A Planning Application by

SATNAM MILLENIUM LIMITED

In respect of

Peel Hall, Warrington

Flood Risk Assessment

June 2016

www.tpa.uk.com

DOCUMENT SIGNATURE AND REVIEW SHEET

Project Details

Project Title:	Peel Hall, Warrington		
Project No.:	1506-45	**Report No.:**	1506-45/FRA/01 Rev B
Client:	SATNAM MILLENIUM LIMITED		

	Prepared By:	Checked By:	Approved for issue
Name	Paul Graham	Leigh Fotiadis	Leigh Fotiadis
Signature	PG	LF	LF
Date	January 2016	January 2016	January 2016

Document Review

Revision	Date	Description	Checked By
A	January 2016	Report Amended following response from United Utilities and CCTV survey	LF
B	June 2016	Report Amended following update to Masterplan	JH

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1 INTRODUCTION

1.1 Transport Planning Associates (TPA) has been commissioned by Satnam Millenium Limited to undertake a Flood Risk Assessment and proposed drainage for the proposed development of Peel Hall, Warrington and surrounding land.

1.2 The proposed development is for an outline application for a new residential neighbourhood including C2 and C3 uses; local employment (B1 use); local centre including a food store up to 2000m^2; A1 – A5 (inclusive) and D1 uses class units of up to 600m^2 total (with no single unit of more than 200m^2) and a family restaurant / pub of up to 800m^2 (A3 / A4 use); a site for a primary school; open space including sports pitches with ancillary facilities; means of access and supporting infrastructure at Peel Hall, Warrington.

1.3 Proposals include the construction of a mixed use development which will comprise the following:

- 1200 (approx) Residential Dwellings;
- 2.3 ha of commercial development including a supermarket and employment space;
- Proposed primary school site; and
- 0.8ha employment zone.

1.4 This report considers the risk of flooding at the application site and assesses any impact to the surrounding catchment resulting from proposed developments. This document sets out the design principles and indicative detail for surface and foul water drainage to serve the proposed development

2 EXISTING SITE

Existing Site

2.1 The site is located south around Peel Hall, Warrington. The nearest postcode is WA2 0TA and the approximate grid reference is X_ 361506 Y_ 391734. Refer to site location plan in **Appendix A**.

2.2 The application site is generally bounded by the M62 to the north, Mill Lane and existing recreational grounds to the east, Windemere Avenue to the south and the A49 to the west.

Site Description

2.3 The total site area is approximately 63.58ha and currently comprises the open land known as Peel Hall and other associated properties and buildings. The site is currently accessed via Radley Lane and Mill Lane to the east and Birch Avenue to the west.

2.4 The topographical survey confirms that the site falls from east to west with levels ranging from approximately 10.32m AOD to the west and 17.97m AOD to the east. A high point is located to the north east with levels at approximately 20.69m AOD. Refer to topographical survey within **Appendix A**.

2.5 A desk top ground study was prepared for the site by Environmental management Solution Limited. Refer to **Appendix A**.

2.6 According to this study the application site is underlain by Glaciofluvial deposits comprising sand and gravel. The British Geological Survey (BGS) records indicate that the bedrock geology at the development is formed of Chester Pebble Beds Formation which comprises sandstone. The BGS borehole logs confirm that clay gravel and sand form the superficial strata at the application site.

Existing Drainage Networks and Water Supply

2.7 Sewer maps provided by United Utilities confirm an existing clean water supply pipe runs adjacent to Peel Cottage Lane and runs to Peel Hall. According to this mapping there are also existing public sewers crossing the western end of the application site.

2.8 Existing foul and surface water sewers are located to the east at Mill Lane and to the west within the existing residential development at Poplars Avenue. Refer to **Appendix B**.

River and Watercourses

2.9 The Environment Agency (EA) flood maps and topographical surveys confirm that there are a series of minor watercourses, including the Spa Brook, located within the application boundary.

2.10 The nearest major watercourse to the development is the Cinnamon Brook which is located approximately 125m to the east of the site.

3 PROPOSED DEVELOPMENT

3.1 Development proposals include the construction of a mixed use development at Peel Hall and the surrounding land. According to the draft masterplan the existing farm house and Peel Hall Cottage are to remain as existing and do not fall within the application boundary.

3.2 The proposed development is to comprise the following:

- 1200 (approx) Residential Dwellings
- Residential care home
- 2ha of commercial development including a supermarket and employment space
- Proposed primary school site
- 0.8ha employment zone, predominantly B2 units.

3.3 Areas of public open space and attenuation ponds have been located on the draft masterplan, it is assumed that private roads, parking and landscaping will be incorporated into the proposed site layout at a later stage.

3.4 According to the draft masterplan site access will be achieved via newly constructed junctions off of Poplars Avenue to the west and south, Birch Avenue to the west, Blackbrook Avenue to the east, and Mill Lane to the north east. Radley Lane, located to the east which provides access to Peel Hall Farm and Peel Hall Cottage is to remain as existing. Refer to **Appendix A**.

4 FLOOD RISK

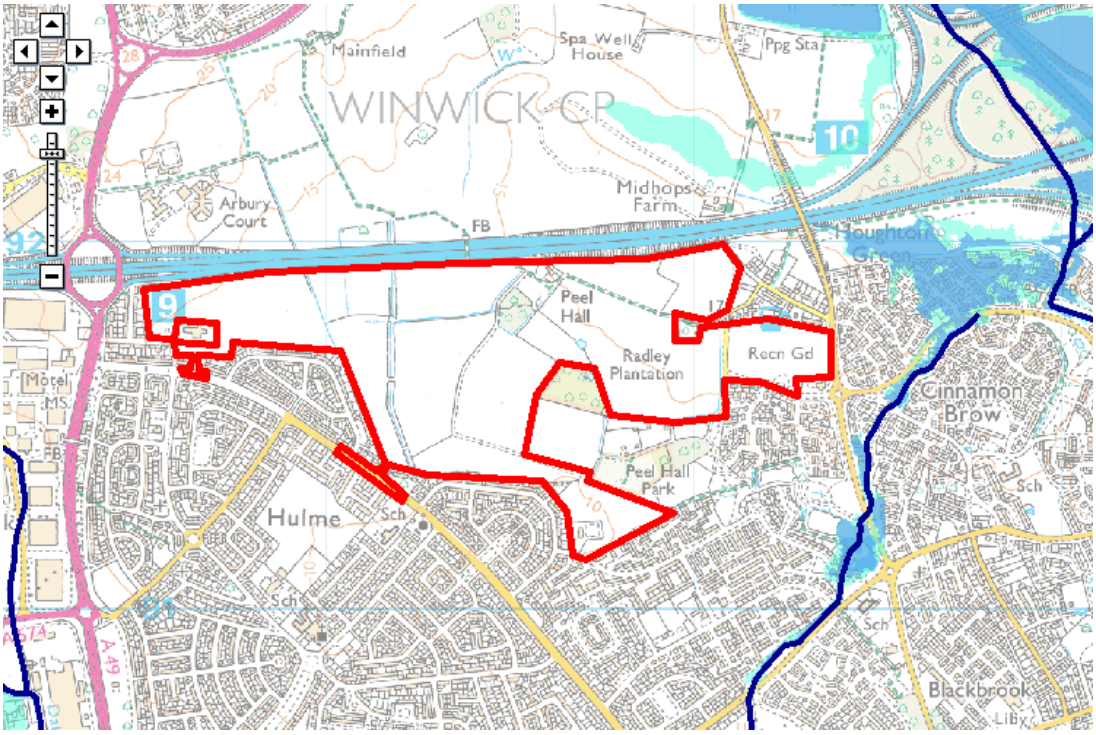
4.1 The Environment Agency (EA) Indicative Flood map in figure 1 below, confirms that the site is located in Flood Zone 1 and is not at risk of fluvial flooding.

4.2 Areas located in Flood Zone 1 have less than 0.1% chance of flooding in any given year. Only a 1 in 1000 year flood event puts this site at risk from fluvial and tidal events.

4.3 The NPPF classes residential development as 'More Vulnerable' to the risk of flooding.

4.4 The topographic survey shows that the site falls from east to west. The application site is bounded by the M62 to the north, existing residential development at Mill Lane and recreational grounds to the east. Existing residential development at Birch Avenue and Newhaven Road is located to the west and existing residential development at Windermere and Woodside Farm is located to the south.

Figure 4.1 EA Indicative Flood Map – Peel Hall



Warrington Borough Council Strategic Flood Risk Assessment (SFRA) and Flood Risk Management Strategy (FRMS)

4.5 A Strategic Flood Risk Assessment (SFRA) was prepared by Jeremy Benn Associates (JBA) in 2011 for Warrington Borough Council. A Flood Risk Management Strategy was also prepared by the Environment Agency (EA) in March 2011, in which sub-catchments have been identified as areas at risk and how flooding can be managed. The application site is not located within any of these areas and is not identified within the SFRA as being at risk of flooding.

Tidal and Fluvial Flooding

4.6 The SFRA confirms that the main sources of flooding in Warrington are the River Mersey and its 5 key tributaries (Sankey, Padgate, Spittle, Penketh and Whittle Brooks). The development is not within the vicinity of any of these sources.

4.7 According to the EA map the nearest major watercourse is the Cinnamon Brook, this is approximately 125m from the development. There are minor watercourses and ponds located within the application boundary however according to the EA map these do not pose a risk to the site.

Groundwater Flooding

4.8 The EA indicative flood map confirms that the application site is located within a Zone 3 groundwater source protection zone. This is described by the EA as:

'Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source. In confined aquifers, the source catchment may be displaced some distance from the source. For heavily exploited aquifers, the final Source Catchment Protection Zone can be defined as the whole aquifer recharge area where the ratio of groundwater abstraction to aquifer recharge (average recharge multiplied by outcrop area) is >0.75. There is still the need to define individual source protection areas to assist operators in catchment management;'

4.9 The Envirocheck report within the desk top study for Phase 1 of the development, that the drinking water source itself is located approximately 560m to the north of the site. The sites groundwater is also assumed to be moderately to highly susceptible to groundwater contamination.

4.10 According to the EA groundwater maps the application site is underlain by secondary A aquifers, which are described as:

*'**Secondary A** - 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. These are generally aquifers formerly classified as minor aquifers;'*

Overland Flooding

4.11 As previously mentioned the site falls from east to west and bounded by the M62 to the north and existing residential development at Mill Lane to the east which will act as a cut off preventing overland flow from reaching the development.

4.12 Due to topography, any overland flow from the south and west will flow away from the development.

4.13 Surface water from the development will be managed on-site and will be restricted to Greenfield run-off rate; therefore the risk of overland flooding causing by the development is negligible.

Sewer Flooding

4.14 The United Utilities DG5 records are provided within the SFRA. These records show a data set of all properties that have been previously flooded by a drainage system. The application site is not highlighted on this plan as being at risk of flooding from the existing sewerage network and therefore flood risk due to sewers is considered to be low.

4.15 Areas to the north east and south are also highlighted as low risk and the area to the west is considered as medium risk. Refer to **Appendix C**.

Surface Water Flooding

4.16 According to the EA flood maps, the application site is at low risk of surface water flooding. According to the SFRA there are certain locations within Warrington that are at risk of surface water flooding.

4.17 The critical drainage map within the SFRA confirms that development does not fall within a critical drainage area. However land to the east south and west are within critical drainage areas, according to the SFRA there are a number of culverts through the area which if unmaintained could increase flood risk.

4.18 Surface Water from the development will be managed on-site via attenuation and will be restricted to the existing run-off rate.

Reservoir Flooding

4.19 The EA flood maps confirm that the site is not at risk from flooding from reservoirs. Refer to **Appendix C**.

5 PROPOSED SURFACE WATER DRAINAGE STRATEGY

Existing Surface Water Drainage

5.1 The United Utilities maps confirm there are no public surface water sewers crossing the development site.

5.2 An existing domestic kennels and dwelling are located within the development but do not form part of the application site.

5.3 The site is currently greenfield; it is proposed that discharge from the proposed development will be restricted to the existing QBAR as calculated using the HR Wallingford IH124 Greenfield run-off calculation. QBAR has been calculated as 334.8 l/s, refer to **Appendix D**.

Proposed Surface Water Drainage Strategy

5.4 The hierarchy of surface water disposal stated within The Building Regulations approved document Part H is as follows:

- An adequate soakaway/infiltration system
- A watercourse
- A sewer

5.5 The proposed options of surface water discharge include the following:

SuDS

5.6 It is proposed that surface water from the development is restricted to the QBAR rate of 334.8 l/s.

5.7 The desk top study prepared by Environmental Management Solution Ltd indicates that the superficial strata at the site is formed from gravel and sand, therefore infiltration drainage may be feasible at the development, however the site is also located within a groundwater source protection zone and therefore discussions with Environment Agency as the design progresses will need to be undertaken in order to agree what areas could be utilised for soakaway drainage but at the same time protect the groundwater from contamination.

5.8 Due to this reason and to avoid causing any contamination to groundwater soakaways we would need to make sure areas that go to a soakaway are areas that do not generate or have a risk of generating contamination to groundwater.

Watercourse

5.9 There are existing ponds and minor watercourses located within the application site including the Spa Brook. It is proposed that surface water from the development will discharge to these minor watercourses at the restricted run off rate.

5.10 The Spa Brook is located to the west of the application site and appears to be culverted to the rear of the existing properties at Poplars Avenue. United Utilities records suggest that this drains to Mill Brook behind the Alban Retail Park. It is assumed that flows from the site restricted to the greenfield rate will be able to discharge into this surface water system with a system of onsite attenuation as proposed. Further modelling of this pipe may be requested.

5.11 In addition to Spa Brook, there appears to be a drainage ditch located within the application boundary. This ditch is connected to Dallam Brook via a large diameter culvert which runs via Densham Avenue and Northway.

5.12 The area to the north west of the site which will comprise the employment space and residential units falls to the north west.

5.13 It is proposed that surface water from the development will discharge to the watercourses at the restricted rate, attenuation will be used to achieve this. Discharge to this existing drainage ditches and watercourse will require consent from the Local Authority and may require discharge consent.

5.14 The QBAR for the whole development has been calculated as 334.8 l/s. This will be pro rata'd per sub-catchment and the storage requirement will be based on this restricted rate. These areas have been broken down as follows:

Table 5.1 Proposed Storage Volumes

Pond Reference	Sub-catchment Area (ha)	Percentage of Sub-catchment (%)	QBAR for sub-catchment (l/s)	55 % Impermeable Area (ha)	Volume requirement – Q100+30% (m^3)
A	4.336	6.81	22.80	2.38	1373
B	5.26	8.27	27.68	2.89	1668
C	5.48	8.61	28.83	3.01	1736
D	5.64	8.87	29.69	3.1	1788

E	4	6.29	21.06	2.2	1270
F	2.91	4.57	15.32	1.6	924
G	0.83	1.31	4.39	0.45	266
H	4.6	7.23	24.22	2.53	1459
I	2.92	3.97	13.32	1.61	930
J	4.08	6.4	21.48	2.24	1291
K	2.54	4	13.42	1.40	808

Water Quality

5.15 Due to the application site being located within a groundwater protection zone, groundwater quality needs to be controlled to limit any contamination from the development.

5.16 It is proposed that a two stage treatment will be provided, initially using lined permeable paving with this discharging to the designated ponds and secondly via the ponds themselves. The commercial areas in particular will require use of permeable paving and oil separators where appropriate.

Attenuation Features

5.17 Potential use of SuDS have been considered for the attenuation of surface water on-site and are listed below, infiltration drainage cannot be used at the site due to the development being located within in groundwater protection zone. Water quality has also been considered when proposing the following attenuation features:

Attenuation Ponds

5.18 It is proposed that surface water from the development will discharge to attenuation ponds which in turn will discharge to the existing watercourses and ditches within the site. The discharge into these watercourses will be restricted to QBAR rates listed above in Table 1.

Permeable Paving

5.19 Further attenuation can be provided using permeable paving for private drive areas. Permeable paving would be beneficial as it allows for a reduction of the occurrence of runoff flooding. Permeable paving would also improve water quality by filtration through the pavement as they are an effective initial method of removing total suspended solids, heavy metals and hydrocarbons from runoff.

6 PROPOSED FOUL WATER DRAINAGE STRATEGY

Existing Foul Flow

6.1 An existing dwelling and kennels are located within the overall extent of the site but these do not form part of the application site itself, therefore the site is considered to be greenfield.

Proposed Foul Flow

6.2 The proposed development will comprise up to circa 1300 new residential dwellings, commercial areas and a school. Based upon Sewers for Adoption 7th Edition and British Water Flows and Loads the foul flow has been calculated as: 64.52 l/s.

6.3 This flow has been based on the following assumptions, refer to Foul Flow calculations within **Appendix E**:

- Commercial Area: Employment zone comprising approximately 150 members of staff and Supermarket comprising 80 members of staff, plus support retail in smaller units and a family pub / restaurant;
- School – Comprising up to approximately 180 pupils and 25 members of staff; and
- Retirement Home – Comprising approximately 100 residents.

Foul Water Drainage Strategy

6.4 Foul networks are located to the east at Mill Lane, to the west at Windermere Lane and to the west within the site boundary.

6.5 Any sewers located within the application site will require easements either side. The sewer sizes have been confirmed as a maximum of 225mm on the existing site so assuming that these are laid at no deeper than 3m cover to invert then a 3m easement will need to be provided for these pipes in line with the statuary requirement defined by the statuary undertaker.

6.6 United Utilities have not given a preference for a point of connection but have no objection with foul flows communicating with their sewers, preferably via a gravity connection. Refer to correspondence within **Appendix E**.

7 CONCLUSIONS AND RECOMMENDATION

7.1 This report concludes that the development is not at risk of fluvial, tidal, overland or groundwater flooding and will not increase flooding to surrounding catchments.

7.2 It is proposed that surface water from the development will be restricted to the existed Greenfield run-off rate of 334.8l/s.

7.3 The site is located within a groundwater source protection zone and therefore to prevent any contamination, surface water infiltration drainage will need to be subject to Environment Agency confirmation. Areas contributing to soakaways will need to be carefully designed and selected so they do not pose any risk of contamination to groundwater.

7.4 It is proposed that surface water from the development will discharge to the watercourses at the restricted rate; attenuation will be used to achieve this. Discharge to this existing drainage ditches and watercourse will require consent from the Local Authority and may require discharge consent.

7.5 CCTV has been carried out to determine the nature and condition of onsite drainage features.

7.6 Due to the application site being located within a groundwater protection zone, groundwater quality needs to be controlled to limit any contamination from the development.

7.7 United Utilities have not given a preference for a point of connection but have no objection with foul flows communicating with their sewers, preferably via a gravity connection.

7.8 Foul capacity has been confirmed at a rate of 64.52l/s.

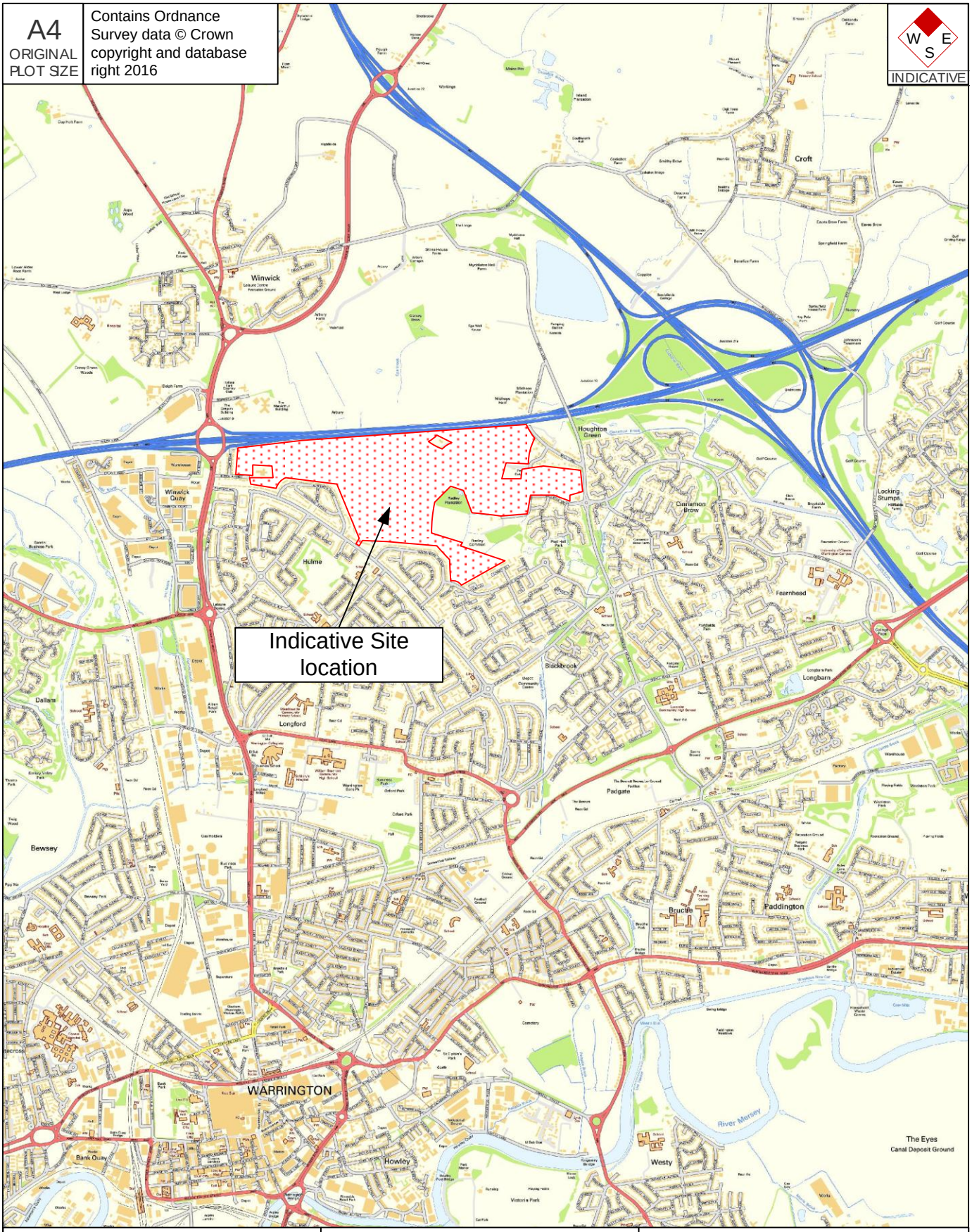
7.9 A minimum of 3m easements are required for all existing on site drainage owned by United Utilities in line with the statuary requirement.

APPENDIX A

A4
ORIGINAL
PLOT SIZE

W E S

INDICATIVE



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tpa Transport Planning Associates

PEEL HALL FARM, WARRINGTON

STATUS: INFORMATION

SITE LOCATION PLAN

SCALE:	PREPARED BY:	CHECKED BY:	APPROVED BY:
NTS	TH	JH	JH

SATNAM PLANNING SERVICES LIMITED

JOB NO:	FIGURE NO:	DATE:
1506-45	2.1	JUNE '15

WARRINGTON NORTH BORO CONS

WINWICK WARD

M 62

NEWTON ROAD

BIRCH AVENUE

BIRCH AVENUE

NEWTON ROAD

ELM ROAD

Shelter

GVC

LB

TCB

13.5m

6901 7901 7902 7903 8901 8902

300 VC 300 VC 300 CO 375 CO

225 VC 150 VC

6809 6813 6802 6805 6808 6806 6807 6801 6803 6810 6811 6812 6804

225 VC 225 CO 225 VC 150 VC 225 VC 225 VC 225 VC

4808 4809 4803 4806 4807 4816 4817 4804 4810 4818 4813 4805 4812 4802 4811 4801 4819 4815

225 VC 225 VC 150 VC 150 VC 150 150 150 100 VC 150 150 150 150

5802 5801 5703 5707 5701 5702

225 VC 225 VC 225 VC 225 VC 225 VC

3801 3705 3702 3703 3706 3704 3701 3707

450 225 VC 300 VC 450 VC 150 VC

4705 4709 4711 4704 4701 4703

150 VC 150 VC 150 VC 150 VC 225 VC

7704 8702 8707

225 VC 225 VC

Abandoned Loss of vision crawler stopped moving on poss. electrics

1.85m

Lanes Group Plc

19661 - Land off Birch Avenue

25 November 2015

LANES GROUP PLC
LANCING HOUSE
BROUGHTON MILLS ROAD
BRETTON
CH4 0BY

GRADE 3,4 & 5 Summary

STRUCTURAL DEFECTS

Structural defects			
Section	PLR	Grade	Fault description
Acceptable Structural Condition			

Grade 3; Best practice suggests consideration be given to repair in the medium term
Grade 4; Best practice suggests consideration be given to a repair to avoid potential collapse
Grade 5; Best practice suggests this pipe is at risk of collapse at any time; urgent consideration should be given to a repair to avoid collapse

SERVICE / OPERATIONAL DEFECTS

Service defects			
Section	PLR	Grade	Fault description
1	MH5703 X	3	Attached deposits, grease, from 9 to 3 o'clock, 10% cross-section

Grade 3; Best practice suggests consideration be given to maintenance activities in the medium term
Grade 4; Best practice suggests consideration be given to maintenance activity to avoid potential blockage
Grade 5; Best practice suggests this pipe is at immediate risk of backing up / causing flooding

Abandoned Surveys

Camera no access		
Section	PLR	Fault description
1	MH5703 X	General remark

Information

These summaries are based on the SRM grading from the WRC

Lanes Group Plc
Lancing House, Broughton Mills Road
Bretton
Tel.: 01244 661691
Fax: 01244 661692
Email: northwalesops@lanesgroup.co.uk

Table of contents

Project Name:	Project number:	Date:	Contact:	
19661 - Land off Birch Aven	PJ00206803	17/11/2015		

Place :

Lanes Group Plc
Lancing House, Broughton Mills Road
Bretton
Tel: 01244 661691
Fax: 01244 661692
Email: northwalesops@lanesgroup.co.uk

∑∅ / Main sections

Project name :	Project number :	Contact :	Date :
19661 - Land off Birch Avenue	**PJ00206803**		**17/11/2015**

Nr.	US MH	DS MH	Date	Road	Tape No.	Material	m	(m)
1	MH5703	MH5701	17/11/2015	BIRCH AVENUE		Vitrified clay	8.89	8.89

Pipe size: CIRCULAR 225 = 8.89 m (8.89 m)

All sections = 8.89 m (8.89 m)

Place :

Lanes Group Plc
Lancing House, Broughton Mills Road
Bretton
Tel: 01244 661691
Fax: 01244 661692
Email: northwalesops@lanesgroup.co.uk

Structural Defects (SRM 4)

Project name :	Project number :	Contact :	Date :
19661 - Land off Birch Avenue	**PJ00206803**		**17/11/2015**

No.	PLR	Dir.	Use	Shape / Size	Date	Mat.	Total Length	Insp. Length	Peak HWG	Peak Score	Grade	Mean Score	Total Score
1	MH5703X	U	F	C 225	17/11/2015	VC	8.89	8.89	-	0	1	0	0

Lanes Group Plc
Lancing House, Broughton Mills Road
Bretton
Tel: 01244 661691
Fax: 01244 661692
Email: northwalesops@lanesgroup.co.uk

Project-information

Project name :	Project Number :	Contact :	Date :
19661 - Land off Birch Avenue	**PJ00206803**		**17/11/2015**

Client:	**Satnam Millennium Limited**
Contact Name:	
Department:	
Road:	**17 Imperial Square**
Town:	**Cheltenham**
County:	**Gloucester, GL50 1QZ**
Telephone:	
Fax:	
Mobile:	
E-mail:	

Site:	**Land Off**
Contact Name:	
Department:	
Road:	**Birch Avenue**
Town:	**Warrington**
County:	**WA2 9TN**
Telephone:	
Fax:	
Mobile:	
E-mail:	

Contractor	**Lanes Group Plc**
Contact Name:	**Peter Knight- Gregson**
Department:	**North Wales Division**
Road:	**Lancing House, Broughton Mills Road**
Town:	**Bretton**
County:	**Flintshire, CH4 0BY**
Telephone:	**01244 661691**
Fax:	**01244 661692**
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E-mail:	**northwalesops@lanesgroup.co.uk**

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Legend of Drawing:

	**WATER FLOW 1**		**Tree_Winter**
	**Tree_Summer**		**CESS PIT**
	**SOAKAWAY: FOUL WATER**		**GNDFLWC**
	**SURFACE WATER**		**SYPHON INTERCEPTOR**
	**PETROL INTERCEPTOR**		**PIPE RUN**
	**RAINWATER PIPE**		**ROAD GULLY**
	**RODDING EYE**		**SEPTIC TANK**
	**SOIL & VENT PIPE**		**COMBINED**
	**SOAKAWAY: SURFACE WATER**		**GULLY**
	**W.C.**		**PUMP CH**
	**FOUL WATER**		

Lanes Group Plc
Lancing House, Broughton Mills Road
Street : Bretton
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Inspection report

Date :	Job number :	Weather :	Operator :	Section number :	PLR SUFFIX:
17/11/2015	**PJ206803**	**no rain or snow**	**PAUL TURK**	**1**	**X**
Weather	Vehicle :	Camera :	Preset :	Cleaned :	Operator :
no rain or snow	**PE57KFA**	**ROVVER125**		**no**	**PAUL TURK**

Place :	**WARRINGTON**	Location details:		U/S MH :	**MH5703**
Road :	**BIRCH AVENUE**	Catchment:		U/S Depth :	**0**
Location	**A footway beside a road**	Tape number :		D/S MH :	**MH5701**
Inspection	**MH5701 (U/S) MH5703**	Pipe Length		D/S Depth :	**1.82**

Use:	**Foul**	Pipe shape :	**Circular**
Year laid :	**Z**	Pipe size :	**225 mm**
Purpose :	**Investigation of known defects**	Pipe material :	**Vitrified clay**
Total length :	**8.89 m**	Lining :	**Vitrified clay**

Comment :

1:75 Position		Code	Observation	Grade
Depth: 1.82				
MH5701				
0.00		MH	Start node type, manhole, reference number : MH5701	(Constr) 0
0.00	**S01**	DEG	Attached deposits, grease, from 9 to 3 o'clock, 10% cross-sectional area loss, Start	(Serv) 3
0.01		WL	Water level, 30% of the vertical dimension	(Serv) 0
1.32		WL	Water level, 70% of the vertical dimension	(Serv) 0
1.96	**S02**	CUW	Loss of vision, camera under water, Start	(Misc) 0
8.72	**F02**	CUW	Loss of vision, camera under water, End	(Misc) 0
8.87	**F01**	DEG	Attached deposits, grease, from 9 to 3 o'clock, 10% cross-sectional area loss, End	(Serv) 3
8.89		REM	General remark Remarks: CAMERA STOPPED MOVING	(Misc) 0
8.89		SA	Survey abandoned Remarks: DUE TO LOSS OF VISION AND CRAWLER STOPPED MOVING REQUIRES JETTING	(Misc) 0

Structural Defects | **Constructional Features**
Service Defects | **Miscellaneous Features**

STR no def	STR peak	STR mean	STR total	STR grade	SER no def	SER peak	SER mean	SER total	SER grade
0	**0**	**0**	**0**	**1**	**1**	**2**	**1.98**	**17.6**	**3**

Notes

Do not scale from this drawing.

All dimensions are to be checked prior to construction and any discrepancies are to be identified to the Architect.

N

PROPOSED ACCOMMODATION SCHEDULE

RESIDENTIAL	335,960 sqm / 83.02 acres
EMPLOYMENT ZONE	24,868 sqm / 6.14 acres 7,500sqm GFA
CARE HOME	4,112 sqm / 1.02 acres -100beds
SCHOOL	11,883 sqm / 2.94 acres
LOCAL CENTRE	15,095 sqm / 4 acres Food Store 2,000sqm/20,940sqft Local Centre 600sqm/6,282sqft
APARTMENTS (mechanicaly ventilated within buffer zone)	14,755 sqm / 4 acres

Note, all areas based on OS data, not measured surveys.

EMPLOYMENT ZONE
24,863sqm / 2.48ha
7,500sqm WORKSPACE

RESIDENTIAL-
PLOT A
3,955sqm / 0.39ha

RESIDENTIAL-
PLOT B
2,205sqm / 0.22ha

RESIDENTIAL - PLOT C
28,267sqm / 2.82ha

APARTMENTS PLOT D
2,150sqm / 0.21ha

RESIDENTIAL
PLOT D
5,935sqm / 0.59ha

APARTMENTS PLOT E
2,329sqm / 0.23ha

RESIDENTIAL
PLOT E
8,209sqm / 0.82ha

RESIDENTIAL
PLOT F
28,765sqm / 2.87ha

APARTMENTS PLOT G
2,734sqm / 0.27ha

50m Buffer Zone Boundary Line

RESIDENTIAL
PLOT G
21,832sqm / 2.18ha

RESIDENTIAL
PLOT H
28,532sqm / 2.85ha

RESIDENTIAL
PLOT J
17,276sqm / 1.72ha

CARE
HOME
3 storey - 100 beds
4,112sqm / 0.41ha

LOCAL
CENTRE

FAMILY PUB
& RETAURANT

PROPOSED SCHOOL SITE
11,883sqm / 1.18ha

FORMAL SPORTS USE

APARTMENTS PLOT K
2,223sqm / 0.22ha

50m Buffer Zone Boundary Line

RESIDENTIAL
PLOT K
24,360sqm / 2.43ha

Public Open Space

RESIDENTIAL
PLOT L
29,675/ 2.96ha

APARTMENTS PLOT M
5,092sqm / 0.5ha

RESIDENTIAL
PLOT M
19,723sqm / 1.97ha

RESIDENTIAL
PLOT N
17,217sqm / 1.72ha

RESIDENTIAL
PLOT P
25,348sqm / 2.53ha

RESIDENTIAL
PLOT Q
26,893sqm / 2.69ha

RESIDENTIAL
PLOT R
25,672sqm / 2.56ha

RESIDENTIAL
PLOT S
22,136sqm / 2.21ha

IMPROVED FORMAL SPORTS USE

ISSUED FOR COMMENT / REVIEW

M	10.05.16	Plot N access amended	JHD
L	06.05.16	Plots areas & landscaping updated.	DW
K	04.05.16	Plots areas & Access roads amended.	JHD
J	14.03.16	Area Schedule & Boundary Line amended	JHD

Revisions

Client
Satnam

Project
Peel Hall Masterplan

Title
Illustrated Masterplan

Scale	Size	Date	Drawn	Checked
1:2500	A1	JUL. 15	AMZ	DB

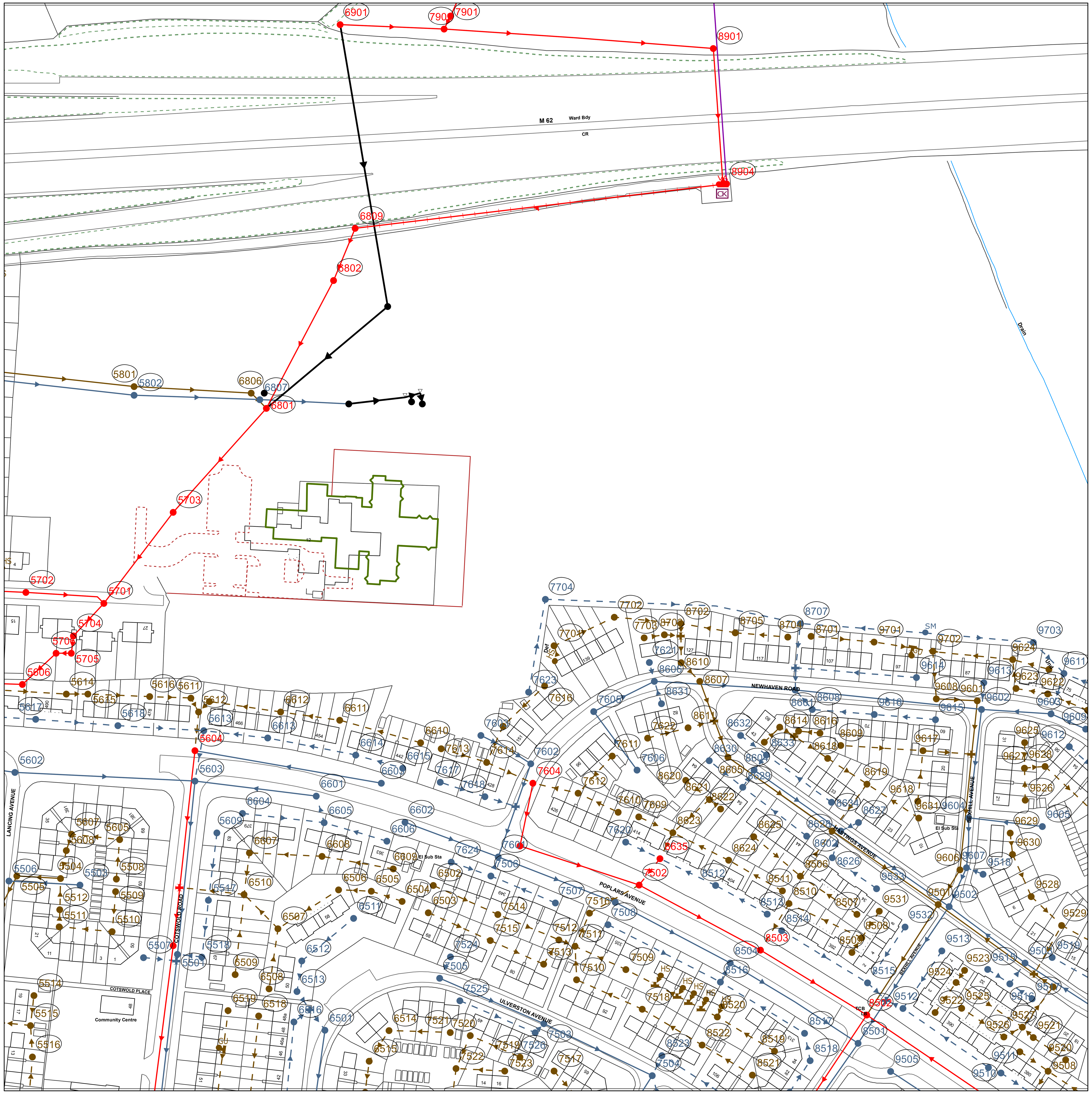
3DReid
12 Caroline Street,
Birmingham,
B3 1TR
t : +44 (0)345 271 6200
w : http://www.3dreid.com

Architecture Conservation
Interiors Masterplanning
Partnerships Sustainability

Drawing No. 140367 - B - 001

Rev. M

APPENDIX B



Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad
8902		CO	0			CI	VC	1.86	

Refno	Cover	Func	Invert	Size.x	Size.y	Shape	Matl	Length	Grad

WASTE WATER SYMBOLOGY

Foul / Surface / Combined / Overflow

- Manhole
- Manhole, Side Entry
- MainSewer, Public
- MainSewer, Private
- MainSewer, S104
- Rising Main, Public
- Rising Main, Private
- Rising Main, S104
- Highway Drain, Private

Foul / Surface / Combined

- WW Site Termination
- Air Valve
- Cascade
- Non Return Valve
- Extent of Survey
- Flow Meter
- Gulley
- Hatch Box
- Head of System
- Hydrobrake / Vortex
- Inlet
- Inspection Chamber
- Bifurcation
- Catchpit
- Contaminated Surface Water
- WW Pumping Station
- Sludge Pumping Station
- Sewer Overflow
- T Junction/Saddle
- LampHole
- OilInterceptor
- PenStock
- Pump
- RoddingEye
- Soakaway
- Summit
- Valve
- Valve Chamber
- Washout Chamber
- DropShaft
- WW Treatment Works
- Septic Tank
- Vent Column
- Network Storage Tank
- Orifice Plate
- Vortex Chamber
- Penstock Chamber
- Blind Manhole

Foul / Surface / Combined / Overflow

- Screen Chamber
- Discharge Point
- Outfall

- Sludge Main, Public
- Sludge Main, Private
- Sludge Main, S104

ABANDONED PIPE

- MainSewer
- Rising Main
- Highway Drain
- Sludge Main

- Control Kiosk
- Unspecified

LEGEND

MANHOLE FUNCTION

FO	Foul
SW	Surface Water
CO	Combined
OV	Overflow

SEWER SHAPE

CI	Circular	TR	Trapezoidal
EG	Egg	AR	Arch
OV	Oval	BA	Barrel
FT	Flat Top	HO	HorseShoe
RE	Rectangular	UN	Unspecified
SQ	Square		

SEWER MATERIAL

AC	Asbestos Cement	DI	Ductile Iron
BR	Brick	PVC	Polyvinyl Chloride
PE	Polyethylene	CI	Cast Iron
RP	Reinforced Plastic Matrix	SI	Spun Iron
CO	Concrete	ST	Steel
CSB	Concrete Segment Bolted	VC	Vitrified Clay
CSU	Concrete Segment Unbolted	PP	Polypropylene
CC	Concrete Box Culverted	PF	Pitch Fibre
PSC	Plastic/Steel Composite	MAC	Masonry, Coursed
GRC	Glass Reinforced Concrete	MAR	Masonry, Random
GRP	Glass Reinforced Plastic	U	Unspecified

The position of underground apparatus shown on this plan is approximate only and is given in accordance with the best information currently available.
The actual positions may be different from those shown on the plan and private pipes, sewers or drains may not be recorded.
United Utilities will not accept any liability for any damage caused by the actual positions being different from those shown.

OS Sheet No: SJ6091NE

Scale: 1: 1250 Date: 15/07/2015

301 Nodes

Sheet 1 of 1

United Utilities
helping life flow smoothly

SEWER RECORDS

OS Sheet No: SJ6091NE

Printed By: Property Searches

Approximately Scale: 1: 1250 Date: 15/07/2015

APPENDIX C

Preliminary Environmental Risk Assessment (Phase I Desk Study)

for

Peel Hall Farm, Mill lane, Warrington

(EMS3165)

For

Satnam Group

November 2011

1967 OS map	No change on site. The Orford area to the south of the site now 500 m away continues to become a more densely populated residential area. The tannery is no longer marked.
1977 OS map	The M62 motorway and associated embankments are constructed running east-west against the site's northern boundary. The density of housing 500 m to the south continues to expand in the newly labelled Hulme residential area.
OS 1987 map	Again little change on site. However, the new residential area of Cinnamon Brow to the east of the site has developed, associated with the motorway junction 10.
OS map 1999-2011	A large reservoir / wetlands lake is now present 550 m north of the site (1999 edition) just beyond the pumping station. Housing density in the surrounding area increases slightly.

2.3 Geological information

Geological maps are presented within the Envirocheck report appendix C.

1: 50,000 British Geological Survey (BGS) map sheet 108 'Runcorn' indicates the site is underlain by Glaciofluvial deposits comprising sand and gravel, underlain by Wilmslow Sandstone bedrock across the majority of the site, with pebbly sandstone, of the Chester pebble bed formation in the north west area of the site. Made ground is unlikely at the site, given its recent history.

Glacial fluvial deposits are typically moderately sorted and bedded sand and gravel deposits often with good bearing capacities and low settlements. They are generally highly permeable as the fines have usually been washed out.

Coal mining area

The site lies within a coal mining area, and a Coal Authority report should be purchased and assessed to confirm the absence of mining voids below ground. However, it is noted that there was no evidence of quarrying, adits or shafts in the immediate vicinity of the site from OS historical maps.

Other geological risks

The potential for collapsible and compressible ground, land slide hazards, and shrink/swell behaviour or running sand are very low at this site.

The site is in a low risk radon area and protective measures are not required.

2.4 Historical BGS borehole records

BGS Historical borehole log records, within the Peel Hall Farm site and its surrounding area have been reviewed, and are summarised in the table below. The BGS borehole location plan for the area, and selected logs are reproduced in appendix D.

Borehole location (distance in m)	BGS borehole reference No. (Envirocheck map ID in brackets)	Geology Summary	Typical SPT 'N' value range
On-site: centre	SJ69SW2041 (38)	Firm to stiff clay to 6 mbgl termination depth	Clay 11 -15
On-site: east	SJ69SW2042 (39)	Soft clayey MG to 2.7 mbgl. Firm sandy clay to 5.7 mbgl. Dense gravels encountered at 5.7 mbgl. Terminated at 6.0 mbgl	MG 3 - 5 Clay 9-15 Sand and Gravel 53
On-site: south	SJ69SW2030 (37)	Loose sand to 3.2 mbgl. Firm to stiff clay to 6.1 mbgl termination depth.	Sand 6 - 9 Clay 14 - 23
Off-site: north (10)	SJ69SW112 (50)	Compact sand to 4.1 mbgl underlain by stiff clay to 5.03 mbgl termination depth.	Sand 17 – 28 increasing with depth. Clay 38
Off-site: south (125)	SJ69SW2028 (55)	Loose sand with trace of peat and organic clay to 2.8 mbgl underlain by stiff clay to 5.1 mbgl underlain by very dense cemented sand	Loose sand 7-12 Stiff clays 17 (Shear strength 100KN/m^2) Very dense partially cemented sand 100+
Off-site: west (1)	SJ69SW2040 (40)	Loose sand to 1.8 mbgl underlain by firm to stiff clay to 6 mbgl termination depth	Sand 3 – 8 Clay 8 – 12 (Shear strength 150KN/m^2)

Notes: MG = Made Ground

Groundwater strikes were encountered in four of the six tabulated boreholes, ranging between 1.4 and 2.6 mbgl.

No visual or olfactory indication of contamination is noted within the soil descriptions. The one instance of made ground appears to be reworked natural material.

The historical boreholes tabulated above indicate ground conditions are variable across the site, often with loose sand in the upper 2 – 3 m underlain by firm to stiff stoney clays, with very dense sand and gravel or cemented sand at 5 - 6 m depth at some locations. One location encountered soft reworked clay in the east of the site (Envirocheck ID 39). Traces of peat and organic clay were noted in the sands off-site to the south (Envirocheck ID 125).

2.5 Hydrogeology

Groundwater vulnerability data from Envirocheck (appendix C) indicates the site is underlain by:

- A principal bedrock aquifer which is highly permeable (sandstone is typically a highly permeable, high porosity rock type with a large groundwater storage capacity); with overlying superficial soil deposits classed as secondary A aquifer type (sand and gravel).

- Soils of low leachability potential are recorded on the groundwater vulnerability map for the area;

The site is also within a groundwater drinking source protection zone III. Zone II is approximately 60 m north. Zone I is 370 m north of the site. The groundwater source itself is 560 m north of the site, this corresponds with the pumping station noted on current and historical maps.

The site's groundwater is assumed to be moderately to highly susceptible to groundwater contamination given the site's proximity to a source protection zone and potentially highly permeable underlying soils and bedrock.

2.6 Hydrology

The following surface water features were noted during the site walkover and from available site maps (appendix C):

- A series of field drains and small ponds are located south of the site, marked within 10 m of the site's southern boundary (OS 2011 map);

- Cinnamon brook is located 125 m east of the site;

- Spa brook is located 250 m north west of the site, Black Brook also runs 500 m south east of the site;

- A large wetland lake/reservoir is located approximately 600 m north of the site's boundary, beyond the pumping station.

Pollution incidents to controlled waters

Five pollution incidents to controlled water have been recorded within 250 m of the site, all are minor incidents typically relating to rubbish or septic tank overflows to small brooks, the nearest incident to the site was 90 m south west of the site (pollution type: ochre).

Sensitive land use

The site lies within an area of adopted 'Greenbelt' land administered by Warrington Borough Council. Typically urban development may be resisted in these areas and the council should be consulted on this at an early stage.

North of the site, beyond the M62, the land is classified as a nitrate vulnerable zone.

Flooding risk

The site is not located within an Environment agency assessed area of flood risk.

2.7 Landfills and waste

No current or historical landfill, or waste transfer stations are recorded within 2000 m of the site's boundary.

A4
ORIGINAL
PLOT SIZE

Rev	Date	Details	Drawn by	Checked by	Approved by

Bristol
Cambridge
Cardiff
London
Welwyn Garden City

tpa
Transport Planning Associates

21 Berkeley Square
Clifton
Bristol
BS8 1HP

0117 925 9400
www.tpa.uk.com

CLIENT:
SATNAM PLANNING SERVICES LTD

PROJECT:
Peel Hall Farm
Warrington

TITLE:
EA Flood Maps
Rivers and Sea Indicative
Flood Map

STATUS:
INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	06.07.15	PG	RB	LF

JOB NO:	DRAWING NO:	REVISION:
1506-45	SK01	-

A4
ORIGINAL
PLOT SIZE

Rev	Date	Details	Drawn by	Checked by	Approved by

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Clifton
Bristol
BS8 1HP

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www.tpa.uk.com

CLIENT:
SATNAM PLANNING SERVICES LTD

PROJECT:
Peel Hall Farm
Warrington

TITLE:
EA Flood Maps
Surface Water Indicative
Flood Map

STATUS:
INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	06.07.15	PG	RB	LF

JOB NO:	DRAWING NO:	REVISION:
1506-45	SK02	-

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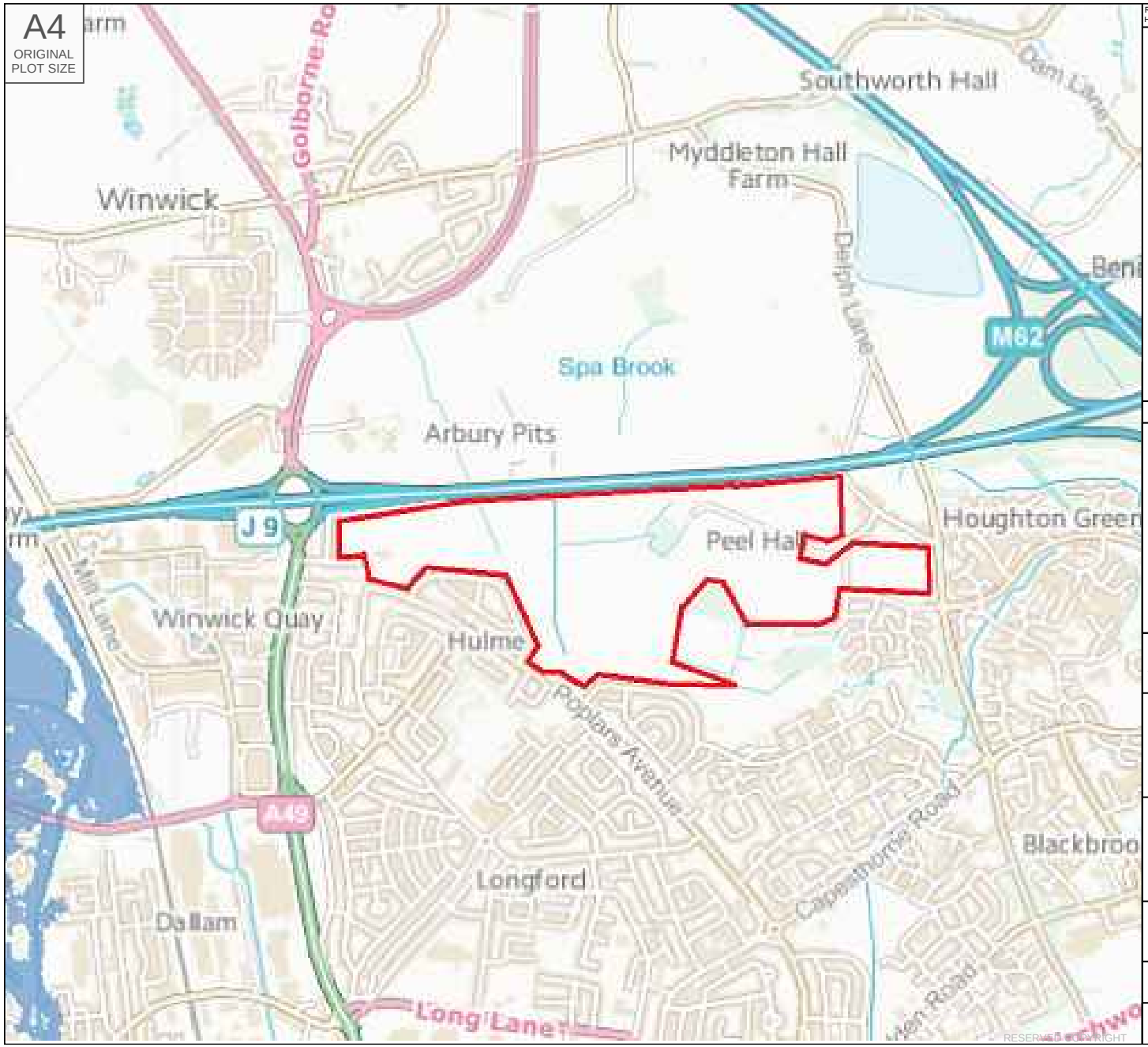
PLOT SIZE



Rev	Date	Details	Drawn by	Checked by	Approved by

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Bristol
BS8 1HP

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CLIENT:
SATNAM PLANNING SERVICES LTD

PROJECT:
Peel Hall Farm
Warrington

TITLE:
EA Flood Maps
Reservoir Indicative
Flood Map

STATUS:
INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	06.07.15	PG	RB	LF

JOB NO:	DRAWING NO:	REVISION:
1506-45	SK03	-

A4
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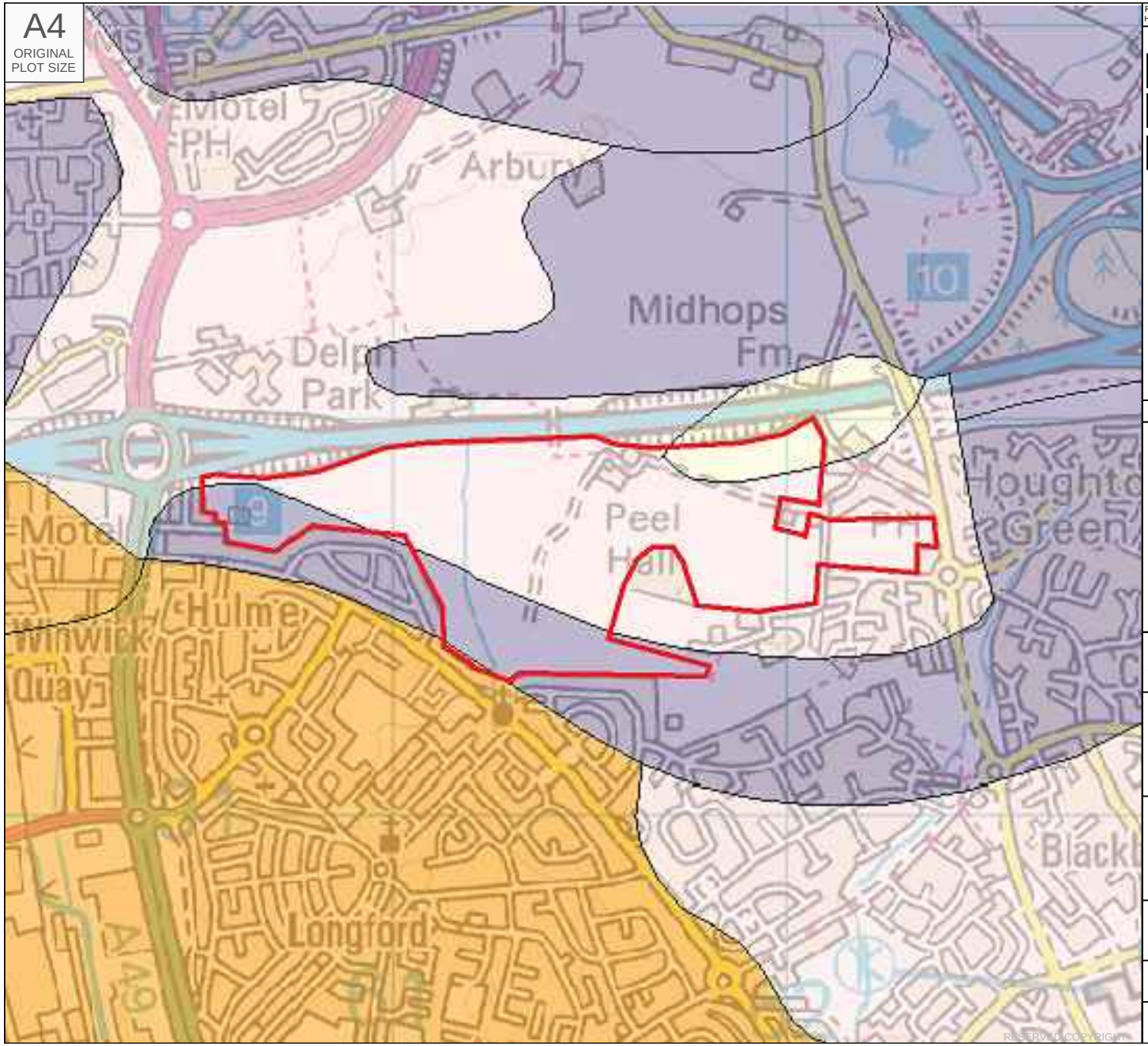
PLOT SIZE



Major Aquifer High Vulnerability

Major Aquifer Intermediate Vulnerability

Minor Aquifer High Vulnerability

Rev	Date	Details	Drawn by	Checked by	Approved by

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Clifton
Bristol
BS8 1HP

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CLIENT:
SATNAM PLANNING SERVICES LTD

PROJECT:
Peel Hall Farm
Warrington

TITLE:
EA Flood Maps
Grounwater Vulnerability
Flood Map

STATUS:
INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
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JOB NO:	DRAWING NO:	REVISION:
1506-45	SK04	-

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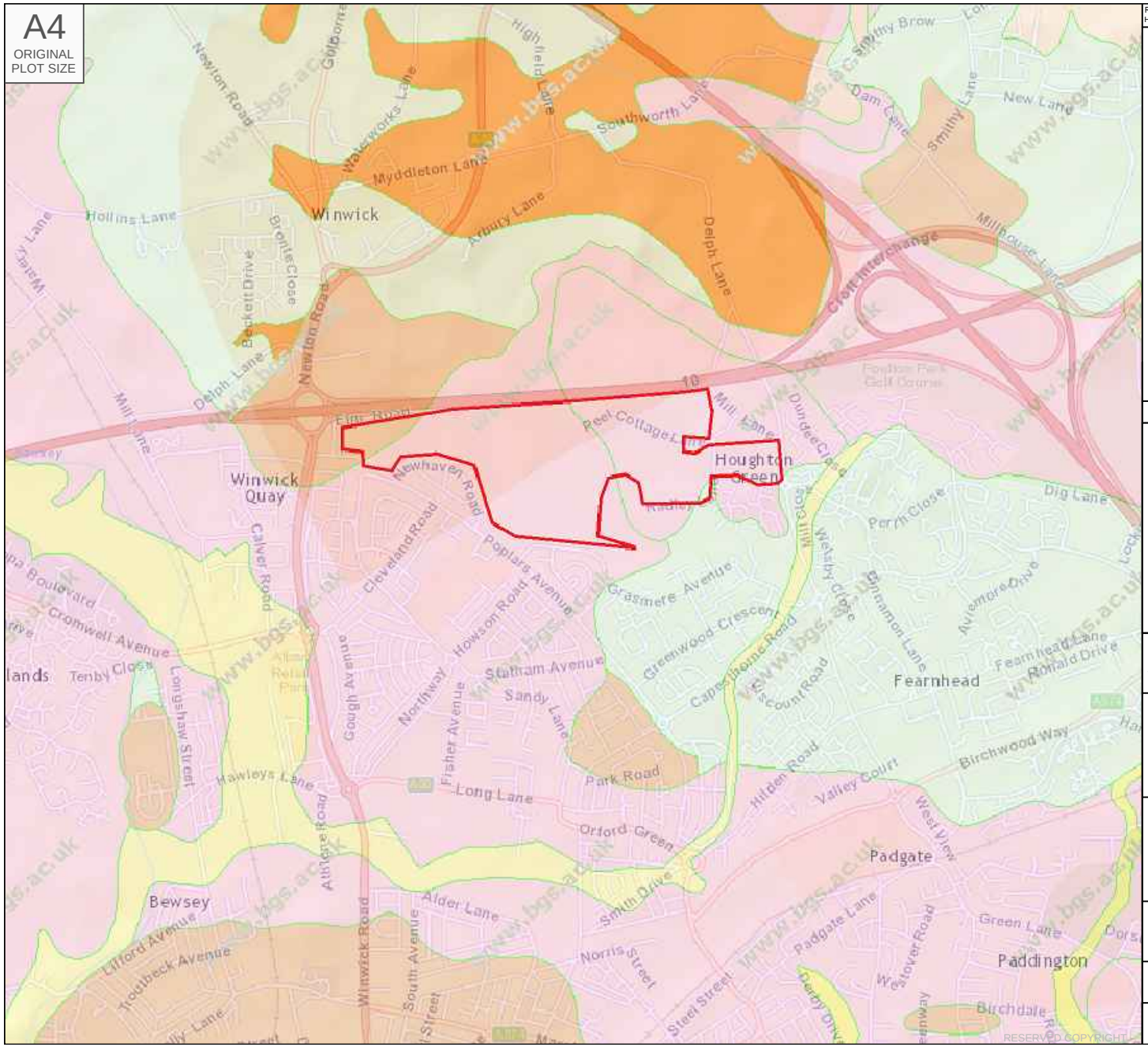

Rev	Date	Details	Drawn by	Checked by	Approved by

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Cambridge
Cardiff
London
Welwyn Garden City

tpa Transport Planning Associates

21 Berkeley Square
Clifton
Bristol
BS8 1HP

0117 925 9400
www.tpa.uk.com

CLIENT:
SATNAM PLANNING SERVICES LTD

PROJECT:
Peel Hall Farm
Warrington

TITLE:
BGS Geology Maps

STATUS:
INFORMATION

SCALE:	DATE:	DRAWN:	CHECKED:	APPROVED:
NTS	02.07.15	PG	RB	LF

JOB NO:	DRAWING NO:	REVISION:
1506-45	SK05	-

Warrington Borough Council Strategic Flood Risk Assessment

Volume II - SFRA Technical Report

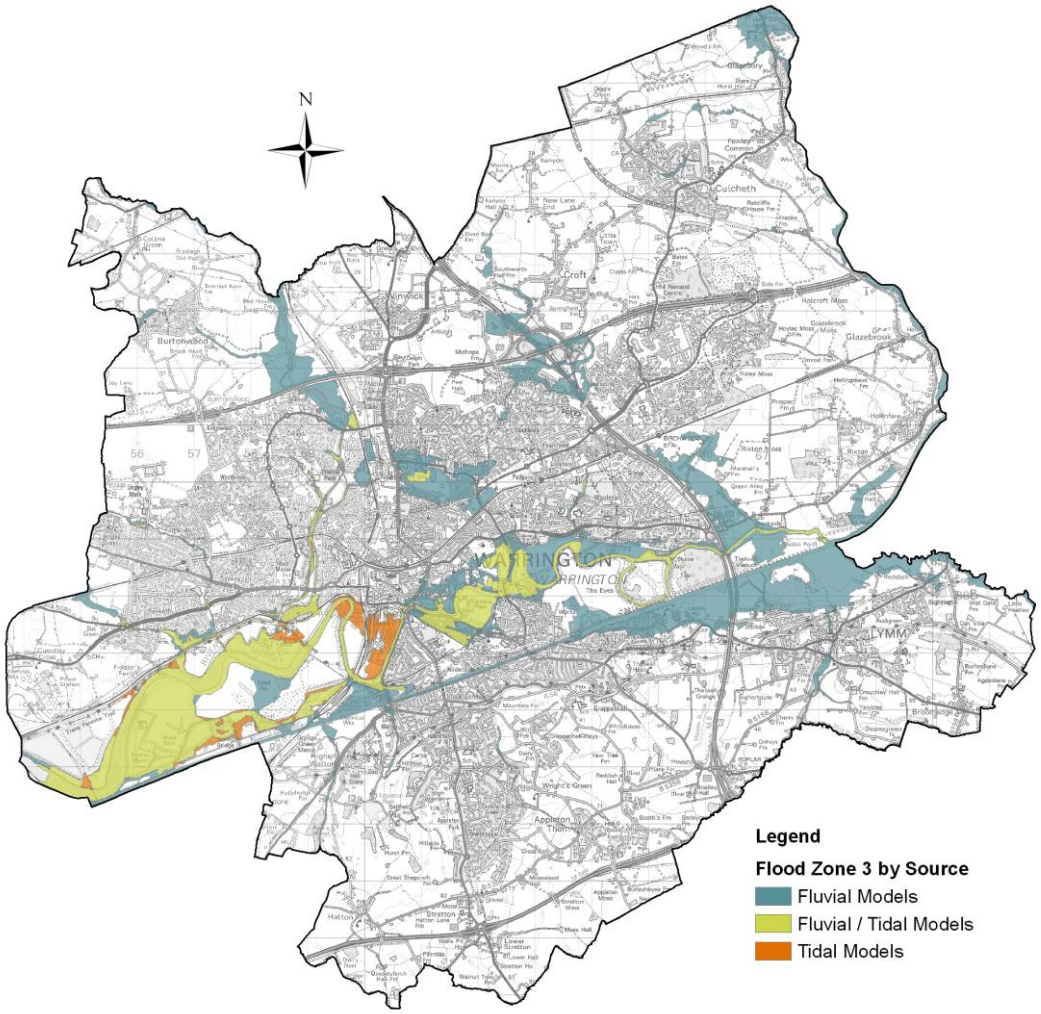
September 2011

Warrington Borough Council
New Town House
Butter Market Street
WARRINGTON
Cheshire
WA1 2NH

3.3.1 Environment Agency Flood Map

The Environment Agency Flood Map provides flood extents for the 1 in 100-year fluvial, 1 in 200-year tidal and the 1 in 1000-year fluvial and tidal flood events. As Warrington is at risk from fluvial and tidal flooding (or a combination of both), these flood zones can help identify the source of flooding as illustrated in Figure 3-1.

Figure 3-1: Flood Zone 3 by Source



Flood zones were originally prepared by the Environment Agency using a methodology based on the national digital terrain model (NextMap), derived river flows (Flood Estimation Handbook (FEH)) and two dimensional flood routing. Since their initial release, the Environment Agency has updated the zones with detailed hydraulic modelling studies. This SFRA uses the Environment Agency Flood Map issued in June 2011.

Table 3-3 identifies the modelling study and date of all main river Flood Zones through Warrington.

Table 3-3: Main River Flood Zones by Study and Date

Main River	Date	Study
River Mersey	2010	Warrington Flood Risk Management Strategy - updated in late 2010 to include the failure of the Manchester Ship Canal sluice gates. The inclusion of the Manchester Ship Canal was not included until February 2011.

Main River	Date	Study
Padgate Brook	2010	Warrington Flood Risk Management Strategy
Spittle Brook	2010	Warrington Flood Risk Management Strategy
Sankey Brook (downstream of M62)	2010	Warrington Flood Risk Management Strategy
North Park Brook	2010	Warrington Flood Risk Management Strategy
Penketh Brook	2010	Warrington Flood Risk Management Strategy
Lumb Brook	2009	Mersey Esturary Tributaries Flood Risk Management Study
Longford Brook	2010	Warrington Flood Risk Management Strategy - the Longford/Dallam Joint Modelling outputs have not been included in the current flood zones.
Dallam Brook	2010	Warrington Flood Risk Management Strategy - the Longford/Dallam Joint Modelling outputs have not been included in the current flood zones.
River Glaze	2008	Middle and Lower Mersey Areas Benefitting from Defences and Flood Zone 2 Study
Carr Brook	2008	Middle and Lower Mersey Areas Benefitting from Defences and Flood Zone 2 Study
Jibcorft Brook	2008	Middle and Lower Mersey Areas Benefitting from Defences and Flood Zone 2 Study
Holcroft Lane Brook	2008	Middle and Lower Mersey Areas Benefitting from Defences and Flood Zone 2 Study
Whittle Brook	2008	Middle and Lower Mersey Areas Benefitting from Defences and Flood Zone 2 Study
Thelwall Brook	2007	Thelwall Brook Flood Zone Map Challenge
Sankey Brook (upstream of M62)	2003	Sankey Brook Flood Risk Mapping Study
Phipps Brook	2003	Middle and Lower Mersey Flood Risk Management Study
Watercourses not provided in this list are either non main rivers or do not have flood zones associated with them at the time of this SFRA.		

The Flood Map is precautionary in that it does not take account of flood defences (which can be breached, overtopped or may not be in existence for the lifetime of the development) and, therefore, represent a worst-case extent of flooding. They do not consider sources of flooding other than fluvial and tidal, and do not take account of climate change.

As previously mentioned, the operation of the Manchester Ship Canal significantly reduces fluvial risk along the River Mersey as the majority of water flows down the canal. However, the flood risk management element of the canal has only recently been acknowledged by the Environment Agency in their Flood Map (February 2011). The impact of the Manchester Ship Canal on flood zones through Warrington has been derived using a modelling scenario that assumes the sluice gates at Latchford Locks are closed. This approach is based on the view that the sluice gates act as a flood defence and follows PPS25 and the Environment Agency's national approach to flood zones by showing what would be at risk ignoring the presence of defences.

Users of the Flood Map should be aware that the Environment Agency has received a judicial review challenge to the mapping of the Manchester Ship Canal at Trafford, Salford and Warrington on the ground that the preparation of the map is flawed in respect of our consideration of the role of the sluice gates in preventing flooding.

The Environment Agency is defending the challenge and believe and are advised that it is ill-founded. Nevertheless, pending determination of the challenge, users of the map need to consider whether the existence of the challenge, and the basis of it, affects the weight they judge may be given to the zoning of the Manchester Ship Canal within the Flood Map.

As such, Flood Mapping of the Manchester Ship Canal in Trafford, Salford and Warrington may be subject to revision in the Environment Agency's August 2011 update as a result of representations.

direct overtopping from Sankey Brook. Within the Callands residential area, ground levels rise rapidly, however residential properties adjacent to the Sankey Valley Park are at risk of inundation from rising floodwaters in Sankey Brook.

The most extensive flooding of urban areas ever recorded in the catchment occurred in the lower reaches of Sankey Brook, around the Sankey Bridges area, in 1978. Tidal inundation as well as the combined effects of fluvial and tidal flooding affects this area. In the case of Sankey Bridges, the mill bridge over Liverpool Road is a known obstruction to flow and its hydraulic behaviour is highly influenced by downstream water levels in the River Mersey.

The St. Helens (Sankey) Canal acts as a bypass channel during periods of high flow, and therefore provides some flood alleviation; a series of mechanisms have been constructed to divert overflows from Sankey Brook into the canal system (flood alleviation scheme 1976). A maximum 20m³/s is estimated to be transferred from the Brook into the Canal overflow at Dallam, increasing the flow in the canal to 33m³/s. From this point, the Brook and the Canal continue to interact and exchange flow at various locations.

According to the Mersey Estuary CFMP, the onset of significant flooding is expected to occur in events just smaller than the 1 in 20-year event, where 130 houses and 56 industrial/commercial properties in the Sankey Bridges area are thought to be at risk. This rises to 313 houses and 71 industrial/commercial properties in a 1 in 75-year event.

3.5.2 Longford Brook and Dallam Brook

Longford Brook and Dallam Brook are two key tributaries to Sankey Brook, which drain the urban area of Orford. Both tributaries are highly urbanised and have been extensively modified during the last 50 years.

The area drained by Longford Brook is low lying with little or no gradient, water levels in both Dallam and Longford Brook are largely dominated by water levels on the Sankey Brook. A barrage was constructed on Longford Brook during the 1980s to prevent water backing up along the channel. The barrage consists of twin-flapped orifices and a duty/standby pump arrangement, which pumps Longford flows to the Dallam Brook during flood conditions.

United Utilities operates the pumping station on Longford Brook, which is an inherited asset. The condition of the pumping station is currently poor, with the exact operating rules unknown. There is significant risk of siltation and accumulation of debris upstream of the station, which may reduce/alter its efficiency.

Both United Utilities and the Environment Agency have undertaken separate modelling studies to investigate and quantify flood risk to the area in recent years, however due to the complex and urban nature of the catchment, it was considered that both the fluvial system and drainage network would have to be considered in tandem to fully understand flooding mechanisms. As such, United Utilities and the Environment Agency assessed the flood risk along Longford and Dallam Brook through a joint study[11] in 2010. The aim of the study was to produce robust flood maps for the Orford area taking account of flood risk from both surface water sewer and fluvial sources.

The modelling carried out in the study has demonstrated that the Orford area is at significant risk of flooding from a range of flood events, from both fluvial and surface water sources, and that the Longford Barrage is critical in controlling flood risk. Whilst the United Utilities and the Environment Agency study does not yet represent a base condition of the system, its probability represents the best estimate of the Longford and Dallam area and the fluvial sewer systems. An integrated approach to modelling, as used in this study, will be required to fully understand flood risk in this area.

Currently the Longford/Dallam Joint Modelling outputs have not been included in the Environment Agency Flood Map. United Utilities are currently further improving the modelling in Longford/Dallam with an Integrated Catchment Model.

[11] Halcrow (2010) Dallam and Longford Joint Study

3.5.3 Spittle Brook and Padgate Brook

Spittle and Padgate Brooks are located in central of Warrington and are minor tributaries of the River Mersey. Spittle Brook and Padgate Brook have catchment areas of 22km² and 6km² respectively. Both watercourses are heavily urbanised, flowing through the urban centres of Warrington before discharging into the River Mersey upstream of Howley Weir.

This whole area was farmland until the 1970s when it became urbanised as part of the New Town. During this development, Spittle Brook was realigned creating a noticeable dogleg. There are two main areas of flood risk on Spittle Brook. At Cinnamon Brow, the channel contains a sharp bend that slows the flow of water. Close to this, a pumping station owned by the Coal Board and operated for the purposes of draining and area that has subsided, transfers water from Cinnamon Brook to the channel. There is therefore a residual risk associated with the pumping station if incorrectly operated or fails.

Both watercourses were included in the Warrington Flood Risk Management Strategy modelling (2008) and the Warrington Flood Hazard Mapping project (2010). According to the Warrington Strategy, onset of significant flooding along Padgate Brook occurs between a 1 in 75-year and 1 in 100-year flood event. In the 1 in 75-year event, 42 houses are at risk. The Warrington Strategy modelling notes that there is a potential for a considerable volume of water passing between Spittle Brook and Padgate Brook via the Solway Close area (immediately south of the M62). However, as the Strategy modelling was undertaken in 1D there was a degree of uncertainty with this flooding mechanism. During the Warrington Flood Hazard mapping study, a 2D model was used to represent the area confirming the flood flow route.

On the back of the Warrington Strategy and in consideration of the September 2008 flood event, which affected upon the Solway Close area, the hydrology of Spittle Brook and Padgate Brook was re-evaluated in August 2010 for the Warrington M2 PAR. The updated hydrology reduces the flow along both Brooks (e.g. during the 1 in 100-year event flow along Spittle Brook has fallen from 15.75m³/s to 9.18 m³/s), which may alter (lower) the amount of water leaving the Brooks and entering the Longford/Dallam system.

As of yet, the hydrology calculated in this study have not been transferred into any update model and as such, the current Environment Agency Flood Map is still based on modelling carried out during the Warrington Flood Risk Management Strategy.

3.5.4 Penketh and Whittle Brook

Penketh and Whittle Brooks are located in the north-west of Warrington BC. Both watercourses originate outside of Warrington BC in St Helens, and flow in a southeasterly direction through farmland before entering the areas of Great Sankey and Penketh.

Whilst Whittle Brook itself has remained open, urban development and structures pose significant restrictions to flow. This is most notable at Barrow Hall Bridge, where limited capacity results in a greater extent of flooding on the Great Sankey High School sports field. Downstream of Barrow Hall Bridge the watercourse flows through an area previously subjected to a river rehabilitation scheme. Whittle Brook turns south as it flows through Penketh. There are a number of further obstructions including the railway line, A57, A582 and the St Helens Canal. Downstream of Penketh, Whittle Brook flows into Sankey Brook just upstream of the confluence of Sankey Brook and the River Mersey.

There are two distinct variations in the Flood Zones surrounding Penketh Brook marked by Brookside Farm. Upstream of the farm the Flood Zones are based on early Environment Agency broad scale modelling and are wide. They do not take account of channel capacity and obstructions such as the railway line. Downstream of the farm, Penketh Brook has been modelled in detail during the Warrington Strategy. These Flood Zones are narrower and do take into account the influence of culverts and road bridges.

Downstream of the A564, Penketh Brook is culverted below residential properties along Tragan Drive and Station Road, re-emerging within the recreation ground to the east. This culvert surcharges during the 1 in 100-year event, causing flooding to those properties along

Figure 4-4 identifies blockage as the main cause of sewer flooding (7745 incidents across Warrington as a whole from 1983 to 2008) with the highest number of incidents focused within the urban centres. However, analysing both Figure 4-4 and Figure 4-5 suggests that whilst blockage is the biggest cause of sewer related incidents, it mainly results in foul flooding of properties, gardens and highways; there are very few incidents of surface water flooding effects.

Figure 4-4 identifies hydraulic incapacity as another major cause of flooding (296 incidents across Warrington as a whole from 1983 to 2008). It could be viewed that this cause is probably more related to this SFRA, as it will have an impact on the amount of pluvial flow captured by the sewer system and how quickly the sewer system reaches its capacity and surcharges.

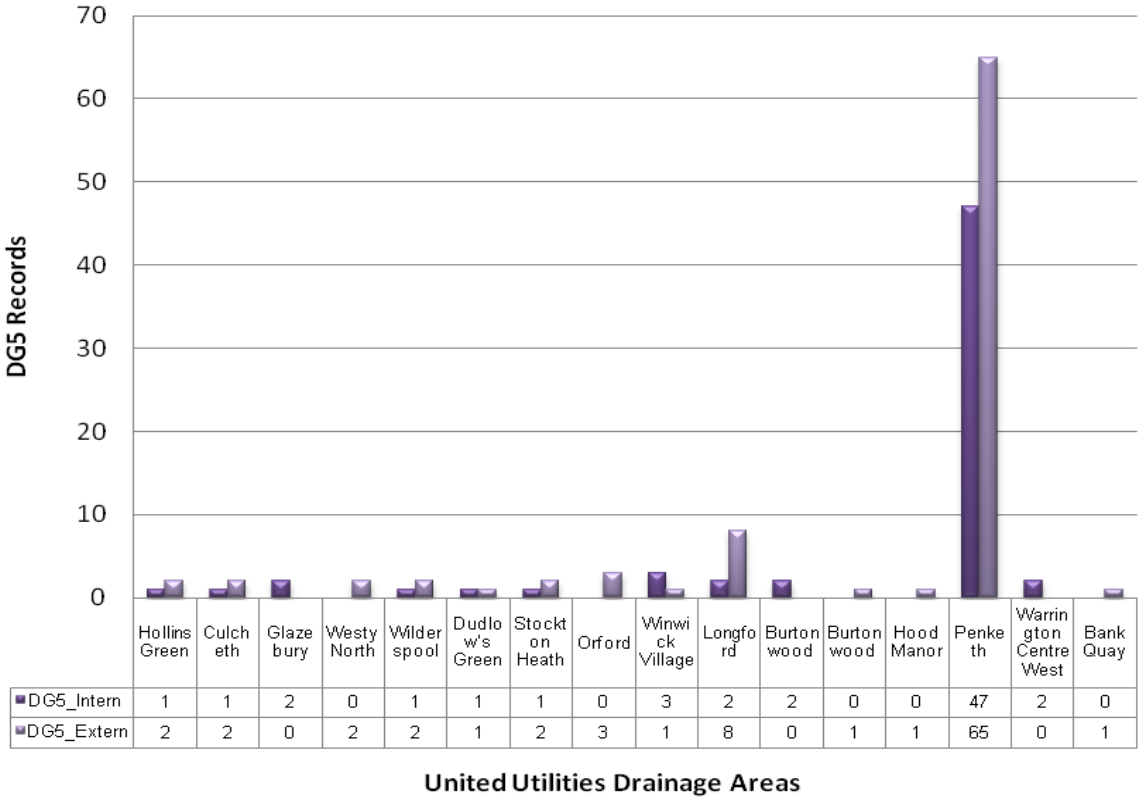
One of the largest effects identified in Figure 4-5 from the historical incidents are 'surcharged systems'. After reviewing the data and consulting with United Utilities, it is indistinguishable what the surcharged system incidents would then result in (foul or surface water flooding) as all sewer flooding will have discharged from the system in some form. It is also unlikely that only purely 'clean' flooding would occur in any event. As part of this SFRA, it is therefore assumed that 'surcharged system' could relate to either surface water or foul flooding.

4.3.3 United Utilities DG5 "at risk register"

United Utilities provided internal and external DG5 records at a property level for use in the SFRA. DG5 records are a dataset of all properties flooded from the drainage system, with internal records being those where sewer flooding has occurred within the property and external relating to those areas outside.

Figure 4-6 provides a comparison of the total number of properties on the internal and external DG5 register. The Penketh area has significantly more properties on the internal and external DG5 register at 47 and 65 respectively than any other area in Warrington BC. Longford is the next drainage area with the highest number of DG5 records with 10 properties.

Figure 4-6: United Utilities Internal & External DG5 Records Graph

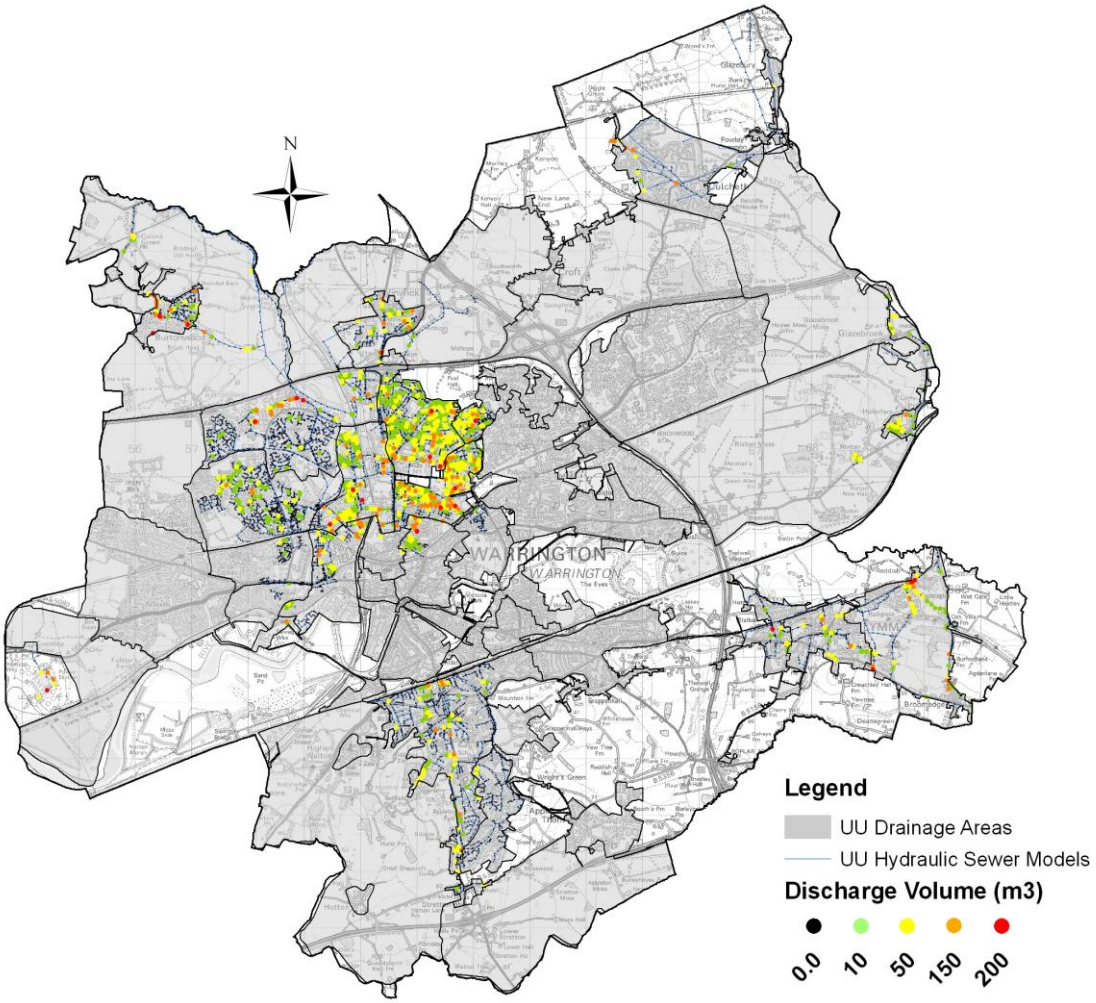


	Hollins Green	Culcheth	Glazebury	Westy North	Wilderspool	Dudlow's Green	Stockton Heath	Orford	Winwick Village	Longford	Burtonwood	Burtonwood	Hood Manor	Penketh	Warrington Centre West	Bank Quay
DG5_Intern	1	1	2	0	1	1	1	0	3	2	2	0	0	47	2	0
DG5_Extern	2	2	0	2	2	1	2	3	1	8	0	1	1	65	0	1

Figure 4-8 illustrates the volume discharged (m^3) by each manhole during the 1 in 30 year flood event at a strategic scale. Each manhole has been colour coded to indicate the total flood volume.

Whilst this map allows a high-level analysis of sewer flood risk to be made there are a number of limitations with the data that must be acknowledged. Firstly, not all sewer networks in Warrington have been modelled; those that are identify previous high-risk areas from other sources (fluvial and surface water). United Utilities have run all models available, although age and confidence in the models are unknown. Older models may be outdated because of sewer network improvements. The data, shown as it is, does not provide an illustration of which areas would be affected once the floodwater is discharged from the system only where the discharge would occur. For example, floodwater may flow down streets, through properties, nearby watercourses or simply re-enter the sewerage systems further downstream.

Figure 4-8: 1 in 30 years Sewer Flooding



4.3.5 Sewer Flooding Conclusion

Whilst the DG5, SIRS and WIRS registers can give an idea of those areas with limited drainage capacity, or are susceptible to blockage and may result in flooding to properties, gardens or highways, it must be acknowledged that they are purely a historical register of incidents or properties that have already been flooded. They do not provide the data required to assess the current risk of flooding.

For these reasons, the historical registers obtained for the SFRA have limited usefulness in predicting future flooding locations alone. In addition to this, sewer flooding problems may have been resolved since the incident occurred or the register was compiled during ongoing sewer improvements by United Utilities. Current and future schemes are discussed in Section7.4.

What they do is provide a good starting point and useful dataset in validating alternative data sources such as the Environment Agency's Areas Susceptible to Surface Water Flooding and Flood Map for Surface Water as discussed in Section 4.2.1.

4.4 Groundwater Flooding

Groundwater flooding is caused by the emergence of water from underground, either at point or diffuse locations. The occurrence of groundwater flooding is usually local and unlike flooding from rivers and the sea, does not generally pose a significant risk to life due to the slow rate at which the water level rises. However, groundwater flooding can cause significant damage to property, especially in urban areas, and can pose further risks to the environment and ground stability. There are several mechanisms, which produce groundwater flooding including:

- Prolonged rainfall
- High in bank river levels
- Artificial structures
- Groundwater rebound
- Mine water rebound

4.4.1 Areas Susceptible to Groundwater Flooding

The Environment Agency's national dataset, Areas Susceptible to Groundwater Flooding (AStGWF), provides the main dataset used to asses the future risk of groundwater flooding. The top two susceptibility bands of the British Geological Society (BGS) 1:50,000 Groundwater Flood Susceptibility Map derives the AStGWF map and thus covers consolidated aquifers (chalk, sandstone etc., termed 'clearwater' in the data attributes) and superficial deposits. It does not take account of the chance of flooding from groundwater rebound.

The AStGWF map uses four susceptible categories to show proportion of each 1km grid square where geological and hydrogeological conditions show that groundwater might emerge. It does not show the likelihood of groundwater flooding occurring.

In common with the majority of datasets showing areas which may experience groundwater emergence, this dataset covers a large area of land, and only isolated locations within the overall susceptible area are actually likely to suffer the consequences of groundwater flooding.

Unless an area identified as 'susceptible to groundwater flooding' is also identified as 'at risk from surface water flooding', it is unlikely that this location would actually experience groundwater flooding to any appreciable depth, and therefore it is unlikely that the consequences of such flooding would be significant.

4.4.2 Groundwater Flooding in Warrington

As well as the national Groundwater Flood Map, there are a number other national and more local datasets and studies which contain some details about possible groundwater flooding in Warrington.

The Environment Agency's CFMPs identified a number of locations in Warrington, including significant areas of the River Glaze and Sankey Brook that are at risk of groundwater flooding

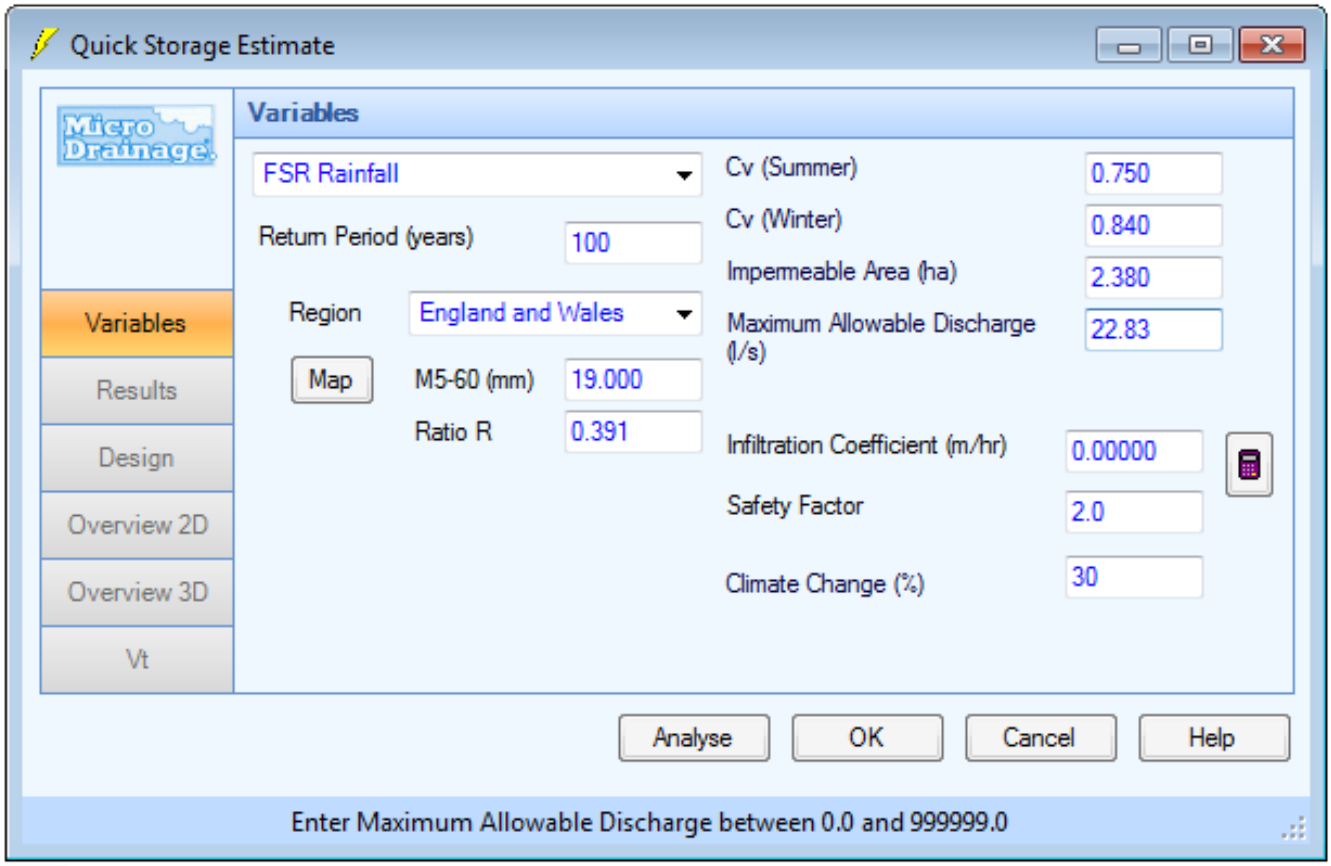
APPENDIX D

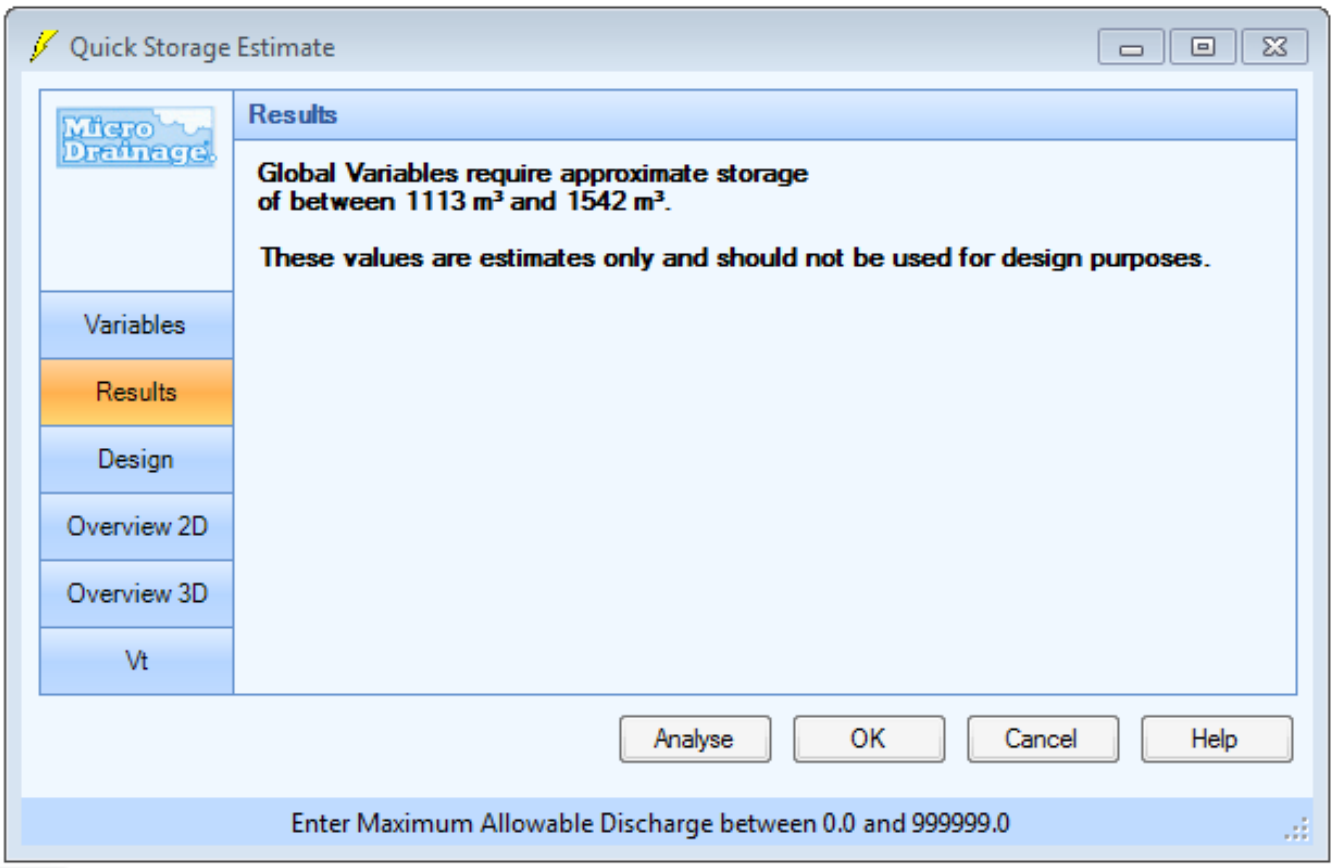
IH 124 Mean Annual Flood

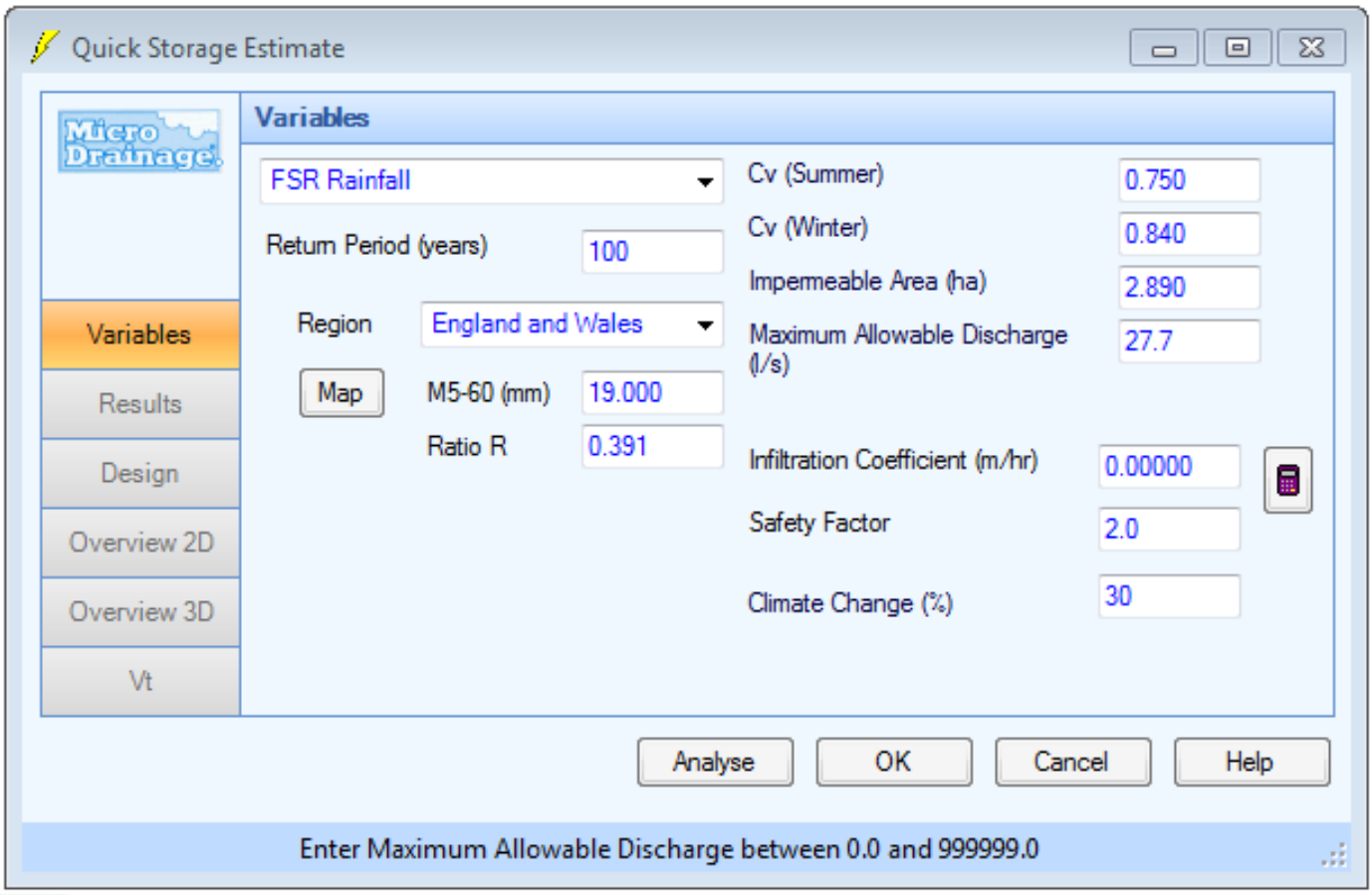
Input

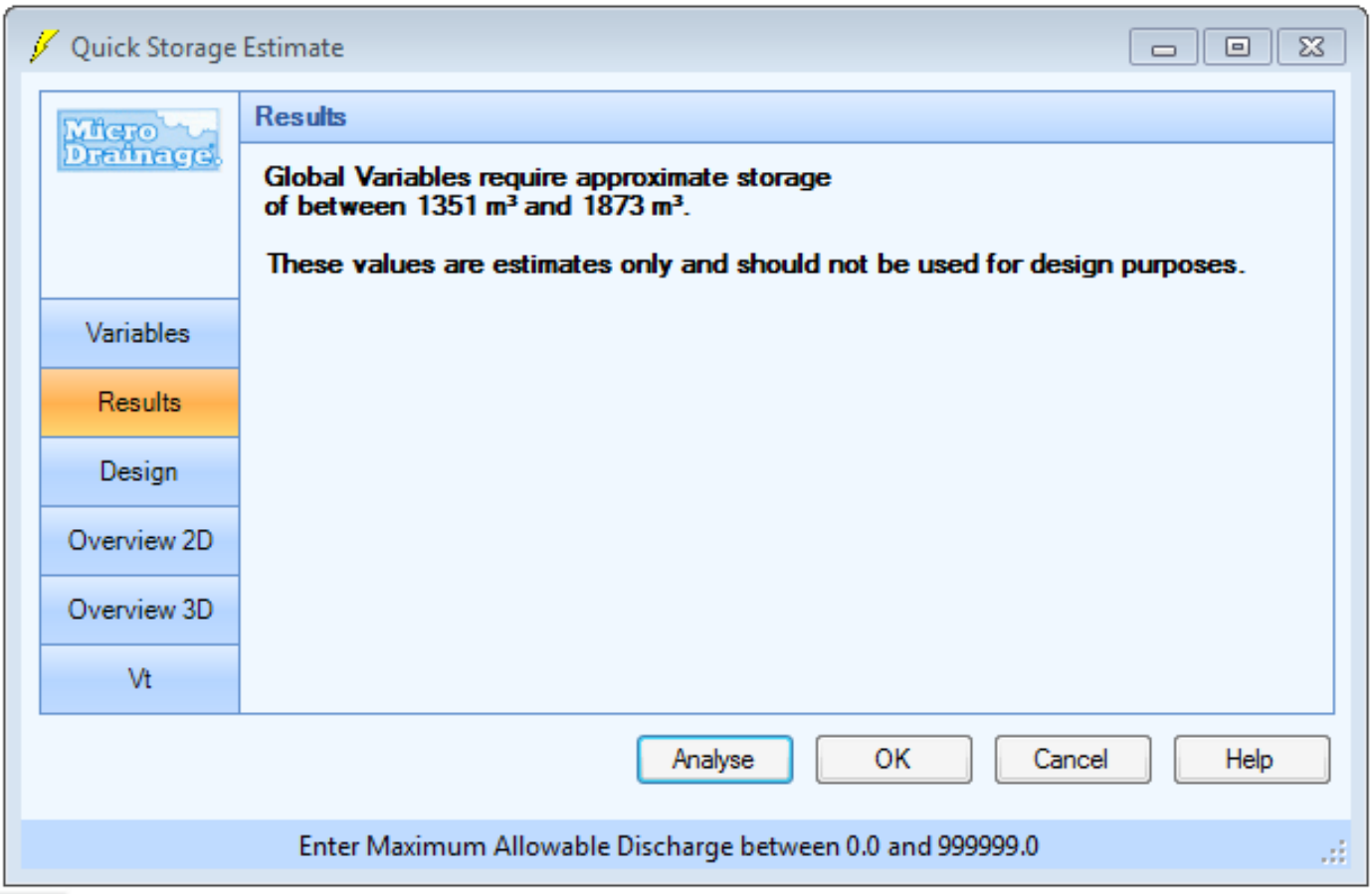
Return Period (years)	100	Soil	0.450
Area (ha)	63.580	Urban	0.000
SAAR (mm)	836	Region Number	Region 10

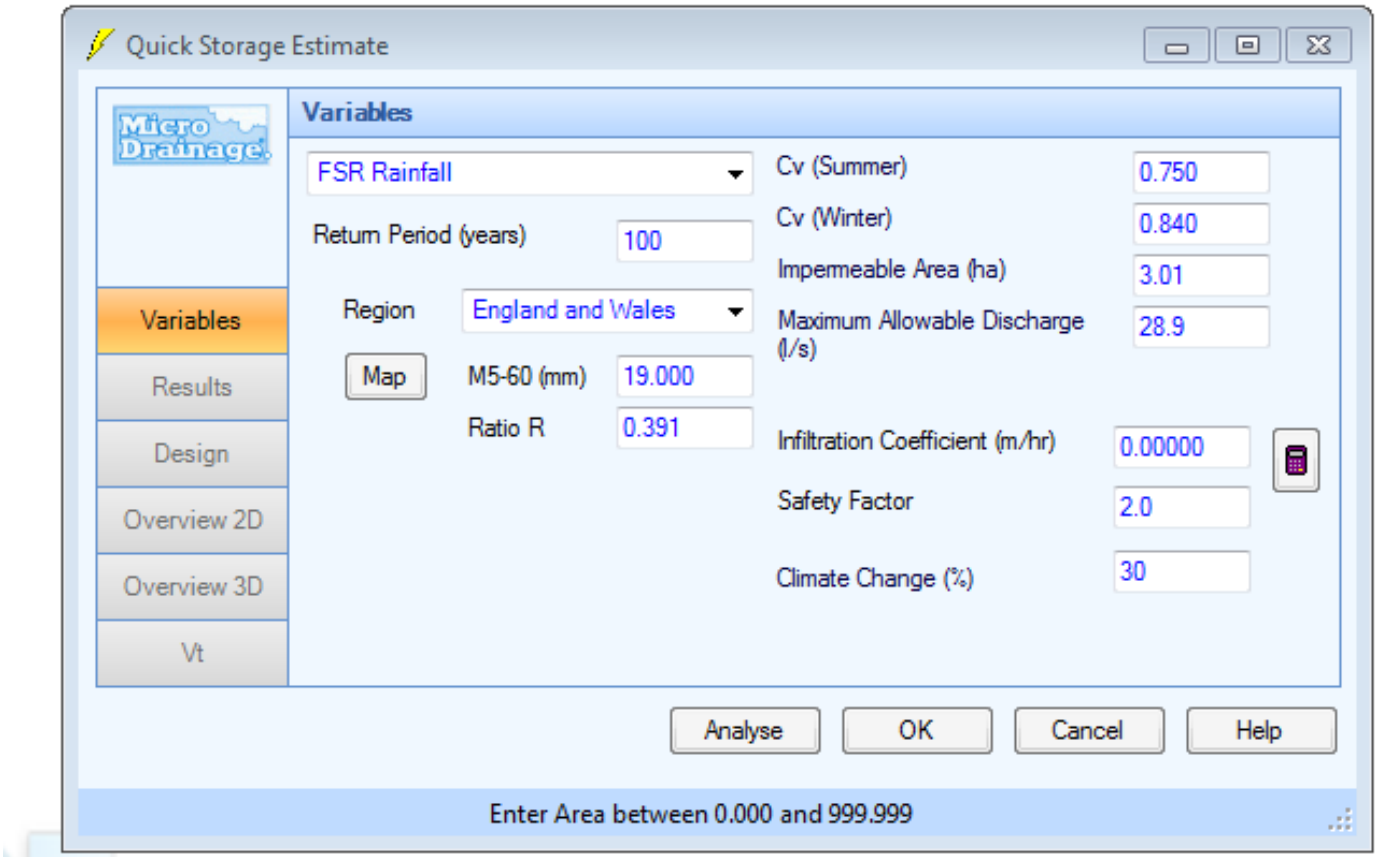
Results	**l/s**
QBAR Rural	334.8
QBAR Urban	334.8
Q100 years	696.5
Q1 year	291.3
Q2 years	311.9
Q5 years	398.5
Q10 years	462.1
Q20 years	526.4
Q25 years	549.1
Q30 years	567.7
Q50 years	619.4
Q100 years	696.5
Q200 years	790.2
Q250 years	820.3
Q1000 years	1017.9

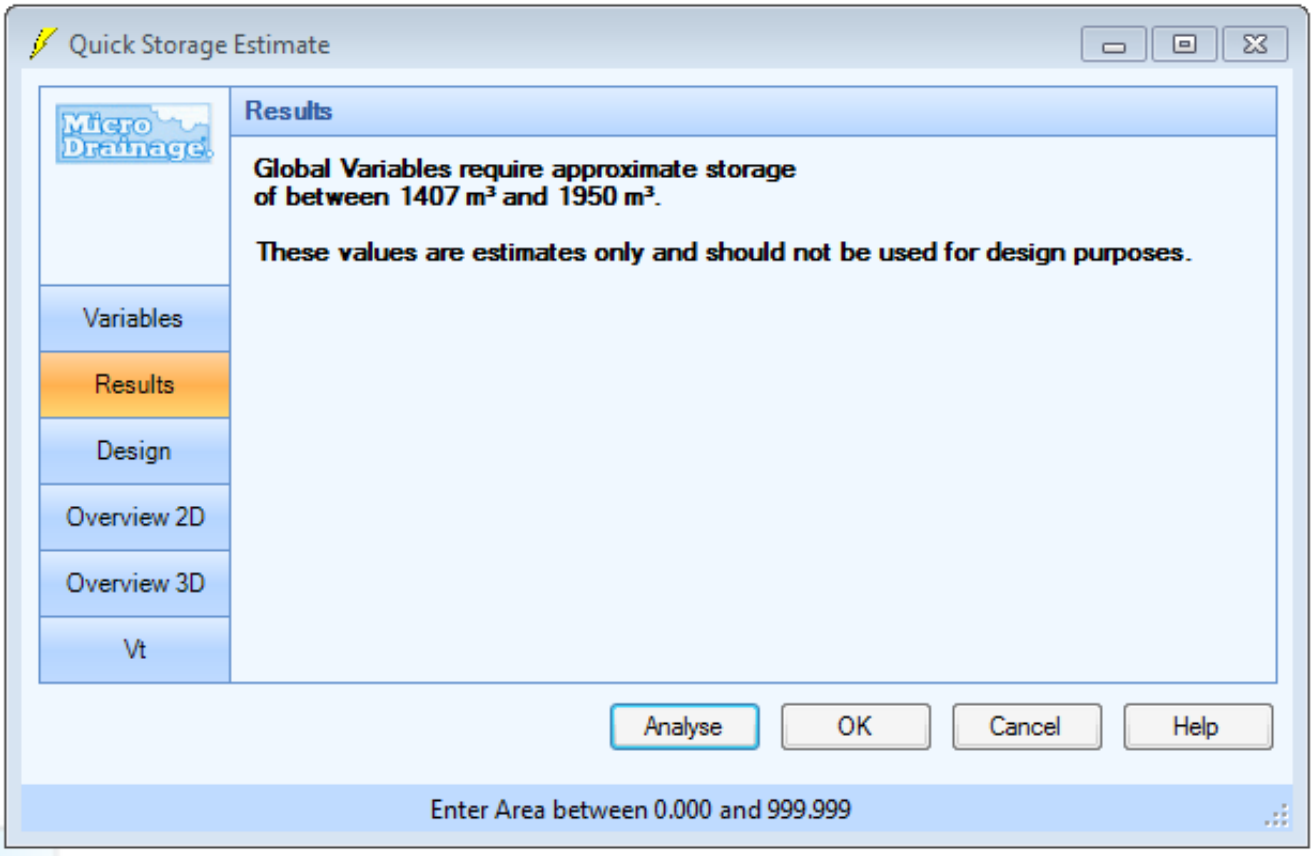

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
2.380
Maximum Allowable Discharge (l/s)
22.83
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0

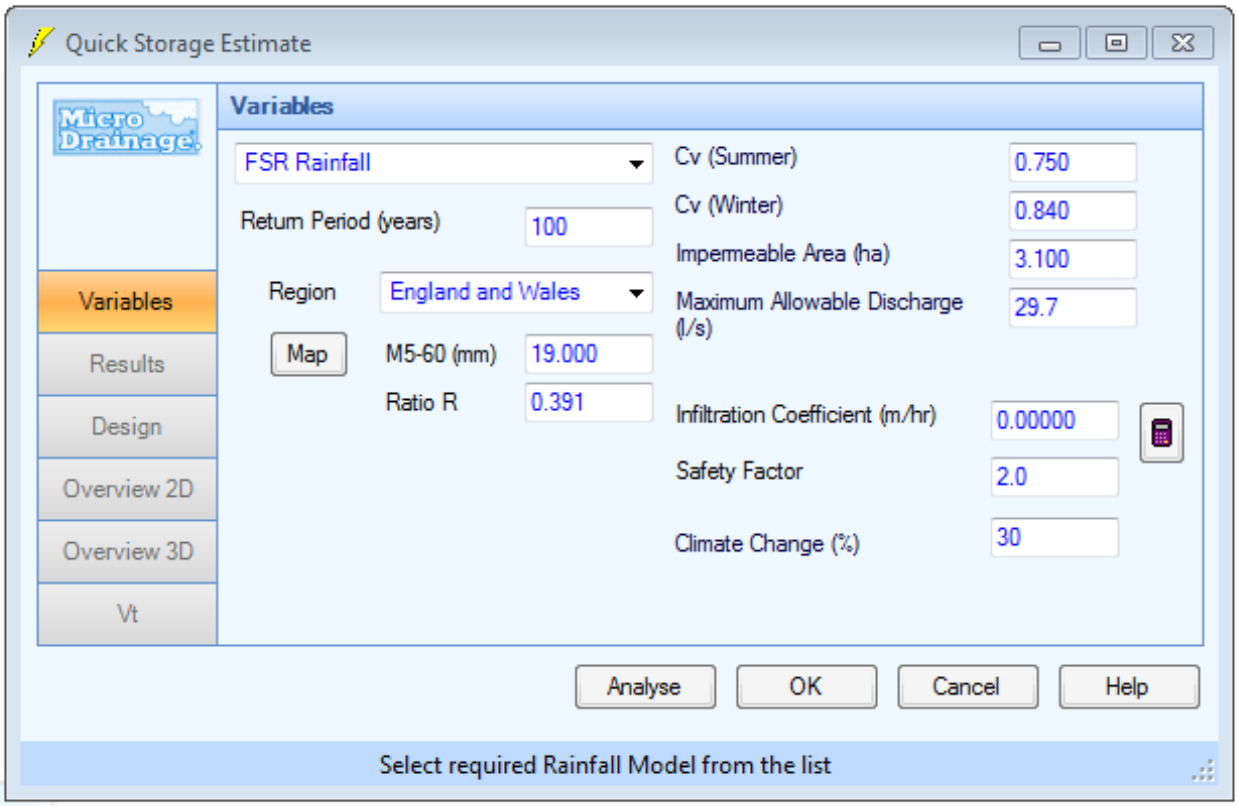

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 1113 m³ and 1542 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0

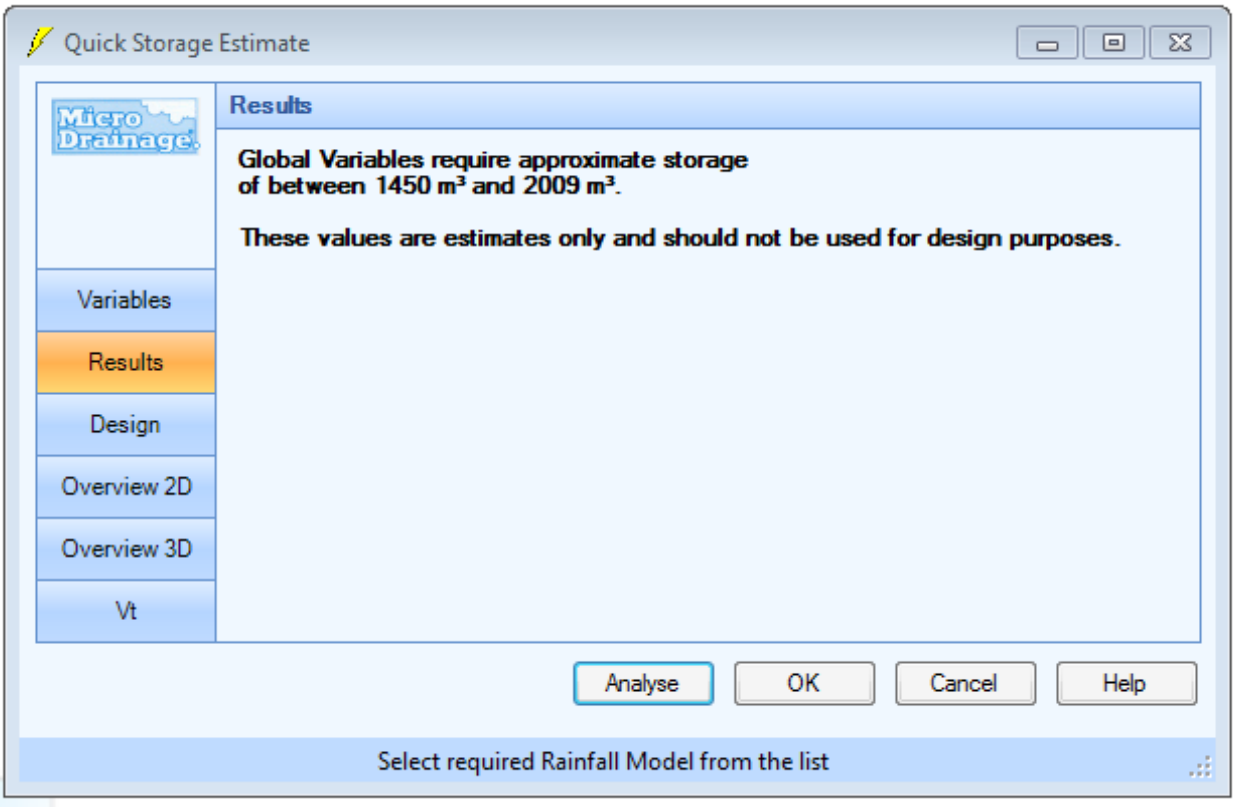

Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
2.890
Maximum Allowable Discharge (l/s)
27.7
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 1351 m³ and 1873 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


Quick Storage Estimate
Micro Drainage
Variables
FSR Rainfall
Return Period (years) 100
Region England and Wales
Map
M5-60 (mm) 19.000
Ratio R 0.391
Cv (Summer) 0.750
Cv (Winter) 0.840
Impermeable Area (ha) 3.01
Maximum Allowable Discharge (l/s) 28.9
Infiltration Coefficient (m/hr) 0.00000
Safety Factor 2.0
Climate Change (%) 30
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Area between 0.000 and 999.999


Quick Storage Estimate
Micro Drainage
Results
Global Variables require approximate storage
of between 1407 m³ and 1950 m³.
These values are estimates only and should not be used for design purposes.
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Area between 0.000 and 999.999


Quick Storage Estimate
Micro Drainage
Variables
Variables
Results
Design
Overview 2D
Overview 3D
Vt
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
3.100
Maximum Allowable Discharge (l/s)
29.7
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list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Micro Drainage
Results
Variables
Results
Design
Overview 2D
Overview 3D
Vt
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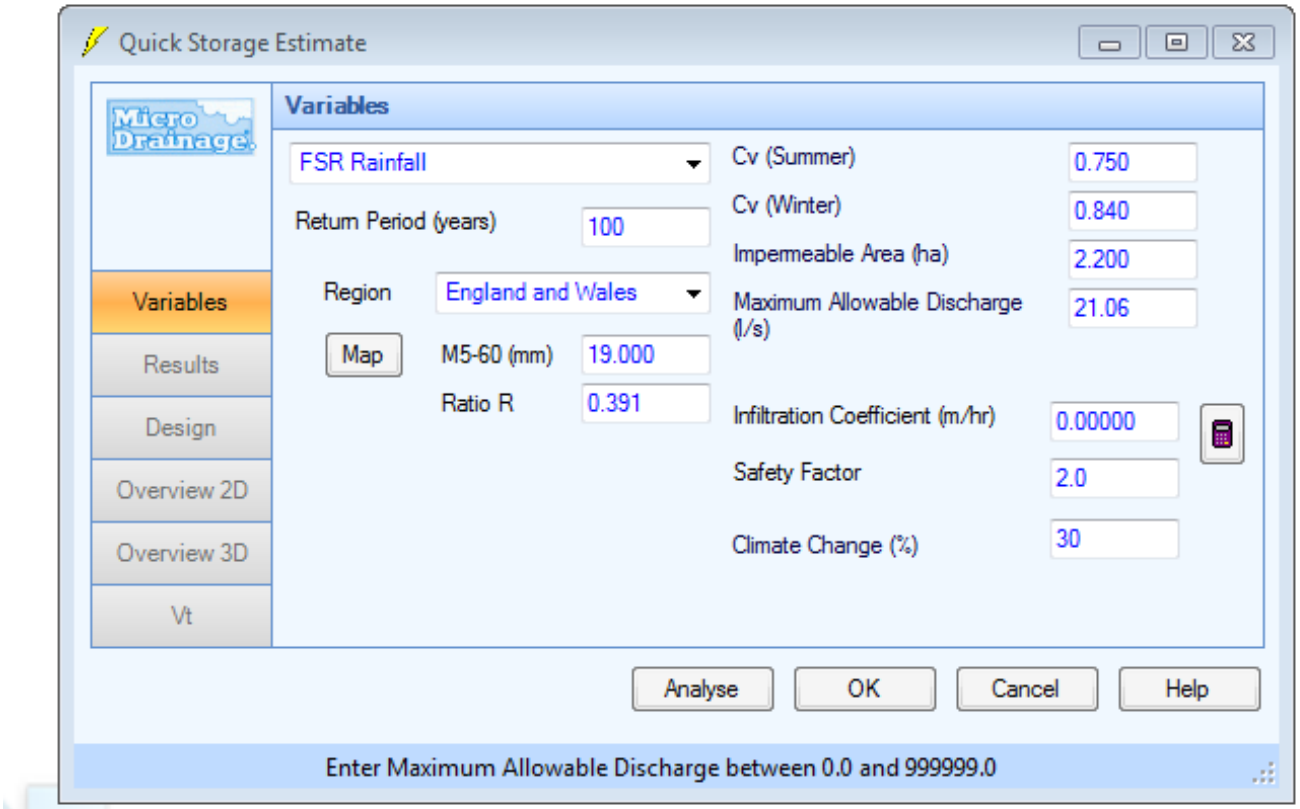
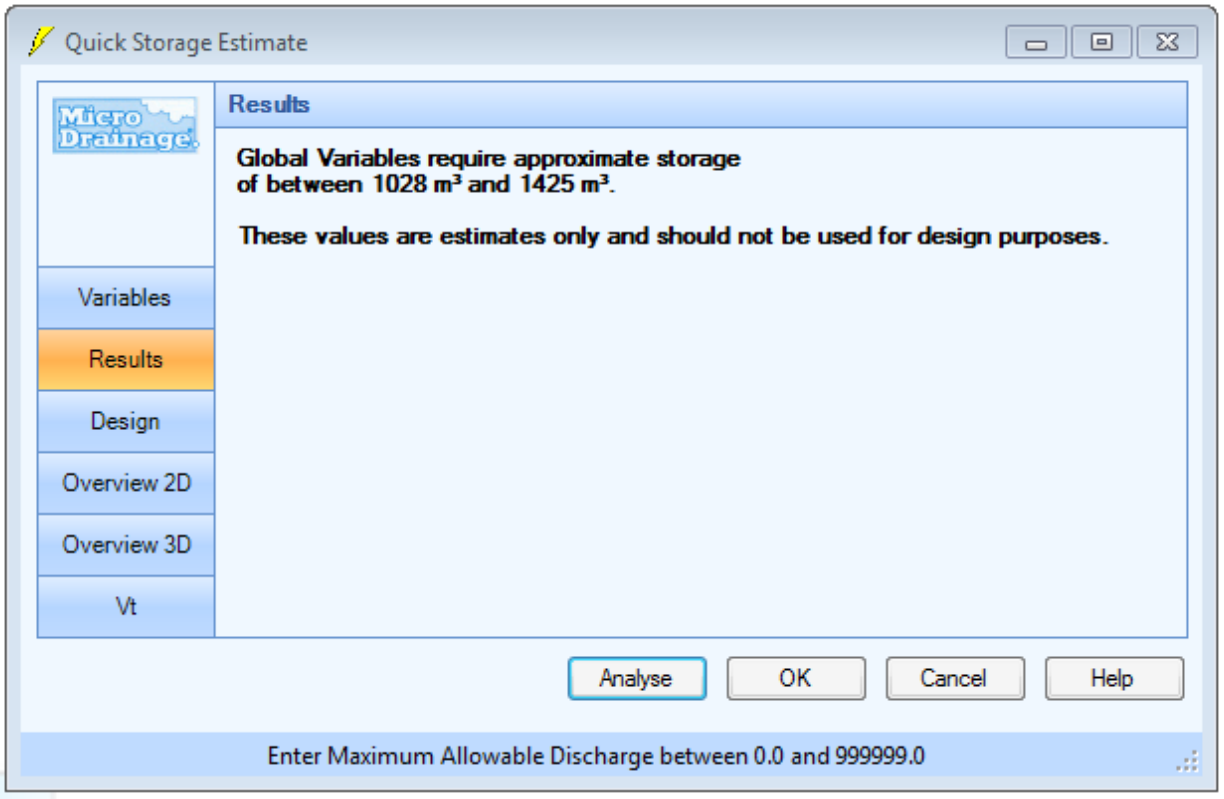
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Select required Rainfall Model from the list


Quick Storage Estimate
Micro Drainage
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
2.200
Maximum Allowable Discharge (l/s)
21.06
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
30
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0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Micro Drainage
Results
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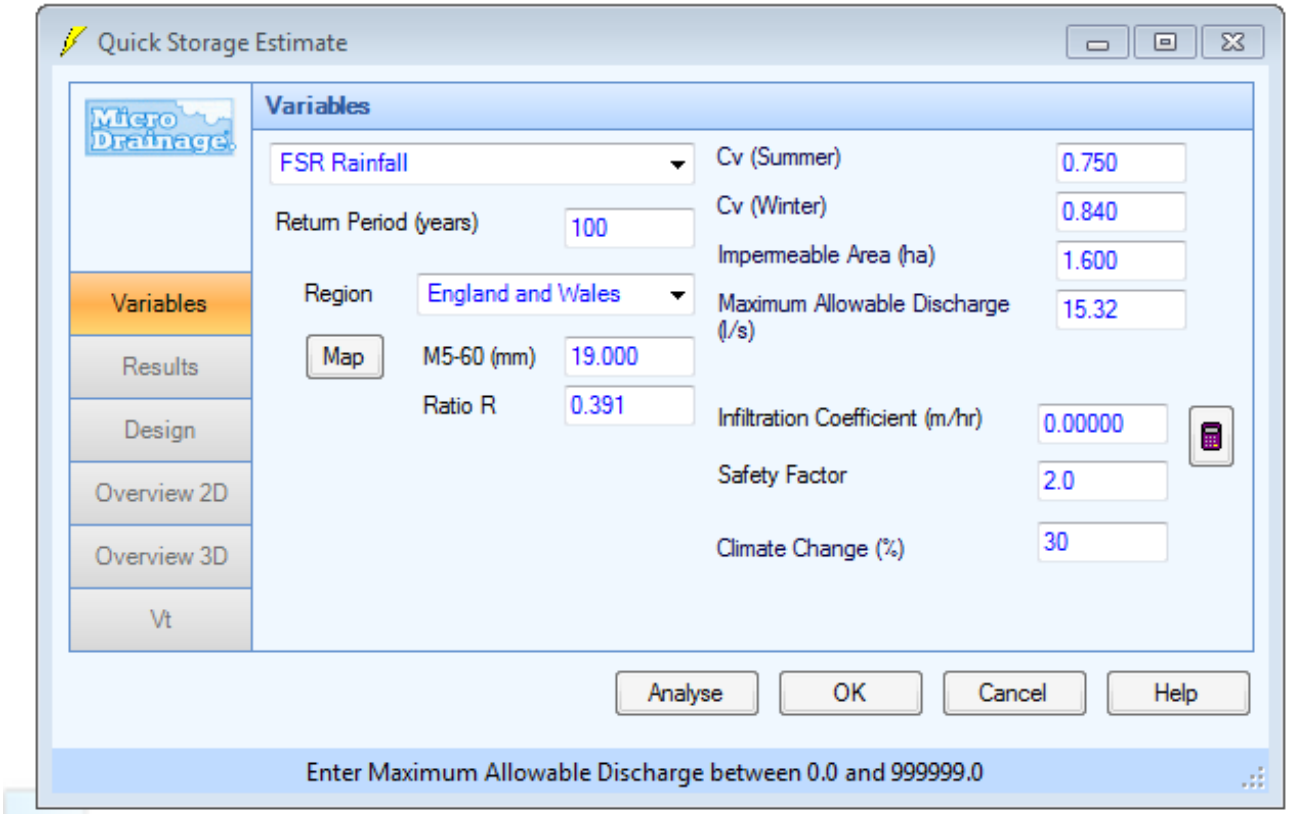
These values are estimates only and should not be used for design purposes.
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
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Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
1.600
Maximum Allowable Discharge (l/s)
15.32
Infiltration Coefficient (m/hr)
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Safety Factor
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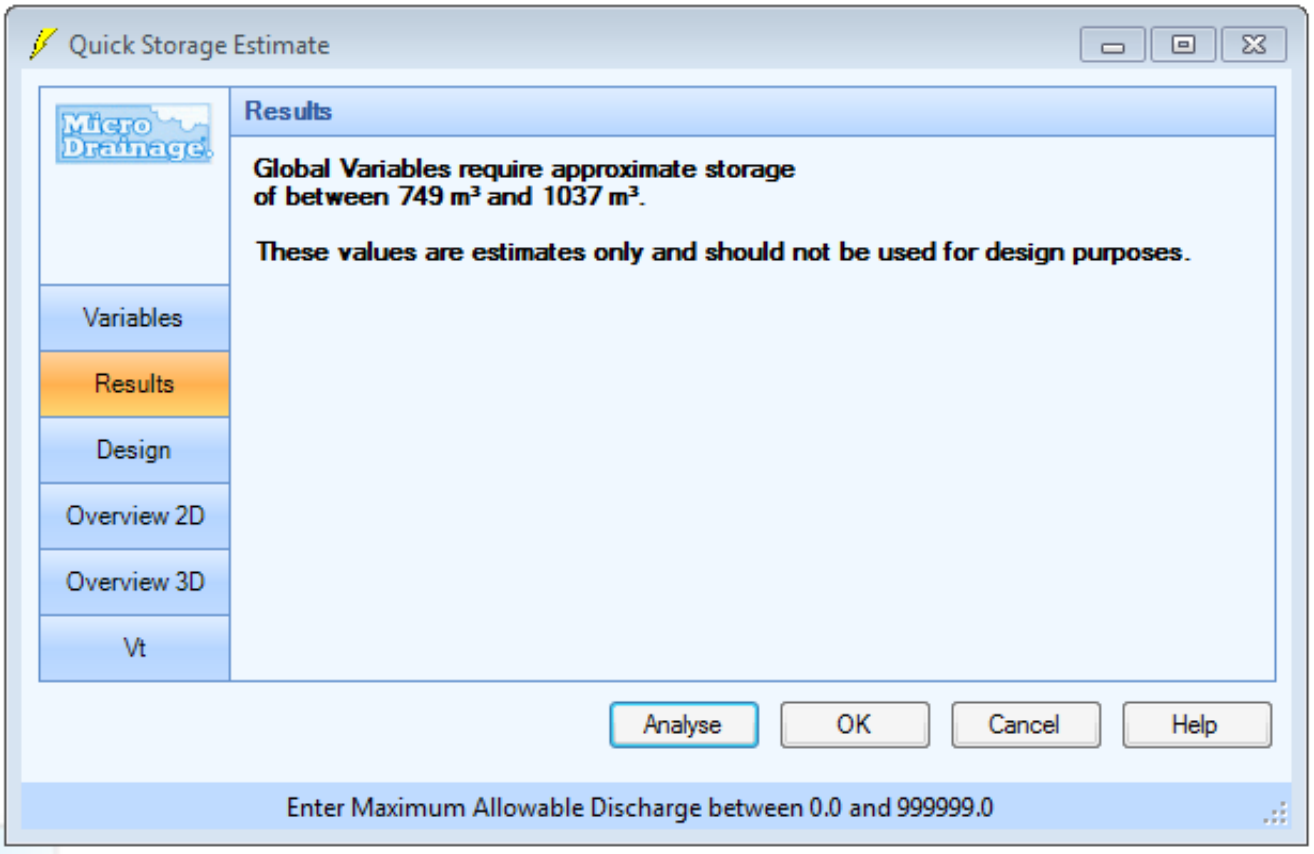
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0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Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
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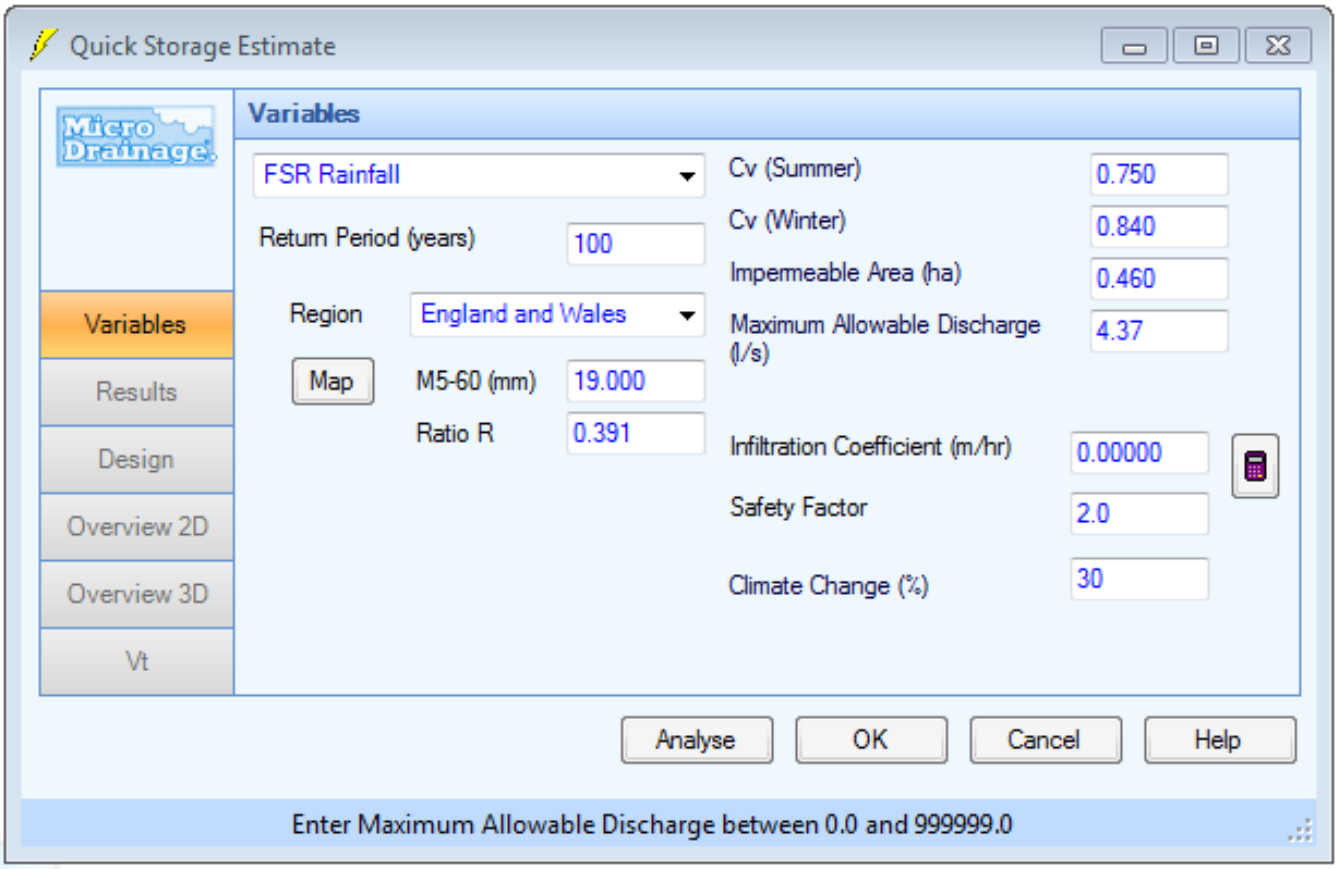
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0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Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
0.460
Maximum Allowable Discharge (l/s)
4.37
Infiltration Coefficient (m/hr)
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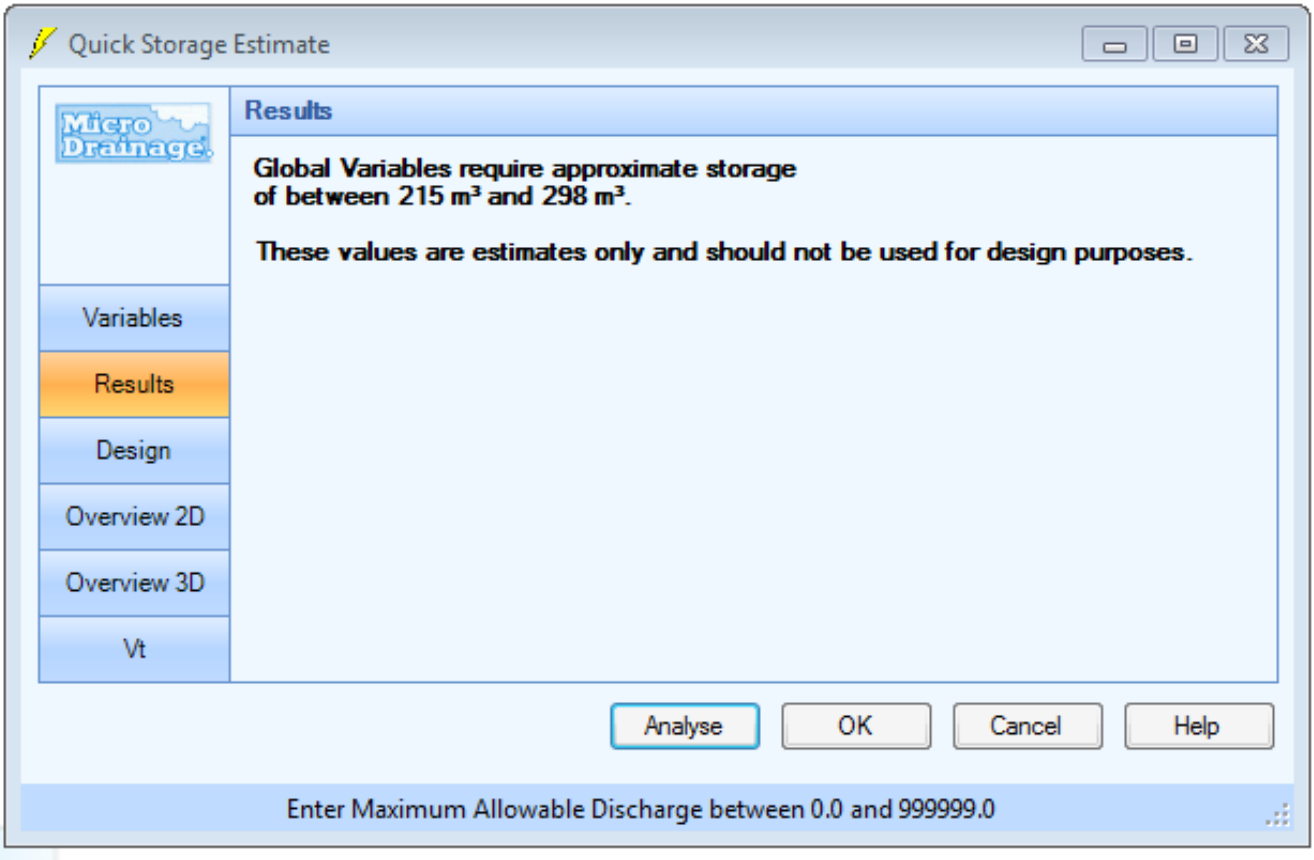
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0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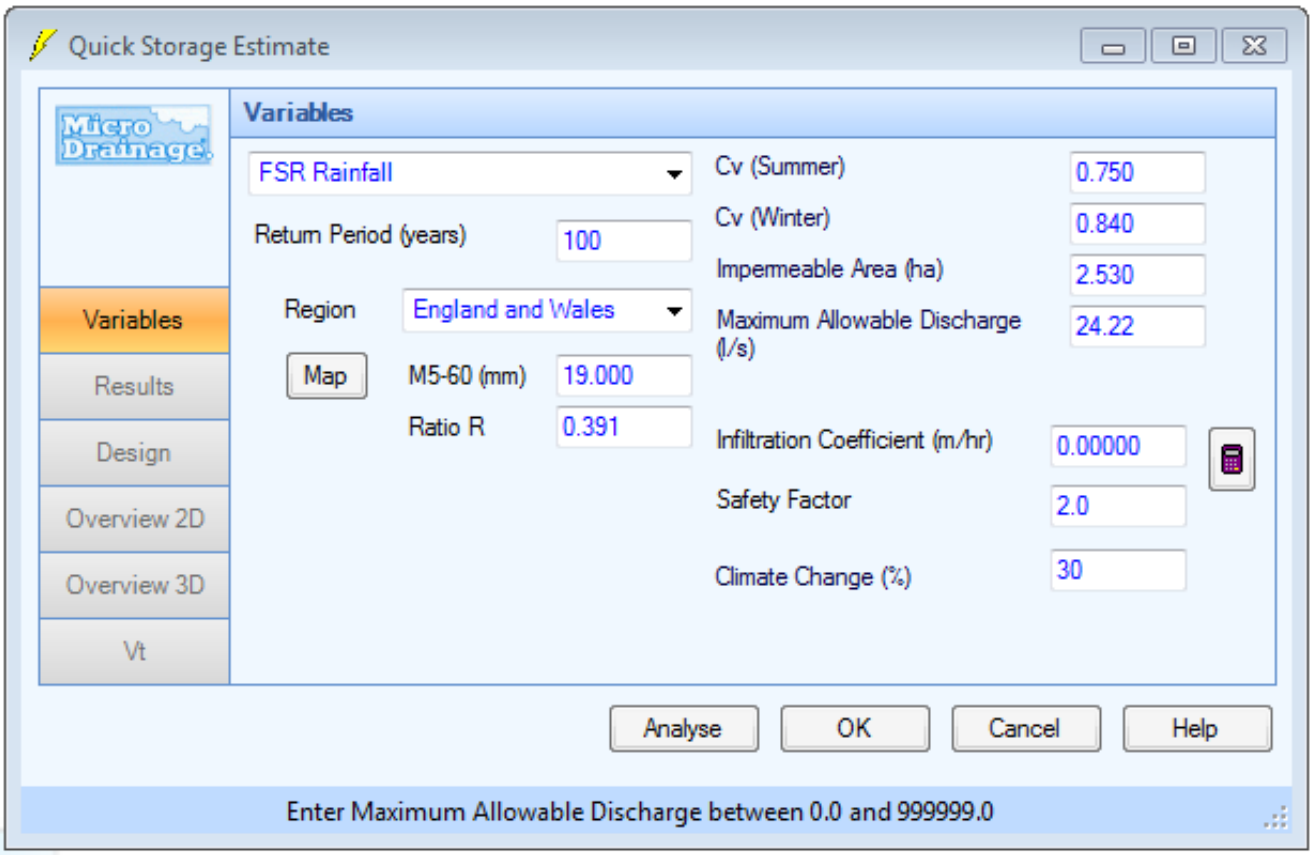
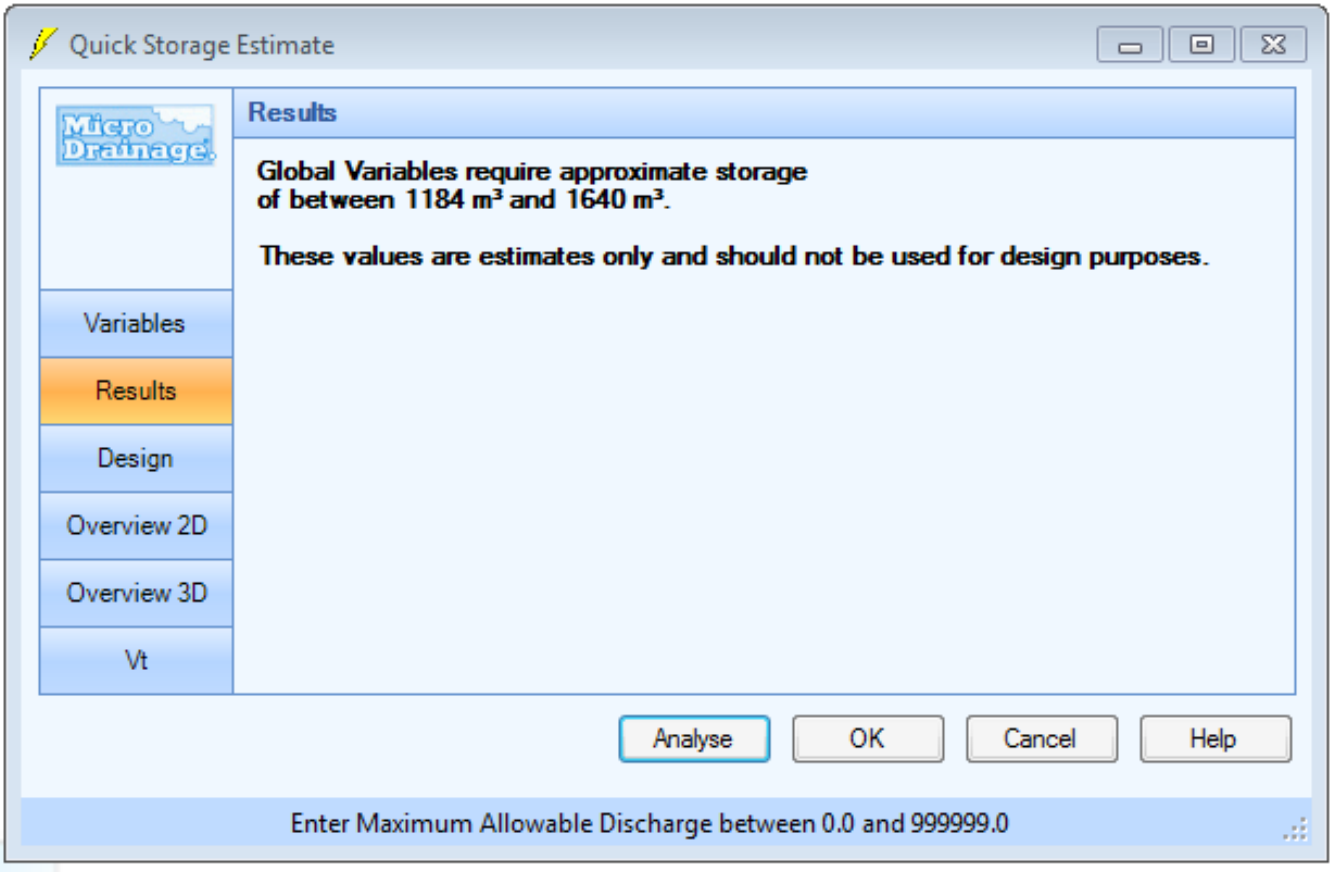
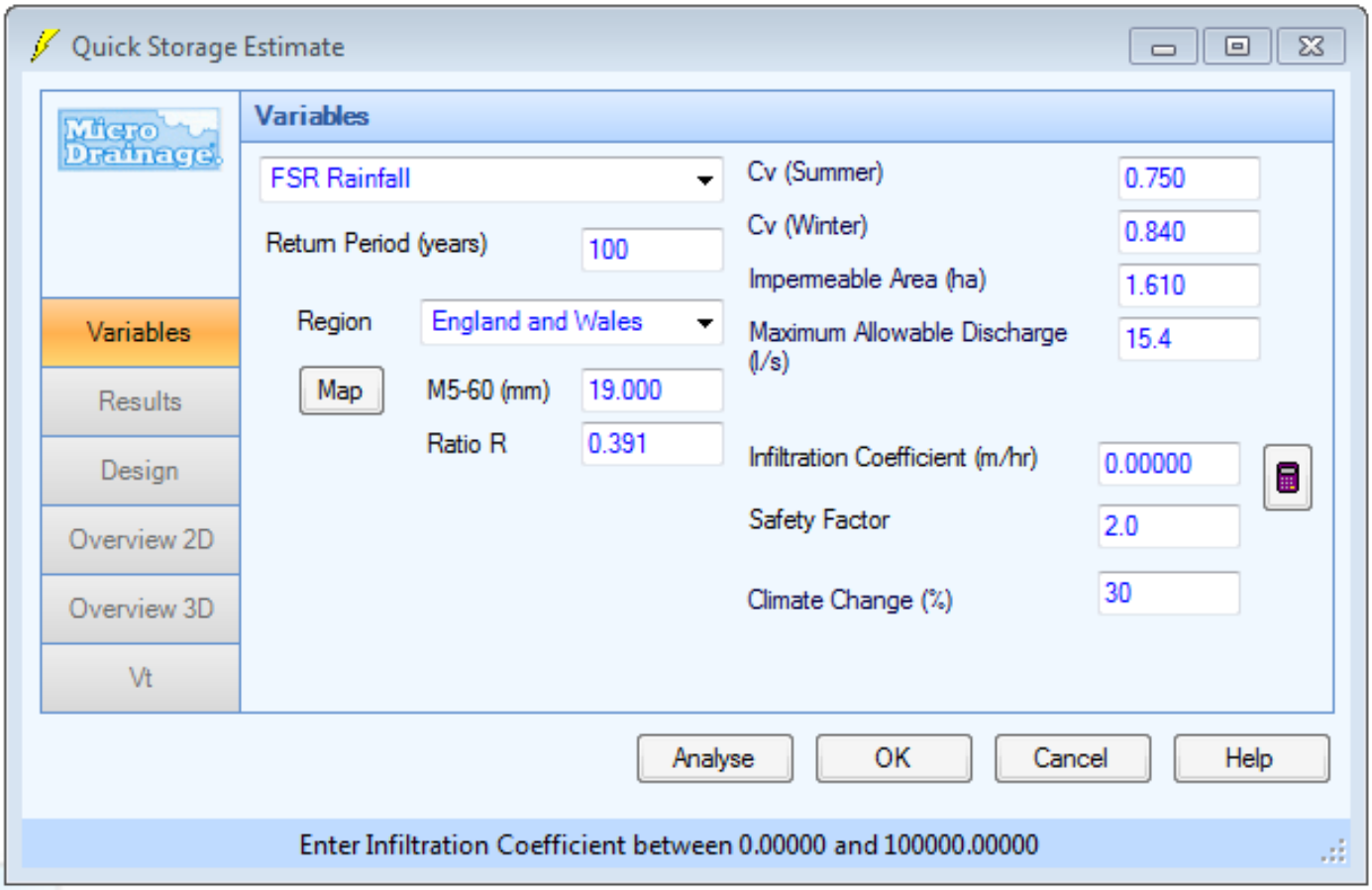
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 215 m³ and 298 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
2.530
Maximum Allowable Discharge (l/s)
24.22
Infiltration Coefficient (m/hr)
0.00000
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Maximum Allowable Discharge between 0.0 and 999999.0


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 1184 m³ and 1640 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


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
1.610
Maximum Allowable Discharge (l/s)
15.4
Infiltration Coefficient (m/hr)
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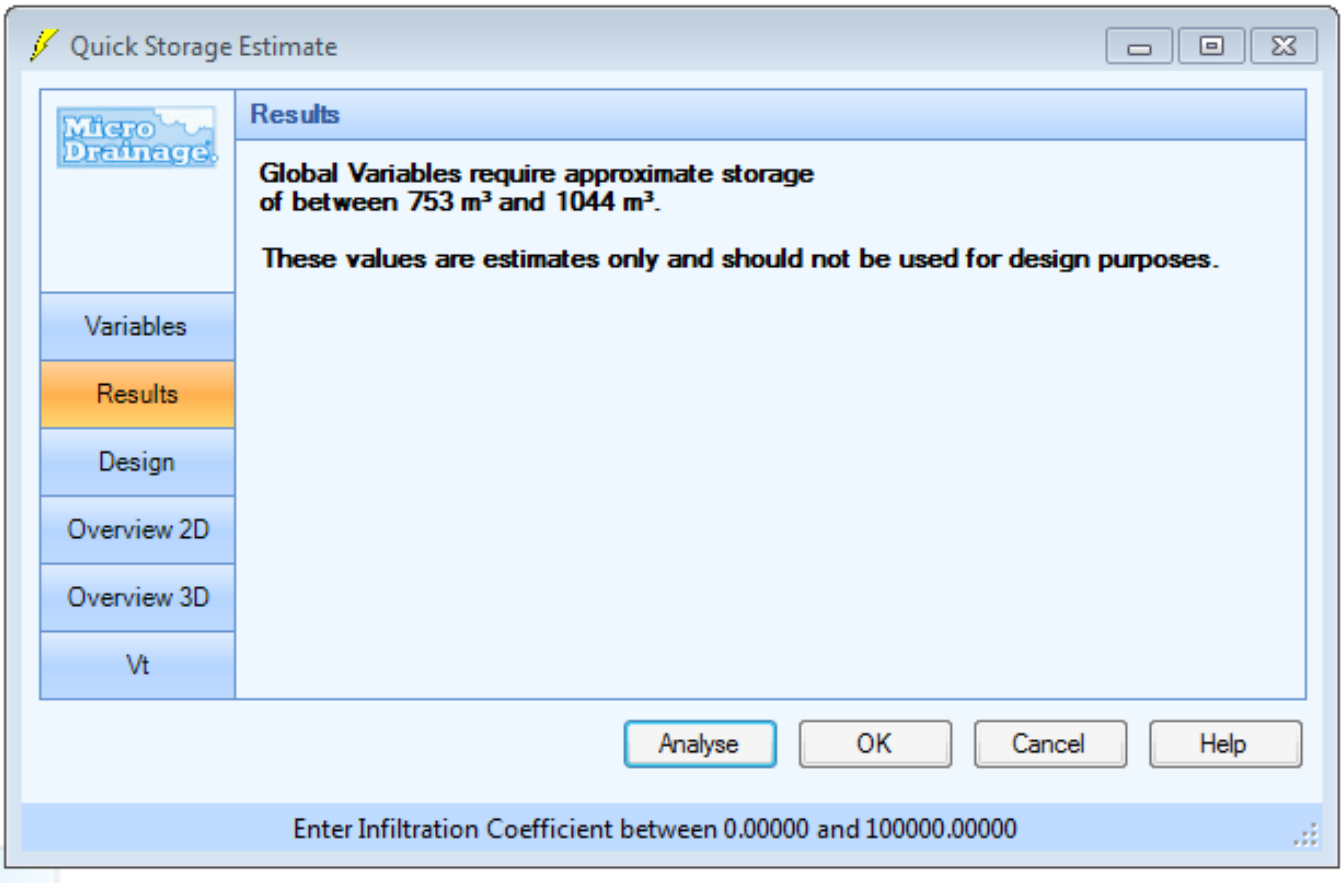
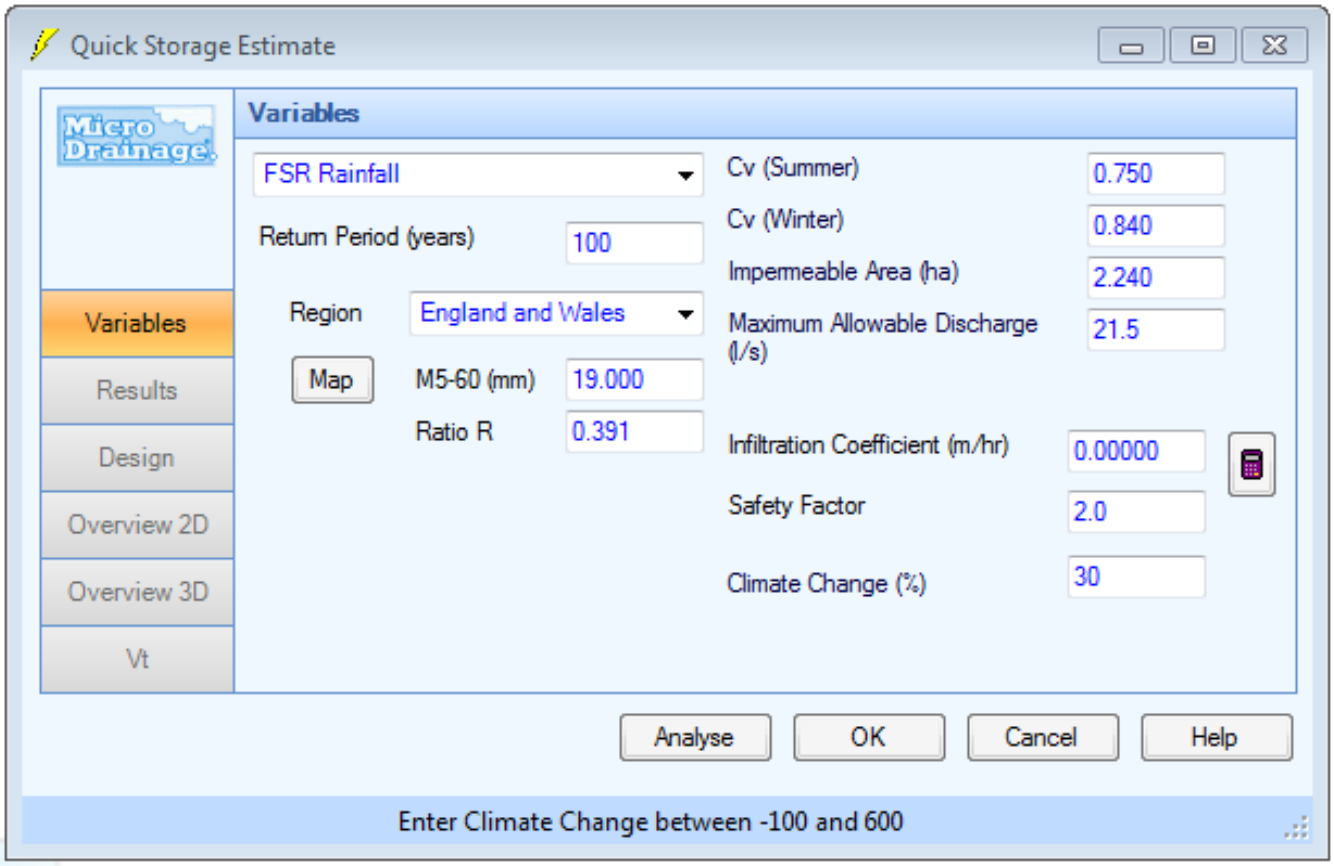
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Infiltration Coefficient between 0.00000 and 100000.00000


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Results
Global Variables require approximate storage of between 753 m³ and 1044 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Infiltration Coefficient between 0.00000 and 100000.00000


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
2.240
Maximum Allowable Discharge (l/s)
21.5
Infiltration Coefficient (m/hr)
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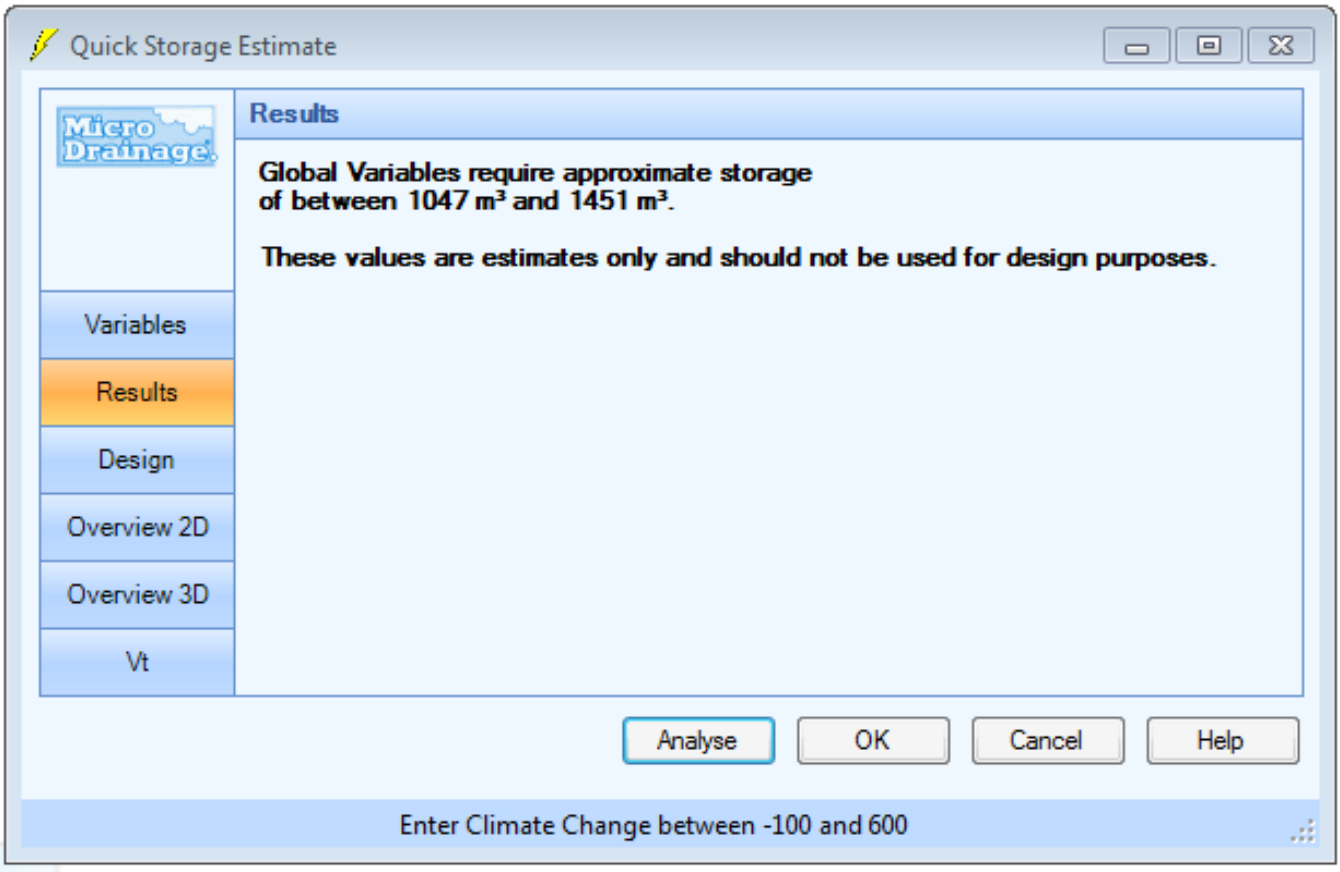
Safety Factor
2.0
Climate Change (%)
30
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600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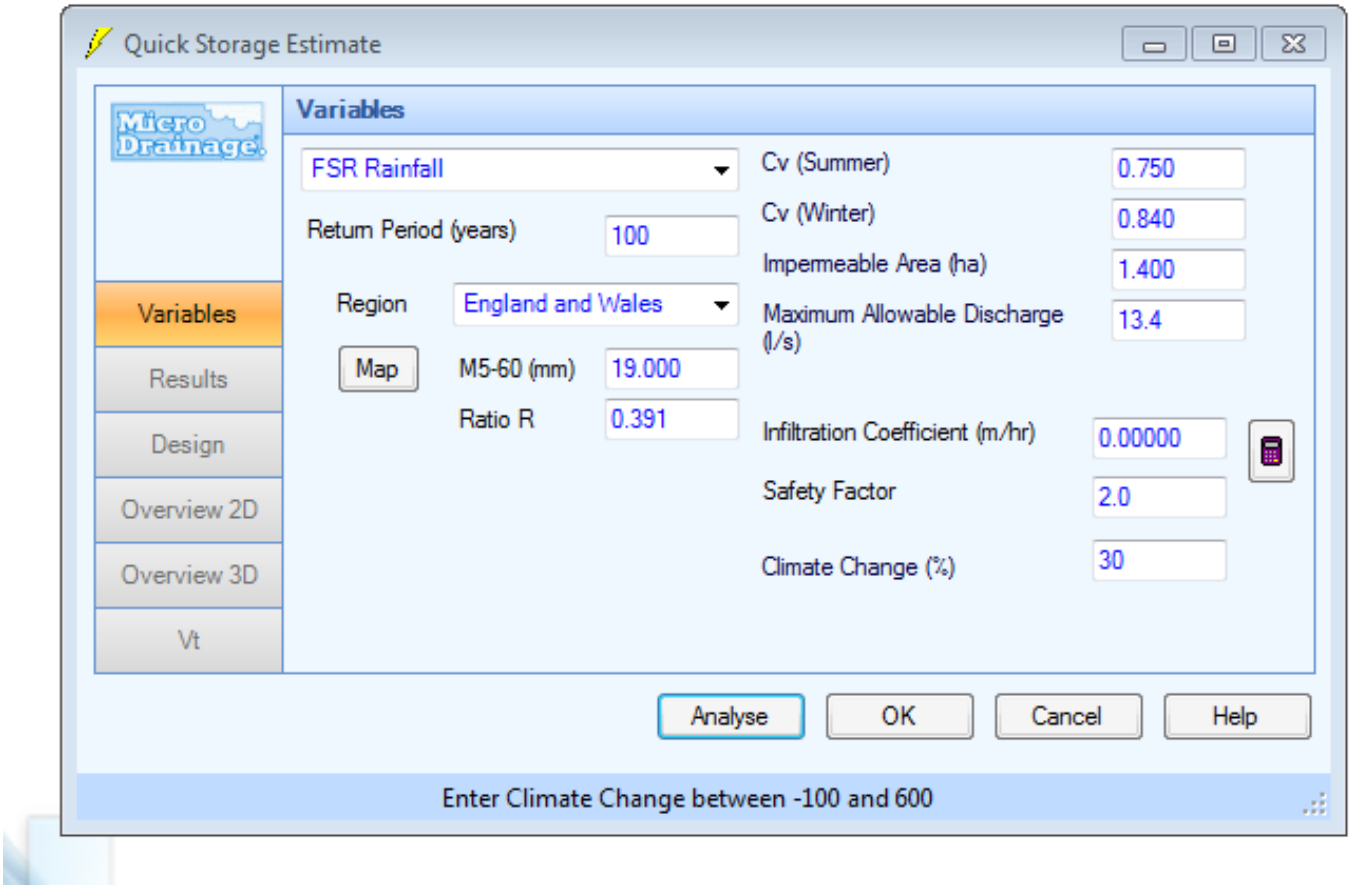
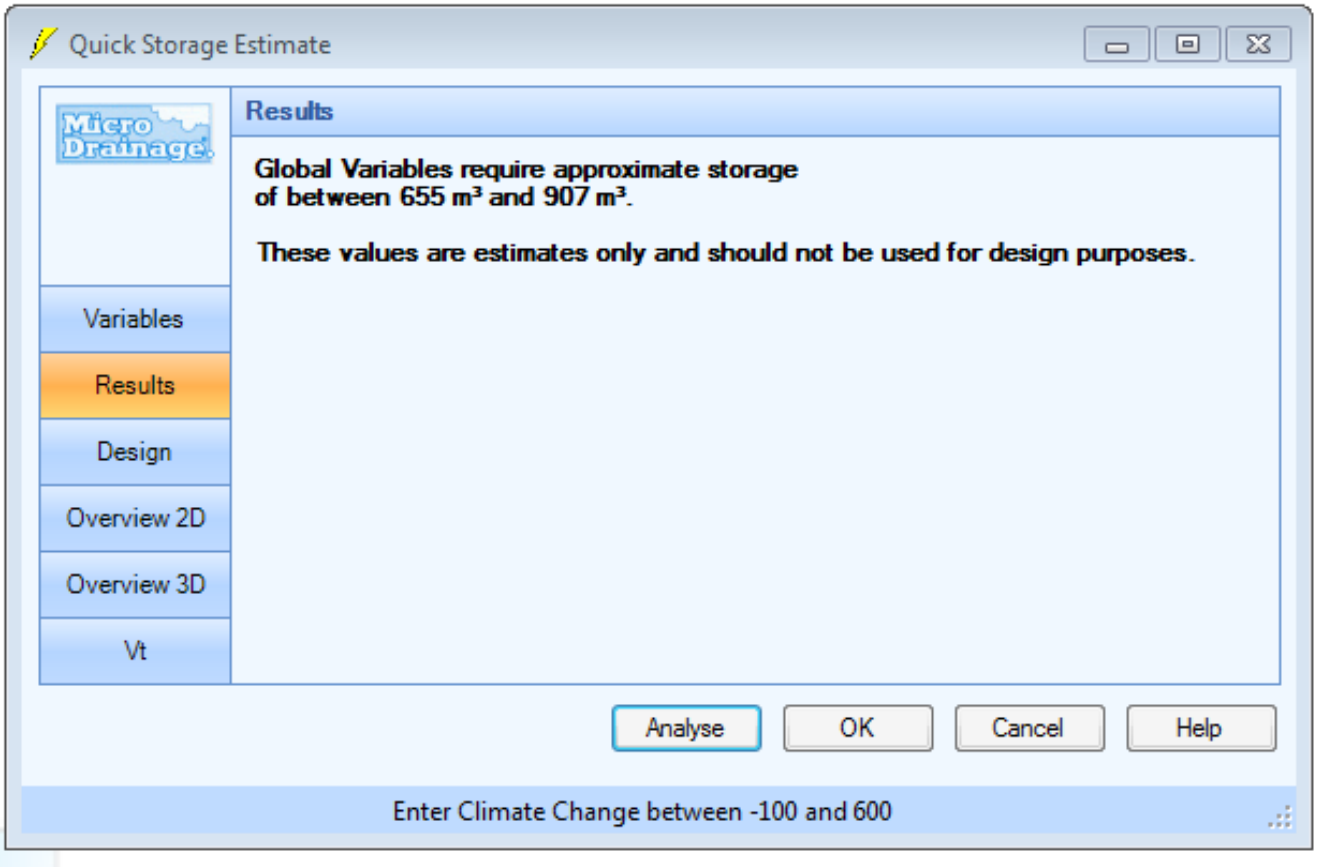
Micro Drainage
Results
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Global Variables require approximate storage
of between 1047 m³ and 1451 m³.
These values are estimates only and should not be used for design purposes.
Analyse
OK
Cancel
Help
Enter Climate Change between -100 and 600


Quick Storage Estimate
Micro Drainage
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Variables
FSR Rainfall
Return Period (years)
100
Region
England and Wales
Map
M5-60 (mm)
19.000
Ratio R
0.391
Cv (Summer)
0.750
Cv (Winter)
0.840
Impermeable Area (ha)
1.400
Maximum Allowable Discharge (l/s)
13.4
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
Variables
Results
Design
Overview 2D
Overview 3D
Vt
Global Variables require approximate storage of between 655 m³ and 907 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

APPENDIX E

From: Laithwaite, Anthony [Anthony.Laithwaite@uuplc.co.uk]
Sent: 27 October 2015 10:57
To: Graham, Paul
Cc: Wastewater Developer Services
Subject: RE: DE1530 Peel Hall Farm Predevelopment Enquiry

Good Morning Paul,

Thank you for your enquiry of 02nd October, please see my response below.

We have carried out an assessment of your application which is based on the information provided; this pre development advice will be valid for 12 months

Foul:

United Utilities would have no objection to foul flows communicating with our foul / combined public sewers. Our preference is for gravity connections rather than pumped flows, however without knowing the topography at this stage we are not in a position to comment further.

Surface Water:

Surface water from this site should drain to either soak away or directly to watercourse. Discharge rates and consents must be discussed and agreed with all interested parties.

Existing Sewers Crossing the Site

Public sewers cross this site and we will require unrestricted access to the sewers for maintenance purposes, we would ask that you maintain a minimum clearance as per table 2.1 SFA. If you cannot achieve this then you may wish to consider diverting the public sewer.

Please refer to the link below to obtain full details of the processes involved in sewer diversion.

http://www.unitedutilities.com/sewer-diversion.aspx

Sewer Adoption Agreement

You may wish to offer the proposed new sewers for adoption. United Utilities assess adoption appliation based on Sewers adoption 6th Edition and for any pumping stations our company addenda document. Please refer to link below to obtain further guidance and application pack:

http://www.unitedutilities.com/sewer-adoption.aspx

Connection Application

Although we may discuss and agree discharge points & rates in principle, please be aware that you will have to apply for a formal sewer connection. This is so that we can assess the method of construction, Health & Safety requirements and to ultimatley inspect the connection when it is made. Details of the application process and the form itself can be obtained from our website by following the link below

http://www.unitedutilities.com/connecting-public-sewer.aspx

Please be aware that on site drainage must be designed in accordance with Building Regulations, National Planning Policy, Planning Conditions and local flood authority guidelines, we would recommend that you laise and make suitable agreements with the relevant statutory bodies.

Regards

Anthony

Anthony Laithwaite
Developer Services & Planning
Operational Services
United Utilities

T: 01925 679369
unitedutilities.com

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Visit: unitedutilities.com/wow

From: Graham, Paul [mailto:paul.graham@tpa.uk.com]
Sent: 02 October 2015 17:23
To: Wastewater Developer Services
Subject: Peel Hall Farm Predevelopment Enquiry

Good Evening,

Please see attached wastewater predevelopment enquiry for Peel Hall Farm. I am unsure if a colleague who has now left the company has already submitted an enquiry on the 31st July for this site but I do not believe she has. If this is not the case, please can you advise.

Also attached is a site location plan, masterplan and Greenfield calcs to use for the enquiry.

If you have any issues, please do not hesitate to contact me.

Kind regards

Paul Graham (paul.graham@tpa.uk.com)
Assistant Engineer
Transport Planning Associates

029 2023 0303

32 Windsor Place
Cardiff
CF10 3BZ

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Transport Planning Associates	Project **Peel Hall Farm**			Status	
	Date 27/01/16 By PG Checked LF	Job no. 1503-116	Section	Sheet no.	Rev
Rev	Date	Details Foul Drainage		Tel Fax	
Part Proposed Foul Flow Rates					

Proposed Foul Flow

These foul calculations have been based upon Sewers for Adoption. The proposed foul flow for 1300 dwellings has been calculated as:

Residential Flow – 4000l/day/dwelling
(4000x1300) = 5,200,000/86400 = 60.19 l/s

Commercial Flow –100/l/day/staff
230 x 100 = 23000 l/day
23000 x 6dwf (dry weather flow) = 138000 l/day
138000/86400 = 1.59 l/second

School Flow – 90/l/day/person
205 x 90 = 18450 l/day
18450 x 6dwf (dry weather flow) = 110700 l/day
110700/86400 = 1.28 l/second

Retirement Home Flow – 350/l/day/person
60 x 350 = 21000 l/day
21000 x 6dwf (dry weather flow) = 126000 l/day
126000/86400 = 1.46 l/second

Combined – 60.19 + 1.59 + 1.28 + 1.46 = 64.52l/s

86400 = 24 x 60 x 60 (l/day → l/sec)