

wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT



PENTLAND HOMES AND JARVIS HOMES

KINGSNORTH GREEN

SURFACE WATER DRAINAGE ASSESSMENT

AUGUST 2015

your earth our world



Wardell Armstrong

Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom
Telephone: +44 (0)845 111 7777 Facsimile: +44 (0)845 111 8888 www.wardell-armstrong.com



DATE ISSUED: August 2015

JOB NUMBER: ST13901

REPORT NUMBER: 006

PENTLAND HOMES AND JARVIS HOMES

KINGSNORTH GREEN

SURFACE WATER DRAINAGE ASSESSMENT

AUGUST 2015

This report has been prepared by Wardell Armstrong LLP with all reasonable skill, care and diligence, within the terms of the Contract with the Client. The report is confidential to the Client and Wardell Armstrong LLP accepts no responsibility of whatever nature to third parties to whom this report may be made known.

No part of this document may be reproduced without the prior written approval of Wardell Armstrong LLP.

**Wardell Armstrong**

Sir Henry Doulton House, Forge Lane, Etruria, Stoke-on-Trent, ST1 5BD, United Kingdom
Telephone: +44 (0)845 111 7777 Facsimile: +44 (0)845 111 8888 www.wardell-armstrong.com

ENERGY AND CLIMATE CHANGE
ENVIRONMENT AND SUSTAINABILITY
INFRASTRUCTURE AND UTILITIES
LAND AND PROPERTY
MINING AND MINERAL PROCESSING
MINERAL ESTATES
WASTE RESOURCE MANAGEMENT

CONTENTS

1	Introduction	1
1.1	General	1
2	Background Information	1
2.1	General	1
2.2	Climate Change	1
2.3	Existing Surface Water Runoff Rates	2
2.4	Drainage Rationale	3
3	Outline Sustainable Drainage Strategy (see Drawing No. ST13901-014)	4
3.1	General	4
3.2	Residential Areas	5
3.3	Community Retail Areas	5
3.4	Primary Road Links	5
3.5	Outfall Arrangements	6
4	Summary	7

APPENDICES

Appendix 1 Attenuation Estimates

DRAWINGS

ST13901-014 Indicative Surface Water Management Plan

1 INTRODUCTION

1.1 General

- 1.1.1 Wardell Armstrong LLP has been commissioned to undertake a Surface Water Drainage Assessment, on behalf of Pentland Homes and Jarvis Homes, relating to the proposed development of land at Kingsnorth, Ashford, Kent.
- 1.1.2 This report provides indicative details the proposed surface water drainage strategy required by the Local Planning Authority in support of the outline planning application for this development.

2 BACKGROUND INFORMATION

2.1 General

- 2.1.1 New development often poses a risk of flooding to neighbouring properties and areas downstream of the site, often as a result of an increase in impermeable area which has the effect of increasing the rate and volume of surface water runoff.
- 2.1.2 The predicted effects of climate change can also be expected to increase the risk of flooding over the lifetime of the development. In particular, rainfall intensity and peak river flows are expected to increase, which will result in higher surface water runoff rates and volumes, and more frequent fluvial flooding respectively.
- 2.1.3 The proposed site is primarily greenfield agricultural land with very minor areas of impermeable surfacing (access tracks etc). Under the current development proposals it is estimated that the impermeable area of the site will increase to approximately 21.66ha (based on an assumption that 55% of the development areas will be impermeable). The overall rate and volume of surface water runoff from the site will, therefore, increase as a result of the development and will require mitigation.

2.2 Climate Change

- 2.2.1 In planning new developments, the predicted effects of climate change over the lifetime of the development must be considered. The anticipated lifetime of the proposed residential development at Kingsnorth is 100 years. The climate change allowances recommended by the Environment Agency to support the NPPF are as follows.

Peak rainfall intensity: 30%

Peak river flow: 20%

2.2.2 It will, therefore, be necessary to make allowances for climate change, particularly with regards to peak rainfall intensity, when assessing surface water runoff rates.

2.3 Existing Surface Water Runoff Rates

2.3.1 Surface water runoff will be restricted to the pre-development greenfield runoff rates (see Table 1) for the whole site.

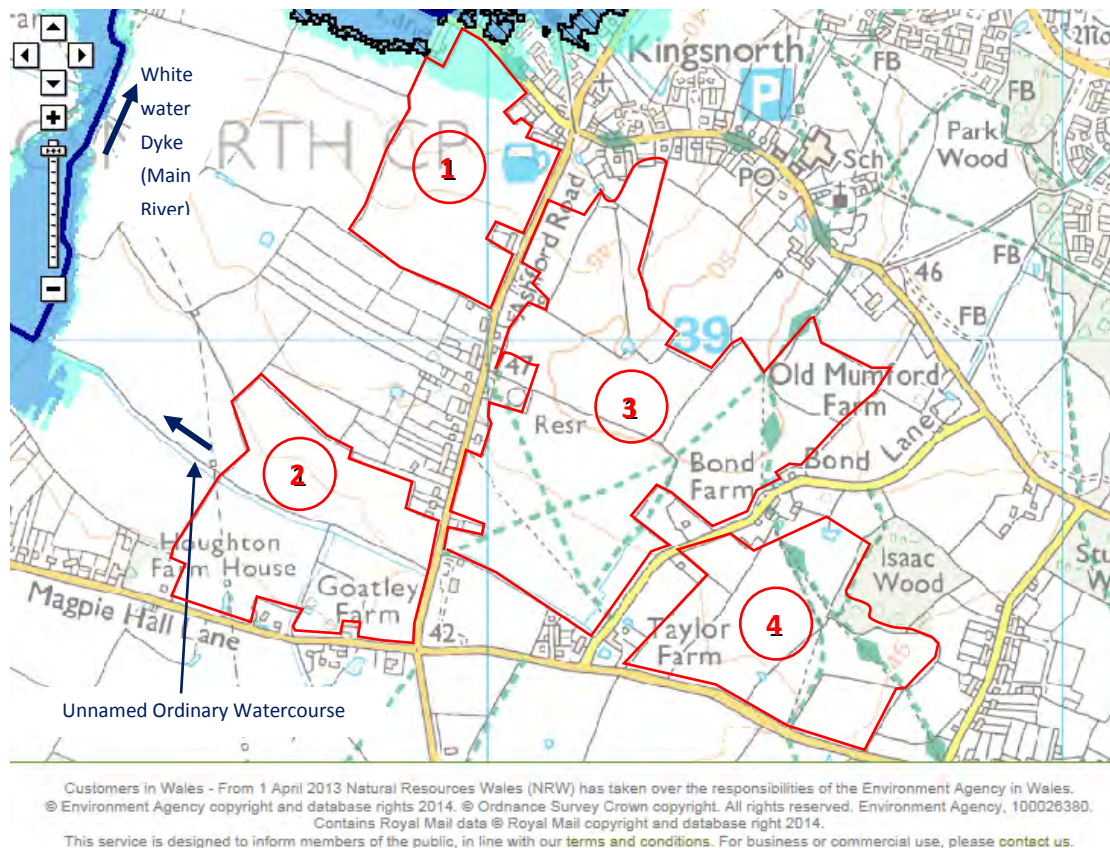


Figure 1. Site Areas

2.3.2 Policy CS20 of the Adopted Core Strategy (July 2008, Ashford District Council) specifies that post-development runoff rates should not exceed greenfield rates of 4 litres/second/hectare for areas south of the M20, and outside the Ashford Growth Area. On this basis, the greenfield runoff rates for each area of the site (see Figure 1) have been estimated and are summarised in Table 1 below.

Table 1. Greenfield Runoff Rates		
	Development Area (ie excluding Green Infrastructure)	Greenfield Runoff Rate (litres/second)
Area 1	7.78 ha	31.1
Area 2	7.75ha	31
Area 3	17.37 ha	69.5
Area 4	6.5 ha	26
TOTAL	39.4 ha <i>(ie 40.15ha less 0.75ha School G.I.)</i>	157.6

2.4 Drainage Rationale

- 2.4.1 Any flows in excess of the pre-development greenfield runoff rates will be attenuated on site for all storm events up to and including the 1 in 100 year event including an allowance for climate change.
- 2.4.2 The 1 in 30 year and 1 in 100 year +CC attenuation volumes have been estimated for each area of the site (see Appendix 1) and are summarised in Table 2 below.
- 2.4.3 It is proposed that, as a minimum, the attenuation facilities and drainage system are designed to accommodate the 1 in 30 year storm event. Any flows in excess of this are permitted to flow overland and be temporarily stored at ground level within the site. Overland flow routes and safe areas of storage for surface water can be designed into the development accordingly.

Table 2. Estimated Attenuation Requirements		
Area	1 in 30 year attenuation	1 in 100 year +CC attenuation
Area 1	1,409m ³ (≈181m ³ per ha of development)	2,724m ³ (≈350m ³ per ha of development)
Area 2	1,450m ³ (≈187m ³ per ha of development)	2,800m ³ (≈361m ³ per ha of development)
Area 3	3,210m ³ (≈185m ³ per ha of development)	6,202m ³ (≈357m ³ per ha of development)
Area 4	1,213m ³ (≈187m ³ per ha of development)	2,342m ³ (≈360m ³ per ha of development)

- 2.4.4 Adoptable surface and foul water drainage will be designed and built in accordance with the requirements of Sewers for Adoption, 7th Edition (August 2012) and submitted to Southern Water for adoption under a S104 agreement of the Water Industry Act.
- 2.4.5 All private surface and foul water drainage will be designed and built to comply with the requirements of Building Regulations Approved Document H '*Drainage and Waste Disposal*' (December 2010).

3 OUTLINE SUSTAINABLE DRAINAGE STRATEGY (SEE DRAWING NO. ST13901-014)

3.1 General

- 3.1.1 Surface water runoff is proposed to be managed in a sustainable manner through the use of Sustainable Drainage Systems (SuDS). SuDS provide a range of benefits, including flood risk management, in comparison to conventional piped drainage systems. In particular SuDS can reduce the rate and volume of surface water runoff, act as conveyance routes, provide water quality treatment, and enhance amenity and biodiversity when designed as part of a suitable SuDS management train.
- 3.1.2 Source control and attenuation are key factors in managing surface water runoff sustainably. It is proposed, therefore, that as far as practicable, surface water runoff is managed within the individual land parcels incorporating the necessary attenuation volumes for that area, with a pro-rata discharge rate.
- 3.1.3 The additional benefits provided by SuDS features, other than surface water management and water quality, will be further considered at the detailed design stage to ensure that they are enhanced as much as possible. This will include, for example, consideration of the benefits to wildlife which may require the inclusion of buffer zones around ponds and wetlands, and consideration of the type of planting.
- 3.1.4 The choice of SuDS techniques will be determined at the detailed design stage but could potentially include permeable paving, swales, ponds, and detention basins as described below.
- 3.1.5 An Indicative Surface Water Management Plan has been produced and is included as Drawing No. ST13901-014. Options for SuDS within different areas of the proposed development are outlined below.

3.2 Residential Areas

3.2.1 SuDS options for the residential areas include, but are not limited to the following:

- Rain gardens / Bioretention
- Permeable Paving and other similar Pervious Surfaces
- Swales
- Filter Drains / Infiltration Trenches
- Ponds and Wetlands
- Dry Detention basins

3.2.2 Any one, or combination of the above features could be incorporated into the residential development land. Use of permeable paving has the added benefit of not requiring any additional land take (ie attenuation can be provided beneath roads, driveways and parking areas).

3.2.3 Ponds, wetlands and detention basins require more land take and may only be feasible in residential land parcels that incorporate Public Open Space (POS). Incorporating open SuDS features such as dry detention basins into POS creates a multi-functional space, providing enhanced amenity and biodiversity benefit as well as flood management.

3.3 Community Retail Areas

3.3.1 These areas will provide services to the local community such as convenience stores and, therefore, are likely to have a more urban design. Space for SuDS may, therefore, be more limited within these areas. However, if space permits, a number of urban SuDS features such as ponds, canals and rills could be incorporated into the design and form part of the urban landscape, providing enhanced amenity benefit and increasing community engagement with the concept of sustainable drainage.

3.3.2 Other urban SuDS options include bio-retention areas, rain gardens and permeable/pervious surfacing, all of which do not require any significant additional land take.

3.4 Primary Road Links

3.4.1 Indicative locations for access routes and road links are shown on the Masterplan, Drawing No. 14007 (sk) 001 Rev.N. SuDS features such as swales can be provided along some of these roads to act primarily as conveyance features. These features will ultimately convey all surface water runoff from the development to the final

discharge locations and, therefore, provide connectivity between development parcels.

- 3.4.2 Surface water runoff from the roads could be attenuated within the roads by incorporating a single-sized stone storage layer in the road construction, and providing inlets in the form of beany block kerbs, for example.
- 3.4.3 Alternatively, the road surfacing could be designed as either permeable (eg block paving) or pervious (eg porous asphalt) with attenuation provided beneath.
- 3.4.4 Depending on the required volume and subject to levels, some surface water attenuation could be provided in SuDS features running alongside the roads. These SuDS features could be in the form of wet, dry and/or enhanced swales, filter strips and filter drains.
- 3.4.5 Attenuation could also be provided in a pond, wetland or detention area in downstream areas of the system.

3.5 Outfall Arrangements

- 3.5.1 It is proposed that open SuDS features such as a ponds, wetlands or detention basins, or a combination of these are provided at the downstream end of the surface water drainage systems. This provides a site control feature for managing surface water runoff and a temporary storage area for flows that exceed the design capacity of the system.
- 3.5.2 In addition, the open SuDS features will also provide a final stage of treatment to ensure that water quality standards are met.
- 3.5.3 The outlets from ponds and/or detention basins can be designed as open features such as channels where appropriate to do so, to enhance ecological value.
- 3.5.4 Due to the size and topography of the site, it is considered likely that the surface water drainage for the development will require multiple discharge points. There are a number of potential surface water outfall locations available for the development as shown on the Indicative Surface Water Management Plan (Drawing No. ST13901-014).
- 3.5.5 In the first instance surface water runoff will discharge to ground via infiltration SuDS, if this is not feasible surface water will be discharged to nearby local watercourses, ie the Whitewater Dyke (Main River) to the north of the site and the Ordinary Watercourse within the south-western site area. Where it is not feasible to

discharge to watercourses, it is proposed that surface water runoff is discharged to the public sewerage system at a restricted rate.

4 SUMMARY

- 4.1.1 Surface water runoff from the development will be restricted to the pre-development greenfield runoff rates.
- 4.1.2 Any flows in excess of the greenfield runoff rates will be attenuated on site for all storm events up to and including the 1 in 100 year event, including an allowance for climate change.
- 4.1.3 Attenuation will be provided throughout the site in a range of SuDS features.
- 4.1.4 SuDS will be incorporated into the development to provide attenuation and water quality treatment. A suitable SuDS treatment train will be provided for each development 'type' within the site.
- 4.1.5 Surface water will either infiltrate to the ground or be discharged to adjacent watercourses, whichever is most appropriate following detailed design.

APPENDIX 1

Attenuation Estimates

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	
CALCULATION	CALC. BY:	CHECKED BY:	APPROVED BY:
Area 1 Preliminary Runoff and Attenuation Estimates	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)
	E Skelley		
	DATE: 29/04/2015	DATE:	DATE:

Post-development runoff rate to be restricted to **4 litres/second/hectare** in accordance with Policy CS20 of the Adopted Core Strategy, the Ashford Integrated Water Management Study and the Ashford SuDS Supplementary Planning Document

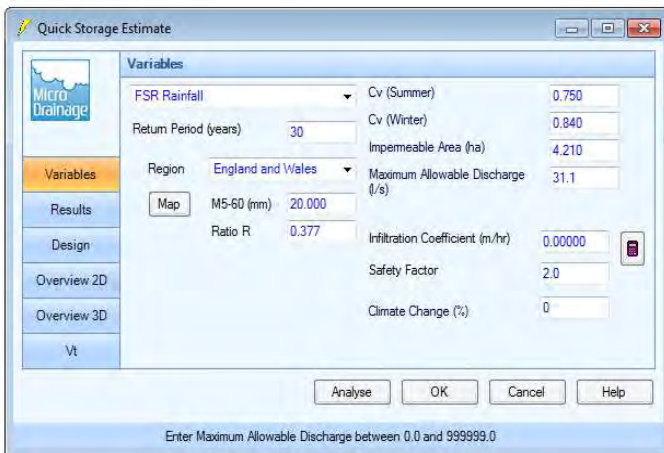
Estimated Development Area = 7.78 hectares

Post Development Runoff Rate = 31.1 litres/second

Estimated Impermeable Area = 4.21 hectares

Attenuation Estimates

1 in 30 year attenuation volume = **1409m³** (average) = 181m³ per hectare of development



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 30

Region England and Wales

Map M5-60 (mm) 20,000

Ratio R 0.377

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 4.210

Maximum Allowable Discharge (l/s) 31.1

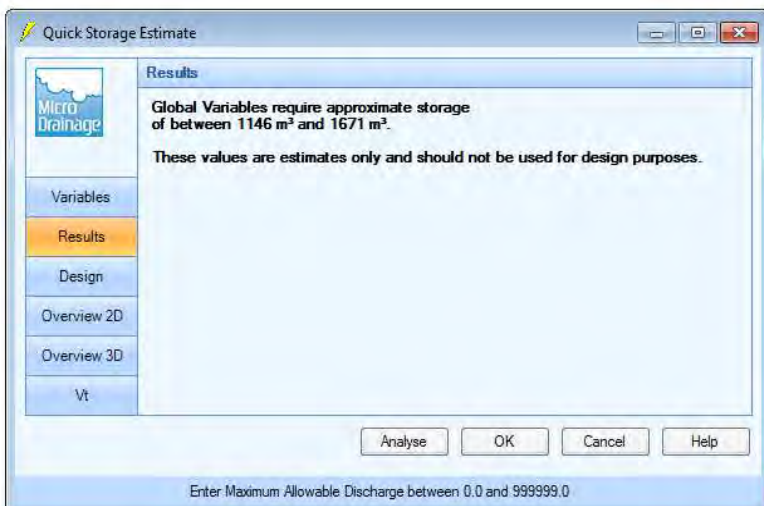
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 1146 m³ and 1671 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

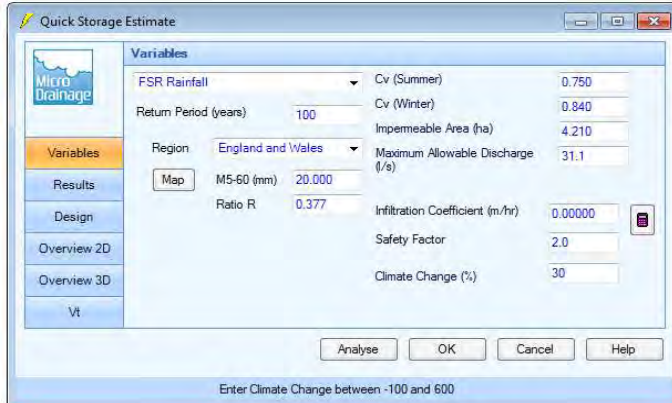
Enter Maximum Allowable Discharge between 0.0 and 999999.0

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	

1 in 100 year +30% climate change attenuation volume = **2724m³** (average)

= 350m³ per hectare of development



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 100

Region England and Wales

Map

M5-60 (mm) 20.000

Ratio R 0.377

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 4.210

Maximum Allowable Discharge (l/s) 31.1

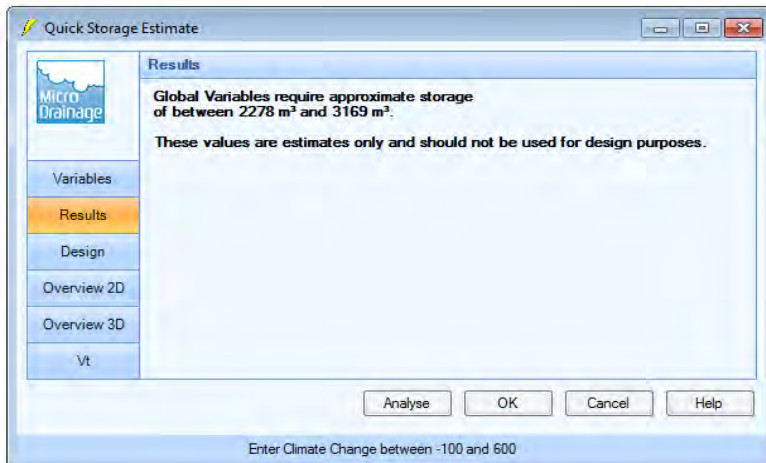
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 30

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 2278 m³ and 3169 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	
CALCULATION	CALC. BY:	CHECKED BY:	APPROVED BY:
Area 2 Preliminary Runoff and Attenuation Estimates	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)
	E Skelley		
	DATE: 29/04/2015	DATE:	DATE:

Post-development runoff rate to be restricted to **4 litres/second/hectare** in accordance with Policy CS20 of the Adopted Core Strategy, the Ashford Integrated Water Management Study and the Ashford SuDS Supplementary Planning Document

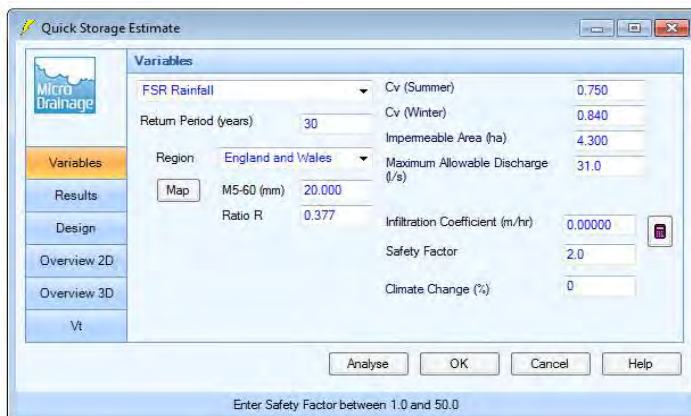
Estimated Development Area = 7.75 hectares

Post Development Runoff Rate = 31 litres/second

Estimated Impermeable Area = 4.3 hectares

Attenuation Estimates

1 in 30 year attenuation volume = **1450m³** (average) = 187m³ per hectare of development



Quick Storage Estimate

Micro Drainage

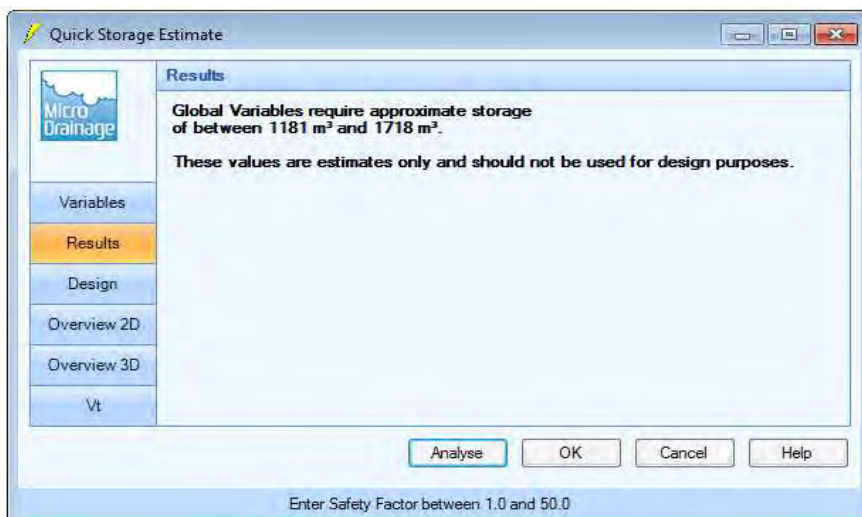
Variables

FSR Rainfall: [dropdown]
Return Period (years): 30
Region: England and Wales
Map: M5-60 (mm) 20.000
Ratio R: 0.377

Cv (Summer): 0.750
Cv (Winter): 0.840
Impermeable Area (ha): 4.300
Maximum Allowable Discharge (l/s): 31.0
Infiltration Coefficient (m/hr): 0.00000
Safety Factor: 2.0
Climate Change (%): 0

Analyse OK Cancel Help

Enter Safety Factor between 1.0 and 50.0



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 1181 m³ and 1718 m³.
These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

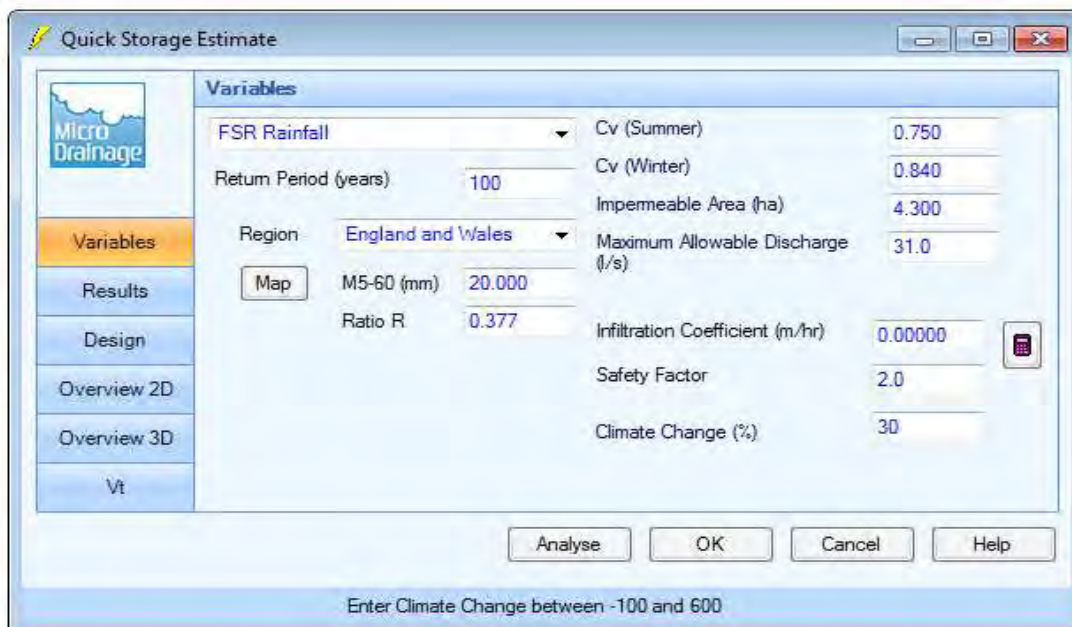
Enter Safety Factor between 1.0 and 50.0

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	

1 in 100 year +30% climate change attenuation volume = **2800m³** (average)

= 361m³ per hectare of development



Quick Storage Estimate

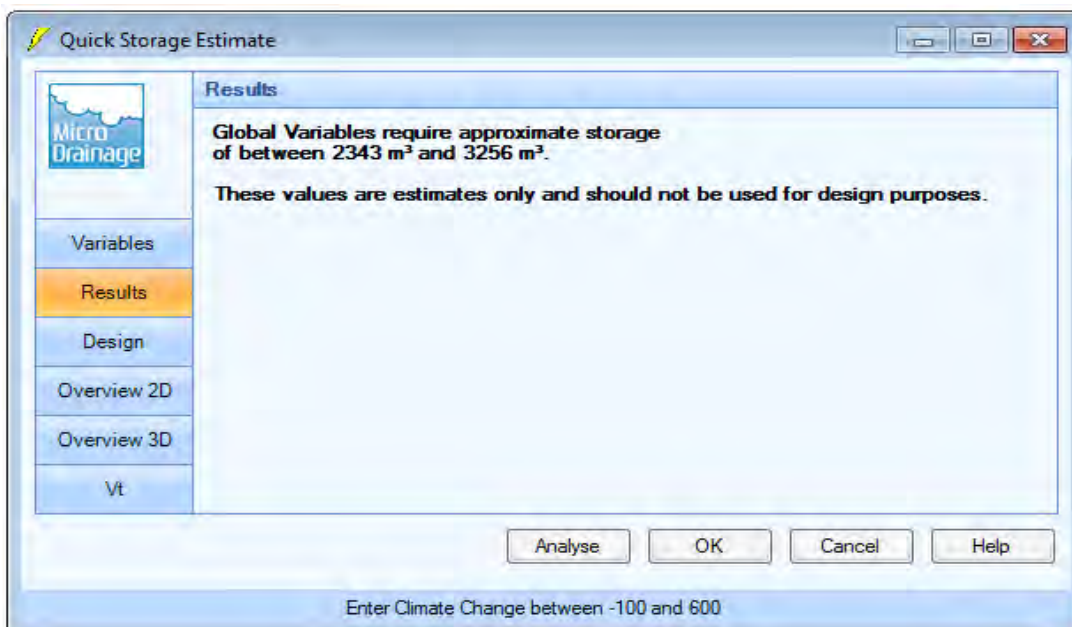
Variables

FSR Rainfall: [dropdown]
 Return Period (years): 100
 Region: England and Wales [dropdown]
 Map: M5-60 (mm) 20.000
 Ratio R: 0.377

Cv (Summer): 0.750
 Cv (Winter): 0.840
 Impermeable Area (ha): 4.300
 Maximum Allowable Discharge (l/s): 31.0
 Infiltration Coefficient (m/hr): 0.00000
 Safety Factor: 2.0
 Climate Change (%): 30

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Results

Global Variables require approximate storage of between 2343 m³ and 3256 m³.
 These values are estimates only and should not be used for design purposes.

Buttons: Analyse, OK, Cancel, Help

Enter Climate Change between -100 and 600

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	
CALCULATION	CALC. BY:	CHECKED BY:	APPROVED BY:
Area 3 Preliminary Runoff and Attenuation Estimates	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)
	E Skelley		
	DATE: 29/04/2015	DATE:	DATE:

Post-development runoff rate to be restricted to **4 litres/second/hectare** in accordance with Policy CS20 of the Adopted Core Strategy, the Ashford Integrated Water Management Study and the Ashford SuDS Supplementary Planning Document

Estimated Development Area = 17.37 hectares

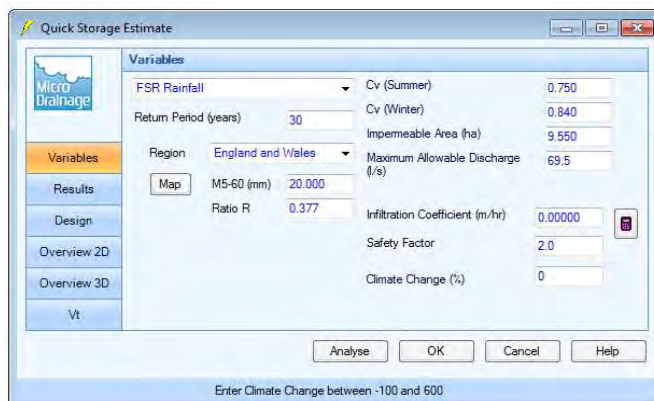
Post Development Runoff Rate = 69.5 litres/second

Estimated Impermeable Area = 9.55 hectares

Attenuation Estimates

1 in 30 year attenuation volume = **3210m³** (average)

= 184m³ per hectare of development



Quick Storage Estimate

Micro Drainage

Variables

FSR Rainfall

Return Period (years) 30

Region England and Wales

Map M5-60 (mm) 20,000

Ratio R 0.377

Cv (Summer) 0.750

Cv (Winter) 0.840

Impermeable Area (ha) 9.550

Maximum Allowable Discharge (l/s) 69.5

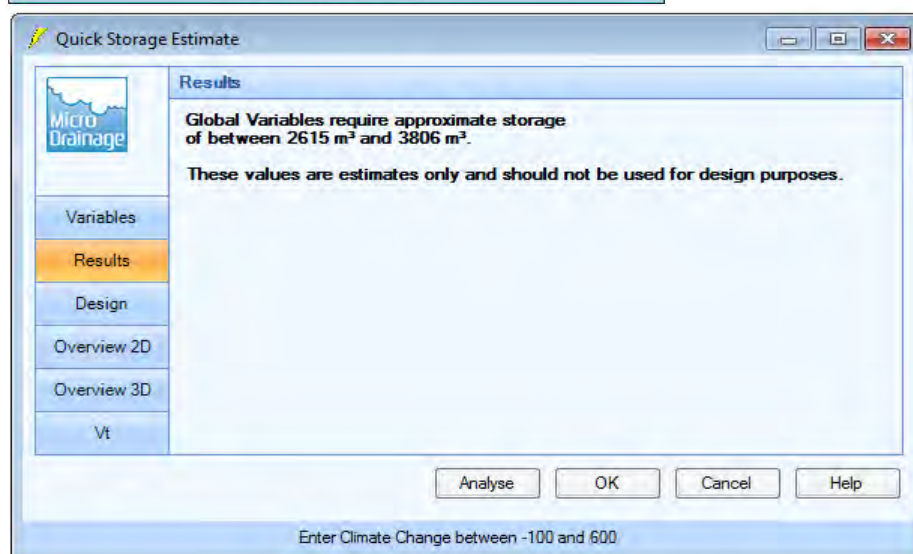
Infiltration Coefficient (m/hr) 0.00000

Safety Factor 2.0

Climate Change (%) 0

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 2615 m³ and 3806 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

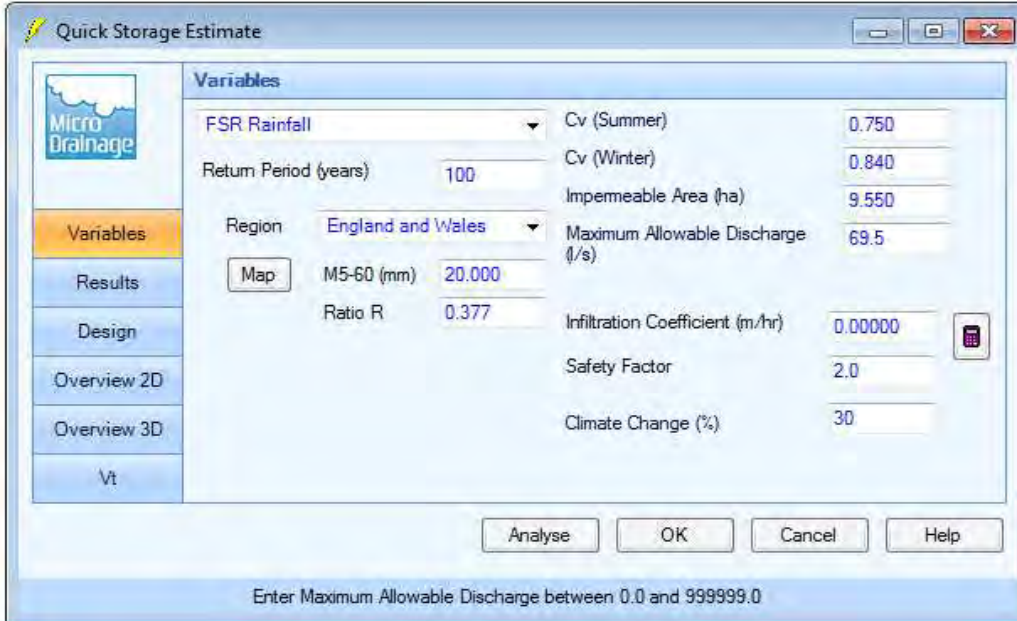
Enter Climate Change between -100 and 600

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	

1 in 100 year +30% climate change attenuation volume = **6202m³** (average)

= 357m³ per hectare of development



Quick Storage Estimate

Variables

FSR Rainfall: Cv (Summer) 0.750, Cv (Winter) 0.840

Return Period (years): 100

Impemeable Area (ha): 9.550

Region: England and Wales

Map: M5-60 (mm) 20.000

Ratio R: 0.377

Maximum Allowable Discharge (l/s): 69.5

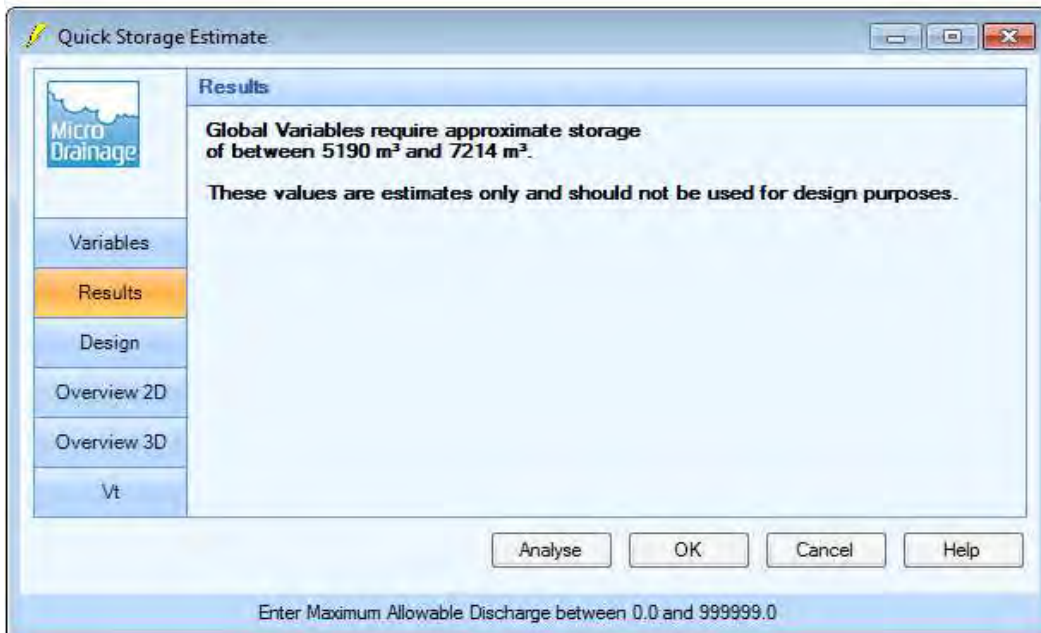
Infiltration Coefficient (m/hr): 0.00000

Safety Factor: 2.0

Climate Change (%): 30

Buttons: Analyse, OK, Cancel, Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0



Quick Storage Estimate

Results

Global Variables require approximate storage of between 5190 m³ and 7214 m³.

These values are estimates only and should not be used for design purposes.

Buttons: Analyse, OK, Cancel, Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	
CALCULATION	CALC. BY:	CHECKED BY:	APPROVED BY:
Area 4 Preliminary Runoff and Attenuation Estimates	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)	(NAME AND SIGNATURE)
	E Skelley		
	DATE: 29/04/2015	DATE:	DATE:

Post-development runoff rate to be restricted to **4 litres/second/hectare** in accordance with Policy CS20 of the Adopted Core Strategy, the Ashford Integrated Water Management Study and the Ashford SuDS Supplementary Planning Document

Estimated Development Area = 6.1 hectares

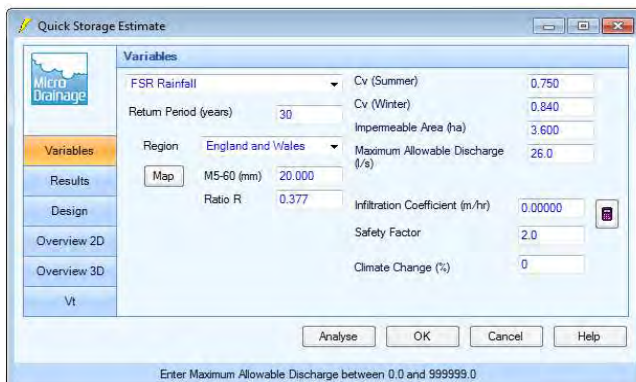
Post Development Runoff Rate = 26 litres/second

Estimated Impermeable Area = 3.6 hectares

Attenuation Estimates

1 in 30 year attenuation volume = **1213m³** (average)

= 199m³ per hectare of development



Quick Storage Estimate

Micro Drainage

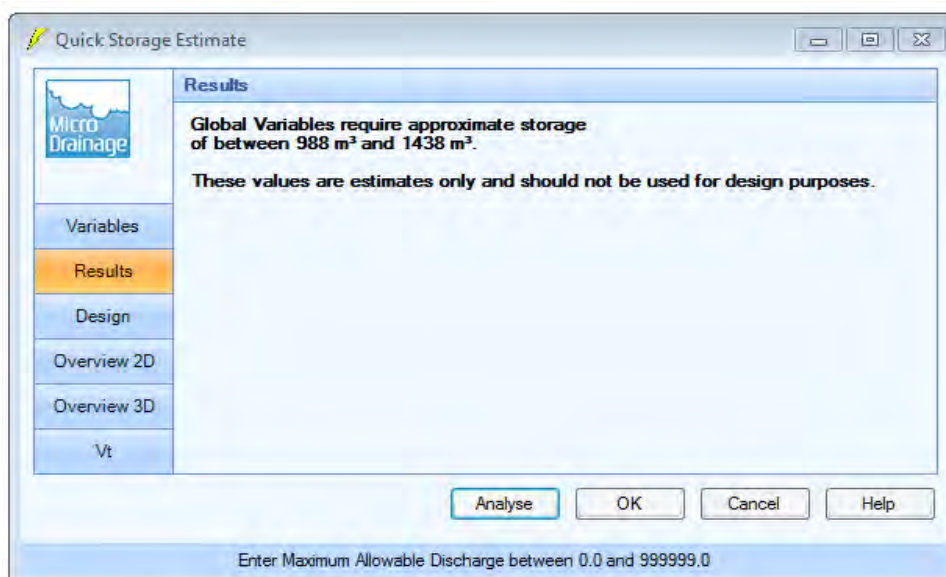
Variables

FSR Rainfall: [dropdown]
Return Period (years): 30
Region: England and Wales
Map: M5-60 (mm) 20.000
Ratio R: 0.377

Cv (Summer): 0.750
Cv (Winter): 0.840
Impermeable Area (ha): 3.600
Maximum Allowable Discharge (l/s): 26.0
Infiltration Coefficient (m/hr): 0.00000
Safety Factor: 2.0
Climate Change (%): 0

Analyse OK Cancel Help

Enter Maximum Allowable Discharge between 0.0 and 999999.0



Quick Storage Estimate

Micro Drainage

Results

Global Variables require approximate storage of between 988 m³ and 1438 m³.
These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

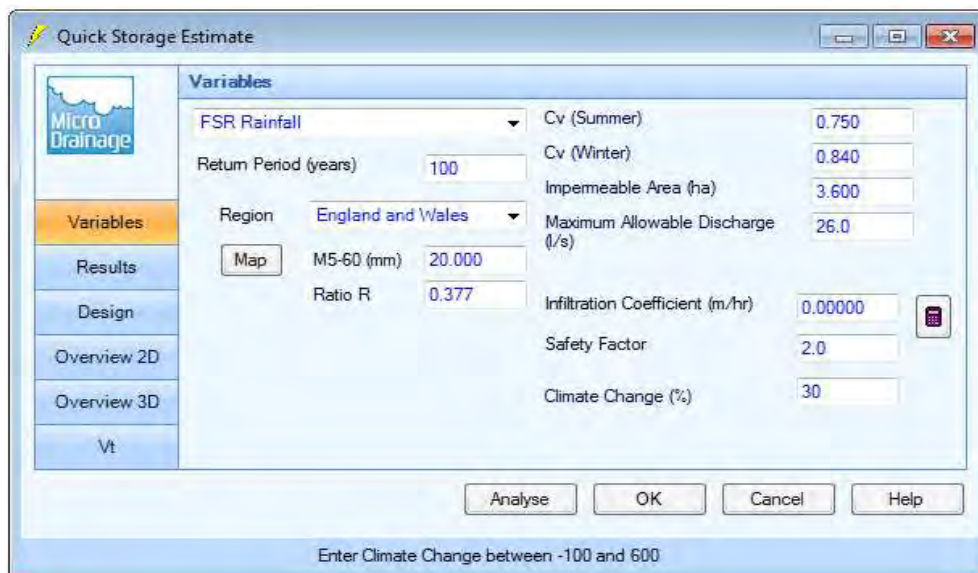
Enter Maximum Allowable Discharge between 0.0 and 999999.0

Calculation Sheet

CLIENT:	PROJECT:	JOB NO.:	CALC. REF. NO.:
Pentland Homes and Jarvis Homes	Kingsnorth, Ashford	ST13901	

1 in 100 year +30% climate change attenuation volume = **2342m³** (average)

= 383m³ per hectare of development



Quick Storage Estimate

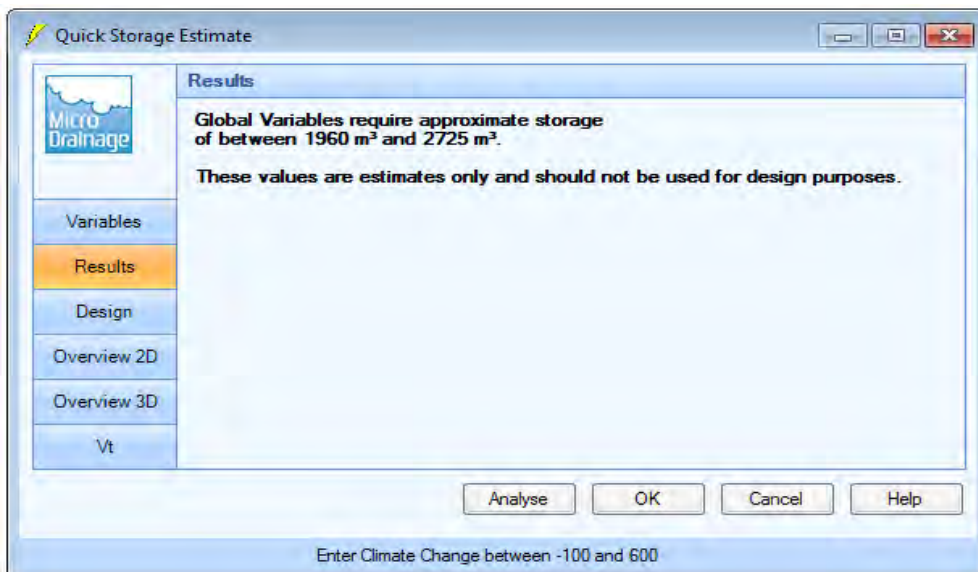
Variables

FSR Rainfall: [dropdown]
 Return Period (years): 100
 Region: England and Wales [dropdown]
 Map: [button]
 M5-60 (mm): 20.000
 Ratio R: 0.377

Cv (Summer): 0.750
 Cv (Winter): 0.840
 Impervious Area (ha): 3.600
 Maximum Allowable Discharge (l/s): 26.0
 Infiltration Coefficient (m/hr): 0.00000
 Safety Factor: 2.0
 Climate Change (%): 30

Analyse OK Cancel Help

Enter Climate Change between -100 and 600



Quick Storage Estimate

Results

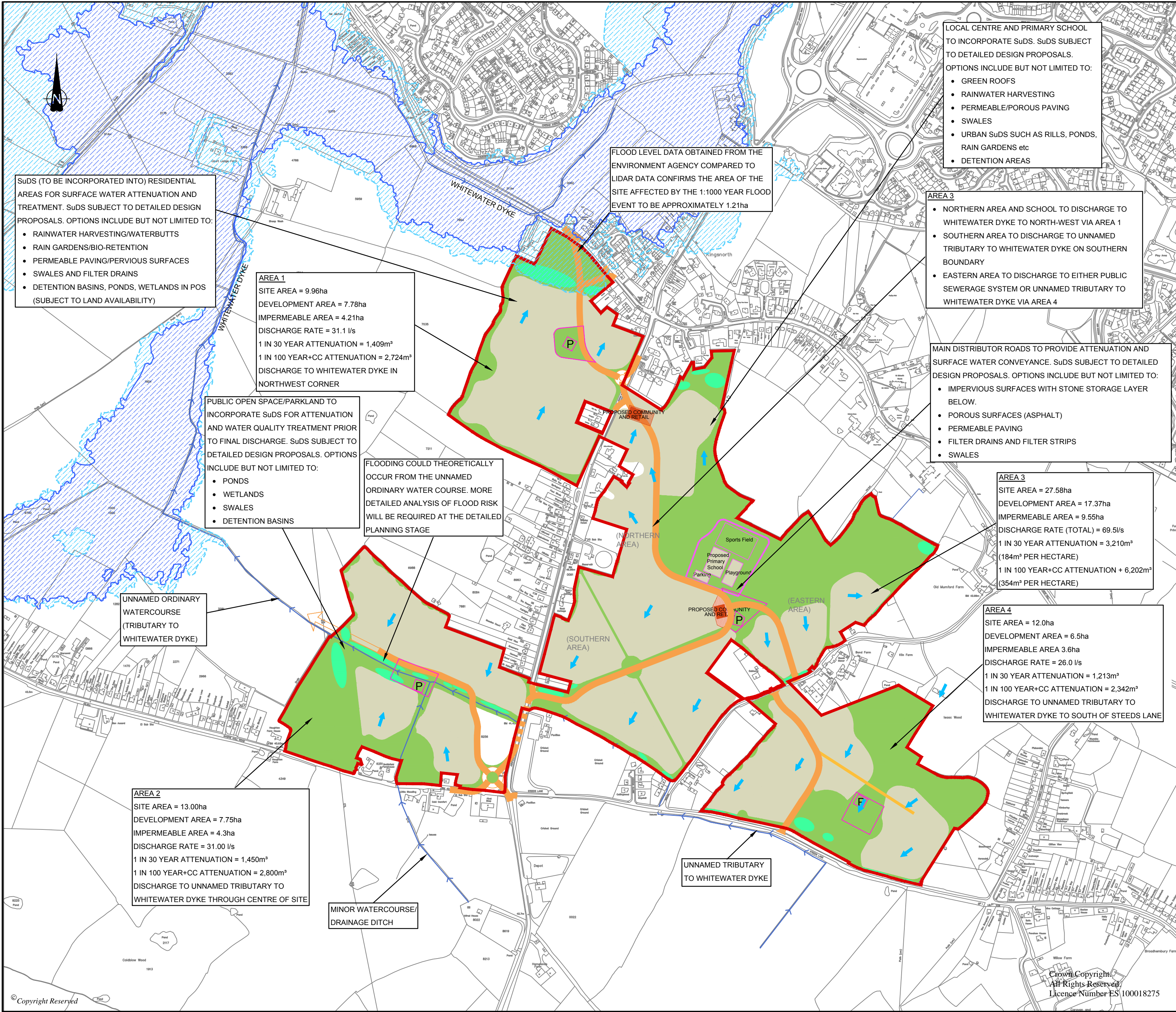
Global Variables require approximate storage of between 1960 m³ and 2725 m³.

These values are estimates only and should not be used for design purposes.

Analyse OK Cancel Help

Enter Climate Change between -100 and 600

DRAWINGS



KEY

SITE BOUNDARY

GENERAL DIRECTION OF FALL

POTENTIAL OPEN SuDS/ATTENUATION AREAS

EXISTING WATERCOURSES

EXTENT OF FLOOD ZONE 3

EXTENT OF FLOOD ZONE 2

PROPOSED DEVELOPMENT AREA

PROPOSED OPEN SPACE / GREEN INFRASTRURCTURES

PROPOSED ROADS

NOTES

SURFACE WATER ATTENUATION VOLUMES INDICATED ON THIS DRAWING ARE PROVISIONAL ESTIMATES ONLY AND ARE THEREFORE TO BE USED FOR GUIDANCE PURPOSES ONLY.

CALCULATIONS OF ATTENUATION ARE BASED ON ASSUMED DEVELOPMENT HARDSTANDING / IMPERMEABLE AREAS = 55% - TBC AT DETAILED DESIGN STAGE.

INDICATIVE ONLY

C	New Masterplan added	02/06/15	DR	EJS	JG
B	KNMP001-Masterplan_RevM_200515	20/05/15	SLB	SR	JK
A	First Issue	06/05/15	SLB	EJS	JG
REVISION		DETAILS	DATE	DRAWN	CHKD
CLIENT		Pentland Homes & Jarvis Homes			
PROJECT		Kingsnorth Green			
DRAWING TITLE		Indicative Surface Water Management Plan			
DRG No.	ST13901-014	SCALE	1:5000	DATE	22/09/14
DRAWN BY	DR	CHECKED BY	EJS	APPROVED BY	JG
<input checked="" type="checkbox"/> STOKES-ON-TRENT (HEAD OFFICE)		TEL 0845 111 7777	<input type="checkbox"/> CARDIFF		TEL 029 2072 9191
<input type="checkbox"/> NEWCASTLE UPON TYNE		TEL 0191 232 0943	<input type="checkbox"/> LEIGH		TEL 01942 260101
<input type="checkbox"/> WEST BROMWICH		TEL 0121 580 0909	<input type="checkbox"/> SHEFFIELD		TEL 0114 245 6244
<input type="checkbox"/> LONDON		TEL 020 7287 2872	<input type="checkbox"/> EDINBURGH		TEL 0131 555 3311
			<input type="checkbox"/> LIVERPOOL		TEL 0151 494 5431

STOKE-ON-TRENT
Sir Henry Doulton House
Forge Lane
Etruria
Stoke-on-Trent
ST1 5BD
Tel: +44 (0)845 111 7777

CARDIFF
22 Windsor Place
Cardiff
CF10 3BY
Tel: +44 (0)292 072 9191

EDINBURGH
Suite 2/3
Great Michael House
14 Links Place
Edinburgh
EH6 7EZ
Tel: +44 (0)131 555 3311

GREATER MANCHESTER
2 The Avenue
Leigh
Greater Manchester
WN7 1ES
Tel: +44 (0)194 226 0101

LONDON
Third Floor
46 Chancery Lane
London
WC2A 1JE
Tel: +44 (0)207 242 3243

NEWCASTLE UPON TYNE
City Quadrant
11 Waterloo Square
Newcastle upon Tyne
NE1 4DP
Tel: +44 (0)191 232 0943

SHEFFIELD
Unit 5
Newton Business Centre
Newton Chambers Road
Thorncliffe Park
Chapelton
Sheffield
S35 2PH
Tel: +44 (0)114 245 6244

TAUNTON
Suite E1
Victoria House
Victoria Street
Taunton
Somerset
TA1 3JA
Tel: +44 (0)182 370 3100

TRURO
Baldhu House
Wheal Jane Earth Science Park
Baldhu
Truro
TR3 6EH
Tel: +44 (0)187 256 0738

WEST BROMWICH
Thynne Court
Thynne Street
West Bromwich
West Midlands
B70 6PH
Tel: +44 (0)121 580 0909

International offices:

ALMATY
29/6 Satpaev Avenue
Hyatt Regency Hotel
Office Tower, 7th Floor
Almaty
Kazakhstan
050040
Tel: +7(727) 334 1310

MOSCOW
Suite 2, Block 10
Letnikovskaya Street
Moscow
Russia
115114
Tel: +7(495) 980 0767

**Wardell Armstrong
Archaeology:**

CUMBRIA
Cocklakes Yard
Carlisle
Cumbria
CA4 0BQ
Tel: +44 (0)122 856 4820

SHAFTESBURY
Unit 3
Chaldicott Barns
Tokes Lane
Semley
Nr. Shaftesbury
SP7 9AW
Tel: +44 (0)174 783 0603