchment or areas of a catchment have been developed.

Due to the difficulties associated with upgrading sewer systems it is uncommon for sewer and drainage systems to keep pace with the rate of development/redevelopment and the increasingly stringent controls placed on discharges to watercourses. As development progresses and/or urban areas expand, these systems become inadequate for the volumes and rates of storm water they receive, resulting in increased flood risk and/or pollution of watercourses. Allied to this are the implications of climate change on rainfall intensities, overwhelming catchment responses and surcharging piped systems.

In addition, as flood risk has increased in importance within planning, a disparity has emerged between the design of conventional sewer systems (1 in 30yr) and the typical design event (1 in 100yr). This often results in drainage inadequacies for the flood return period developments need to consider, often resulting in potential flood risk from surface water sewers and combined sewer systems.

A sustainable solution to these issues is to reduce the volume and/or rate of water entering the sewer system and watercourses.

6.3 What are Sustainable Drainage Systems

Sustainable Drainage Systems (SUDS) are the preferred method (as set by the Environment Agency, Government and Building Regulations) for managing the surface water runoff generated by developed sites. SUDS seek to manage surface water runoff as close to the source as possible. Typically, this approach involves a move away from piped systems to softer engineering solutions inspired by natural drainage processes, where adoptable drainage criteria allow.

In addition, they should be designed to take into account the surface water run-off quantity, rates and also water quality ensuring their effective operation up to and including the 1 in 100year design event.

Where possible a SUDS technique should seek to contribute to each of the three goals identified below with the favoured system contributing significantly to each objective:

- Reduce flood risk (to the site and to neighbouring areas)
- Reduce pollution
- Provide landscape and biodiversity benefit

In keeping with the guidance of Planning Policy Statement 25, Local Planning Authorities encourage the application of SUDS techniques.

Typically, the application of SUDS techniques is not limited to one technique per site. Often a successful SUDS solution will utilise a number of techniques in combination, providing flood risk, pollution and biodiversity benefits. In addition, SUDS can be employed on a strategic scale, for example with a number of sites contributing to large scale jointly funded and managed SUDS.

6.4 SUDS Techniques

SUDS techniques can be used to reduce the rate and volume and improve the water quality of surface water discharges from sites to the receiving environment (*i.e. natural watercourse or public sewer etc*). Various SUDS techniques are available; however, the techniques operate on two main principles:

- Infiltration
- Attenuation

All systems generally fall into one of these categories, or a combination of the two.

The design of SUDS measures should be undertaken as part of the drainage strategy and design for a development site. A ground

investigation is normally required to assess the suitability of using infiltration measures, with this information being used to assess the required volume on site storage. Hydrological analysis is undertaken using industry approved methods.

The viability of alternative SUDS techniques needs to be robustly assessed on an individual site basis as part of this Flood Risk Assessment taking account of the following:

- Underlying geology and the results of on site Geo-Environmental Investigations;
- Proximity of groundwater table
- Long term maintenance and management of the SUDS asset
- Sewerage undertakers' criteria relating to any public sewer systems that would rely upon the function of the SUDS asset
- Environment Agency criteria relating to the protection of underlying groundwater and water resources
- Contaminated land issues

During the detailed design process of the SUDS liaison should take place with the Local Planning Authority, the Environment Agency and United Utilities in order to establish that the design methodology is satisfactory and to also agree a permitted rate of discharge from the site.

Building regulations advise that a SUDS hierarchy be followed in order to select the appropriate solution for a development site, with preference given to infiltration techniques over attenuation systems, provided that underlying conditions allow.

6.5 Infiltration SUDS

This type of Sustainable Drainage System relies on discharges to ground, where suitable ground conditions allow. Therefore, infiltration SUDS are reliant on the local ground conditions (i.e. permeability of soils and geology, the groundwater table depth and the importance of underlying aquifers as water resources etc) for their successful operation.

Various infiltration SUDS techniques are available from directing the surface water run-off to ground. However, development pressures and a desire to maximise development potential often result in typically small land areas available for infiltration systems. Small areas, allied to the rapid rates of run-off generation often require some form of supplementary attenuation as part of the infiltration system. The storage may be provided in the sub-base of a permeable surface, within the chamber of a soakaway, as a pond/water feature, or within underground storage pipes

Infiltration measures include the use of permeable surfaces and other systems that are generally located below ground.

6.6 Permeable Surfaces

Permeable surfaces are designed to allow water to drain through to a sub-base at a rate greater than the rain that falls to the surface. Permeable surfaces act by directly intercepting the rain that falls and are therefore true source controls. In theory, this system would prevent any surface water running off the site. However, in reality it is impractical to design permeable surfaces to directly infiltrate intense rainfall events. The permeable sub-base can be used to temporarily store infiltrated run-off underground allowing it to percolate into the ground below. Alternatively, stored water within sub-base can be discharged from the site.

Maintenance programmes will need to ensure that the surface is kept clear of silt and voids are clear. The use of grit and salt during the winter months will adversely affect the drainage potential of paved surfaces, however this should not be required often as ice is less likely to form on these types of surfaces.

Grass/Landscaped Areas: Grassed or landscaped areas provide a permeable surface that allows for the infiltration of rain falling onto these areas, and potentially also run-off from adjacent impermeable areas. Grassed or landscaped areas are some relatively inexpensive SUDS measure however they are likely to be restricted to where vehicles are not present.

Reinforced Grass: Techniques are available that allow grass to be incorporated into a pavement type surface. These provide varying ratios of hard-pavement to grass dependant on the site requirements. These range from concrete block arrangements to plastic meshes and can be utilised in those areas where the hard permanence of typical pavement might be undesirable, such as in conservation areas, roadside verges,

emergency services access, canal towpaths, farm tracks, rural settings etc. In the past, these systems have been typically adopted for situations where a load bearing surface is required to fit into the surrounding environment, however these systems are often now installed for surface water management purposes. The grass: hard pavement ratio is one of the dominant factors that determine the rate of infiltration through to sub-surface.

Gravel: A bed of gravel with a high void space on a permeable sub-base offers a cost-effective solution for trafficked areas. Rain falling directly onto the area is able to infiltrate through to the sub base.

Solid paving with Void Spaces: Solid paving can be installed in such a way that voids are present that can be in-filled with a permeable material such as grass or gravel etc. If this is to be used as a SUDS measure, a permeable sub-base is required to allow infiltration into the underlying ground and/or temporary storage to attenuate discharges.

Permeable Pavements: Permeable pavements allow the rain falling directly onto the area to infiltrate through into a sub-base and where suitable, through into the underlying strata. Permeable pavements are constructed using porous concrete blocks. Small projects of less than 100m² (depending on sub-grade permeability can often be managed using 100% infiltration, whereas larger schemes will often require a combined system, with some form of attenuation as back up for periods of exceptional flows. The use of geo-membranes can trap pollutants and prevent them being carried into the environment. The use of geo-membranes can trap pollutants and prevent them being carried into the receiving environment. The use of an impermeable membrane beneath the sub base will work to contain any pollutants within the sub-base. One major advantage of tanked permeable paving systems is that any significant contamination, for example a diesel spillage, will be restricted to the immediate area and not transported into local sewers or watercourses. The performance of permeable pavements will dramatically decrease over a period of time with the clogging of voids and this should be taken into consideration during the design process and maintenance.

6.7 Sub Surface Infiltration.

Where permeable surfaces are not a practical option, more defined infiltration systems are available. In order to infiltrate run-off into the ground, a storage system is provided that allows the infiltration of the stored water into the surrounding ground through both the sides and bottom of the storage. These systems are constructed below ground and therefore may be advantageous with regards to the developable area of the site, however consideration needs to be given of construction methods and maintenance access to any development that takes place over an underground infiltration system. Consideration is also needed of the depth to the groundwater table. The provision of large volumes of infiltration /storage underground has potential cost implications and infiltration devices should not generally be built within 5m of a building, under a road or on soil that may dissolve or be washed away, in line with Building Regulations advice.

Geocellular Systems: Modular block systems can be used to provide an underground infiltration facility. The modular structures are usually made of plastic and can be staked side by side or on top of each other to construct an infiltration/storage unit of the required size. The modular blocks are usually sited upon a highly permeable sub-base through which the surface water run-off is discharged (usually through perforated pipes). The outlet from the pipes is restricted which causes the run-off to rise up through the sub-base into a geocellular storage system. The storage systems are usually tanked with a geomembrane. These types of systems are quick and easy to install, flexible in their configuration, and have minimal maintenance requirements (providing the inflow of silt is limited). While many manufacturers claim that their products are suitable for installation beneath roadways or car parks, their use in these areas should be taken with caution. Geocellular systems can also be utilised for providing storage without infiltration in order to attenuate discharge rates. In these situations, the system is tanked with a geomembrane or similar.

Filter Drain: A filter drain is a trench that contains a perforated or porous pipe that runs along its bottom. The trench is filled with a suitable filler material, granular material or lightweight aggregate fill, all with high void space. The fill may be exposed at the ground surface or capped with turf, topsoil etc that allow the trench to flood (i.e. not an impermeable surface that could pressurise the trench). Surface water run-off generated by the site is directed through the perforated pipe which then flows into the trench and infiltrates into the surrounding ground. Filter drains have been used extensively for highways and car parking areas, where they generally been constructed in the verge and median strip.

Soakaway (Chamber): Surface water run-off is directed to a chamber set in the ground with holes in the sides and base. This allows the stored water to soak into the ground. The storage capacities of soakaway chambers are limited and therefore they are more suitable for dwellings than large developed areas. The chambers are prone to silting up over time and therefore, need regular maintenance

Soakaway (Trench): Where the liner space is available, soakaways that use a trench rather than a chamber may be used to manage the runoff from larger areas.

Soakaway (Granular Soakaway): Similar to a filter drain, a soakaway (either chamber or trench) filled with a high percentage void, granular material can be used to store surface water runoff as it is infiltrated into the surrounding ground. The granular fill will offer structural strength to the soakaway although the storage volume will be substantially reduced.

6.8 Attenuation SUDS

Where site ground conditions are deemed unsuitable for the widespread implementation of infiltration techniques, the surface water runoff discharged from a site will need to be attenuated utilising on site attenuation storage. While this is a SUDS technique that will reduce the rate of discharge from the site, the overall volume will not be minimised using on site storage alone. An important factor that needs to be taken into consideration when assessing the suitability of on site storage as part of a proposed development is the volume required and the associated impacts the storage will impose on development proposals and risks to neighbouring properties.

Should the use of infiltration to either partially or fully dispose of the water runoff from a developed site be found to be unfeasible, on site storage will be required in order to attenuate the discharge from the site. An allowable rate of discharge will need to be agreed with the Environment Agency, United Utilities and the Planning Authority. This can have significant implications to the proposed development with regard to the large volume of storage that may be required. On site storage can be constructed above ground or below ground; the above ground systems usually being cheaper on a cost per m3 of storage basis. It should be noted, however, that below ground systems may pose less constraints on the developable area of the site.

6.9 Basins

Basins are areas that have been re-profiled (or alternatively embanked) to allow for the temporary storage of runoff from a developed site. Basins are drained in such a way that ensures that they are free from water in dry weather. Therefore, between periods of rainfall they can be used for other purposes such as open public space, recreation etc. Basins treat run-off in a variety of ways i.e. settlement of solids in still water, absorption by aquatic vegetation by aquatic vegetation or biological activity etc. the construction of basins uses relatively simple techniques. Local varieties of vegetation should be used wherever possible and should be fully established before the basins are used. Access to the basin should be provided such that a maintenance programme can be implemented. This would include inspections, regular cutting of grass, annual clearance of aquatic vegetation and silt removal as required.

Detention Basins: A detention basin is designed and constructed to store surface water run-off temporarily in order to attenuate flows over a minimal period of time. Detention basins provide better flow attenuation than floodplains as they store water until the flood has passed. The stored water is then released at a controlled rate after the storm to avoid flooding downstream. If the runoff is held back for long enough, solids start to settle out of the water, which improves water quality.

Extended Detention Basin: If the period of detention increases to approximately 24hrs, the basin is referred to as an extended detention basin. This result in surface water runoff being stored beyond the time normally required for attenuation which provides extra time for natural processes to remove some of the pollutants in the water.

6.10 Ponds

Ponds are similar to basins except that the outflow is configured such that a volume of water is contained during dry weather, usually for amenity, recreational or agricultural purposes. Ponds are designed to hold the additional surface water runoff generated by the site during rainfall events. Like basins, ponds are designed to control discharge rates by storing the collected runoff and releasing it slowly once the risk of flooding has passed. Ponds can provide wildlife habitats, water features to enhance the urban landscape and where quality and flooding

risks are acceptable, they can be used for recreation. It may be possible to integrate ponds and wetlands into public area to create new community ponds. Ponds and wetlands trap silt which may need to be removed periodically. Ideally, the contaminants should be removed at source to prevent silt from reaching the pond or wetland in the first place. In situations where this is not possible, consideration should be given to a small detention basin placed at the inlet to the pond in order to trap and subsequently remove the silt. Depending on the setting of a pond, health and safety issues may be important issues that need to be taken into consideration. The design of the pond can help minimise any health and safety issues (i.e. shallower margins to the pond to reduce the danger of falling in). A fence may also be required for keeping children and wildlife out.

Balancing/Attenuating Ponds: A balancing or attenuation pond is designed only to store surface water run-off and attenuate discharge until the flood/storm peak has passed. Therefore, storage periods may not be long enough to significantly improve water quality capacity compared with ponds with longer retention times. They contain some water at all times with the water level fluctuating as the runoff passes through the device.

Flood Storage Reservoirs: Flood storage reservoirs are very similar to balancing/attenuation ponds except that they are usually much larger. They are generally used to attenuate fluvial flood flows rather than the surface water run-off from developed areas and are therefore likely to be utilised as a SUDS measure. Should an existing flood storage reservoir in the vicinity of the proposed development be identified to offer spare capacity, then depending on ownership and agreement, it may be possible to utilise the spare capacity for storm water management of development areas.

Lagoons: Should the surface water run-off have high suspended solids content; a lagoon could be a suitable method for attenuating its discharge to the receiving environment. Lagoons are similar to balancing /attenuation ponds except that they are also designed for the settlement of suspended solids. Usually they are long and narrow in shape to ensure the longest retention time and therefore an efficient removal of suspended solids. However, lagoons are usually free of vegetation and therefore do not provide any biological treatment.

Retention ponds: Retention ponds are designed to detain the surface water run-off for periods between several days and two weeks. This allows for a higher level of settlement, biological treatment and limited attenuation of flows. Retention ponds provide a greater degree of treatment than extended detention basins.

Wetlands: A wetland is similar to a pond except that it has a high proportion of emergent vegetation in relation to open water. Wetlands use plants to make the treatment of surface water run-off more efficient and can allow detention times required to fully treat the run-off to be reduced to a couple of weeks. Constructed wetlands are ponds with irregular perimeters and undulating bottom contours into which the wetland vegetation is purposely placed to enhance pollutant removal from surface water runoff. Surface water run-off enters a constructed wetland through a forebay where larger solids and coarse organic material settle out. The run-off discharged from the forebay passes through emergent vegetation which acts to filter organic materials and soluble nutrients. The use of constructed wetlands can be looked at from two perspectives. The first is that the wetland is primarily used to maximise pollutant removal from storm water flows. Alternatively, it may be used primarily to control storm water flows, with increased pollutant removal capabilities.

6.11 Alternative forms of Attenuation

In many situations the development of a site may involve proposals that would inhibit the use of basins or ponds as a means of managing surface water run-off discharged from the site. This may be due to land take, economic feasibility, or other issues such as health and safety etc. In these situations, it may be appropriate to use a storage option that is viewed as being more 'engineered' than an open basin or pond. Most of these methods involve the provision of storage beneath the ground surface, which may be advantageous with regards to the developable area of the site; however, consideration needs to be given to construction methods, maintenance access and to any development that takes place over an underground storage facility. The provision of large volumes of storage underground also has potential cost implications.

Deep Shafts: Deep shafts can be utilised in areas with low groundwater tables. Shafts have small footprints and are therefore useful on sites with low land availability. However, pumping from the shaft into the receiving drainage network will be required. Therefore, substantial

mechanical and electrical works will be required as potentially would major civil engineering requirements. With a relatively small cross-sectional area, a shaft would be prone to siltation at a rapid rate depending on the quality of the run-off. Therefore, a maintenance programme would be required as would regular servicing of any pump works.

Oversized pipes: Over sizing the pipes that make up the on-site drainage network is a cost-effective method that is often used for providing attenuation storage within the network. The main drawback with using this method is that it can be very difficult to obtain the required level of storage as the pipe diameters are often restricted by depth of cover (vertical distance between top of pipe work and ground surface) available and the need to gravity drain into an existing network. A solution to this is to lay multiple pipes side by side; however, this increases the excavation areas and may also place restrictions on the development footprint. The use of oversized pipes is not an effective method of providing on site storage if the network is at a relatively steep gradient. This is because the storage at the upstream end of the pipe is unlikely to be utilised.

Rainwater Harvesting: Rainwater harvesting is the process of collecting rain that falls directly onto roofs (and in some cases hardstanding areas) such that it can be re used for non-potable uses around the home or business (typically flushing toilets, car washing and irrigation etc). The simplest form of rainwater harvesting involves the collection of run-off from a roof via a water butt situated at the bottom of a down pipe. This water can then be used for irrigation. For systems where the collected run-off is to be used for toilet flushing, washing machines etc, it is likely that the water would be pumped from a storage tank installed on the grounds of the property. Packaged systems are available although the costs (including ongoing maintenance) may outweigh the payback in terms of reduced water supply charges. The use of rainwater harvesting fits well with the overall water cycle, as it may assist with a minor reduction in volumes of off-site run-off 'post development' together with reducing overall demand for potable water.

Tanks: The use of tanks for the provision of storage to attenuate surface water runoff is varied in the number of options available. While most storage tanks are installed beneath the ground surface, above ground storage tanks may be feasible as part of industrial or commercial type developments where amenity issues or space are not significant restrictions. Tanks are likely to be prefabricated, but could also be constructed in-situ for below ground concrete tanks. Plastic and Glass Reinforced Plastic Tanks are also often utilised with sizes up to 25m² being available off the shelf (although larger tanks used above ground may have additional reinforcing requirements). Consideration must be given to below ground tanks with regards to cover depths, load bearings, and also invert depths should the tank be drained by gravity. The storage requirements need to be based on a sound hydrological assessment as under-sizing the tank would be costly to remediate.

Green Roofs: A roof area that is used for growing appropriate types of vegetation which provides a degree of retention and attenuation, it also promotes evapotranspiration. In addition, vegetation and substrate can absorb a range of pollutants. Green roofs are more suitable for public and institutional buildings that have good maintenance programmes and support. Green roofs are available in both pre-fabricated and in-situ construction, however they are heavy systems and can have major structural implications for buildings and are usually impractical to retro-fit.

6.12 Combined Infiltration/Attenuation Systems

In most situations, SUDS systems include both infiltration and storage, and most of the techniques identified above can be used in combination. Dedicated infiltration and attenuation systems may also include swales and filter strips.

Swales: A swale is a grass lined channel designed to control both the flow rate and quality of the surface water run-off that is generated by the adjacent site. Not only does the water run down the sides of the swale at reduced speed, but it can also be slowed further as it flows along the channel before being discharged from the site. This detention of the runoff also increases the infiltration from the swale.

Filter strips: A filter strip runs along the edge of a permeable area and is sloped to allow the sheet flow across the vegetated strip. Unlike a swale however, no storage is offered other than what is held back by the vegetation. The overland flow across the filter strip is likely to run into a water course at some point rather than being formally collected and discharged at a controlled rate from the site.

6.13 SUDS Options Appraisal

Taking account of the context setting of the site, it is strongly preferred that surface water runoff be wholly directed into the United Utilities

drainage system, and consultations should be made with UU to determine the feasibility of this. However, should supplementary SUDS be required by UU, or for conformity with design accreditations e.g. **BREAM**, then the following comments are made:

- The documented geology suggests that the runoff from the site is unlikely to be capable of being discharged into the ground via soakaways since the underlying drift deposits comprise an impermeable clay aquiclude.
- The preferred solution for the developed sites is to wholly direct surface water run-off into the existing surface water sewers to the east and south of the site. However, consultations with the **UU** will be required to explore this possibility.
- If the rate of run-off cannot be accepted by **UU**, then attenuation will be required in the form of oversize pipes or storage / attenuation tanks

In considering the foregoing recommendations, it should be borne in mind that the purpose of this FRA is to demonstrate that simple practical measures can be adopted to achieve the objectives of PPG. Detailed design of the adopted systems is outside the scope of this assessment.

7.0 CONCLUSIONS AND RECOMMENDATIONS

- It is concluded that the site is situated within an **EA** designated Flood Zone I and hence is not at risk of flooding
- The proposed commercial development forming the eastern section of the site classifies as “*Less Vulnerable*” in respect of the PPG definitions, and in its present form is “*appropriate*” due to occupying a Flood Zone I. In this circumstance, an Exception Test is not applicable
- The proposed residential development forming the remainder of the site classifies as “*More Vulnerable*” in respect of the PPG definitions, and in its present form is “*appropriate*” due to occupying a Flood Zone I. In this circumstance, an Exception Test is not applicable
- OS mapping illustrates that the site is located some distance from the River Mersey and/or the Irish Sea and therefore the risk of coastal flooding is Very Low
- The **EA** have no records pertaining to historical watercourse flood events on, or within 250m of the site
- The **EA** does not have any flood modelling data at this site
- Consultations indicated that there is a potential for Pluvial Flooding along the south-eastern and north-western boundaries
- Based on the calculated pre/post-construction surface water run-off rates (l/s), it is calculated that the configuration of the proposed replacement social club may increase surface water run-off rates during a 1:100yr+ Climate Change event since there will be an increase in impermeable surface cover
- Based on the calculated pre/post-construction surface water run-off rates (l/s), it is calculated that the configuration of the proposed new housing development will increase surface water run-off rates during a 1:100yr+Climate Change event since there will be marked increase in impermeable surface cover
- An application to **UU** should be made in respect of surface water discharge with the preferred solution being full acceptance of the rate of run off.
- The evidence of the documented **BGS** geology is that soakaway drainage systems will not be a viable option on this site
- Should **UU** refuse the calculated rate of runoff for the 1-100yr+Climate Change event then attenuation will be required in the form of oversize pipes or storage / attenuation tanks incorporating a regulated rate of run-off regulated by Vortex Flow Control or similar

DRAWINGS:

**10015-1 – SITE LOCATION PLAN
10015-2 – AERIAL PHOTOGRAPH
EXISTING & PROPOSED LAYOUT PLANS**

All dimensions are to be checked on site, any discrepancies are to be reported to the Architect before work commences. Do not scale from this drawing.

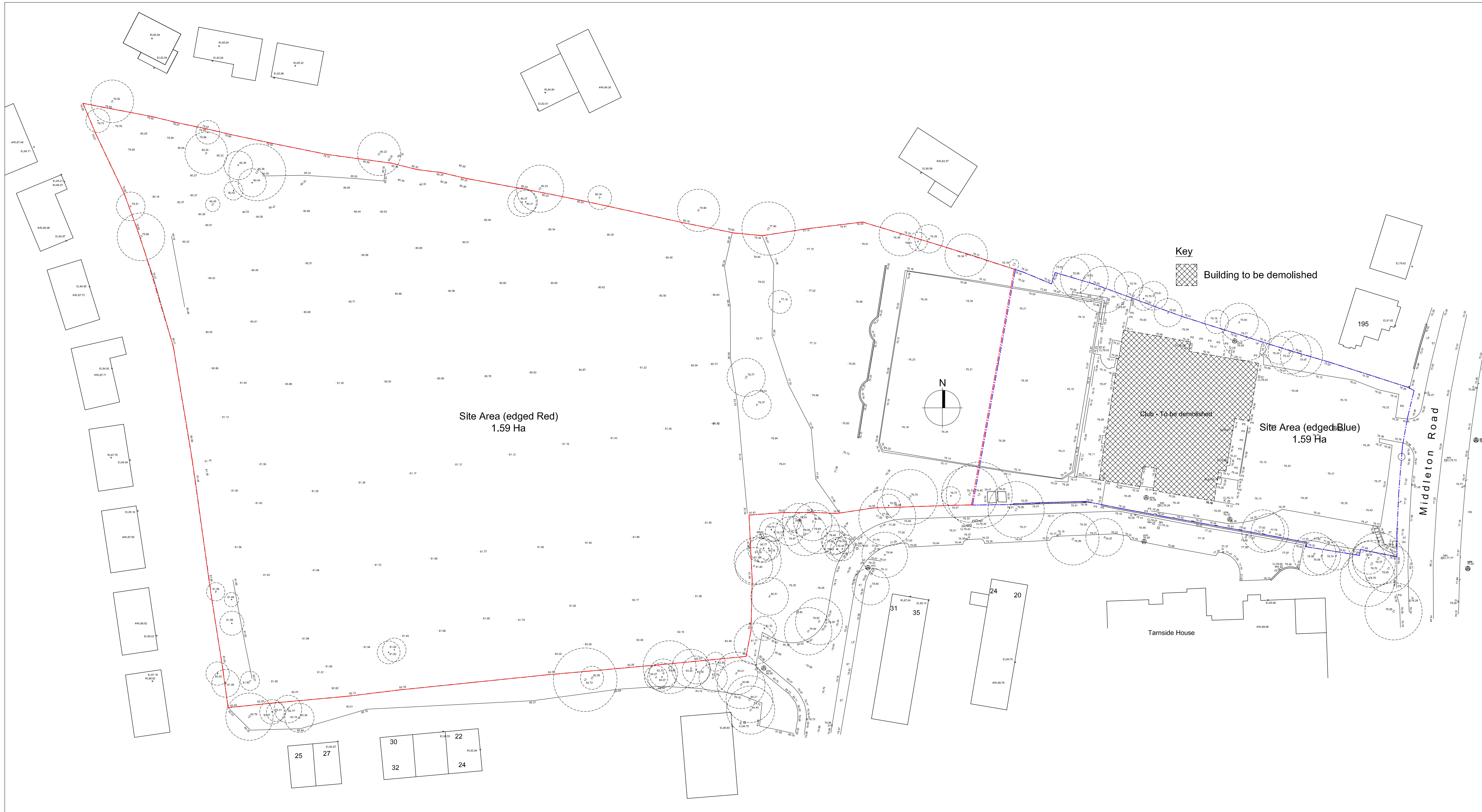
This drawing is to be read in conjunction with all relevant consultants and specialist drawings / documents, any discrepancies are to be reported to the Architect before the affected work commences.

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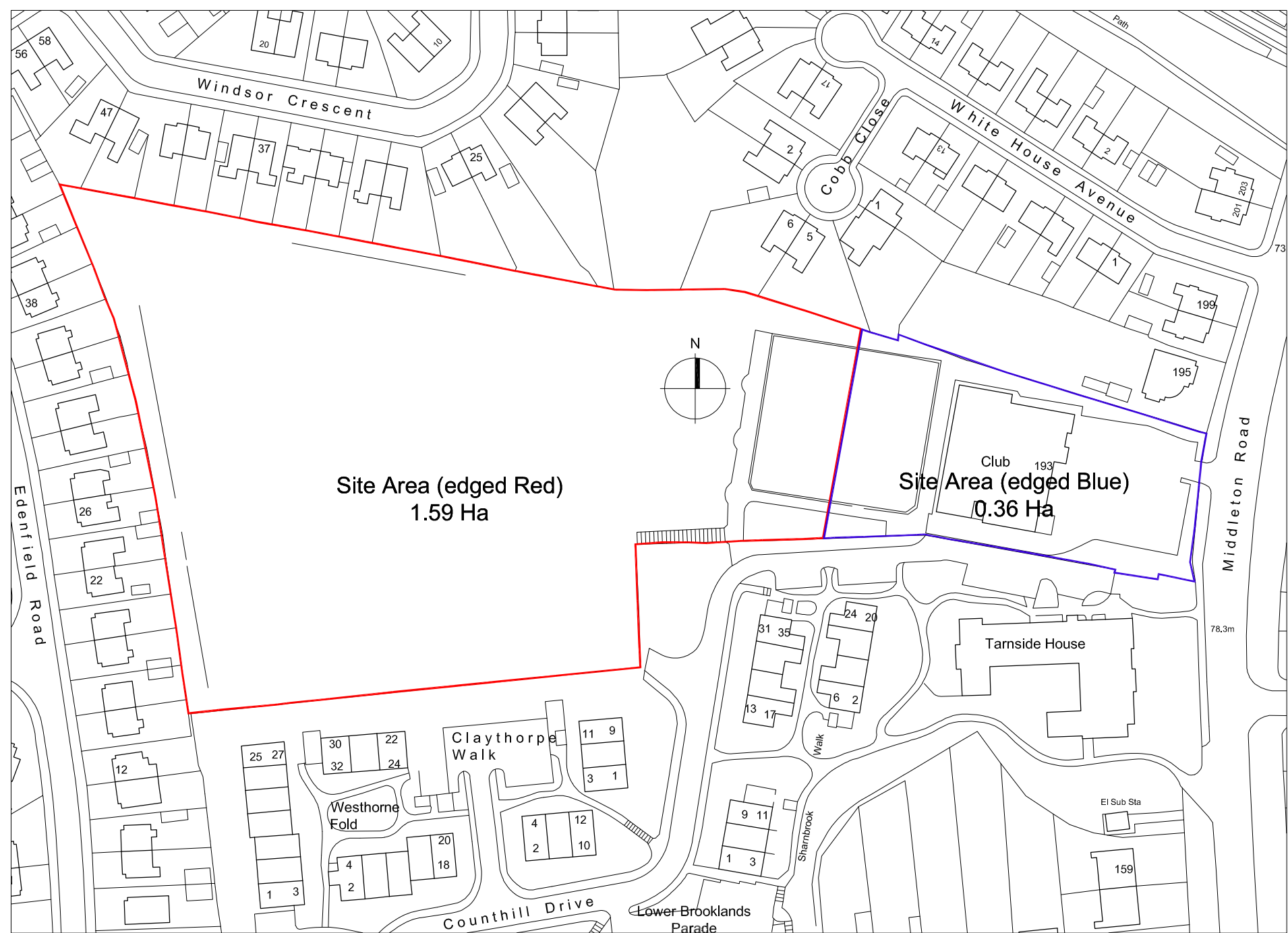
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12/01/2017



Existing Site Plan - 1:500



Existing Site Plan - 1:1250

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Client:

Dappa Homes Ltd

Project:

Whitehouse Club, Middleton, Crumpsall,
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Drawing Title:

Existing Site Plan - Housing Development

Scale:

1:500 / 1:1250 @ A1

Date:

Jan 2017

Drawing No:

4050 / 002

Revision:

C



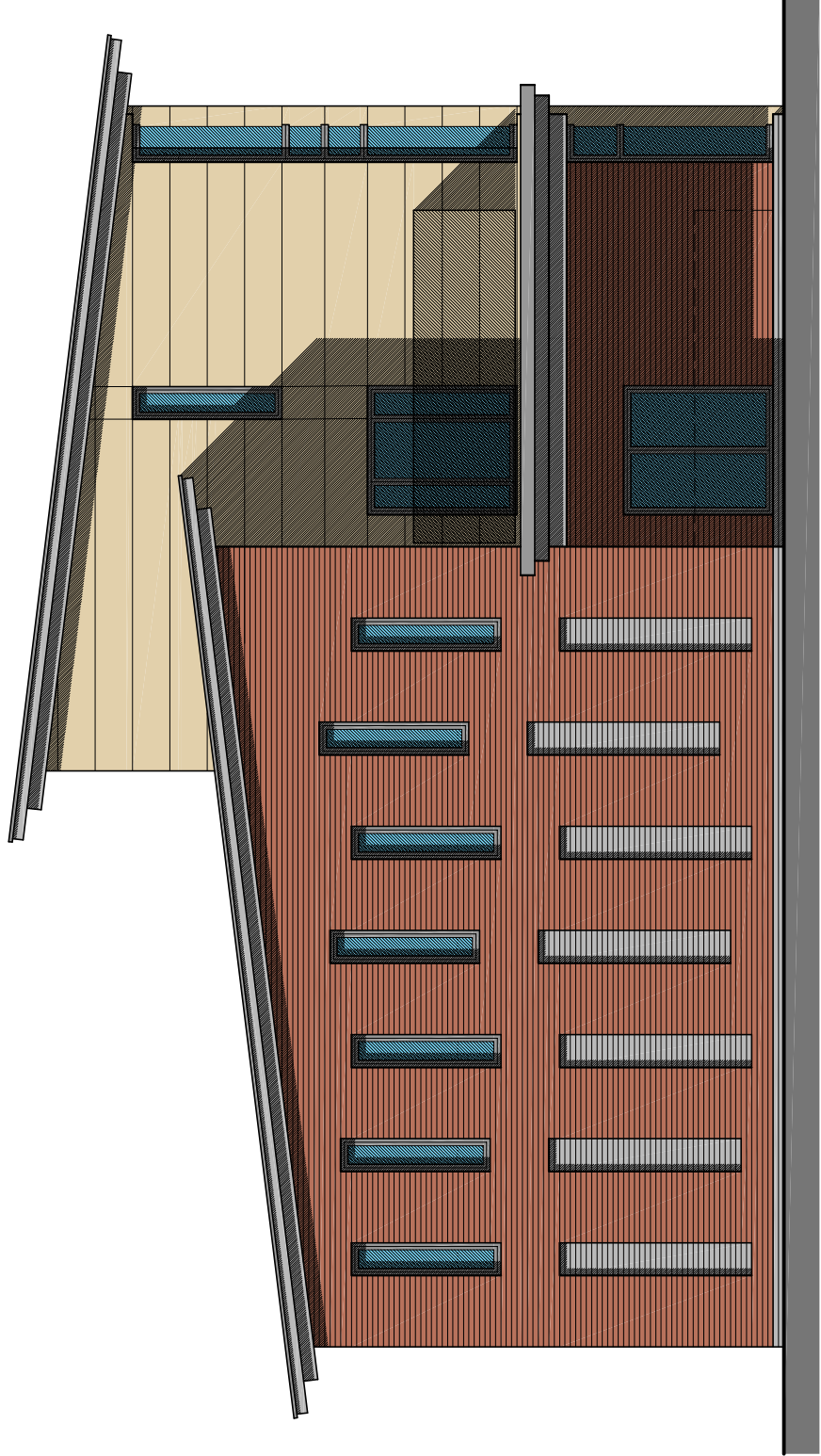
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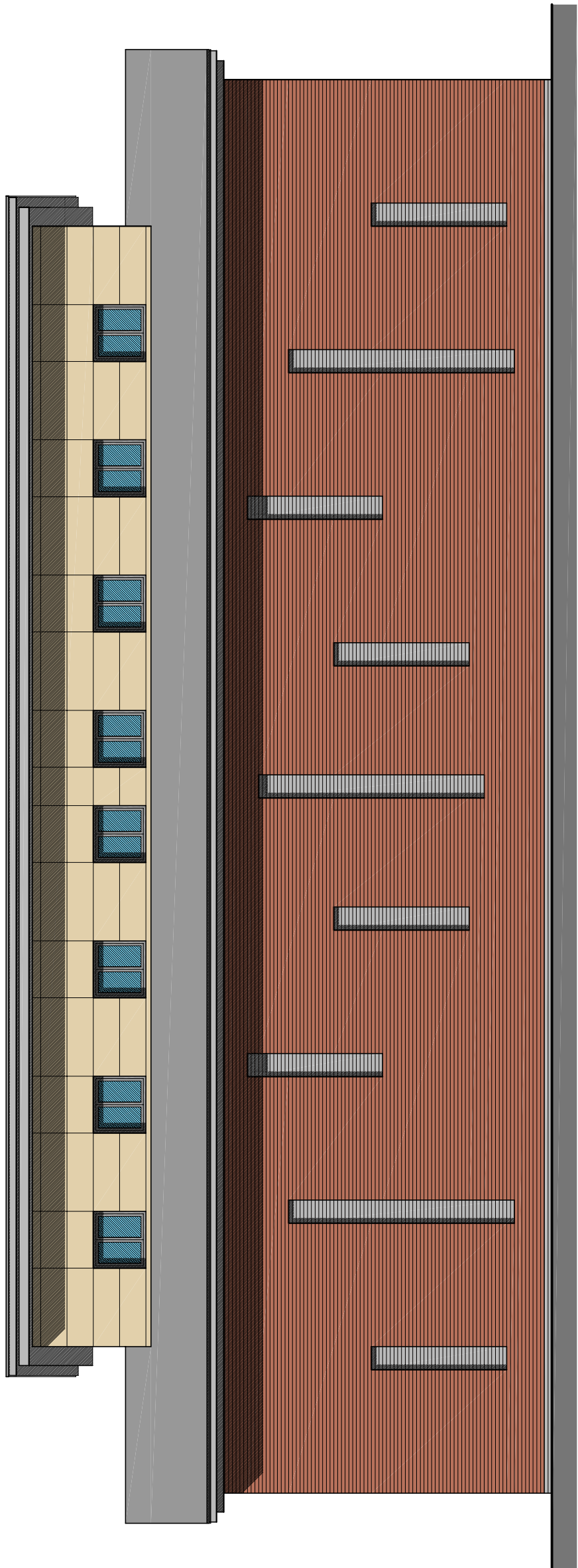
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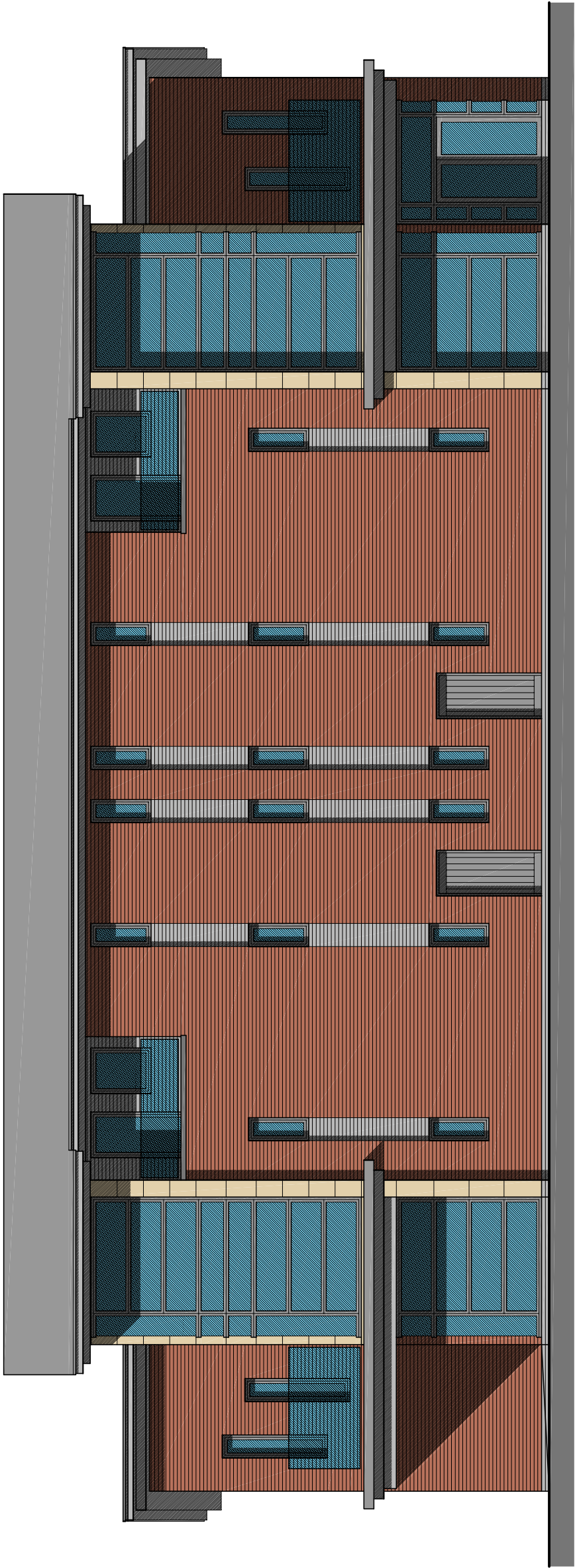
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Middleton Road Elevation



Rear Elevation



Main Elevation



Car Park Elevation



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Dappia Homes Ltd

Project:
Whitehouse Club, Middleton, Crumpsall,
M8 4JZ

Drawing Title:

Proposed Elevations - Club House

Scale:

1:100 @ A1

Date:

March 2015

Drawing No:

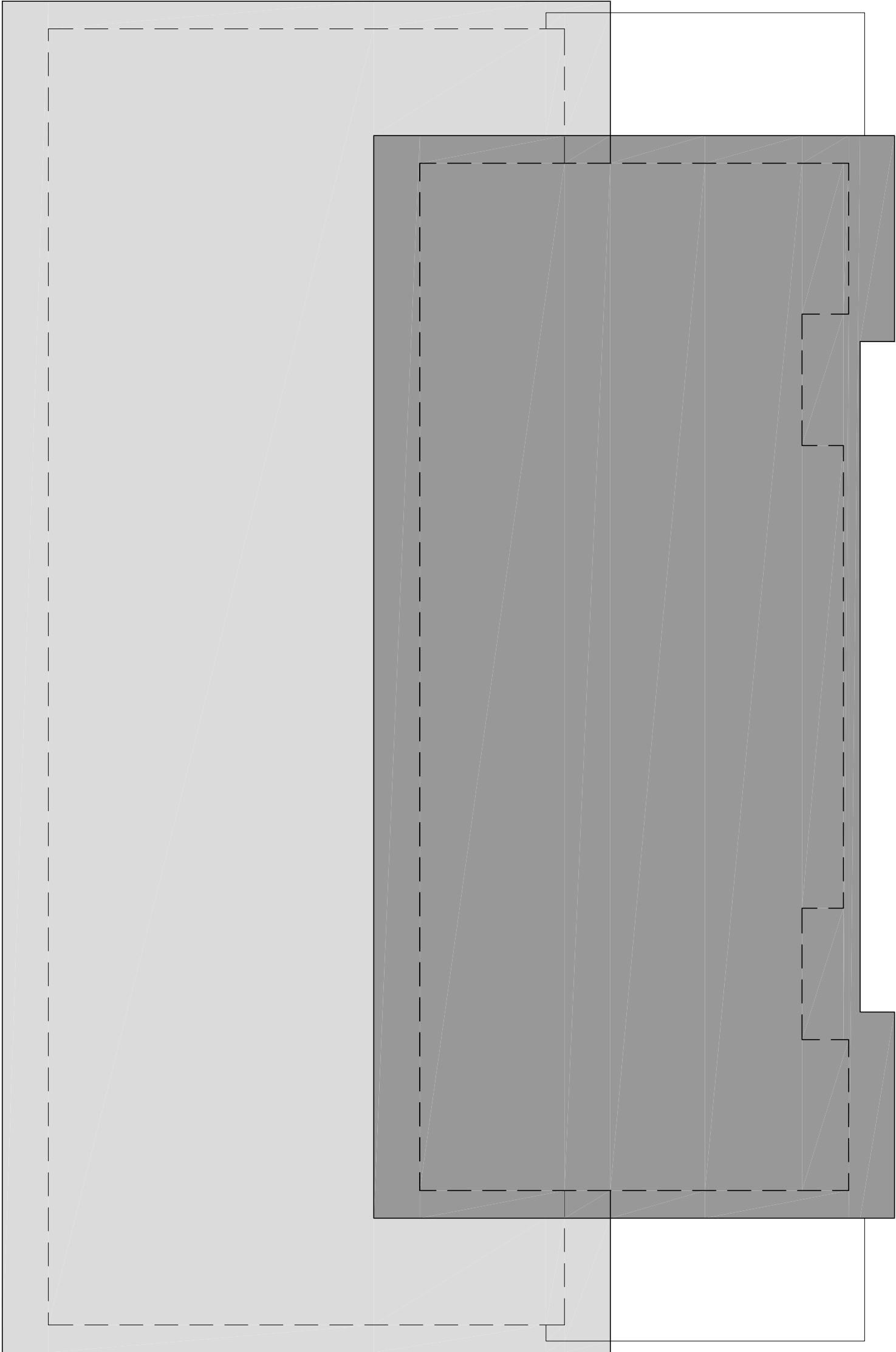
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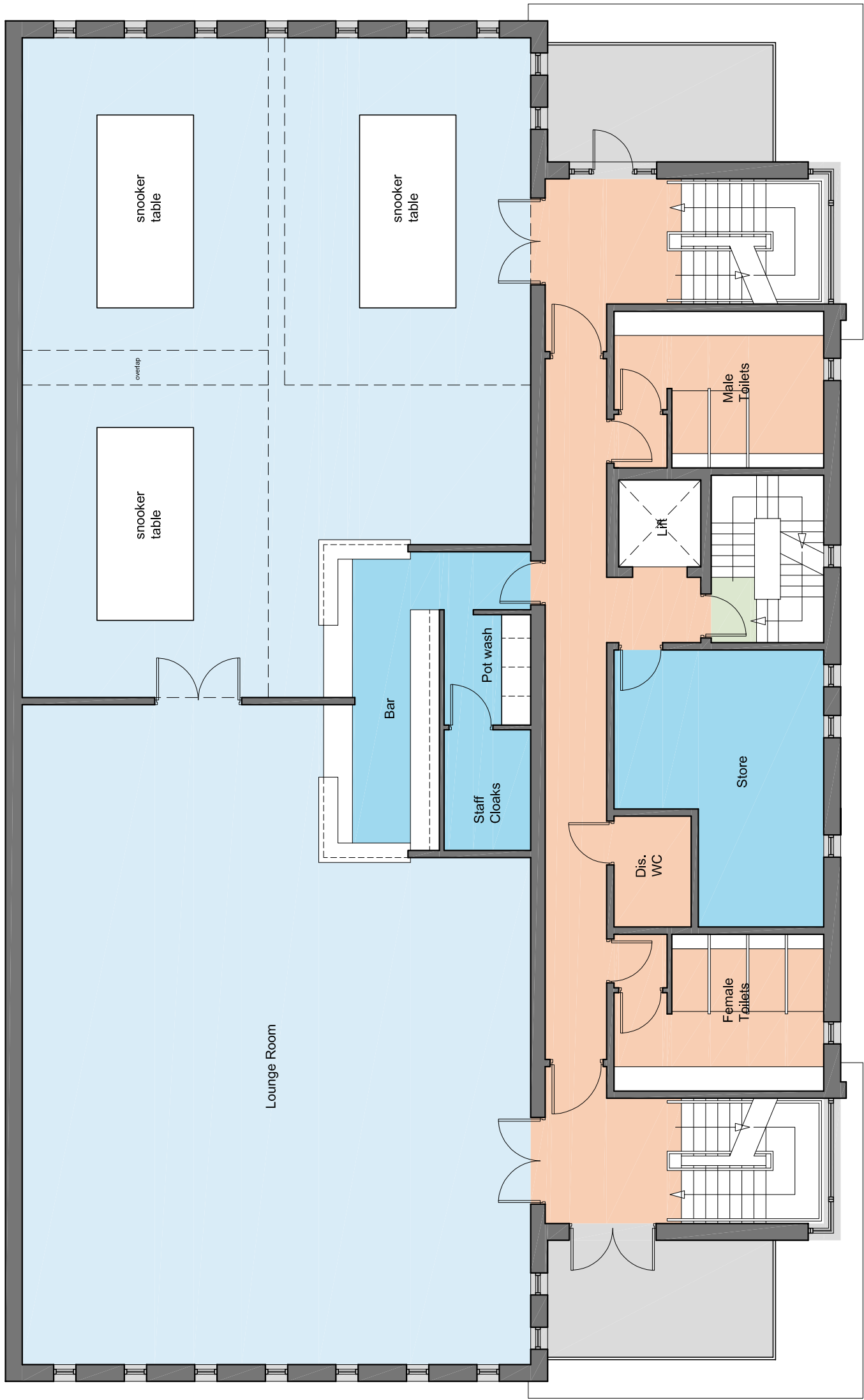
A	General Annotations	01/03/2015
B	General Annotations	01/03/2015
C	Additional Specification Included	08/10/2015
D	General Annotations	22/01/2016
E	General Annotations	22/01/2016
F	General Annotations	06/07/2016
G	General Annotations	07/07/2016
H	Smoking areas omitted	07/07/2016
I	Revised for Planning	08/10/2017



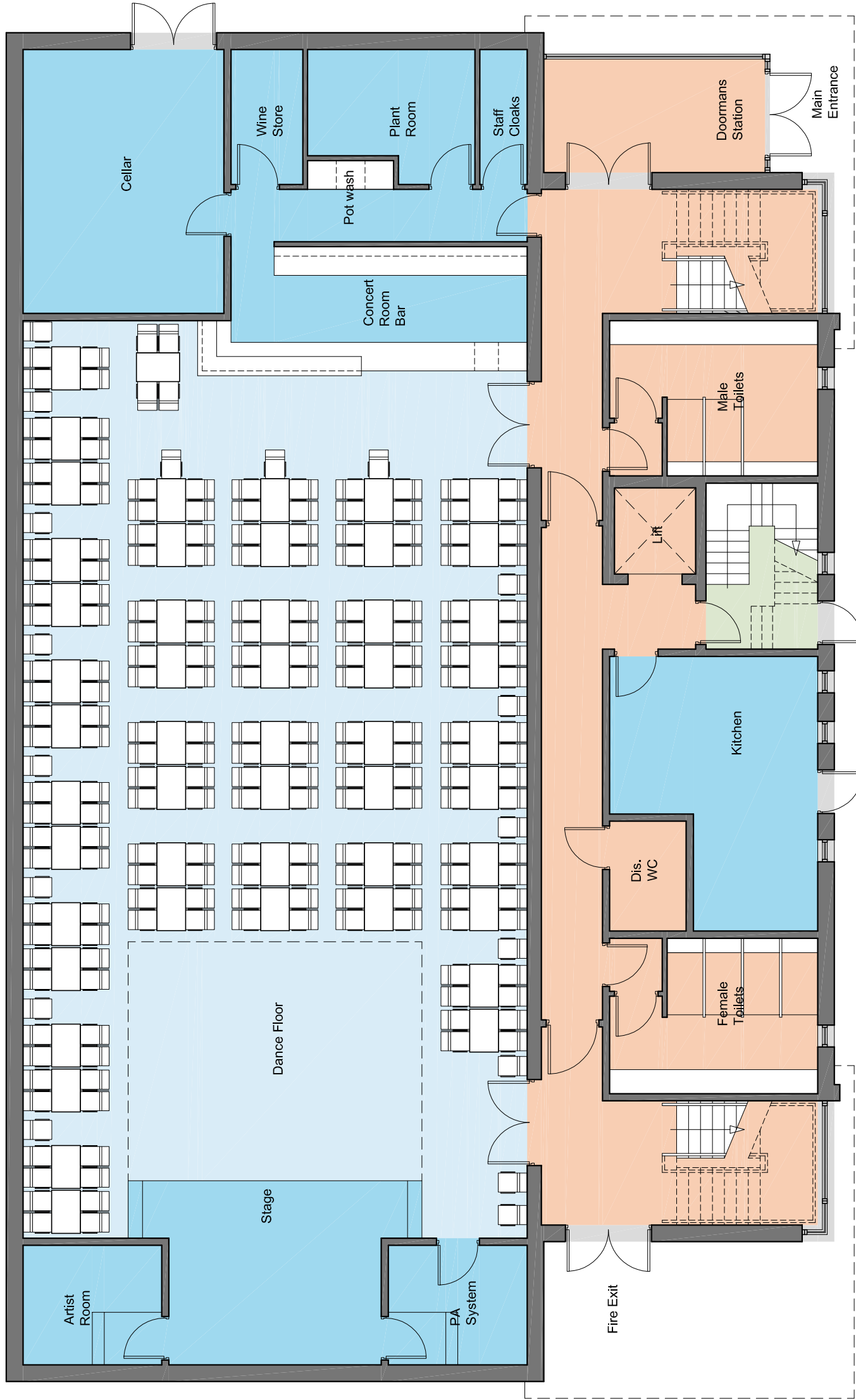
Roof Plan



Second Floor Plan



First Floor Plan



Ground Floor Plan

Areas		
Ground Floor Area	-	432 sqm
First Floor Area	-	435 sqm
Second Floor Area	-	179 sqm
Total	-	1,046 sqm (11,259 sqft)



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Dappa Homes Ltd

Project:
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Drawing Title:
Proposed Plans and Section - Club House

Scale:
1:100 @ A1

Date:
March 2015

Drawing No:
4050 / 110

Revision:
H

4050 / 001 C

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Scale: 1:500 / 1:1250 @ A1 Date: July 2016

Drawing No: 4050 / 001 Revision: C

APPENDIX A: NOTES ON LIMITATIONS

Standard Terms and Conditions of Engagement
Notes on Limitations
For
Geoenvironmental and Geotechnical Consultancy Services

General

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the consequences of this document being used for any purpose or project other than for which it was commissioned
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Phase I Environmental Audits / Desk Studies

The work undertaken to provide the basis of a Phase 1 Desk Study report comprises a study of available documented information from a variety of sources (including the client), together with (where appropriate) a walk over inspection of the site and meetings and discussions with relevant authorities and other interested parties. The opinions given in a Desk Study report have been dictated by finite data on which they are based and are relevant only to the purpose for which the report was commissioned. The information reviewed should not be considered exhaustive and has been accepted in good faith as providing true and representative data pertaining to site conditions. Should additional information become available which may affect the opinions expressed in the report, **CC GEOTECHNICAL LTD** reserves the right to review such information and to modify the opinions accordingly.

It should be noted that any risks identified in this report are perceived risks based on the information reviewed; actual risks can only be assessed following a physical investigation of the site.

Phase II Environmental Audits

The investigation of the site has been carried out with the intention of providing sufficient information concerning the type and degree of contamination, and ground and groundwater conditions to allow a reasonable risk assessment to be made. The objectives of the investigation have been limited to establishing the risks associated to potential human targets, building materials, the environment (including adjacent land), and surface and groundwater.

The amount of exploratory work and chemical testing undertaken may have been restricted by the timescale available, and the locations of the exploratory holes may have been restricted to areas unoccupied by the building(s) on the site, and further restricted by the existence of buried services. A more comprehensive investigation may be required if the site is to be redeveloped as, in addition to risk assessment, a number of important engineering and environmental issues may need to be resolved.

For those reasons, if costs have been included in relation to site remediation these must be considered as tentative only and must, in any event, be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of site conditions. The number of sampling points and the methods of sampling and testing do not preclude the existence of localised “hotspots” of contamination where concentrations may be significantly higher than those actually encountered.

Geoenvironmental Ground Investigations

The investigation of the site has been carried out to provide sufficient information within the agreed scope of the investigation, under the general headings of type and degree of contamination, geotechnical characteristics, and ground and groundwater conditions, to provide a reasonable assessment of the environmental risks together with engineering and development implications.

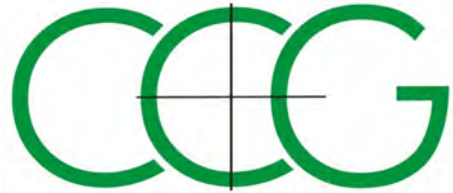
If costs have been included in relation to the site remediation, these must be confirmed by a qualified quantity surveyor.

The exploratory holes undertaken, investigate only a small volume of the ground in relation to the size of the site, and can only provide a general indication of the site conditions. The opinions provided and recommendations given in this report are based on the ground conditions apparent at the site of each of the exploratory holes. There may be ground conditions present on the site which have not been disclosed by this investigation, and which have therefore not been taken into account in this report.

The comments made on groundwater conditions are based on observations made at the time that site work was carried out. It should be noted that groundwater levels will vary owing to seasonal, tidal, weather, or other effects.

The risk assessment and opinions provided, inter alia, take into consideration currently available guidance relating to acceptable contamination concentrations; no liability can be accepted for the retrospective effects of any future changes or amendments to these values.

APPENDIX B: COMMERCIAL FLOOD REPORT & HISTORICAL MAPPING



Report Reference: CMAPS-AAG-672034-4165-221117

Client Reference: 4165

Report Date 22 Nov 2017

Report Delivery Method: Email - pdf

Client Email: andy@centremaps.com

Flood Insight

Address: Whitehouse Club, Middleton Road, Crumpsall, Manchester, M8 4JZ

Dear Sir/ Madam,

Thank you for placing your order with Groundsure. Please find enclosed the **Groundsure Flood Insight** as requested.

If you need further assistance, please do not hesitate to contact our helpline on 01886 832972 quoting the above CENTREMAPS reference number.

Yours faithfully,

CENTREMAPS

Enc.
Groundsure Floodinsight

Flood Insight

Address: Whitehouse Club, Middleton Road, Crumpsall, Manchester, M8 4JZ
Date: 22 Nov 2017
Reference: CMAPS-AAG-672034-4165-221117
Client: CENTREMAPS



Aerial Photograph Capture date: 11-Jun-2015
Grid Reference: 383432,403028
Site Size: 2.01ha

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Overview of Findings

For further details on each dataset, please refer to each individual section in the main report as listed.

Section 1: Environment Agency/Natural Resources Wales Flood Zones

1.1 Are there any Environment Agency Zone 2 floodplains within 250m of the study site?	No
1.2 Are there any Environment Agency/Natural Resources Wales Zone 3 floodplains within 250m of the study site?	No
1.3 Are there any Flood Defences within 250m of the study site?	No
1.4 Are there any areas benefiting from Flood Defences within 250m of the study site?	No
1.5 Are there any Proposed Flood Defences within 250m of the study site?	No
1.6 Are there any areas used for Flood Storage within 250m of the study site?	No

Section 2: Risk of Flooding from Rivers and the Sea (RoFRaS)

2.1 What is the Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating for the study site?	Very Low
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Section 3: Historic Flood Events

3.1 Has the site been subject to past flooding as recorded by the Environment Agency/Natural Resources Wales?	No
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Section 4: JBA Surface Water (Pluvial) Flood

4.1 Is the site or any area within 50m at risk of Surface Water (Pluvial) Flooding?	Yes
---	-----

Section 5: Surface Water Features

5.1 Are there any surface water features within 250m of the study site?	Yes
---	-----

Section 6: Groundwater Flooding

6.1 What is the maximum BGS Groundwater Flooding susceptibility within 50m of the study site?	Limited potential
6.2 What is the BGS confidence rating for the Groundwater Flooding susceptibility areas?	Low

Section 7: BGS Geological Indicators of historic flooding

7.1 Are there any geological indicators of historic flooding within 250m of the study site?	No
---	----

Section 8: JBA Reservoir and Canal Data

8.1 Is the property located in an area identified as being at potential risk in the event of a reservoir failure?	No
8.2 Is the property located in an area identified as being at potential risk in the event of a canal break?	No

Additional Matters

Riparian ownership

If your land abuts a river, stream or ditch, you may have responsibility to maintain this watercourse, even if Title Deeds show the property boundary to be adjacent to the watercourse. This includes the responsibility for clearing debris and obstructions which may impede the free passage of water and fish, and also includes the responsibilities to accept flood flows through your land, even if these are caused by inadequate capacity downstream. There is no duty in common law for a landowner to improve the drainage capacity of a watercourse. Please contact Groundsure if you need further advice on riparian ownership issues relating to this property.

Sewerage Flooding

Extreme rainfall events may overwhelm sewerage systems and cause local flooding. The water and sewerage companies within the UK are required to maintain 'DG5 – At Risk Registers' which record properties that have flooded from sewers and/or are considered to be at risk of flooding from sewers in the future. If your property is on the 'At Risk' Register, this may be recorded within a standard CON29 Drainage and Water search.

Using this Report

The following report is designed by Environmental Consultants for Environmental Professionals bringing together the most up-to-date market leading environmental data. This report is provided under and subject to the Terms & Conditions agreed between Groundsure and the Client.

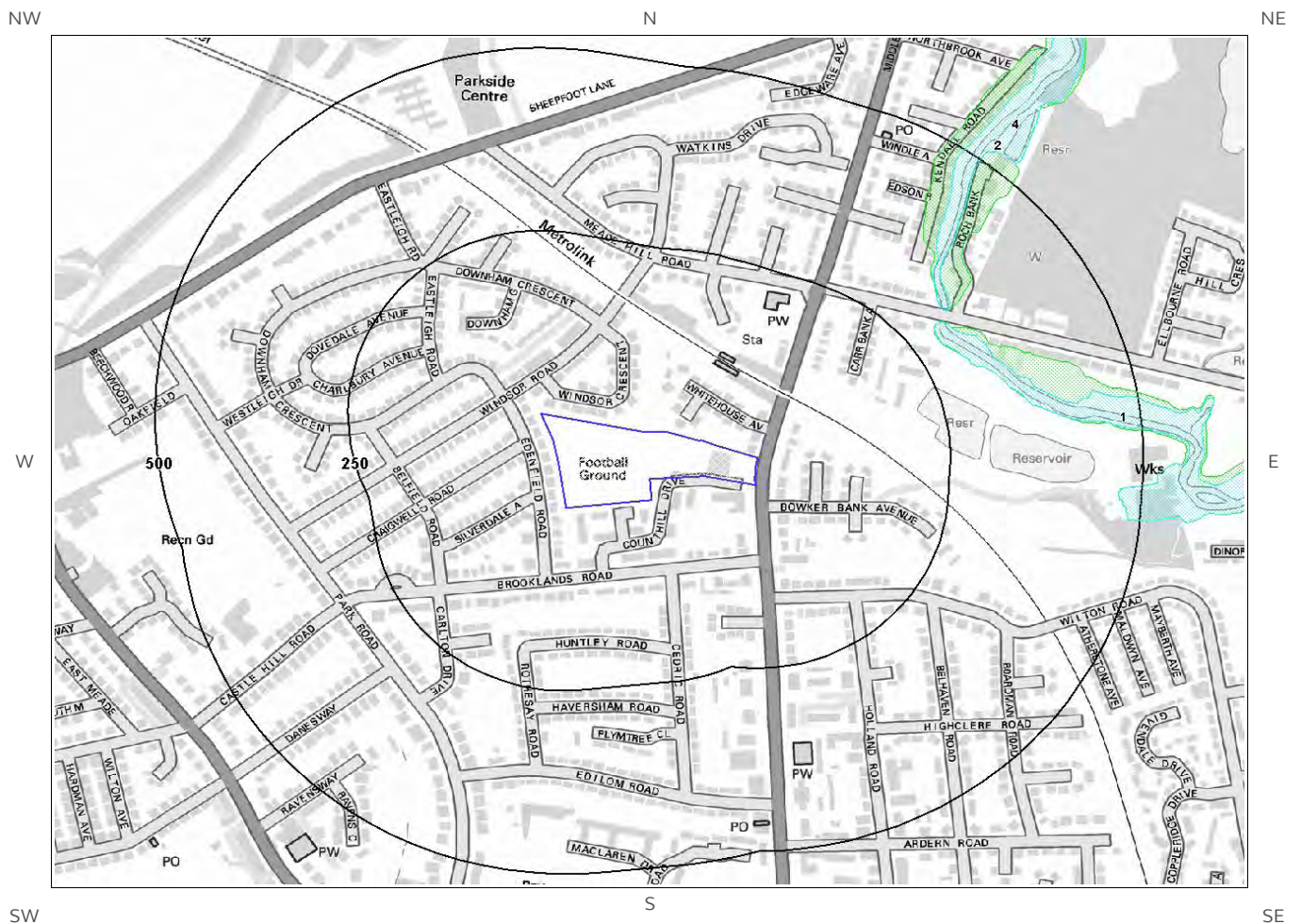
Note: Maps

Only certain features are placed on the maps within the report. All features represented on maps found within this search are given an identification number. This number identifies the feature on the mapping and correlates it to the additional information provided below. This identification number precedes all other information and takes the following format -Id: 1, Id: 2, etc. Where numerous features on the same map are in such close proximity that the numbers would obscure each other a letter identifier is used instead to represent the features. (e.g. Three features which overlap may be given the identifier "A" on the map and would be identified separately as features 1A, 3A, 10A on the data tables provided).

Where a feature is reported in the data tables to a distance greater than the map area, it is noted in the data table as "Not Shown".

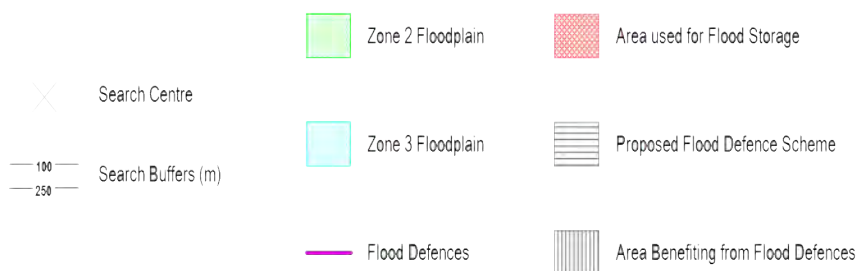
All distances given in this report are in Metres (m). Directions are given as compass headings such as N: North, E: East, NE: North East from the nearest point of the study site boundary.

1. Environment Agency/Natural Resources Wales Flood Map for Planning (from rivers and the sea)



Environment Agency/Natural Resources Wales Flood Map for Planning Legend

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1. Environment Agency/Natural Resources Wales Flood Zones

1.1 River and Coastal Zone 2 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 2 floodplain? No

Environment Agency/Natural Resources Wales Zone 2 floodplains estimate the annual probability of flooding as between 1 in 1000 (0.1%) and 1 in 100 (1%) from rivers and between 1 in 1000 (0.1%) and 1 in 200 (0.5%) from the sea. Any relevant data is represented on Map 1 – Flood Map for Planning:

Database searched and no data found.

1.2 River and Coastal Zone 3 Flooding

Is the site within 250m of an Environment Agency/Natural Resources Wales Zone 3 floodplain? No

Zone 3 shows the extent of a river flood with a 1 in 100 (1%) or greater chance of occurring in any year or a sea flood with a 1 in 200 (0.5%) or greater chance of occurring in any year. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.3 River and Coastal Flood Defences

Are there any Flood Defences within 250m of the study site? No

This search consists only of flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Any relevant data is represented on Map 1 – Flood Map for Planning.

Database searched and no data found.

1.4 Areas benefiting from Flood Defences

Are there any areas benefiting from Flood Defences within 250m of the study site? No

Any relevant data is represented on Map 1 – Flood Map for Planning.

1.5 Areas of Proposed Flood Defences

Are there any Proposed Flood Defences within 250m of the study site?

No

* This illustrates the number of households that move from 'very significant' or 'significant' to 'moderate' or 'low' probability of flood risk bands if the proposed flood scheme is to be implemented.

Any relevant data is represented on Map 1 – Flood Map for Planning.

Guidance: This search consists only of proposed flood defences present in the dataset provided by the Environment Agency/Natural Resources Wales. Please note that proposed flood defence schemes will not influence the current RoFRaS ratings for the site.

1.6 Areas used for Flood Storage

Are there any areas used for Flood Storage within 250m of the study site?

No

Flood Storage Areas are considered part of the functional floodplain, and are areas where water has to flow or be stored in times of flood. Technical Guidance to the National Planning Policy Framework states that only water-compatible development and essential infrastructure should be permitted within flood storage areas, and existing development within this area should be relocated to an area with a lower risk of flooding. Any relevant data is represented on Map 1 – Flood Map for Planning.

Notes on Flood Zone Data:

This data relates solely to flooding from rivers or the sea. The Environment Agency/Natural Resources Wales estimate that over 2.5 million properties are at risk of flooding within England and Wales. River flooding occurs when a watercourse cannot cope with the water draining into it from the surrounding land. This can happen, for example, when heavy rain falls on an already waterlogged catchment. Coastal flooding results from a combination of high tides and stormy conditions. If low atmospheric pressure coincides with a high tide, a tidal surge may happen which can cause serious flooding.

The Groundsure Flood Insight Report comments upon whether a property lies in proximity to Environment Agency/Natural Resources Wales Zone 2 and Zone 3 floodplains. The Government's Technical Guidance to the National Planning Policy Framework explains how flood risk should be considered at all stages of the planning and development process in order to reduce future damage to property and potential loss of life. The Government looks to planning authorities to ensure that flood risk is properly taken into account in the planning of developments to reduce the risk of flooding and the damage which floods cause.

Flood Zones enable planning authorities to apply the sequential test (see Technical Guidance to the National Planning Policy Framework) for development proposals and prevent inappropriate development.

Technical Guidance to the National Planning Policy Framework defines the flood zones as: -

Zone 1 – little or no risk with an annual probability of flooding from rivers and the sea of less than 0.1%

Zone 2 – low to medium risk with an annual probability of flooding of 0.1-1.0% from rivers and 0.1-0.5% from the sea.

Zone 3 – high risk with an annual probability of flooding of 1.0% or greater from rivers, and 0.5% or greater from the sea.

Flood Zone 3b/Flood Storage Areas - very high risk with the site being used as part of the functional flood plain or as a Flood Storage Area.

The flood zones are the main constraint map underpinning decisions on development and flood risk.

Existing Flood Defences

Flood defences seek to reduce the risk of flooding and to safeguard life, protect property, sustain economic activity and the natural environment. Flood defences are designed to protect against flood events of a particular magnitude, expressed as risk in any one year. For example, defences in urban areas may be built to provide protection against flood events of a size which might occur on average once in one hundred years or less.

Proposed Flood Defences

This information is taken from the Environment Agency/Natural Resources Wales's database of Areas to Benefit from New and Reconditioned Flood Defences under the Medium Term Plan (MTP). The dataset contains funding allocation for the first financial year (from April). Funding for the following four financial years is not guaranteed, being only indicative, and will be reviewed annually. Projects within the Medium Term Plan qualify for inclusion in this dataset if:

- the investment leads to a change in the current standard of protection (change projects);
- the investment is a replacement or refurbishment in order to sustain the current standard of protection (sustain projects);
- the project has an initial construction budget of £100,000 or more; and
- the project is included within the first five years of the MTP

The data includes all the Environment Agency/Natural Resources Wales's projects over £100K that will change or sustain the standards of flood defence in England and Wales over the next 5 years. It also includes the equivalent schemes for all Local Authority and Internal Drainage Boards. The number of households and areas of land contributing to DEFRA's Outcome Measures (OM) are also attributed i.e. could benefit from major work on flood defences.

These data also contain Intermittence Flood Maintenance Programme that show the annual maintenance programme of work scheduled to be carried by the Environment Agency/Natural Resources Wales, Local Authority or Internal Drainage Board on flood defences. Data details routine maintenance as well as intermittent work that has been funded for the coming year. The data contains a start and end coordinate defining the relevant river section where work is planned.

Information Warning

Please note that the maps show the areas where investment is being made to reduce the flood and coastal erosion risk and are not detailed enough to account for individual addresses. Individual properties may not always face the same risk of flooding as the areas that surround them. Also, note that funding figures are indicative and any use or interpretation should account for future updates where annual values may change.

Every possible care is taken to ensure that the maps reflect all the data possessed by the Environment Agency/Natural Resources Wales and that they have applied their expert knowledge to create conclusions that are as reliable as possible. The Environment Agency/Natural Resources Wales consider that they have created the maps as well as they can and so should not be liable if the maps by their nature are not as accurate as might be desired or are misused or misunderstood, despite their warnings. For this reason, they are not able to promise that the maps will always be accurate or completely up to date.

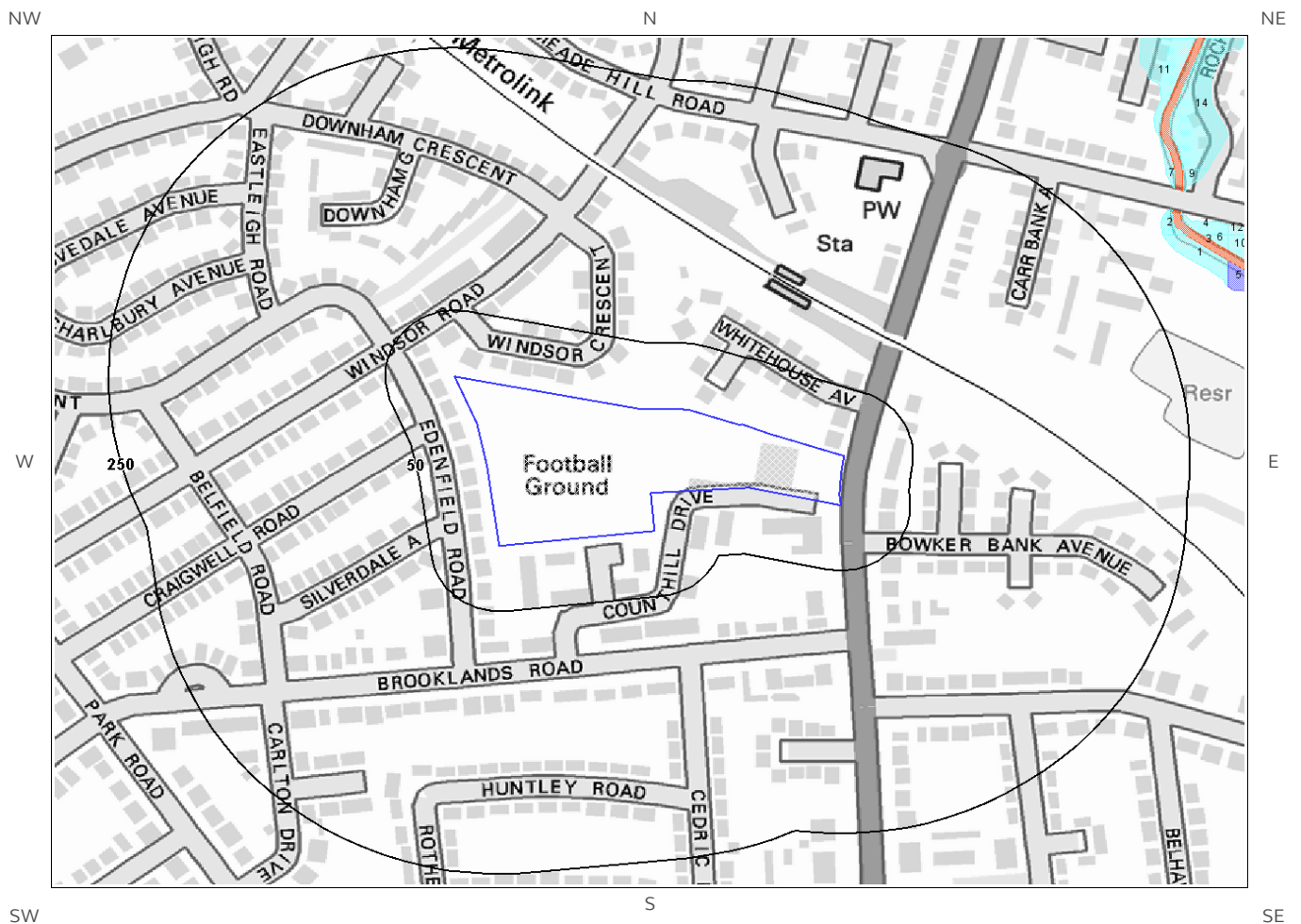
This site includes mapping data licensed from Ordnance Survey used for setting the Environment Agency/Natural Resources Wales's data in its geographical context. Ordnance Survey retains the copyright of this material and it can not be used for any other purpose.

Flood Storage Areas

Flood Storage Areas may also act as flood defences. A flood storage area may also be referred to as a balancing reservoir, storage basin or balancing pond. Its purpose is to attenuate an incoming flood peak to a flow level that can be accepted by the downstream channel. It may also delay the timing of a flood peak so that its volume is discharged over a longer time interval.

A flood storage area may take the form of a wet or dry reservoir. A wet reservoir is a water storage facility in which storage can be effected by allowing water levels to rise during flood times. A dry reservoir is typically adjacent to a river and comprises an enclosed area that accepts water only at peak times. These areas are also referred to as Zone 3b or 'the functional floodplain' and has a 5% or greater chance of flooding in any given year, or is designed to flood in the event of an extreme (0.1%) flood or another probability which may be agreed between the Local Planning Authority and the Environment Agency/Natural Resources Wales, including water conveyance routes. Development within Flood Storage Areas is severely restricted.

2. Environment Agency/Natural Resources Wales RoFRaS Flooding Map



Environment Agency/Natural Resources
Wales RoFRaS Flooding legend

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Site Outline
100m
250m Search Buffers (m)

RoFRaS Rating
Very Low
Low
Medium
High

2. Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS)

2.1 Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) Flood Rating (River and Coastal)

What is the highest risk of flooding onsite?

Very Low

The Environment Agency/Natural Resources Wales RoFRaS database provides an indication of river and coastal flood risk at a national level on a 50m grid with the flood rating at the centre of the grid calculated and given above. The data considers the probability that the flood defences will overtop or breach by considering their location, type, condition and standard of protection.

RoFRaS data for the study site indicates the property is in an area with a Very Low (less than 1 in 1000) chance of flooding in any given year.

Notes on RoFRaS data:

This information is based on the very latest Environment Agency/Natural Resources Wales Risk of Flooding from Rivers and the Sea (RoFRaS) data. This data has been created by dividing the flood plain into 50m squares, or smaller areas where a square is intersected by a river or coastline. These are called impact cells. The method then calculates the likelihood that the centre of each impact cell will start to flood using a number of different flood scenarios.

A number of insurance companies providing cover for flood risk use this data as the basis of their risk model, although they may also utilise additional information such as claims histories, which may further influence their decision. Where a high risk of flooding is identified flood risk insurance may be difficult to obtain without further work being undertaken. Property owners of sites within Low and Medium risk areas are still considered to be at risk of flooding and insurance premiums may be increased as a result. Owners of properties within Low, Medium and High risk areas are advised to sign up to the Environment Agency/Natural Resources Wales's Flood Warning scheme. The probability estimates for RoFRaS risk bands are as follows:

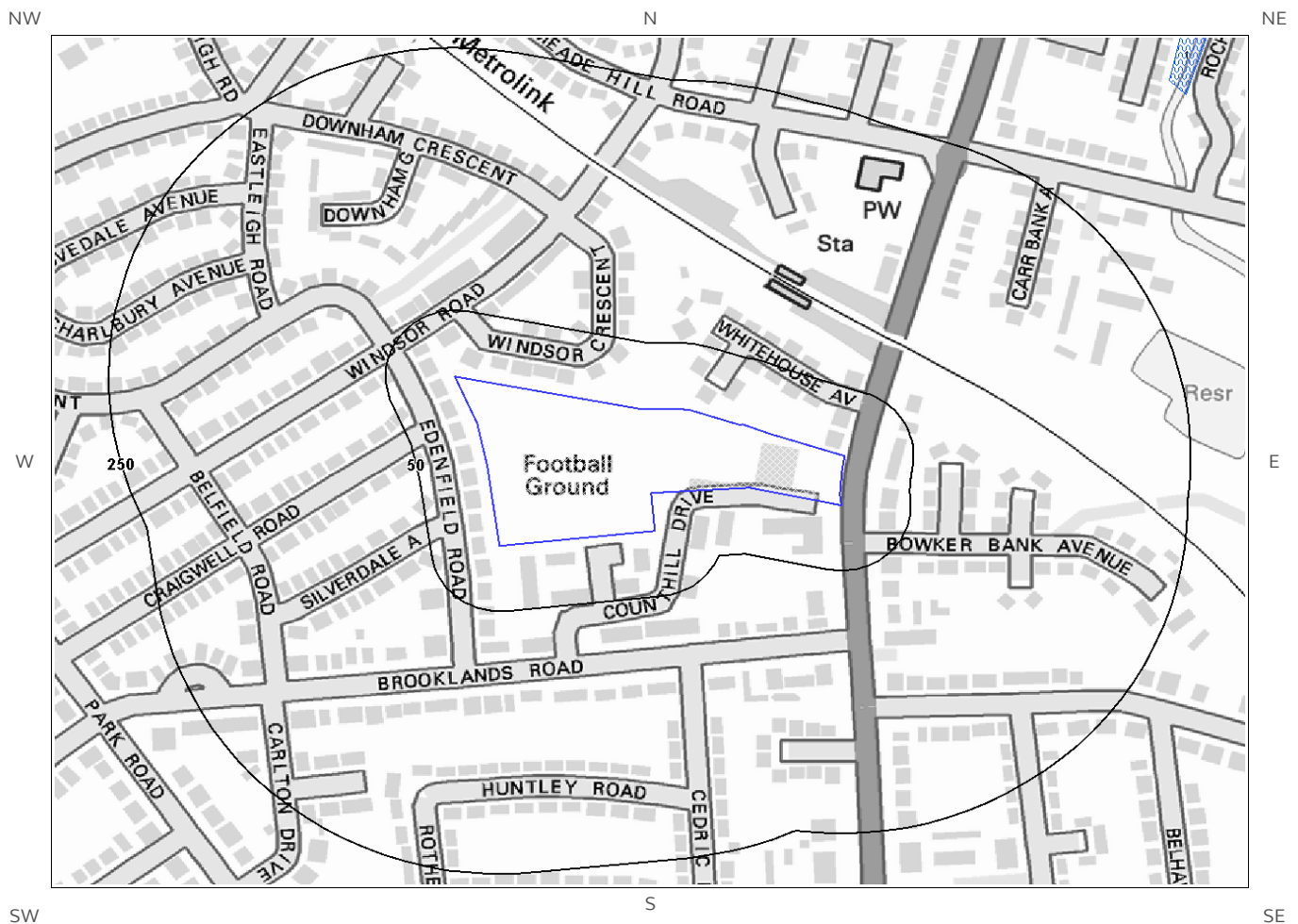
Very Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 1000 (0.1%) in any given year.

Low – the chance of flooding from rivers or the sea is considered to be less than 1 in 100 (1%) but greater than or equal to 1 in 1000 (0.1%) in any given year.

Medium – the chance of flooding from rivers or the sea is considered to be less than 1 in 30 (3.3%) but greater than 1 in 100 (1%) in any given year.

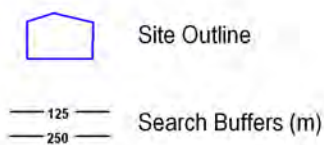
High – the chance of flooding from rivers or the sea is considered to be greater than or equal to 1 in 30 (3.3%) in any given year.

3. Environment Agency/Natural Resources Wales Historic Flooding Events Map



Environment Agency/Natural Resources
Wales Historic Flooding Events legend

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3. Environment Agency/Natural Resources Wales Historic Flooding Events

3.1 Historic Flood Outlines

Has the site or any area within 250m been subject to historic flooding as recorded by the Environment Agency/Natural Resources Wales? No

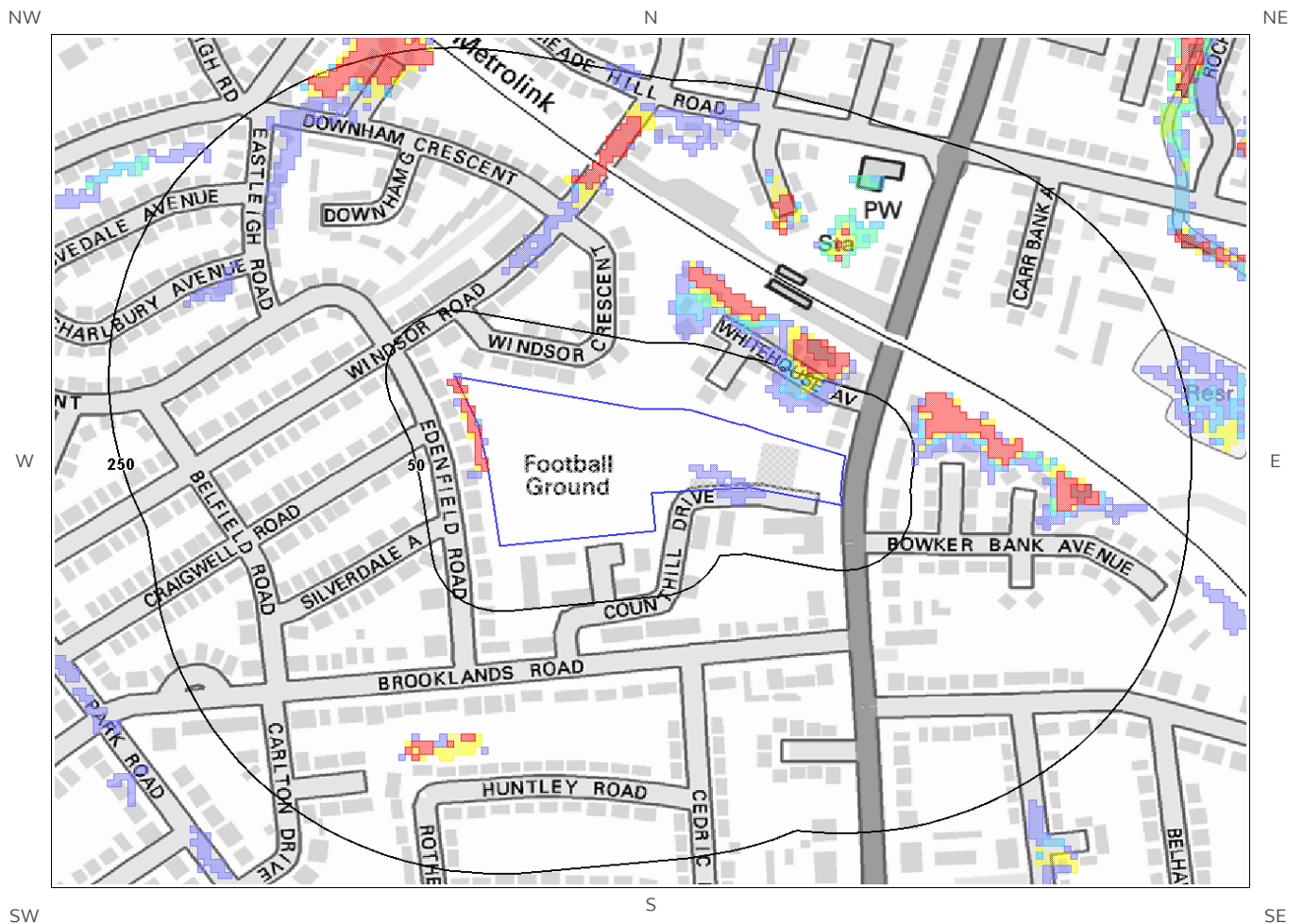
This database shows the individual footprint of every flood event recorded by the Environment Agency/Natural Resources Wales and previous bodies.

Any records found within the search radius are displayed on Map 3 – Historic Flooding Events.

Notes on Historic Flooding data:

Over 21,000 separate events are recorded within this database, dating back to 1947. This data is used to understand where flooding has occurred in the past and provides details as available. Absence of a historic flood event for an area does not mean that the area has never flooded, but only that the Environment Agency/Natural Resources Wales do not currently have records of flooding within the area. Equally, a record of a flood footprint in previous years does not mean that an area will flood again, and this information does not take account of flood management schemes and improved flood defences.

4. JBA Surface Water (Pluvial) Flood Map



JBA Surface Water (Pluvial) Flood
Legend

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4. JBA Surface Water (Pluvial) Flooding

Surface Water (pluvial) flooding is defined as flooding caused by rainfall-generated overland flow before the runoff enters a watercourse or sewer. In such events, sewerage and drainage systems and surface watercourses may be entirely overwhelmed.

Surface Water (pluvial) flooding will usually be a result of extreme rainfall events, though may also occur when lesser amounts of rain falls on land which has low permeability and/or is already saturated, frozen or developed. In such cases overland flow and 'ponding' in topographical depressions may occur.

What is the risk of pluvial flooding at the study site? Significant

Guidance: The site or an area in close proximity has been assessed to be at Significant Risk of surface water (pluvial) flooding. This indicates that this area would be expected to be affected by surface water flooding in a 1 in 75 year rainfall event to a depth of between 0.3m to 1m.

Flood data provided by JBA RISK MANAGEMENT LIMITED Copyright © JBA RISK MANAGEMENT LIMITED 2008-2017

The following pluvial (surface water) flood risk records within 50m of the study site are shown on the JBA Surface Water Flooding Map:

Distance	Direction	Risk
0.0	On Site	High
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low
0.0	On Site	Low to Moderate
0.0	On Site	Significant
0.0	On Site	Significant
3.0	SW	High
4.0	W	High
4.0	W	High
4.0	SW	Low
5.0	W	Low
19.0	N	Low
30.0	N	Low to Moderate
36.0	N	High
39.0	N	Low to Moderate
48.0	E	Low
48.0	E	Low

Distance	Direction	Risk
49.0	N	Low

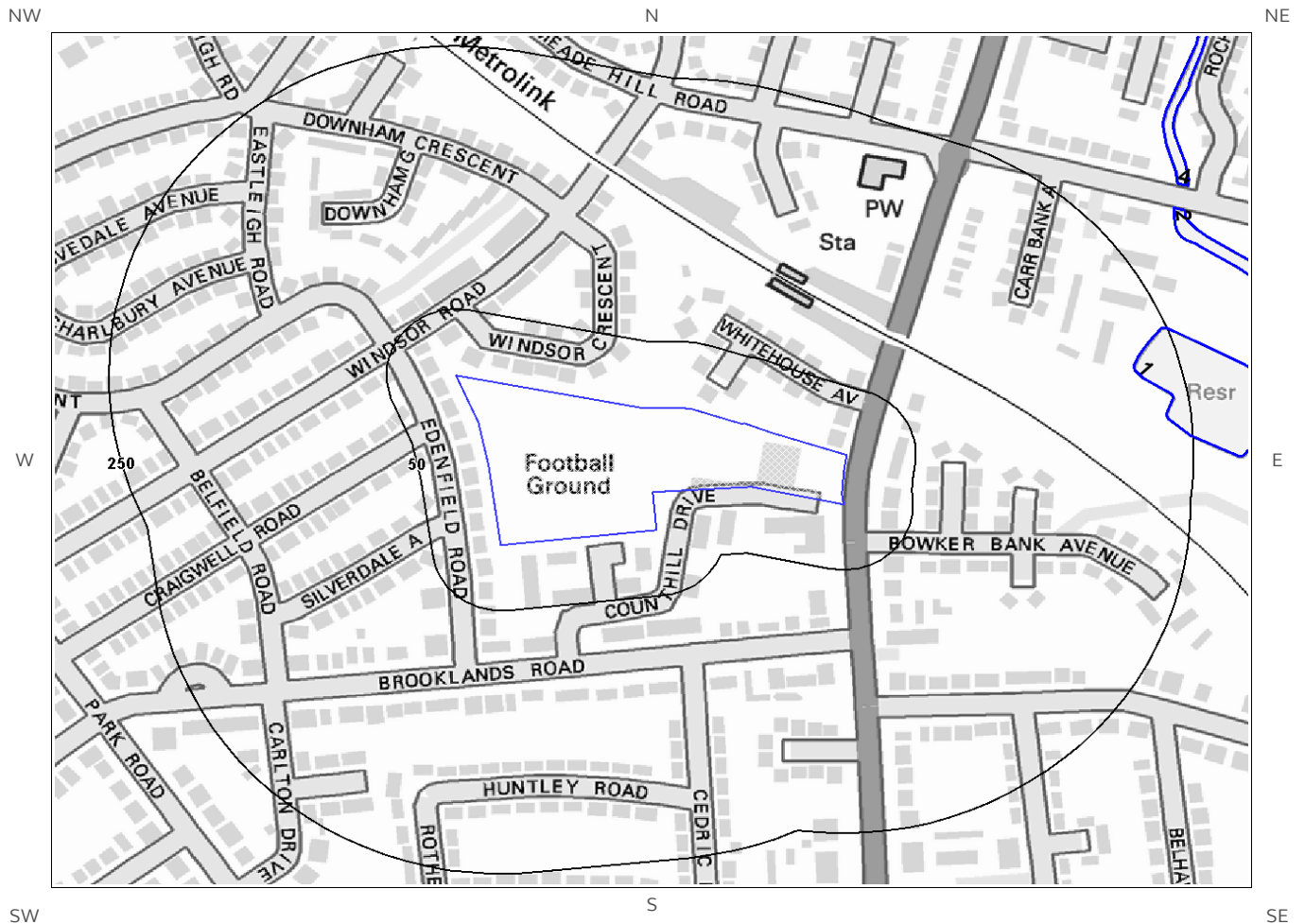
Notes on Surface water (Pluvial) Flooding data:

JBA Consulting surface water flood map identifies areas likely to flood following extreme rainfall events, i.e. land naturally vulnerable to surface water or “pluvial” flooding. This data set was produced by simulating 1 in 75 year, 1 in 200 year and 1 in 1000 year rainfall events. Modern urban drainage systems are typically built to cope with rainfall events between 1 in 20 and 1 in 30 years, though older ones may even flood in a 1 in 5 year rainstorm event.

The model provides the maximum depth of flooding in each 5m “cell” of topographical mapping coverage. The maps include 7 bands indicating areas of increasing natural vulnerability to surface water flooding. These are:-

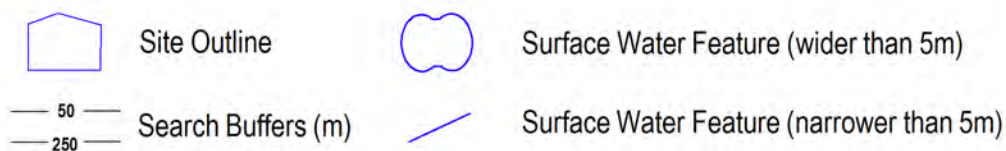
- **Less than 0.1m in a 1 in 1000 year rainfall event** - Negligible
- **Greater than 0.1m in a 1 in 1000 year rainfall event** - Low
- **Between 0.1m and 0.3m in a 1 in 200 year rainfall event** – Low to Moderate
- **Between 0.3m and 1m in a 1 in 200 year rainfall event** – Moderate
- **Greater than 1m in a 1 in 200 year rainfall event** – Moderate to High
- **Between 0.1m and 0.3m in a 1 in 75 year rainfall event** – High
- **Between 0.3m to 1m in a 1 in 75 year rainfall event** - Significant
- **Greater than 1m in a 1 in 75 year rainfall event** – Highly Significant

5. Surface Water Features map



Surface Water Features legend

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5. Surface Water Features

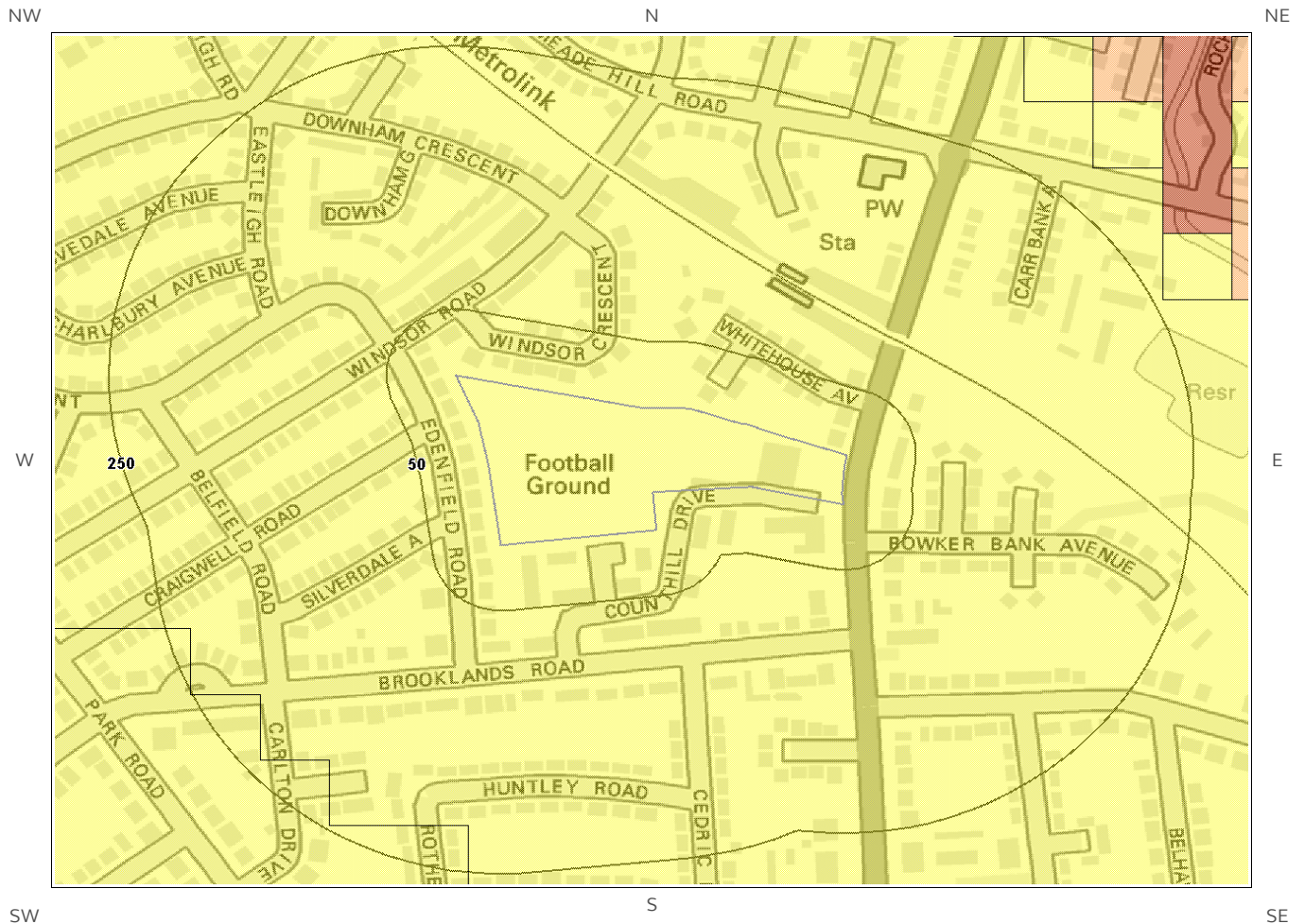
Are there any surface water features within 250m of the study site?

Yes

The following surface water records are represented on mapping:

ID	Distance (m)	Direction
1	217.0	E

6. BGS Groundwater Flooding Map



BGS Groundwater Flooding legend

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- Limited potential for groundwater flooding to occur
- Potential for groundwater flooding of property below ground level
- Potential for groundwater flooding to occur at surface

6. Groundwater Flooding

6.1 Groundwater Flooding Susceptibility Areas

Are there any British Geological Survey groundwater flooding susceptibility flood areas within 50m of the boundary of the study site? Yes

What is the highest susceptibility to groundwater flooding in the search area based on the underlying geological conditions? Limited potential for groundwater flooding

Does this relate to Clearwater Flooding or Superficial Deposits Flooding? Clearwater Flooding

Where limited potential for groundwater flooding to occur is indicated, this means that although given the geological conditions there may be a groundwater flooding hazard, unless other relevant information, e.g. records of previous flooding, suggests groundwater flooding has occurred before in this area, you need take no further action in relation to groundwater flooding hazard.

6.2 Groundwater Flooding Confidence Areas

What is the British Geological Survey confidence rating in this result? Low

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

The confidence rating is on a threefold scale - Low, Moderate and High. This provides a relative indication of the BGS confidence in the accuracy of the susceptibility result for groundwater flooding. This is based on the amount and precision of the information used in the assessment. In areas with a relatively lower level of confidence the susceptibility result should be treated with more caution. In other areas with higher levels of confidence the susceptibility result can be used with more confidence.

Notes on Groundwater Flooding data:

The BGS Susceptibility to Groundwater Flooding hazard dataset identifies areas where geological conditions could enable groundwater flooding to occur and where groundwater may come close to the ground surface.

Groundwater flooding may either be associated with shallow unconsolidated sedimentary aquifers which overlie unproductive aquifers (Superficial Deposits Flooding), or with unconfined aquifers (Clearwater Flooding).

The susceptibility data is suitable for use for regional or national planning purposes where the groundwater flooding information will be used along with a range of other relevant information to inform land-use planning decisions. It might also be used in conjunction with a large number of other factors, e.g. records of previous incidence of groundwater flooding, rainfall, property type, and land drainage information, to establish relative, but not absolute, risk of groundwater flooding at a resolution of greater than a few hundred metres. The susceptibility data should not be used on its own to make planning decisions at any scale, and, in particular, should not be used to inform planning decisions at the site scale. The susceptibility data cannot be used on its own to indicate risk of groundwater flooding.

7. BGS Geological Indicators of Flooding

Are there any geological indicators of flooding within 250m of the study site?

No

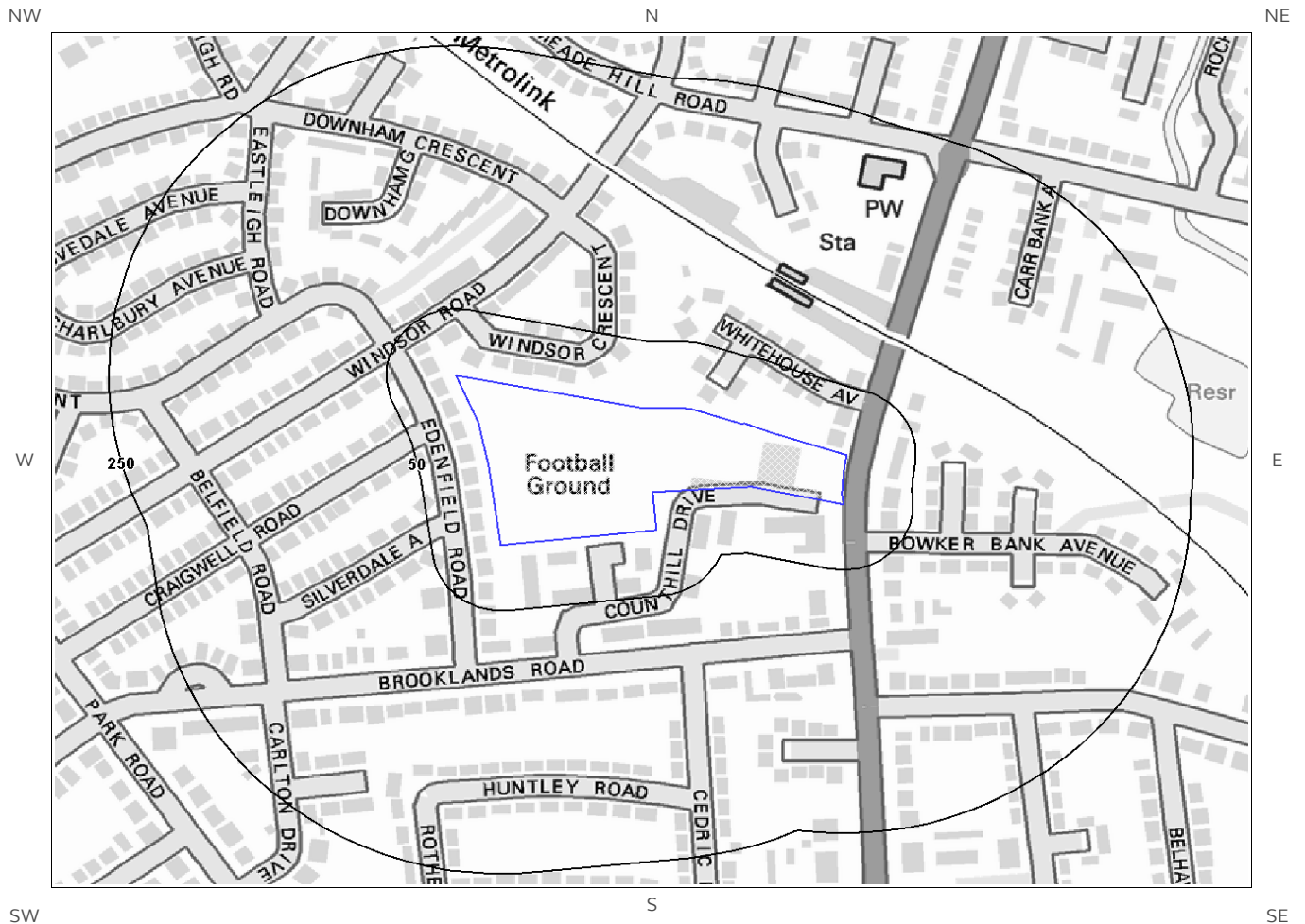
This dataset identifies the presence of superficial geological deposits which indicate that the site may be, or have been in the past, vulnerable to inland and/or coastal flooding. This assessment does not take account of any man-made factors such as flood protection schemes, and the data behind the report are purely geological.

Notes on BGS Geological Indicators of Flooding data:

The BGS Geological Indicators of Flooding (GIF) data set is a digital map based on the BGS Digital Geological Map of Great Britain at the 1:50,000 scale (DiGMapGB-50). It was produced by characterising Superficial (Drift) Deposits on DiGMapGB-50 in terms of their likely vulnerability to flooding, either from coastal or inland water flow. These Superficial Deposits are considered 'recent' in geological terms, most having been formed in the later parts of the Quaternary geological period (i.e. within the last few tens of thousands of years). Observations made during recent major inland and coastal flooding events have demonstrated that the erosion and deposition of these recent geological sediments have produced subtle topographical variations, resulting in landforms such as fluvial and coastal floodplains. The mapping of these landforms, in conjunction with the fluvial and/or coastal deposits that underlie them, has in turn determined the extent of previous coastal and inland flooding.

On this basis, the floodplains which are at greatest risk from flooding can be both visualised and defined by Superficial Deposits as depicted on geological maps. These include deposits such as river alluvium and lacustrine (lake) alluvium, as well as the First River Terrace or 'Floodplain terrace' (raised flat areas adjacent to or within floodplains, which represent the level of the floodplain prior to the most recent episode of down-cutting). Older and higher river terraces have been excluded as they lie outside the geologically defined floodplain. Areas at risk from coastal inundation are similarly characterised by a range of estuarine or marine deposits that include, for example, tidal flats.

8. JBA Canal Break map



JBA Canal Break legend

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8. JBA Reservoir and Canal Data

8.1 JBA Reservoir Failure Impact Modelling

Is the property located in an area identified as being at potential risk in the event of a reservoir failure? No

JBA consulting have modelled the flooding impact from 1,700 reservoirs in England and Wales, should there be a catastrophic failure of a reservoir wall or embankment. This data is not displayed on mapping.

Guidance: None required

Notes on Reservoir Failure Impact data:

This dataset identified areas that are most likely to flood following the sudden catastrophic failure of a reservoir and is provided by JBA Consulting. JBA has identified over 1,700 reservoirs that pose a risk to people and property. These maps identify properties that would flood in the unlikely event of the failure of the reservoir's dam or embankment. Empirical methods were used to predict the flow that would result from the failure which was then modelled onto high resolution Digital Terrain Models (DTM) using JBA's advanced 2D hydraulic modelling techniques. The model provides the maximum depth of flooding in each cell of the DTM.

8.2 JBA Canal Break Modelling

Is the property located within 500m of an area identified as being at potential risk in the event of a canal break? No

Database searched and no data found.

Notes on Canal Break modelling data

Canal failure mapping includes two types of failure:

- Breach of raised canal embankments - failure of the embankment due to weaknesses; these are typically caused by erosion or animal burrowing but can also arise from poor maintenance.
- Aqueduct failure - an aqueduct is where the canal passes over infrastructure such as roads, railways and subways, or over other canals and rivers. Failures of these are typically caused by the collapse of the underlying culvert.

A length of over 1,700km of canal covering England, Wales and Scotland was modelled. The canal modelling is restricted to the areas where LIDAR is available as the raised embankments are more defined in the LIDAR than in the Photogrammetry data. Each canal is categorised as part of the Merchant Shipping Notice (MSN 1776 (M)). The majority of the modelled canals are categorised as A, with a few exceptions, which fell under category B.

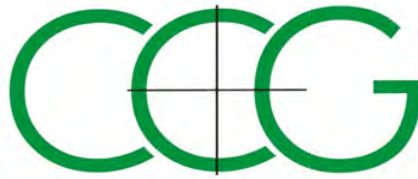
- Category A: narrow rivers and canals where the depth of water is generally less than 1.5m.
- Category B: wider rivers and canals where the depth of water is generally 1.5m or more and where the significant wave height could not be expected to exceed 0.6m at any time.
- Category C: tidal rivers and estuaries and large, deep lakes and lochs where the significant wave height could not be expected to exceed 1.2m at any time.
- Category D: tidal rivers and estuaries where the significant wave height could not be expected to exceed 2m at any time.

The canal map provides flood extent data only and show flooded areas with a depth greater than 0.1m.

Contact Details

CENTREMAPS

Telephone: #CustomerHelpLine#
Groundsure@centremaps.co.uk



British Geological Survey Enquiries

Kingsley Dunham Centre
Keyworth, Nottingham NG12 5GG
Tel: 0115 936 3143.
Fax: 0115 936 3276.
Email: enquiries@bgs.ac.uk
Web: www.bgs.ac.uk



BGS Geological Hazards Reports and general geological enquiries

Environment Agency

National Customer Contact Centre, PO Box 544
Rotherham, S60 1BY
Tel: 03708 506 506
Web: www.environment-agency.gov.uk
Email: enquiries@environment-agency.gov.uk



JBA Risk Management

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Tel: 01756 799919



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Local Authority

Authority: Manchester City Council
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Address: Town Hall, Albert Square, Manchester, M60 2LA

Getmapping PLC

Virginia Villas, High Street, Hartley Witney
Hampshire RG27 8NW
Tel: 01252 845444
Website: <http://www1.getmapping.com/>



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Standard Terms and Conditions

Groundsure's Terms and Conditions can be viewed online at this link:
<https://www.groundsure.com/terms-and-conditions-sept-2016/>

APPENDIX C: NATIONAL PLANNING POLICY FRAMEWORK TABLE 1 – 3

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

TABLE 1: FLOOD ZONES

Zone 1 - low probability

Definition

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

Appropriate uses

All uses of land are appropriate in this zone.

Flood risk assessment requirements

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

Policy aims

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

Zone 2 - medium probability

Definition

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

Appropriate uses

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

Flood risk assessment requirements

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

Policy aims

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

Zone 3a - high probability

Definition

This zone comprises land assessed as having a 1:100 or greater annual probability of river flooding (>1%), or a 1:200 or greater annual probability of flooding from the sea (>0.5%) in any year.

Appropriate uses

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

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

Flood risk assessment requirements

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

Policy aims

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

- Reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- Relocate existing development to land in zones with a lower probability of flooding; and
- Create space for flooding to occur by restoring functional floodplain and flood flow pathways and by identifying, allocating and safeguarding open space for flood storage.

Zone 3b - the functional floodplain

Definition

This zone comprises land where water has to flow or be stored in times of flood.

Local planning authorities should identify in their Strategic Flood Risk Assessments areas of functional floodplain and its boundaries accordingly, in agreement with the Environment Agency.

The identification of functional floodplain should take account of local circumstances and not be defined solely on rigid probability parameters. But land which would flood with an annual probability of 1:20 (5%) or greater in any year, or is designed to flood in an extreme (0.1%) flood, should provide a starting point for consideration and discussions to identify the functional floodplain.

Appropriate uses

Only the water-compatible uses and the essential infrastructure listed in table 2 that has to be there should be permitted in this zone. It should be designed and constructed to:

- remain operational and safe for users in times of flood;
- result in no net loss of floodplain storage;
- not impede water flows; and
- not increase flood risk elsewhere.

Essential infrastructure in this zone should pass the Exception Test.

Flood risk assessment requirements

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

Policy aims

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

- reduce the overall level of flood risk in the area through the layout and form of the development and the appropriate application of sustainable drainage systems;
- relocate existing development to land with a lower probability of flooding.

TABLE 2: FLOOD RISK VULNERABILITY CLASSIFICATION

Essential infrastructure

- Essential transport infrastructure (including mass evacuation routes) which has to cross the area at risk.
- Essential utility infrastructure which has to be located in a flood risk area for operational reasons, including electricity generating power stations and grid and primary substations; and water treatment works that need to remain operational in times of flood.
- Wind turbines.

Highly vulnerable

- Police stations, ambulance stations and fire stations and command centres and telecommunications installations required to be operational during flooding.
- Emergency dispersal points.
- Basement dwellings.
- Caravans, mobile homes and park homes intended for permanent residential use³.
- Installations requiring hazardous substances consent⁴. (Where there is a demonstrable need to locate such installations for bulk storage of materials with port or other similar facilities, or such installations with energy infrastructure or carbon capture and storage installations, that require coastal or water-side locations, or need to be located in other high flood risk areas, in these instances the facilities should be classified as “essential infrastructure”)⁵

More vulnerable

- Hospitals.
- Residential institutions such as residential care homes, children’s homes, social services homes, prisons and hostels.
- Buildings used for dwelling houses, student halls of residence, drinking establishments, nightclubs and hotels.
- Non-residential uses for health services, nurseries and educational establishments.
- Landfill and sites used for waste management facilities for hazardous waste⁶.
- Sites used for holiday or short-let caravans and camping, subject to a specific warning and evacuation plan⁷

³ For any proposal involving a change of use of land to a caravan, camping or chalet site, or to a mobile home site or park home site, the

Sequential and Exception Tests should be applied.

⁴ See Circular 04/00: Planning controls for hazardous substances (paragraph 18) at:

www.communities.gov.uk/publications/planningandbuilding/circularplanningcontrols

⁵ In considering any development proposal for such an installation, local planning authorities should have regard to planning policy on pollution in the National Planning Policy Framework.

⁶ For definition, see Planning for Sustainable Waste Management: Companion Guide to Planning

Policy Statement 10 at www.communities.gov.uk/publications/planningandbuilding/planningsustainable

⁷ See footnote 3.

Less vulnerable

- Police, ambulance and fire stations which are not required to be operational during flooding.
- Buildings used for shops, financial, professional and other services, restaurants and cafes, hot food takeaways, offices, general industry, storage and distribution, non-residential institutions not included in “more vulnerable”, and assembly and leisure.
- Land and buildings used for agriculture and forestry.
- Waste treatment (except landfill and hazardous waste facilities).
- Minerals working and processing (except for sand and gravel working).
- Water treatment works which do not need to remain operational during times of flood.
- Sewage treatment works (if adequate measures to control pollution and manage sewage during flooding events are in place).

Water-compatible development

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

Notes to table 2:

1. This classification is based partly on Department for Environment, Food and Rural Affairs and Environment Agency research on Flood Risks to People (FD2321/TR2)8 and also on the need of some uses to keep functioning during flooding.
2. Buildings that combine a mixture of uses should be placed into the higher of the relevant classes of flood risk sensitivity. Developments that allow uses to be distributed over the site may fall within several classes of flood risk sensitivity.
3. The impact of a flood on the particular uses identified within this flood risk vulnerability classification will vary within each vulnerability class. Therefore, the flood risk management infrastructure and other risk mitigation measures needed to ensure the development is safe may differ between uses within a particular vulnerability classification.

⁸ See website for further details. www.defra.gov.uk/science/Project_Data/DocumentLibrary/FD2320_3364_TRP.pdf

TABLE 3: FLOOD RISK VULNERABILITY AND FLOOD ZONE COMPATIBILITY						
VULNERABILITY CLASSIFICATION (TABLE 2)		ESSENTIAL INFRASTRUCTURE	WATER COMPATIBLE	HIGHLY VULNERABLE	MORE VULNERABLE	LESS VULNERABLE
FLOOD ZONE (TABLE 1)	Zone 1	√	√	√	√	√
	Zone 2	√	√	Exception Test Required	√	√
	Zone 3a	Exception Test Required	√	*	Exception Test Required	√
	Zone 3b Functional Floodplain	Exception Test Required	√	*	*	*

Key:

√ Development is appropriate

* Development should not be permitted

Notes on Table 3;

- The application of the Sequential Test which guides development to Flood Zone 1 first, then Zone 2, and then Zone 3;
- Flood risk assessment requirements; or
- The policy aims for each flood zone.