

**PROPOSED RESIDENTIAL DEVELOPMENT
MANOR NURSERY
ANGMERING
WEST SUSSEX
BN16 4AW**

FLOOD RISK STATEMENT & DEVELOPMENT DRAINAGE STRATEGY

HANBURY PROPERTIES LTD



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Figure 1&2 - Site Location

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Figure 3 - Development Site Boundary

Imagery © 2013 Digital Globe, Getmapping plc, Infoterra Ltd & Bluesky, Map data ©2013 Google

Figure 4 - Extract from Environment Agency Flood Zone Map

Contains Environment Agency information © Environment Agency 2013

REFERENCES:

Environment Agency Flood Map Information © and database right www.environment_agency.gov.uk

Technical Guidance to the National Planning Policy Framework - NPPF (2012)

Department for Communities and Local Government ISBN: 978-1-4098-3410-6

Contains British Geological Survey materials © NERC (2014)

CIRIA Report 624: Development and Flood Risk - Guidance for the Construction Industry

Building Research Establishment (BRE) Digest 365 – Soakaway Design - www.bre.co.uk

1 Executive Summary

- Hanbury Properties Ltd is proposing to develop a 1.11ha parcel of land associated with the former Manor Nurseries off High Street on the eastern outskirts of the village of Angmering, West Sussex.
Development proposals include the demolition of the existing Manor Nursery and all associated out-buildings and the construction of 32No. residential dwellings with associated access roads, onsite parking and areas of public open space.
- The proposed foul and surface water drainage strategy for this development has been designed to offer a safe and robust system which will not only afford complete flood risk protection to this site, but will ensure that the development of this land will not increase the existing level of flood risk to the surrounding properties within Angmering.
- The Environment Agency's Flood Zone Map shows the proposed development site to be entirely located within the lowest risk flood zone category - Flood Zone 1.
This is an area of land which has less than a 1 in 1000 (<0.1%) annual probability of flooding from watercourses, rivers or the sea.
- Following a review of the site geology and potential soil permeability, infiltration as a method of surface water disposal from the proposed development will be feasible.
- It is proposed that all surface water runoff from impermeable areas is discharged to the ground via infiltration.
Infiltration is a sustainable drainage method (SuDS) that enables storm water to be dealt with at source rather than discharging into an offsite sewer network or watercourse. This method of disposal improves the quality of the storm water runoff, whilst maintaining the existing natural drainage regime, maintaining the greenfield rates of runoff and volumes. Infiltration is also an important process of maintaining groundwater recharge.
- The SuDS proposed for this development will be in the form of permeable block paving for the adoptable highways (subject to technical approval) and cellular or stone filled soakaways for private parking areas and roof runoff.
All SuDS will be sized to manage the runoff from the exceptional 1 in 100 storm event (1% chance of occurrence each year) plus an additional 30% allowance for predicted future climate change effects, in accordance with EA recommendations up to the year 2115.
- This strategy will ensure that the peak runoff rate leaving the site post development will be no greater than the site in its existing 'greenfield' state, by utilising the natural method of infiltration.
- Records supplied by Southern Water indicate an existing DN150 public foul sewer is located within the access road off High Street, approximately 65m beyond the north western corner of the site.

The predicted peak foul sewer discharge from the site to the existing foul sewer based on the Sewers for Adoption figure (4000 l/dwelling/day) for 32No.units will be 1.5 l/s. Southern Water has confirmed that there is sufficient capacity with this network to receive the predicted foul flows from the proposed 32No. units.



- The foul water discharge from each property will drain via gravity through the private house drainage before out falling to a new private sewer system within the development road network.

A section of offsite sewer will discharge into the existing Southern Water public foul sewer within via the existing manhole Ref: 5301. (Refer to MJA drawing 4963:P70).

The development foul drainage network will be offered to Southern Water for adoption under a Section 104 agreement of the Water Industry Act 1991.

- The proposed foul and surface water drainage strategy for the development offers a sustainable, safe and robust system which will afford complete flood risk protection to:
 - New residents of properties within the proposed development boundary.
 - Residents of properties upstream and downstream of the outfall watercourse.
 - Residents of existing properties within Angmering.

2 Introduction

2.1 Scope

MJA Consulting have been instructed by Hanbury Properties Ltd to undertake a Flood Risk Assessment and Development Drainage Strategy to determine the potential flood risks associated with the site and to provide a suitable strategy for the disposal of surface and foul water from the proposed residential development.

2.2

Hanbury Properties Ltd is proposing to develop a 1.11ha parcel of land associated with the former Manor Nurseries off High Street on the eastern outskirts of the village of Angmering, West Sussex.

Development proposals include the demolition of the existing Manor Nursery and all associated out-buildings and the construction of 32No. residential dwellings with associated access roads, onsite parking and areas of public open space.

2.3 Report Structure

The National Planning Policy Framework - *Department for Communities and Local Government (2012)* is the current guidance on development and flood risk in England and Wales.

This guidance replaces but retains key elements of Planning Policy Statement 25: Development and Flood Risk.

The Flood Risk technical guidance for the National Planning Policy Framework requires a Flood Risk Assessment to be carried out to consider all potential forms of flooding including that from river, sea, estuarial, land drainage, groundwater, overland flow, surface water run-off, sewer systems, and artificial water bodies (lakes, reservoirs, canals etc.).

A Flood Risk Assessment is required to consider the impact of all these potential forms of flooding on both the development site and off site parties and land.

2.4

This report will take the structure of a 'Flood Risk Statement' in accordance with the Environment Agency's Flood Risk Assessment Guidance, the National Planning Policy Framework and CIRIA Report 624 'Development and Flood Risk – Guidance for the Construction Industry.

2.5

The purposes of this report are:

- To confirm that the proposed development will not be subject to flood risk or increase the population within a floodplain.
- To confirm that a satisfactory strategy for the disposal of surface and foul water from the proposed development is achievable.
- To confirm that this development will not increase the risk of flooding to any offsite parties and land.

3 Existing Site

3.1 Site Location and Description

The site is located off High Street on the eastern outskirts of the village of Angmering, West Sussex and is home to the former Manor Nursery garden centre.

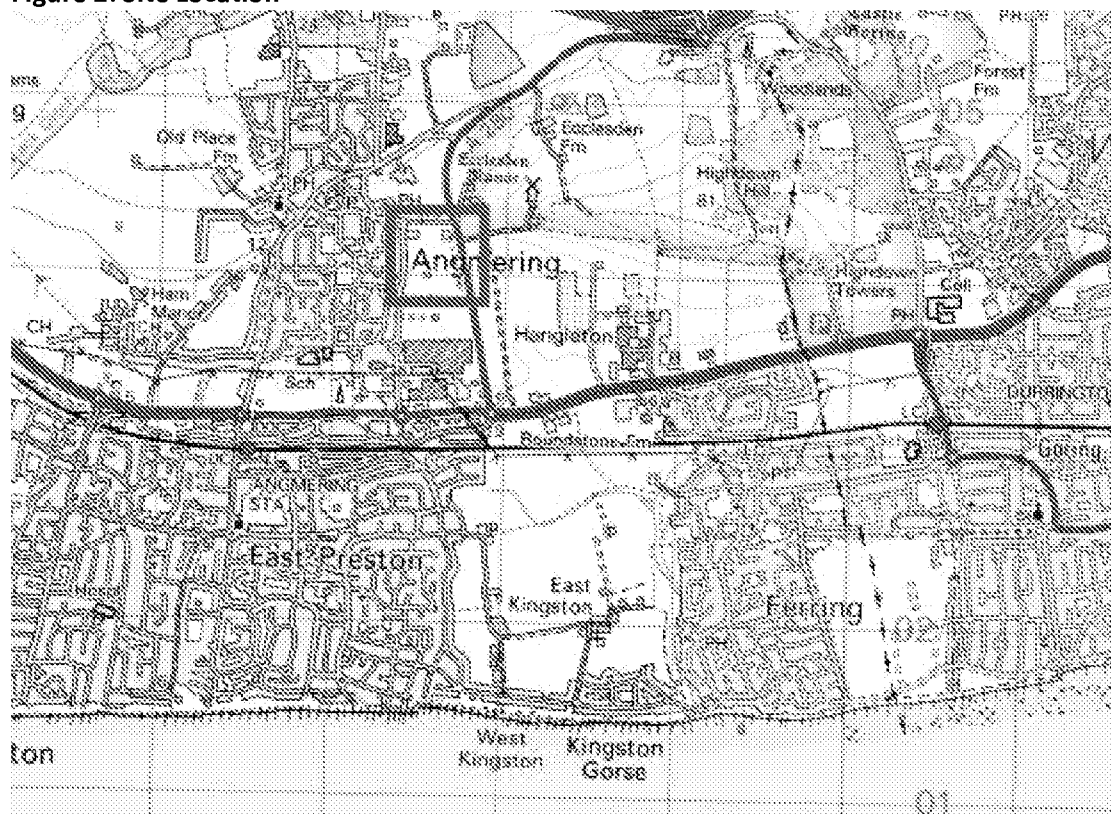
- 3.2 The 1.11ha site comprises of gravel dressed rough car parking, areas of outside plating and ancillary storage together with a number of single storey retail buildings, a restaurant and a number of glass houses associated with the commercial garden centre.

Figure 1: Site Location



©2014 Microsoft Corporation Image courtesy of Ordnance Survey

Figure 2: Site Location



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Figure 3: Development Site Boundary



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3.3 Topography

The topography of the existing site falls northwest to south east, with ground levels ranging from 17.00mAOD to 15.00mAOD (metres above Ordnance Datum).

3.4 Geology

The British Geological Survey 1:50 000 scale - Solids and Drift Deposits geological map indicates the site geology as:

Superficial Deposits: River Terrace Deposits (undifferentiated) – GRAVEL, SAND, SILT & CLAY

Bedrock: Seaford Chalk Formation (Upper Chalk) - CHALK

3.5 Soil Permeability

A suitable level of infiltration should be achievable within the highly permeable gravel/sand and chalk soils underlying the site.

Soakage testing in accordance with BRE Digest 365 will be carried out to ascertain accurate soil infiltration rates across the site.

3.6 Ground Contamination

The former use of the site would suggest the potential for ground contamination is low.

Further testing will be carried out during the intrusive ground investigation to ascertain any sources of contamination.

3.7 Hydrogeology

The Environment Agency's mapping website (www.maps.environmentagency.gov.uk) has classified the site as not located within a groundwater source protection zone for groundwater abstractions.

3.8 The underlying superficial deposits are classified by the Environment Agency as being a 'Secondary A - Aquifer'.

These are permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.

The underlying bedrock of the Seaford Chalk formation is classified by the Environment Agency as being a 'Principal Aquifer'.

These are layers of rock or drift deposits that have high intergranular and/or fracture permeability, providing a high level of water storage which may support water supply and/or river base flow on a strategic scale.

3.9 Groundwater

Historic borehole data supplied by the British Geological Society (BGS) for Angmering suggest that groundwater should not be present at shallow depths at the site.

No evidence or incidents of groundwater emergence or flooding has been recorded at the site.

Further monitoring will be required to determine the depth of groundwater across the site.

3.10 Catchment Information

The nearest watercourses to the development are approximately 500m north of the site, a tributary of the Black Ditch stream and 1.3km south of the site, a tributary of the Ferring Rife stream.



3.11 The Black Ditch stream flows west to its confluence with the River Arun 7km west of the site, before outfalling into the English Channel at Littlehampton.
The Ferring Rife flows south to its outfall into the English Channel at Kingston Gorse, 2.5km south of the site.

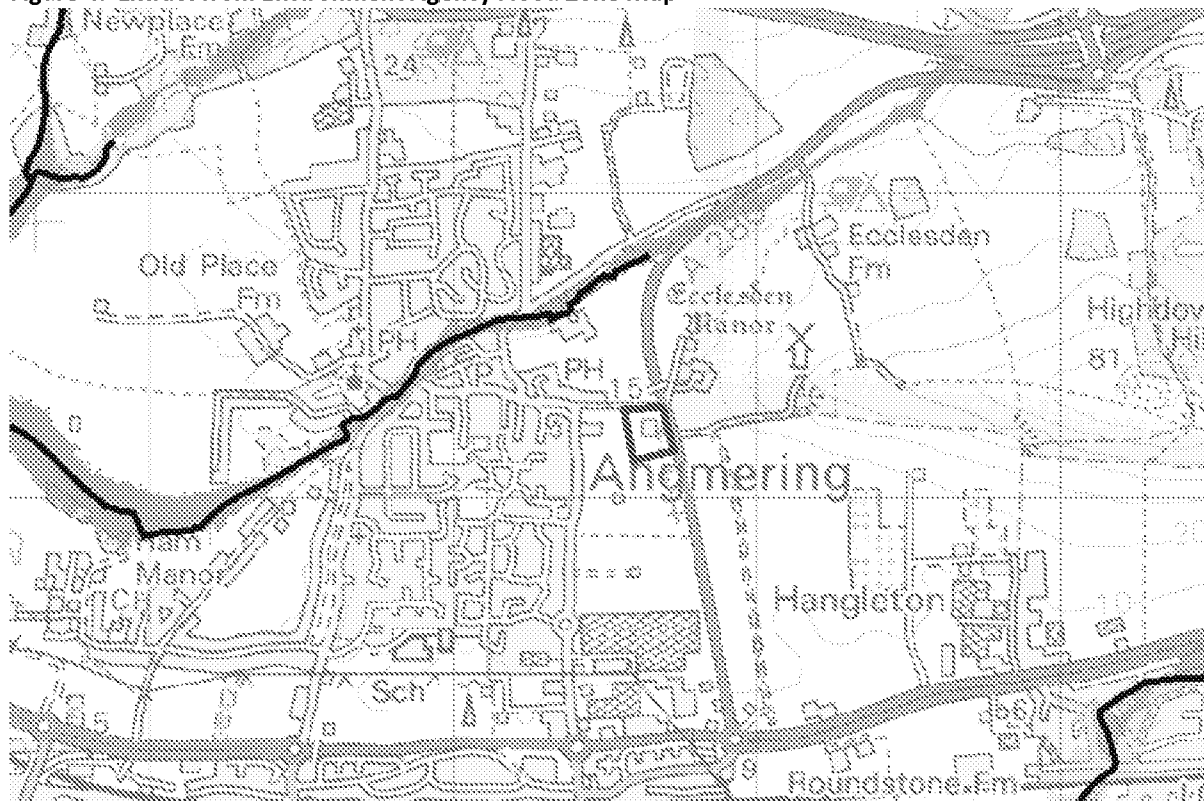
3.12 Artificial Sources

There are no reservoirs, canals or large waterbodies within a 1km radius of the site that would have an influence on flood risk to the development.

4 Flood Risk Assessment

4.1 Flood Zone Map

Figure 4: Extract from Environment Agency Flood Zone Map



Contains Environment Agency information © Environment Agency 2014

Key:

 Main Rivers

Dark Blue : (Flood Zone 3)

Shows the area that could be affected by flooding, either from rivers or the sea, if there were no flood defences. This area could be flooded: from the sea by a flood that has a 0.5 per cent (1 in 200) or greater chance of happening each year, or from a river by a flood that has a 1 per cent (1 in 100) or greater chance of happening each year.

Light Blue : (Flood Zone 2)

Shows the additional extent of an extreme flood from rivers or the sea.

These outlying areas are likely to be affected by a major flood, with up to a 0.1 per cent (1 in 1000) chance of occurring each year.

These two colours show the extent of the natural floodplain if there were no flood defences or certain other manmade structures and channel improvements.

Clear : (Flood Zone 1)

Shows the area where flooding from rivers and the sea is very unlikely.

There is less than a 0.1 per cent (1 in 1000) chance of flooding occurring each year.

- 4.2 The Environment Agency's indicative Flood Map shows the site to be located within the lowest risk category - Flood Zone 1.
This is land assessed as having a less than 1 in 1000 (<0.1%) annual probability of flooding from a river or stream in any year by the Environment Agency and is not within an area subject to either flooding or extreme flooding events.

- 4.3 The flood risk technical Guidance to the National Planning Policy Framework Table 2: Flood Risk Vulnerability classification, classifies residential developments as 'More Vulnerable'.

NPPF Table 2 of technical Guidance: Flood Risk Vulnerability classification

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 waste ⁶ .
•	Sites used for holiday or short-let caravans and camping, <i>subject to a specific warning and evacuation plan.</i> ⁷

- 4.4 Table 2 & 3 would indicate that 'more vulnerable' developments located within Flood Zone 1 are considered appropriate under the National Planning Policy Framework.

NPPF Table 3: Flood Risk Vulnerability and Flood Zone 'compatibility'

Flood risk vulnerability classification (see table 2)		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood zone (see 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.

4.5 Sequential Test

The National Planning Policy Framework Guidance states that Planning Authorities should complete a risk based 'Sequential Test' at all stages of the planning process, to steer new development to areas with the lowest probability of flooding.

Under the requirements of the 'sequential test' and as the proposed development is already located within flood zone 1 (lowest risk), there are no more suitable, developable and deliverable alternative sites, better located from a flood risk perspective, which would accommodate the proposed development.

5 Surface Water Drainage Strategy

- 5.1 The National Planning Policy Framework (NPPF) requires that developments do not exacerbate flood risks both to the development site and to offsite parties and land, which means there is a need to control surface water drainage and overland runoff to ensure there are no increases in peak runoff rates and volume as a result of the development.
- 5.2 Environment Agency guidance and government legislation such as the Flood and Water Management Act (Defra 2010) requires surface water drainage strategies for new developments to be in accordance with the ideals of ‘sustainable development’ via the provision of Sustainable Drainage Systems (SuDS).
- 5.3 SuDS are more sustainable than conventional drainage methods because they can mitigate many of the adverse effects of urban stormwater runoff on the environment. This can be achieved through reducing runoff rates and volumes to sewer networks and watercourses, reducing the risk of downstream flooding. Where appropriate SuDS can reduce pollutant concentrations in stormwater, protecting the quality of the receiving water body.
- 5.4 The Building Regulations Document H (2002) details a hierarchy of potential methods for disposing of surface water from a site:
- An adequate soakaway or some other adequate infiltration system, or where that is not practicable,
 - A watercourse, or where that is not practicable,
 - A sewer.
- 5.5 Following a review of the site geology and potential soil permeability, infiltration as a method of surface water disposal from the proposed development will be feasible (subject to further infiltration and groundwater testing.)
- 5.6 It is proposed that all surface water runoff from impermeable areas is discharged to the ground via infiltration. This will be in the form of permeable block paving and cellular soakaways. All SuDS will be sized to manage the runoff from the exceptional 1 in 100 storm event (1% chance of occurrence each year) plus an additional 30% allowance for predicted future climate change effects, in accordance with EA recommendations up to the year 2115.
- 5.7 Infiltration is a SuDS technique that enables storm water to be dealt with at source rather than discharging into an offsite sewer network or watercourse. This method of disposal improves the quality of the storm water runoff, whilst maintaining the existing natural drainage regime, maintaining the greenfield rates of runoff and volumes. Infiltration is also an important process of maintaining groundwater recharge.
- 5.8 This strategy will ensure that the peak runoff rate leaving the site post development will be no greater than the site in its existing ‘greenfield’ state, by utilising the natural method of infiltration.

5.9 Drainage Strategy

The surface water drainage strategy for the proposed development will utilise the following options:

5.10 Roof Runoff

Roof runoff will be collected by a conventional system of guttering and downpipes where it will be discharged via cellular or stone filled soakaways located within rear gardens. Water Butts are to be provided per plot where feasible on a rainwater downpipe to collect roof runoff for grey water re-use.

5.11 Private Driveways & Parking courts

Private Driveways & Parking courts are to be macadam surfacing laid to fall towards a linear drainage channel conveying flow to a permeable sub base, cellular or stone filled soakaways depending on final design.

5.12 Access Roads

The main adoptable roads are to permeable block paved (subject to technical approval). The stone sub base of the permeable paving system will be laid to fall to a central trench conduit within the highway to enable runoff to penetrate through to the highly permeable chalk strata, providing maximum percolation.

Alternatively should the road be a macadam finish with a standard gully & piped storm network an outfall soakaway will be located within the Open Space Area.

5.13 Pollution mitigation

The permeable block paving system consists of block pavers that allow runoff to flow between the joints laid upon a stone sub-base, the base of which is lined with a permeable membrane to allow infiltration in the underlying soils whilst capturing hydrocarbon pollutants.

All chambers prior to soakaways will be catchpit manholes, offering a level of sediment capture.

As the site lies outside a groundwater protection zone, additional management of pollutants associated with the proposed development will not be required.

5.14 SuDS Management and Maintenance

Soakaways that serve an individual plot will be owned and maintained by the property owner.

Any soakaways that serve two or more properties will be adopted by a management company who will be entrusted with a robust inspection and maintenance programme to ensure the optimum operation of the surface water drainage network is continually maintained.

The permeable paving will be offered for adoption to West Sussex Highways who will carry out inspection and maintenance on the access roads.

6 Foul water drainage strategy

- 6.1 Records supplied by Southern Water indicate an existing DN150 public foul sewer is located within the access road off High Street , approximately 65m beyond the north western corner of the site.
- 6.2 The predicted peak foul sewer discharge from the site to the existing foul sewer based on the Sewers for Adoption figure (4000 l/dwelling/day) for 32No.units will be 1.5 l/s. Southern Water has confirmed that there is sufficient capacity with this network to receive the predicted foul flows from the proposed 32No. units.
- 6.3 The foul water discharge from each property will drain via gravity through the private house drainage before out falling to a new private sewer system within the development road network.
A section of offsite sewer will discharge into the existing Southern Water public foul sewer within via the existing manhole Ref: 5301. (Refer to MJA drawing 4963:P70).
The development foul drainage network will be offered to Southern Water for adoption under a Section 104 agreement of the Water Industry Act 1991.



APPENDIX A

FOUL & SURFACE DRAINAGE STRATEGY LAYOUT



Development foul water drainage system to connect to Southern Water foul sewer at existing manhole ref:5301

Typical surface water drainage layout

Proposed surface water soakaway designed to store up to the 1:100+30% storm event. Polypropylene units Hydro International 'Stormbloc' or similar approved. To include integral inspection chambers / maintenance channel running the length of the structure at the base of the tank. Size TBC following infiltration rate testing. Located a minimum of 5m from buildings.

Permeable Block Paving upon AC20 dence/HCM/HMB sub running coarse with core drilled holes upon permeable sub-base (sized 4-20mm OGCR stone) minimum 350mm thick

Private Drives/Parking Court Macadam surfacing to parking bays laid to fall towards linear drainage channel

Water butt with draw off tap to be provided per plot where feasible

Adoptable Highway Permeable Block Paving upon AC20 dence/HCM/HMB sub running coarse with core drilled holes upon permeable sub-base (sized 4-20mm OGCR stone) depth TBC, laid to fall towards central 600mm wide stone trench. Trench to extend into the chalk layer (depth TBC) below ground level.

Typical foul water drainage layout

TYPICAL SECTION THROUGH PERMEABLE BLOCK PAVED AREAS
NOT TO SCALE

Construction Notes:

1. Do not scale from this drawing.
2. All dimensions in metres unless noted otherwise.
3. All levels relate to ordnance datum.
4. This drawing is based on the latest Architectural planning layout and shall be read in conjunction with all other relevant longitudinal sections and construction drawings.
5. Any discrepancies with any of the drawings shall be reported to an MJA Consulting Engineer.
6. The level and location of all existing services shall be verified on site by the Contractor before commencing any construction work.
7. Contractor must comply with all current legislation relating to CDM, Health and Safety and COSHH.
8. Manholes, sewers, headwalls and other structures intended to convey surface water or sewerage are to be constructed in accordance with the Water Authorities Association specification Sewers for Adoption and to any Southern Water specification and addendum.
9. All foul and storm water drains which are not to be adopted as public sewers under a section 104 agreement shall be constructed using uPVC pipes or similar approved, bedded and backfilled in accordance with the manufacturers instructions and to the Building Regulations Part H, BS EN 752 & B.R.E. SD1.
10. Sewers and drains of different diameters should be laid soffit to soffit.
11. All gully connections to be 150 dia. uPVC ultrarib or similar.
12. All gully connections other than at manholes to be "Y" junctions.
13. All soakaways to be positioned a minimum of 5.0m from buildings.
14. All finished floor levels are shown on the drawing for guidance only and may need to be adjusted on site. However there is to be no deviation without prior approval.

Key:

Existing Foul Sewer

Sewer to be abandoned

Proposed Foul Water Sewer

Proposed Surface Water Sewer

Linear Drainage Channel

Road Gully (deep trapped)

Permeable Block Paving (with permeable sub-base)

Macadam surfacing

Surface Water Soakaway

Fall direction arrow

All existing foul and surface water infrastructure to be abandoned and removed

PRELIMINARY FOR PLANNING ONLY

REV. No.	DATE	DESCRIPTION	INITIALS
Client			
HANBURY PROPERTIES		MJA CONSULTING CIVIL AND STRUCTURAL ENGINEERS Monarch House, Barton Lane, Abingdon, Oxon, OX14 3NB Tel: 01235 555173 Fax: 01235 523226	
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