7 OVERVIEW OF FLOOD RISK

7.1 INTRODUCTION

7.1.1. The following section provides an overview of flood risk to the Application Site, and the risk arising to and from the Proposed Development. An assessment has been undertaken for each source that could affect the Proposed Development in accordance with the NPPF and PPG.

7.2 RISK OF FLOODING TO AND FROM THE PROPOSED DEVELOPMENT

FLOODING FROM COASTAL AND TIDAL SOURCES

7.2.1. Tidal flooding occurs when sea levels rise above the level of the land or beyond the operational level of flood defences.

The National Planning Policy Framework (NPPF) categorises flood risk as follows:

- Zone 1 (low probability) is assessed as having less than a 1 in 1,000 annual probability of river or sea flooding (<0.1%);
- Zone 2 (medium probability) is assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (1% – 0.1%), or between a 1 in 200 and 1 in 1,000 annual probability of sea flooding (0.5% – 0.1%) in any year; and
- Zone 3 (high probability) is assessed as having a 1 in 100 or greater annual probability of river flooding (>1%), or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year.

7.2.2. The Environment Agency's detailed flood mapping (refer to Appendix A) shows the Application Site is within Flood Zone 3.

7.2.3. The Environment Agency's undefended tidal model *Ems to Littlehampton (Arun to East Head Model)* indicates that the Site is within an area of high probability of tidal flooding. The undefended modelled flood levels for the 1 in 200 year event (0.5% AEP) are 3.03m AOD for the Application Site.

7.2.4. The Environment Agency has confirmed that the area of the Proposed Development benefits from flood defences in the form of an embankment which is in good condition and provide standard protection of 1 in 200 years (0.5 AEP). The upstream effective crest level of the flood defences is 5.64 mAOD and is over 2m higher than the undefended flood level at the Site. Consequently, due to the presence of the flood defences the risk is considered to be low.

7.2.5. The risk of flooding from tidal and coastal sources to and from the Proposed Development is therefore considered to be low; no specific mitigation measures are required.

FLOODING FROM FLUVIAL SOURCES

7.2.6. Fluvial flooding occurs when flows within a watercourse exceed the capacity of the watercourse causing out of bank flows.

7.2.7. The Environment Agency flood zone map is provided in Appendix A and it indicates that the site is located within Flood Zone 3.

7.2.8. The Arun District Council SFRA modelled the risk of flooding from fluvial sources with the presence of defences for the 1% AEP event now and with climate change (2006 model). Map A1-F shows this flood extent for the present day. The Application Site is not at risk of fluvial flooding in this scenario (refer to Appendix I).

7.2.9. The Environment Agency has provided a fluvial flood map for the Site based on the modelling results of the *Alingbourne model* (2015) which was modelled for both undefended and defended scenarios. The mapping indicates that the proposed residential units are within an area of high risk of fluvial flooding.

7.2.10. The fluvial water levels within the Site obtained from the defended model are 1.93 mAOD for the 1 in 1000 year event (0.1% AEP). For correspondence with the Environment Agency refer to Appendix B.

7.2.11. The risk of flooding from fluvial sources to and from the Proposed Development is therefore considered to be high.

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7.2.12. Therefore, mitigation measures are required and the proposed mitigation measures are included in Section 8.

FLOODING FROM PLUVIAL / OVERLAND SOURCES

7.2.13. During extreme storms the ground may become saturated and the drains and sewers which carry away surface water may not be able to accommodate these flows, or may become blocked with debris, leading to surface water flooding.

7.2.14. The Environment Agency's Risk of Flooding from Surface Water map indicates that the risk of flooding from surface water at the Application Site ranges from 'Low' to 'Medium'. Areas at low risk of surface water flooding have an annual probability of between 0.1% (1 in 1,000) and 1.0% (1 in 100); areas at medium risk have an annual probability of between 1.0% and 3.33% (1 in 100 and 1 in 30); and areas at high risk have an annual probability of greater than 3.33%.

7.2.15. The "Low" to "Medium" risk from surface water flooding is associated with the surface water flow route that originates to the west of the site and runs eastward between Hook Lane and the current University of Chichester campus. The Environment Agency's map indicates some ponding at the Site.

7.2.16. However, the topographic survey in Appendix D has been compared with the Environment Agency's Lidar DTM (Drawing 47808-TOP-001 in Appendix A) and indicates differences in ground level ranging from approximately 0.5m to 2.5m. This difference is caused by the presence of trees and dense vegetation along the eastern site boundary. Therefore, the flood risk associated with the surface water overland flow route is likely to be lower than the risk indicated on the Environment Agency's Risk of Flooding from Surface Water map.

7.2.17. By developing the Application Site, the risk of pluvial / overland flows from the Proposed Development could increase. This is due to an increase in impermeable surfaces covering the Application Site, which will result in greater volumes and rates of surface water discharging from the site. The risk of the Proposed Development exacerbating pluvial / overland flood risk prior to mitigation is therefore considered to be moderate to high.

7.2.18. However, the proposed surface water drainage strategy (SWDS) will incorporate sufficient attenuation to restrict run-off from the development to as close to existing Greenfield rates as reasonably practicable, in accordance with the non-statutory technical standards for sustainable drainage. The SWDS will therefore mitigate the potential for the Proposed Development to exacerbate flood risk to and from pluvial / overland flow sources. The resultant risk from the Proposed Development will be low.

7.2.19. Further information on flood risk management measures to mitigate this risk is provided in Section 8 of this FRA.

FLOODING FROM GROUNDWATER SOURCES

7.2.20. Groundwater flooding occurs when the water table rises above the level of the ground, usually as the result of prolonged rainfall periods.

The Site is underlain mainly by superficial deposits of raised marine deposits (clay, silt, sand and gravel) as shown on Drawing 47808-BGS-002 in Appendix A. Site specific ground investigations at the adjacent development site publicly available FRA for the University of Chichester campus extension[2] indicate low infiltration rate for the underlying geology.

7.2.21. Given the low permeability of the underlying strata, groundwater flooding is unlikely to occur at the Site however high groundwater is possible in that area.

7.2.22. The risk of flooding from groundwater sources to and from the Proposed Development after the implementation of the proposed mitigation measures detailed in Section 8 is considered to be low.

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[2] WSP (2015) *University of Chichester Engineering and Digital Technology Park. Flood Risk Assessment.* Available on Planning application portal Arun District Council. Reference No. BR/54/16/PL

FLOODING FROM SEWER AND DRAINAGE INFRASTRUCTURE SOURCES

7.2.23. Flooding from sewers is usually attributable to either a blockage or structural defect, or a storm event that overwhelms the capacity of the sewers.

7.2.24. Historical incidents of flooding are detailed by Southern Water in their DG5 register. Arun District Council SFRA shows the sewer flood incidents from Southern Water grouped by post code. The Application Site is within post code PO22 8 and there have been 12 recorded flood incidents for this post code.

7.2.25. Because of historic flood incidents in the post code area of the Application Site, the risk of sewer flooding to the Site is considered to be moderate.

7.2.26. Improvements to the Public Surface and Foul Water Sewers are the responsibility of the Sewer Authority. No specific mitigation for the Proposed Development is considered necessary as the risk of the proposed development exacerbating this flood risk is low.

FLOODING FROM ARTIFICIAL SOURCES

7.2.27. The Government's flood mapping indicates that the Application Site does not lie within the extreme inundation area of any reservoirs.

7.2.28. The Application Site is not located within the vicinity of a canal and is not influenced by canal infrastructure.

7.2.29. The risk of flooding from these sources to and from the Application Site is considered to be negligible.

7.3 OFFSITE IMPACTS

7.3.1. The Proposed Development will not increase the flood risk profile, and no adverse offsite effects are expected after the implementation measures detailed in Section 8. The inclusion of a SuDS drainage system and providing a restriction in runoff rate from the Proposed Development will not increase in flood risk offsite.

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8 FLOOD RISK MITIGATION MEASURES

8.1 INTRODUCTION

8.1.1. Following a review of the flood risks to and arising from the Proposed Development; the following section discusses the mitigation measures necessary to ensure the Proposed Development remains safe over its lifetime and does not exacerbate flood risk to neighbouring property (including allowances for the effects of climate change).

8.2 MITIGATION MEASURES

Tidal flood risk

8.2.1. The risk of flooding from tidal and coastal sources to and from the Proposed Development is therefore considered to be low; no specific mitigation measures are required.

Fluvial flood risk

8.2.2. The fluvial water levels within the Site obtained from the defended model are 1.93m AOD for the 1 in 1000 year event (0.1% AEP). Assuming that the 0.1% AEP event is similar to the 1% plus climate change event, in accordance with the NPPF, it is necessary to mitigate the fluvial flood risk to and from the proposed residential development.

8.2.3. To mitigate the fluvial flood risk to the future residents, the buildings will need to be raised above the predicted flood water level. The finished floor levels (FFL) of these buildings will be elevated further to accommodate freeboard and the floor construction: The finished floor levels will be lifted to approximately 2.43m AOD base on the following:

- modelled 0.1% annual probability flood level at 1.93m AOD;
- 0.3m freeboard; and,
- 0.2m floor construction allowance.

8.2.4. Finished floor levels will be set to provide resilience against flood events in exceedance of the design event, and enable safe occupation by providing backup power and clean water in each building.

8.2.5. The Environment Agency's fluvial model outputs indicate that the Application Site is at the edge of the model flood extent for the 1 in 1000 years from the river Aldingbourne Rife. Therefore compensation of the potential displaced volume of water during a flood event will need to be provided in order to mitigate the risk of fluvial flooding arising from the Proposed Development to the neighbouring properties.

8.2.6. The flood compensation volume which will be required for the Proposed Development is calculated based on the following assumptions:

- The piers of the proposed buildings are 450 mm in diameter;
- 6 piers will be required per proposed building.

8.2.7. Drawing 47808-FCA-001 shows the location of the proposed compensation area. The ground levels will be re-profiled in the northern part of the Site by lowering them to approximately 1.3m AOD which is the existing ground level at the proposed buildings. The proposed flood compensation area will therefore accommodate the volume of water displaced by the piers for flood events up to 1 in 1000 years return period (0.1% AEP) and will provide a compensation area of 10% more than the proposed footprint of the piers.

8.2.8. It is therefore proposed that floodplain compensation will be achieved by lowering an area of approximately 25.2m^2 in the northern section of the Site, i.e. located immediately outside the flood model extent (refer to Drawing 47808-FCA-001 in Appendix F). This total area is equivalent to the footprint of the piers plus an additional 10% allowance.

Pluvial flood risk

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8.2.9. The flood risk from pluvial sources pre-mitigation is considered moderate due to an existing flow route across the Site. Leaving space under the proposed buildings will also mitigate the risk of surface water to the proposed residential units as it will allow the surface water flow to pass under the proposed properties.

8.2.10. Landscaping will be designed to direct flows away from buildings as is shown on Drawing 47808-DS-001 in Appendix G.

Groundwater flood risk

8.2.11. The risk of flooding from groundwater is considered to be low, in addition it is proposed the future buildings to be raised above the ground level and therefore, no further mitigation measures are required for the Site.

Flood risk from sewer and drainage infrastructure

8.2.12. Improvements to the Public Surface Water Sewers are the responsibility of the Sewer Authority and therefore, no specific mitigation for the Proposed Development is considered necessary as the risk of the Proposed Development exacerbating this flood risk is low.

Flood risk from artificial sources

8.2.13. The risk of flooding from artificial sources is considered negligible and therefore flood mitigation measures are not required.

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9 INDICATIVE SURFACE WATER DRAINAGE STRATEGY

9.1 EXISTING DRAINAGE REGIME

EXISTING CATCHMENTS AND DISCHARGE LOCATIONS

9.1.1. The Application Site is predominantly a Greenfield site, with a gross area of 0.28ha.

9.1.2. The Application Site currently drains via overland flow to the small watercourse that runs from west to east at the southern end of the Site.

9.1.3. The topographical survey and the Environment Agency's LiDAR data indicate that levels at the Application Site range from approximately 2.20m AOD in the north-western corner of the site to approximately1.05m AOD in the open ditch at the eastern boundary of the site.

9.1.4. In accordance with current national guidance, the Institute of Hydrology (IoH) Report 124 Flood Estimation for Small Catchments (1994) method has been used to estimate the peak greenfield runoff rates currently generated by the Site.

9.1.5. Table 5 summarises the estimated peak greenfield runoff rates for the Site obtained from the UK SuDS Tools[3].

Table 5 – Summary of Peak Greenfield Runoff Rates

Return Period (Year)	Peak Greenfield Runoff Rate – Site (l/s)
QBAR	0.81
1	0.69
30	1.86
100	2.58

9.2 PROPOSED WATER QUANTITY MANAGEMENT

DISCHARGE LOCATIONS

Part H of the Building Regulations: Drainage and Waste Disposal establishes a hierarchy for surface water disposal, which encourages a SuDS based approach. This hierarchy stipulates that surface water runoff not collected for reuse must be discharged to one of more of the following in order of priority:

- Discharge into the ground (infiltration); or, where not reasonable practicable;
- Discharge to a surface water body; or, where not reasonably practicable;
- Discharge to a surface water sewer, highway drain, or another drainage system; or, where not reasonably practicable,
- Discharge to a combined sewer.

9.2.1. Based on the underlying geology described in Section 4.4, it has been assumed that the disposal of the surface water generated by the Proposed Development to ground using infiltration-based SuDS features will not be feasible, because of a high watertable and poor infiltration rates. Consequently, non-infiltrating SuDS techniques are assessed in order to manage surface water within the Proposed Development. If detailed infiltration testing demonstrates that infiltration is practicable, this will reduce or eliminate offsite runoff.

9.2.2. As it has been assumed surface water cannot be discharged to ground, it will be preferable to be discharged to an open watercourse, in accordance with the hierarchy set out above. Adjacent to the eastern site boundary, there is a ditch as shown in the Topographic Survey (Appendix D). Due to dense vegetation cover, the discharge point of the ditch was not confirmed, it is likely however to be connected to the Southern Water 750mm diameter surface water sewer at the southern-eastern part of the Site. For the surface water sewer network refer to Appendix E).

[3] HR Wallingford (2018) *UK SuDS Tools*; accessed April 2018 from http://www.uksuds.com

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9.2.3. If during site investigation it is established that the ditch along the eastern boundary is not connected to the surface water or to other watercourse, then a direct connection to the Southern Water surface water sewer will be required.

9.2.4. The Arun District Council Supplementary Requirements for Surface Water Drainage Proposals requires that all surface water runoff generated on site discharge is limited to the estimated mean annual maximum greenfield runoff rate (Qbar) of 0.81 l/s (refer to calculations in Appendix G). However for small development sites, this requirement could be difficult to meet. Hence, Building Research Establishment (BRE) identify that surface water flow controls shall be designed to restrict surface water flows to a minimum of 5 l/s in order to reduce the risk of blockage within the drainage system.

IMPERMEABLE AREAS AND REQUIRED STORAGE VOLUMES

9.2.5. In order to manage the increase in peak runoff rates generated by the Proposed Development that would result from the proposed increase in impermeable areas, flows will restricted to the peak greenfield runoff rates. This will necessitate the use of attenuation features within the Proposed Development.

9.2.6. Table 6 shows the approximate areas of the Proposed Development and attenuation required based on the Development Proposal (refer to Appendix C). The Application Site is approximately 0.28ha in size, comprising approximately 0.18ha of open space and 0.1ha of impermeable surfaces.

Table 6 – Indicative impermeable areas and total required attenuation storage

Proposed Development Impermeable areas	Impermeable Area (ha)	Total Required Attenuation Volume for 1 in 100 + 40% (m3)
Access Road	0.024	28
Parking spaces and driveways	0.033	
Building	0.046	

9.2.7. The attenuation volumes required to limit runoff generated by the Proposed Development to the peak allowable discharge rates for the 100 year plus 40% climate change event have been calculated using the UK SuDS Tools[4]. The total indicative attenuation storage volume required for the Proposed Development is 28 m^3, based on the minimum discharge of 5 l/s.

PROPOSED SUDS FEATURES

9.2.8. Following a review of the potential use of SuDS techniques available for incorporation into the Proposed Development, it is proposed that permeable paving will be used to attenuate surface water runoff within the Proposed Development.

9.2.9. Permeable paving can be designed to collect surface water runoff and attenuate, prior to discharge to an open watercourse or to the sewer without exceeding the runoff rates of 5l/s.

9.2.10. A void ratio of 30% and permeable paving depth of 400mm have been assumed for the calculation of surface water attenuation volume which can be accommodated within the Site.

9.2.11. An indicative surface water storage requirement of 28m^3 has been calculated for the Site for the 1 in 100 year plus climate change event (refer to Appendix G). The proposed access road and parking spaces provide 330m^2 of potential permeable paving. If 400mm of permeable paving depth is applied, the storage capacity of this SuDS feature is 39.3 m^3 compared to a requirement of 28m^3.

9.2.12. The final depth of the permeable paving sub-base will depend on the final site gradients and the structural requirements (based on the surface loading and ground CBR value), as well as existing underground services

[4] HR Wallingford (2018) *UK SuDS Tools*; accessed April 2018 from http://www.uksuds.com

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or the depth required for surface water attenuation purposes. A detailed design will further confirm the exact form and depth that is considered feasible to meet the attenuation volume requirement at the Site.

9.2.13. The surface water gradients on site are expected to be low, as the site is on a relatively flat area. However, permeable paving will be used as the main SuDS feature and it will act as a filter and intercept sediments to minimise the risk of blockage to the flow control device.

9.2.14. Due to the low gradients on site, it is recommended the installation of non-return valves along the drainage network to prevent potential water backing up into the future properties.

9.2.15. By controlling run-off, the downstream areas can be better protected from the variability of rainfall events.

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10 CONCLUSIONS

10.1.1. An outline planning permission is sought for a Proposed Development of 6 residential units with parking spaces and access road. The Proposed Development is located in the rear gardens of the properties 94 - 100 Hook Lane and it is approximately 0.28 hectares (ha) in total.

The flood risk to and from the Proposed Development from all sources prior to mitigation is considered to be as follows:

- Tidal - low
- Fluvial – high
- Pluvial – low to moderate
- Groundwater – low
- Sewers and Drainage Infrastructure - moderate
- Artificial Sources – negligible

10.1.2. The Environment Agency confirmed that the Site is defended from tidal flood risk for the 1 in 200 year event, and therefore the tidal flood risk is considered to be low.

10.1.3. To mitigate the fluvial and pluvial flood risk to the future residents, the buildings will need to be raised above 1.93m AOD which is the modelled fluvial flood levels for 0.1% annual probability. The units will be built on piers with void space underneath. The finished floor levels of these buildings will be elevated further above the design flood level to accommodate freeboard (0.3m) and the floor construction (0.2m), i.e. finished floor levels of 2.43m AOD.

10.1.4. Finished floor levels will be set to provide resilience against flood events in exceedance of the design event, and enable safe occupation by providing backup power and clean water in each building.

10.1.5. The Environment Agency's fluvial model outputs indicate that the Application Site is at the edge of the model flood extent for the 1 in 1000 years from the river Aldingbourne Rife. Therefore compensation for the potential displaced volume of water during a flood event will need to be provided in order to mitigate the risk of fluvial and pluvial flooding arising from the Proposed Development to the neighbouring properties. This can be achieved by lowering an area equivalent to the footprint of the buildings outside the flood footprint. For the Proposed Development the Flood compensation Area includes an addition of 10% to the total footprint.

10.1.6. The surface water drainage strategy will mitigate the flood risk from surface water caused by the increasing hardstanding of the Proposed Development. As it has been assumed that surface water generated by the Proposed Development cannot be discharged to ground, a solution has been assessed whereby surface water is discharged to the open ditch at the eastern site boundary or the surface water sewer at the southern site boundary in accordance with the drainage hierarchy.

10.1.7. The required surface water storage to attenuate on site has been calculated for the 1 in 100 year plus climate change event. Permeable paving as a main SuDS feature can be installed along the proposed access road and parking areas to meet the surface water storage requirement. Preliminary calculations indicate that by using permeable paving at the site, the required surface water attenuation is met.

10.1.8. The risk of sewer flooding to the Site is considered to be moderate because of historical incidents recorded in the post code area of the Application Site included in Arun District Council's SFRA. Improvements to the Public Surface and Foul Water Sewers are the responsibility of the Sewer Authority and therefore, no specific mitigation for the Proposed Development is considered necessary as the risk of the proposed development exacerbating this flood risk is low.

10.1.9. The Local Planning Authority needs to confirm the Site is sequentially appropriate with this FRA demonstrating that the Site passes part 2 of the Exception Test. Therefore, this FRA demonstrates how the Proposed Development can be delivered in accordance with the NPPF with regards to flooding.

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Appendix A

DRAWINGS

ARUN DISTRICT COUNCIL BR/124/21/OUT

FLOOD RISK PACK

Client:
COUNTERPOINT PROPERTIES

Project Reference:
70047808 - Hook Lane, Bognor Regis

Site Reference:
HOOK LANE, BOGNOR REGIS

Site Location
494310, 99701.

Site Area:
0.28 hectares

Map Scale:
1:5000

CONTENTS:

Page 1 - Site Location

Page 2 - Flood Map for Planning

Page 3 - Risk of Flooding from Rivers and the Sea

Page 4 - Risk of Flooding from Surface Water

Page 5 - Risk of Flooding from Reservoirs

Page 6 - Risk of Flooding from Multiple Sources

Page 7 - Historic Flood Map

Page 8 - Source Protection Zones

Page 9 - Aquifer Designation

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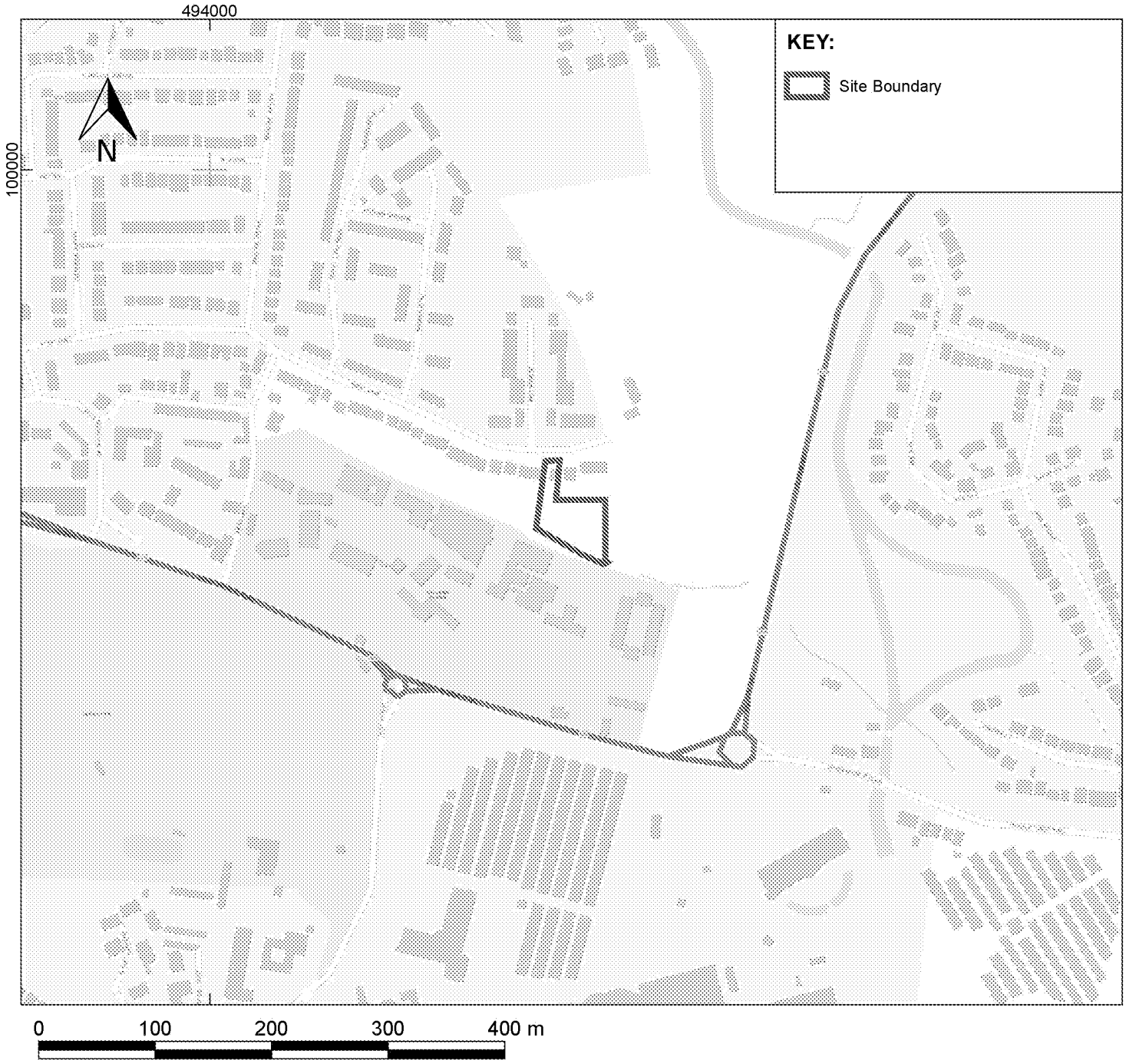
\\uk.wspgroup.com\central data\Projects\700478xx\70047808 - Hook Lane, Bognor Regis\02 WIP\EI EIA and flood risk\02 Drawing\Flood Map Pack\70047808 - Hook Lane, Bognor Regis.qgs

SITE LOCATION



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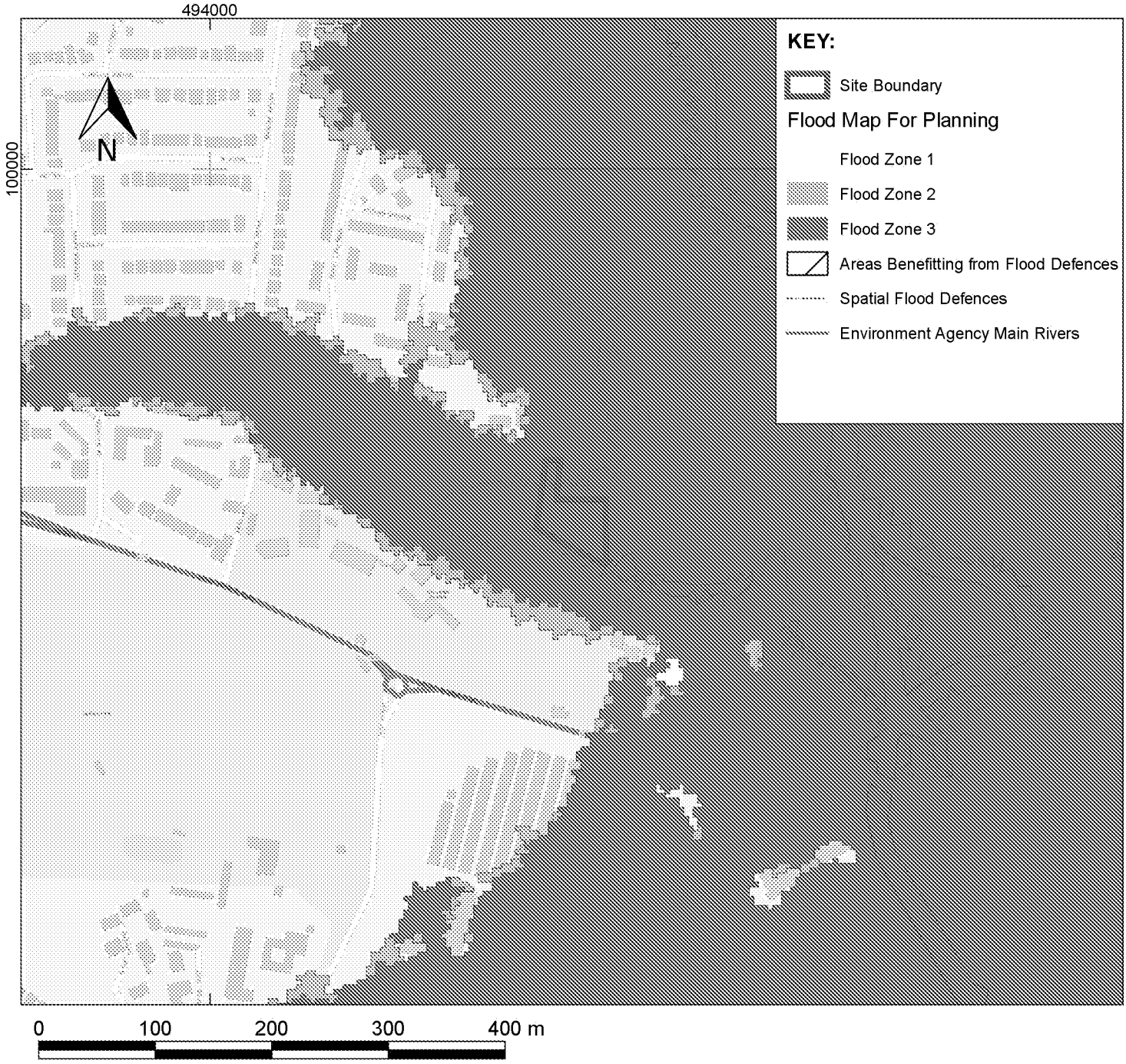
ENVIRONMENT AGENCY FLOOD MAP FOR PLANNING



Flood zone maps are modelled using local and national river and sea data. This information provides an indication of the likelihood of flooding and is intended for planning use only.

Flood Zone 1 - 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).

Flood Zone 2 - 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)

Flood Zone 3 - 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)

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ENVIRONMENT AGENCY RISK OF FLOODING FROM RIVERS AND THE SEA

High risk means that each year this area has a chance of flooding of greater than 3.3%.

Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.

Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

This takes into account the effect of any flood defences in the area. These defences reduce but do not completely stop the chance of flooding as they can be overtopped, or fail.

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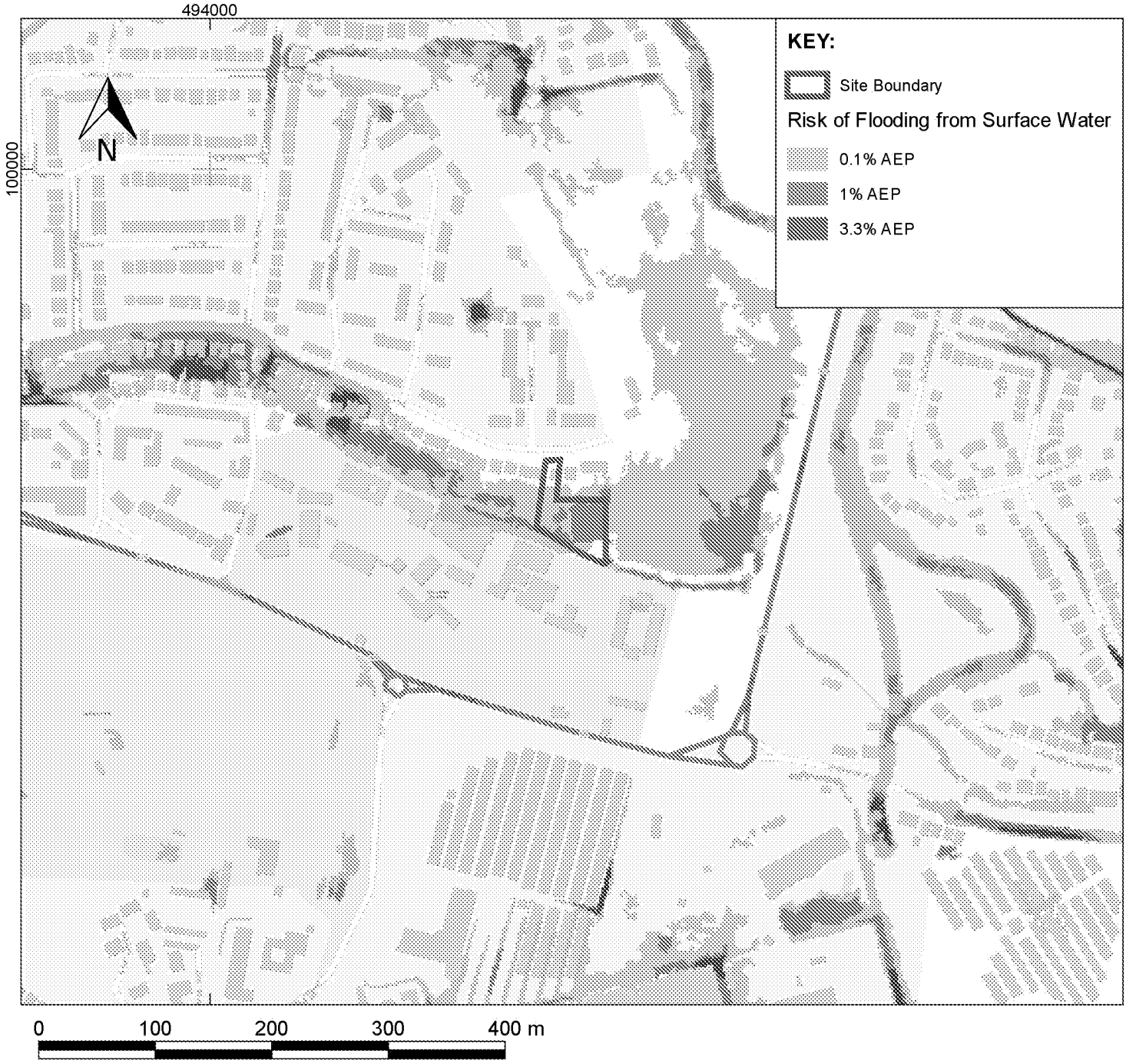
ENVIRONMENT AGENCY RISK OF FLOODING FROM SURFACE WATER



High risk means that each year this area has a chance of flooding of greater than 3.3%.

Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.

Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

Flooding from surface water is difficult to predict as rainfall location and volume are difficult to forecast. In addition, local features can greatly affect the chance and severity of flooding.

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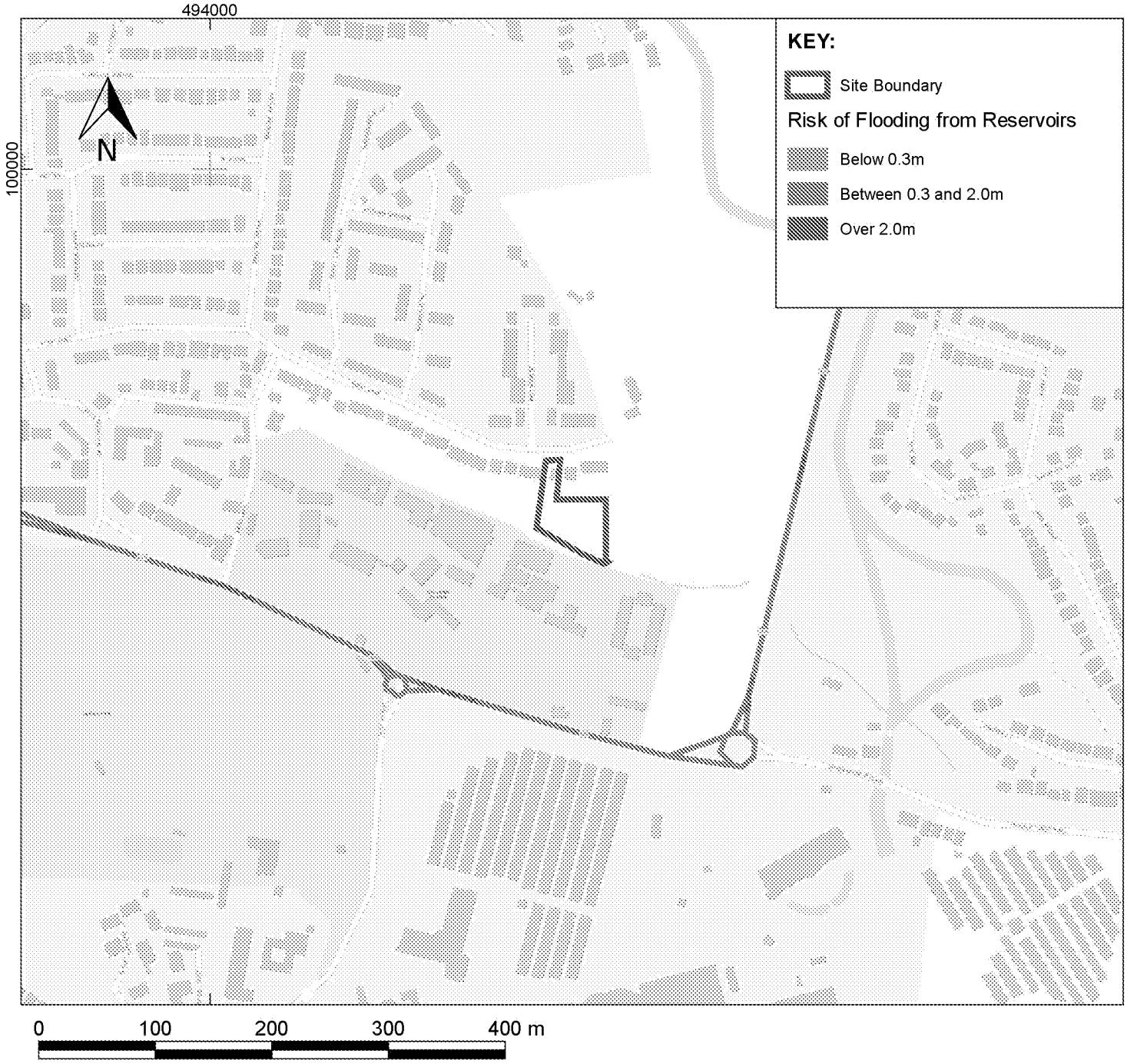
ENVIRONMENT AGENCY RISK OF FLOODING FROM RESERVOIRS



If a location is at risk, flooding from reservoirs is extremely unlikely. There has been no loss of life in the UK from reservoir flooding since 1925.

An area is considered at risk if peoples' lives could be threatened by an uncontrolled release of water from a reservoir.

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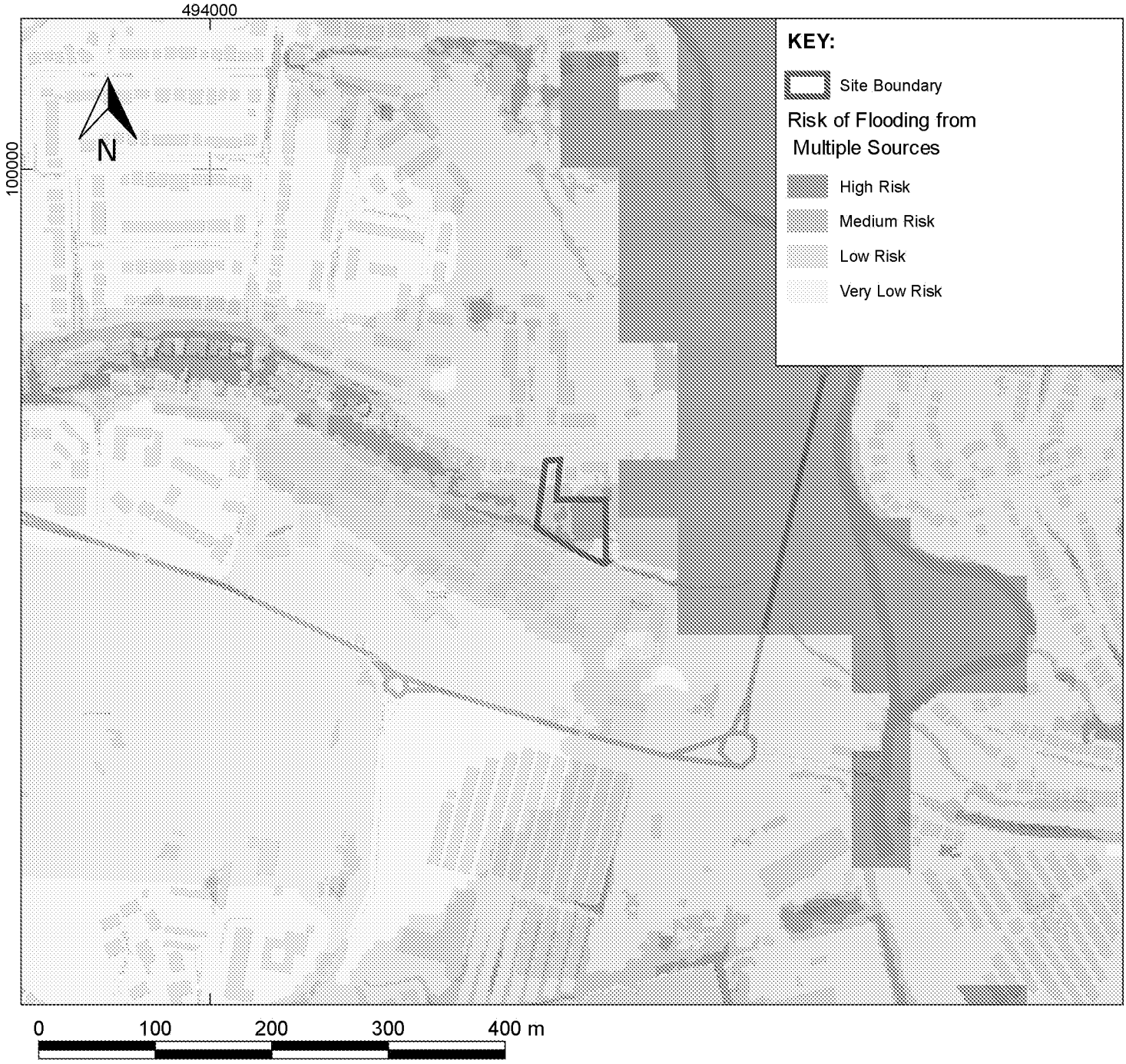
ENVIRONMENT AGENCY RISK OF FLOODING FROM MULTIPLE SOURCES



High risk means that each year this area has a chance of flooding of greater than 3.3%.

Medium risk means that each year this area has a chance of flooding of between 1% and 3.3%.

Low risk means that each year this area has a chance of flooding of between 0.1% and 1%.

Very low risk means that each year this area has a chance of flooding of less than 0.1%.

This dataset is not suitable for identifying whether an individual property will flood. The Risk of Flooding from Multiple Sources (RoFMS) information is a national scale assessment. It gives an indication of what areas of land may be at risk of flooding from more than one source. This first version of the assessment considers flooding from rivers, the sea and surface water.

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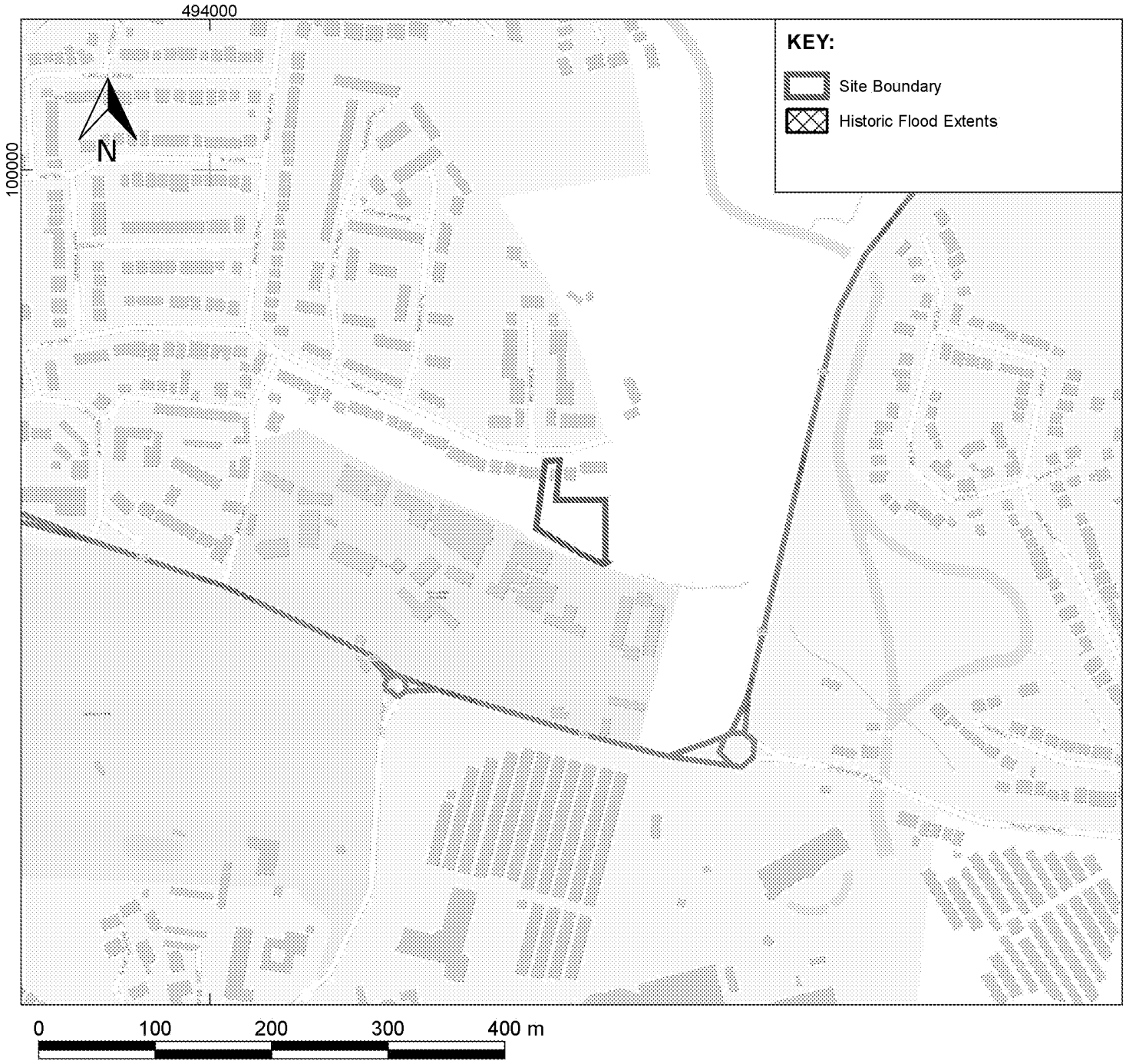
ENVIRONMENT AGENCY HISTORIC FLOOD MAP



The Historic Flood Map is a GIS layer showing the maximum extent of all individual Recorded Flood Outlines from river, the sea and groundwater springs and shows areas of land that have previously been subject to flooding in England. Records began in 1946 when predecessor bodies to the Environment Agency started collecting detailed information about flooding incidents, although limited details may be held about flooding incidents prior to this date.

The absence of coverage by the Historic Flood Map for an area does not mean that the area has never flooded, only that we do not currently have records of flooding in this area. It is also possible that the pattern of flooding in this area has changed and that this area would now flood under different circumstances. The Historic Flood Map will take into account of the presence of defences, structures, and other infrastructure where they existed at the time of flooding. It will include flood extents that may have been affected by overtopping, breaches or blockages. Flooding shown to the land and does not necessarily indicate that properties were flooded internally.

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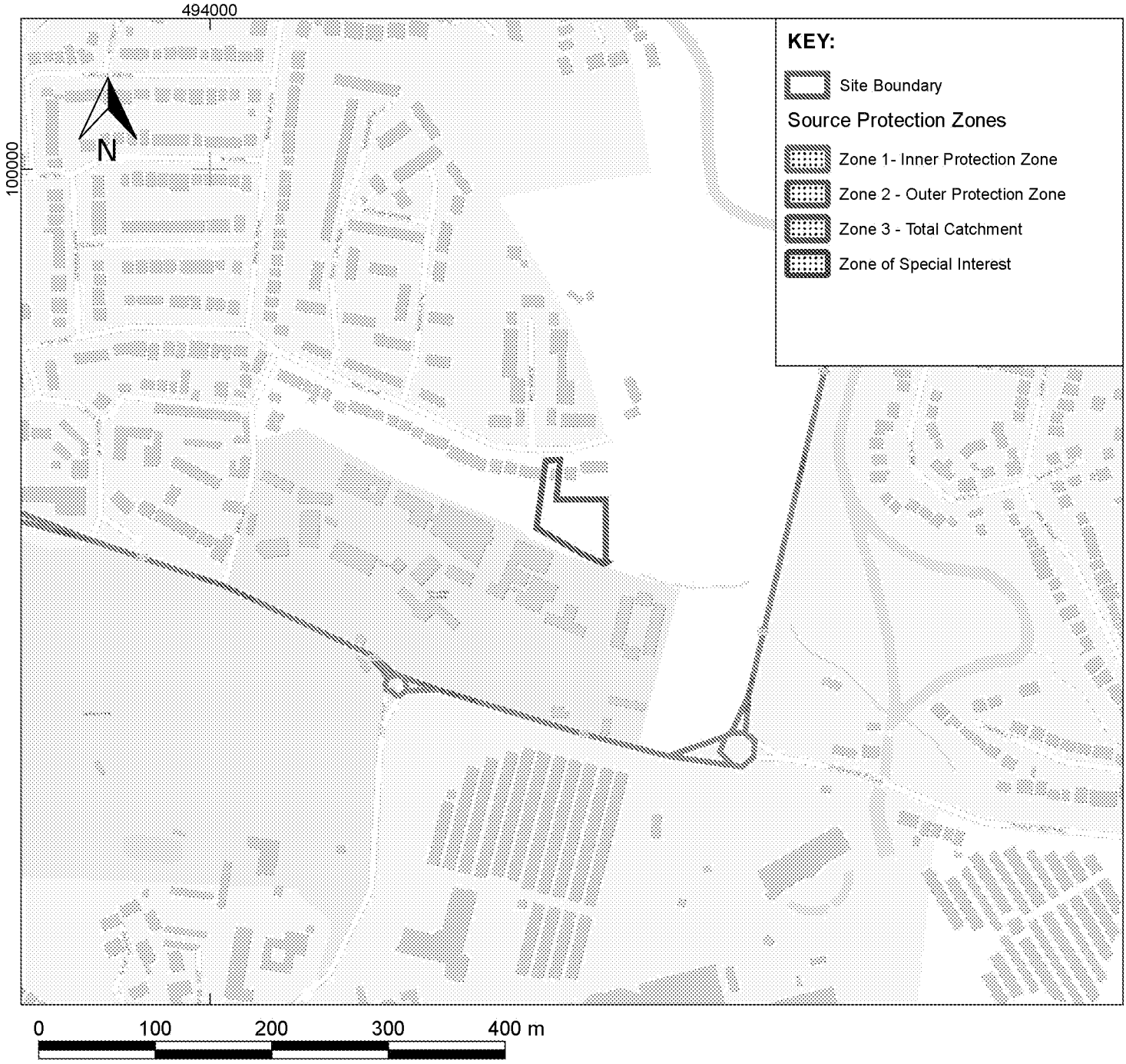
ENVIRONMENT AGENCY SOURCE PROTECTION ZONES



Inner zone (Zone 1) - Defined as the 50 day travel time from any point below the water table to the source. This zone has a minimum radius of 50 metres;

Outer zone (Zone 2) - Defined by a 400 day travel time from a point below the water table. The previous methodology gave an option to define SPZ2 as the minimum recharge area required to support 25 per cent of the protected yield. This option is no longer available in defining new SPZs and instead this zone has a minimum radius of 250 or 500 metres around the source, depending on the size of the abstraction;

Total catchment (Zone 3) - Defined as the area around a source within which all groundwater recharge is presumed to be discharged at the source.

Special interest (Zone 4) - A fourth zone SPZ4 or 'Zone of Special Interest' was previously defined for some sources. SPZ4 usually represented a surface water catchment which drains into the aquifer feeding the groundwater supply (i.e. catchment draining to a disappearing stream).

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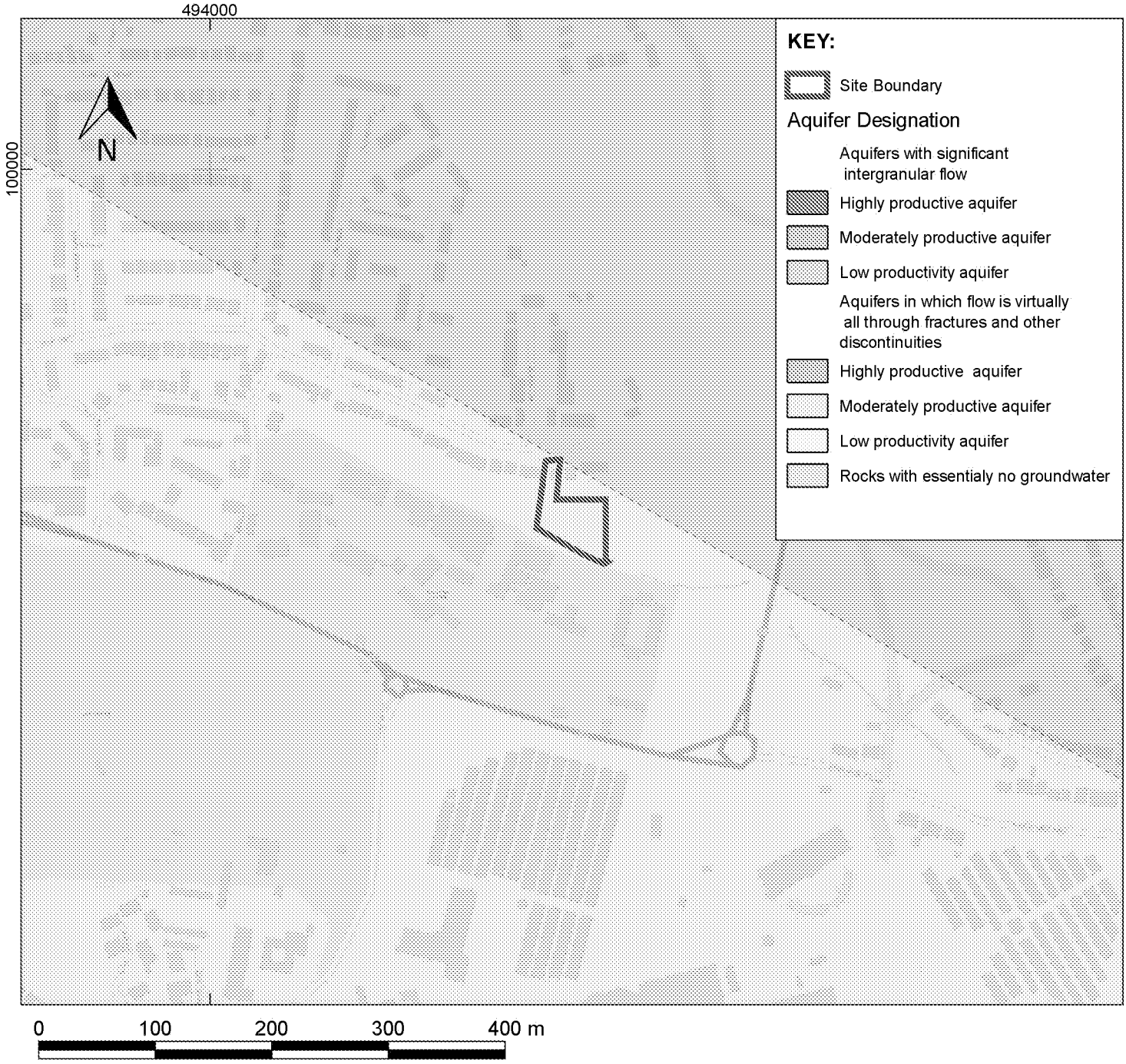
ENVIRONMENT AGENCY 1:625,000 SCALE AQUIFER DESIGNATION



The hydrogeological map indicates aquifer potential in generalised terms using a threefold division of geological formations:

1. those in which intergranular flow in the saturated zone is dominant
2. those in which flow is controlled by fissures or discontinuities
3. less permeable formations including aquifers concealed at depth beneath covering layers

Highly productive aquifers are distinguished from those that are only of local importance or have no significant groundwater. Within each of these classes the strata are grouped together according to age or lithology.

The 1:625 000 scale data may be used as a guide to the aquifers at a regional or national level, but should not be relied on for local information.

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