

Keepmoat Developments

Flood Risk Assessment

Land at Pottery Lane, West Gorton
Phase 1 Development

880507 R01 (01)

MAY 2014

RSK GENERAL NOTES

Project No.: 880507 R01 (01)

Title: Flood Risk Assessment- Land at Pottery Lane, West Gorton. Phase 1 development

Client: Keepmoat Developments

Date: May 2014

Office: Helsby

Status: Draft

Author	K Jackson	**Technical reviewer**	C Whittingham
Signature		Signature	
Date:	May 2014	Date:	May 2014
Project manager	C Blinkhorn	**Project Director**	I Clark
Signature		Signature	
Date:	May 2014	Date:	May 2014

RSK LDE (RSK) has prepared this report for the sole use of the client, showing reasonable skill and care, for the intended purposes as stated in the agreement under which this work was completed. The report may not be relied upon by any other party without the express agreement of the client and RSK. No other warranty, expressed or implied, is made as to the professional advice included in this report.

Where any data supplied by the client or from other sources have been used, it has been assumed that the information is correct. No responsibility can be accepted by RSK for inaccuracies in the data supplied by any other party. The conclusions and recommendations in this report are based on the assumption that all relevant information has been supplied by those bodies from whom it was requested.

No part of this report may be copied or duplicated without the express permission of RSK and the party for whom it was prepared.

Where field investigations have been carried out, these have been restricted to a level of detail required to achieve the stated objectives of the work.

This work has been undertaken in accordance with the quality management system of RSK LDE.

CONTENTS

1 INTRODUCTION 1
2 CONTEXT AND SCOPE OF WORKS 3
3 SITE LOCATION AND DESCRIPTION 4
3.1 Site Description 4
3.2 Outline development proposals 4
3.3 Geology and hydrogeology 5
3.4 Surrounding hydrology 5
3.4.1 Main Rivers 5
3.4.2 Ordinary Watercourses 5
4 PLANNING POLICY 7
4.1 National 7
4.2 Local 8
5 SOURCE OF FLOOD RISK 9
5.1 Environment Agency Maps 9
5.2 Flooding from rivers (fluvial flood risk) 9
5.3 Flooding from the sea (tidal flood risk) 10
5.4 Flooding from the land (overland pluvial flood risk) 10
5.5 Flooding from groundwater 11
5.6 Flooding from sewers 11
5.7 Flooding from reservoirs, canals and other artificial structures 12
5.8 Historic flooding 12
5.9 Flood risk summary 13
6 CLIMATE CHANGE 14
6.1 Climate change impacts 14
6.2 Increased fluvial flows 14
6.3 Increased rainfall intensity 14
7 SURFACE WATER DRAINAGE STRATEGY 16
7.1 Pre-development situation 16
7.2 Post-development off-site discharge options 16
7.2.1 Infiltration 16
7.2.2 Discharge to watercourse 16
7.2.3 Discharge to sewer 17
8 CODE FOR SUSTAINABLE HOMES ASSESSMENT 18
8.1 SUR 1 Assessment 18
8.1.1 Peak runoff rate 18
8.1.2 Volume of runoff 18
8.2 SUR 2 Assessment 19
8.2.1 Environment Agency flood zone 19
8.2.2 Fluvial flood risk 19
8.2.3 Pluvial flood risk 19
8.2.4 Groundwater flooding 19
8.2.5 Flooding from sewers 20

8.2.6 Flooding from reservoirs, canals and other artificial structures....20
8.2.7 SUR 2 assessment criteria....20
9 PLANNING CONTEXT....21
9.1 Application of planning policy....21
9.2 Land use vulnerability – Phase 1....21
10 CONCLUSIONS....23
11 REFERENCES....25

FIGURES

Figure 1 Environment Agency flood zone map
Figure 2 Site location plan
Figure 3 Environment Agency surface water flood map
Figure 4 Environment Agency reservoir flood map

APPENDICES

Appendix A RSK service constraints
Appendix B Environment Agency flood data
Appendix C Proposed development plans
Appendix D UU Sewer records
Appendix E Pre and post development impermeable areas

1 INTRODUCTION

RSK Land and Development Engineering Ltd were commissioned by Keepmoat Developments to carry out a flood risk assessment for a site off Pottery Lane, West Gorton.

This assessment has been prepared in accordance with National Planning Policy Framework (NPPF) (Ref. 1) and its accompanying guidance document (Ref. 2), the Interim Code of Practice for Sustainable Drainage (Ref. 3) and BS 8533-2011 Assessing and managing flood risk in development Code of practice (Ref. 4), with site-specific advice from the Environment Agency, the Local Planning Authority and the Client.

The NPPF sets out the criteria for development and flood risk by stating that inappropriate development in areas at risk of flooding should be avoided by directing development away from areas at highest risk, but where development is necessary, making it safe without increasing flood risk elsewhere. The key definitions are:

- “areas at risk of flooding” means land within Flood Zones 2 and 3; or land within Flood Zone 1 which has critical drainage problems and which has been notified to the local planning authority by the Environment Agency
- “flood risk” means risk from all sources of flooding - including from rivers and the sea, directly from rainfall on the ground surface and rising groundwater, overwhelmed sewers and drainage systems, and from reservoirs, canals and lakes and other artificial sources.

For this site, the key aspects that require the assessment are:

- the site is in excess of 1Ha in size
- the Environment Agency’s indicative flood map (**Figure 1** and **Appendix B**) shows the site is located within Flood Zone 1, and as such in accordance with NPPF, a flood risk assessment is required.

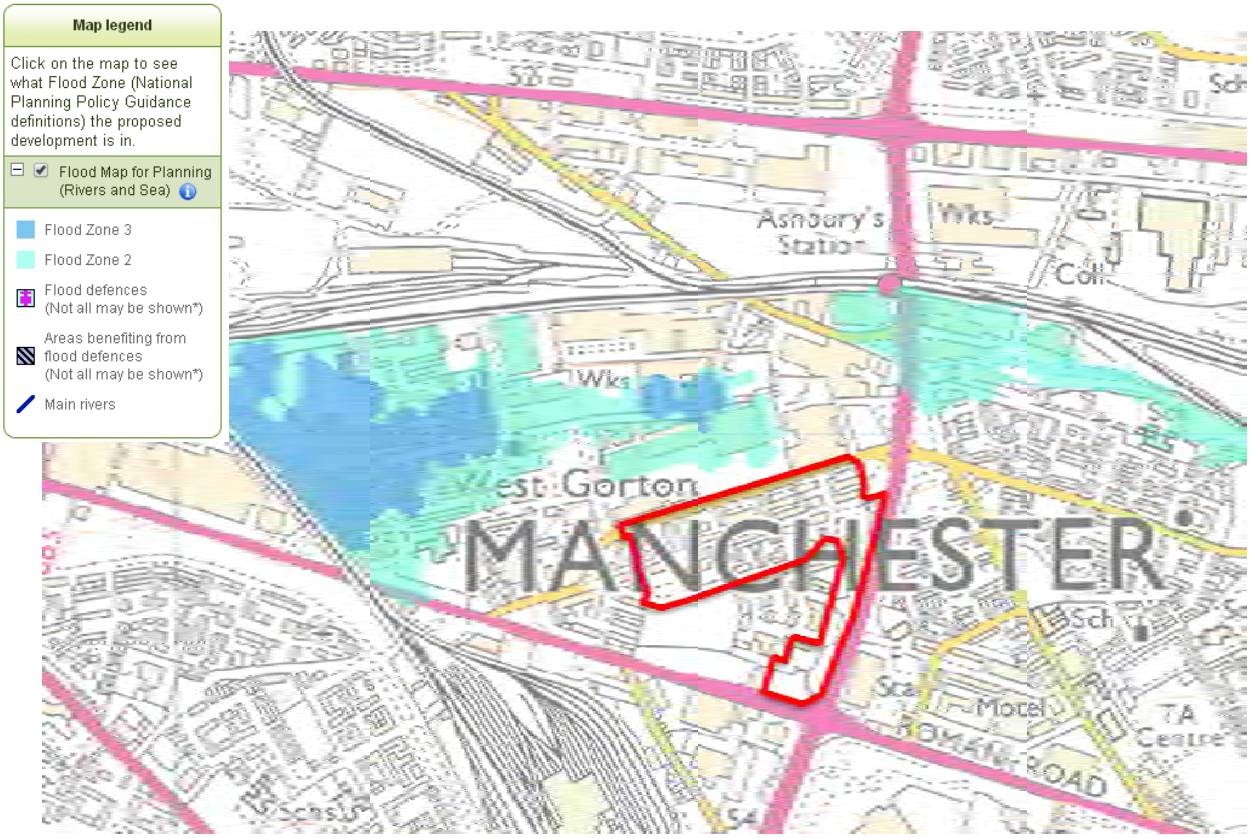


Figure 1- Environment Agency flood zone map (accessed April 2014)

2 CONTEXT AND SCOPE OF WORKS

A key element of project development is to prepare a Flood Risk Assessment to establish the risk associated with site and to propose suitable mitigation, if required to reduce the risk to a more acceptable level.

The scope of work relating to a flood risk assessment is based on the guidance provided in Section 10 of NPPF (Ref. 1) and its accompanying guidance (Ref. 2).

A site-specific flood Risk assessment must demonstrate that the site will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall. The scope of this assessment therefore comprises of the following elements:

- to obtain information on the hydrology and hydrological regime in and around the site
- to obtain the views of the Environment Agency including scope, location and impacts
- to determine the extent of any new flooding provision and the influence on the site
- to review site surface water drainage based on the proposed layout. To determine the extent of any new infrastructure required
- to review architect plans and planning information and other studies to determine the existing site conditions
- to assess the impact on the site from climate change effects and anticipated increases in rainfall over a 100 year period for residential uses
- preparation of a report including calculations and summaries of the source information and elements reviewed.

3 SITE LOCATION AND DESCRIPTION

3.1 Site Description

The Site is located in West Gorton approximately 2.3 km south east from Manchester City Centre, in between Pottery Lane (A6010) and Hyde Road (A51). A site location plan has been provided, **Figure 2.**



Figure 2: Site location map (accessed April 2014)

The proposed Site is approximately 7 Hectares (Ha) in area and is bounded by Wenlock Way to the north and residential properties west, Hyde Road (A57) to the south and Pottery Lane (A6010) to the east. This parcel of land currently contains a mixture of residential and commercial development, with some public open space to the south and east.

3.2 Outline development proposals

Based on the latest masterplan (**Appendix C**), the proposals are for a planning application for the development of a residential scheme with up to 254 units, including associated car parking and soft landscaping.

3.3 Geology and hydrogeology

The Superficial (Drift Geology) beneath the Site was found to be Till, Devensian (boulder clay).The underlying Bedrock and Faults (Solid Geology) beneath the west of the Site was found to be variable, with banding of Chester Pebble Bed Formation, Manchester Marl Formation and Collyhurst Formation. The solid geology beneath the remainder and majority of the Site (eastern extent) was found to be Halesowen Formation, whilst an area of Etruria Formation was located towards the north east corner of the Site. It is further noted that there are small areas of Made Ground located throughout the Site, with a large area located along the south east corner of the Site.

The Groundwater Vulnerability maps show that there is varying groundwater vulnerability across the site, suggesting banding of Major Aquifer (high permeability) and Non Aquifer (negligible permeability) within the far west extent of the Site. The remainder and majority of the Site is classified as a Minor Aquifer with variable permeability. Based on the Bedrock Aquifer Designation Map, the far west of the Site is a mix of Principal and Secondary-B Aquifer, whilst the remainder and majority of the Site is Secondary-A Aquifer.

Based on the Source Protection Zone map, there are no Source Protection Zones located within the Site boundary of within the immediate vicinity of the Site.

The soil categorisation (Land Information System's Soilscapes) on the Phase 1 section of the site is defined as 'slowly permeable seasonally wet acid loamy and clayey soils with impeded drainage'.

3.4 Surrounding hydrology

3.4.1 Main rivers

There are no Main Rivers located within the boundary of the Site. The closest Main River in relation to the Site is the River Medlock, which flows in a south west direction approximately 680m to the North West of the Site. Additionally, Gore Brook flows in a westerly direction approximately 1 km southeast from the site.

3.4.2 Ordinary watercourses

Based on the AECOM flood risk assessment for the West Gorton Neighbourhood Regeneration Flood Risk Assessment (Ref 5.), a number of ordinary watercourses cross the site. These are known as Corn Brook and Black Brook and are culverted to an area to the north of the site. Based on Ordnance Survey maps, Corn Brook flows within open channel to the east of Pottery Lane (A6010) where it then enters culvert and flows in a westerly direction. It is noted that there is an approximate 10 m reach of open channel section boundary between Ambrose Street and Textile Street. From here it is understood the flow continues westwards in culvert and then continues east beneath the railway.

It is understood that Black Brook flows to the northwest of the Site within culvert. Black Brook joins Corn Brook to the North West of the Site before flowing under the railway. A detail of the culverted sections to the North West of the Site (referred to as the Quinn Container plot) was confirmed by a CCTV survey conducted during 2008 and has been documented within the White Young Green FRA (Ref. 6), with a summary of the culvert assessment is outlined below:

Corn Brook

The Corn Brook culvert is a brick lined 2550mm by 19000mm arched culvert with a flat bottom. The culvert falls westerly to the north west of the Site. Available invert levels ranged from 2.35m AOD towards the east, to 4.12m AOD along the western boundary of the surveyed area. The gradient was estimated at 1 in 64.

Black Brook

The Black Brook culvert changes in size and shape across to the north west of the site ranging from a 1300mm by 1050mm at the upstream, to 3500mm by 300mm arched culvert with a flat bottom at the downstream end. It was not possible to obtain the invert levels of this watercourse during the survey and therefore the gradient is unknown.

4 PLANNING POLICY

4.1 National

Table 4.1: National policy context

Policy/Legislation name	Key Provisions
National Planning Policy Framework	The aims of planning policy on development and flood risk are to ensure that flood risk is taken into account at all stages in the planning process to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk. Where new development is, exceptionally, necessary in such areas, policy aims to make it safe without increasing flood risk elsewhere and where possible, reducing flood risk overall.

Table 4.2 National legislation

Policy/Legislation name	Key Provisions
Water Resources Act 1991	Section 24 - The Environment Agency (EA) [now NRW] is empowered under this Act to maintain and improve the quality of 'controlled' waters Section 85 - It is an offence to cause or knowingly permit pollution of controlled waters. Section 88 - Discharge consents are required for discharges to controlled waters.
Flood and Water Management Act 2010	This legislation was formally ratified in April 2010 with the aim is to implementing the findings of the 2007 Pitt Review and co-ordinating control of drainage and flood issues. There are a number of increased responsibilities within the act that affect adoption of Sustainable Drainage Systems (SuDS) features and the role of the NRW to expand on the mapping data they provide. The implementation of SuDS features has many beneficial impacts on the treatment of surface water during remediation works.
Water Framework Directive (2000)	The Water Framework Directive (WFD) came in to force in 2000 and requires all inland and coastal waters to reach 'good' chemical and biological status by 2015. Flood risk management is unlikely to have a significant impact on chemical water quality except where maintenance works disturb sediment (such as de-silting) or where pollutants are mobilised from contaminated land by flood waters. The main impact of the WFD on flood risk management, both now and in the future, relates to the ecological quality of water bodies. Channel works, such as straightening and deepening, or flood risk management schemes that modify geomorphological processes can change river morphology. The WFD aims to protect conservation sites identified by the EC Habitats Directive and Birds Directive that have water-related features, by designating them as 'protected sites'.

4.2 Local

Table 4.3 Local policy

Policy/Legislation name	Key Provisions
Manchester City Council Manchester Core Strategy 2012 to 2027 Policy EN 14 - Flood Risk	In line with the risk-based sequential approach contained within PPS25, development should be directed away from sites at the greatest risk of flooding, and towards sites with little or no risk of flooding; this should take account of all sources of flooding identified in the Manchester-Salford-Trafford Strategic Flood Risk Assessment (SFRA). In addition to the requirements for site-specific Flood Risk Assessments (FRAs) set out in PPS25, an appropriate FRA will also be required for all development proposals, including changes of use, on sites greater than 0.5ha within Critical Drainage Areas (CDAs) and Canal Hazard Zones identified in the SFRA. All new development should minimise surface water run-off, including through Sustainable Drainage Systems (SUDS) and the appropriate use of Green Infrastructure. Developers should have regard to the surface water run-off rates in the SFRA User Guide. In CDAs, evidence to justify the surface water run-off approach / rates will be required. The City of Manchester contains many sections of rivers which are culverted or 'hidden'; where these are indicated in the SFRA beneath the proposed development site, further investigation will be required and the development proposal should take this into account; where feasible and appropriate development should seek to open up culverted/hidden rivers to reduce the associated flood risk and danger of collapse, taking advantage of opportunities to enhance biodiversity and Green Infrastructure.
Manchester City Council Manchester Core Strategy 2012 to 2027 Policy EN 8 - Adaptation to Climate Change	All new development will be expected to be adaptable to climate change in terms of the design, layout, siting and function of both buildings and associated external spaces. In achieving developments which are adaptable to climate change developers should have regard to the following, although this is not an exhaustive list: • Minimisation of flood risk by appropriate siting, drainage, and treatment of surface areas to ensure rain water permeability • Reduction in urban heat island effect through the use of Green Infrastructure such as green roofs, green walls, increased tree cover and waterways • The need to control overheating of buildings through passive design • The opportunity to provide linked and diverse green space to enhance natural habitats which will assist species adaptation

5 SOURCE OF FLOOD RISK

In accordance with NPPF (Ref. 1) and advice from the Environment Agency, a prediction of the flood sources and levels is required along with the effects of climate change from the present for the design life of the development (in this case assumed to be 100 years). To consider these effects of climate change, NPPF recommends consideration of a 20% increase in peak river flows over this timeframe

The flood risk elements that need to be considered for any site are defined in BS 8533 as the "Forms of Flooding" and are listed as:

- flooding from Rivers (fluvial flood risk)
- flooding from the Sea (tidal flood risk)
- flooding from the Land
- flooding from Groundwater
- flooding from Sewers (sewer and drain exceedance, pumping station failure etc)
- flooding from Reservoirs, Canals and other Artificial Structures.

5.1 Environment Agency maps

The Environment Agency has produced Flood Zone maps for much of England and Wales. The current displayed map is reproduced as **Figure 1** and included in **Appendix B.** The latest Flood Zone map shows the Phase 1 development is located wholly within Flood Zone 1.

5.2 Flooding from rivers (fluvial flood risk)

The Environment Agency were originally consulted in April 2012 regarding the site, a full copy of which is included as **Appendix B.** This data has been confirmed as still relevant for the purpose of this report. The following is taken from the Environment Agency data:

Corn Brook and Tributary

Corn Brook is classified as an Ordinary Watercourse and is known to be a 'hidden watercourse' of Manchester. The Environment Agency believes Corn Brook to be culverted until it discharges into the Manchester Ship Canal. Furthermore, a Corn Brook tributary existed within West Gorton. No evidence has been found for its continuing existence (other than some lengths of combined sewer) and therefore the watercourse is considered to be 'completely obliterated'.

Black Brook and Tributary

Black Brook is classified as an Ordinary Watercourse and is known to be a 'hidden watercourse' of Manchester. The Environment Agency believes that Black Brook north from Ashfield New Road and south of Gorton Lane (located to the north of the Site) is

'completely obliterated'. It is believed that Black Brook continues to exist south from Grey Mare Lane where it connects into Corn Brook. It is considered that this length of Black Brook has potentially been replaced by sewers. Furthermore, the Black Brook tributary north of Shefford Close is considered to be 'completely obliterated' due to recent development in the area.

As noted above, the land outlined for the Phase 1 development is located within Flood Zone 1 and as such flooding from this source is considered **low**.

5.3 Flooding from the sea (tidal flood risk)

On the coast storm surges and high tides can threaten low lying coastal areas, and can be sometimes large and rapid enough to overtop defence works, causing significantly more damage than river flooding. Tidal flooding is not considered a risk to the site due to the location of the site away from the coast.

5.4 Flooding from the land (overland pluvial flood risk)

If intense rain is unable to soak into the ground or be carried through manmade drainage systems, for a variety of reasons, it can run off over the surface causing localised floods before reaching a river or other watercourse.

Generally, where there is impermeable surfacing or where the ground infiltration capacity is exceeded, surface water runoff will occur. Excess surface water flows from the site are believed to drain naturally to the local water features, either by overland flow or through infiltration.

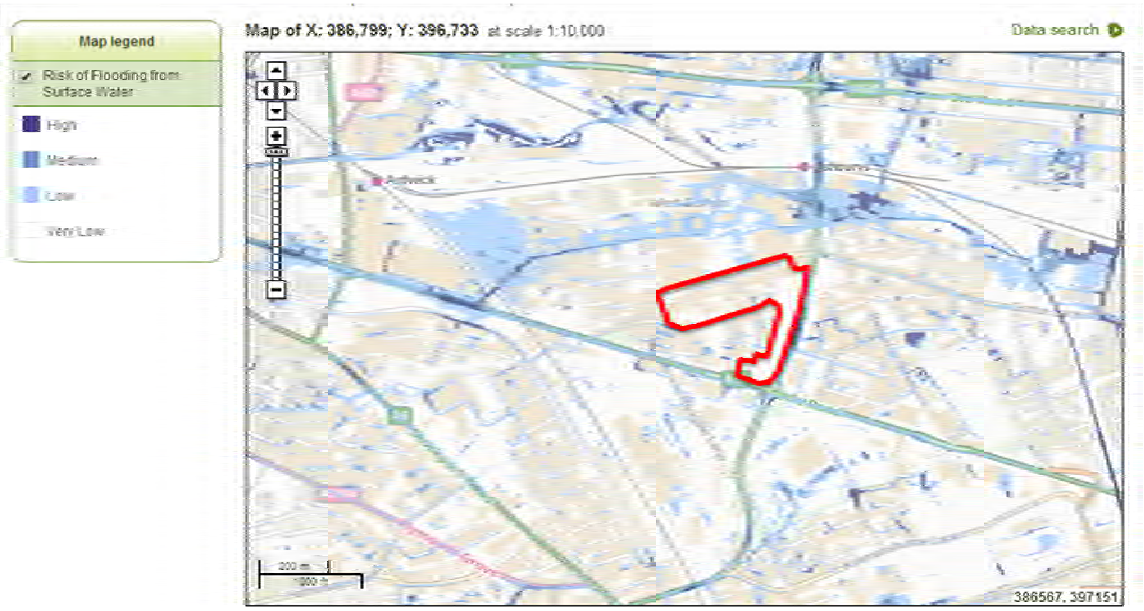


Figure 3- Environment Agency surface water flood map (accessed April 2014)

The Environment Agency's surface water flood map (**Figure 3**) shows the Phase 1 development to be in an area that is at a very low risk of surface water flooding. Flood

risk from this source will be considered when carrying out the detailed surface water management scheme.

Overall the surface water flood risk to Phase 1 is **low**.

5.5 Flooding from groundwater

Groundwater flooding tends to occur after much longer periods of sustained high rainfall. Higher rainfall means more water will infiltrate into the ground and cause the water table to rise above normal levels. Groundwater tends to flow from areas where the ground level is high, to areas where the ground level is low. In low-lying areas the water table is usually at shallower depths anyway, but during very wet periods, with all the additional groundwater flowing towards these areas, the water table can rise up to the surface causing groundwater flooding.

The Manchester, Salford and Trafford Strategic Flood Risk Assessment (Ref. 7) identifies specific areas susceptible to groundwater flooding. From the groundwater flooding map in the SFRA, the Site is not shown to be in area at risk of groundwater flooding. Groundwater flooding to the site is therefore considered **low**.

5.6 Flooding from sewers

Flooding from artificial drainage systems occurs when flow entering a system, such as an urban storm water drainage system, exceeds its conveyance capacity, the system becomes blocked or it cannot discharge due to a high water level in the receiving watercourse. A sewer flood is often caused by surface water drains discharging into the combined sewer systems; sewer capacity is exceeded in large rainfall events causing the backing up of floodwaters within properties or discharging through manholes. Most adopted surface water drainage networks are designed to the criteria set out in Sewers for Adoption (Ref. 8). One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage.

A large number of existing sewers are located within and surrounding the site, these would have served the previous (and remaining) development on the site, a copy of the sewer records can be found in **Appendix D**.

Development has the potential to cause an increase in impermeable area, an associated increase in surface water runoff rates and volumes, and a consequent potential increase in downstream flood risk due to overloading of sewers, watercourses, culverts and other drainage infrastructure.

Surface water flooding must be considered within the design of the site, to ensure that any additional surface water and overland flows are managed correctly, to minimise flood risk to the site and the surrounding area. The proposed surface water network on the site should be designed to ensure exceedance of the network has been considered. The site is located within the Conurbation Core Critical Drainage Area (CDA) and as such runoff rates should be reduced by 50% compared to existing rates for brownfield sites. Greenfield sites should be reduced to greenfield runoff rates.

All new sewer infrastructure for the site will be designed to the latest best practice. Overall the flood risk from this source can be considered to be **low**.

5.7 Flooding from reservoirs, canals and other artificial structures

The Environment Agency has recently published flood risk mapping as a result of potential failure of reservoirs and artificial structures. The Environment Agency reservoir flood map shows the largest area that might be flooded if a reservoir were to fail and release the water it holds. Since this is a prediction of a worst-case scenario, it is unlikely that any actual flood would be this large.

The Environment Agency's reservoir flood map shows that the Phase 1 development is not at risk of reservoir flooding **Figure 4.** According to the Environment Agency there are five reservoirs located to the east of the Site; Gorton Lower Gorton Upper, Audenshaw No.1, Audenshaw No.2, and Audenshaw No. 3 which pose a potential risk to the surroundings areas. Reservoir flooding is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925. Since then reservoir safety legislation has been introduced to ensure reservoirs are maintained.

The SFRA indentifies areas where there is a risk of flooding from overtopping or breach of canals. The Canal Hazards Zone map in the SFRA shows that the Site is not located in any 'Canal Overtop Hazard Zone' or 'Canal Breach Hazard Zone'.

Flood risk from this source is therefore considered **low**.

Figure 4: Environment Agency reservoir flood map (accessed April 2014)

5.8 Historic flooding

The Environment Agency reported that they hold no records of historical flooding on the site. It is noted that the absence of records does not mean that there has never been flooding at this Site, nor that flooding will occur in the future.

5.9 Flood risk summary

The proposed Phase 1 development is located wholly within Flood Zone 1, and is therefore classed as at a low risk of flooding from fluvial sources. The Phase 1 development has also been assessed to be at a low risk of flooding from other sources (tidal, pluvial, groundwater, sewer and reservoir).

6 CLIMATE CHANGE

6.1 Climate change impacts

Within the context of the existing flood risk at the site, and the requirements of the TGNPPF, climate change impacts from different flood sources have been considered alongside the present day scenario as described in Section 5.

As an overview; Climate change can affect local flood risk in several ways. Impacts will depend on local conditions and vulnerability.

In the North West River Basin District, wetter winters and more rain falling in wet spells may increase river flooding for rivers and tributaries. More intense rainfall causes more surface runoff, increasing localised flooding and erosion. In turn, this may increase pressure on drains, sewers and water quality. Storm intensity in summer could increase even in drier summers. Rising sea or river levels may increase local flood risk inland or away from major rivers because of interactions with drains, sewers and smaller watercourses.

In accordance with the requirements of the NPPF the latest climate change predictions will be considered within this assessment.

Latest figures for the North West River Basin District (Ref. 9) show that if emissions follow a medium future scenario, UKCP09 projected changes by the 2050s relative to the recent past are:

- winter precipitation increases of around 18% (very likely to be between 2% and 39%)
- precipitation on the wettest day in winter up by around 16% (very unlikely to be more than 34%)
- relative sea levels are very likely to be up between 10cm and 40cm from 1990 levels (not including extra potential rises from polar ice sheet loss)
- peak river flows in a typical catchment likely to increase between 11% and 24%.

6.2 Increased fluvial flows

The increase in fluvial flows has been included within the assessment of fluvial flood risk from the ordinary watercourses to the north of the site (Corn Brook). This has been drawn directly from the fluvial data provided by the Environment Agency of the existing models which include an allowance for climate change.

6.3 Increased rainfall intensity

For the surface water runoff assessment, an allowance of a 30% increase in the rainfall intensity values for the period 2085 to 2115 has been included to account for the impact of climate change in accordance with TGNPPF.

The potential increase in risk of flooding from pluvial and surface water flooding has been considered within the design of the surface water scheme for the development, an increase in rainfall intensity is therefore unlikely to significantly increase the risk.

7 SURFACE WATER DRAINAGE STRATEGY

7.1 Pre-development situation

The existing development site area contains a mix of residential and commercial uses, comprising both greenfield and brownfield land. The total site area is approximately 7ha of permeable and impermeable land.

It is believed that surface water from the site currently drains either towards Corn Brook to the north of the site via the existing adopted UU sewer network, or infiltrates into the ground (greenfield areas).

7.2 Post-development off-site discharge options

An order of preference exists for drainage receptors. Infiltration drainage should be used where possible. Where this is not possible, or does not provide sufficient capacity, attenuated discharge to watercourses should be sought. Only where neither of these two options is available should discharge to sewers be considered, subject to approvals from the sewerage undertaker.

7.2.1 Infiltration

Further investigation should be carried out to assess whether discharge to the ground, or infiltration, may be a possible drainage solution for this site; however the effectiveness of infiltration is completely dependent on the physical conditions at the site. Potential obstacles include:

Local Variations In Permeability Preventing Infiltration - This testing should be undertaken in line with the guidance contained in BRE 365 (Ref.10) or CIRIA R156 (Ref. 11) and the results used to firstly check feasibility and secondly to size the necessary infiltration features.

Shallow Groundwater Table - For infiltration drainage devices Building Regulation approved document H2 states that these, “should not be built in ground where the water table reaches the bottom of the device at any time of the year”.

Source Protection Zones - As discussed in Section 3, the site is not located in a source protection zone. If the local ground conditions prove suitable, water could be infiltrated to the ground in a number of different ways (provided suitable treatment options are incorporated into the design), including discharge to infiltration trenches, retention ponds designed to infiltrate water or more laterally extensive systems constructed beneath roadways.

7.2.2 Discharge to watercourse

Should it be found that infiltration is not suitable on the site or does not provide a sufficient discharge rate, discharge to watercourse is the next option to consider. Due to the location of Corn Brook it is unlikely that a direct connection can be achieved.

7.2.3 Discharge to sewer

If either of the above two options are not suitable for the site then connection to sewer may be required. Further discussions are ongoing with UU to determine the most suitable point of connection and any discharge rates. A UU developer enquiry has been submitted (**Appendix E**) at the time of writing a response has not been received.

Further details on surface water drainage for the site will be provided at the detailed design stage.

8 CODE FOR SUSTAINABLE HOMES ASSESSMENT

This surface water and flood risk assessment has been carried out to support a Code for Sustainable Homes 2010 assessment for the Phase 1 re-development at Pottery Lane, West Gorton, Manchester.

8.1 SUR 1 assessment

The aim of the SUR 1 is to design surface water drainage for housing developments which avoid, reduce and delay the discharge of rainfall runoff to watercourses and public sewers using SuDS techniques. This will protect receiving waters from pollution and minimise the risk of flooding and other environmental damage in watercourses.

8.1.1 Peak runoff rate

Where there is an increase in impermeable area, ensure that the peak rate of run-off over the development lifetime, allowing for climate change, will be no greater for the developed site than it was for the pre-development site. This should comply at the 1 year and 100 year return period events.

The code sets criteria for the design of drainage systems, the main criteria being that 'the peak rate of run-off into watercourses is no greater for the development site than it was for the pre-development site'.

If there is no increase in the man-made impermeable area as a result of the new development, then the peak rate of run-off criterion does not apply.

As the total impermeable area is not increased post development, this section of the CfSH has been met.

8.1.2 Volume of runoff

If the developed site would otherwise discharge, over the development lifetime allowing for climate change, a greater volume of rainwater run-off than the pre-development site for the 100 year 6 hour event then criterion A applies. If A cannot be satisfied then B applies.

a. Ensure that the post development volume of run-off, allowing for climate change over the development lifetime, is no greater than it would have been before the development. The additional predicted volume of runoff for the 100 year 6 hour event must be prevented from leaving the site by using infiltration or other SuDS techniques.

b. If A cannot be satisfied then reduce the post development peak rate of runoff to the limiting discharge.

If there is no increase in the man-made impermeable area as a result of the new development, then the volume run-off criterion does not apply.

As the total impermeable area is not increased post development, this section of the CfSH has been met.

Based on the above, the mandatory requirements of SUR 1 have been met.

8.2 SUR 2 assessment

The aim of the SUR 2 is to promote development in low flood risk areas, or to take measures to reduce the impact of flooding on houses built in areas with a medium or high risk of flooding.

The flood risk elements as defined in the NPPF and detailed in Section 5 are listed as;

- flooding from rivers (fluvial flood risk)
- flooding from the sea (tidal flood risk)
- flooding from the land (overland pluvial flood risk)
- flooding from groundwater
- flooding from sewers (sewer and drain exceedance, pumping station failure etc)
- flooding from reservoirs, canals and other artificial structures.

The following section briefly reviews the assessment in Section 5.

8.2.1 Environment Agency flood zone

The proposed development site is located entirely within Flood Zone 1 according to the latest Environment Agency flood maps.

8.2.2 Fluvial flood risk

As mentioned above, the proposed development is located within flood zone 1 and as such is not a risk of flooding from fluvial sources.

No other potential sources of fluvial flood risk have been identified at the proposed development site. Flood risk from this source is therefore considered to be low.

8.2.3 Pluvial flood risk

Intense rainfall that is unable to soak into the ground or enter drainage systems can quickly run overland and result in local flooding. This is exacerbated by highly impermeable urban development or low permeability soils and geology.

Surface water flood maps produced by the Environment Agency place the site at very low risk of flooding from surface water.

Flooding of the site from this source is therefore considered to be low.

8.2.4 Groundwater flooding

In some areas underground permeable rocks can become saturated by rainfall, releasing water onto the surface as floods into intermittent channels, or gradually

flooding areas as the local water table rises. This can sometimes be a seasonal [phenomenon, water tables rising in the wetter winters before dipping again in the summer. It is related to specific geological conditions and rock types. It is also slower to develop and slower to recede than other types of flooding.

According to the Manchester, Salford and Trafford Strategic Flood Risk Assessment, the site is not in an area though to be at risk from groundwater flooding.

The risk of flooding to the site from groundwater sources is therefore considered to be low.

8.2.5 Flooding from sewers

Most adopted surface water drainage network are designed to the criteria set out in Sewers for Adoption. One of the design parameters is that sewer systems be designed such that no flooding of any part of the site occurs in a 1 in 30 year rainfall event. By definition a 1 in 100 year event would exceed the capacity of the surrounding sewer network as well as any proposed drainage. When exceeded, the surcharged pipework will lead to flooding from backed up manholes and gully connection. This will lead to immediate flooding within highways surrounding the site.

Flooding of the site from this source is considered to be low, provided any new infrastructure is installed in line with current best practice.

8.2.6 Flooding from reservoirs, canals and other artificial structures

The Environment Agency has recently published flood risk mapping as a result of potential failure of reservoirs. The map shows the site area is not in an area at risk of flooding from this source. There are no other known structures in the vicinity of the site that could pose a flood risk to the site.

Flooding of the site from reservoirs, canals and other artificial structures is low.

8.2.7 SUR 2 assessment criteria

Two credits are available for developments situated in Zone 1 – low annual probability of flooding (as defined in NPPF) and where the site-specific Flood Risk Assessment (FRA) indicated that there is low risk of flooding from all sources.

The above review and Section 5 confirm that the site is located within Flood Zone 1 and flood risk from all other sources is considered low. Therefore 2 credits can be awarded under Sur 2 of the Code for Sustainable Homes.

9 PLANNING CONTEXT

9.1 Application of planning policy

NPPF includes (Section 10) measures specifically dealing with development planning and flood risk using a sequential characterisation of risk based on planning zones and the Environment Agency Flood Map. The main study requirement is to identify the flood zones and vulnerability classification relevant to the proposed development, based on an assessment of current and future conditions.

Within NPPF Technical Guidance on flood risk each flood zone has a list of appropriate land uses dependent on vulnerability to flooding.

9.2 Land use vulnerability – Phase 1

From the NPPF Technical Guidance, a "Less Vulnerable" land use could be appropriate to Flood Zone 3a (High Probability of flooding at higher than 1 in 100 annual probability) with the "More Vulnerable" use only permitted if the exception test is passed. For a "More Vulnerable" class, development on this site could be appropriate within Flood Zone 2 (Medium Probability of flooding at less than 1 in 100 but higher than 1 in 1,000 annual probability).

In applying the sequential test, reference is made to the following table (reproduced from Table 3 contained within NPPF).

Phase 1 is confined within Flood Zone 1, therefore is deem appropriate for more vulnerable development;

Table 9.1: Flood risk vulnerability and flood zone 'compatibility'

Flood Risk Vulnerability Classification		Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Flood Zone	Zone 1	Appropriate	Appropriate	Appropriate	Appropriate	Appropriate
	Zone 2	Appropriate	Appropriate	Exception Test Required	Appropriate	Appropriate
	Zone 3a	Exception Test Required	Appropriate	Should not be permitted	Exception Test Required	Appropriate
	Zone 3b functional floodplain	Exception Test Required	Appropriate	Should not be permitted	Should not be permitted	Should not be permitted

The proposed use as a residential development site can be classed as ‘More Vulnerable’ therefore is considered acceptable in terms of the sequential test.

The Sequential Test is required to assess flood risk and NPPF Technical Guidance recommends that the test be applied at all stages of the planning process to direct new development to areas with the lowest probability of flooding (Flood Zone 1).

According to NPPF, if there is no reasonably available site in Flood Zone 1, the flood vulnerability of the proposed development (see NPPF Technical Guidance Table 2) can be taken into account in locating development in Flood Zone 2 and then Flood Zone 3. Within each Flood Zone new development should be directed to sites at the lowest probability of flooding from all sources.

Due to the Phase 1 section of the development being located within Flood Zone 1, assessment under the Exception Test is not required.

.

10 CONCLUSIONS

This flood risk assessment complies with the National Planning Policy Framework (NPPF) and demonstrates that flood risk from all sources has been considered in the proposed development. It is also consist with the Local Planning Authority requirements with regard to flood risk. The site has also been outlined to be assessed through the Code for Sustainable Homes 2010, and has been assessed against the Sur 1 and Sur 2 criteria.

Phase 1 of the development site lies in an area designated by the Environment Agency as Flood Zone 1 indicating a low risk of flooding from fluvial and tidal sources

NPPF sets out a Sequential Test, which states that preference should be given to development located within Flood Zone 1; the location of these Phases in flood zone 1 therefore meets the requirements of the sequential test and the exception test is not required.

In summary Phase 1 of the development is in aid of the regeneration of East Manchester and in line with the Strategic Regeneration Framework for New East Manchester. The development will increase the housing stock in the area, provide local jobs during construction and increase the demand for local services. The development will not increase flood risk elsewhere as due to the location being classified as a Conurbation Critical Drainage Area. It is likely that surface water will discharge to the existing sewer network, subject to UU approval.

This flood risk assessment has concluded that:

- for Phase 1, there is a low flood risk to the site in the event of extreme fluvial flood events
- flood risk from surface water is considered low for Phase 1
- flood risk from other sources – groundwater, sewers, reservoirs and artificial sources – is demonstrated to be low
- the impact of the development on other forms of flooding is demonstrated to be low
- any increase in surface water runoff from the proposed development will be attenuated on site and discharged at pre-development rates to an agreed location (most likely the UU sewer network)
- overall, taking into account the above points, the development of Phase 1 should not be precluded on flood risk grounds.

The Code for Sustainable Homes assessment has concluded that:

- there is a net decrease in impermeable area from the pre development state to the post development state; therefore the development satisfies the mandatory elements of the Sur 1
- this flood risk assessment has shown that the development site lies in flood zone 1, indicating a low risk of fluvial and tidal flooding, and flood risk from other sources has also been demonstrated to be low. Therefore the development satisfies the

criteria of the Sur 2 and can be awarded 2 credits under the Code for Sustainable Homes.

11 References

1. Communities and Local Government “National Planning Policy Framework” NPPF, March 2012.
2. Communities and Local Government “Technical Guidance to the National Planning Policy Framework”, March 2012.
3. DEFRA “Interim Code of Practice for Sustainable Drainage Systems” National SUDS Working Group, July 2004.
4. BS 8533-2011 Assessing and managing flood risk in development Code of practice, November 2011.
5. AECOM “West Gorton Neighbourhood Regeneration Masterplan: Flood Risk Assessment” April 2011.
6. White Young Green, Bennet Street, Ardwick Flood Risk Assessment.
7. Manchester City, Salford City and Trafford Councils Level 2 Hybrid SFRA, Final March 2010.
8. WRC “Sewers for Adoption” 6th Edition, 2006.
9. Environment Agency “Annexes to the PFRA” May 2011.
10. BRE 365, Soakaway Design.
11. Infiltration drainage – Manual of good practice. C156.

APPENDIX A
RSK SERVICE CONSTRAINTS

1. This report is carried out in connection with the report (together the "Services") were compiled and carried out by RSK LDE Ltd (RSK) for Keepmoat Developments (the "client") in accordance with the terms of a contract between RSK and the "client". The Services were performed by RSK with the skill and care ordinarily exercised by a reasonable Civil Engineer at the time the Services were performed. Further, and in particular, the Services were performed by RSK taking into account the limits of the scope of works required by the client, the time scale involved and the resources, including financial and manpower resources, agreed between RSK and the client.

2. Other than that expressly contained in paragraph 1 above, RSK provides no other representation or warranty whether express or implied, in relation to the Services.

3. Unless otherwise agreed the Services were performed by RSK exclusively for the purposes of the client. RSK is not aware of any interest of or reliance by any party other than the client in or on the Services. Unless expressly provided in writing, RSK does not authorise, consent or condone any party other than the client relying upon the Services. Should this report or any part of this report, or otherwise details of the Services or any part of the Services be made known to any such party, and such party relies thereon that party does so wholly at its own and sole risk and RSK disclaims any liability to such parties. Any such party would be well advised to seek independent advice from a competent environmental consultant and/or lawyer.

4. It is RSK's understanding that this report is to be used for the purpose described in the introduction to the report. That purpose was a significant factor in determining the scope and level of the Services. Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances by the client without RSK's review and advice shall be at the client's sole and own risk. Should RSK be requested to review the report after the date hereof, RSK shall be entitled to additional payment at the then existing rates or such other terms as agreed between RSK and the client.

5. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should not be relied upon in the future without the written advice of RSK. In the absence of such written advice of RSK, reliance on the report in the future shall be at the client's own and sole risk. Should RSK be requested to review the report in the future, RSK shall be entitled to additional payment at the then existing rate or such other terms as may be agreed between RSK and the client.

6. The observations and conclusions described in this report are based solely upon the Services, which were provided pursuant to the agreement between the client and RSK. RSK has not performed any observations, investigations, studies or testing not specifically set out or required by the contract between the client and RSK. RSK is not liable for the existence of any condition, the discovery of which would require performance of services not otherwise contained in the Services. For the avoidance of doubt, unless otherwise expressly referred to in the introduction to this report, RSK did not seek to evaluate the presence on or off the site of asbestos, electromagnetic fields, lead paint, heavy metals, radon gas or other radioactive or hazardous materials.

7. The Services are based upon RSK's observations of existing physical conditions at the Site gained from a walk-over survey of the site together with RSK's interpretation of information including documentation, obtained from third parties and from the client on the history and usage of the site. The Services are also based on information and/or analysis provided by independent testing and information services or laboratories upon which RSK was reasonably entitled to rely. The Services clearly are limited by the accuracy of the information, including documentation, reviewed by RSK and the observations possible at the time of the walk-over survey. Further RSK was not authorised and did not attempt to independently verify the accuracy or completeness of information, documentation or materials received from the client or third parties, including laboratories and information services, during the performance of the Services. RSK is not liable for any inaccurate information or conclusions, the discovery of which inaccuracies required the doing of any act including the gathering of any information which was not reasonably available to RSK and including the doing of any independent investigation of the information provided to RSK save as otherwise provided in the terms of the contract between the client and RSK.

8. The phase II or intrusive environmental site investigation aspects of the Services is a limited sampling of the site at pre-determined borehole and soil vapour locations based on the operational configuration of the site. The conclusions given in this report are based on information gathered at the specific test locations and can only be extrapolated to an undefined limited area around those locations. The extent of the limited area depends on the soil and groundwater conditions, together with the position of any current structures and underground facilities and natural and other activities on site. In addition chemical analysis was carried out for a limited number of parameters [as stipulated in the contract between the client and RSK] [based on an understanding of the available operational and historical information,] and it should not be inferred that other chemical species are not present.

9. Any site drawing(s) provided in this report is (are) not meant to be an accurate base plan, but is (are) used to present the general relative locations of features on, and surrounding, the site.

APPENDIX B
ENVIRONMENT AGENCY FLOOD MAP

Alstead, Daniel

From: NW South, External Relations [NWSouthFolder@Environment-agency.gov.uk]
Sent: 10 April 2012 14:49
To: Alstead, Daniel
Subject: PRRWAR3484 - West Gorton, Manchester
Attachments: Node_locations.pdf; Levels.pdf; Product4.pdf; standard notice.doc

Our Ref: PRRWAR3484

Date: 10 April 2012

Dear Daniel,

PUBLIC REGISTER AND ENVIRONMENTAL INFORMATION REQUEST
West Gorton, Manchester.

Thank you for your email regarding the above site. Requests for recorded information are generally governed by the Freedom of Information Act 2000 (FOIA).The information you have requested is environmental and is therefore exempt from the provisions of FOIA by FOIA s.39(1). We have therefore considered your request under the Environmental Information Regulations 2004 (EIR). Please find our response below.

Please find attached Product 4.

the site specific Flood Risk Assessment (FRA) should refer to Manchester SFRA:
http://www.manchester.gov.uk/info/100006/environment_and_planning/4700/strategic_flood_risk_assessment_sfra

The site is located within the Conurbation Core Critical Drainage Area (CDA) and as such runoff rates should be reduced by 50% compared to existing rates for brownfield sites. Greenfield sites should be reduced to greenfield runoff rates. Any existing surface water drainage connections should be confirmed within the FRA not assumed.

Corn Brook is classed as an Ordinary Watercourse although it is also known as a well documented 'hidden watercourse' of Manchester. After a report was completed for the Agency it is believed that Corn Brook is culverted until discharging into the Manchester Ship Canal and not the River Irk (the River Irk is a Main River).

From the report a summary of 'Corn Brook Tributary (West Gorton)' is that although it is clear that this watercourse existed in 1848, no evidence has been found for its continuing existence apart from (possibly) some lengths of combined sewer, therefore it can be considered that this watercourse to be 'completely obliterated'.

Black Brook & Tributary

Black Brook also featured in the report for Hidden Watercourses of Manchester with a summary below:

The reach of Black Brook tributary north of Shefford Close is considered to have been 'completely obliterated' due to recent developments in the area. From Shefford Close to Gorton Road the tributary has been 'potentially replaced by Sewers.

According to sewer records Black Brook should be considered to be 'completely obliterated' north of Ashfield New Road and south of Gorton Lane as there is no record of it. However the MCC 1984 plan suggests that Black Brook exists southwards from Grey Mare Lane and is connected to Corn Brook. Therefore this length can be considered 'potentially replaced by sewers'.

Black Brook (Dry)

No evidence has been found that this still exists despite being clear in 1848 that it did exist. Therefore, this watercourse can be considered to be 'completely obliterated'. A comparison of map from different periods has also demonstrated that significant land use changes have occured in the area which suggest that an entirely new sewer network has replaced the natural channel shown on the 1848 map.

It may be worth checking with Untied Utilities or Manchester Council for any CCTV reports or further information.

There are also no flood defences withtin the location of the site in question.

Rights of appeal

We hope that our response has addressed all of the questions that you have asked. However, if you are not satisfied with our response to your request for information, you can contact us to ask for our decision to be reviewed. If you are still not satisfied following this, you can make an appeal to the Information Commissioner, who is the statutory regulator for Freedom of Information. Their contact details are: Office of the Information Commissioner, Wycliffe House, Water Lane, Wilmslow, Cheshire SK9 5AF .
Tel: 01625 545700. Fax: 01625 524 510
email: mail@ico.gsi.gov.uk.
Website: http//www.ico.gov.uk

Regards,



Kim Everson
Customer Service Officer
Richard Fairclough House,
Knutsford Road,
Warrington
WA4 1HT

Phone: 01925 542915

kim.everson@environment-agency.gov.uk

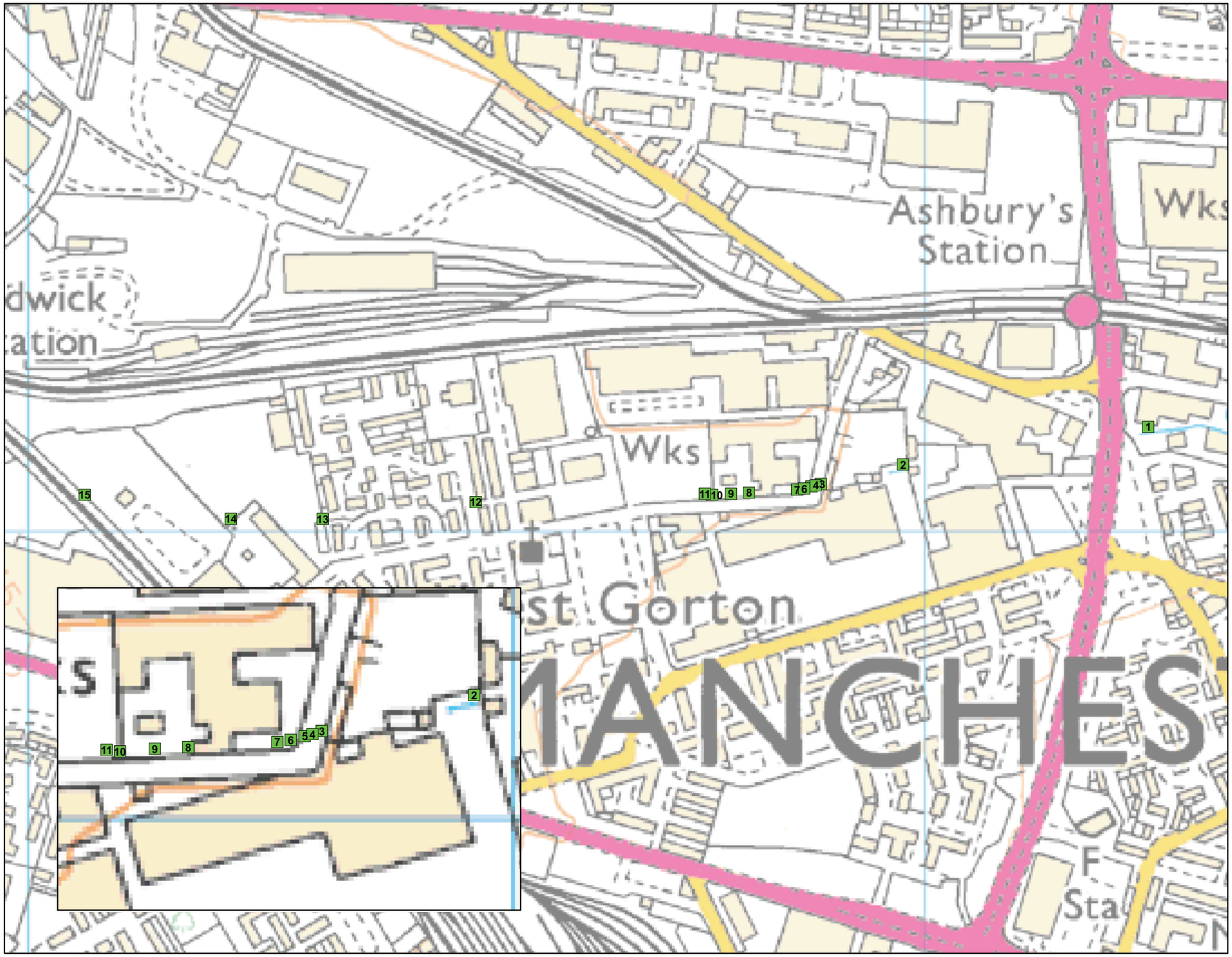
You can contact me on my direct dial or if you have a general query please ring our customer contact team on 03708 506 506 or visit the website at www.environment-agency.gov.uk

Information in this message may be confidential and may be legally privileged. If you have received this message by mistake, please notify the sender immediately, delete it and do not copy it to anyone else.

We have checked this email and its attachments for viruses. But you should still check any attachment before opening it.
We may have to make this message and any reply to it public if asked to under the Freedom of Information Act, Data Protection Act or for litigation. Email messages and attachments sent to or from any Environment Agency address may also be accessed by someone other than the sender or recipient, for business purposes.

If we have sent you information and you wish to use it please read our terms and conditions which you can get by calling us on 08708 506 506. Find out more about the Environment Agency at www.environment-agency.gov.uk

Node map centred on West Gorton, Manchester. Created on 27th March 2012 [Ref. PRRWAR3484]



Environment Agency

Scale 1:10,000

N

Legend

- Nodes

© Environment Agency copyright and / or database rights 2011. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100026380, 2012.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

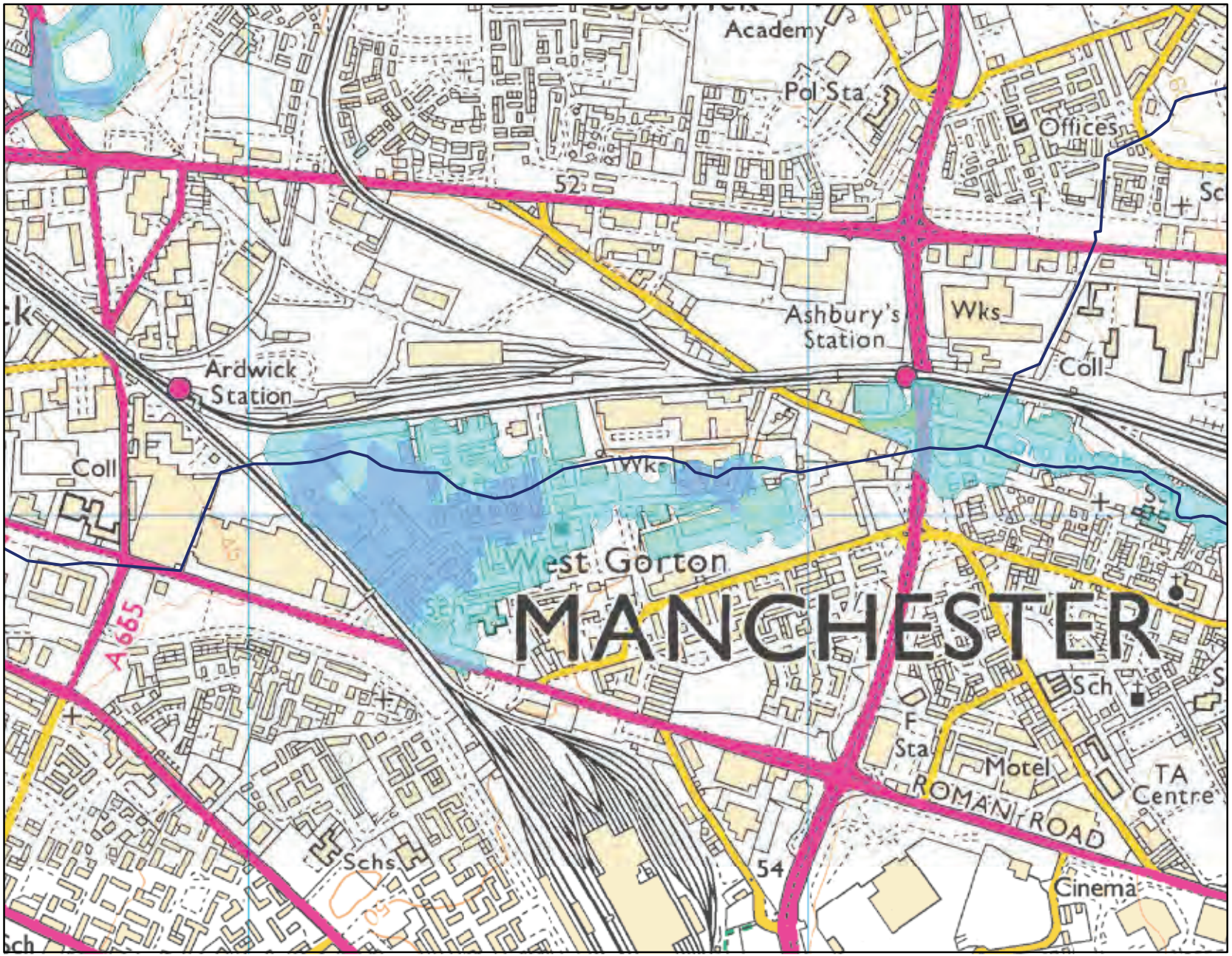
					ea013_0027_U									
Map Reference	Model Node Reference	Easting	Northing	Data	50 % AEP	4 % AEP (1 in 25 year)	20 % AEP (1 in 5 year)	2 % AEP (1 in 50 year)	10 % AEP (1 in 10 year)	1.33 % AEP (1 in 75 year)	1 % AEP (1 in 100 year) + Climate Change*	1 % AEP (1 in 100 year)	0.5 % AEP (1 in 200 year)	0.1 % AEP (1 in 1000 year)
1	ea013_Model_CORN02_00065	387252	397116	Modelled Water Level (m aod)	49.04	49.34	49.14	49.57	49.22	50.21	51.5	50.62	51.5	53.18
				Modelled Flow (cumecs)	2.72	4.87	3.38	5.73	3.96	6.45	8.13	6.92	7.89	11.39
2	ea013_Model_CORN02_00059	386978	397074	Modelled Water Level (m aod)	47.62	48.09	47.71	49.03	47.8	49.72	50.67	50.03	50.73	51.68
				Modelled Flow (cumecs)	2.72	4.88	3.38	5.96	3.96	6.88	8.13	6.97	7.88	11.39
3	ea013_Model_CORN02_00058	386868	397047	Modelled Water Level (m aod)	47.13	47.89	47.26	48.75	47.39	49.36	50.35	49.69	50.43	51.14
				Modelled Flow (cumecs)	3.06	6.49	3.95	7.77	4.83	8.04	8.48	8.09	8.55	11.32
4	ea013_Model_CORN02_00057	386881	397051	Modelled Water Level (m aod)	47.29	47.98	47.42	48.89	47.55	49.52	50.43	49.82	50.52	51.27
				Modelled Flow (cumecs)	3.02	5.54	3.76	6.74	4.44	7.57	7.43	7.57	7.36	7.55
5	ea013_Model_CORN02_00056	386876	397049	Modelled Water Level (m aod)	47.29	47.97	47.42	48.86	47.54	49.48	50.43	49.8	50.51	51.26
				Modelled Flow (cumecs)	3.06	6.5	3.95	7.77	4.83	8.03	8.04	8.07	8.04	8.82
6	ea013_Model_CORN02_00055	386806	397043	Modelled Water Level (m aod)	46.97	47.78	47.11	48.5	47.24	49.04	50.02	49.38	50.11	50.52
				Modelled Flow (cumecs)	3.05	6.46	3.95	7.77	4.83	8.35	9.67	8.75	9.82	10.34
7	ea013_Model_CORN02_00054	386860	397046	Modelled Water Level (m aod)	47.1	47.87	47.24	48.7	47.36	49.29	50.29	49.63	50.38	51.04
				Modelled Flow (cumecs)	3.06	6.48	3.95	7.77	4.83	8.53	9.92	8.96	10	13.8
8	ea013_Model_CORN02_00053	386886	397052	Modelled Water Level (m aod)	47.3	47.99	47.44	48.93	47.56	49.58	50.45	49.86	50.53	51.28
				Modelled Flow (cumecs)	3.02	5.48	3.76	6.68	4.4	7.51	7.96	7.52	7.8	8.55
9	ea013_Model_CORN02_00052	386786	397042	Modelled Water Level (m aod)	46.75	47.59	46.89	48.23	47.01	48.64	49.54	48.94	49.62	50.05
				Modelled Flow (cumecs)	3.05	6.45	3.95	7.77	4.83	8.35	9.67	8.75	9.82	10.34
10	ea013_Model_CORN02_00051	386757	397041	Modelled Water Level (m aod)	46.6	47.44	46.73	47.97	46.87	48.26	49.02	48.48	49.09	49.54
				Modelled Flow (cumecs)	3.08	6.5	3.99	7.82	4.9	8.4	9.72	8.79	9.86	10.46
11	ea013_Model_CORN02_00050	386765	397040	Modelled Water Level (m aod)	46.7	47.55	46.83	48.15	46.96	48.54	49.42	48.83	49.5	49.93
				Modelled Flow (cumecs)	3.08	6.5	3.99	7.82	4.9	8.4	9.72	8.79	9.86	10.46
12	ea013_Model_CORN02_00049	386501	397032	Modelled Water Level (m aod)	44.44	46.42	44.75	46.6	45.24	46.66	46.8	46.69	46.82	47.17
				Modelled Flow (cumecs)	3.11	6.12	4.02	6.33	4.86	6.5	6.51	6.55	6.51	6.18
13	ea013_Model_CORN02_00048	386227	397013	Modelled Water Level (m aod)	43.98	45.18	44.09	45.54	44.26	45.78	46.25	45.96	46.34	47.32
				Modelled Flow (cumecs)	0.73	1.57	1.01	1.92	1.25	2.2	2.71	2.39	2.88	3.88
14	ea013_Model_CORN02_00047	386064	397040	Modelled Water Level (m aod)	43.6	45.06	43.87	45.33	44.13	45.47	45.73	45.57	45.76	46.36
				Modelled Flow (cumecs)	4.36	7.99	5.67	8.17	6.88	8.25	8.29	8.29	8.3	8.12
15	ea013_Model_CORN02_00046	386330	397013	Modelled Water Level (m aod)	44.18	45.85	44.49	45.99	44.9	46.05	46.28	46.08	46.3	46.98
				Modelled Flow (cumecs)	3.62	6.6	4.64	6.65	5.59	6.63	6.86	6.68	6.87	7.63

Levels taken from River Medlock and Corn Brook 2008/9 Flood Risk Mapping commission

Notes:

AEP - Annual Exceedence Probability
m aod - metres above ordnance datum
cumecs - cubic metres per second
*Climate Change Scenario - 20% increase in flow

Detailed map centred on West Gorton, Manchester. Created on 27th March 2012 [Ref. PRRWAR3484]



Environment Agency

Scale 1:10,000

N

Legend

- Flood Zone 3
- Flood Zone 2
- Corn Brook (taken from Trunk Sewer maps)

© Environment Agency copyright and / or database rights 2011. All rights reserved. © Crown Copyright and database right. All rights reserved. Environment Agency, 100026380, 2012.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 08708 506 506 (Mon-Fri 8-6). E mail: enquiries@ environment-agency.gov.uk

CStandard Notice *[not for use with Special Data, Personal Data or unlicensed 3rd party rights]*

Information warning

We (The Environment Agency) do not promise that the Information supplied to You will always be accurate, free from viruses and other malicious or damaging code (if electronic), complete or up to date or that the Information will provide any particular facilities or functions or be suitable for any particular purpose. You must ensure that the Information meets your needs and are entirely responsible for the consequences of using the Information. Please also note any specific information warning or guidance supplied to you.

Permitted use

- The Information is protected by intellectual property rights and whilst you have certain statutory rights which include the right to read the Information, you are granted no additional use rights whatsoever unless you agree to the licence set out below.
- Commercial use is subject to payment of a £50 licence fee (+VAT) for each person seeking the benefit of the licence, except for use as an Environment Agency contractor or for approved media use.
- To activate this licence you do not need to contact us (unless you need to pay us a Commercial licence fee) but if you make any use in excess of your statutory rights you are deemed to accept the terms below.

Licence

We grant you a worldwide, royalty-free, perpetual, non-exclusive licence to use the Information subject to the conditions below.

You are free to:

- copy, publish, distribute and transmit the Information
- adapt the Information
- exploit the Information commercially, for example, by combining it with other Information, or by including it in your own product or application

You must (where you do any of the above):

- acknowledge the source of the Information by including the following attribution statement:
  "Contains Environment Agency information © Environment Agency and database right"
- ensure that you do not use the Information in a way that suggests any official status or that We endorse you or your use of the Information
- ensure that you do not mislead others or misrepresent the Information or its source or use the Information in a way that is detrimental to the environment, including the risk of reduced future enhancement
- ensure that your use of the Information does not breach the Data Protection Act 1998 or the Privacy and Electronic Communications (EC Directive) Regulations 2003

These are important conditions and if you fail to comply with them the rights granted to you under this licence, or any similar licence granted by us will end automatically.

No warranty

The Information is licensed 'as is' and We exclude all representations, warranties, obligations and liabilities in relation to the Information to the maximum extent permitted by law. We are not liable for any errors or omissions in the Information and shall not be liable for any loss, injury or damage of any kind caused by its use. We do not guarantee the continued supply of the Information.

Governing Law

This licence is governed by the laws of England and Wales.

Definitions

"Information" means the information that is protected by copyright or by database right (for example, literary and artistic works, content, data and source code) offered for use under the terms of this licence.

"Commercial" means:

- offering a product or service containing the Information, or any adaptation of it, for a charge, or
- Internal Use for any purpose, or offering a product or service based on the Information for indirect commercial advantage, by an organisation that is primarily engaged in trade, commerce or a profession.

APPENDIX C
PROPOSED DEVELOPMENT LAYOUT