Project Name:	Keymer Road, Burgess Hill
Job No:	14-205
Note Title:	Flood Risk and SuDS Appraisal Technical Note
Author:	NM
Checked:	GG
Approved:	GG
Date:	July 2020

1.0 INTRODUCTION

1.1 Odyssey has been commissioned by Thakeham Homes to provide Flood Risk and Drainage Appraisal technical support for the potential local plan allocation for residential development of Land at Keymer Road, Burgess Hill.

1.2 The 15.3-hectare site is listed as site SA13 *"Land East of Keymer Road and South of Folders Lane, Burgess Hill"* in the Mid Sussex District Council (MSDC) Site Allocations Development Plan (2019), and is described as a *"housing allocation with on site open space and children's equipped playspace"*.

1.3 This Technical Note sets out the existing site conditions, assesses the potential sources of flood risk to the site and potential surface water drainage options. Constraints and opportunities are identified with regards to flood risk and drainage.

2.0 EXISTING SITE CONDITIONS

2.1 Site Location

2.1.1 The site is located east off of Keymer Road, Burgess Hill, Sussex, approximately 1.2 kilometres (km) south-east of Burgess Hill town centre. The Ordnance Survey (OS) grid reference for the centre of the site is 532122 East, 117748 North. The postcode for the site is RH15 0BA.

2.1.2 The site is currently greenfield land and is bound by existing residential development to the north, south and west, and existing treeline to the east. A site location plan can be found in **Appendix A**, and a concept masterplan can be found in **Appendix B**.

2.2 Topography

2.2.1 There is currently no topographical survey for the site. LiDAR data was utilised to provide level information at the site. The acquired data shows the site slopes from the north-west and south of the site to the centre. The highest level on site is approximately 66mAOD (Above Ordnance Datum), in the north-west and south of the site, while the lowest point is approximately 54mAOD in the centre. For topographical data, refer to **Appendix C**.

2.3 Geology and Hydrogeology

2.3.1 British Geological Survey (BGS) online maps (accessed July 2020) indicate that the site sits on a bedrock of Weald Clay Formation – Mudstone. There are records of superficial deposits on site, although it is noted that there are superficial deposits of *"Alluvium – Clay, Silt, Sand and Gravel"*, and *"Head – Clay, Silt, Sand and Gravel"* in the south and east of the site.

2.3.2 BGS records (accessed July 2020) also show the site underlain with the Wealden Group aquifer, described as *"rocks with essentially no groundwater"*, where *"very small yields of often poor quality water have been obtained from subordinate sandstones and limestones"*. For BGS records, refer to **Appendix D**.

2.3.3 There are no borehole records available on the BGS database within the site boundary. Borehole scans in the vicinity of the site have been utilised to provide a picture of the geology in the surrounding area.

2.3.4 Scan TQ31NW1 was taken approximately 650m north-west of the site, and shows the following layers:

- Ground level – 0.30m below ground level (bgl) - Topsoil layer described as *"ashes, track ballast and pieces of chalk"*
- 0.30m – 0.53m bgl - *"Dark soil with pea ballast and large round ballast";*
- 0.53m – 0.69m bgl - *"Very dark soil with mixture of small stones and brick"*;
- 0.69m – 2.46m bgl - Weathered chalk, described as *"soft to very soft";*
- 2.46m – 2.62m bgl - *"Very light orange silty clay"*;
- 2.62m – 2.84m bgl - *"Light brown silty clay"*;
- 2.84m – 3.12m bgl - *"Dark grey silty clay";*
- 3.12m – 3.43m bgl - *"Soft greenish silty clay";*
- 3.43m – 4.22m bgl - *"Firm light brown/grey mottled silt clay"*;

- 4.22m – 4.52m bgl - *"Light brown/grey mottled clay"*;
- 4.52m – 4.88m bgl - *"Light brown/grey mottled clay with pea sandstone and ballast";*
- 4.88m – 6.33m bgl - *"Firm light brown/grey mottled fissured silt clay"*; and,
- 6.33m – 7.00m bgl - *"Very soft light brown/grey mottled silty clay"* and *"stiff light brown/grey mottled fissured clay".*

2.3.5 Scan TQ31NW7 was taken approximately 1.0km to the south of the site, and shows Weald Clay extending down the borehole, in various forms:

- Ground level – 20.7m bgl - *"Old bore"*;
- 20.7m – 24.7m bgl – *"Blue clay"*;
- 24.7m – 25.3m bgl – *"Brown soil"*;
- 25.3m – 54.9m bgl – *"Blue clay";* and,
- 54.9m – 56.1m bgl – *"Blue clay and rock".*

2.3.6 Scan TQ31NW13 was taken approximately 850m to the north-east of the site, and shows the following layers:

- Ground level – 0.30m bgl – Topsoil layer
- 0.30m – 2.75m bgl – Weald Clay, described as *"firm ochre and grey mottled, silty CLAY"*;
- 2.75m – 4.80m bgl – Completely to highly weathered Weald Clay, described as *"very stiff ochre with grey mottling very silty CLAY"*;
- 4.80m – 9.85m bgl – Highly to moderately weathered Weald Clay, described as *"very stiff, dark blue grey, silty CLAY"*; and,
- 9.85m – 11.45m bgl – Highly to moderately weathered Weald Clay.

2.3.7 The site is shown to be located outside any of the Environment Agency (EA) Groundwater Source Protection Zones (SPZ). The development should still adhere to the EA's *'Approach to Groundwater Protection'* policy, to ensure that groundwater quality is maintained and improved where practicable across the site.

2.3.8 The EA has recently updated their Groundwater Vulnerability Zones (GVZ) Map, this now includes six risk categories (Major Aquifer High, Major Aquifer Intermediate, Major Aquifer Low, Minor Aquifer High, Minor Aquifer Intermediate, and Minor Aquifer Low). The mapping summarises the overall risk to groundwater, considering groundwater vulnerability, the types of aquifer present (superficial and/or bedrock) and their designation status. The majority of the site is located in the *'Unproductive'* area, whilst there is a small area in the centre of the site at *"low"* risk.

2.3.9 It is noted that groundwater was not struck at any of the aforementioned borehole scans. It is therefore assumed that groundwater is at least 11.45m bgl on site.

2.3.10 Site specific groundwater monitoring should be conducted to determine the exact level of groundwater on site, as the borehole scans taken are too spread out and too far away from the site to make an accurate inference from. For BGS records, refer to **Appendix D**.

2.4 Hydrology

2.4.1 The nearest EA designated Main River is located approximately 200m to the north-east of the site. For EA data, see **Appendix E**.

2.4.2 OS mapping and EA flood maps show an Ordinary Watercourse, which flows through the centre of the site.

2.5 Existing Drainage Regime

2.5.1 Southern Water (SW) records show that there are no surface water sewers flowing across the site. A surface water sewer is located west of the site on Greenlands Drive flowing running in a north-westerly direction away from the site.

2.5.2 Southern Water records also show foul water sewers flowing along Folders Gardens and Woodwards Close to the north of the site, and Keymer Road to the west of the site. Refer to **Appendix F**.

2.5.3 It is anticipated that in its current state, surface water generated from the site discharges to the low point in the centre of the site, and into the Ordinary Watercourse before being conveyed away from the site. This surface water then flows into the Main River located 200m to the north-east of the site, before being channelled away from the site.

2.5.4 The developable area for this site is less than 50ha, meaning that the Institute of Hydrology (IoH) Report 124 Flood Estimation for Smaller Catchments (1994) method is suitable to estimate greenfield peak flow rates (50ha is used in the formula and linearly interpolates the flow rate value based on the ratio of the development area). This methodology is approved in the Construction Industry Research and Information Association (CIRIA) C753 Sustainable Drainage Systems (SuDS) Guidance; the parameters used can be seen in **Table 2.1**.

Table 2.1: Interim Code of Practice SuDS Parameters

Parameter	Value	Unit
SAAR	908	mm
Soil Index	0.450	-
Region	7	-
Urban	0.000	-

2.5.5 **Table 2.2** summarises the estimated current greenfield discharge rates for the site. Calculations are provided in **Appendix G**.

Table 2.2 Existing Surface Water Discharge Rates

Return Period	Existing Greenfield Discharge Rates from site (l/s)	Existing Greenfield Discharge Rates per Hectare (l/s/ha)
QBAR	90.2	5.9
Q_{30}	204.4	13.4
Q_{100}	287.7	18.8

3.0 SOURCES OF FLOOD RISK

3.1 Fluvial Flooding

3.1.1 Fluvial flooding is caused by high flows in rivers or streams exceeding the capacity of the river channel and spilling into the floodplain, or in some cases non-designated floodplain, which can occur after a period of heavy rainfall.

3.1.2 The EA Flood Map for Planning (accessed July 2020) shows that the site is primarily located in Flood Zone 1, which comprises land assessed as *"having less than 1 in 1,000 annual probability of river or sea flooding (<0.1% Annual Exceedance Probability [AEP])"*.

3.1.3 The flood risk vulnerability classification of dwellings is deemed as *"more vulnerable"*. In accordance with the Planning Policy Guidance (PPG), development of this nature in Flood Zone 1 is acceptable.

3.1.4 There are no known historic records of the site being affected by fluvial flooding, and the MSDC Strategic Flood Risk Assessment (SFRA) states one property is at risk of flooding from rivers and sea in the Burgess Hill area. The risk of flooding from fluvial sources is therefore considered to be very low. For EA flood map records, refer to **Appendix E**.

3.2 Surface Water Flooding

3.2.1 Surface water (pluvial) flooding usually occurs during high intensity rainfall, when the excess water cannot be absorbed into the ground. However, it can also occur with low intensity rainfall in areas where the land has a low permeability.

3.2.2 The EAs Risk of Flooding from Surface Water (RoFSW) shows a surface water flow route, associated with the Ordinary Watercourse, flowing through the site from north-east to south-west. This flow route contains areas at *'low'*, *'medium'* and *'high'* risk. These risk areas should be incorporated into the masterplan as public open space, to avoid locating any in areas of risk.

3.2.3 The MSDC SFRA contains a table which states 2,500 properties in Burgess Hill are at risk of surface water flooding. However, there are no known records of the site or immediate vicinity being affected by pluvial flooding. As a result, the risk of pluvial flooding is considered to be low.

3.3 Groundwater Flooding

3.3.1 Groundwater flooding is caused by the emergence of water originating from sub-surface permeable strata. A groundwater flood event results from a rise in groundwater level sufficient for the water table to intersect the ground surface and inundate low lying land. Periods of prolonged rainfall may also be a cause of groundwater flooding with aquifers and soils becoming saturated.

3.3.2 The MSDC SFRA discusses the existing levels of groundwater risk in the district, and states that *'the majority of the district is considered to have medium potential for groundwater flooding, however a small area within the South Downs National Park is considered to have high potential for flooding from this source'*.

3.3.3 Nearby BGS borehole scans do not show records of groundwater, and the site is underlain on the Wealden Group aquifer, described as *"rocks with essentially no groundwater".* Furthermore, in accordance with updated EA GVZ Mapping, the site is deemed to be at *"unproductive"* and *"low"* risk of groundwater.

3.3.4 There are no records of the site being affected by historic groundwater flooding. Considering the available information, the risk of flooding from groundwater is considered to be very low.

3.4 Sewer Flooding

3.4.1 Flooding can occur due to the failure of existing foul or surface water drainage infrastructure. If flows within the drainage system exceed the designed capacity or foreign matter causes blockages, overflow to the surface can occur leading to flooding.

3.4.2 There are no public sewers within the site boundary. The MSDC SFRA contains information on the risk of sewer flooding. It is stated that *"the data identified incidents in Bolney, Burgess Hill"* and other locations. It is further stated within the SFRA that *"Burgess Hill was previously known to have experienced regular sewer flooding"*. However, there are no records of the site itself being affected by flooding, and therefore the risk is considered to be low. For SW records, see **Appendix F**.

4.0 SURFACE WATER DRAINAGE STRATEGY OPTIONS

4.1 Surface Water Drainage Strategy Requirements

4.1.1 Any surface water drainage strategy must demonstrate that the proposed development can be drained in a sustainable manner, commensurate with local and national policy. The National Planning Policy Framework requires flood risk to land and property is not increased as a result of new development.

4.1.2 A fundamental principle of sustainable development in terms of flood risk is the reduction of surface water runoff from new developments. Drainage calculations for this site have been carried out to ensure that any discharge is limited to equivalent greenfield rates or lower, in order to avoid increasing flood risk downstream.

4.2 Proposed Surface Water Management Strategy

4.2.1 Preliminary Micro Drainage calculations have been prepared, and can be found in **Appendix G**.

4.2.2 The current PPG sets out the following hierarchy for discharge of surface water, in descending order of preference:

- *"Into the ground (infiltration);*
- *to a surface water body;*
- *to a surface water sewer;*
- *to a combined sewer."*

4.2.3 The most preferred option of the drainage hierarchy is *"into the ground (infiltration)"*. The underlying geology of the site is Weald Clay Formation – Mudstone; which is known to be an impermeable bedrock. Furthermore, it is stated in the Mid Sussex SFRA *"due to the geology of the Burgess Hill area, poor permeability is likely to limit the effectiveness of SuDS that promote infiltration; however some infiltration may still be achieved"*.

4.2.4 Owing to this, infiltration is not considered a feasible option of surface water discharge, although on site soakage testing, in accordance with Building Research Establishment (BRE) 365 principles, should be conducted to confirm this.

4.2.5 The second-most preferred option of the drainage hierarchy is *"to a surface water body"*. As previously mentioned, an Ordinary Watercourse flows through the centre of the site, from north-east to south-west. This watercourse is considered a suitable point to discharge runoff generated by the proposed development.

4.2.6 SuDS features should be incorporated into the development to help capture, attenuate and treat the surface water flows on site, before discharging into the Ordinary Watercourse. 'On parcel' measures such as permeable paving and cellular storage tanks could be designed to accept the runoff from impermeable areas on site, before discharging flows to attenuation basins (suitably designed and located at low points on the site).

4.2.7 These attenuation basins should be the final point of storage before flows are discharged at a controlled rate (Q_{BAR}) to the ordinary watercourse running through the site.

4.2.8 The site should be split into catchments, based on the indicative site layout and the natural topography of the site. SuDS features would be suitably designed and implemented to drain each catchment, mimicking the existing drainage regime.

4.2.9 Attenuation basins should be designed in 3D from an early stage to ensure they provide an accurate picture of the footprint required to suitably drain the relevant catchments. It is recommended attenuation basins do not exceed 1.5m depth, and cater for 1 in 4 side slopes (to accord with both CIRIA, and Health and Safety recommendations).

4.2.10 Any SuDS features proposed for the site would be sized to attenuate flows from all rainfall events up to and including the 1 in 100 year plus 40% climate change storm. Flow controls would be fitted to the outfall of any SuDS features to ensure the discharge is restricted to the agreed flows. The overall discharge from the SuDS features to the Ordinary Watercourse would be equal to the Q_{BAR} rate for the site (90.2 litres per second). This would ensure greenfield conditions are being maintained, and the flood risk on site and to downstream areas is not exacerbated by the proposed development during the design return period.

4.2.11 A Quick Storage Estimate (QSE) was conducted to understand, at a high-level, the volume of attenuation that would be needed for the proposed development. This was undertaken assuming an impermeable area of 65% of the total site area. Once a detailed site layout is obtained, more detailed drainage calculations can be undertaken to provide a more accurate understanding of the attenuation requirements for the proposed development. The results of the QSE can be seen below in **Figures 4.1** and **4.2**.

Figure 4.1: Quick Storage Estimate Variables

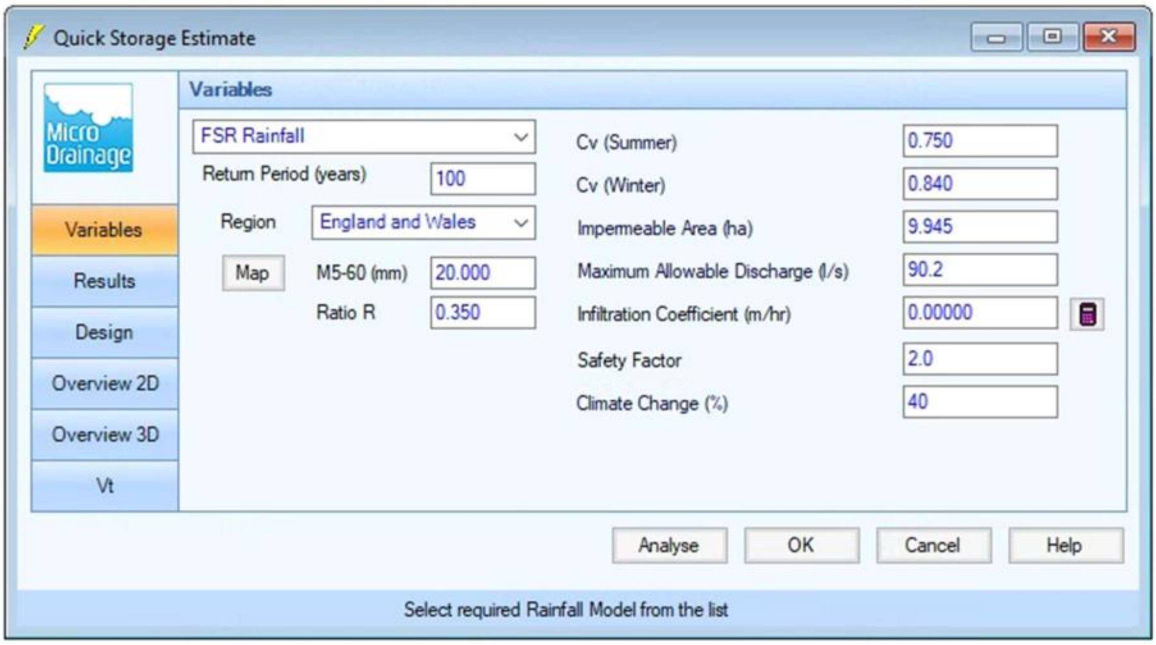
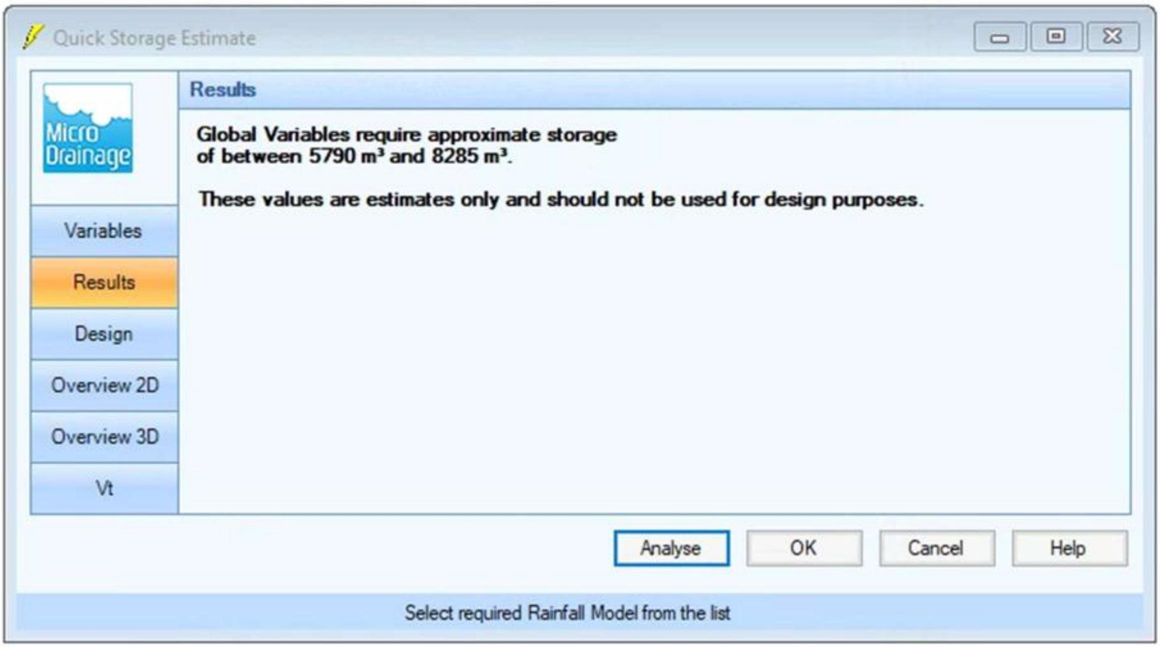


Figure 4.2: Quick Storage Estimate Results



4.2.12 The attenuation volume required for the site is shown to be 5790 – 8285m^3. To adopt a conservative approach, it should be assumed that 8285m^3 of storage would be required; although this figure may be reduced once accurate catchments for the site have been calculated.

4.2.13 An allowance for urban creep would be included in the SuDS calculations for each catchment, by adding 10% of all roof areas into the total impermeable area.

4.2.14 Drawings would be produced showing exceedance routes; pathways and strategies for managing surface water in the event that the proposed drainage network is inundated and cannot accept any more surface water.

4.2.15 The Ordinary Watercourse and the associated surface water flow route running through the centre of the site should be maintained, and left undeveloped to ensure that the extent is not worsened, to protect dwellings and to avoid impacting the natural watercourse.

4.3 Water Quality

4.3.1 Water quality is a key component of a SuDS system. Steps would be taken to ensure water quality on site and leaving the site is not negatively impacted by the proposed development. **Table 4.1** details the Pollution Hazard Indices of the different land use classifications of the site, in accordance with the CIRIA SuDS Manual (2015) C753.

Table 4.1: Pollution Hazard Indices for Proposed Development

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-carbons
Residential roofs	Very Low	0.2	0.2	0.05
Individual property driveways, residential car parks, low traffic roads (e.g. cul-de-sacs, home zones and general access roads) and non-residential car parking with infrequent change (e.g. schools, offices) i.e. <300 traffic movements/day	Low	0.5	0.4	0.4

4.3.2 Based on **Table 4.1** above, the pollution hazard level for the proposed development is anticipated to be 'low'. All surface water generated by the proposed development would be directed through at least one SuDS feature, providing flows with suitable water quality treatment before they are discharged from the site to the Ordinary Watercourse. In the anticipation an attenuation basin and/or permeable paving would be implemented as part of the proposed development; the indicative SuDS mitigation indices for these features can be seen in **Table 4.2**.

Table 4.2: SuDS Mitigation Indices for Proposed SuDS Features

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydrocarbons
Permeable Paving	0.7	0.6	0.7
Attenuation Basin	0.7	0.7	0.5

4.3.3 Based on the above table, surface water generated by the proposed development would receive adequate water quality treatment before it is discharged to the Ordinary Watercourse.

4.4 Foul Drainage Strategy

4.4.1 The foul water sewer company operating within the vicinity of the development proposal is SW.

4.4.2 Peak design foul discharges would be calculated based on the Sewers for Adoption 8th Edition Residential Domestic Flow Rate:

Residential domestic flow = 4000 litres/dwelling/day (peak)

4.4.3 It is proposed the foul flows from the site connect into the existing SW foul sewer system running along Keymer Road, at manhole reference 8802. This would be achieved through the implementation of a foul pumping station, which would pump the flows to the proposed connection point via a rising main.

4.4.4 If any upgrades to the network are required as a result of the proposed development, the cost for these works would be covered by SW as part of their updated improvement works funded by infrastructure charges. Subsequently, a Water Industry Act (WIA) Section 106 connection would be made to obtain permission from SW to connect to the public sewer. For SW records, refer to **Appendix F**.

5.0 SUMMARY AND CONCLUSIONS

5.1 Odyssey has been commissioned by Thakeham Homes to provide Flood Risk and Drainage Appraisal technical support for the proposed residential development of Land at Keymer Road, Burgess Hill.

5.2 The 15.3-hectare site is listed as site SA13 *“Land East of Keymer Road and South of Folders Lane, Burgess Hill”* in the Mid Sussex District Council Site Allocations Development Plan (2019), and has the description of a “*housing allocation with on site open space and children’s equipped playspace”*. There is an indicative scope for 300 dwellings on the site.

5.3 A surface water drainage strategy would be designed to incorporate suitable SuDS measures, to ensure the site drains in a manner commensurate with local and national policy. Infiltration rates are not expected to be sufficient to propose infiltration as a method of surface water discharge. Infiltration potential should be confirmed via on site soakage testing, to ascertain site-specific infiltration rates.

5.4 It is anticipated the most feasible method of surface water discharge would be *“to a surface water body”*; the second most-preferred option of the drainage hierarchy as set out in the PPG. Surface water flows generated from the proposed development would pass through suitably designed SuDS features before discharging to the Ordinary Watercourse flowing through the centre of the site.

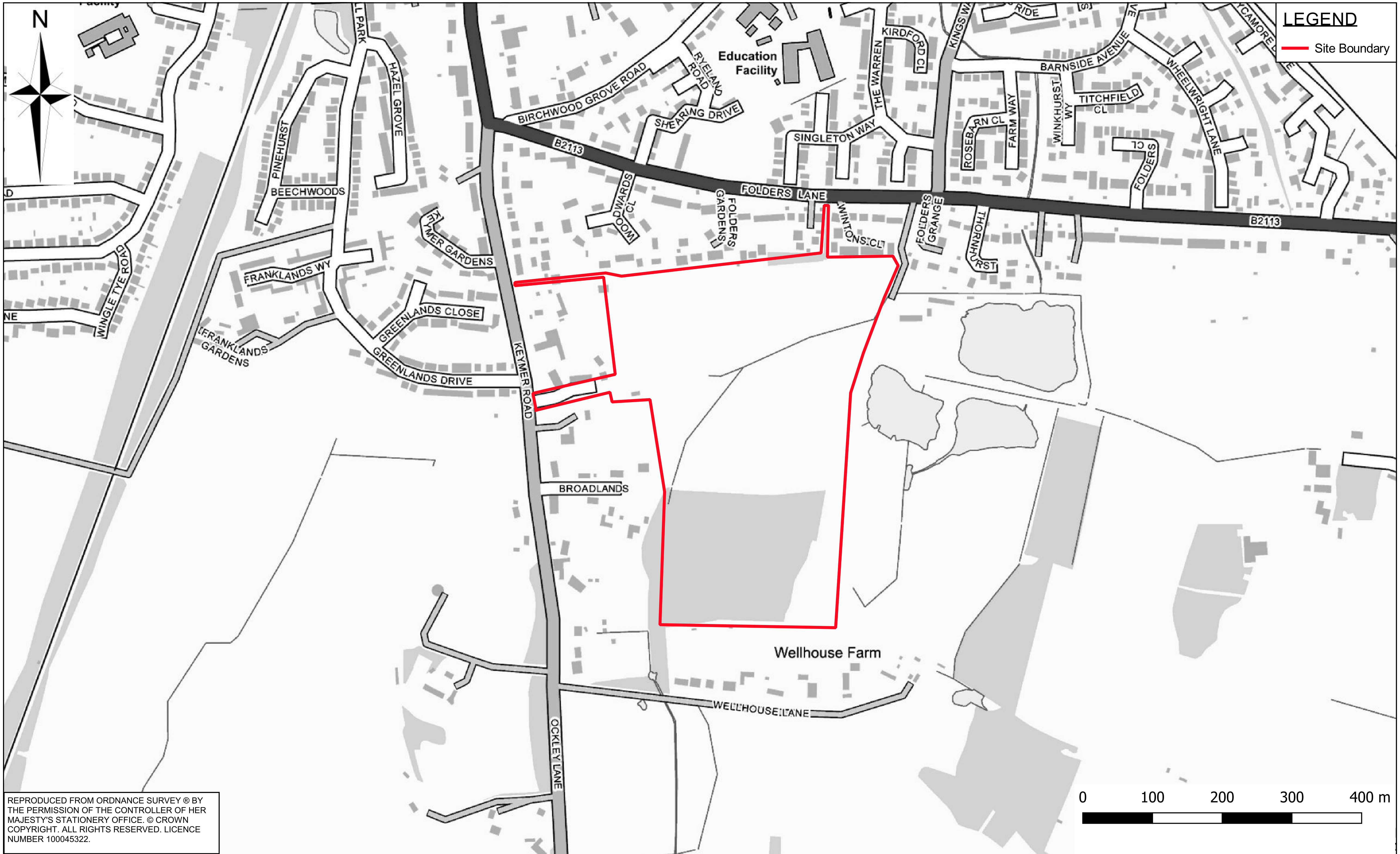
5.5 The proposed SuDS measures would ensure that surface water generated by the proposed development receives adequate water quality before discharging downstream, to reduce the risk of pollution to the Ordinary Watercourse. SuDS features are expected to consist of permeable paving and/or an attenuation basin, determined at the outline stage of the scheme and informed by soakage tests. Any discharge offsite would be limited to Q_{BAR} equivalent rates, to ensure that flood risk to downstream areas is not exacerbated by the proposed development during flood events up to and including the 1 in 100 year plus 40% climate change event.

5.6 It is proposed that the foul flows from the site should connect into the existing Southern Water foul sewer system running along Keymer Road, at manhole reference 8802. This would be achieved through the implementation of a foul pumping station, which should send the flows to the proposed connection point via a rising main. Any necessary infrastructure upgrades would be covered by Southern Water as part of their updated costing scheme.

5.7 This Technical Note has set out existing site conditions, assessed the potential sources of flood risk to the site and potential surface water drainage options, and identified constraints and opportunities with regards to flood risk and drainage. This report demonstrates no major issues from a flood risk or drainage perspective that would pose a constraint to the allocation of the proposed development.

APPENDIX A

Site Location Plan



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Job Title	LAND AT KEYMER ROAD, BURGESS HILL
Figure Title	SITE LOCATION PLAN
Client	THAKEHAM HOMES
Scale	1:5000 @ A3
Date	JULY 20
Designed	NM
Drawn	NM
Checked	GG
Approved	GG
Job No	14-205
Figure No	FIGURE 1
Rev	

APPENDIX B

Concept Masterplan

0 20 40 60 80 100 metres

N

Site Boundary and draft allocation (Policy number SA13): **Approx. 15.17ha**

Proposed developable area: **7.50ha**
Up to 265 dwellings @ 35dph

Movement and Infrastructure

- Proposed vehicular access points
- Proposed spine streets
- Proposed secondary streets and private drives

Green Infrastructure and Public Open Space

- Proposed green infrastructure and public open space
- Existing vegetation (subject to tree survey)
- Trees with Tree Preservation Orders (TPO)
- Proposed tree, hedgerow and thicket planting
- Potential location for Sustainable Drainage System (SuDS) basins (subject to drainage input)
- Proposed locations for children's play areas
- Proposed recreational routes
- Potential pedestrian links
- Existing water features

Context

- +55m Existing contours
- Public footpaths
- Public bridleways
- B Main vehicular routes and existing bus stops
- South Downs National Park
- Protecting Areas of Townscape Value (Source: Mid Sussex District Council, 2018)
- Informal Open Space (Source: Mid Sussex District Council, 2018)
- Listed Building
- Extent of Flood Zone (Source: Mid Sussex District Council, 2018)
- Ancient woodland

Rev	Date	By	Description
B	28/04/20	BS	Proposed planting amended
A	21/01/20	SM	Spine street amended

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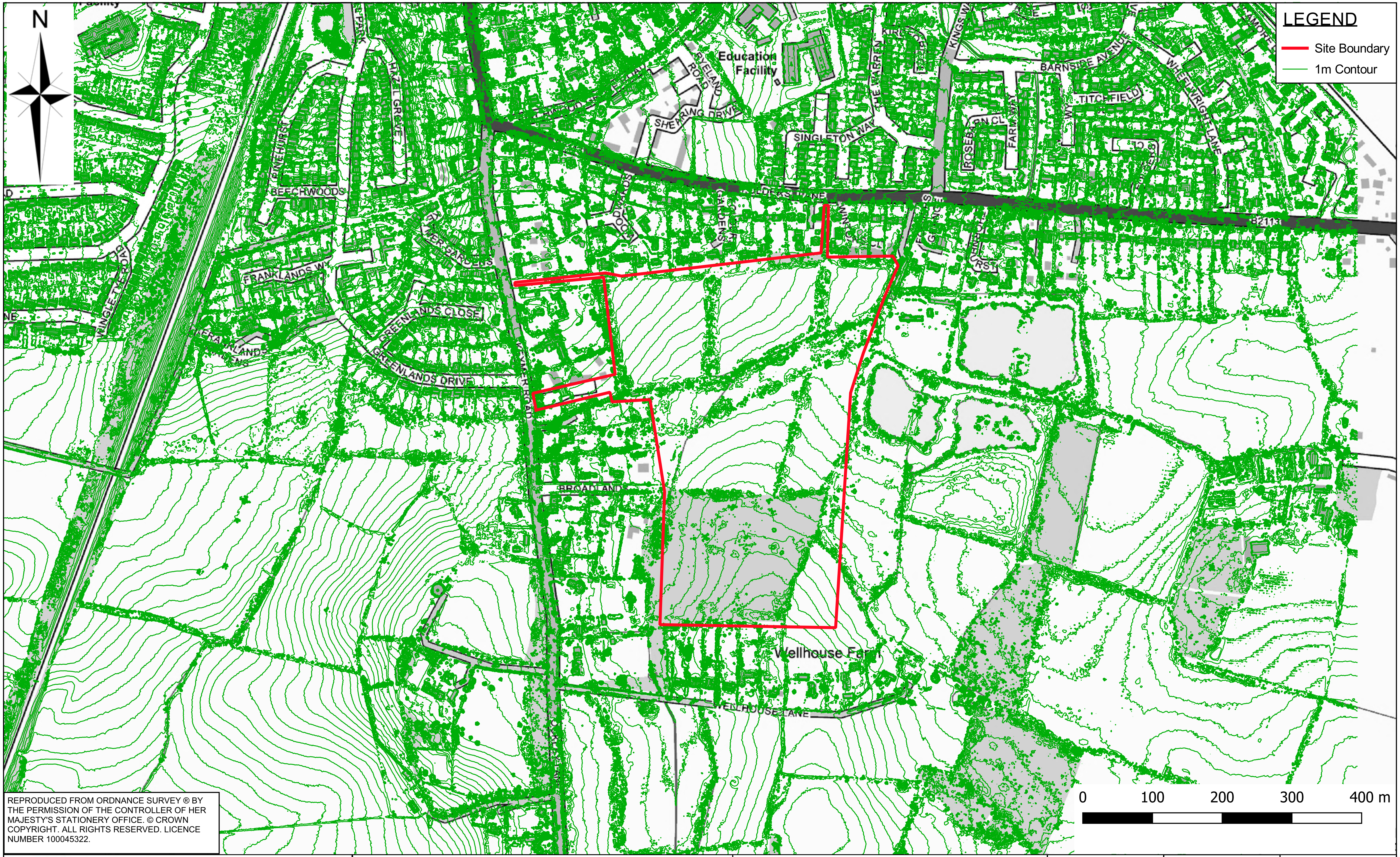
Project	Land East of Keymer Road & South of Folders Lane, Burgess Hill		
Title	Concept Masterplan		
Client	Persimmon Homes Thames Valley & Thakeham		
Scale	1:2000 @ A2	Drawn	SM
Date	Nov 2019	Checked	CA
Drawing No.	CSA/4007/104	Rev	B

APPENDIX C

Topographical Data



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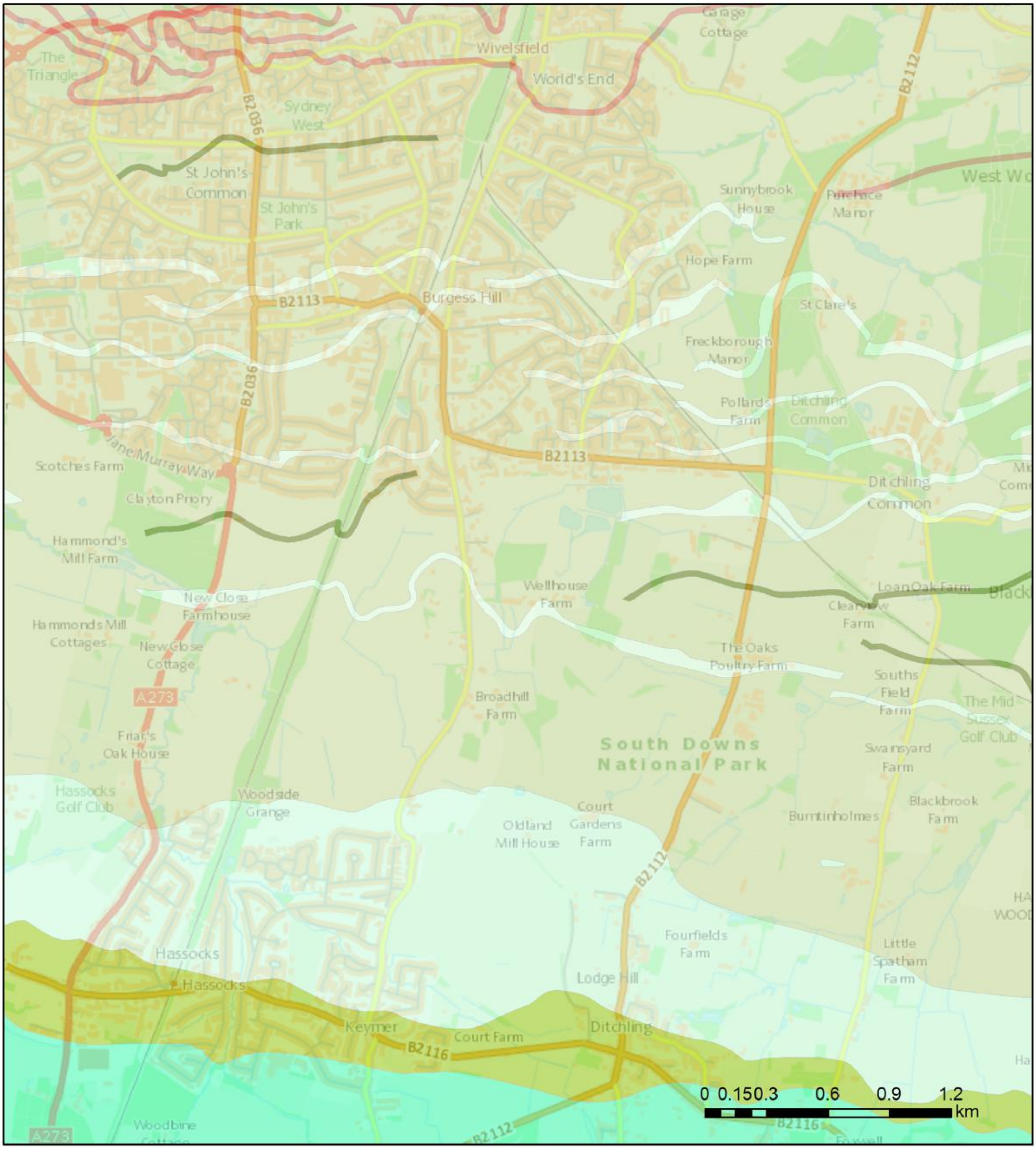
Job Title	LAND AT KEYMER ROAD, BURGESS HILL
Figure Title	TOPOGRAPHICAL DATA 1m CONTOUR
Client	THAKEHAM HOMES
Scale	1:5000 @ A3
Date	JULY 20
Designed	NM
Drawn	NM
Checked	GG
Approved	GG
Job No	14-205
Figure No	FIGURE 2
Rev	

APPENDIX D

British Geological Survey Records

14-205 Bedrock Geology

GEOINDEX ONSHORE



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

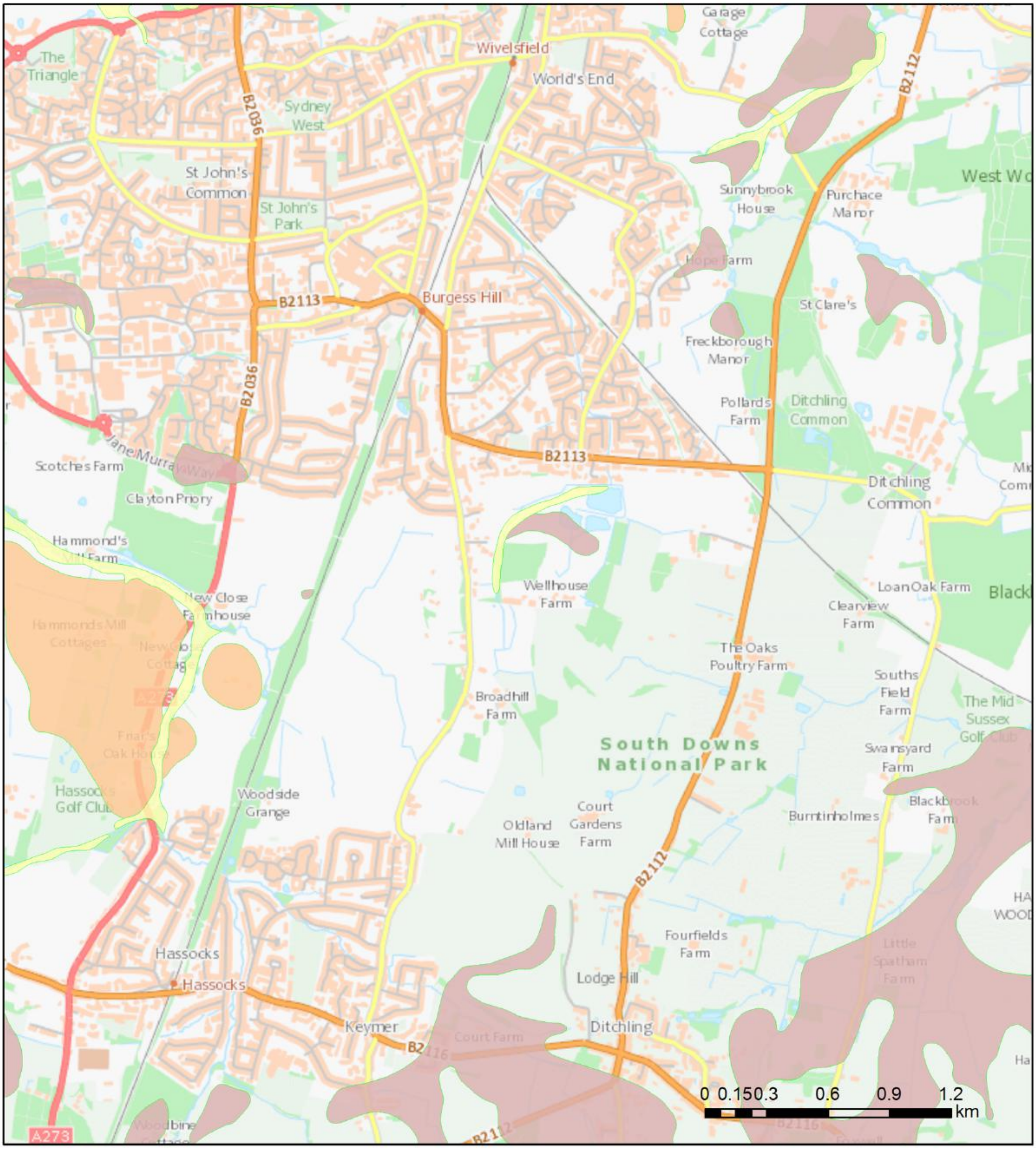
Bedrock geology 1:50,000 scale

- HORSHAM STONE MEMBER - SANDSTONE
- WEALD CLAY FORMATION - SANDSTONE
- LOWER GREENSAND GROUP - SANDSTONE, SILTY
- WEALD CLAY FORMATION - SILICATE-CLAYSTONE
- GAULT FORMATION - MUDSTONE
- WEALD CLAY FORMATION - MUDSTONE
- UPPER TUNBRIDGE WELLS SAND - SILTSTONE, MUDSTONE AND SANDSTONE
- WEALD CLAY FORMATION - CLAY-IRONSTONE
- WEST MELBURY MARLY CHALK FORMATION - CHALK
- UPPER GREENSAND FORMATION - SILTSTONE AND SANDSTONE
- FOLKESTONE FORMATION - SANDSTONE
- WEALD CLAY FORMATION - LIMESTONE

Selection Results

14-205 Superficial Deps

GEOINDEX ONSHORE



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

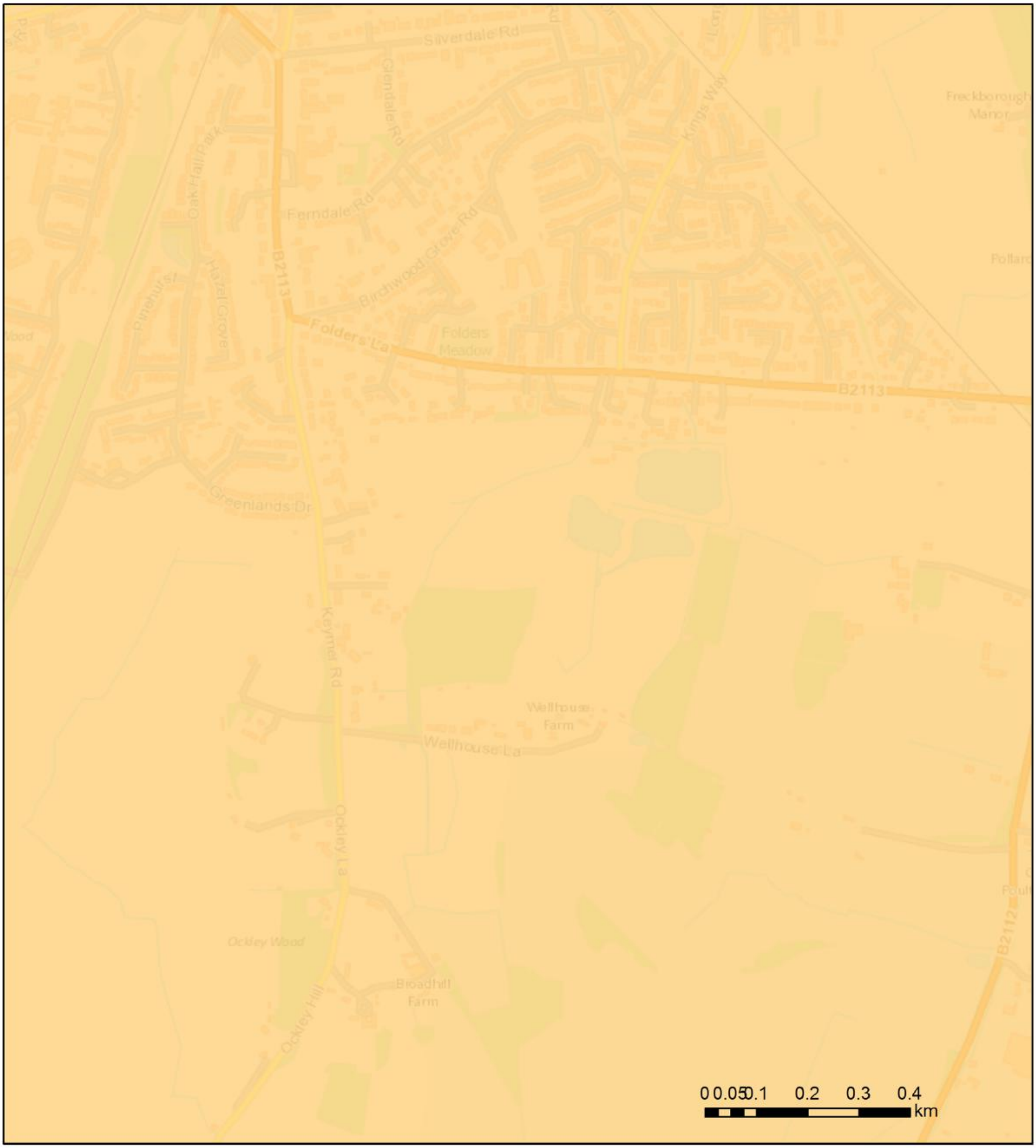
Superficial deposits 1:50,000 scale

- ALLUVIUM - CLAY, SILT, SAND AND GRAVEL
- HEAD - CLAY, SILT, SAND AND GRAVEL
- RIVER TERRACE DEPOSITS, 2 (ADUR) - SAND AND GRAVEL

Selection Results

14-205 Hydrogeology

GEOINDEX ONSHORE



GeoIndex Onshore Data Sources: NERC, Natural England, English Heritage and Ordnance Survey

Map Key

Hydrogeology 1:625,000 scale

Aquifers with significant intergranular flow

- **Highly productive aquifer**
- **Moderately productive aquifer**
- **Low productivity aquifer**

Aquifers in which flow is virtually all through fractures and other discontinuities

- **Highly productive aquifer**
- **Moderately productive aquifer**
- **Low productivity aquifer**
- **Rocks with essentially no groundwater**

Selection Results

BOREHOLE No. 1

SITE :- BURGESS HILL, NEW SIGNAL BOX. TQ31NW1

DATUM FOR LEVELS :- GROUND LEVEL

GROUND LEVEL :- APPROX. R.L.

POSITION :- SEE SITE PLAN.

SITE PLAN No.

DATE :- 17·4·59

STRATA	THICKNESS	DEPTH (M)	KEY	WATER LEVELS	SAMPLES	REMARKS
TOP SOIL, ASHES, TRACK BALLAST AND PIECES OF CHALK	1'-0"	1'-0" (0.30)			1'-0"	
DARK SOIL WITH PEA BALLAST AND LARGE ROUND BALLAST	0'-9"	1'-9" (0.53)				standard penetration test N=7
VERY DARK SOIL WITH MIXTURE OF SMALL STONES AND BRICK.	0'-6"	2'-3" (0.69)			2'-6"	
WEATHERED CHALK (SOME PIECES UPTO 4" DIA.) BECOMING SOFT TO VERY SOFT.	5'-10"	8'-1" (2.46)			3'-6" – 5'-0"; 6'-1" – 7'-7"	standard penetration test N=3; standard penetration test N=3 for 18 ins.
VERY LIGHT ORANGE SILTY CLAY	0'-6"	8'-7" (2.62)			8'-4"	
LIGHT BROWN SILTY CLAY WITH LARGE CLAYSTONES	0'-9"	9'-4" (2.84)			T.12	
DARK GREY SILTY CLAY	0'-11"	10'-3" (3.12)			9'-10"	
SOFT GREENISH SILTY CLAY	1'-0"	11'-3" (3.43)				
FIRM LIGHT BROWN/GREY MOTTLED SILTY CLAY WITH SMALL ROOTS AND SOME SMALL CLAYSTONES	2'-7"	13'-10" (4.22)			11'-5" T99 12'-11"	
LIGHT BROWN/GREY MOTTLED CLAY. (FIRM)	1'-0"	14'-10" (4.52)				
LIGHT BROWN/GREY MOTTLED CLAY WITH 'PEA' SANDSTONE & BALLAST.	1'-2"	16'-0" (4.88)			14'-5" T48 15'-11"	
FIRM LIGHT BROWN / GREY MOTTLED FISSURED SILTY CLAY WITH SOME SMALL ROOTS	3'-9"	20'-9" (6.33)		▼	17'-10" T28 19'-4"	W.L. 16'-8"
VERY SOFT LIGHT BROWN/GREY MOTTLED SILTY CLAY					20'-10"	
STIFF LIGHT BROWN/GREY MOTTLED FISSURED CLAY.					T14 22'-4"	

▯ UNDISTURBED CORE	FIELD WORK		DATE	SCALE	2 FT. TO 1 IN.
○ DISTURBED SAMPLE	DRAWN	D.A.B.	9·7·59	C C.E's No.	B116/15
Δ WATER SAMPLE	CHECKED	R.E.L.	20·7·59		

RESEARCH SECTION, SOUTH SIDE OFFICES, WATERLOO. EXT. 2786.

BRITISH RAILWAYS, SOUTHERN REGION, CHIEF CIVIL ENGINEER'S DEPARTMENT, WATERLOO STATION, S.E.1.

TQ31NW/7
3235.1665

1

318/78 **Court Gardens Farm, Ditchling.** (Disused)

Surface +220. Bore 68. Lining tubes: 65 x 4 in. R.W.L. +180. Suction +155½. *Harper, Dec. 1933.*
Deepened. Lining tubes: 165 x 4 in; 76 x 3 in. R.W.L. +185. *Harper, July 1934.* R.W.L. +217. Yield 4,000 g.p.d. *Mar. 1940.*

WC	...	...	184 184

Weald clay	Old bore		68
	Blue clay	13	81
	Brown "soil" [sic]	2	83
	Blue clay	97	180
	Blue clay & rock	4	184

TQ 3236 1665

318/78 Court Gardens Farm, Ditchling. (Disused) TQ 31|17

Surface +220. Bore 68. Lining tubes: 65 x 4 in. R.W.L. +180. Suction +155½. Harper, Dec. 1933.

Deepened. Lining tubes: 165 x 4 in; 76 x 3 in. R.W.L. +186. Harper, July 1934. R.W.L. +217. Yield 4,000 g.p.d. Mar. 1940.

WC	...	...	184	184

Weald clay	Old bore		68
	Blue clay	13	81
	Brown "Soil" [sic]	2	83
	Blue clay	97	180
	Blue clay & rock	4	184

2

RECORD OF WELL (SHAFT OR BORE)

318/78

N.S.
O.S.
Grid Ref.

At Court Gardens Farm

Town or Village Ditchling County Six-inch quarter sheet 31 SW

Exact site (A rough sketch-map or a tracing from a map is very desirable)

in parish of

Level of ground surface above sea-level (O.D.) +220 ft. If well starts below ground surface, state how far ft.

Shaft ft., diameter ft. Bore 68 ft. Diameter of bore: at top ins.; at bottom ins.

Details of permanent lining tubes (internal diameters preferred) 65 ft. of 4" Tube.

TQ31/17

Water struck at depths of (feet)

Rest-level of water below top of well 40 feet. Suction at feet. Yield on hours'/days' test gallons per (with pump of capacity g.p.h.); depressing water level to feet below top. Time of recovery hrs. Amount normally pumped daily g.p.h. for hours.

Quality (attach copy of analysis if available)

Sunk by Harper & Eede for Mr. J.E. Muggeridge Date of well December, 1933.

Information from ~~H. & E., Ltd., Lewes~~

(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA (and any additional remarks).	THICKNESS Feet.	THICKNESS Inches.	DEPTH Feet.	DEPTH Inches.
	Pump 64 ft. 5 ins. from top.				
	Silted 4 ft.				
	Deepened, see 1934 record.				
	DATA Bank				

For Survey use only

Date received	G.S.M. Office File No.	Site marked on 1" map (use symbol)
29 MAY 1940		

(*11815) Wt.29051/O.369 10,000 9/39 A.& E.W.Ltd. Gp.686

2

RECORD of WELL or BORING

318

TQ 31/17

Survey No.
1′ N.S. 318
1′ O.S.

78

at (house or farm) Court Gardens, Ditchling

Town, Village, &c. .... County Sussex .... Six-inch map.

Exact site (unless a tracing from a map is supplied, give distance and direction from parish church, cross-roads, or other object shown on maps). .... Popular Edition Sheet .... of one-inch map. (Square ....

Surface level of ground .... ft. above Ordnance Datum. Well or Bore commenced at .... ft. below surface level of ground.

Sunk .... ft., diameter .... ft. Bored .... ft.; diameter of boring: at top .... in., at bottom .... in.

Details of lining tubes (internal diameters preferred) Total depth of borehole 184 ft.; old bore 68 ft. additional bore 116 ft.: water level 34 ft. from surface. 115′ x 4″; 76′ x 3″ and 50′ x 6″ ate

Water struck at depths of (feet) ....

Rest-level of water below/above top of well or bore 34 ft. Pumping level .... ft. Time of recovery .... hours.

Suction at .... ft. depth. Yield: (i) on test .... galls. per ...., (ii) normal .... galls. per ....

Quality (attach copy of analysis if available) ....

Made by Harper & Eede, Ltd. for Mr. J. Muggeridge Date of boring July, 1934.

Information from C.B. Wedd, Esq.

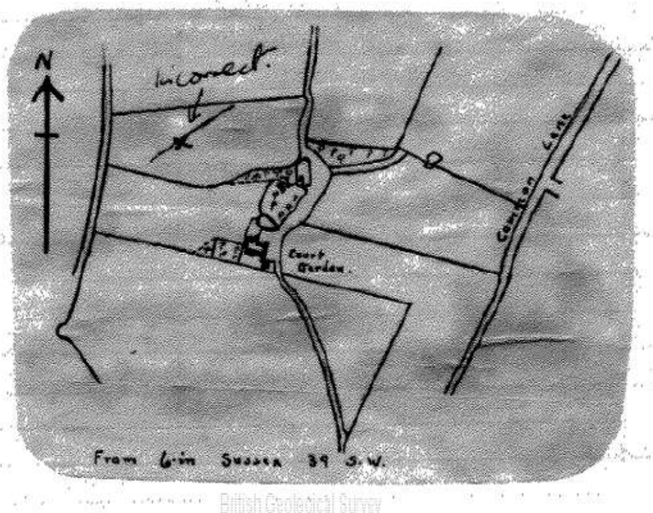
(For Survey use only). GEOLOGICAL CLASSIFICATION.	NATURE OF STRATA. (and any additional remarks)	THICKNESS. Feet.	Inches.	DEPTH. Feet.	Inches.
	Old bore			68	-
Weald Clay	Blue clay	13	-	81	-
	Brown "soil" [sic]	2	-	83	-
	Blue clay	97	-	180	-
	Blue clay and rock	4	-	184	-

JHB 8/38

Ref. 9509/30 March 25th 1940 [Court Garden Guernsey Farm]
Site plan obtained. O.D. + 250. 6 in Sussex 39 S.W.
Rest level 3 ft. down. Yield 4000 g.p. day.

WRE

Visited. Now Mr. Widdicombe. Site corrected.
Bore with engine in middle of field – no pumphouse.
Disused. May be brought into use for cattle as trouble
with small diameter mains pipe. Has been passed as fit
for cattle only.
O.D. c+ 220. 20-5-59 ASR.



From 6-in Sussex 39 S.W.

Geological Survey and Museum,
South Kensington,
London, S.W.7.

For Survey use only.

Date received.	G.S.M.	M. of H. notified.	Site marked on 1″ map.
7/38			

Soil Engineering Limited

BOREHOLE LOG

TQ31NW/13

Contract No. E.3342
Location Burgess Hill Railway
Client West Sussex C.C.
Method of Boring Percussion
Diameter of Borehole 204 mm

Approx. Location
532 590 E
118 655 N

Sheet 1 of 1
Chainage 5.95
Ground Level 49.90 m.A.O.D.
Date 30/4 - 4/5/76

Description of Strata	Legend	Depth below G.L. (m)	O.D. Level (m)		Sampling and Coring	"N"
TOPSOIL		0.30	49.60		0.35	
Firm ochre and grey mottled, silty CLAY. (completely weathered Weald Clay)		2.75	47.15		1.40 2.30	
Very stiff ochre with grey mottling very silty CLAY. (completely to highly weathered Weald Clay).		4.80	45.10		3.60 S	46
Very stiff, dark blue grey, silty CLAY with mudstone horizons. (highly to moderately weathered Weald Clay).		9.85	40.05		4.80-5.30 5.30 S 7.00-7.40 7.70 S 8.30-9.00 9.40 S	116 45 105

Remarks (Observations of Ground Water etc.)

Water added to assist boring.

Type of Sample

Is S.P.T. | Undisturbed
Ic. C.P.T. | X Vane
O Jar | Δ Water
Bulk | Piezometer

TQ 3I NW/13

BOREHOLE LOG

Contract No. F.3342
Location Burgess Hill Railway
Client West Sussex C.C.
Method of Boring Percussion
Diameter of Borehole 204 mm

Sheet 2 of 2
Chainage 31.25
Ground Level 49.75 m.A.O.D.

Description of Strata	Legend	Depth Below G.L. (m)	O.D. Level (m)		Sampling and Coring	"N"	
Very stiff, dark blue grey, silty CLAY, with mudstone horizons up to 45 mm thick. (highly to moderately weathered Weald Clay).		11.45	38.30		11.00 S	177	

Type of Sample

Is S.P.T. ▯ Undisturbed
Ic. C.P.T. × Vane
O Jar Δ Water
● Bulk Piezometer

Remarks (Observations of Ground Water etc.)

Water added to assist boring.

APPENDIX E

Environment Agency Data

Flood map for planning

Your reference	Location (easting/northing)	Created
14-205	**532109/117823**	**13 Jul 2020 15:48**

Your selected location is in flood zone 1, an area with a low probability of flooding.

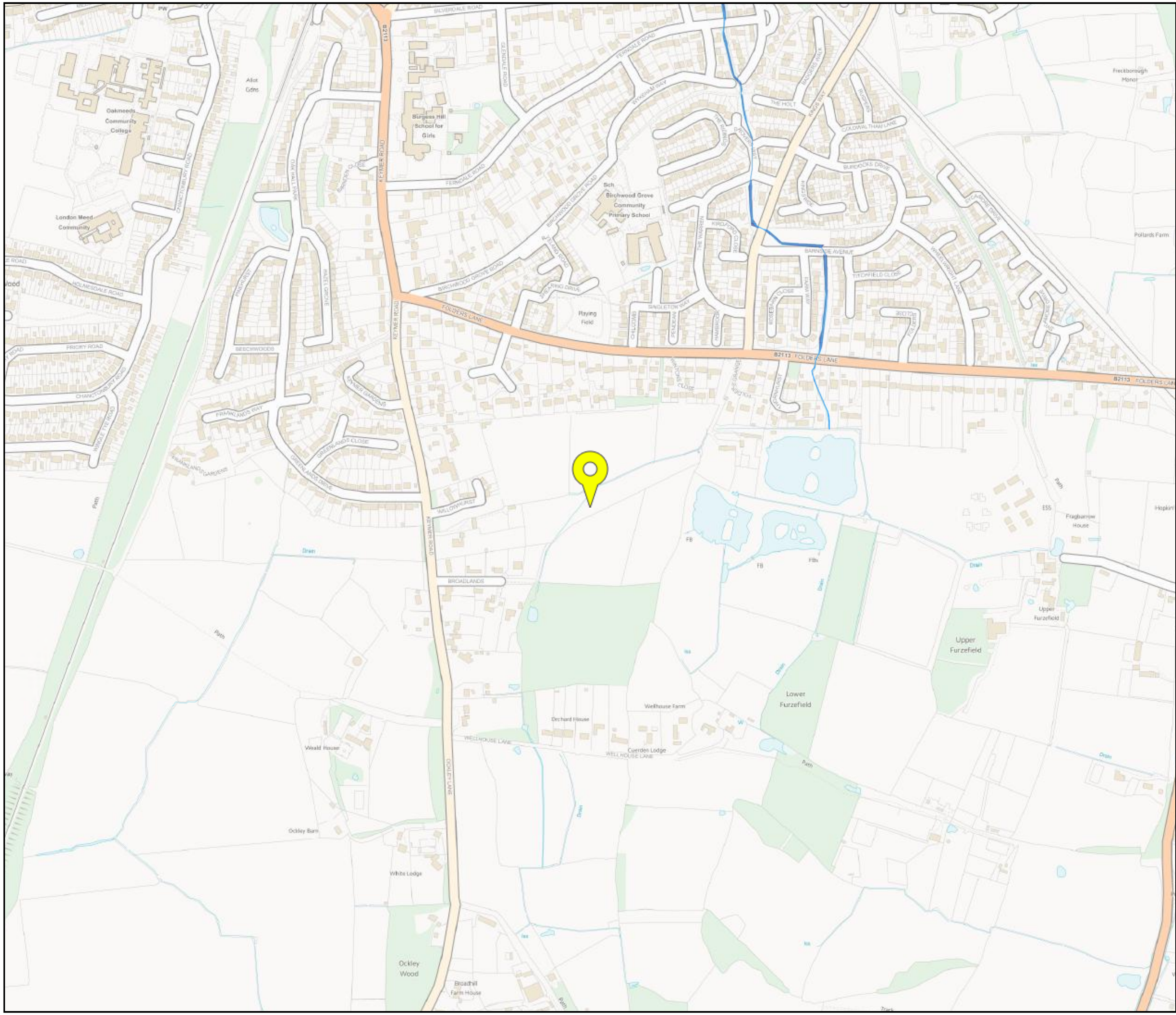
This means:

- you don't need to do a flood risk assessment if your development is smaller than 1 hectare and not affected by other sources of flooding
- you may need to do a flood risk assessment if your development is larger than 1 hectare or affected by other sources of flooding or in an area with critical drainage problems

Notes

The flood map for planning shows river and sea flooding data only. It doesn't include other sources of flooding. It is for use in development planning and flood risk assessments.

This information relates to the selected location and is not specific to any property within it. The map is updated regularly and is correct at the time of printing.



Environment Agency

Flood map for planning

Your reference
14-205

Location (easting/northing)
532109/117823

Scale
1:10000

Created
13 Jul 2020 15:48

Selected point

Flood zone 3

Flood zone 3: areas benefitting from flood defences

Flood zone 2

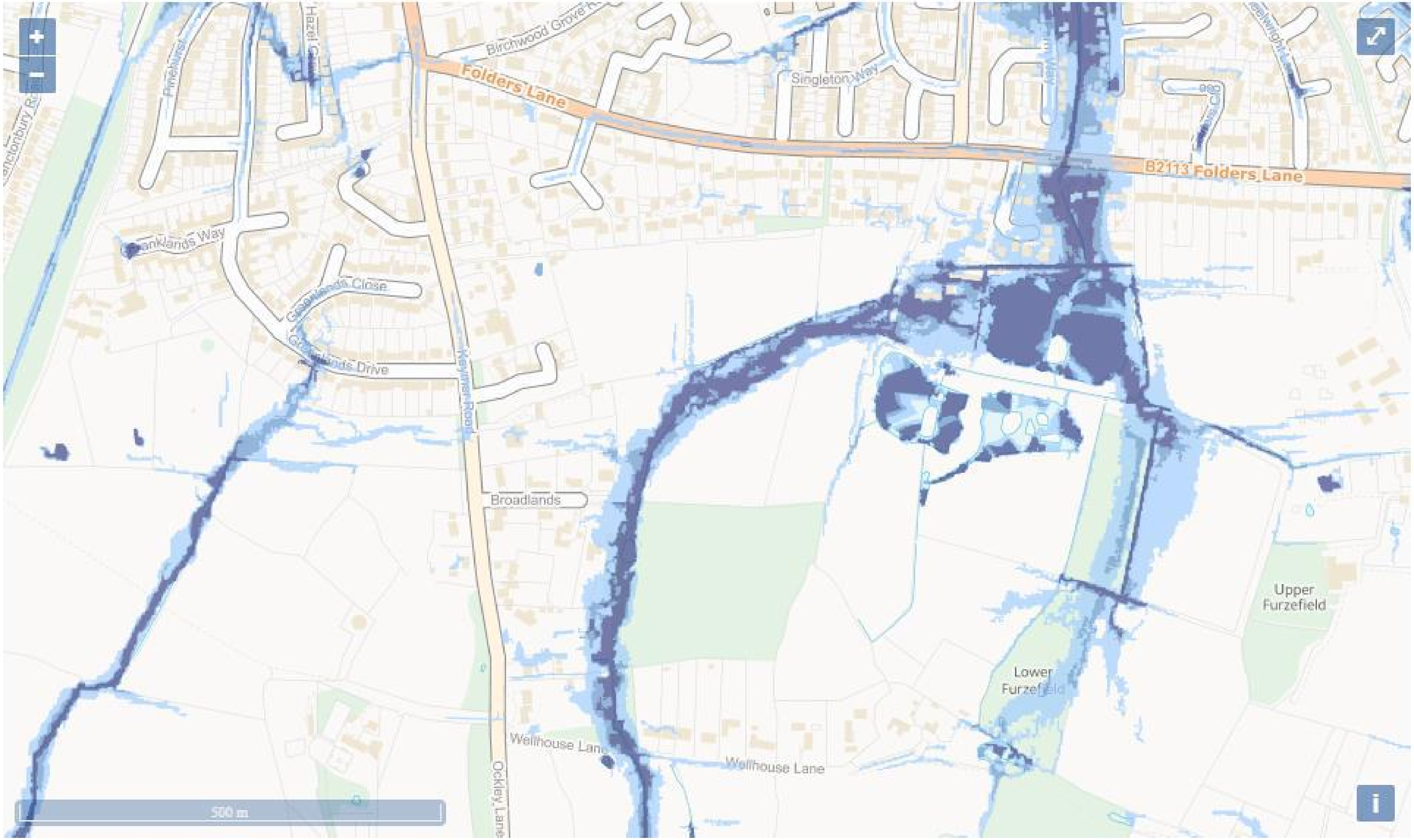
Flood zone 1

Flood defence

Main river

Flood storage area

0 100 200 300m



Extent of flooding from surface water

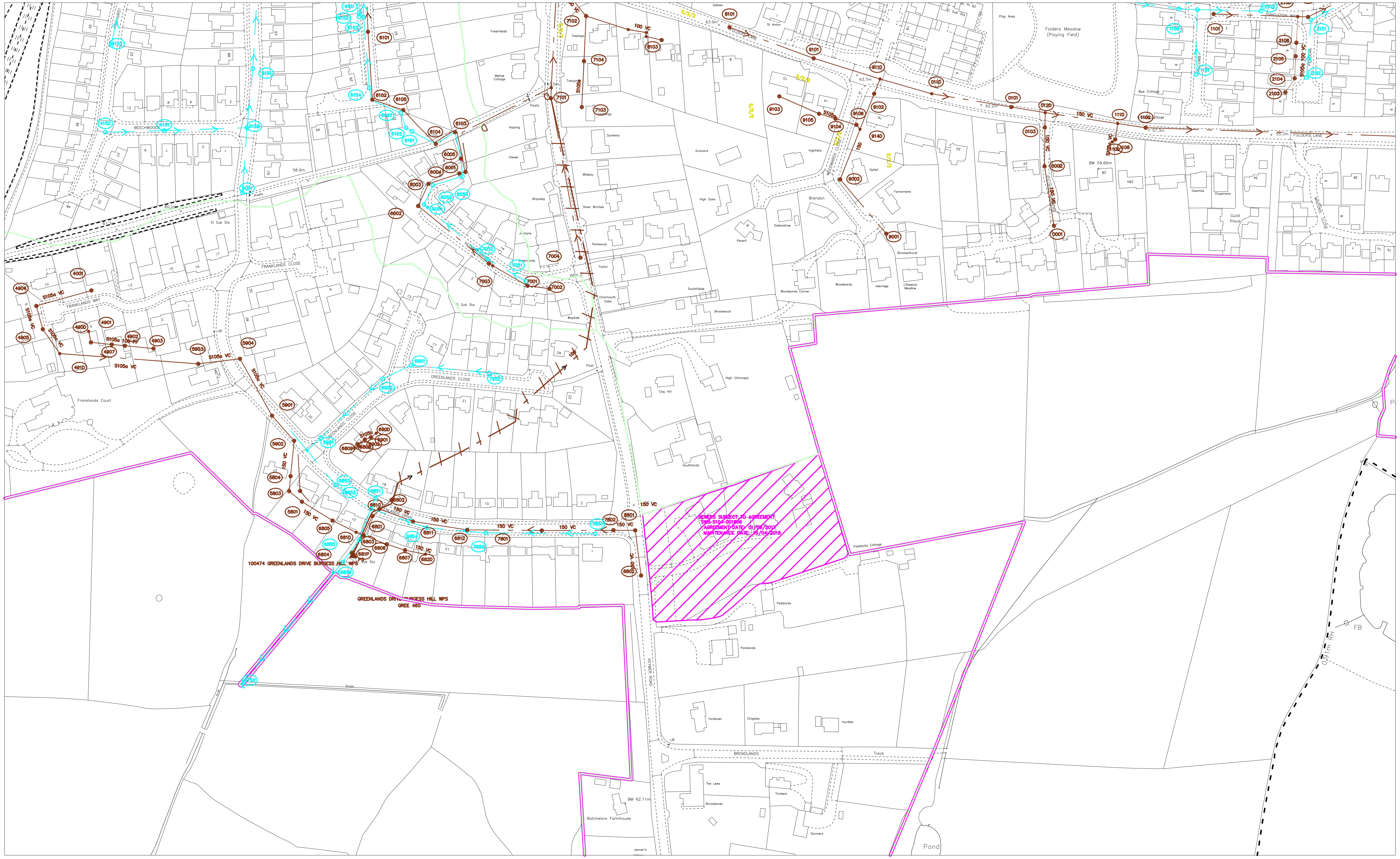
High Medium Low Very low

APPENDIX F

Southern Water Records

SEWER RECORDS PAGE 1 OF 2

118198



117620

531378

532322

O.S. REF.	Drawn by: okuneyf	The positions of pipes shown on this plan are believed to be correct, but Southern Water Services Ltd accept no responsibility in the event of inaccuracy. The actual positions should be determnined on site. WARNING: BAC pipes are constructed of Bonded Asbestos Cement WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement
TQ3117NE	Scale: 1:2500	
Title: 361907_1 Folders Gardens, Burg	Date: 28/11/2019	Based upon Ordnance Survey Digital Data with the permission of the controller of H.M.S.O. Crown Copyright Reserved Licence No. WU 298530.

N

Southern Water

SEWER RECORDS PAGE 2 OF 2

Node	Cover	Invert	Size	Material	Shape	
0001X	60.18	58.63	150	VC	CIRC	
0002X	60.67		150	VC	CIRC	
0101X			150	VC	CIRC	
0103X			150	VC	CIRC	
011DX			150	VC	CIRC	
012DX			150	VC	CIRC	
1101X	54.52	52.32	150	VC	CIRC	
1102X			150	VC	CIRC	
1105X	54.374	52.864	300	PP	CIRC	
1106X			UNK	VC	CIRC	
110DX			UNK	VC	CIRC	
111DX			150	VC	CIRC	
1151X	55.57	54.27	150	VC	CIRC	
1155X	54.51	53.1	225	PP	CIRC	
2101X	53.94	51.44	150	VC	CIRC	
2102X	54.913	54.213	300	PP	CIRC	
2103X			100	VC	CIRC	
2104X			100	VC	CIRC	
2105X			100	VC	CIRC	
2106X			100	VC	CIRC	
210DX			150	VC	CIRC	
2151X	53.89	51.99	225	VC	CIRC	
2152X	54.41	53.1	150	VC	CIRC	
4001X			UNK	VC	CIRC	
4151X	59.18	57.47	150	VC	CIRC	
4152X	59.95	58.05	150	VC	CIRC	
4153X	53.22	51.86	150	VC	CIRC	
4901X						
4902X			100	PF	CIRC	
4904X			UNK	VC	CIRC	
4905X			UNK	VC	CIRC	
490DX			100	PF	CIRC	
491DX			UNK	VC	CIRC	
5051X	59.82	58.34	150	VC	CIRC	
5151X	53.15	51.55	150	VC	CIRC	
5152X	56.12	54.91	150	VC	CIRC	
5801X	52.18	50.92	150	VC	CIRC	
5803X	52.33	51.38	150	VC	CIRC	
5804X	53.05	51.75	150	VC	CIRC	
585DX			225	VC	CIRC	
5901X	57.69	54.95	150	VC	CIRC	
5902X	55.66	54.02	150	VC	CIRC	
5903X			UNK	VC	CIRC	
5904X			UNK	VC	CIRC	
5951X	55.04		150	VC	CIRC	
6001X	58.41	55.65	150	PF	CIRC	
6002X	59.63	56.94	150	VC	CIRC	
6003X	58.62	56.01	150	VC	CIRC	
6004X	58.16	55.75	150	VC	CIRC	
6005X	58.27		150	VC	CIRC	*
6005Y	58.27		150	VC	CIRC	*
6051X	59.52	56.72	150	VC	CIRC	
6052X	58.58	55.8	150	VC	CIRC	
6053X	58.24	55.4	150	VC	CIRC	
6101X	49.17	47.68	150	VC	CIRC	
6102Y	53.25	53.25	150	VC	CIRC	*
6102X	53.25	51.13	150	VC	CIRC	*
6103X	58.39		150	VC	CIRC	*
6103Y	58.39		150	VC	CIRC	*
6104X	58.13		150	VC	CIRC	*
6104Y	58.13		150	VC	CIRC	*
6105X			150	VC	CIRC	
6151X	49	47.57	300	VC	CIRC	
6152X	49.03	47.61	300	VC	CIRC	
6153X	48.85	47.63	225	VC	CIRC	*

Node	Cover	Invert	Size	Material	Shape	
6153Y	48.85	47.63	300	VC	CIRC	*
6154X	52.2	50.96	150	VC	CIRC	
6161X			150	VC	CIRC	
6162X			150	VC	CIRC	
6163X			150	VC	CIRC	
6801X	51.26	50.22	150	VC	CIRC	
6802X	51.7	50.77	150	VC	CIRC	
6803X	50.47	49.28	300	VC	CIRC	
6804X	49.82	49.82	300	VC	CIRC	
6805X	50.51	49.87	150	VC	CIRC	
6806X			UNK	VC	CIRC	
6807X			150	VC	CIRC	
6808X			UNK	UNK	CIRC	
6809X			UNK	UNK	CIRC	
6811X	52.509	50.63	150	VC	CIRC	
6812X	54.02	51.7	150	VC	CIRC	
681DX	50.84	49.36	150	VC	CIRC	
682DX			150	VC	CIRC	
6851X	51.38	50.55	150	VC	CIRC	
6852X	51.28	50.23	300	VC	CIRC	
6853X	52.51	51.19	225	VC	CIRC	
6854X	52.64	51.17	225	VC	CIRC	
6855X	50.27	49.45	300	VC	CIRC	
6856X	49.62	48.82	300	VC	CIRC	
6901X			UNK	UNK	CIRC	
6902X			UNK	UNK	CIRC	
6951X	57.38	55.77	150	VC	CIRC	
6952X	57.11	55.36	150	VC	CIRC	
7001X	65.21	63.17	150	VC	CIRC	
7002X	66.36	63.69	150	VC	CIRC	
7003X	63.38	60.96	150	VC	CIRC	
7004X	66.38	64.47	150	VC	CIRC	
7051X	65.19	62.82	150	VC	CIRC	
7052X	63.28	60.66	150	VC	CIRC	
7101X	63.55		225	VC	CIRC	
7102X			150	VC	CIRC	
7103X			UNK	UNK	CIRC	
7104X			UNK	UNK	CIRC	
710DX			225	VC	CIRC	
7801X	57.72	55	150	VC	CIRC	
7802X	60.15	57.7	150	VC	CIRC	
7851X	59.99	58.78	150	VC	CIRC	
7852X	55.02	54	150	VC	CIRC	
7952X	58.42	56.91	150	VC	CIRC	
8101X	64.02	62.17	150	VC	CIRC	
8103X			100	VC	CIRC	
812DX			100	VC	CIRC	
813DX			100	VC	CIRC	
814DX			100	VC	CIRC	
8801X	59.75	57.81	150	VC	CIRC	
8802X	59.45	58.07	150	VC	CIRC	
9001X			150	UNK	CIRC	
9002X			150	UNK	CIRC	
9101X	64.02	60.73	150	VC	CIRC	
9102X	63.48	60.69	150	VC	CIRC	
9103X			UNK	UNK	CIRC	
9104X			UNK	UNK	CIRC	
9105X			UNK	UNK	CIRC	
9106X			UNK	UNK	CIRC	
911DX	59.99		150	VC	CIRC	
914DX			150	UNK	CIRC	

Node	Cover	Invert	Size	Material	Shape

Node	Cover	Invert	Size	Material	Shape

LINE STYLES / COLOURS

Brown
- Foul
- Foul Syphon Sewer
- Foul Vacuum Main
- Foul Rising Main

Red
- Combined
- Combined Syphon Sewer
- Combined Rising Main
- Lateral Drain

Orange
- Building Over Agreement Area

Dark Blue
- Treated Effluent

Purple
- Sludge
- Sewer Catchment
- Section 104 Area

Light Blue
- Surface Water
- Surface Water Rising Main

Yellow
- Private

Green
- Access Shaft

- Decommissioned

MATERIALS

AK	Alkathene
BAC	Bonded Asbestos Cement
BRC	Brick (Common)
BRE	Brick (Engineering)
CC	Concrete Box Culvert
CI	Cast Iron
CO	Concrete (In-Situ)
CP	Concrete (Pre-Cast)
CSB	Concrete Segments (bolted)
CSU	Concrete Segments (unbolted)
DI	Ductile Iron
GRC	Glass Reinforced Concrete
GRP	Glass Reinforced Plastic
MAC	Masonry in regular Courses
MAR	Masonry in random Courses
PE	Polyethylene
PF	Pitch Fibre
PP	Polypropylene
PVC	Polyvinyl Chloride
RPM	Reinforced Plastic Matrix
SI	Spun Iron
ST	Steel
VC	Vitrified Clay
XXX	Other
ZZZ	Unknown

LEGEND - SEWERS

- Manhole (SW)
- Manhole (F&C)
- LH Lamp hole (SW)
- LH Lamp hole (F&C)
- Pumping Station (SW)
- Pumping Station (F&C)
- Side entry manhole (SW)
- Side entry Manhole (F&C)
- BS Blind shaft (SW)
- BS Blind shaft (F&C)
- EJ Ejector station (SW)
- EJ Ejector station (F&C)
- WD Watertight door (SW)
- WD Watertight door (F&C)
- FC Flushing ch. Mn-e (SW)
- FC Flushing ch. Mn-e (F&C)
- FC Flushing ch. No-e (SW)
- FC Flushing ch. No-e (F&C)
- DC Demarcation Chamber
- WO Washout (SW)
- WO Washout (F&C)
- RE Rodding Eye (SW)
- RE Rodding Eye (F&C)
- GP Gauging point (SW)
- GP Gauging point (F&C)
- IC Intercept chamber (SW)
- IC Intercept chamber (F&C)
- ST Storm Tank (SW)
- ST Storm Tank (F&C)
- VC Vortex chamber (SW)
- VC Vortex chamber (F&C)
- 4301 Label ellipse
- Dummy/S24 manhole
- Outfall
- PK Penstock chamber
- DB Damboards
- SO Storm Overflow
- Backdrop manhole
- ? Other (s)
- ? Other
- Change in sewer (s)
- Change in sewer
- Reflux valve
- Flap valve
- CC Cascade
- AN Anode
- Valve
- Closed Valve
- Air Valve
- HB Hatch box (SW)
- HB Hatch box (F&C)
- Direction arrow
- EM Emptying valve
- CP Catchpit
- S Soakaway
- Inlet
- BP Balancing Pond
- WTW Wastewater treatment works
- MTW Marine treatment works
- Outfall headworks
- VT Vent
- VE Vent column
- TST Tidal storage tank
- B Blank end
- Head of Public Sewer
- MPS Micro Pumping Station

SHAPES (S)

A	Arched	R	Rectangular
B	Barrel	S	Square
C	Circular	T	Trapezoidal
E	Egg	U	U Shape
H	Horseshoe	X	Other

NODE REFERENCING SYSTEM

1st digit: hundred metre easting identifier
2nd digit: hundred metre northing identifier
3rd digit: sewer type identifier
0-4 = Foul/Combined
5-9 = Surface Water
4th digit: next sequential node

Drawn by:	okuneyf
Title:	361907_1 Folders Gardens, Burg
Date:	28/11/2019

Southern Water

APPENDIX G

Preliminary Micro Drainage Calculations

ICP SUDS Mean Annual Flood

Input

Return Period (years)	100	Soil	0.450
Area (ha)	15.300	Urban	0.000
SAAR (mm)	900	Region Number	Region 7

Results	**l/s**
QBAR Rural	90.2
QBAR Urban	90.2
Q100 years	287.7
Q1 year	76.7
Q30 years	204.4
Q100 years	287.7