Development at Eastmere Stables
Eastergate Lane, Eastergate

Flood Risk Assessment and Drainage Strategy

For

NJS Partnerships Ltd

motion

Document Control Sheet

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Eastergate Lane, Eastergate

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Contents

1.0 Introduction 1
3.0 Legislative and Policy Framework 5
4.0 Current Flood Risk 7
5.0 Future Flood Risk & Climate Change 10
6.0 Surface Water Drainage Strategy 12
7.0 SuDS Maintenance Regime 17
8.0 Summary and Conclusion 19

Appendices

A Proposed Site Layout
B Topographic Survey
C BGS Borehole Records
D Envirocheck Flood Screening Report
E Infiltration Testing Results and Groundwater monitoring
F Southern Water Asset Records
G UKSuDS Greenfield Runoff Calculations
H Environment Agency Flood Product 4 Data Set
I Environment Agency Risk of Flooding from Surface Water (RoFSW) map
J Impermeable Area Plan
K Proposed Drainage Strategy
L MicroDrainage Calculations
M Exceedance Plan

1.0 Introduction

1.1 Motion has been commissioned by NJS Partnerships Ltd to undertake a Flood Risk Assessment (FRA) and Drainage Strategy in support of a full planning application for the proposed development at Eastmere Stables, Eastergate Lane, Eastergate, West Sussex. The development proposals are for up to nine residential units with associated roads and parking. The site plan can be found in full in Appendix A.

1.2 In 2022 a planning application for the site (BN/25/23/OUT) and appeal ref APP/C3810/W/22/3312864 received outline approval.

1.3 This FRA and Drainage Strategy will discuss the risks to the proposed development from all sources of flooding. This report will also define how the site will manage surface water so that the development does not increase flood risk in the area or to neighbouring properties.

1.4 This FRA and drainage strategy follows the guidance set out in:

- National Planning Policy Framework (NPPF)
- Technical Guidance to the National Planning Policy Framework
- CIRIA SuDS Manual 2015 (C753)
- Environment Agency Rainfall Runoff Management for Developments.

1.5 This FRA and drainage strategy pertains only to the design of the drainage system for the built site. It does not provide details of how the site will be drained during the construction phase. This is considered to be temporary works and can only be prescribed and provided by the eventual appointed contractor.

1.6 This report does not provide information on how the drainage infrastructure will be protected during the construction phase of the project. The provision of this information is the responsibility of the appointed contractor.

2.0 Site Description

Table 2.1 – Site Summary

Site Name	Development at Eastmere Stables.
Location	Eastmere stables, Eastergate Lane, Eastergate, West Sussex PO20 3SJ.
Grid Reference	E 495217 N 106198.
Site Area	7,100 m^2 (0.71Ha).
Development Type	Construction of nine properties and associated roads and gardens.
Environment Agency (EA) Flood Zone	The site is located wholly within Flood Zone 1 (less than 1 in 1,000 annual probability of flooding from rivers or the sea).
Surface Water Flood Risk	The Jeremy Benn Associates (JBA) Pluvial Flood Risk Mapping (undefended) and the EA's Risk of Flooding from Surface Water (RoFSW) map show that the whole site is in an area of low risk of surface water flooding.
Ground Water Flood Risk	The Envirocheck report shows that the site has geological and hydrogeological indicators that have the potential for groundwater flooding to occur at the surface. According to the BGS Groundwater Flooding Susceptibility maps and the GeoSmart Information, the site is in an area of negligible risk.
Local Water Authority	Southern Water.
Local Planning Authority	Arun District Council (ADC).
Lead Local Flood Authority	West Sussex County Council (WSCC).

Site Location and Description

2.1 The proposed 0.71 hectare (ha) site is located off Eastergate Lane and the nearest postcode is PO20 3SJ.

2.2 The grid reference is E 495217 N 106198. As detailed in the introduction to this report, the plan of the proposed development site can be found in Appendix A.

2.3 The site is a former equine site for training racehorse and latterly as a livery. The last use of the site was for the storage of scaffolding in relation to the former site owner's business following the demise of the livery.

2.4 The site currently is an open field but there are some small areas of hardstanding.

Topography

2.5 A topographic survey of the site has been undertaken by Medlams Surveys Limited and the outputs can be seen in Appendix B. The site is relatively flat. The highest elevations are along the western boundary where levels are approximately 17.281 metres Above Ordnance Datum (mAOD). The lowest elevations are on the eastern boundary of the site, with levels being approximately 15.155 mAOD in this location. The topography also details that there is an existing drainage channel on site which seems to drain to the north towards the fields and the horse running track.

Geology

2.6 The British Geological Survey (BGS) online Geoindex Mapping indicates that the site is underlain by London Clay Formation, which is made up of clay, silt and sand with superficial deposits of Head, which is made up of gravel, clay, silt and sand. Borehole records from the surrounding area have been obtained from the BGS online index and these can be found in Appendix C. These Borehole records support the findings of the BGS mapping and confirm that the site is underlain by clay, silt and sand.

2.7 The Department for the Environment, Food and Rural Affairs (Defra's) Magic Map states that soils in the area are 'Freely Draining Slightly Acid Loamy Soils'.

Hydrogeology

2.8 Defra's Magic Map indicates that the site is not located in a Groundwater Source Protection Zone (SPZ) but falls within a 'Secondary A' Aquifer designation for superficial and bedrock geology. As such, there is a risk of water passing from the surface into the water table and vice versa due to the permeable superficial deposits on the site.

2.9 A flood screening report has been obtained from Envirocheck Landmark Information Group Ltd and this can be found in Appendix D. The report shows that the site has potential for groundwater flooding to occur at the surface according to the BGS Groundwater Flooding Susceptibility maps and that the GeoSmart Information on groundwater flood risk places the site in an area of negligible risk.

Hydrology

2.10 The nearest watercourse to the site is a small watercourse that is a tributary of the Lidsey Rife, which runs in a southerly direction approximately 0.5km south of the site.

Infiltration Testing

2.11 As part of this application BRE365 infiltration testing of the site has been undertaken by Mate Geotechnic Services in February 2022. The results are summarised in Table 2.2 and can be found in full in Appendix E. The infiltration results demonstrate that infiltration varies across the site from 1.329 x 10^{-3} m/s to 6.797 x 10^{-5} m/s. This means that infiltration techniques will be a viable means of managing surface runoff on site. To comply with building regulations, point-source infiltration systems (conventional ring or trench soakaways) are required to be constructed a minimum of 5.0m away from proposed or existing buildings. The groundwater monitoring can also be found in Appendix E which details that the maximum ground water level on site is 1.7 meters below ground level (mbgl). In line with WSCC guidance the recommended distance of from below ground SuDS features and maximum ground water level is 1m.

Table 2.2 – Infiltration Testing Results

Trial Pit	Infiltration rate no. 1 (m/s)	Infiltration rate no. 2 (m/s)	Infiltration rate no. 3 (m/s)
TP1	6.797E-05	3.540E-05	3.709E-05
TP2	5.168E-03	-	-
TP3	2.158E-05	1.839E-05	1.028E-05
TP4	1.329E-03	5.587E-04	3.069E-04

Existing Drainage Regime

2.12 The site is existing agricultural land site made up of open fields. Therefore, the existing site can be described as greenfield.

2.13 Asset location plans were obtained from Southern Water (see Appendix F), and these indicate there are no surface water sewers which currently serve the site.

2.14 The total area of the site is approximately 0.71 ha. UKSuDS's online calculator was used to determine the QBAR greenfield runoff rate for the site area that is to be developed. This, showings a result of 0.13 l/s or 0.19 l/s/ha. The UKSuDS greenfield calculations can be found in Table 2.3 and in full in Appendix G.

Table 2.3 – Greenfield Runoff Rate

Return Period	1 in 1	1 in 30	1 in 100	QBAR
Discharge Rate (l/s/ha)	0.16	0.44	0.61	0.19
Discharge Rate (l/s)	0.11	0.31	0.43	0.13

3.0 Legislative and Policy Framework

Flood and Water Management Act

3.1 The Flood and Water Management Act 2010 (FWMA) received Royal Assent on 8th April 2010. The Act was introduced to enforce some of the key proposals set out within UK Government flood and water strategies along with UK Government's response to the Sir Michael Pitt's Review of the summer 2007 floods.

3.2 LLFA's, including West Sussex County Council (WSCC), have a responsibility under the FWMA to develop, maintain, apply and monitor the application of a strategy for local flood risk in their area. Local flood risk is defined as flood risk arising from surface run-off, groundwater and ordinary watercourses (i.e. non main rivers). The EA plays a role in managing the watercourses designated as 'main rivers'.

The Environment Agency Flood Map for Planning

3.3 The Environment Agency's (EA) Flood Map for Planning gives an indicative prediction of areas at risk of fluvial and tidal flooding. The mapping is an amalgamation of modelled flood levels and historical flood event outlines.

3.4 The Flood Map is split into 'Flood Zones', which demarcate the extent of flooding from rivers or the sea for different return periods. The Flood Map for Planning shows the extent of the natural floodplain if there were no defences or other man-made structures. They do not provide a definitive picture of where flooding would occur; rather, they provide an indicative prediction of areas at risk.

3.5 Table 3.1, below, lists the flood zone categories and explains the flood risk probabilities they represent.

Table 3.1 – Flood Zone Categories

Flood Zone	Definition
Zone 1 Low Probability	Land having a less than 1 in 1,000 annual probability of river or sea flooding. (Shown as 'clear' on the Flood Map – all land outside Zones 2 and 3)
Zone 2 Medium Probability	Land having between a 1 in 100 and 1 in 1,000 annual probability of river flooding; or land having between a 1 in 200 and 1 in 1,000 annual probability of sea flooding. (Land shown in light blue on the Flood Map)
Zone 3a High Probability	Land having a 1 in 100 or greater annual probability of river flooding; or Land having a 1 in 200 or greater annual probability of sea flooding. (Land shown in dark blue on the Flood Map)
Zone 3b The Functional Floodplain	This zone comprises land where water has to flow or be stored in times of flood. This is generally delineated as land having a 1 in 30 or greater annual probability of flooding. Local planning authorities should identify in their SFRAs areas of functional floodplain and its boundaries accordingly, in agreement with the EA. (Not separately distinguished from Zone 3a on the Flood Map)

The National Planning Policy Framework

3.6 The NPPF sets out the Government's national policies on different aspects of land use planning in England in relation to flood risk. The Technical Guidance to the NPPF provides further information on the policies set out in the NPPF. It encourages development to take place in areas of lower flood risk wherever possible and stresses the importance of preventing increases in flood risk off-site to the wider catchment area. This includes ensuring that flood risk is taken into account at all stages of the planning process, avoiding inappropriate development in areas at risk of flooding and directing development away from those areas where risks are highest.

3.7 A site-specific FRA is required for proposals of 1ha or greater in Flood Zone 1, all proposals for development in Flood Zones 2 and 3, or in an area within Flood Zone 1 that has critical drainage problems (as notified to the local planning authority by the EA). The FRA should identify and assess the risks of all forms of flooding to and from the development and demonstrate how these flood risks will be managed so that the development remains safe throughout its lifetime, taking climate change into account.

3.8 Within each Flood Zone, a key factor in determining planning applications for development is the flood risk vulnerability of a development. Table 2 of the Technical Guidance to the NPPF categorises different development types according to their vulnerability to flooding. These categories are:

- Essential infrastructure;
- Highly vulnerable development;
- More vulnerable development;
- Less vulnerable development, and;
- Water-compatible development.

3.9 Within the different Flood Zones each of the above development categories are considered appropriate or not permissible. The Technical Guidance to the NPPF lists these as:

Flood Zone 1:

- All the development categories listed above are appropriate.

Flood Zone 2:

- Water-compatible, less vulnerable development, more vulnerable development and essential infrastructure is appropriate in this zone.

Flood Zone 3a:

- Water-compatible and less vulnerable development is appropriate in this zone. Highly vulnerable development should not be permitted in this zone.

Flood Zone 3b:

- Only water-compatible development and essential infrastructure that has to be there should be permitted in this zone.

3.10 The above information sets out the basis by which developments must be assessed in terms of flood risk. Later in this report the proposed development will be reviewed against the Flood Zone in which it is located. This will inform the appropriateness of the proposed development, as per the advice within the Technical Guidance to the NPPF.

Lead Local Flood Authority

3.11 As of April 2015, the LLFA became a statutory consultee on all major planning applications. The LLFA is required to assess planning applications in respect of surface water drainage and sustainable drainage systems. WSCC is the LLFA for the Eastergate Area.

4.0 Current Flood Risk

4.1 Flooding can arise from a variety or combination of sources. These may be natural or artificial and may be affected by climate change. These are discussed, in the following two sections and summarised in the next chapter. The probability of any likely impacts is also assessed.

Fluvial Flood Risk

4.2 The nearest watercourse to the site is a small watercourse that is a tributary of the Lidsey Rife, which runs in a southerly direction approximately 0.5km south of the site.

4.3 The EA's Flood Map for Planning (Appendix H) shows that the entire site is located within Flood Zone 1 (less than 1 in 1000 annual probability of flooding from rivers or the sea). The Envirocheck Flood Screening Report in Appendix D places the site outside of any fluvial or tidal flood risk areas. Residential development is considered to be 'more vulnerable' by the NPPF and is appropriate in Flood Zone 1. Therefore, it is considered that the site is at a very low risk of flooding from rivers and the sea and the development is appropriately located.

In accordance with the NPPF, residential units are classed as a 'More vulnerable' land use and, as such, the proposed development within Flood Zone 1 is appropriately located.

Therefore, it is considered that the proposed development site is currently at a low risk of fluvial flooding.

Surface Water Flooding

4.4 Surface water, or pluvial flooding, results from rainfall-generated overland flow, where rainwater has not yet reached a watercourse or sewer and where the local drainage systems become overwhelmed. Pluvial flooding often occurs during short, very intense storms, but can also occur during longer periods of rainfall when the ground is already saturated, or where land has low permeability due to development.

4.5 In these conditions surface water can build up where the topography allows it to converge or pond. Where it gathers it will travel down prevailing gradients. Pluvial flooding then occurs at locations where significant surface water flow paths converge, at localised low points and/or due to overland obstructions. In urban areas pluvial flooding often occurs where the built environment channels overland flow routes (down roads that are bounded by kerbs, for example) or where there are obstacles to the natural overland flow routes. Boundary walls and buildings are often the main causes and, hence, the likelihood of pluvial flooding to impact property and gardens.

4.6 Pluvial flooding is exacerbated in many cases by the mistreatment or failure of the below ground infrastructure (including partial or full blockages of gullies and/or within the combined sewers and the accumulation of fats, oils and greases within the sewer networks).

4.7 Generally speaking, pluvial flooding is less of an issue in rural areas. This is partly because the natural 'greenfield' state of land allows for the interception of rainfall and the slowing down of overland flow, so the accumulation of surface water is less likely. It is also because there are much less 'receptors' of surface water flooding in rural areas and many incidences of surface water flooding in rural areas go unnoticed or unreported as they are of no consequence.

4.8 The Envirocheck Flood Screening Report in Appendix D provides detailed information on surface water flood risk on the site. Referring to the JBA Pluvial Flood Risk Mapping (undefended), it shows that the site is not at risk from the 1 in 1,000-year (0.1% AEP) pluvial flood event.

4.9 The EA's Risk of Flooding from Surface Water (RoFSW) map for the site can be found in Appendix I. This mapping shows that the site is largely in the 'very low' surface water flood risk category (less than a 0.1% AEP surface water flood event).

4.10 Therefore, it is considered that the site is at a very low risk of surface water flooding. The development is considered to be 'more vulnerable' by the NPPF which means that it is appropriate in this location with regards to the levels of local surface water flood risk.

Therefore, it is considered that the proposed development site is at a low risk of surface water flooding. The development is considered to be 'Less vulnerable' by the NPPF and is appropriately located.

Groundwater Flooding

4.11 The risk of groundwater flooding is dependent on local geological and hydrogeological conditions at any given time. Groundwater levels rise during wet winter months and fall again in the summer when rainfall is low, and extractions are higher. In very wet winters, rising groundwater levels can reactivate flow in ephemeral streams that only flow for part of the year or even lead to the flooding of normally dry land.

4.12 As mentioned in paragraph 2.7, the Envirocheck Flood Screening Report in Appendix D shows that the site has potential for groundwater flooding to occur at the surface according to the BGS Groundwater Flooding Susceptibility maps and that the GeoSmart Information on groundwater flood risk places the site in an area of negligible risk.

4.13 Therefore, the site is considered to be at low risk of flooding from groundwater.

Flooding from Infrastructure Failure

4.14 Sewer flooding can occur when the capacity of the infrastructure is exceeded by excessive flows, or because of a reduction in capacity due to collapse, siltation, blockage, or if the downstream system becomes surcharged. This can lead to the sewers flooding onto the surrounding ground via manholes and gullies, which can generate overland flows.

4.15 Typically, sewer systems are constructed to accommodate rainstorms with a 30-year return period or less, depending on their age. Consequently, rainstorm events greater than 1 in 30-years would be expected to result in surcharging of some parts of the sewer system. In fact, due to most gullies being poorly maintained and often partially blocked with silt, leaves and other debris, their capacity is often estimated to be closer to the 1 in 10-year storm.

4.16 The existing sewer runs in the vicinity of the site have not been surveyed using CCTV, so the condition of the connecting pipework is unknown. The Arum District Council SFRA has no records of flooding from the on-site sewerage on of the site. Therefore, the site is considered to be at low risk of flooding from infrastructure failure.

Flooding from Artificial sources

4.17 The EA provides a map showing the maximum potential flood extent should all reservoirs with a capacity of greater than 25,000 cubic metres fail and release the water they hold.

4.18 The map shows that the site would not experience flooding in this scenario. There are no other significant artificial waterbodies (such as canals) in proximity of the site.

4.19 Therefore, the site is considered to be at low risk of flooding from artificial sources.

The Sequential and Exception Tests

4.20 In July 2021, Chapter 14 of the NPPF was updated with changes that required all plans to take into account all sources of flooding and apply a sequential, risk-based approach to the location of the development. This was specifically laid out in in paragraphs 161 and 162, which stated that the aim should be to steer new development to areas with the lowest risk of flooding from any source and

opportunities should be provided for new green and other infrastructure that can reduce the causes and impacts of flooding.

4.21 With specific regard to the proposed development, the EA Flood Product 4 dataset confirmed that the Site is located wholly within Flood Zone 1. The site is at low risk of groundwater flooding, infrastructure failure and of flooding from artificial sources. Both the JBA Pluvial Flood Risk Mapping and the EA's Risk of Flooding from Surface Water maps show that the Site is not affected by surface water flooding.

4.22 Therefore, the development will be safe with respect to flooding during its lifetime and will not increase the risk of flooding to other sites. Therefore, the proposed development meets the requirements of the Sequential and Exception Test.

5.0 Future Flood Risk & Climate Change

5.1 The 2021 NPPF and the supporting Technical Guidance document sets out how flood risk should be considered over the lifetime of a development. This requires an increase in flood risk due to climate change to be taken into account. Both peak river flows and rainfall intensity should be assessed.

Peak River Flows

5.2 The EA Flood map shows that the site is wholly located within Flood Zone 1.

5.3 The nearest watercourse to the site is a small watercourse that is a tributary of the Lidsey Rife, which runs in a southerly direction approximately 0.5km south of the site.

5.4 As the site is not near any higher risk flood zones, increases in future peak river flows do not need to be considered.

Peak Rainfall Intensity

5.5 With climate change it is becoming more common to see rainfall events of higher intensity, particularly in the southeast of England. Increased rainfall intensity affects river levels and drainage systems, with the result being an increase in surface water flooding and sewerage surcharge.

5.6 The NPPF states that, for flood risk assessments, the Peak Rainfall Allowances Map should be referenced to found out what the anticipated changes in peak rainfall are. For residential developments, which have a minimum lifespan of 100 years, the upper end climate change allowances for both the 3.3% AEP and 1% AEP events should be used.

5.7 The development site lies within the Arun and Western Streams Management Catchment. In this catchment, the upper end climate change allowance for the 3.3% AEP and 1% AEP rainfall events are 40% and 40%, respectively. Therefore, the development can expect peak rainfall increases of this magnitude and should use these percentage increases in the assessment of future surface water flood risk.

5.8 The site is at 'very low' risk of surface water flooding and is anticipated to remain that way.

5.9 However, acknowledging that peak rainfall intensities are expected to increase, it is important that:

- Any changes to the land in this area must remain sensitive to the local surface water flood risk. This will ensure that any natural overland flow routes and surface water pathways will remain the same and the conveyance of surface water is not impeded.
- The surface water strategy for the site takes the latest climate change predictions into account, so as not to increase flood risk on- or off-site.

Residual Flood Risk

5.10 It is important to recognise that flood risk can never be fully mitigated and there will always be a residual risk of flooding. The residual risk is associated with several potential risk factors, including (but not limited to):

- A flood event that exceeds that for which the local flood defences or local drainage system has been designed to withstand.
- A residual danger posed to property and life because of flood defence failure through overtopping or structural collapse.
- General uncertainties inherent in the prediction of flooding.

5.11 Modelling of flood events is not an exact science. Therefore, there is an inherent uncertainty in the prediction of flood levels and extents used in the assessment of flood risk. EA's Flood Map for Planning is largely based upon detailed modelling within the area. However, other mapping products require numerous assumptions to be made. Whilst they all provide a good depiction of flood risk for specific modelled conditions, all modelling requires the making of core assumptions, and these might not occur in the open and dynamic environment of a flood event. Also, the EA's Flood Map for Planning and other flood modelling is updated regularly. Interested parties are recommended to keep abreast of this so that a significant change or increase in flood risk can be determined.

Table 5.1 – Residual Flood Risk

Flood Source	Risk Level				Comment
	High	Medium	Low	Very Low	
Fluvial/ Tidal				X	Flood Zone 1
Groundwater			X		Geology is hydraulically unproductive.
Surface Water				X	The site is at very low surface water flood risk.
Canals				X	There are no canals in the vicinity of the site.
Reservoirs				X	The Reservoir Flood Risk Map places the site well outside a maximum extent of flooding.
Infrastructure Failure				X	No evidence that existing infrastructure has failed.
Increase due to Climate Change				X	Increased peak river flows and rainfall intensities are not expected to affect any infrastructure or properties.

6.0 Surface Water Drainage Strategy

Proposed Surface Water Drainage Strategy

6.1 Current planning policy and EA guidance requires developments to employ SuDS (Sustainable Drainage Systems) techniques wherever feasible. Careful design of SuDS features can ensure that a development's surface water drainage closely reflects the natural hydrology of the pre-developed site.

6.2 SuDS will attenuate and treat surface water run-off quantities at the source (source control) in line with NPPF and EA policies.

6.3 Source control systems treat surface water close to the point of origin, in features such as soakaways, permeable paving and swales, to name a few.

6.4 The existing and proposed impermeable areas for the development site are summarised in Table 6.1 below. This demonstrates that the proposed development will increase the hardstanding area of the site by 0.128 ha. An impermeable area plan is detailed in Appendix 3.

Table 6.1 – Existing and Proposed Surface Cover

Land Use	Impermeable Area		Gardens and Landscaping	
	Area (ha)	% Cover	Area (ha)	% Cover
Existing	0.150	21	0.560	79
Proposed	0.295	42	0.415	58

6.5 Ordinarily the proposed impermeable areas should be used to define the greenfield runoff rate for a development, which then sets the allowable discharge rate from these parts of a site. However, in the case of the Eastmere Stables development, this is not necessary as it will be entirely possible to discharge surface water emanating from impermeable areas on site via infiltration, thus the site will be managing its surface water runoff at a rate below the greenfield runoff rate.

The Drainage Hierarchy

6.6 The drainage hierarchy is a sequential check that intends to ensure that all practical and reasonable measures are taken to manage surface water as high up the hierarchy (with '1' being the highest) as possible, and that the amount of surface water managed at the bottom of the hierarchy is minimised. The PPG to the NPPF) states that "*Generally, the aim should be to discharge surface run off as high up the following hierarchy of drainage options as reasonably practicable*".

6.7 The drainage hierarchy presented in the NPPF presents only four tiers of drainage options. This has been expanded on and adopted by others and now can be viewed as the following:

1. Store rainwater for later use.
2. Use infiltration techniques, such as porous surfaces in non-clay areas.
3. Attenuate rainwater in ponds or open water features for gradual release.
4. Attenuate rainwater by storing in tanks or sealed water features for gradual release.
5. Discharge rainwater direct to a watercourse.
6. Discharge rainwater to a surface water sewer/drain.

7. Discharge rainwater to the combined sewer.

8. Discharge rainwater to the foul sewer.

6.8 The first two tiers of the drainage hierarchy ensure that surface water is retained within the site boundary and does not increase flood risk to others. This is always the most preferable method of surface water management.

6.9 The next six tiers of the hierarchy provide regional control, but with decreasing levels of pollution removal and reduced potential for amenity and habitat creation with each tier of the drainage hierarchy.

6.10 Within the lower six tiers of the drainage hierarchy, there must be some form of flow restriction, so that off-site surface water discharge resembles greenfield runoff rates, as much as is reasonably practicable. This requires on-site storage facilities, which may include ponds, swales, subsurface storage tanks and System C (non-infiltration) permeable paviours with flow control devices. Again, methods that provide the most potential for amenity and pollution removal should be favoured.

6.11 Each tier of the drainage hierarchy has been considered for the surface water drainage for the development. In order of preference, the outcome of these considerations is below.

Tier 1 - Store rainwater for later use

6.12 Water re-use systems can rarely manage 100% of the surface water discharged from a development. This requires the surface water yield from the building and hardstanding areas to balance perfectly with the demand from the proposed development; too much demand will result in a lack of water supply, whereas too little demand will cause the storage systems to become overwhelmed and could result in flooding when the next rainfall event happens. Consequently, even if there are opportunities and a need for rainwater recycling systems, further solutions for attenuating and discharging surface water will almost always be required.

6.13 This report recommends the use of water butts for each property. These will reduce the reliance on potable water supplies during activities such as gardening and car washing. They can also provide small amounts of storage for surface water. The typical types of storage volumes for water butts can be found in Table 6.1, listed below:

Typical Water Butt Options	Dimensions (H x W x L, m)	Storage Volume Provided
Type 1 (Wall-Mounted – Small)	1.22 x 0.46 x 0.23	100 litres (0.1 m^3)
Type 2 (Standard House Water Butt)	0.9 x 0.68 diameter	210 litres (0.21 m^3)
Type 3 (Large House Water Butt)	1.26 x 1.24 x 0.8	510 litres (0.51 m^3)
Type 4 (Column Tank – Very Large)	2.23 x 1.28 diameter	2000 litres (2.00 m^3)

Table 6.1 – Types and Storage Volumes of Water Butts

Tier 2 - Use infiltration techniques, such as porous surfaces in non-clay areas

6.14 A hydraulic model has been produced using MicroDrainage's Network module to represent the proposed drainage strategy, which utilises permeable paving to discharge surface water.

6.15 The MicroDrainage model results can be found in Appendix L. The model was run for a number of events and return periods. They are as follows:

- 1 in 1-year rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440-minute storm durations
- 1 in 30-year (plus 40% increase for climate change) rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440-minute storm durations

- 1 in 100-year (plus 45% increase for climate change) rainfall for 15, 30, 60, 120, 240, 360, 480, 960 and 1440-minute storm durations.

6.16 The MicroDrainage Network model has shown that the proposed drainage strategy can discharge surface water with no flooding for the 1 in 100-year + 45% event.

6.17 Therefore, the proposed drainage strategy can be considered as appropriate and suitable for the proposed development.

6.18 A layout of the proposed drainage strategy can be found in full in Appendix K. In order to attenuate the surface water, it is proposed to have the access road as a 'System A' (Total Infiltration) permeable paviour to drain the residential units and access road. The subbase would provide an opportunity for surface water attenuation and pollution mitigation without the use of proprietary devices or interceptors.

6.19 The access road covers an area of approximately 720m^2 (0.072 ha) and the following permeable paviour design will be specified (from surface to base):

- 30mm Asphalt surface + 90mm Asphalt base + 280mm Coarse Graded Aggregate Type 4 sub-base
- Separating Geotextile
- 300mm permavoid crated system or similar with 95% voids

6.20 This paviour makeup has a total depth of 600mm. As detailed in Appendix E the maximum ground water level is 1.7 mbgl and therefore the recommended distance of 1m from the permeable paviours and maximum ground water level is achieved.

6.21 The infiltration rate used in the MicroDrainage model was based on the BRE365 infiltration testing found in Appendix E and the worst case rate (1.028E-05 m/s) was used.

6.22 As the permeable paviours will discharge surface water directly to the subgrade, the site will have zero site runoff, thus better than greenfield.

6.23 The results of the MicroDrainage hydraulic model can be seen in Appendix L.

Exceedance Event

6.24 An Exceedance Routing Plan for surface water is found in Appendix M. This details where surface water would flow to on Site and where it would be stored in an extreme event.

Urban Creep

6.25 Urban Creep can be described as future urban expansion within a development such as extensions to buildings and paved gardens as the development matures. These activities increase the impermeable area of a site and often sit outside of the development control process.

6.26 A sensitivity test has been undertaken which looked at the effect of urban creep in the catchment. A 10% increase to the impermeable area has been applied to the MicroDrainage model. This is based on the West Sussex LLFA Policy for the Management of Surface Water. The MicroDrainage model results for the urban creep can also be found in Appendix L. The MicroDrainage model results showed that there was no flooding in the catchment for the 1 in 100+CC event including urban creep.

Tier 3 - Attenuate rainwater in ponds or open water features for gradual release

6.27 This tier of the drainage hierarchy will not be needed for surface water discharge.

6.28 Tier 4 - Attenuate rainwater by storing in tanks or sealed water features for gradual release

6.29 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 5 - Discharge rainwater direct to a watercourse

6.30 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 6 - Discharge rainwater to a surface water sewer/drain

6.31 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 7 - Discharge rainwater to the combined sewer

6.32 This tier of the drainage hierarchy will not be needed for surface water discharge.

Tier 8 - Discharge rainwater to the foul sewer

6.33 This tier of the drainage hierarchy will not be needed for surface water discharge.

Surface Water Runoff Quality

6.34 The NPPF states that the development should not have a detrimental impact on the environment, including the water environment. The technical guidance to the NPPF provides further advice on the benefits of ensuring runoff quality is to an appropriate standard.

6.35 The CIRIA SuDS Manual provides guidance on the treatment of surface water runoff. With regards to the parking areas and access road on the site, Table 7.2 of the CIRIA SuDS Manual rates the pollution hazard from on-residential car parking with infrequent change as 'low'. To mitigate a 'low' pollution hazard, the CIRIA SuDS Manual recommends using a simple index approach in line with Section 26.7.1. This is discussed, below.

6.36 Table 26.2 of the CIRIA SuDS Manual provides pollution hazard indices for different land use classifications. The land use classification that requires consideration for the site is in Table 6.1.

Table 6.1 – Excerpt from Table 26.2 of CIRIA SuDS Manual

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Individual property driveways, residential car parks, low traffic roads (e.g. cul de sacs, homezones and general access roads) and non-residential car parking with infrequent change (eg schools, offices) ie < 300 traffic movements/day	Low	0.5	0.4	0.4

6.37 To deliver adequate pollution treatment and mitigation, the CIRIA SuDS Manual recommends using a SuDS component that has a total pollution mitigation index (for each contaminant type) that equals or exceeds the pollution hazard index (for each contaminant type).

6.38 Table 26.3 of the CIRIA SuDS Manual provides indicative SuDS mitigation indices for each SuDS type. Table 6.2, below, which is an excerpt from Table 26.3, shows the mitigation index for permeable paving.

Table 6.2 – Excerpt from Table 26.3 of CIRIA SuDS Manual

Type of SuDS Component	Total Suspended Solids (TSS)	Metals	Hydro-Carbons
Permeable Paving	0.7	0.6	0.7

6.39 The mitigation indices for the Permeable paving exceed those of the pollution hazard index figures from Table 6.1. and the pollution mitigation indices offered by permeable paving easily exceeds the pollution hazard indices for all contaminant types.

7.0 SuDS Maintenance Regime

7.1 This section describes the proposed management and schedules for the maintenance to reduce the risk of the proposed network flooding due to poor maintenance.

Piped Network Maintenance

7.2 The piped network shall be maintained by either Southern Water or an approved maintenance company in accordance with DCG and the manufacturer's guidance.

7.3 This maintenance schedule should include; clearing gullies, removing any large obstructions within the pipes and cleaning catchpits at regular intervals to ensure the correct operation of the sewer network.

Permeable Paving Maintenance

The proposed SuDS features are to have a routine maintenance schedule that conforms to CIRIA SuDS Manual (C753) 2015 guidance. An approved maintenance company is to adhere to the maintenance schedule provided in Tables 7.1, below, for permeable paving to ensure the correct operation and maintenance of the drainage system.

Table 7.1 - Operation and maintenance requirements for permeable paving

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface).	Once a year, after autumn leaf fall, or reduced frequency as required, based on site specific observations of clogging or manufacturer's recommendations - pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment.
Occasional Maintenance	Stabilise and mow contributing and adjacent areas.	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying.	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised within 50mm of the level of the paving.	As requires
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to structural performance or a hazard to users, and replace lost jointing material.	As required
	Rehabilitation of surface and upper substructure by remedial sweeping.	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for 3 months after installation.
	inspect for evidence of poor operation and/or weed growth - if required, take remedial action.	Three-monthly, 48h after large storms in first 6 months.
	Inspect silt accumulation rates and establish appropriate brushing frequencies.	Annually
	Monitor inspection chambers	Annually

8.0 Summary and Conclusion

8.1 Motion has been commissioned by NJS Partnerships Ltd to undertake a Flood Risk Assessment (FRA) and Drainage Strategy in support of a full planning application for the proposed development at Eastmere Stables, Eastergate Lane, Eastergate, West Sussex. The development proposals are for up to nine residential units with associated roads and parking.

8.2 In 2022 Outline permission (BN/25/23/OUT) with all matters reserved, other than access, for nine residential dwellings was submitted for planning and planning was granted. This application is a Departure from the Development Plan.

8.3 The nearest watercourse to the site is a small watercourse that is a tributary of the Lidsey Rife, which runs in a southerly direction approximately 0.5km south of the site.

8.4 As part of this application BRE365 infiltration testing of the site has been undertaken by Mate Geotechnic Services in February 2022. The infiltration results demonstrate that infiltration varies across the site from 1.329×10^{-3} m/s to 6.797×10^{-5} m/s. This means that infiltration techniques will be a viable means of managing surface runoff on site. To comply with building regulations, point-source infiltration systems (conventional ring or trench soakaways) are required to be constructed a minimum of 5.0m away from proposed or existing buildings.

8.5 The EA's Flood Map shows that the entire site is located within Flood Zone 1 (less than 1 in 1000 annual probability of flooding from rivers or the sea).

8.6 The historic flood map in the Envirocheck Flood Screening Report shows that there have been historic fluvial flood events which have affected the development site.

8.7 The JBA Pluvial Flood Risk Mapping (undefended), it shows that the site is not at risk from the 1 in 1,000-year (0.1% AEP) pluvial flood event. The EA's Risk of Flooding from Surface Water (RoFSW) map shows that the site is largely in the 'very low' surface water flood risk category (less than a 0.1% AEP surface water flood event).

8.8 The site is considered to be at low risk of groundwater flooding, flooding from artificial sources and flooding from infrastructure.

8.9 In order to attenuate the surface water, it is proposed to have the access road as a 'System A' (Total Infiltration) permeable paviour to drain the residential units and access road. The subbase would provide an opportunity for surface water attenuation and pollution mitigation without the use of proprietary devices or interceptors.

8.10 The access road covers an area of approximately 720m^2 (0.072 ha) and the following permeable paviour design will be specified (from surface to base):

- 30mm Asphalt surface + 90mm Asphalt base + 280mm Coarse Graded Aggregate Type 4 sub-base
- Separating Geotextile
- 300mm permavoid crated system or similar with 95% voids

8.11 This paviour makeup has a total depth of 600mm. The maximum ground water level is 1.7 meters below ground level (mbgl) and therefore the recommended distance of 1m from the permeable paviours and maximum ground water level is achieved.

8.12 This report demonstrates that the proposed development will not result in an increased risk of flooding on site or to neighbouring areas. Therefore, it can be concluded that the development fulfils the requirements of the PPG and the 2021 NPPF.

Appendix A

Proposed Site Layout

Site Area = 0.71 Hectares / 1.75 Acres

EASTMERE PADDOCKS LTD.

Location Plan
1:1250

Serial number: 292977

Rev	Date	By	Description
P01	29/08/2024	MR	Submission Issue

www.symmetryarchitecture.co.uk
office@symmetryarch.co.uk
3A Station Approach Broadstone Dorset BH18 8AX
01202 973379

ARUN DISTRICT COUNCIL BN/128/24/RES

Eastmere Stables ∧ Location Plan ∧ 1:1250@A3 ∧ **1844**-XX-ZZ-DR-A-**0302 P01**

SYMMETRY architecture

Site Area = 0.71 Hectares / 1.75 Acres

EASTMERE PADDOCKS LTD.

0 2.5 5 7.5 10 12.5 15 17.5 20 22.5 25m

Block Plan
1:500

Serial number: 292977

N

Rev	Date	By	Description
P01	29/08/2024	MR	Submission Issue

www.symmetryarchitecture.co.uk
office@symmetryarch.co.uk
3A Station Approach Broadstone Dorset BH18 8AX
01202 973379

Eastmere Stables ∧ Block Plan ∧ 1:500@A3 ∧ **1844**-XX-ZZ-DR-A-**0303 P01**

SYMMETRY architecture

ARUN DISTRICT COUNCIL BN/128/24/RES

Safety, Health & Environmental

In addition to the hazards / risk normally associated with the type of works detailed on this drawing, please note the following information.

Notes

- Proposed replacement tree location. Species/size to Arboriculturalist details
- Existing tree, to be removed/replaced
- Historic site feature (from topographic survey)
- 1.8m high, close boarded fence
- 1.2m high, close boarded fence
- Tarmacadam - shared surface
- Grey block paving - shared surface parking
- Block Paving
- Patio Paving
- Soft landscaping - grassed/planted areas
- Existing building footprints (from topographic survey)
- Proposed building footprints (at GF level)
- Tactile Paving (at crossing points)
- 'Rumble Strip' speed control

Site Key Plan

Rev	Date	By	Description
P02	29/08/2024	MR	Submission Issue
P01	29/08/2024	MR	Scale reduced to fit A1 paper size. First Issue for comment

SYMMETRY architecture

www.symmetryarchitecture.co.uk
office@symmetryarch.co.uk
3A Station Approach Broadstone Dorset BH18 8AX
01202 973579

Client: Eastmere Paddocks Ltd

Project:

Eastmere Stables
Eastergate Lane
Eastergate, PO20 3SJ

Title:

Site Plan

Scale: 1:250 @ A1

Drawn / Checked: MR / JF

Status / Purpose: **S3 / For Comment**

Date: 24/05/2024

Drawing Number: **1844** - SYM - XX - ZZ - DR - A - **0300**

Revision: **P02**

0 2.5 5 7.5 10 12.5m

Proposed Site Plan
1:250

ARUN DISTRICT COUNCIL BN/128/24/RES

Proposed Site Plan
1:250

Safety, Health & Environmental

In addition to the hazards / risk normally associated with the type of works detailed on this drawing, please note the following information.

Notes

- Proposed replacement tree location. Species/size to Arboriculturalist details
- Existing tree, to be removed/replaced
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- 1.8m high, close boarded fence
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- Existing building footprints (from topographic survey)
- Proposed building footprints (at GF level)
- Tactile Paving (at crossing points)
- 'Rumble Strip' speed control

Site Key Plan

EASTMERE PADDOCKS LTD.

Rev	Date	By	Description
P02	29/08/2024	MR	Submission Issue
P01	26/08/2024	MR	

SYMMETRY
architecture
www.symmetryarchitecture.co.uk
office@symmetryarch.co.uk
3A Station Approach Broadstone Dorset BH18 8AX
01202 973379

Client
Eastmere Paddocks Ltd

Project
Eastmere Stables
Eastergate Lane
Eastergate, PO20 3SJ

Title
Site Plan (Black and White)

Scale	Drawn / Checked
1:250 @ A1	MR / JF
Status / Purpose	Date
S3 / For Comment	24/05/2024

Drawing Number — Revision

1844 - SYM - XX - ZZ - DR - A - **0301** **P02**
project originator zone level type role number

Appendix B

Topographic Survey

NOTES
Survey accurate at time of site attendance. Do not scale from printed drawings except for planning purposes.

Grid is based on ordnance survey national grid fixed by GPS satellite active network.
Levels are related to the ordnance survey GPS active Network and transformed using the OSGM15 & OSTN15 model.

Drainage pipe sizes (where shown) have been gauged from the surface for safety reasons and should be regarded as approximate only.

Tree species (where shown) should be treated with caution and expert identification is advised.

Although this is a digital survey the accuracy and amount of detail shown is only commensurate with the graphical scale of mapping as specified. Care should be exercised when working to larger scales.

Visible features in the vicinity of the boundaries as shown above, may not represent the extent of legally conveyed ownership.

Whilst every effort has been made to achieve accuracy on this plan, CRUCIAL clearance dimensions, levels and invert levels should be checked prior to design and construction.

Areas of dense undergrowth cannot be surveyed in detail, these areas will be shown in outline only and marked as 'dense undergrowth' on the plan.

Kerb levels have been taken on the top of the channel.

0 2 4 6 8 10 12

SCALE 1:250

ABBREVIATIONS (where applicable)

AV	Air Valve	MH	Manhole Cover
BK	Brick	MK	Marker
BL	Bollard	MS	Milestone
BS	Bus Stop	MT	Meter
BT	British Telecom	MY	Mercury
CB	Control Box	OH	Overhead
C/B	Close Boarded	PAV	Paving
CL	Cover Level	PB	Post Box
CLK	Chainlink	PE	Pipe
CO	Column	PM	Parking Meter
Conc	Concrete	P/R	Post and Rail
CP	Catch Pit	PT	Post
CPS	Concrete Paving Slabs	P/W	Post and Wire
CATV	Cable Television	RE	Rodding Eye
DC	Drainage Channel	RET	Retaining
DP	Drain Pipe	RS	Road Sign
EC	Electricity Cover	RSJ	Rolled Steel Joist
ER	Earthing Rod	SC	Stop Cock
FB	Flower Bed	SK	Soakaway
FE	Fence	SP	Signpost
FH	Fire Hydrant	ST	Silt Trap
FL	Floor Level	SV	Stop Valve
FP	Flag Pole	SVC	Security Video Camera
GP	Gate Post	TCB	Telephone Call Box
GV	Gas Valve	TK	Tank
GY,G	Gully	TL	Traffic Light
HT	Height	TP	Telegraph Pole
IC	Inspection Cover	UG	Underground
IL	Invert Level	UTF	Unable To Trace Further
IN	Interceptor	UTL	Unable To Lift
I/R	Iron Railings	VP	Vent Pipe
KO	Kerb Outlet	WL	Water Level
LB	Litter Bin	WM	Water Meter
LP	Lamp Post	WO	Wash Out

medlams
surveys limited
www.medlams-surveys.co.uk
becky@medlams-surveys.co.uk
07717 205 388

project: Eastergate Stables, Eastergate Lane
client: M. Langridge
job ref: S1627
title: Topo Survey
scale 1:250 @A1
date March 2022
dwg no: EX01 rev:

Appendix C

BGS Borehole Records

SU90NE 49 9523 0880

Bore Hole Log Book Ref. [redacted]

BORE HOLE NO. [redacted]

COMMERCIAL IN CONFIDENCE

Ordnance Plot No. [redacted]

Water Struck at 9 ft. 0 ins. Rest Water Level [redacted] ft. [redacted] ins. after [redacted] hours

Ordnance Datum Level ca. +13m.

Description of Material	From ft. ins.	To ft. ins.	Depth of Seam ft. ins.	Total Depth ft. ins.	Bore Hole Section
[redacted] Soil & stone.	0. 0.	3. 0.	3. 0.	[redacted]	
White Hall Ballast.	3. 0.	9. 0.	6. 0.		
[redacted]					
Ballast.	9. 0.	20. 0.	11. 0.		
				20. 0.	
[redacted]					

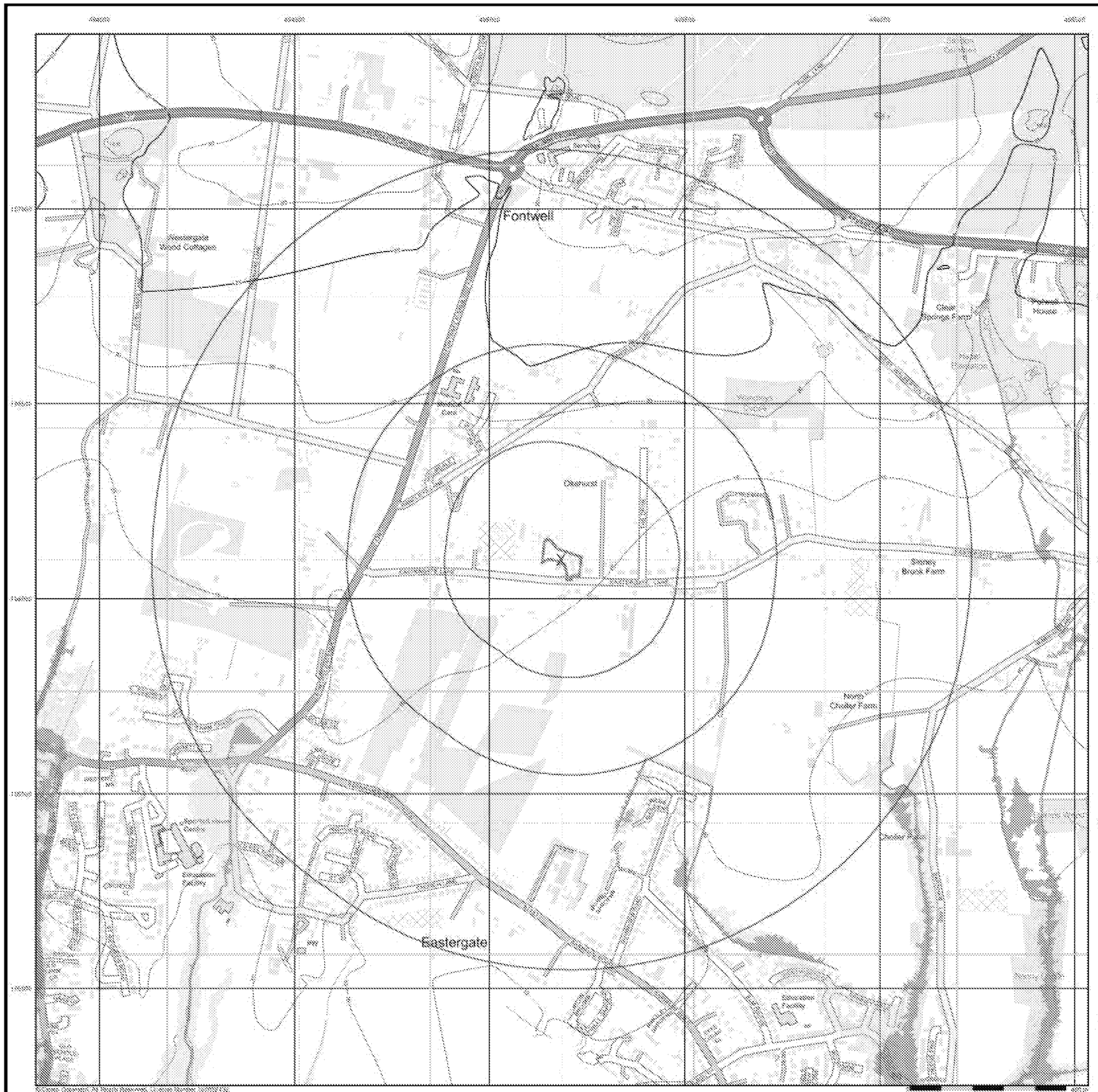
REMARKS

Samples taken at

(1) [redacted] ft. [redacted] ins. (2) [redacted] ft. [redacted] ins. (3) [redacted] ft. [redacted] ins. (4) [redacted] ft. [redacted] ins.

Appendix D

Envirocheck Flood Screening Report



motion

EA/NRW Flood Data Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

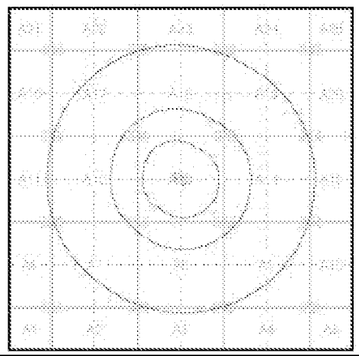
Flood Data

- Extreme Flooding from Rivers or Sea without Defences (Zone 2)
- Flooding from Rivers or Sea without Defences (Zone 3)
- Area Benefiting from Flood Defence
- Flood Water Storage Areas
- Flood Defence

Contours (height in metres)

- Standard Contour
- Master Contour
- Spot Height
- Mean Low Water
- Mean High Water

EA/NRW Flood Data Map - Slice A



Order Details

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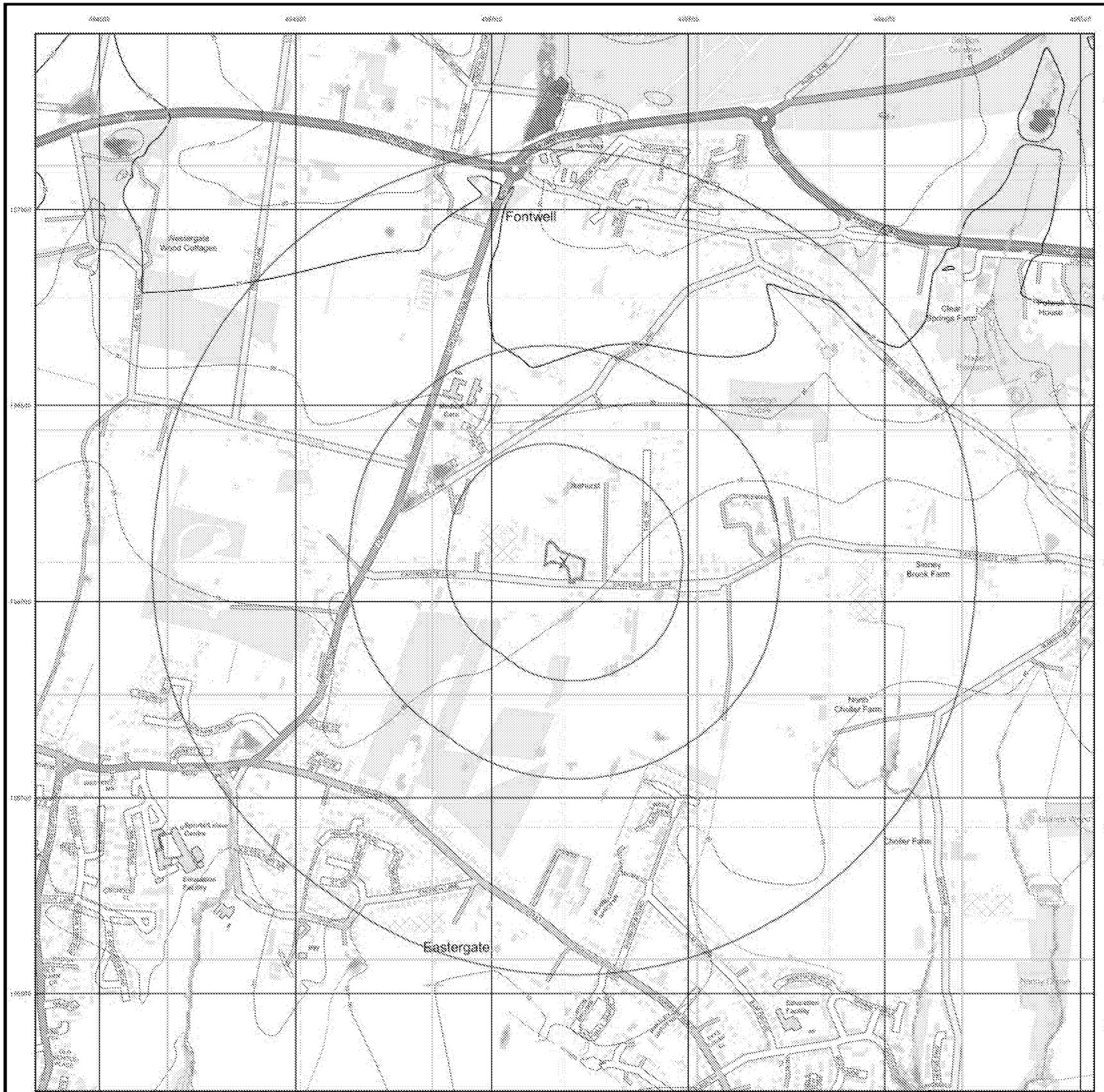
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



motion

JBA 75 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

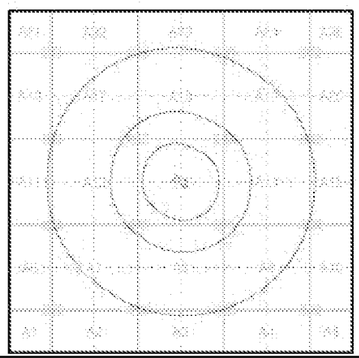
Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0 m	0.05m - 0.05m	0.05m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (height in metres)

Standard Contour — Mean Low Water
Master Contour — Mean High Water
Spot Height

JBA 75 Year Return Flood Map (Undefended) - Slice A



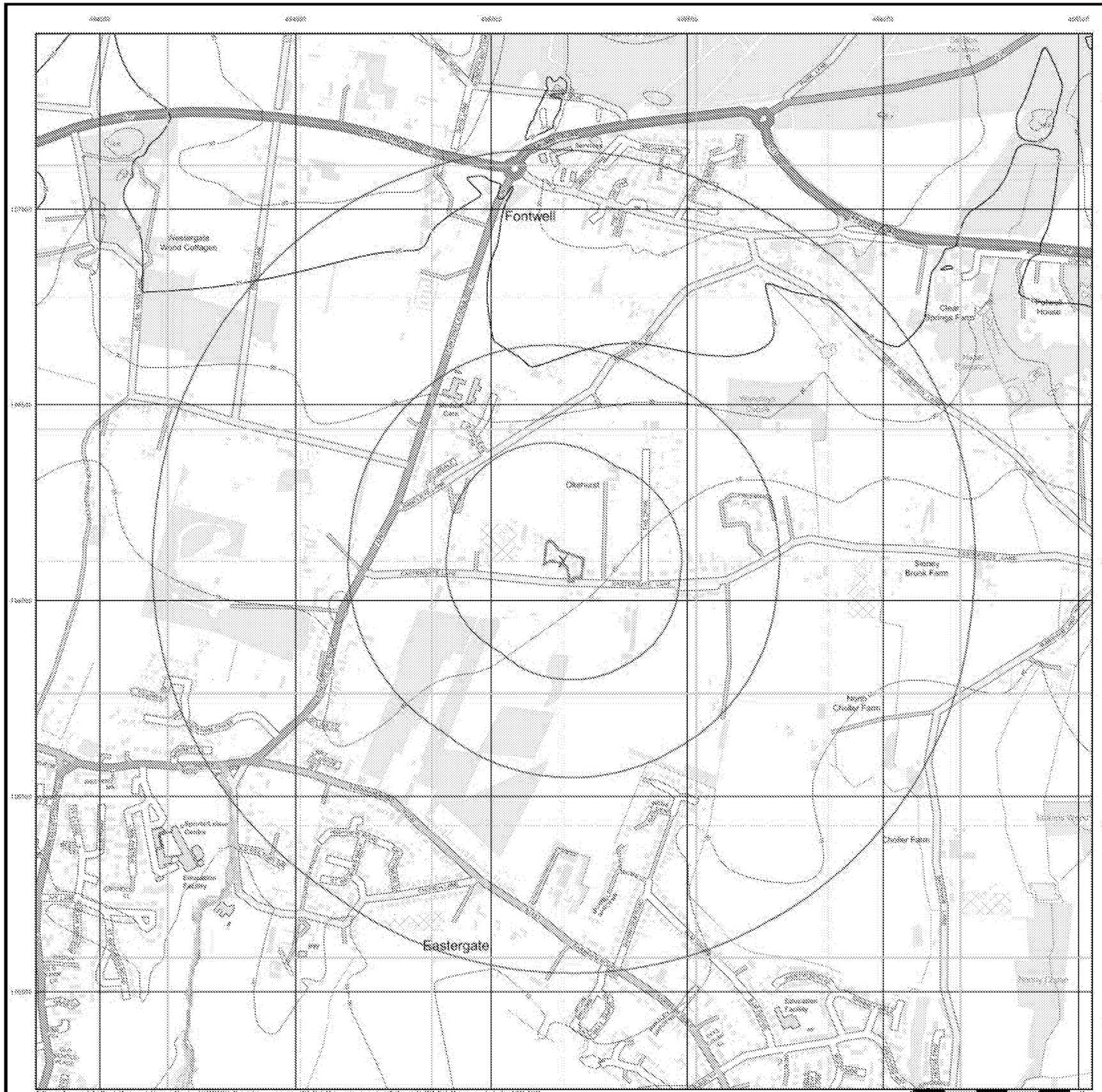
Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP
Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



motion

JBA 100 Year Return Flood Map (Undefended)
(1:10,000)

General

Specified Site

Specified Buffer(s)

Bearing Reference Point

Modelled Flood Depth

Fluvial Depth	Coastal Depth
0.00m - 0.05m	0.00m - 0.05m
0.05m - 0.1m	0.05m - 0.1m
0.1m - 0.3m	0.1m - 0.3m
0.3m - 1m	0.3m - 1m
>1m	>1m

Contours (height in metres)

Standard Contour

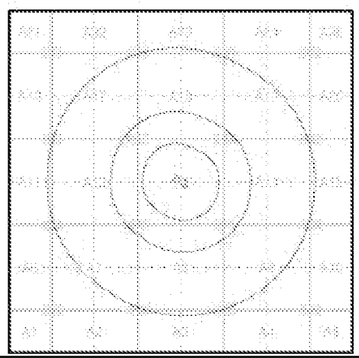
Master Contour

Spot Height

Mean Low Water

Mean High Water

JBA 100 Year Return Flood Map (Undefended) - Slice A



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Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

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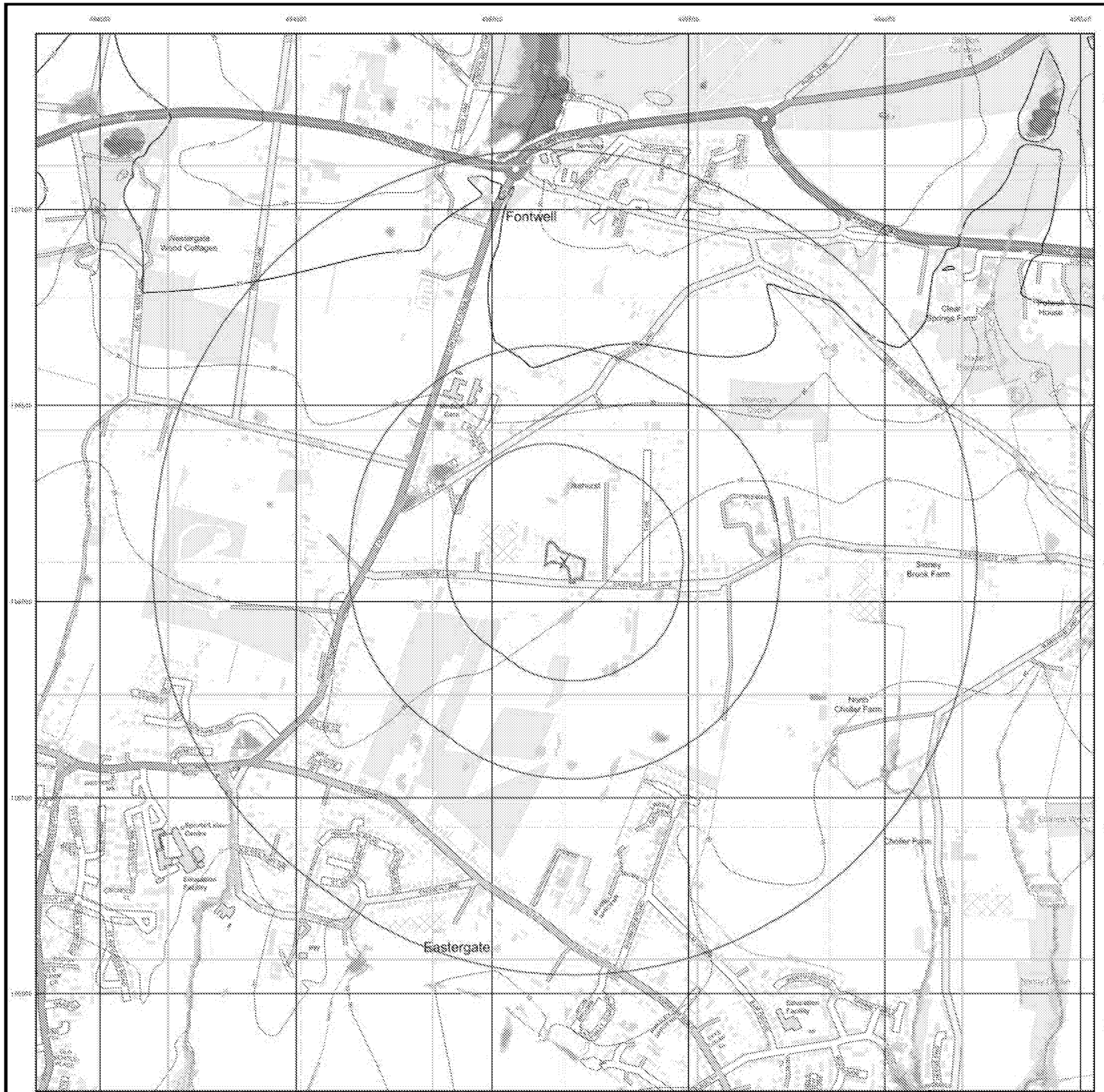


motion

JBA 200 Year Return Flood Map (Undefended) (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Pooling Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0 m	0.05m - 0.05m	0.05m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

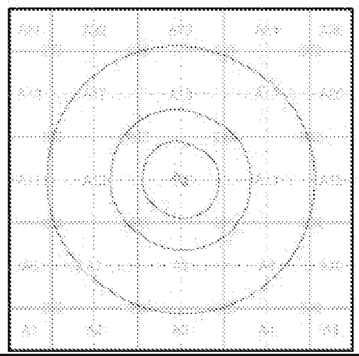
Contours (heights in metres)

Standard Contour — Mean Low Water

Master Contour — Mean High Water

Spot Height

JBA 200 Year Return Flood Map (Undefended) - Slice A



Order Details

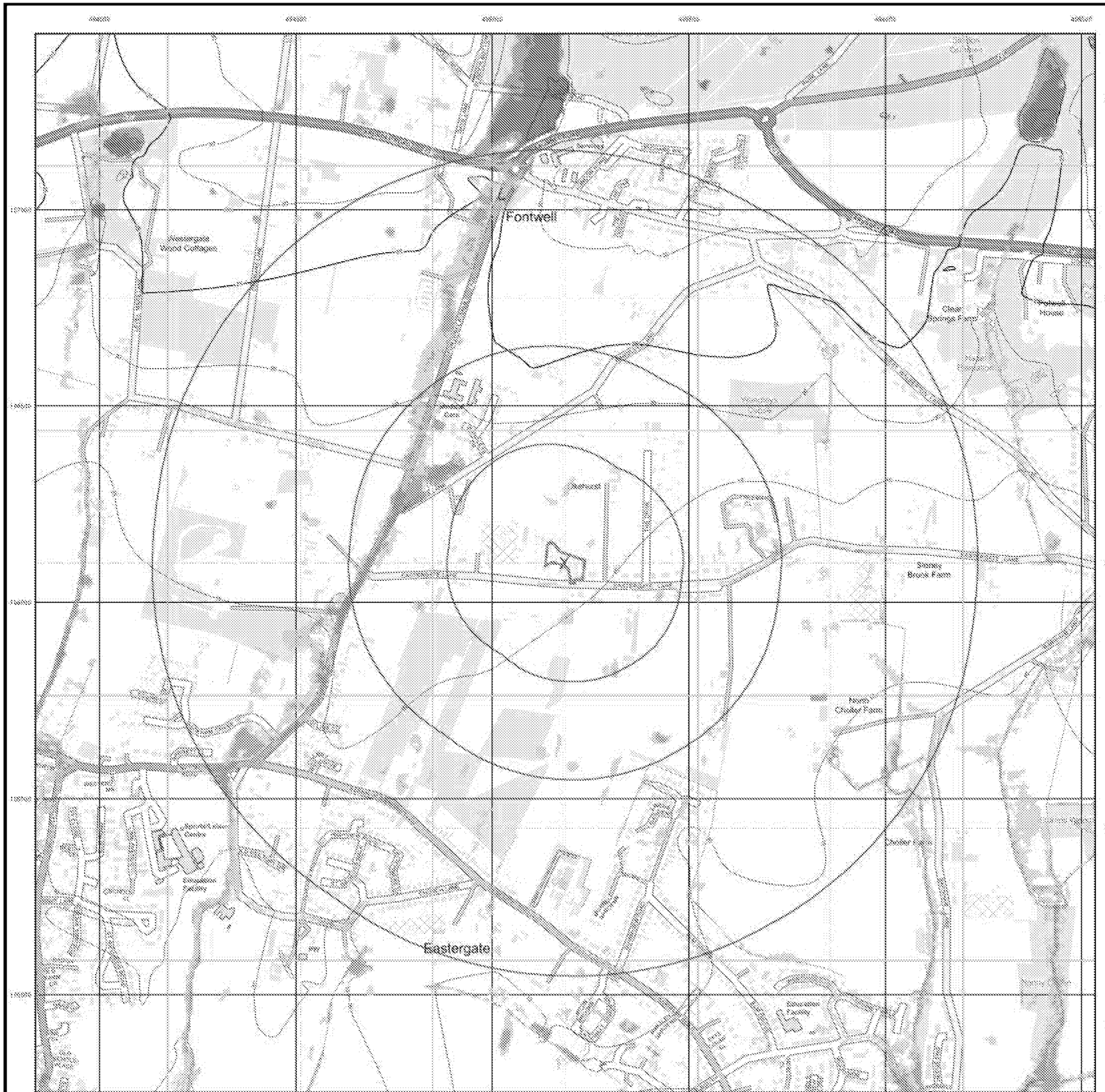
Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



motion

JBA 1000 Year Return Flood Map (Undefended) (1:10,000)

General

Specified Site

Specified Buffer(s)

Bearing Reference Point

Modelled Flood Depth

Pluvial Depth	Fluvial Depth	Coastal Depth
0 m	0.05m - 0.05m	0.05m - 0.05m
0.1m - 0.3m	0.05m - 0.1m	0.05m - 0.1m
0.3m - 1m	0.1m - 0.3m	0.1m - 0.3m
>1m	0.3m - 1m	0.3m - 1m
	>1m	>1m

Contours (heights in metres)

Standard Contour ... 05 ... 10 ... 15 ... 20 ... 25 ... 30 ... 35 ... 40 ... 45 ... 50 ... 55 ... 60 ... 65 ... 70 ... 75 ... 80 ... 85 ... 90 ... 95 ... 100 ... 105 ... 110 ... 115 ... 120 ... 125 ... 130 ... 135 ... 140 ... 145 ... 150 ... 155 ... 160 ... 165 ... 170 ... 175 ... 180 ... 185 ... 190 ... 195 ... 200 ... 205 ... 210 ... 215 ... 220 ... 225 ... 230 ... 235 ... 240 ... 245 ... 250 ... 255 ... 260 ... 265 ... 270 ... 275 ... 280 ... 285 ... 290 ... 295 ... 300 ... 305 ... 310 ... 315 ... 320 ... 325 ... 330 ... 335 ... 340 ... 345 ... 350 ... 355 ... 360 ... 365 ... 370 ... 375 ... 380 ... 385 ... 390 ... 395 ... 400 ... 405 ... 410 ... 415 ... 420 ... 425 ... 430 ... 435 ... 440 ... 445 ... 450 ... 455 ... 460 ... 465 ... 470 ... 475 ... 480 ... 485 ... 490 ... 495 ... 500 ... 505 ... 510 ... 515 ... 520 ... 525 ... 530 ... 535 ... 540 ... 545 ... 550 ... 555 ... 560 ... 565 ... 570 ... 575 ... 580 ... 585 ... 590 ... 595 ... 600 ... 605 ... 610 ... 615 ... 620 ... 625 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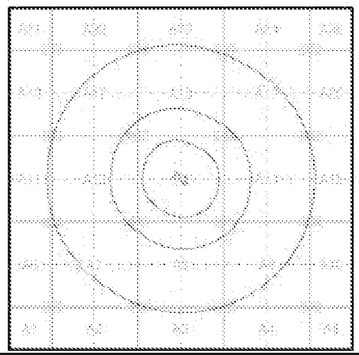
Mean Low Water

Mean High Water

JBA 1000 Year Return Flood Map (Undefended) - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP

Tel: 0844 844 9952
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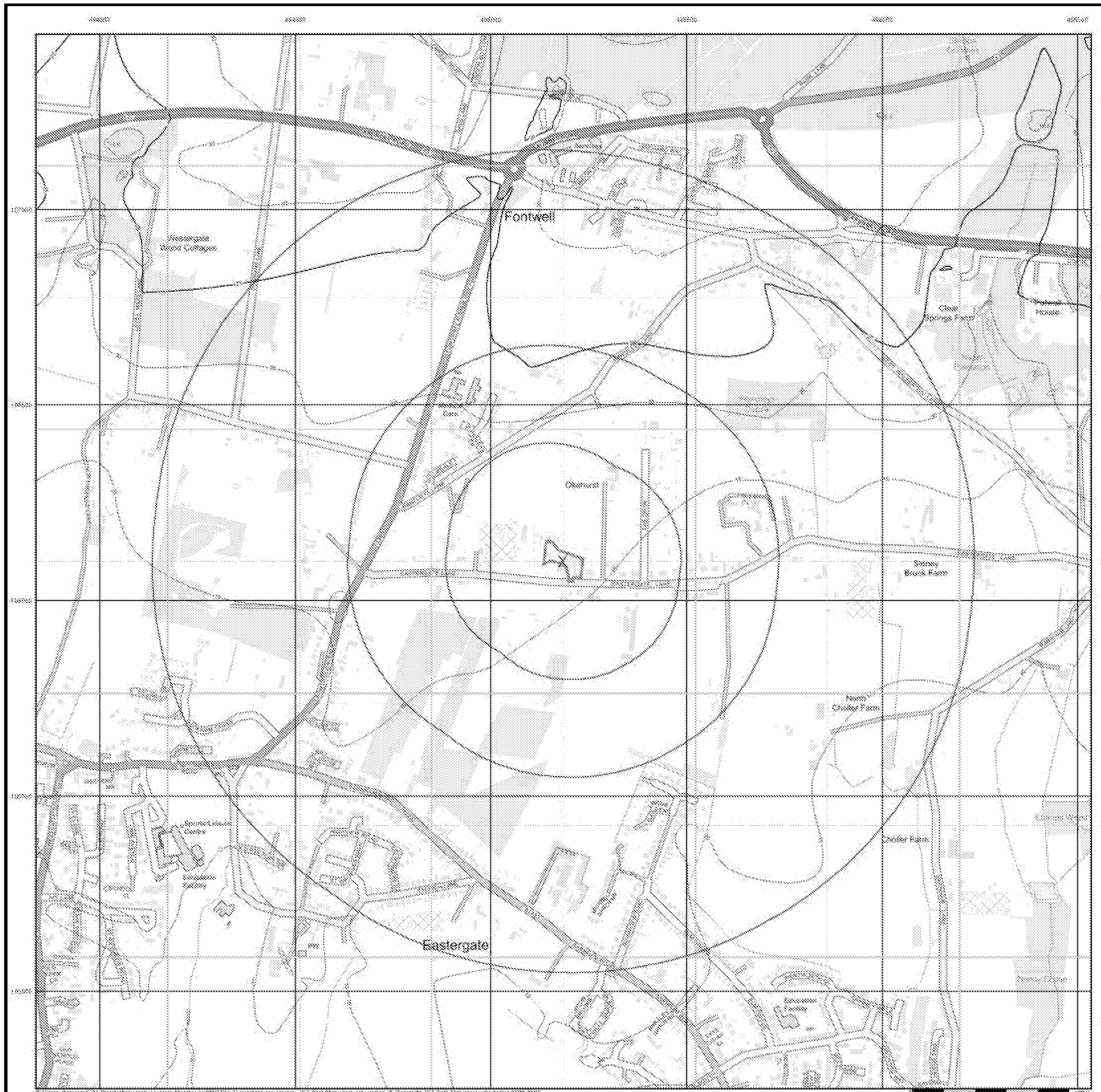


motion

JBA Canal Failure Map (1:10,000)

General

Specified Site

Specified Buffer(s)

X Bearing Reference Point

Flood Data

Canal Failure

Coverage

Contours (height in metres)

Standard Contour

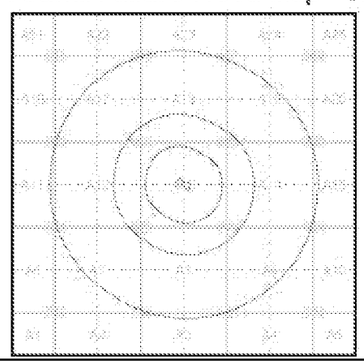
Master Contour

Spot Height

Mean Low Water

Mean High Water

JBA Canal Failure Flood Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark Information Group

Tel: 0844 844 9952
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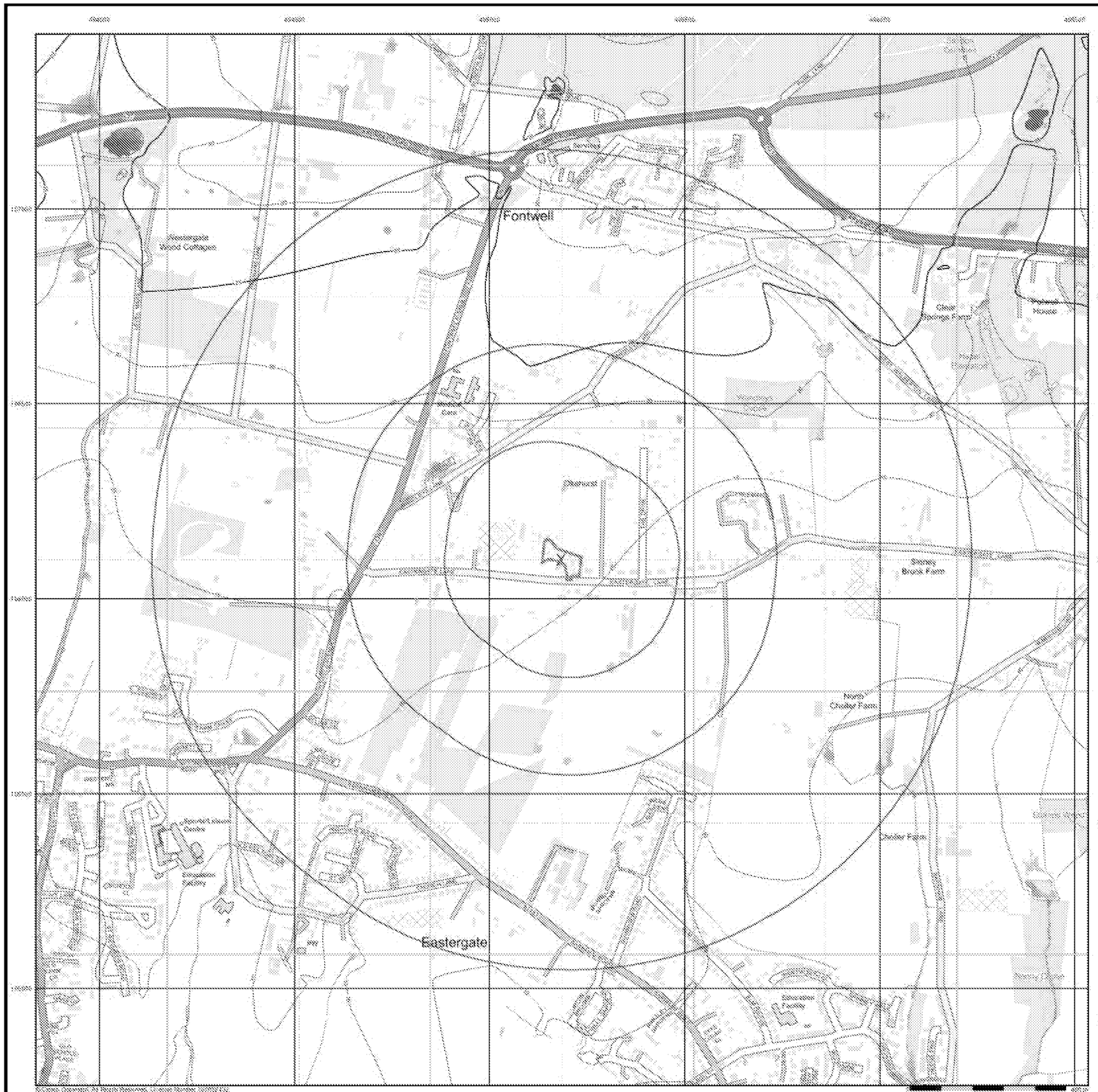


motion

EA/NRW Surface Water 30 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

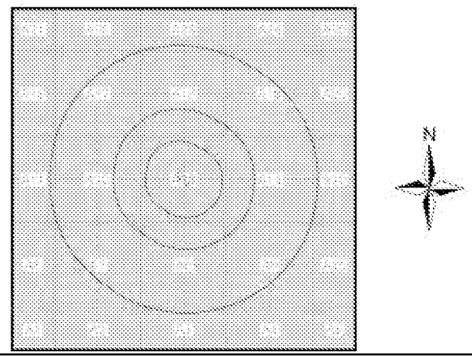
Standard Contour | Master Contour | Spot Height | Mean Low Water | Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

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Landmark INFORMATION GROUP

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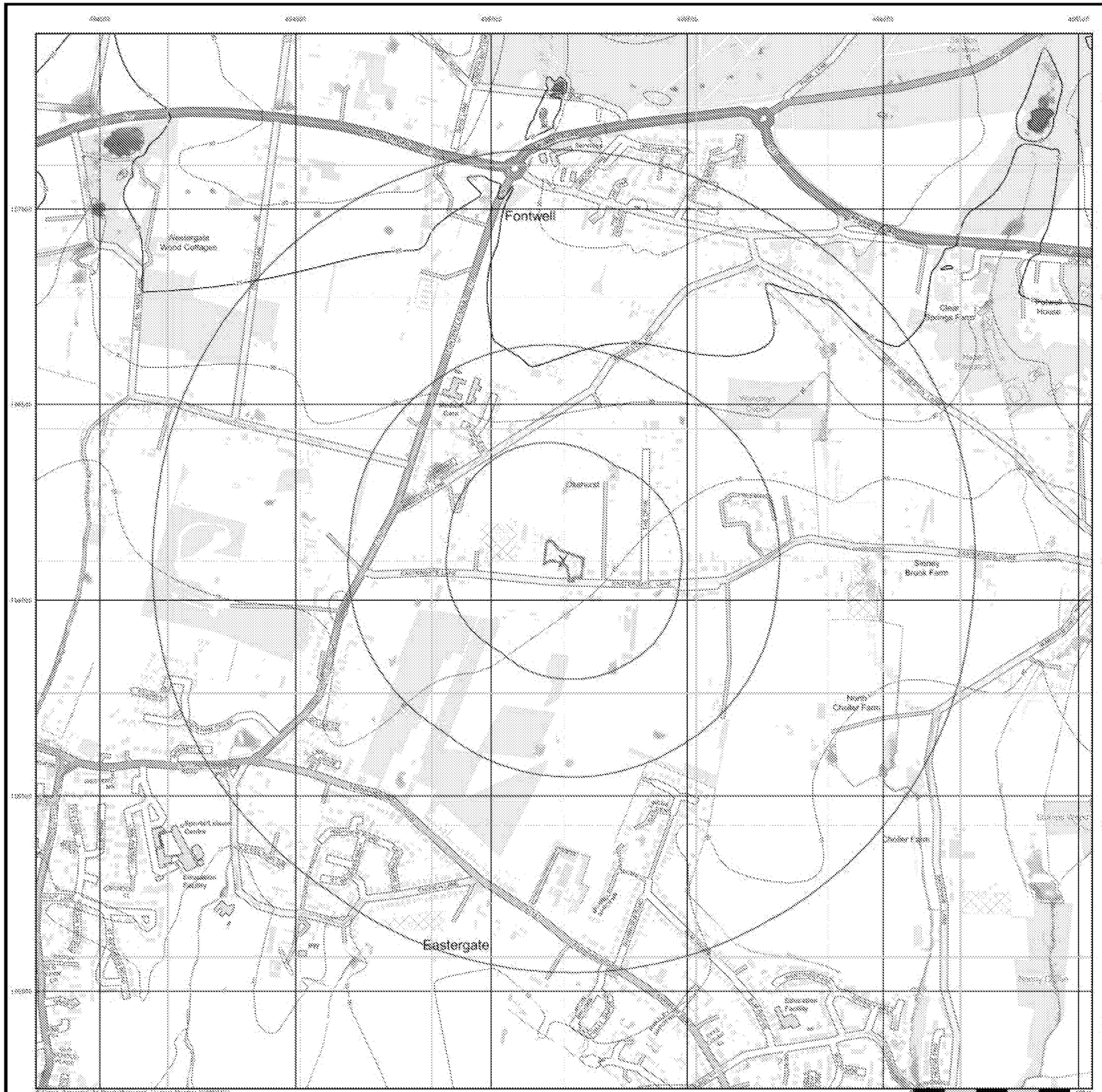


motion

EA/NRW Surface Water 100 Year Return Depth Map

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

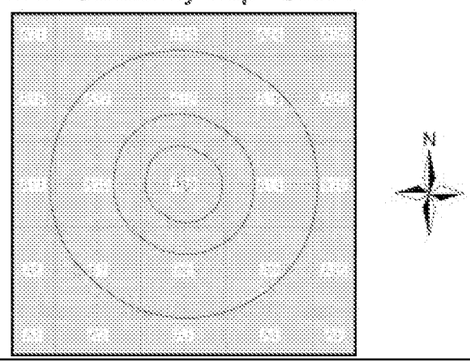
Standard Contour | Master Contour | Spot Height | Mean Low Water | Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

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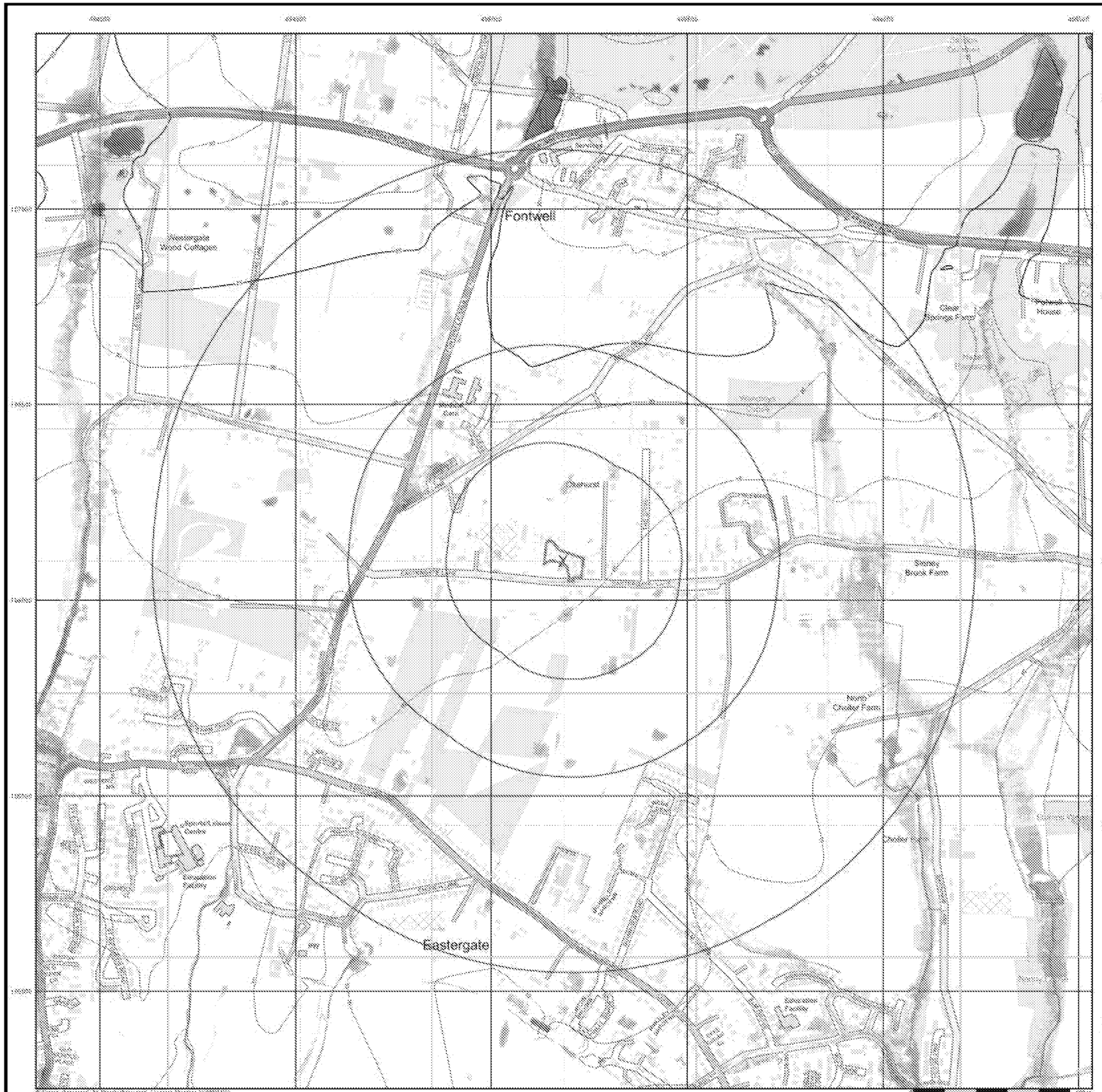


motion

EA/NRW Surface Water 1000 Year Return Depth Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Depth

- 0 - 0.15m
- 0.15 - 0.30m
- 0.30 - 0.60m
- 0.60 - 0.90m
- 0.90 - 1.20m
- > 1.20m

Contours (height in metres)

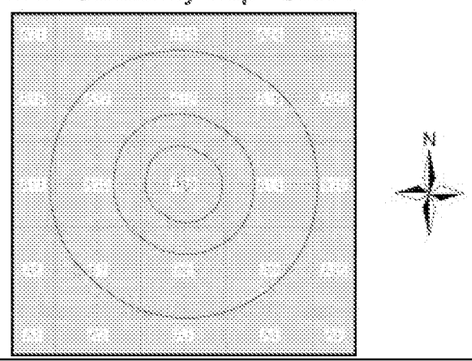
Standard Contour | Master Contour | Spot Height | Mean Low Water | Mean High Water

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

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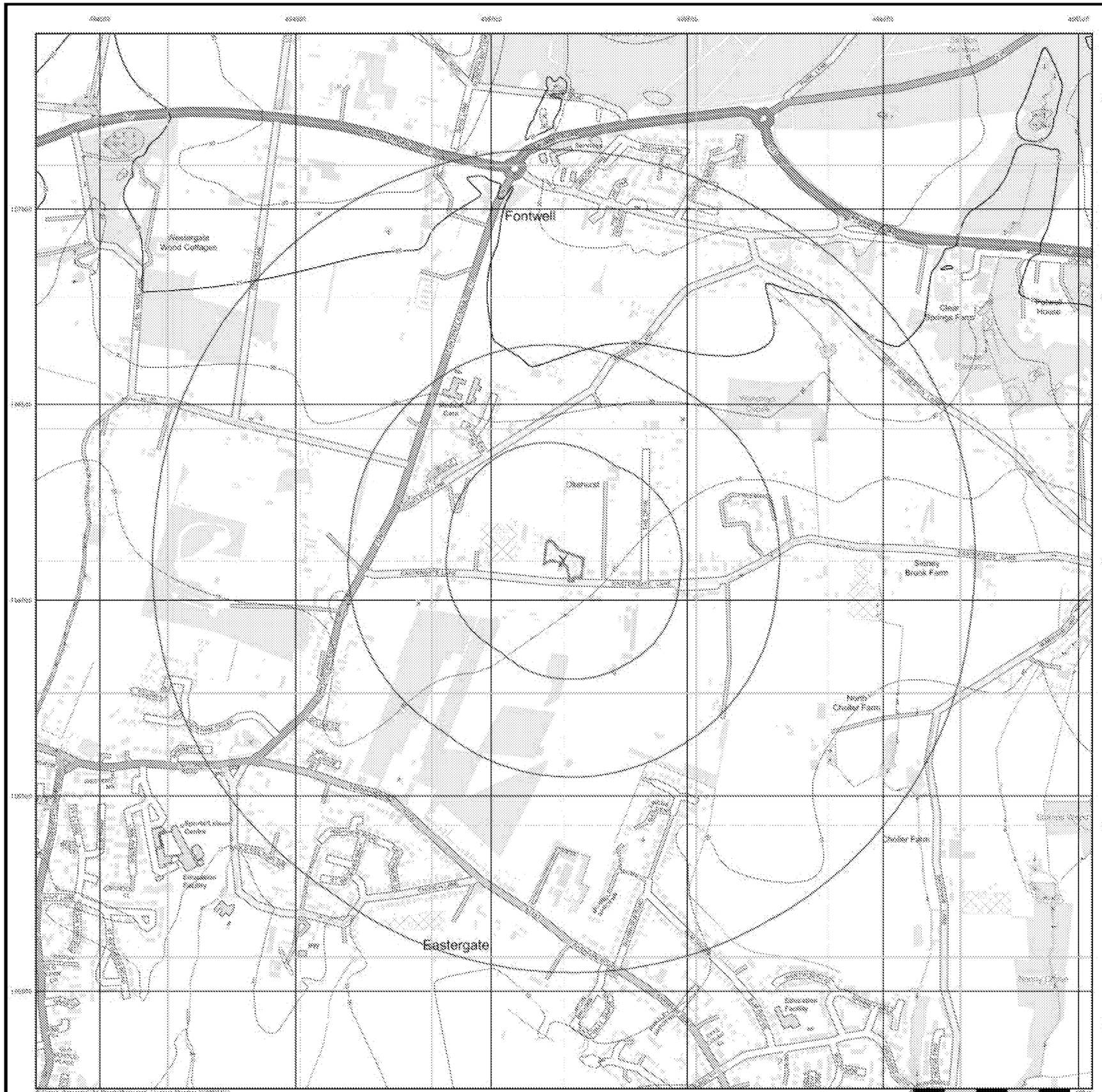
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastgate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP

Tel: 0844 844 9952
Fax: 0844 844 9951
Web: www.envirocheck.co.uk



motion

EA/NRW Surface Water 30 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Velocity and Direction

0.00 - 0.25m/s | 0.25 - 0.50m/s | 0.50 - 1.00m/s | 1.00 - 2.00m/s | > 2.00m/s

Flow Direction of Maximum Velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height

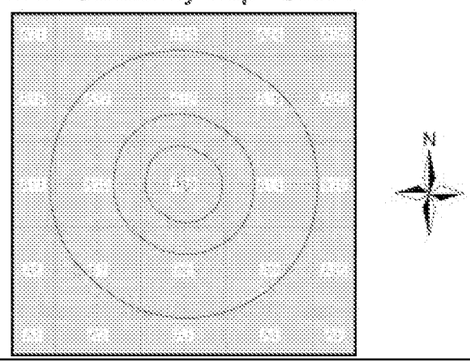
Mean Low Water | Mean High Water

Suitability

See the suitability map below

National to county | County to town | Town to street | Street to parcels of land | Property

EA/NRW Suitability Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

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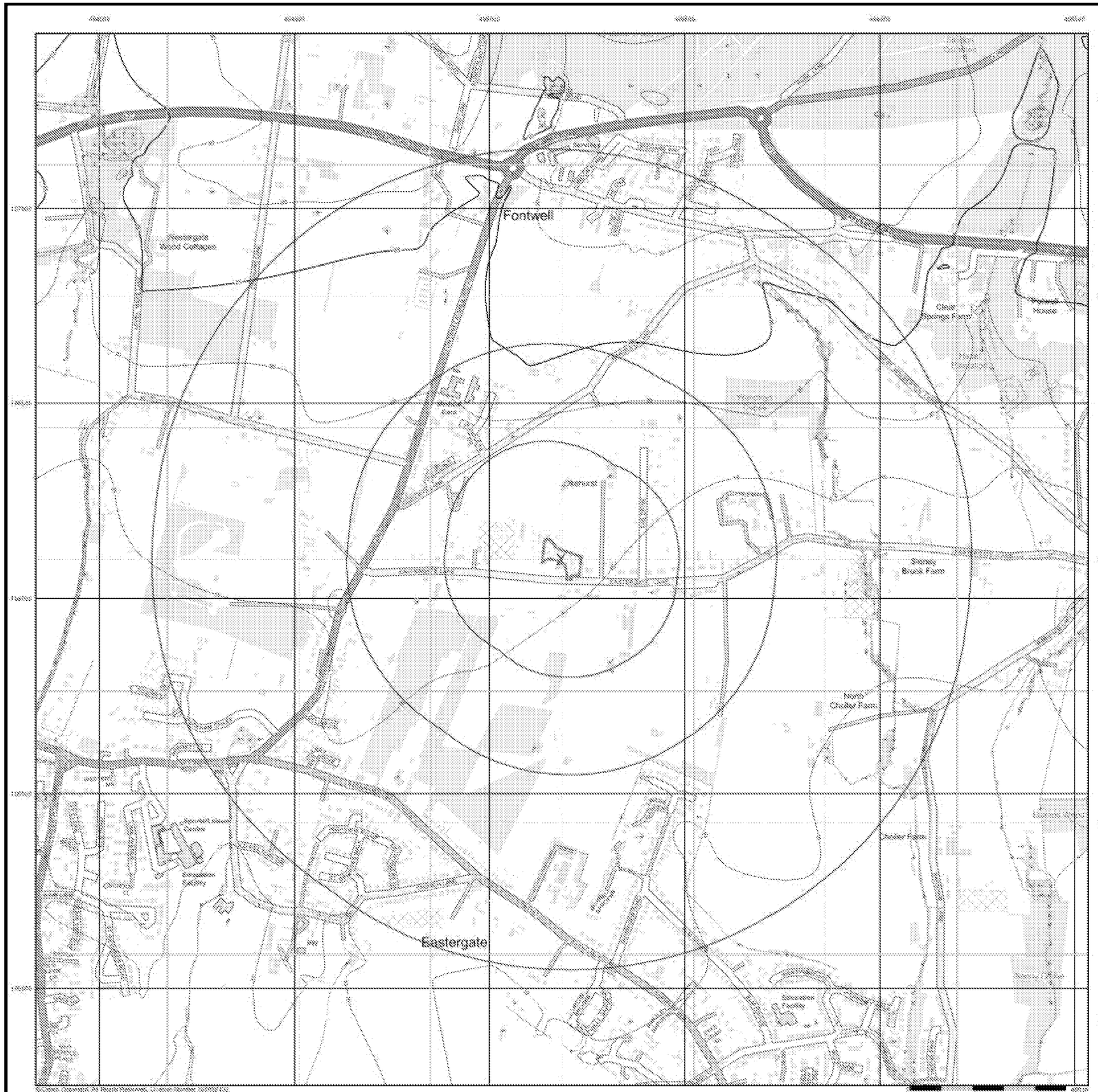


motion

EA/NRW Surface Water 100 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Velocity and Direction

0.00 - 0.25m/s | 0.25 - 0.50m/s | 0.50 - 1.00m/s | 1.00 - 2.00m/s | > 2.00m/s

Flow Direction of Maximum Velocity

Contours (height in metres)

Standard Contour | Master Contour | Spot Height

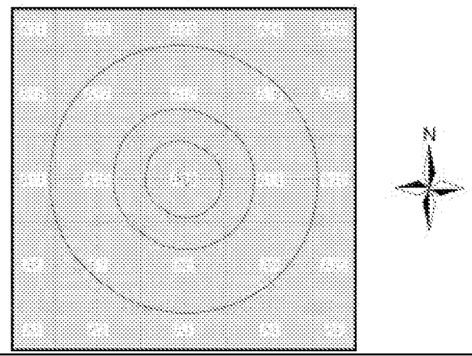
Mean Low Water | Mean High Water

Suitability

See the suitability map below

National to county | County to town | Town to street | Street to parcels of land | Property

EA/NRW Suitability Map - Slice A



Order Details

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Slice:	A
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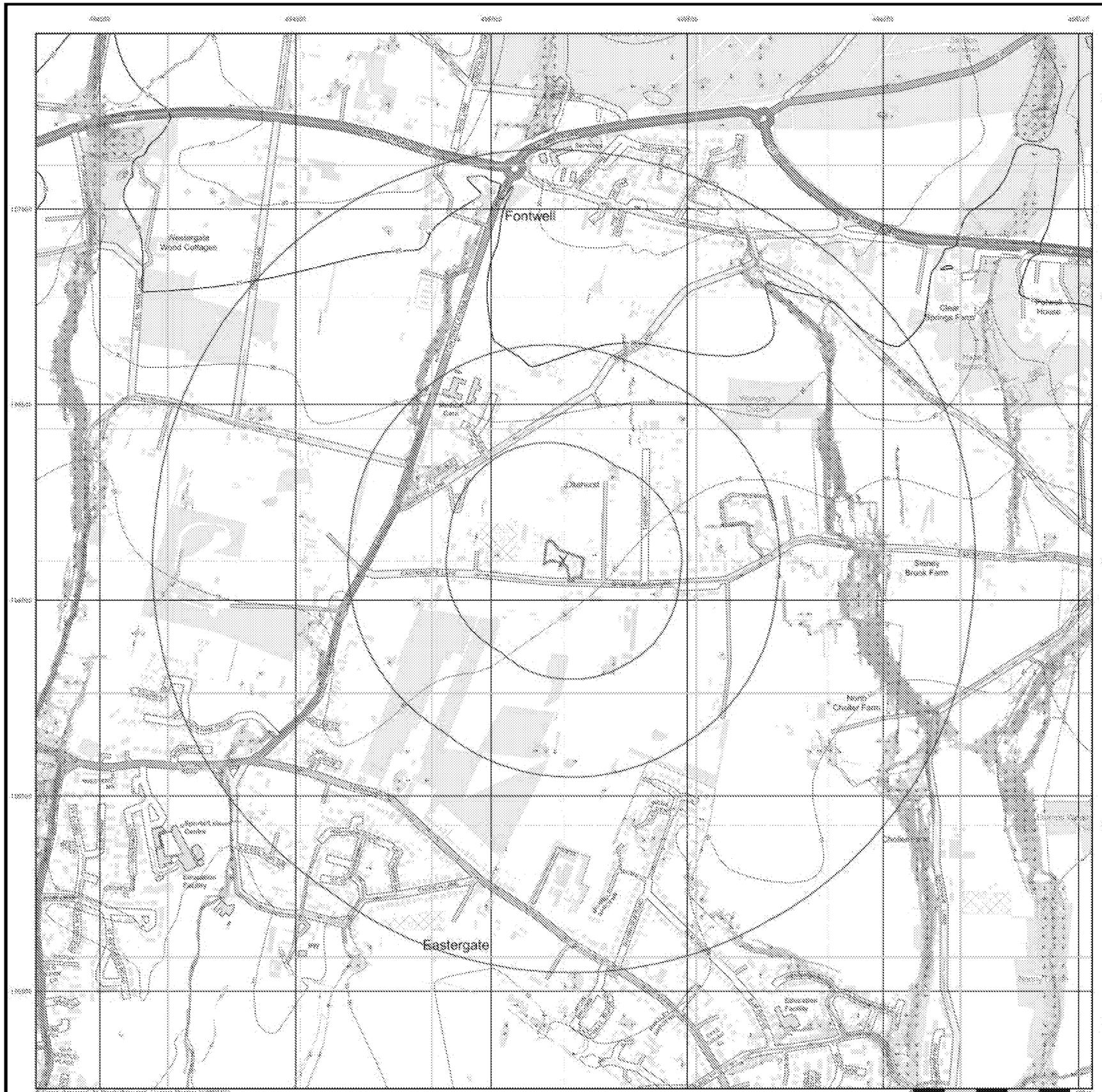


motion

EA/NRW Surface Water 1000 Year Return Velocity and Flow Direction Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Velocity and Direction

0.00 - 0.25m/s
0.25 - 0.50m/s
0.50 - 1.00m/s
1.00 - 2.00m/s
> 2.00m/s

Flow Direction of Maximum Velocity

Contours (height in metres)

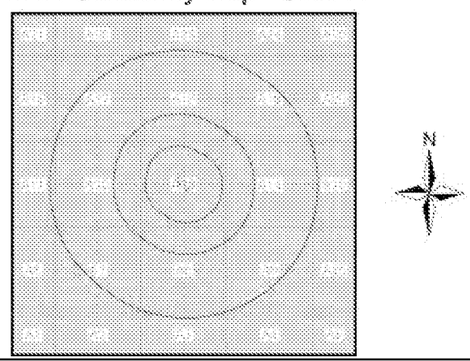
Standard Contour | Mean Low Water
Master Contour | Mean High Water
Spot Height

Suitability

See the suitability map below

National to county
County to town
Town to street
Street to parcels of land
Property

EA/NRW Suitability Map - Slice A



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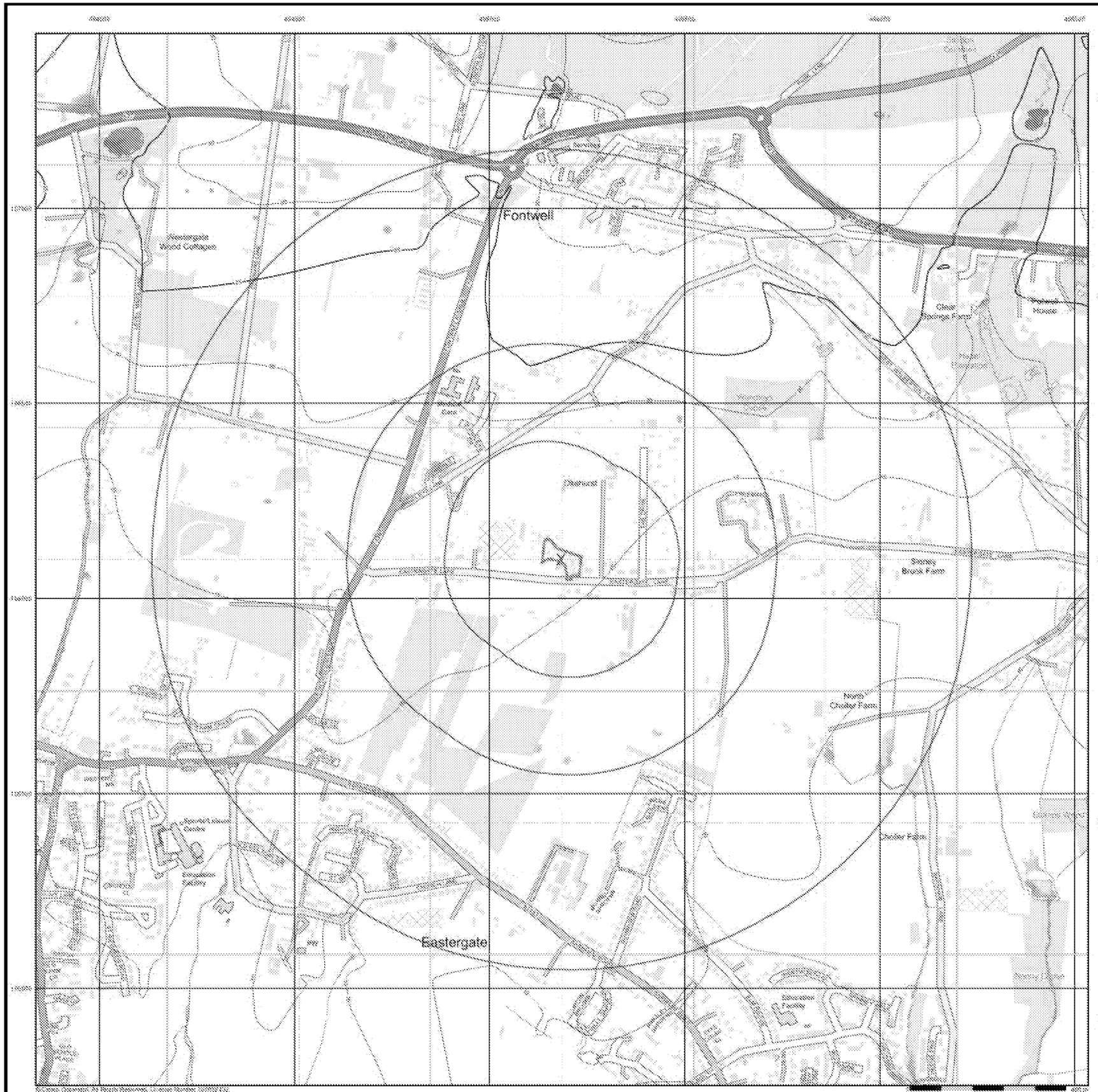


motion

EA/NRW Surface Water 30 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Hazard Rating

- Low (0.5 – 0.75)
- Moderate (0.75 – 1.25)
- Significant (1.25 – 2.0)
- Extreme (>2.0)

Contours (height in metres)

Standard Contour | Mean Low Water

Master Contour | Mean High Water

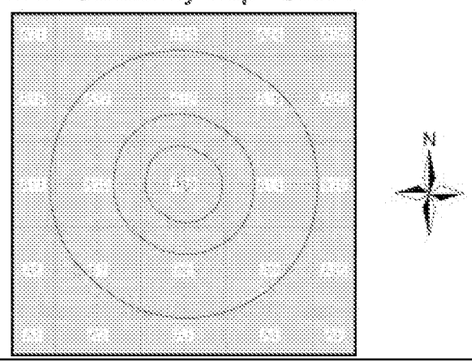
Spot Height

Suitability

See the suitability map below

- National to county
- County to town
- Town to street
- Street to parcels of land
- Property

EA/NRW Suitability Map - Slice A



Order Details

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Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
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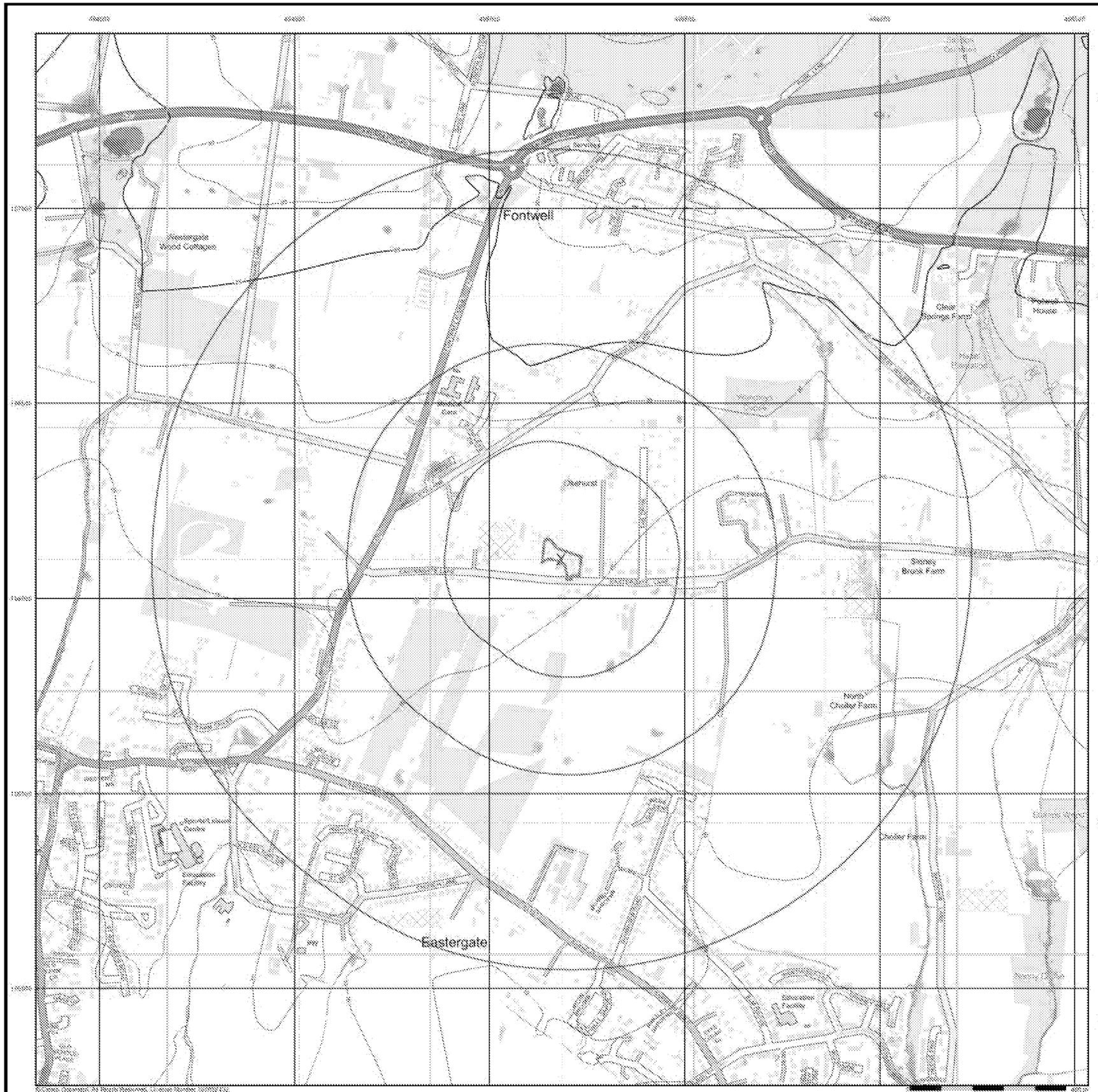


motion

EA/NRW Surface Water 100 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Hazard Rating

Low (0.5 – 0.75)
Moderate (0.75 – 1.25)
Significant (1.25 – 2.0)
Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height

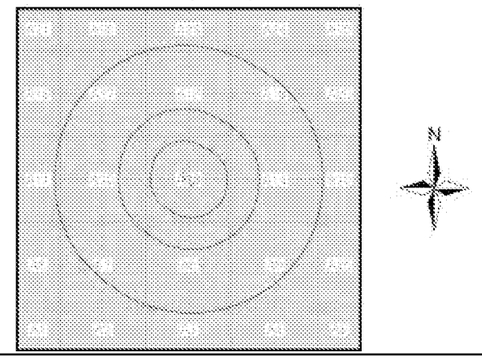
Mean Low Water
Mean High Water

Suitability

See the suitability map below

National to county
County to town
Town to street
Street to parcels of land
Property

EA/NRW Suitability Map - Slice A



Order Details

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Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
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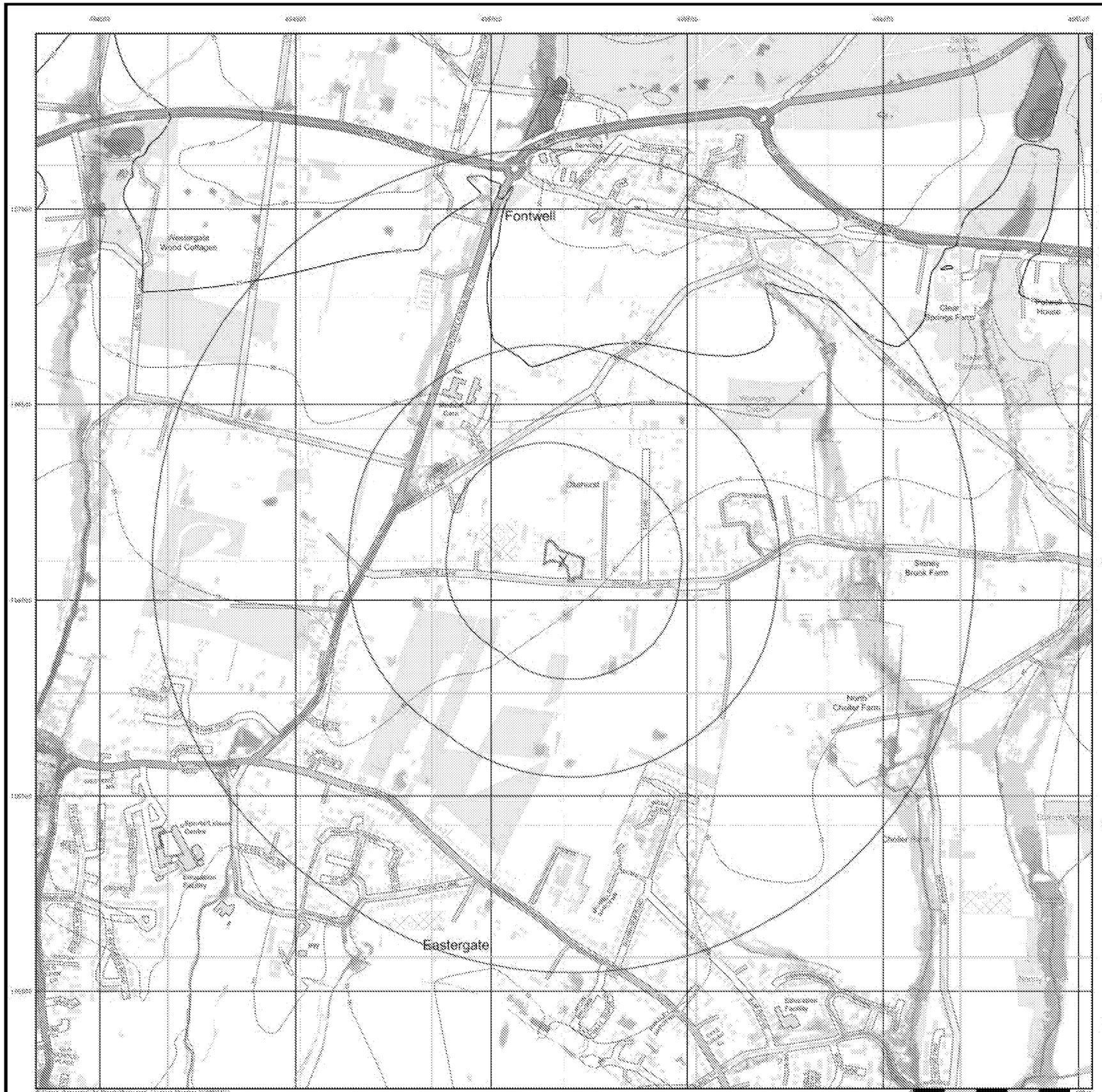

motion

EA/NRW Surface Water 1000 Year Return Hazard Rating Map (1:10,000)

General

Specified Site | Specified Buffer(s) | Bearing Reference Point

Surface Water Hazard Rating

Low (0.5 – 0.75)
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Significant (1.25 – 2.0)
Extreme (>2.0)

Contours (height in metres)

Standard Contour | Master Contour | Spot Height

Mean Low Water
Mean High Water

Suitability

See the suitability map below

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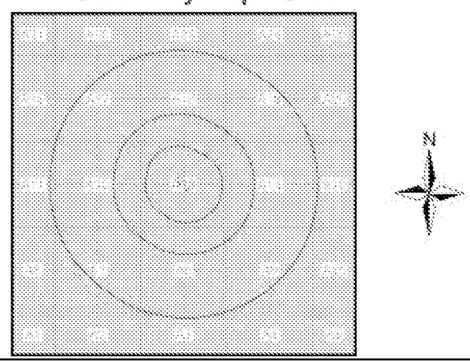
Town to street
Street to parcels of land
Property

EA/NRW Suitability Map - Slice A



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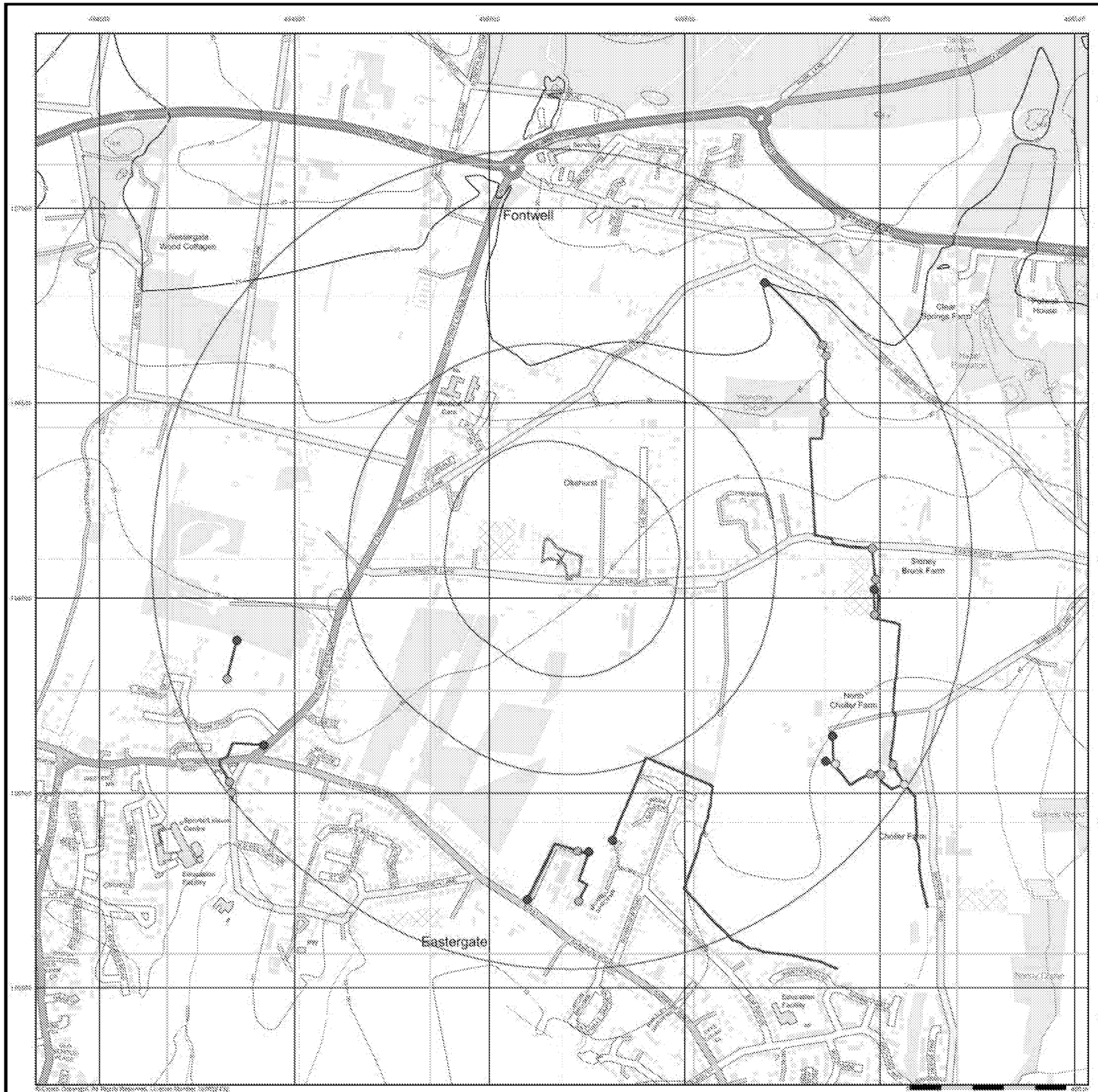


motion

OS Water Network Lines Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Bearing Reference Point

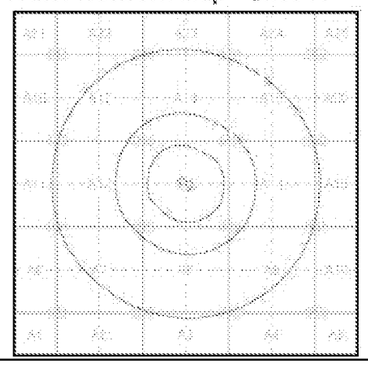
OS Water Network Data

- Canal
- Reservoir
- Foreshore
- Marsh
- Tidal River
- Inland River
- Drain
- Other
- Lake
- Transfer
- Lock Or Flight Of Locks
- Sea
- Junction
- Outlet
- Pseudo
- Source
- Other

Contours (height in meters)

- Standard Contour
- Master Contour
- Spot Height
- Mean Low Water
- Mean High Water

OS Water Network Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
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Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

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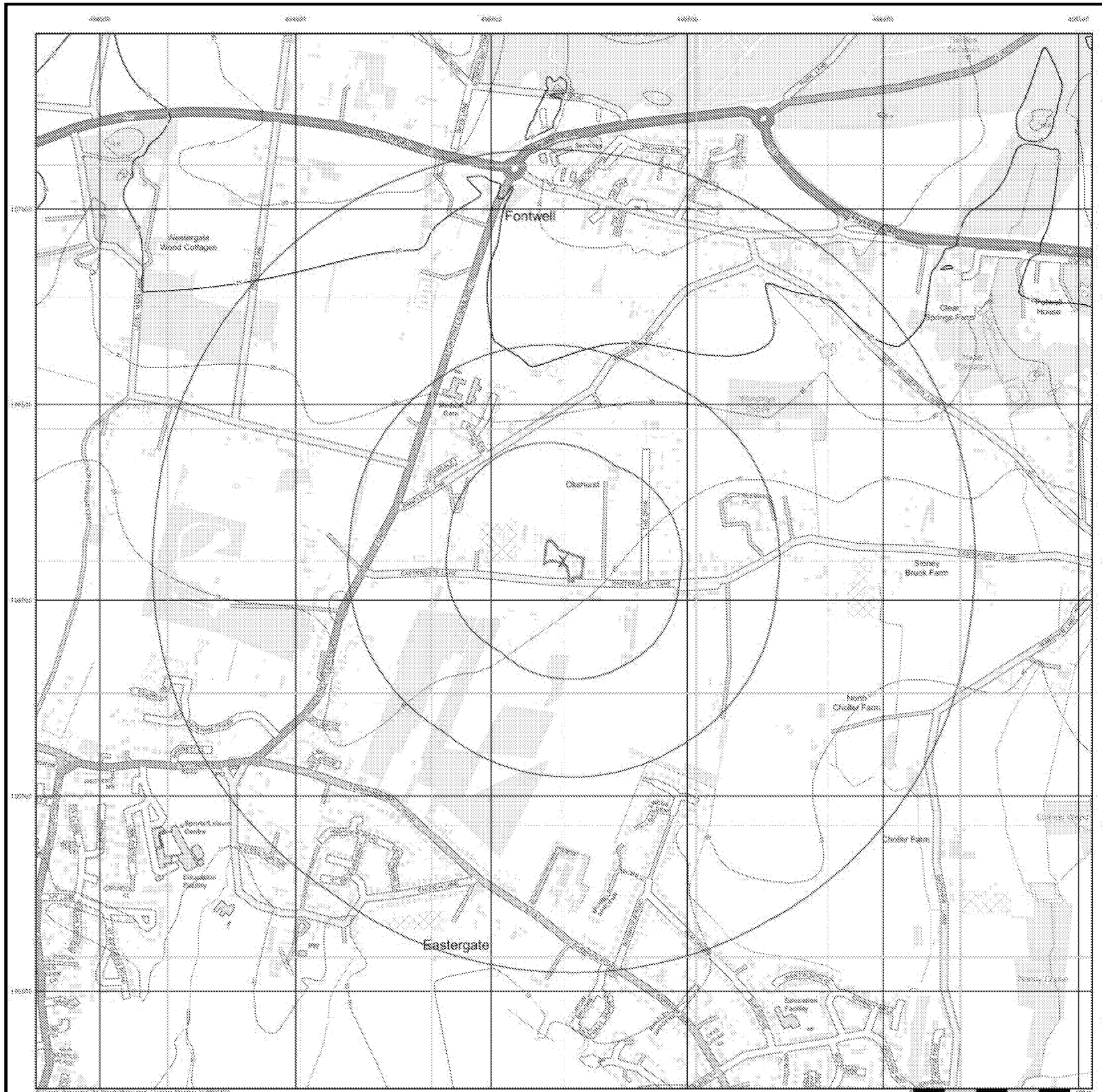


motion

EA/NRW Historic Flood Map (1:10,000)

General

- Specified Site
- Specified Buffer(s)
- Search Reference Point
- Map ID

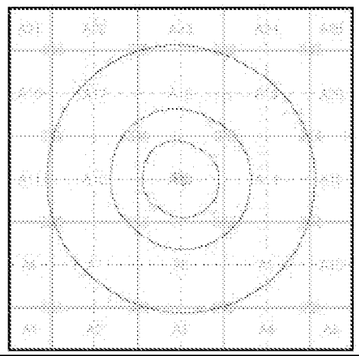
Historic Flood Events Data

- Channel Capacity Exceeded (no raised defences)
- Channel Capacity Exceeded (Surface Water)
- Groundwater/High Water Table
- Local Drainage/Surface Water
- Mechanical Failure
- Obstruction/Blockage - Bridge
- Obstruction/Blockage - Channel
- Historical Flood Liabilities
- Obstruction/Blockage - Culvert
- Obstruction/Blockage - Debris Screen
- Operational Failure/ Breach of Defence
- Other
- Overtopping of Defences
- Surface Water
- Unknown

Contours (height in metres)

- Standard Contour
- Master Contour
- Spot Height
- Mean Low Water
- Mean High Water

EA/NRW Historic Flood Map - Slice A



Order Details

Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

Site Details

Eastmere Stables, Eastergate Lane, Eastergate, CHICHESTER, PO20 3SJ

Landmark INFORMATION GROUP

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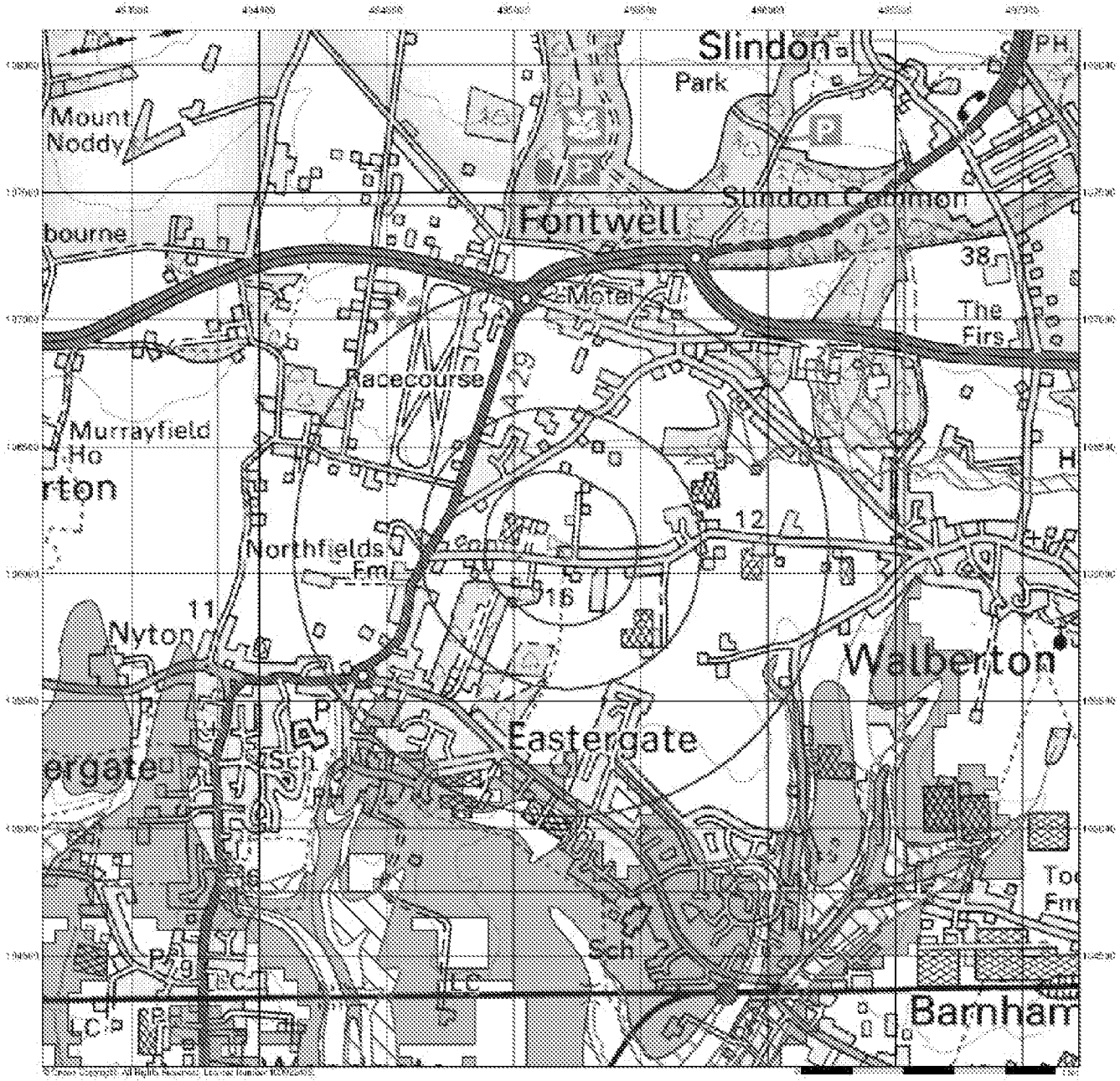


motion

BGS Flood Data (1:50,000)

General

Specified Site · Specified Buffer(s) · Mapping Reference Point · Site · Map ID

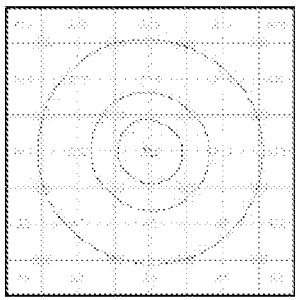
BGS Geological Indicators of Flooding

Coastal

Inland

Bodies of Water

BGS Flood Data Map - Slice A



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Order Number:	294967859_1_1
Customer Ref:	1laeas/2203002
National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
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Site Details

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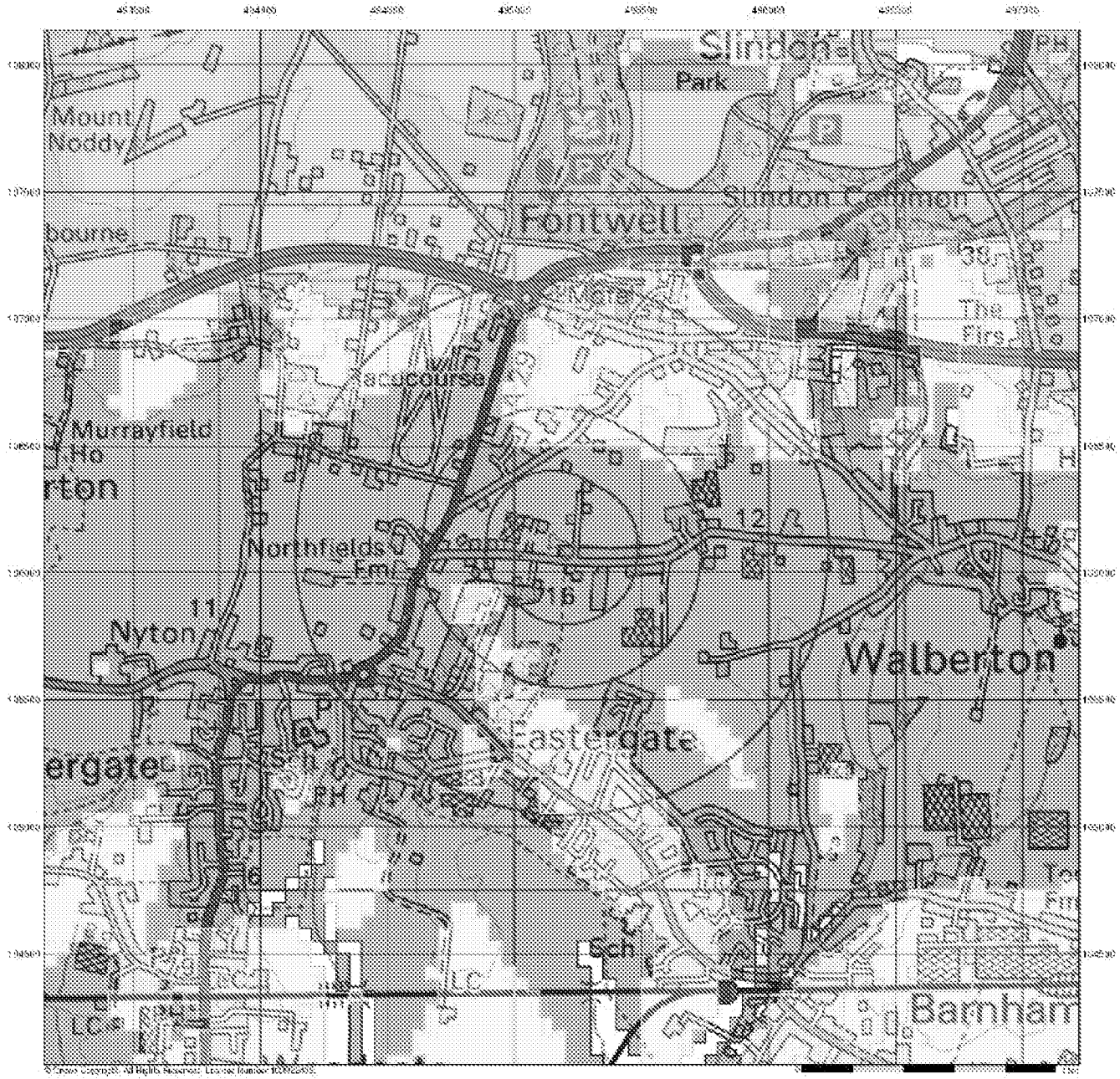


motion

BGS Flood Data (1:50,000)

General

Specified Site | Specified Buffer(s) | Mapping Reference Point | Site | Map ID

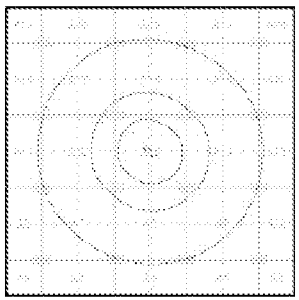
BGS Groundwater Flooding Susceptibility

Potential for Groundwater Flooding to Occur at Surface

Potential for Groundwater Flooding of Property Situated Below Ground Level

Limited Potential for Groundwater Flooding to Occur

BGS Flood Data Map - Slice A



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Order Details

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National Grid Reference:	495180, 106100
Slice:	A
Site Area (Ha):	0.46
Search Buffer (m):	1000

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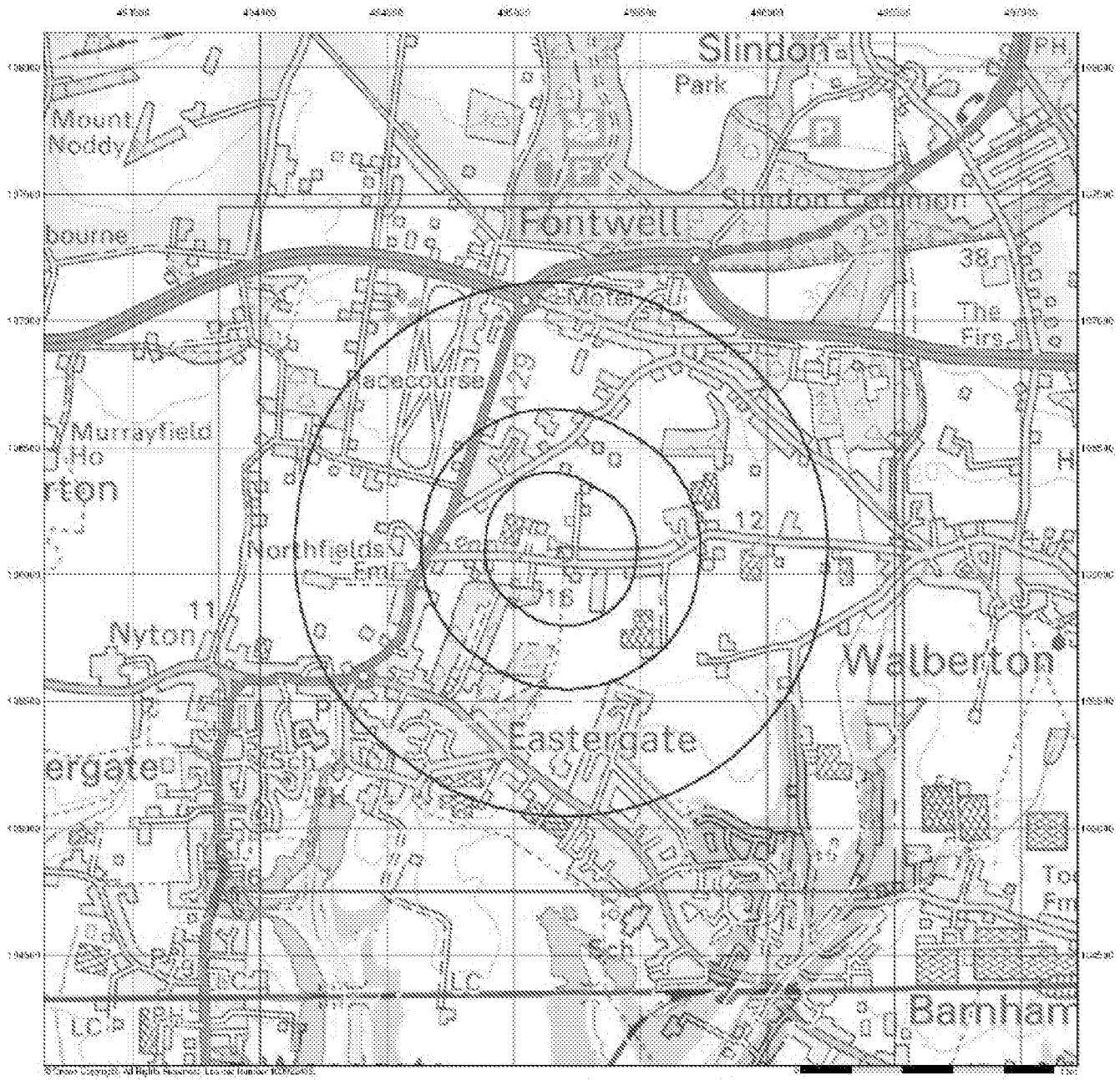


motion

GeoSmart Information Groundwater Flood Map (1:50,000)

General

Specified Site Specified Buffer(s) Bearing Reference Point

Site

GeoSmart Information Groundwater Flooding Risk

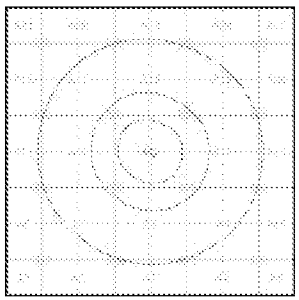
High Risk

Moderate Risk

Low Risk

Negligible Risk

GeoSmart Information Groundwater Flood Map - Slice A



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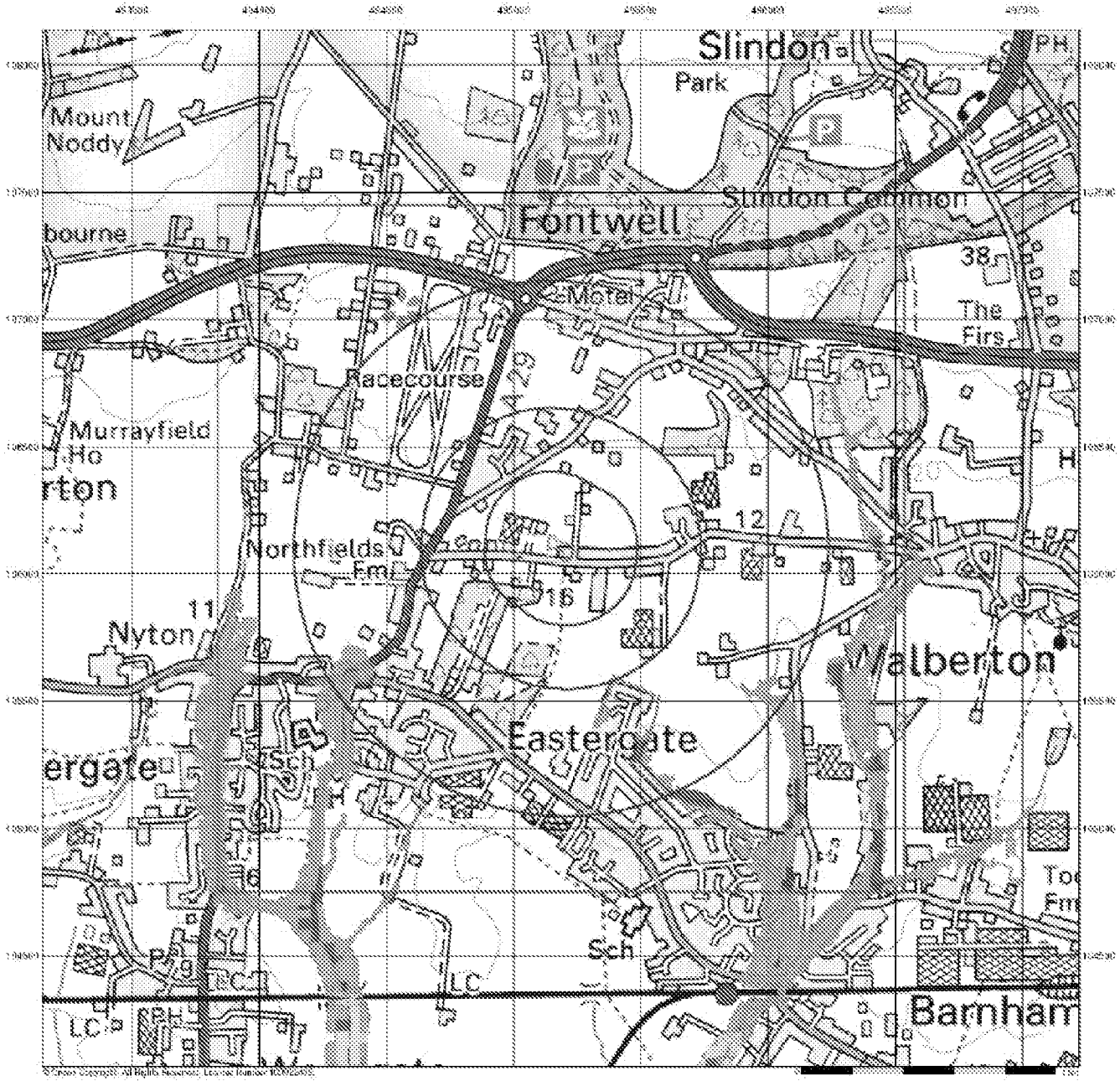


motion

EA/NRW RoFRS Data (1:50,000)

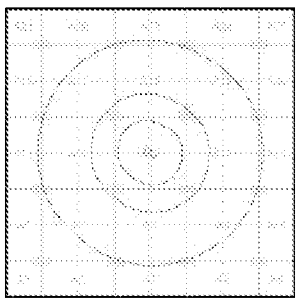
General

Selected Site | Specified Buffer(s) | Grid Ref Point | Slice | Map ID

Risk of Flooding from Rivers and Sea (RoFRS)

- High Risk
- Medium Risk
- Low Risk
- Very Low Risk

EA/NRW RoFRS Data Map - Slice A



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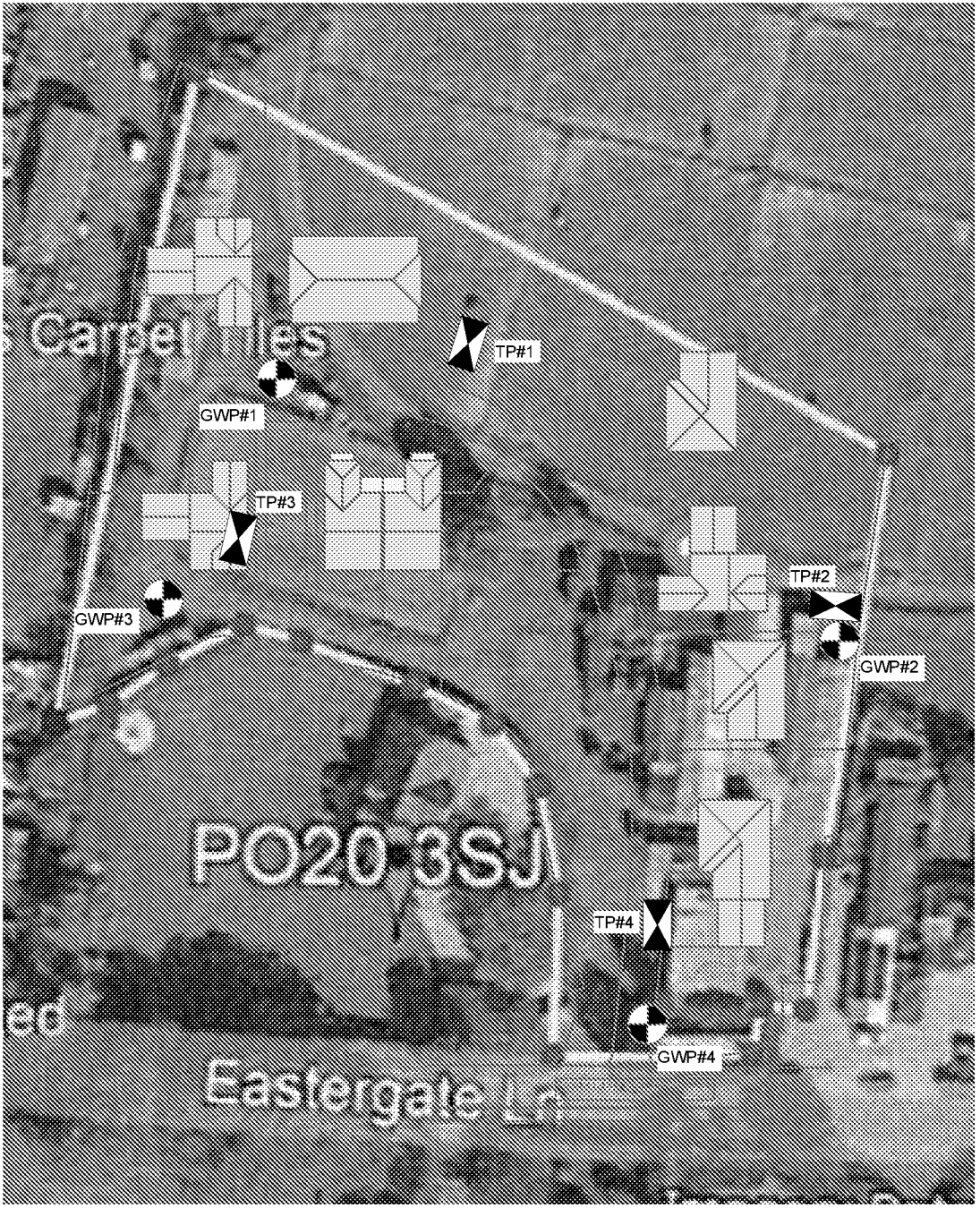
Appendix E

Infiltration Testing Results and Groundwater monitoring


Carpet Tiles
TP#1
GWP#1
TP#3
GWP#3
TP#2
GWP#2
PO20 3SJ
TP#4
GWP#4
Eastergate

Mate GeoTechnic Services

Wednesday 2nd February 2022

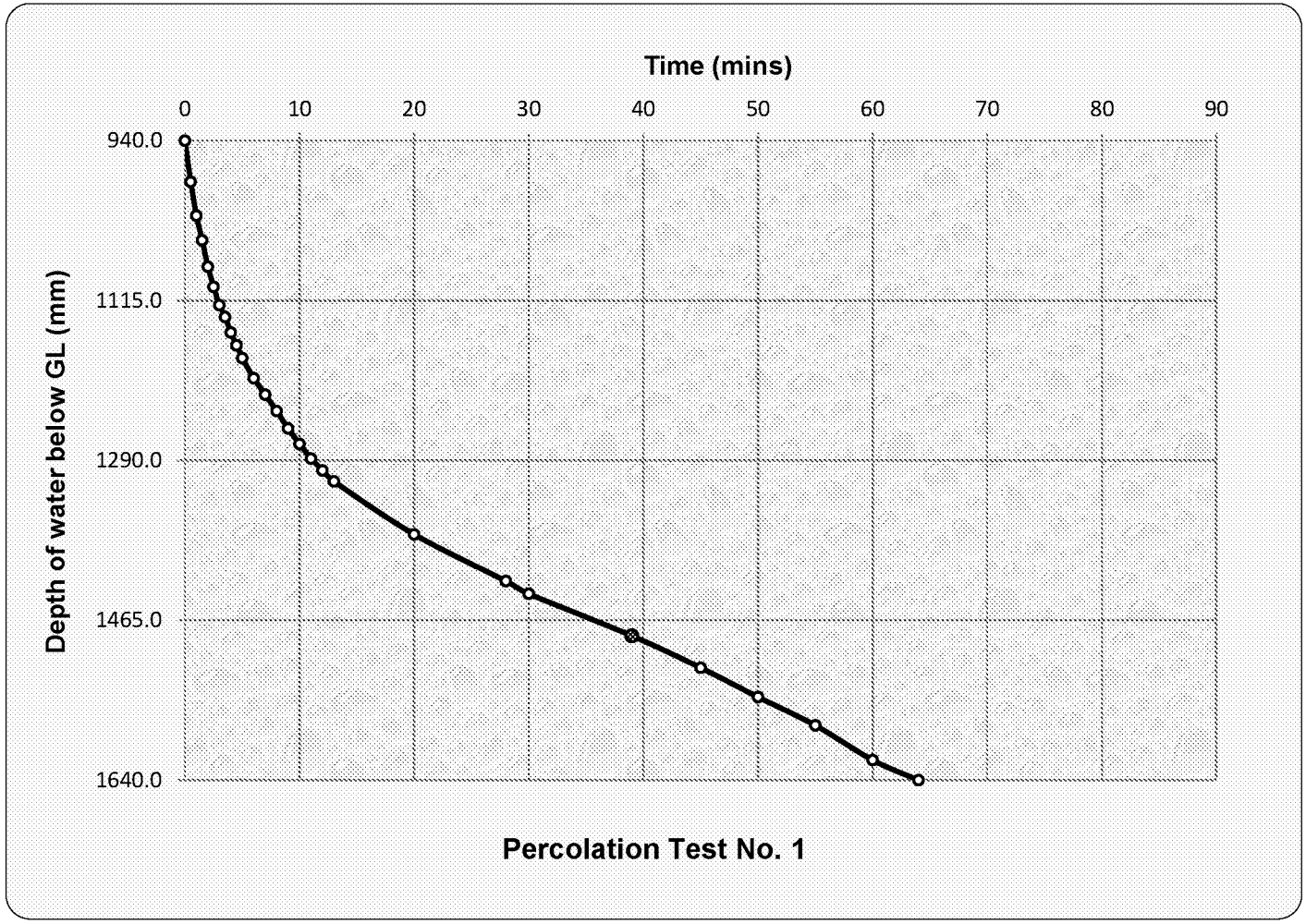
Time (mins)	Depth to Water Surface
0.0	940
0.5	985
1.0	1022
1.5	1049
2.0	1078
2.5	1100
3.0	1120
3.5	1133
4.0	1150
4.5	1164
5.0	1178
6	1200
7	1218
8	1236
9	1255
10	1272
11	1288
12	1301
13	1313
20	1371
28	1422
30	1436
39	1482
45	1517
50	1549
55	1580
60	1618
64	1640

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#1

North Paddock Area Percolation Test#1

1700mm Length x 500mm Width x 1840mm Depth



Non Reading Smoothing Points in BLUE

Soil infiltration rate: $f = \frac{0.383}{2.830 \times 33.1 \times 60} = 6.797E\text{-}05$ m/s

Soil Infiltration Rate is 6.797E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Wednesday 2nd February 2022

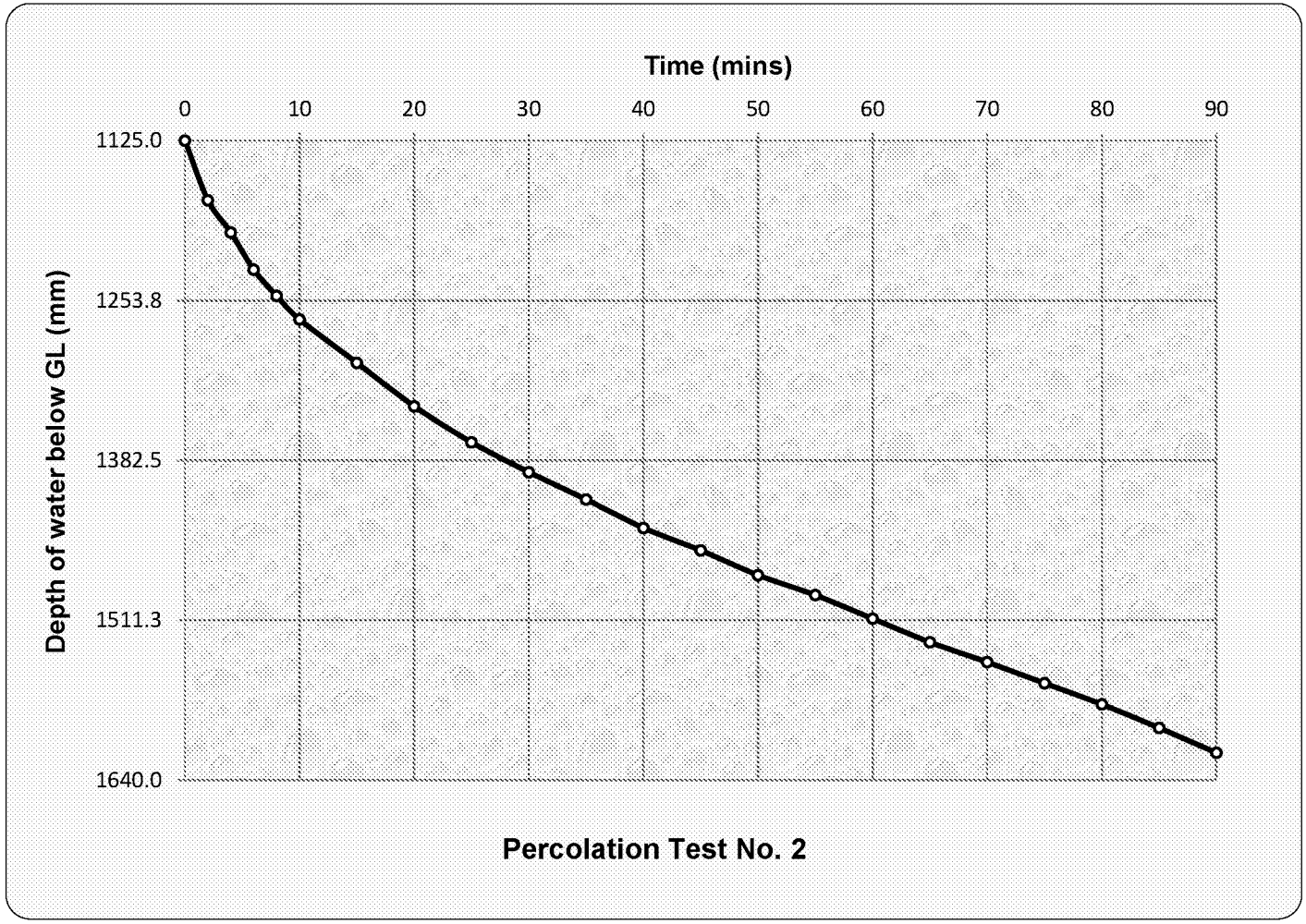
Time (mins)	Depth to Water Surface
0	1125
2	1173
4	1199
6	1229
8	1250
10	1269
15	1304
20	1339
25	1368
30	1392
35	1414
40	1437
45	1455
50	1475
55	1491
60	1510
65	1529
70	1545
75	1562
80	1579
85	1598
90	1618

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#1

North Paddock Area Percolation Test#2

1700mm Length x 500mm Width x 1840mm Depth



Soil infiltration rate: $f = \frac{0.219}{1.983 \times 52.0 \times 60} = 3.540E\text{-}05$ m/s

Soil Infiltration Rate is 3.540E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Thursday 3rd February 2022

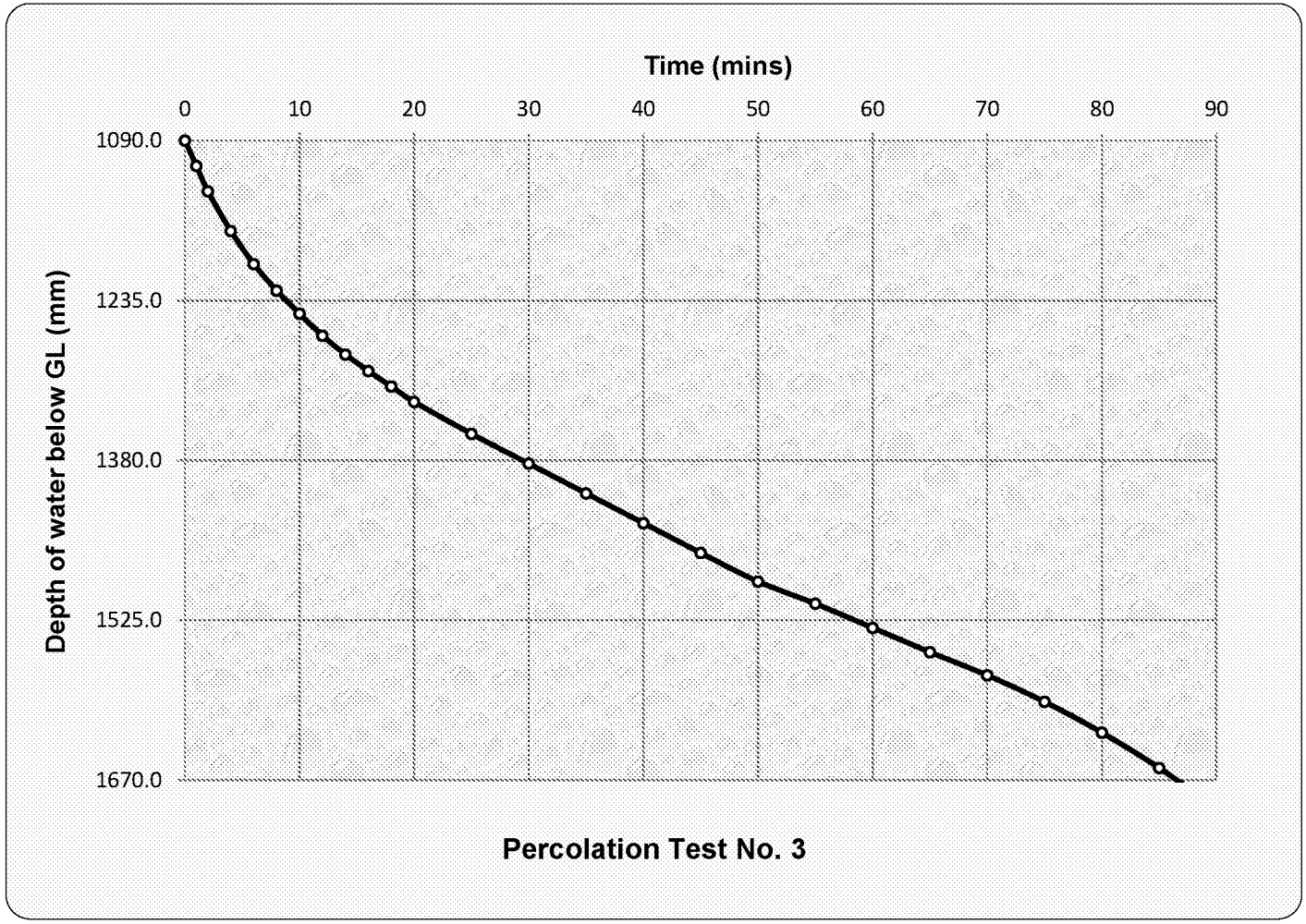
Time (mins)	Depth to Water Surface
0	1090
1	1113
2	1136
4	1172
6	1202
8	1226
10	1247
12	1267
14	1284
16	1299
18	1313
20	1327
25	1356
30	1383
35	1410
40	1437
45	1464
50	1490
55	1510
60	1532
65	1554
70	1575
75	1599
80	1627
85	1659
90	1696

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#1

North Paddock Area Percolation Test#3

1700mm Length x 500mm Width x 1840mm Depth



Soil infiltration rate: $f = \frac{0.219}{1.983 \times 49.6 \times 60} = 3.709E\text{-}05$ m/s

Soil Infiltration Rate is 3.709E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

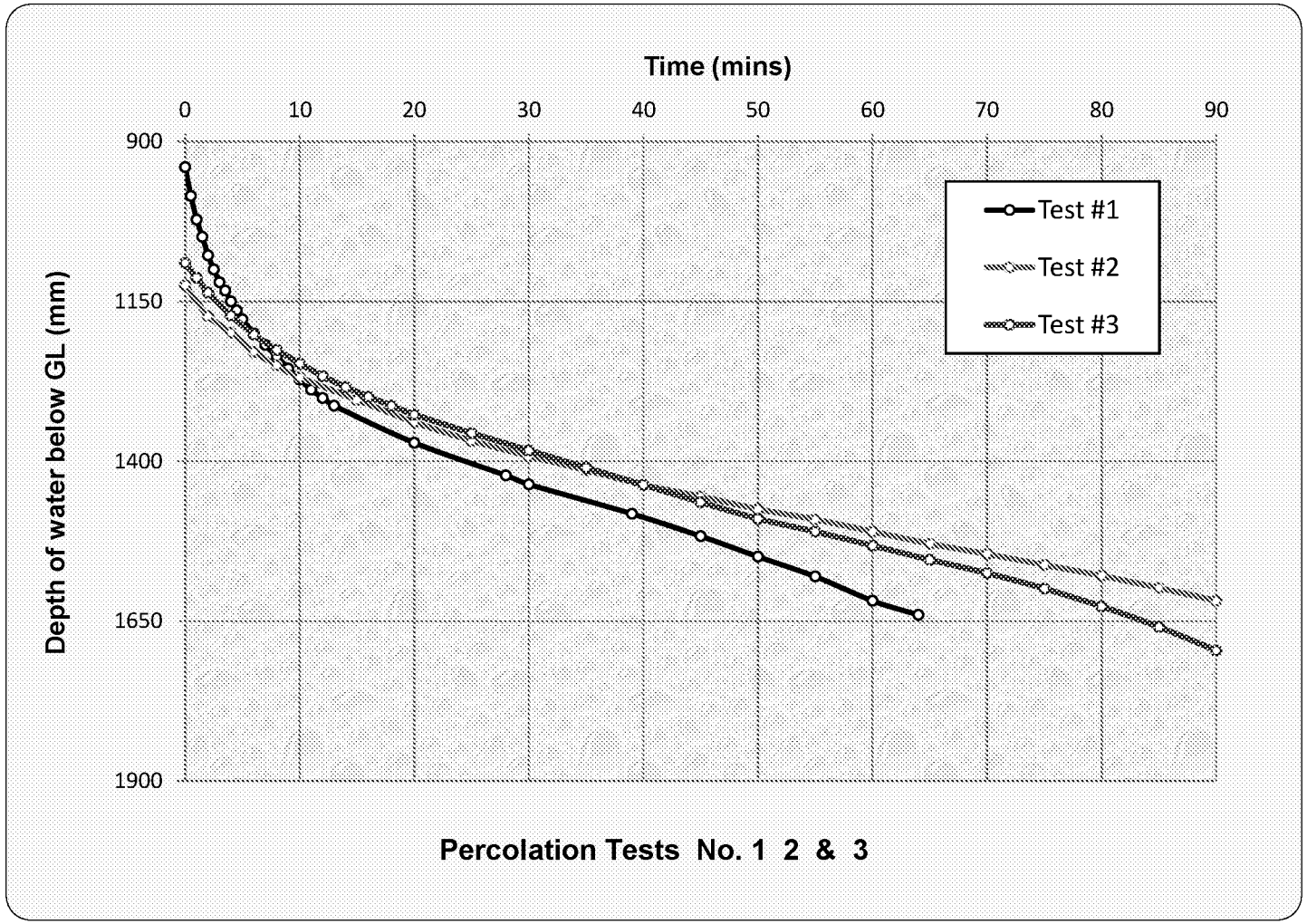
Wednesday 2nd and Thursday 3rd February 2022

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#1

North Paddock Area Percolation All 3 Tests

1700mm Length x 500mm Width x 1840mm Depth



Mate GeoTechnic Services

Monday 7th December 2015

Time (mins)	Depth to Water Surface
0	1230
1.3	1430

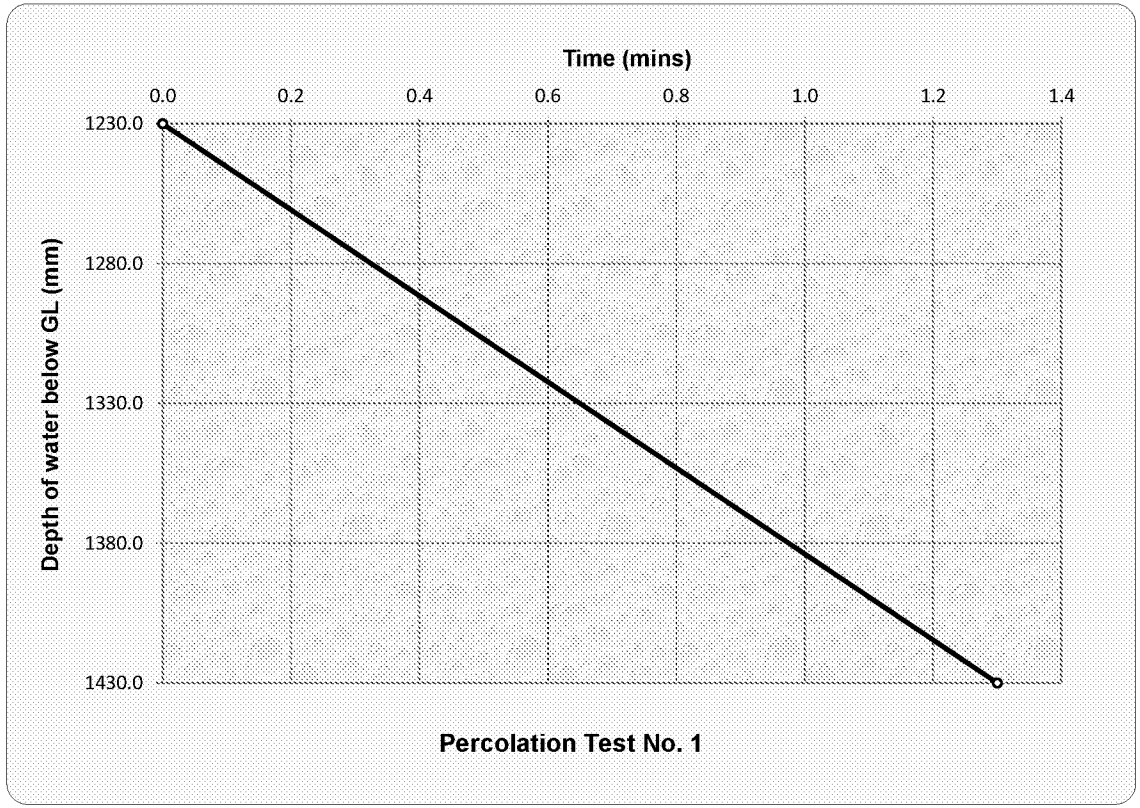
"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#2

N/E Area Adj GWP#2 -- Percolation Test#1

2000mm Length x 1200mm Width x 1430mm Depth

Ellipsoidal Tial Pit



Soil infiltration rate: $f = \frac{0.377143}{1.885714 \times 0.645 \times 60} = 5.168E\text{-}03$ m/s

Soil Infiltration Rate is 5.168E-03 metres/second

Area approximation if a >> c and b >> c

Volume of an Ellipsoid	4*PI*a*b*c	
Volume of lower half of an Ellipsoid	(4*(22/7)*a*b*c)/2	
Volume of water outflowing is	(4*(22/7)*a*b*c)/2/2	0.377143
Surface Area of an Ellipsoid	2*Pi*a*b	
Surface Area of lower half of an Ellipsoid	(2*Pi*a*b)/2	
Area of water outflow is	(2*Pi*a*b)/2	1.885714

Used 10 Containers each filled with 90 litres of water giving a total of 900 litres or 0.90 cu.metre >> effective volume outflowing of 0.450 cu.metre

Mate GeoTechnic Services

Tuesday 1st February 2022

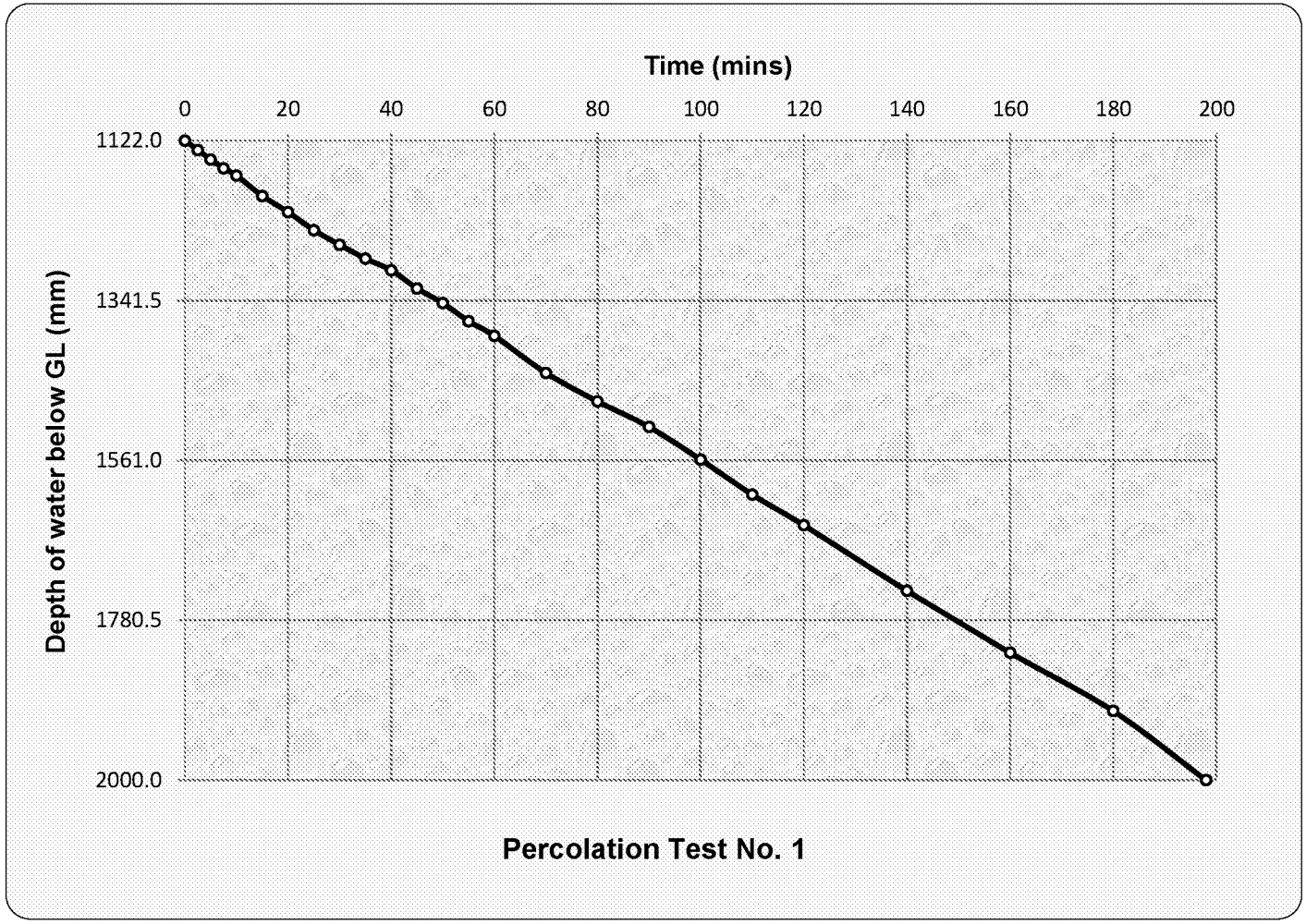
Time (mins)	Depth to Water Surface
0	1122
2.5	1135
5	1148
7.5	1160
10	1170
15	1198
20	1220
25	1245
30	1265
35	1284
40	1300
45	1325
50	1345
55	1370
60	1390
70	1441
80	1480
90	1515
100	1560
110	1608
120	1650
140	1740
160	1825
180	1905
198	2000

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#3

S/W Corner (Made-Up) Percolation Test#1

1400mm Length x 500mm Width x 2000mm Depth



Soil infiltration rate: $f = \frac{0.307}{2.368 \times 100.2 \times 60} = 2.158E\text{-}05$ m/s

Soil Infiltration Rate is 2.158E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Wednesday 2nd February 2022

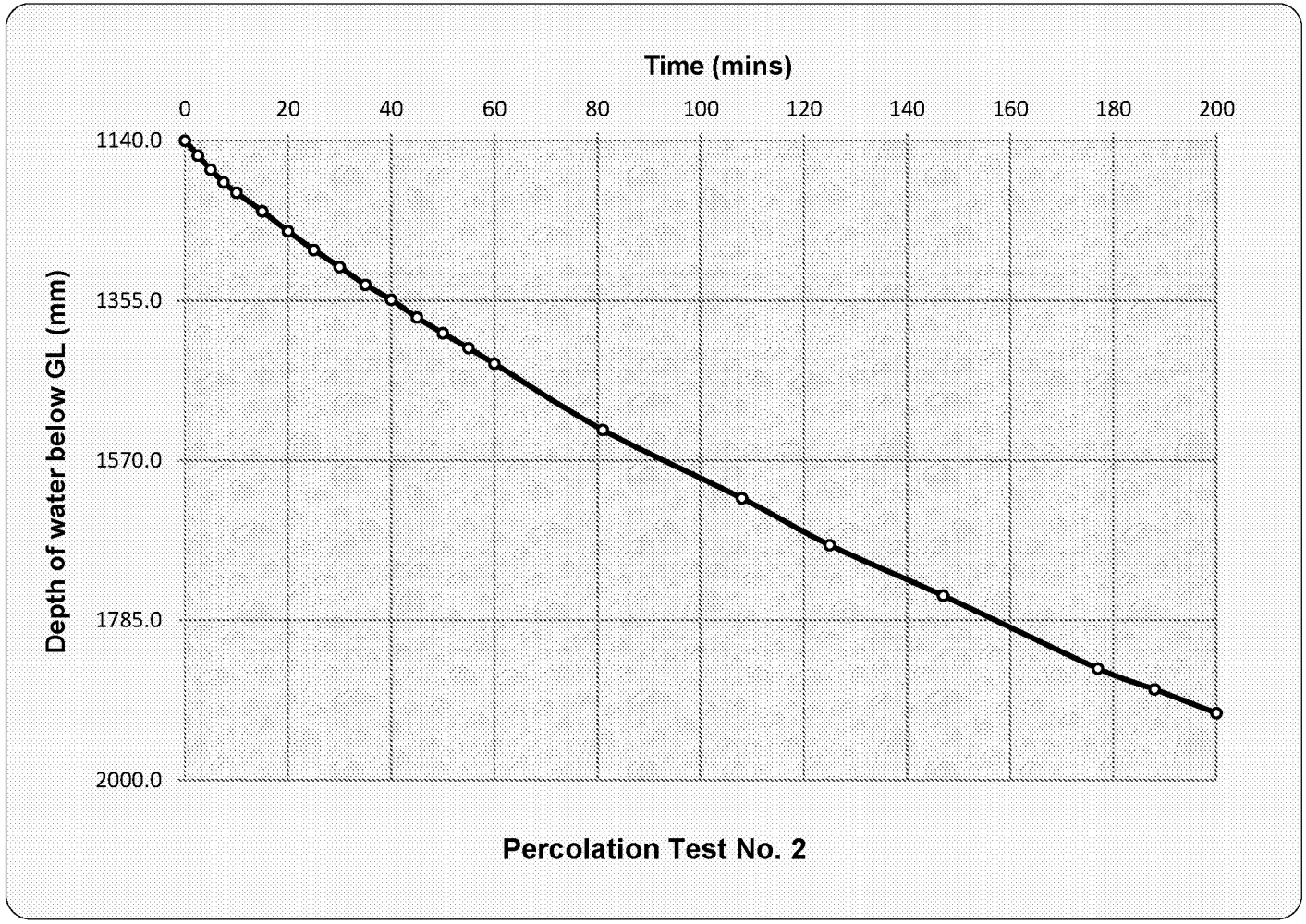
Time (mins)	Depth to Water Surface
0	1140
2.5	1160
5	1179
7.5	1196
10	1210
15	1235
20	1262
25	1287
30	1310
35	1334
40	1354
45	1378
50	1399
55	1419
60	1440
81	1529
108	1621
125	1684
147	1752
177	1850
188	1878
200	1910

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#3

S/W Corner (Made-Up) Percolation Test#2

1400mm Length x 500mm Width x 2000mm Depth



Soil infiltration rate: $f = \frac{0.301}{2.334 \times 116.9 \times 60} = 1.839E\text{-}05$ m/s

Soil Infiltration Rate is 1.839E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Thursday 3rd February 2022

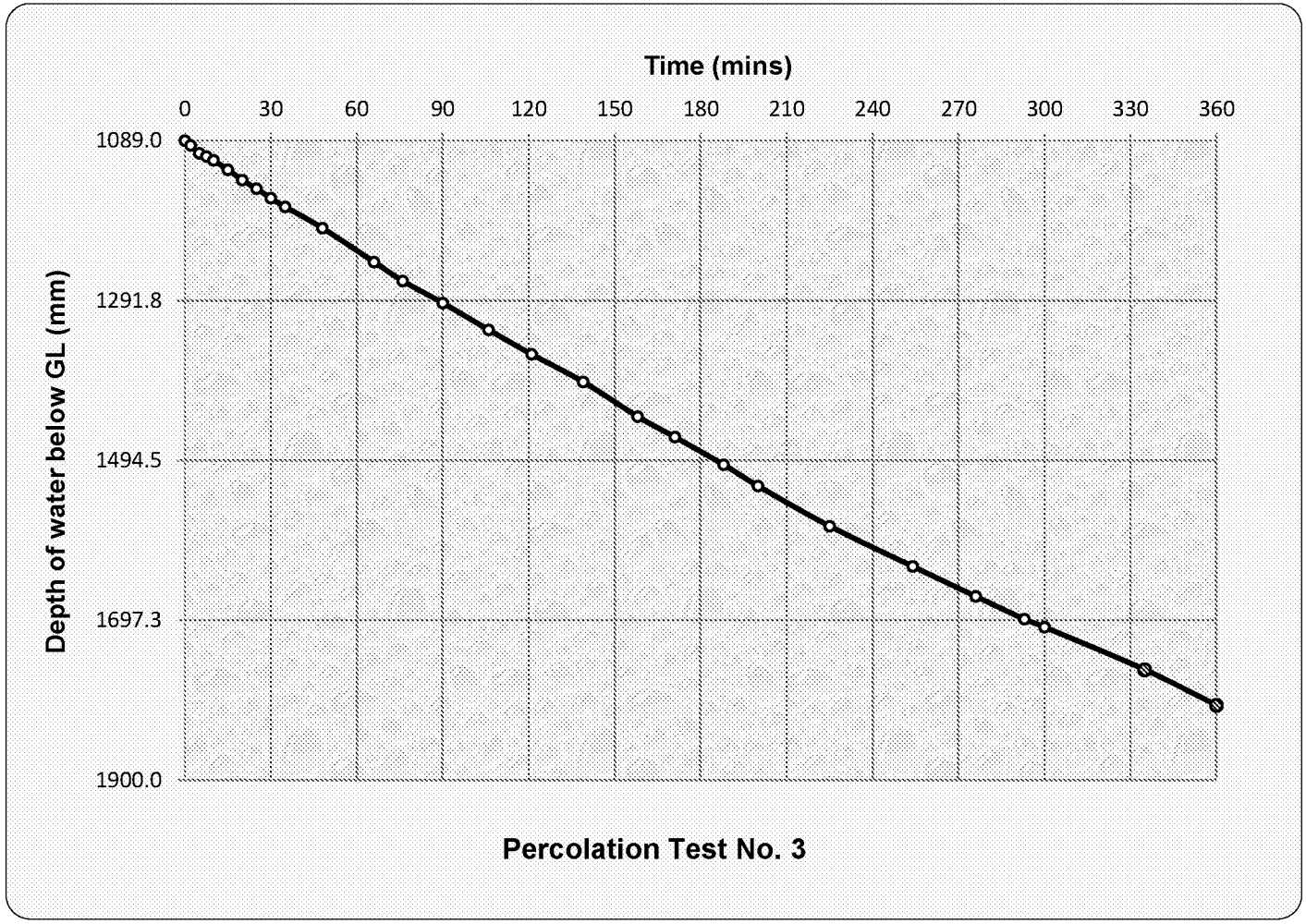
Time (mins)	Depth to Water Surface
0	1089
2	1095
5	1105
7.5	1109
10	1114
15	1126
20	1139
25	1150
30	1162
35	1173
48	1200
66	1243
76	1267
90	1295
106	1329
121	1360
139	1395
158	1439
171	1465
188	1500
200	1527
225	1578
254	1629
276	1667
293	1696
300	1706
335	1760
360	1805

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#3

S/W Corner (Made-Up) Percolation Test#3

1400mm Length x 500mm Width x 2000mm Depth



Non Reading Extrapolated Points in RED

Soil infiltration rate: $f = \frac{0.284}{2.241 \times 205.4 \times 60} = 1.028E\text{-}05$ m/s

Soil Infiltration Rate is 1.028E-05 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

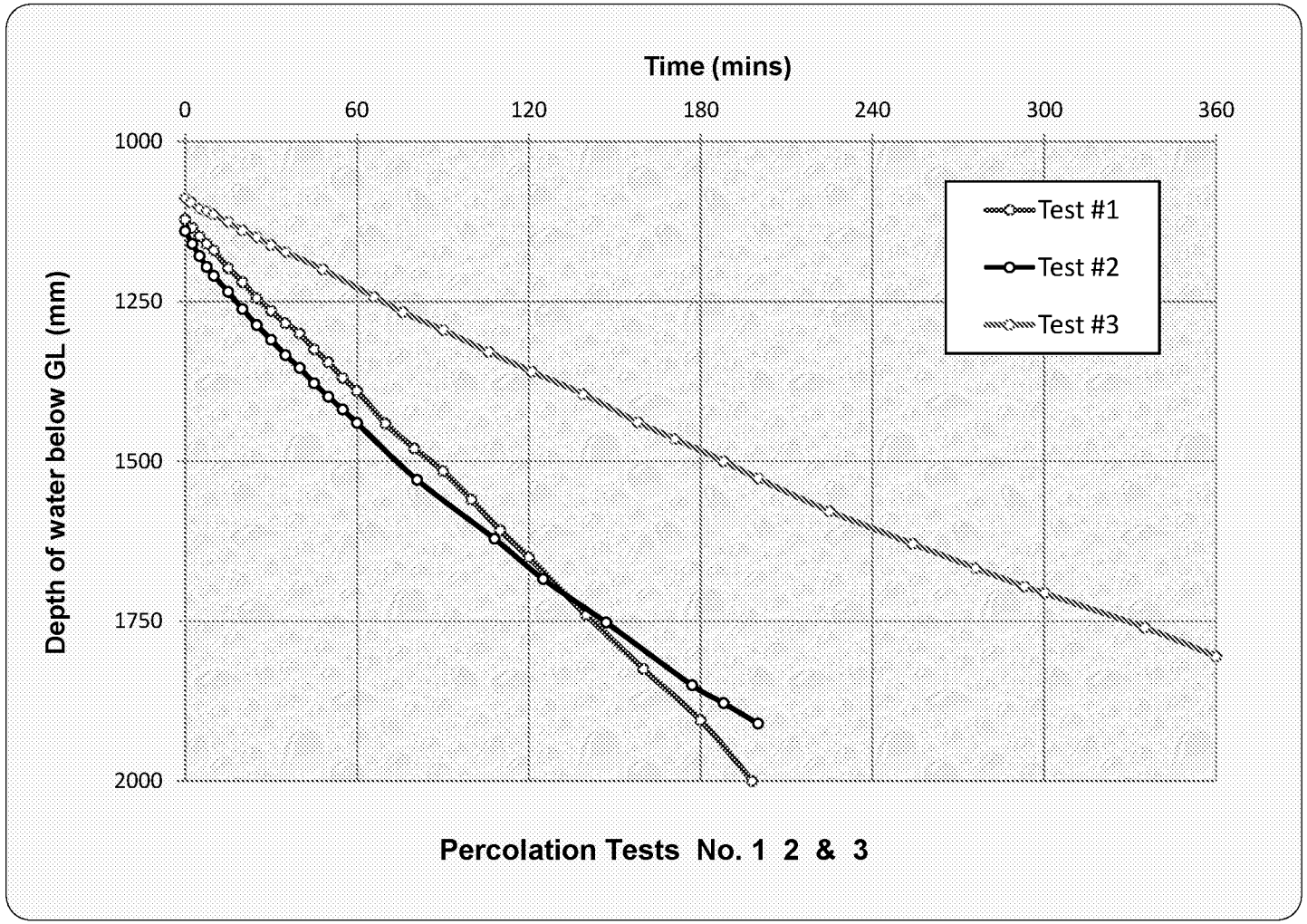
Tuesday 1st to Thursday 3rd February 2022

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#3

S/W Corner (Made-Up) Percolation All Tests

1400mm Length x 500mm Width x 2000mm Depth



Mate GeoTechnic Services

Tuesday 1st February 2022

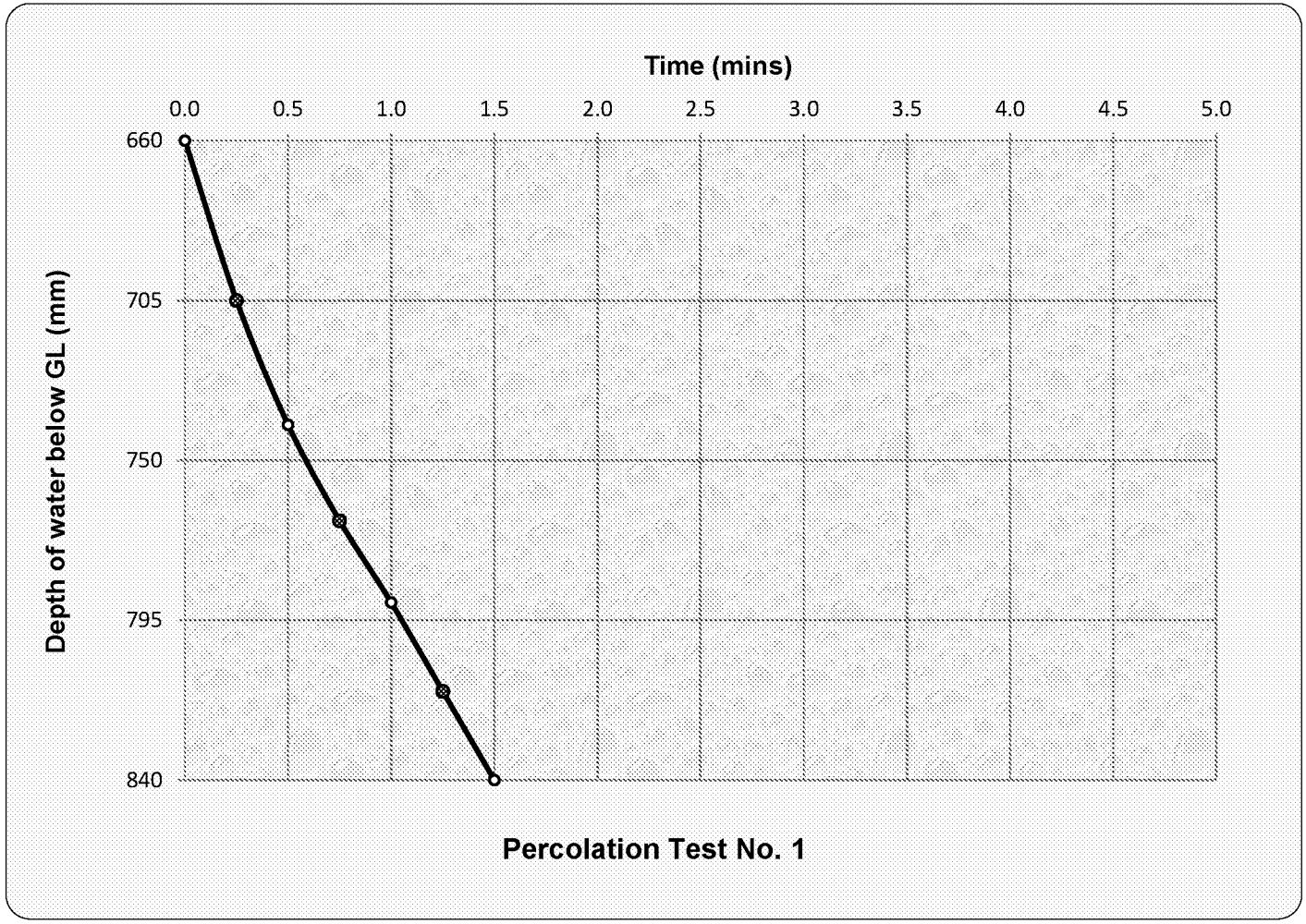
Time (mins)	Depth to Water Surface
0.00	660
0.25	705
0.50	740
0.75	767
1.00	790
1.25	815
1.50	840

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#4

Main Entrance Roadway Percolation Test#1

1800mm Length x 650mm Width x 840mm Depth



Non Reading Smoothing Points in BLUE

Soil infiltration rate: $f = \frac{0.105}{1.611 \times 0.8 \times 60} = 1.329E\text{-}03$ m/s

Soil Infiltration Rate is 1.329E-03 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Tuesday 1st February 2022

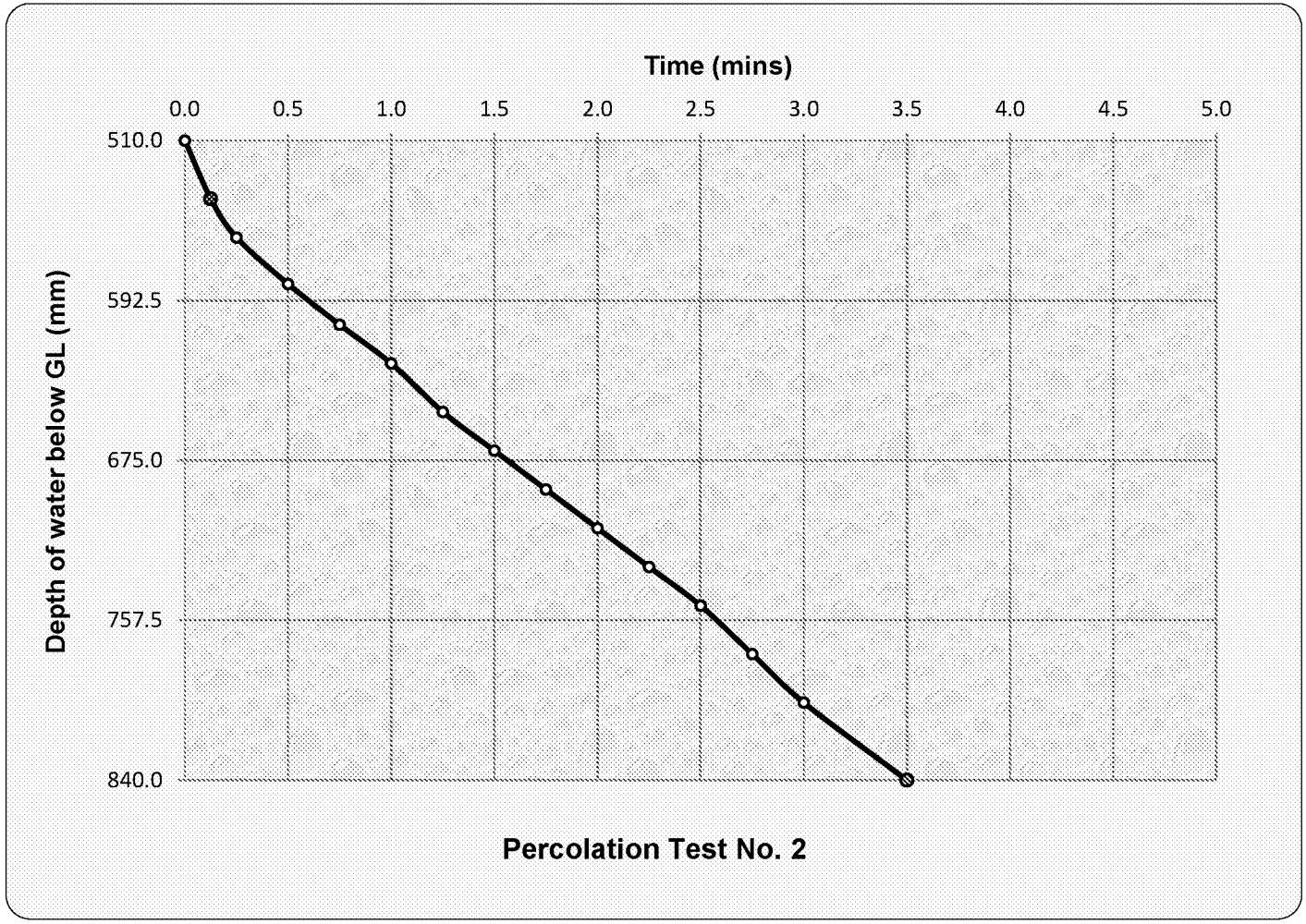
Time (mins)	Depth to Water Surface
0.00	510
0.125	540
0.25	560
0.50	584
0.75	605
1.00	625
1.25	650
1.50	670
1.75	690
2.00	710
2.25	730
2.50	750
2.75	775
3.00	800
3.50	840

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#4

Main Entrance Roadway Percolation Test#2

1800mm Length x 650mm Width x 840mm Depth



Non Reading Smoothing Points in BLUE

Non Reading Extrapolated Points in RED

Soil infiltration rate: $f = \frac{0.105}{1.611 \times 2.0 \times 60} = 5.587E\text{-}04$ m/s

Soil Infiltration Rate is
5.587E-04 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

Tuesday 1st February 2022

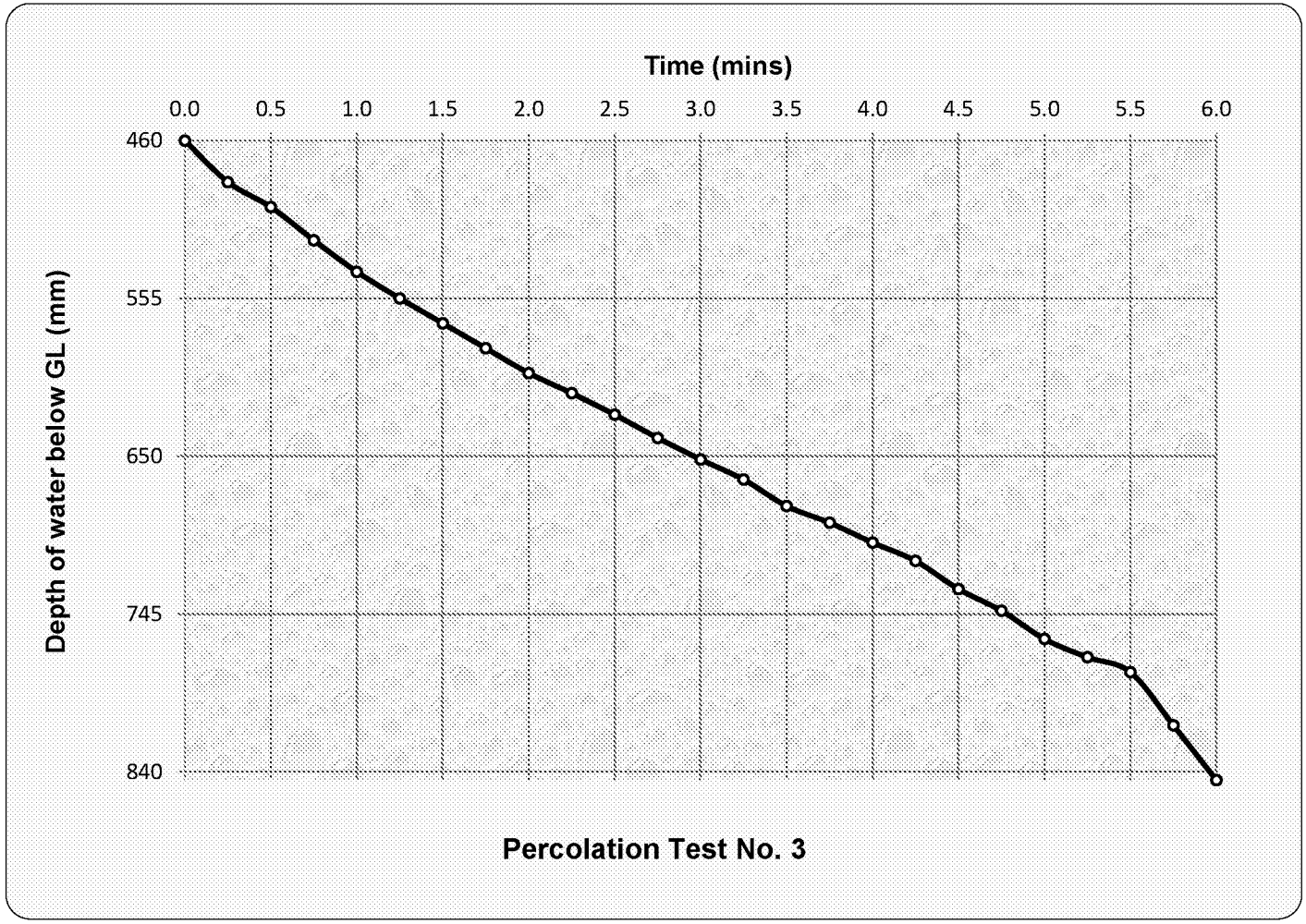
Time (mins)	Depth to Water Surface
0.00	460
0.25	485
0.50	500
0.75	520
1.00	539
1.25	555
1.50	570
1.75	585
2.00	600
2.25	612
2.50	625
2.75	639
3.00	652
3.25	664
3.50	680
3.75	690
4.00	702
4.25	713
4.50	730
4.75	743
5.00	760
5.25	771
5.50	780
5.75	812
6.00	845

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#4

Main Entrance Roadway Percolation Test#3

1800mm Length x 650mm Width x 840mm Depth



Soil infiltration rate: $f = \frac{0.105}{1.611 \times 3.6 \times 60} = 3.069E\text{-}04$ m/s

Soil Infiltration Rate is 3.069E-04 metres/second

ARUN DISTRICT COUNCIL BN/128/24/RES

Mate GeoTechnic Services

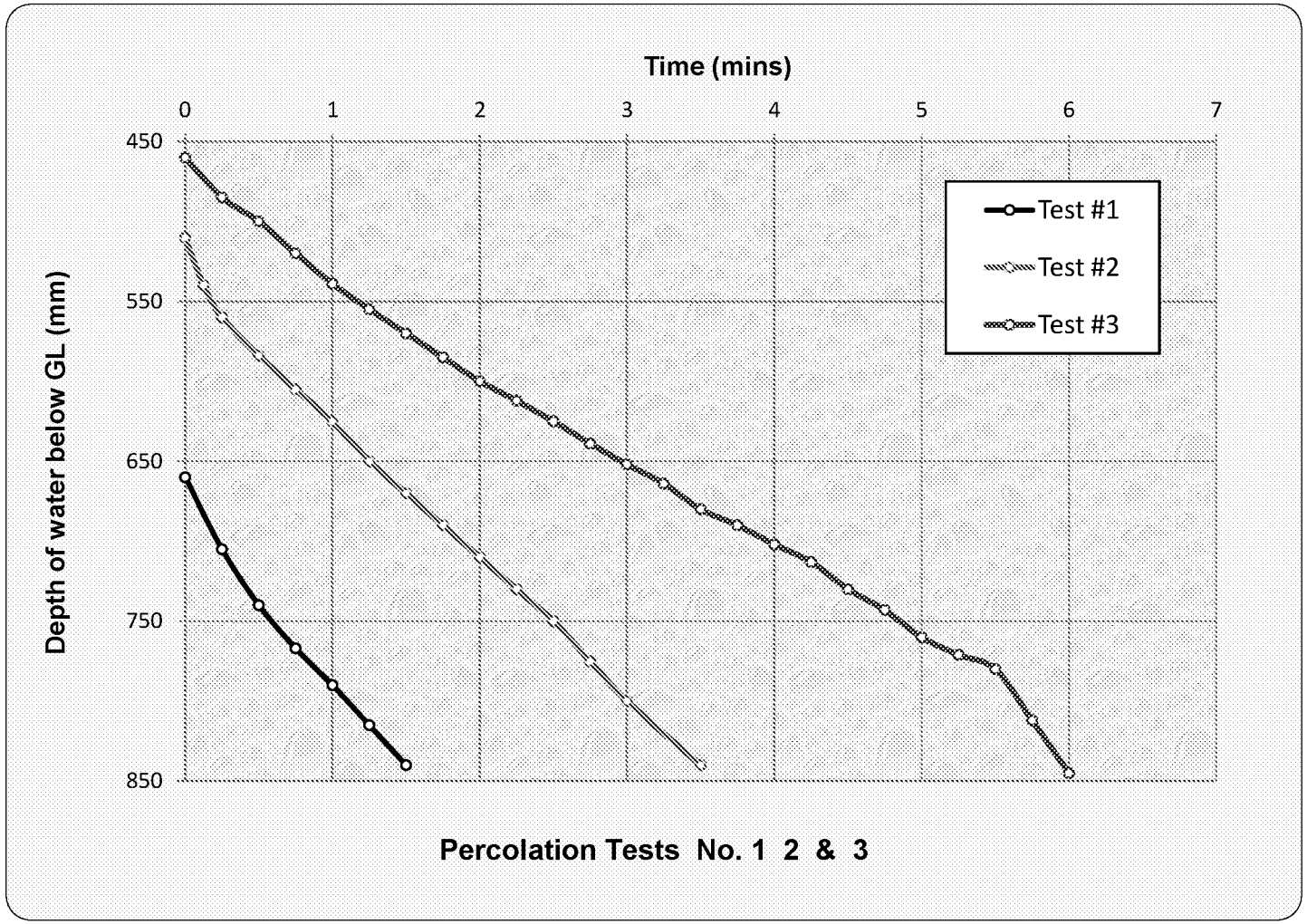
Tuesday 1st February 2022

"Eastmere Stables", Eastergate Lane, Walberton

Percolation Trial Pit TP#4

Main Entrance Roadway Percolation 3 Tests

1800mm Length x 650mm Width x 840mm Depth



mark@langridgegroup.com

From: Ray Cooper [redacted]
Sent: 05 December 2023 14:48
To: mark[redacted]
Subject: Groundwater Monitoring Winter Period 2022-2023 "Eastmere Stables" Eastergate Lane, Walberton
Attachments: GroundWater Second Development Eastmere Stables Eastergate Lane.pdf

Good afternoon Mark.

Here are the results of the second Groundwater Monitoring exercise for the winter period 2022-2023 as you requested. It should be noted that the monitoring exercise was carried out within the original 4 monitoring points, which were installed in late september 2021 for the 2021-2022 winter monitoring period. These monitoring points were left in situ in the event of any future monitoring requirement.

The pdf attachment, detailing the locations of the Groundwater Monitoring Points and the Percolation Testing Trial Pits, overlaid on a Google Earth image, with your original proposal itself overlaid onto the Google Earth image, was part of the original email.

Groundwater Monitoring

Over the monitoring period, groundwater was recorded in monitoring points GWP#1, GWP#2 & GWP#4, on only 2 occasions for a single reading each -- 21st January 2023 (highest) & 12th November 2022 (2nd highest) -- at the times of very heavy rainfall. This is consistent with groundwater monitoring exercises across other sites. These monitoring points were installed in undisturbed natural ground in late September 2021.
Only within GWP#3, which was installed in "made-up" ground consisting of brick pieces, general debris in a clay soil, was there any consistent water recorded and this is not considered, in the true sense, real groundwater levels, but rather 'run-off' from the adjacent area, pooling at the base of the installation pit and not quickly draining away at the base.
The highest recorded level in this monitoring point, GWP#3, was on 13th January 2023 & 2nd January 2023 (2nd highest), though this was not in general keeping with other peaks of groundwater levels recorded across other sites in the region.

Groundwater Monitoring Point Number	Depth of Highest Groundwater (mm BGL)	Date of Highest Groundwater Level	Groundwater Level (metres AOD)	Depth of 2nd Highest Groundwater (mm BGL)	Date of 2nd Highest Groundwater Level
	Below Ground Level	Above Ordnance Datum		Below Ground Level	Above Ordnance Datum
GWP#1	1711	21st January 2023	14.216	1748	12th November 2022
					14.179
GWP#2	1638	21st January 2023	13.730	1651	12th November 2022
					13.717
GWP#3	1429	13th January 2023	14.440	1450	2nd January 2023
					14.419
GWP#4	1765	21st January 2023	13.666	1773	12th November 2022
					13658

Percolation Testing

This is a copy of the Percolation Testing summary which was part of my original email, for your information.
The testing was carried out to BRE365 principles within Trial Pits, of sizes larger than the minimum specifications, at locations & depths pertinent to the proposed soakaway / infiltration installations.
Two trial pits were deep ~1800mm (for soakaways) and one shallow ~800mm (for permeable parking & access roads).
In each of the 3 trial pits, 3 tests were performed as per BRE365 principles, so as to obtain the minimum Soil Infiltration Rate to be used in calculations.

I have included the single test from 2015 from your previous planning application, at the location of GWP#2, as part of the overall soil investigations, as it is still relevant, since it too was carried out in a 'winter period' and nothing has changed there.

A pdf (13 pages) of the tabular and graphical Percolation Test results was attached with the original email. This includes a summary page for each Trial Pit, showing the 3 tests, for comparison.

It can be seen that the eastern side of the plot appears to have the fastest infiltrating soils, whereas the south western corner appears to be in "made-up" soils, though still giving an acceptable result, are of an indeterminate characteristic. It is considered, from investigations, that the bulk of the plot is of soils relevant to the infiltration rate obtained from Trial Pit TP#1 testing.

The results are as follows, with all results in metres / second :-

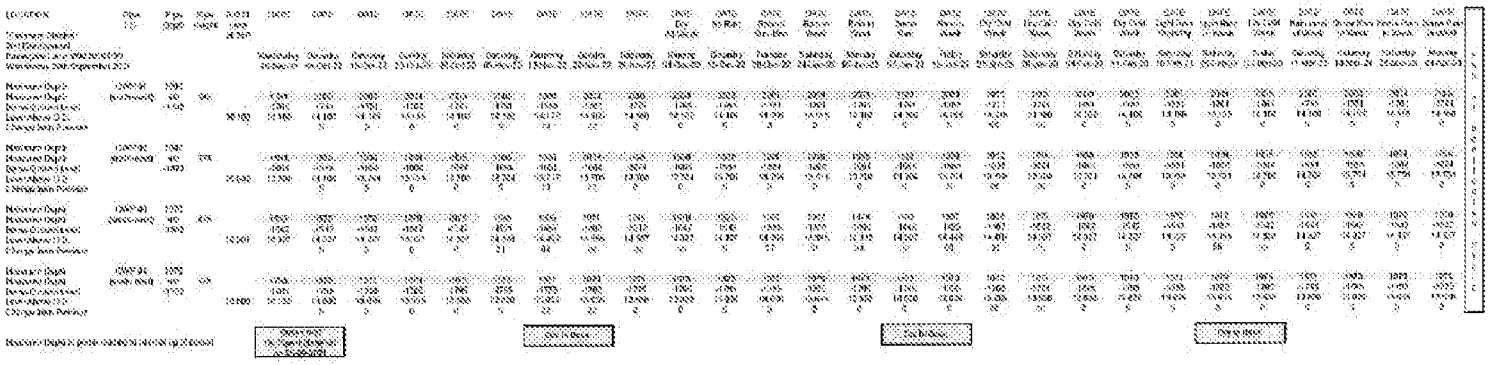
Trial Pit Number	Location	Test #1	Test#2	Test#2
TP#1	North Paddock	6.797 E-05	3.540 E-05	3.709 E-05
TP#2	N/W corner (2015)	2.040 E-03		
TP#3	S/W corner	2.158 E-05	1.839 E-05	1.028 E-05
TP#4	Entrance	1.329 E-03	5.587 E-04	3.069 E-04

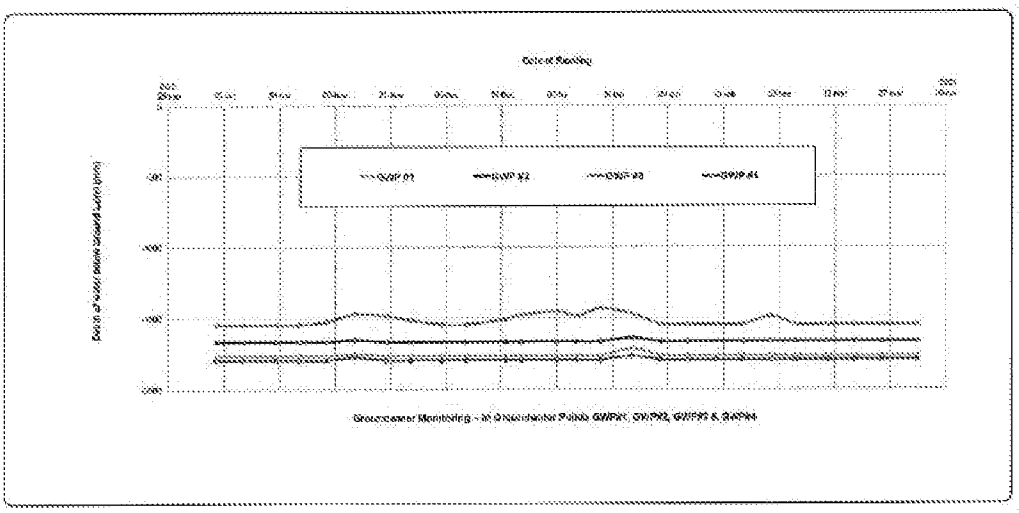
I trust that this is satisfactory and, as normal, if you have any queries then please call me on my mobile.

Regards
Ray

Mole Geotechnical Services

Groundwater Monitoring at Scope 4 Development at "Fontwell Studios" Fontwell Lane Walberton





Appendix F

Southern Water Asset Records

Tank

Ennisdale

Swallowfield

Lyncoombe

Copsefield

Croft Cottage

Pine Trees

0001

1003

1004

1001

Eastmere House

2001

3001

4001

EASTERGATE LANE

Melcroft

Southmeads

Kimberwood

Track

Ryburn Farm

Orchard Barn

0m 50m 100m 150m

(c) Crown copyright and database rights 2022 Ordnance Survey 100031673 | Date: 23/05/22 | Scale: 1:1250 | Map Centre: 495216,106068 | Data updated: 27/04/22 | Our Ref: 862012 - 1 | Wastewater Plan A3

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 determined on site. This plan is produced by Southern Water Services Ltd (c) Crown copyright and database rights 2022 Ordnance Survey 100031673 .This map is to be used for the purposes of viewing the location of Southern Water plant only. Any other uses of the map data or further copies is not permitted.

WARNING: BAC pipes are constructed of Bonded Asbestos Cement.

WARNING: Unknown (UNK) materials may include Bonded Asbestos Cement.

Foul Gravity Sewer | Combined Gravity Sewer | Culverted Water Course or Raised Sewer | Surface Water Gravity Sewer | Rising Main, Vacuum or Syphon

Combined Outlet | Surface Water Outlet | Foul Outlet | Surface Water Inlet

Combined Pumping Station | Surface Water Pumping Station | Foul Pumping Station | Water Treatment Works | Section 104 Area | Building Over Agreement Area

Foul Manhole | Combined Manhole | Surface Water Manhole | Side Entry Manhole, Desander Chamber, Flushing Manhole or Surface Water Soakaway

vholdo@motion.co.uk

eastmere

Water for Life

Southern Water.

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert
0001	F	0.00	0.00	
1001	F	15.19	13.38	
1003	F	0.00	0.00	
1004	F	0.00	0.00	
2001	F	14.94	12.84	
3001	F	14.12	12.35	
4001	F	13.73	11.93	

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Manhole Reference	Liquid Type	Cover Level	Invert Level	Depth to Invert

Appendix G

UKSuDS Greenfield Runoff Calculations

Greenfield runoff rate estimation for sites

www.uksuds.com | Greenfield runoff tool

Calculated by:	Vicki holdo
Site name:	Eastmere Stables
Site location:	Eastmere Stables

This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013) , the SuDS Manual C753 (Ciria, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Site Details

Latitude:	50.84691° N
Longitude:	0.64964° W
Reference:	3190397969
Date:	Jun 25 2024 13:47

Runoff estimation approach

IH124

Site characteristics

Total site area (ha): 1

Methodology

Q_{BAR} estimation method:	Calculate from SPR and SAAR
SPR estimation method:	Calculate from SOIL type

Soil characteristics

	Default	Edited
SOIL type:	1	1
HOST class:	N/A	N/A
SPR/SPRHOST:	0.1	0.1

Hydrological characteristics

	Default	Edited
SAAR (mm):	779	779
Hydrological region:	7	7
Growth curve factor 1 year:	0.85	0.85
Growth curve factor 30 years:	2.3	2.3
Growth curve factor 100 years:	3.19	3.19
Growth curve factor 200 years:	3.74	3.74

Notes

(1) Is Q_{BAR} < 2.0 l/s/ha?

When Q_{BAR} is < 2.0 l/s/ha then limiting discharge rates are set at 2.0 l/s/ha.

(2) Are flow rates < 5.0 l/s?

Where flow rates are less than 5.0 l/s consent for discharge is usually set at 5.0 l/s if blockage from vegetation and other materials is possible. Lower consent flow rates may be set where the blockage risk is addressed by using appropriate drainage elements.

(3) Is SPR/SPRHOST ≤ 0.3?

Where groundwater levels are low enough the use of soakaways to avoid discharge offsite would normally be preferred for disposal of surface water runoff.

Greenfield runoff rates

	Default	Edited
Q_{BAR} (l/s):	0.19	0.19
1 in 1 year (l/s):	0.16	0.16
1 in 30 years (l/s):	0.44	0.44
1 in 100 year (l/s):	0.61	0.61
1 in 200 years (l/s):	0.71	0.71

Appendix H

Environment Agency Flood Product 4 Data Set

Flood map for planning

Your reference	Location (easting/northing)	Created
<Unspecified>	**495187/106101**	**20 Aug 2024 8:51**

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

You will need to do a flood risk assessment if your site is **any of the following:**

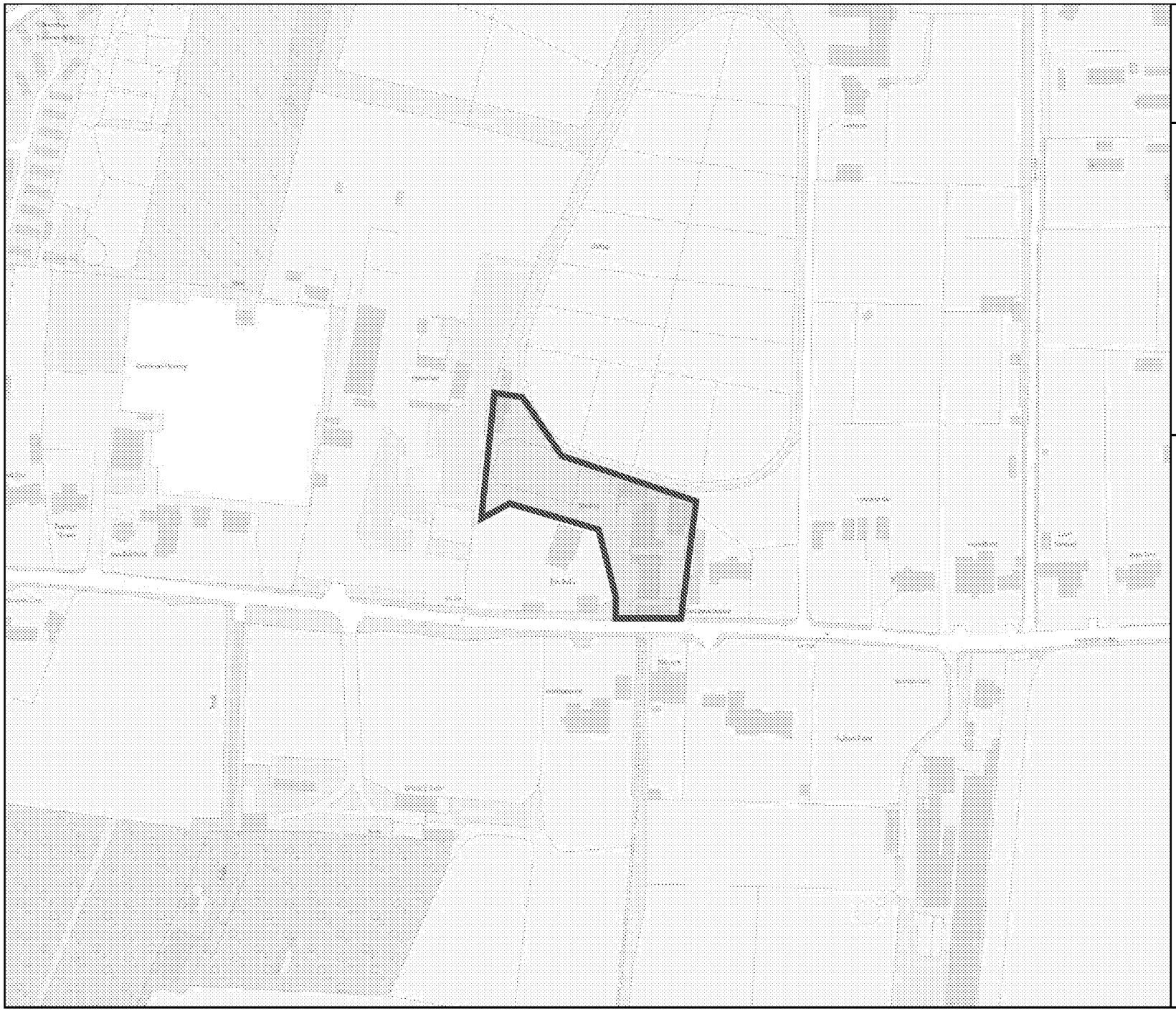
- bigger that 1 hectare (ha)
- in an area with critical drainage problems as notified by the Environment Agency
- identified as being at increased flood risk in future by the local authority's strategic flood risk assessment
- at risk from other sources of flooding (such as surface water or reservoirs) and its development would increase the vulnerability of its use (such as constructing an office on an undeveloped site or converting a shop to a dwelling)

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.

ARUN DISTRICT COUNCIL BN/128/24/RES



Environment Agency

Flood map for planning

Your reference
<Unspecified>

Location (easting/northing)
495187/106101

Scale
1:2500

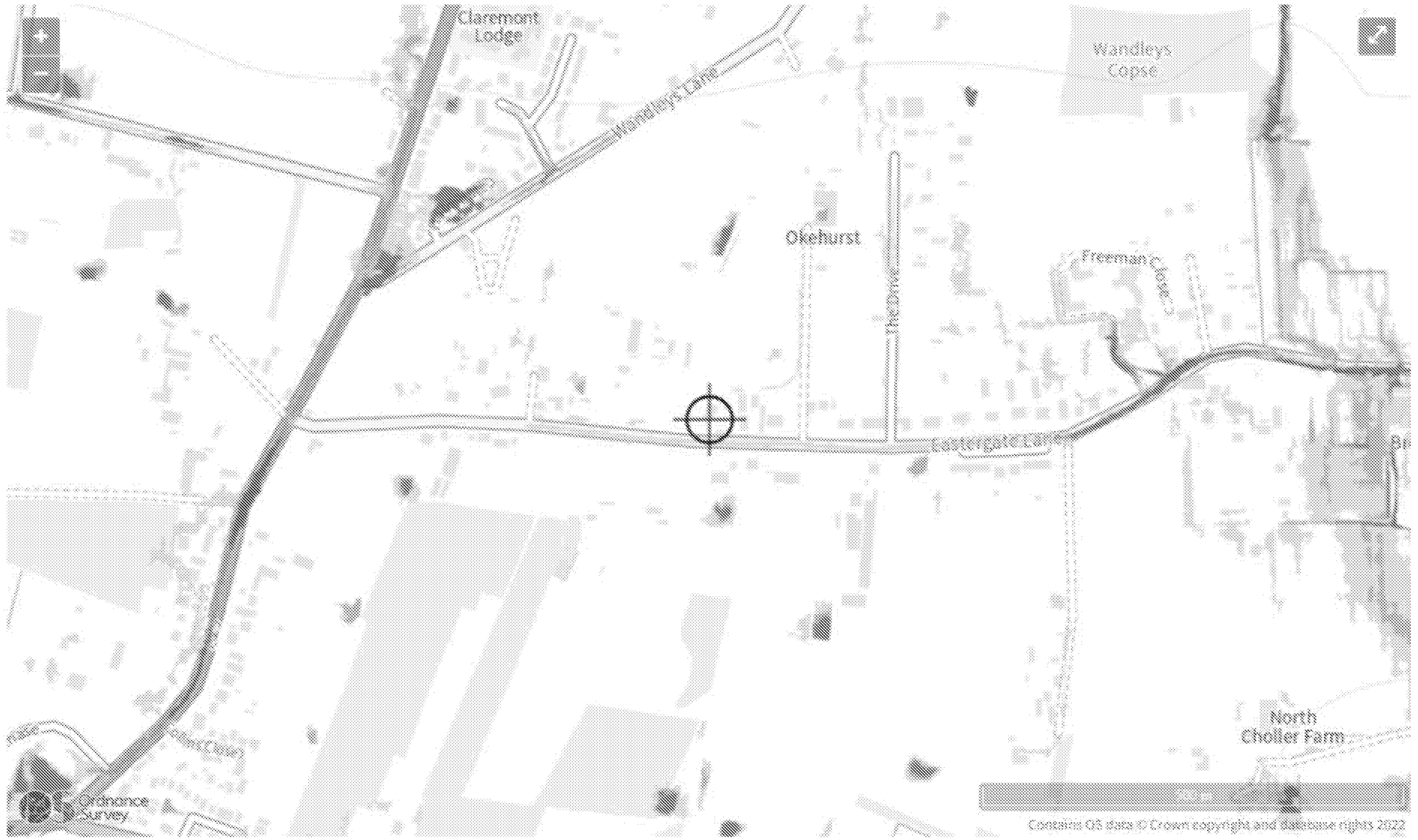
Created
20 Aug 2024 8:51

- Selected area
- Flood zone 3
- Flood zone 2
- Flood zone 1
- Flood defence
- Main river
- Water storage area

0 20 40 60m

Appendix I

Environment Agency Risk of Flooding from Surface Water (RoFSW) map



Extent of flooding from surface water

High Medium Low Very low Location you selected

Appendix J

Impermeable Area Plan

north

0 5 10 15 20m

SCALE IN METRES
1:250

Notes

1. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
2. This drawing has been based upon survey information supplied by Medlams-Surveys and Motion cannot guarantee the accuracy of the data provided.

Legend

	Construction phase boundary	
	Impermeable Area	= 2950.0 m²
	Permeable Area	= 4367 m²

Rev.	Description	Drn	Chk	App	Date
P01	First Issue	ST	VBH	NK	NYI

Drawing Status:

DRAFT
NOT FOR CONSTRUCTION

motion
Guildford - Reading - London
www.motion.co.uk

Client:
NJS Partnerships

Project:
Eastmere Stables

Title:
Impermeable Area Plan

Scale: 1:250 (@ A1)

Drawing: 2406066-0502

Revision: P01

C:\Users\sujanitaja\Motion\Staff\Site - triples 2406066\Drawings\2406066-0502 [Impermeable Area Plan].dwg

Appendix K

Proposed Drainage Strategy

north

dale

16.250

6
(2000ft²)
FFL 16.300
Double Garage

FFL 16.150
Double Garage

FFL 16.000
15.885

5
(1850ft²)
FFL 15.850

15.680

16.060

Double Garage
FFL 16.000

17.765

7
(2000ft²)
FFL 16.000

8
(1850ft²)
FFL 15.850

FFL 15.700
Double Garage

15.915

15.500

FFL 15.550
Car Port

9
(1350ft²)
FFL 15.400

15.500

4
(1850ft²)
FFL 15.550

FFL 15.400
Double Garage

15.500

15.300

FFL 15.550
3
(1800ft²)

FFL 15.400
Single Garage

Single Garage
FFL 15.400

FFL 15.550
2
(1600ft²)

15.400

FFL 15.550
1
(1350ft²)

15.405

15.345

Car Port
FFL 15.400

The Oaks

15.2m

Eastergate Lane

Eastmere House

0 5 10 15 20m
SCALE IN METRES
1:250

Brett Alpha Flow Permeable Paving System (or Similar)

6mm Aggregate bedding course

AC32 Asphalt Base

Prior to laying the permeable concrete paving units and laying course AC32 base to be cored with 75mm diameter holes on a 750mm orthogonal grid. The holes are to be filled with laying course aggregate.

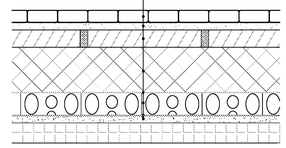
Type 4 Sub-Base with min. 30% voids content

Polypipe permatex 300 Fleece

Thick Polypipe Permavoid Modular Sub-Base Replacement and Infiltration System

Polypipe permatex 300 Fleece

Bedding Layer



HYBRID PERMEABLE CARRIAGEWAY DETAIL

Notes

1. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
2. This drawing has been based upon survey information supplied by Medlams-Surveys and Motion cannot guarantee the accuracy of the data provided.

Legend

- Site Boundary
- New Surface Water Gravity Pipe
- New Surface Lateral Connection
- New Permeable Paving
- New Impermeable Area For Services
- New SW Inspection Chamber
- New Surface Water Catchpit/ Silt Trap
- New Rainwater Diffuser
- Rain Water Pipe Down Pipe

Rev.	Description	Drn	Chk	App	Date
P01	First Issue	ST	VBH	JM	11/09/2024

Drawing Status:

DRAFT
NOT FOR CONSTRUCTION

motion
Guildford - Reading - London
www.motion.co.uk

Client:
NJS Partnerships

Project:
Eastmere Stables

Title:
Surface Water Drainage Strategy

Scale: 1:250 (@ A1)

Drawing: 2406066-0500

Revision: P01

C:\Users\sophiab\Motion\Staff\Site - Triplex 2406066\Drawings\2406066-0500 [Surface Water Drainage Strategy].dwg

Appendix L

MicroDrainage Calculations

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0
Ratio R	0.324	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	6.148	0.047	130.8	0.159	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	4.646	0.043	108.1	0.136	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	141.65	5.07	14.[illegible]	0.159	0.0	0.0	0.0	1.37	97.1	61.1
1.001	141.23	5.12	14.378	0.295	0.0	0.0	0.0	1.74	192.5	113.0

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1.000	15.300	0.800	Open Manhole	1200	1.000	14.500	300				
1.001	15.300	0.922	Open Manhole	1350	1.001	14.378	375	1.000	14.453	300	
	15.300	0.965	Open Manhole	0		OUTFALL		1.001	14.335	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1.000	9.128	8.120	9.128	8.120	Required	
1.001	8.708	1.986	8.708	1.986	Required	
	8.808	-2.659			No Entry	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	User	-	100	0.023	0.023	0.023
	User	-	100	0.026	0.026	0.050
	User	-	100	0.006	0.006	0.056
	User	-	100	0.008	0.008	0.064
	User	-	100	0.022	0.022	0.085
	User	-	100	0.008	0.008	0.093
	User	-	100	0.009	0.009	0.102
	User	-	100	0.012	0.012	0.114
	User	-	100	0.012	0.012	0.126
	User	-	100	0.026	0.026	0.152
	User	-	100	0.005	0.005	0.157
	User	-	100	0.001	0.001	0.157
	User	-	100	0.002	0.002	0.159
1.001	User	-	100	0.077	0.077	0.077
	User	-	100	0.021	0.021	0.098
	User	-	100	0.007	0.007	0.105
	User	-	100	0.009	0.009	0.115
	User	-	100	0.010	0.010	0.125
	User	-	100	0.011	0.011	0.136
				Total	Total	Total
				0.295	0.295	0.295

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		15.300	14.335	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.350		

Online Controls for Storm

Pump Manhole: 1.001, DS/PN: 1.001, Volume (m³): 1.7

Invert Level (m) 14.453

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	0.0000	1.400	0.0000	2.600	0.0000	3.800	0.0000	5.000	0.0000
0.400	0.0000	1.600	0.0000	2.800	0.0000	4.000	0.0000	5.200	0.0000
0.600	0.0000	1.800	0.0000	3.000	0.0000	4.200	0.0000	5.400	0.0000
0.800	0.0000	2.000	0.0000	3.200	0.0000	4.400	0.0000	5.600	0.0000
1.000	0.0000	2.200	0.0000	3.400	0.0000	4.600	0.0000	5.800	0.0000
1.200	0.0000	2.400	0.0000	3.600	0.0000	4.800	0.0000	6.000	0.0000

Storage Structures for Storm

Complex Manhole: 1.000, DS/PN: 1.000

Cellular Storage

Invert Level (m) 14.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03701 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	730.0	730.0	0.300	730.0	762.4	0.301	0.0	762.5

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	73.0
Max Percolation (l/s)	202.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	14.900	Cap Volume Depth (m)	0.300

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Summer	1	+0%	30/240 Summer				14.647	-0.153
1.001	1.001	15 Summer	1	+0%	1/15 Summer				14.761	0.008

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		200	0.0	OK	
1.001	1.001	0.000	0.00			0.0	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Summer	30	+40%	30/240 Summer				14.820	0.020
1.001	1.001	15 Summer	30	+40%	1/15 Summer				14.924	0.171

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		427	0.0	SURCHARGED	
1.001	1.001	0.000	0.00			0.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Winter	100	+45%	30/240 Summer				15.043	0.243
1.001	1.001	15 Summer	100	+45%	1/15 Summer				15.130	0.377

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		559	0.0	FLOOD RISK	
1.001	1.001	0.000	0.00			0.0	FLOOD RISK	

STORM SEWER DESIGN by the Modified Rational Method

Design Criteria for Storm

Pipe Sizes STANDARD Manhole Sizes STANDARD

FSR Rainfall Model - England and Wales

Return Period (years)	100	PIMP (%)	100
M5-60 (mm)	19.600	Add Flow / Climate Change (%)	0
Ratio R	0.324	Minimum Backdrop Height (m)	0.000
Maximum Rainfall (mm/hr)	150	Maximum Backdrop Height (m)	20.000
Maximum Time of Concentration (mins)	30	Min Design Depth for Optimisation (m)	0.500
Foul Sewage (l/s/ha)	0.000	Min Vel for Auto Design only (m/s)	1.00
Volumetric Runoff Coeff.	0.750	Min Slope for Optimisation (1:X)	500

Designed with Level Soffits

Network Design Table for Storm

PN	Length (m)	Fall (m)	Slope (1:X)	I.Area (ha)	T.E. (mins)	Base Flow (l/s)	k (mm)	HYD SECT	DIA (mm)	Section Type	Auto Design
1.000	6.148	0.047	130.8	0.175	5.00	0.0	0.600	o	300	Pipe/Conduit	
1.001	4.646	0.043	108.0	0.150	0.00	0.0	0.600	o	375	Pipe/Conduit	

Network Results Table

PN	Rain (mm/hr)	T.C. (mins)	US/IL (m)	Σ I.Area (ha)	Σ Base Flow (l/s)	Foul (l/s)	Add Flow (l/s)	Vel (m/s)	Cap (l/s)	Flow (l/s)
1.000	141.65	5.07	14.500	0.175	0.0	0.0	0.0	1.37	97.1	67.1
1.001	141.23	5.12	14.378	0.325	0.0	0.0	0.0	1.74	192.5	124.3

Manhole Schedules for Storm

MH Name	MH CL (m)	MH Depth (m)	MH Connection	MH Diam.,L*W (mm)	Pipe Out PN	Pipe Out Invert Level (m)	Pipe Out Diameter (mm)	Pipes In PN	Pipes In Invert Level (m)	Pipes In Diameter (mm)	Backdrop (mm)
1.000	15.300	0.800	Open Manhole	1200	1.000	14.500	300				
1.001	15.300	0.922	Open Manhole	1350	1.001	14.378	375	1.000	14.453	300	
	15.300	0.965	Open Manhole	0		OUTFALL		1.001	14.335	375	

MH Name	Manhole Easting (m)	Manhole Northing (m)	Intersection Easting (m)	Intersection Northing (m)	Manhole Access	Layout (North)
1.000	9.128	8.120	9.128	8.120	Required	
1.001	8.708	1.986	8.708	1.986	Required	
	8.808	-2.659			No Entry	

Area Summary for Storm

Pipe Number	PIMP Type	PIMP Name	PIMP (%)	Gross Area (ha)	Imp. Area (ha)	Pipe Total (ha)
1.000	-	-	100	0.175	0.175	0.175
1.001	-	-	100	0.150	0.150	0.150
				Total	Total	Total
				0.325	0.325	0.325

Free Flowing Outfall Details for Storm

Outfall Pipe Number	Outfall Name	C. Level (m)	I. Level (m)	Min I. Level (m)	D,L (mm)	W (mm)
1.001		15.300	14.335	0.000	0	0

Simulation Criteria for Storm

Volumetric Runoff Coeff	0.750	Additional Flow - % of Total Flow	0.000
Areal Reduction Factor	1.000	MADD Factor * 10m³/ha Storage	2.000
Hot Start (mins)	0	Inlet Coeffiecient	0.800
Hot Start Level (mm)	0	Flow per Person per Day (l/per/day)	0.000
Manhole Headloss Coeff (Global)	0.500	Run Time (mins)	60
Foul Sewage per hectare (l/s)	0.000	Output Interval (mins)	1

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FSR	Profile Type	Summer
Return Period (years)	100	Cv (Summer)	0.750
Region	England and Wales	Cv (Winter)	0.840
M5-60 (mm)	20.000	Storm Duration (mins)	30
Ratio R	0.350		

Online Controls for Storm

Pump Manhole: 1.001, DS/PN: 1.001, Volume (m³): 1.7

Invert Level (m) 14.453

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.200	0.0000	1.400	0.0000	2.600	0.0000	3.800	0.0000	5.000	0.0000
0.400	0.0000	1.600	0.0000	2.800	0.0000	4.000	0.0000	5.200	0.0000
0.600	0.0000	1.800	0.0000	3.000	0.0000	4.200	0.0000	5.400	0.0000
0.800	0.0000	2.000	0.0000	3.200	0.0000	4.400	0.0000	5.600	0.0000
1.000	0.0000	2.200	0.0000	3.400	0.0000	4.600	0.0000	5.800	0.0000
1.200	0.0000	2.400	0.0000	3.600	0.0000	4.800	0.0000	6.000	0.0000

Storage Structures for Storm

Complex Manhole: 1.000, DS/PN: 1.000

Cellular Storage

Invert Level (m) 14.600 Safety Factor 2.0
Infiltration Coefficient Base (m/hr) 0.03701 Porosity 0.95
Infiltration Coefficient Side (m/hr) 0.00000

Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)	Depth (m)	Area (m²)	Inf. Area (m²)
0.000	730.0	730.0	0.300	730.0	762.4	0.301	0.0	762.5

Porous Car Park

Infiltration Coefficient Base (m/hr)	0.00000	Width (m)	10.0
Membrane Percolation (mm/hr)	1000	Length (m)	73.0
Max Percolation (l/s)	202.8	Slope (1:X)	0.0
Safety Factor	2.0	Depression Storage (mm)	5
Porosity	0.30	Evaporation (mm/day)	3
Invert Level (m)	14.900	Cap Volume Depth (m)	0.300

1 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Summer	1	+0%	30/120 Summer				14.652	-0.148
1.001	1.001	15 Summer	1	+0%	1/15 Summer				14.775	0.022

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		199	0.0	OK	
1.001	1.001	0.000	0.00			0.0	SURCHARGED	

30 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Summer	30	+40%	30/120 Summer				14.849	0.049
1.001	1.001	15 Summer	30	+40%	1/15 Summer				14.953	0.200

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		460	0.0	SURCHARGED	
1.001	1.001	0.000	0.00			0.0	SURCHARGED	

100 year Return Period Summary of Critical Results by Maximum Level (Rank 1) for Storm

Simulation Criteria

Areal Reduction Factor	1.000	Additional Flow - % of Total Flow	0.000
Hot Start (mins)	0	MADD Factor * 10m³/ha Storage	2.000
Hot Start Level (mm)	0	Inlet Coeffiecient	0.800
Manhole Headloss Coeff (Global)	0.500	Flow per Person per Day (l/per/day)	0.000
Foul Sewage per hectare (l/s)	0.000		

Number of Input Hydrographs 0 Number of Offline Controls 0 Number of Time/Area Diagrams 0
Number of Online Controls 1 Number of Storage Structures 1 Number of Real Time Controls 0

Synthetic Rainfall Details

Rainfall Model	FEH	D3 (1km)	0.401
FEH Rainfall Version	1999	E (1km)	0.308
Site Location	GB 495800 105700 SU 95800 05700	F (1km)	2.338
C (1km)	-0.025	Cv (Summer)	1.000
D1 (1km)	0.404	Cv (Winter)	1.000
D2 (1km)	0.250		

Margin for Flood Risk Warning (mm)	300.0
Analysis Timestep	2.5 Second Increment (Extended)
DTS Status	OFF
DVD Status	ON
Inertia Status	ON

Profile(s)	Summer and Winter
Duration(s) (mins)	15, 30, 60, 120, 240, 360, 480, 960, 1440
Return Period(s) (years)	1, 30, 100
Climate Change (%)	0, 40, 45

PN	US/MH Name	Storm	Return Period	Climate Change	First (X) Surcharge	First (Y) Flood	First (Z) Overflow	Overflow Act.	Water Level (m)	Surcharged Depth (m)
1.000	1.000	480 Winter	100	+45%	30/120 Summer				15.178	0.378
1.001	1.001	15 Summer	100	+45%	1/15 Summer				15.202	0.449

PN	US/MH Name	Flooded Volume (m³)	Flow / Cap.	Overflow (l/s)	Half Drain Time (mins)	Pipe Flow (l/s)	Status	Level Exceeded
1.000	1.000	0.000	0.00		630	0.0	FLOOD RISK	
1.001	1.001	0.000	0.00			0.0	FLOOD RISK	

Appendix M

Exceedance Plan

n o r t h

16.250

6
(2000ft²)
FFL 16.300
Double Garage

FFL 16.150
Double Garage

FFL 16.000
15.885

5
(1850ft²)
FFL 15.850

15.680

16.060

17.765

15.500

4
(1850ft²)
FFL 15.550

FFL 15.400
Double Garage

Double Garage
FFL 16.000

FFL 16.000
7
(2000ft²)

FFL 15.850
8
(1850ft²)

FFL 15.700
Double Garage

FFL 15.550
Car Port

15.500

15.300

FFL 15.550
3
(1800ft²)

FFL 15.400
Single Garage

Single Garage
FFL 15.400

15.915

15.500

FFL 15.400
9
(1350ft²)

FFL 15.550
2
(1600ft²)

15.400

FFL 15.550
1
(1350ft²)

15.405

15.345

Car Port
FFL 15.400

0 10 20 30 40m
SCALE IN METRES
1:500

C:\Users\SuperHilly\Motion\Staff\Ste - Trpes 2406066\Drawings\2406066-0501 [Exceedance Plan].dwg

Notes

1. All levels and dimensions are to be checked on site before any work commences. All dimensions are in metres unless stated otherwise.
2. This drawing has been based upon survey information supplied by Medlams-Surveys and Motion cannot guarantee the accuracy of the data provided.

Legend

Construction phase boundary

Surface Water Exceedance Flow Direction

Rev.	Description	Drn	Chk	App	Date
P01	First Issue	ST	VBH	NJ	NYI

Drawing Status:

DRAFT
NOT FOR CONSTRUCTION

motion
Guildford - Reading - London
www.motion.co.uk

Client:
NJS Partnerships

Project:
Eastmere Stables

Title:
Exceedance Plan

Scale: 1:250 (@ A1)

Drawing: 2406066-0501

Revision: P01