GeoSmart Information

FloodSmart

Flood Risk Assessment

Site Address

New Zealand House
160 Abbey Foregate
Carshalton
SM5 3EH

Grid Reference

520291, 260888

Report Prepared for

Mr John Smith
Design House
Architect Road
Plan City
SY63 87X

Date

September 2020

Report Status

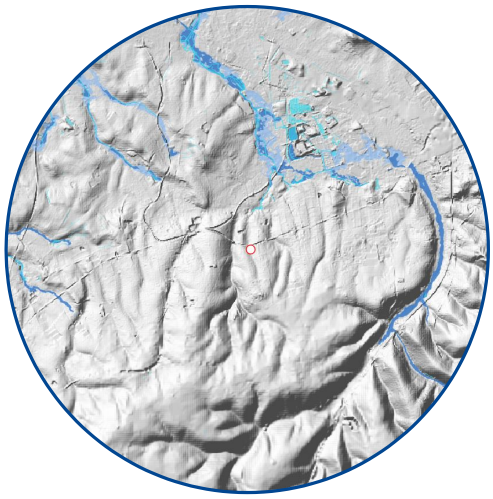
FINAL

Site Area

0.05 ha

Report Reference

FloodSmart Example



Risk - Very Low to Medium

The Site is located within a Flood Zone 1 (low probability), the risk of flooding from rivers and sea is shown to be Negligible. The Site has a Very Low to Medium risk of flooding with flooding up to 0.3 m in the west of the Site in the 1 in 100 year event. The Site has a Low risk of groundwater flooding

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1. Executive summary

A review has been undertaken of national environmental data sets to assess the flood risk to the Site from all sources of flooding in accordance with The National Planning Policy Framework (NPPF) (2019) and National Planning Practice Guidance (NPPG) (2014). A site-specific flood risk assessment, to assess the flood risk to and from the development site, is provided within this concise interpretative report written by an experienced GeoSmart consultant. Baseline flood risk and residual risks that remain after the flood risk management and mitigation measures are implemented are summarised in the table below.

Site analysis

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) and Sea (coastal/tidal)	Negligible	N/A
Surface water (pluvial) flooding	Very Low to Medium	Low
Groundwater flooding	Low	Low
Other flood risk factors present	No	N/A
Is any other further work recommended?	Yes	Yes (see below)

N/A = mitigation not required

Summary of existing and proposed development

The Site is currently used within a residential capacity. The proposed development will comprise of two flats alongside the current property (see Appendix A).

Summary of flood risks

The flood risks from all sources have been assessed as part of this report and are as follows:

According to the Environment Agency's (EA) Flood Map for Planning Purposes, the Site is located within a fluvial and tidal Flood Zone 1 (Low Probability)

According to the EA's Risk of Flooding from Rivers and Sea (RoFRS) map, which considers the type, condition and crest height of flood defences, the Site has a Negligible risk of flooding from Rivers and the Sea.

According to the EA's Risk of Flooding from Surface Water (pluvial) flood mapping, the Site is at a variable risk of pluvial flooding ranging from Very Low to Medium. Flood depths are expected to be less than 0.3m depth.

Groundwater Flood Risk screening data indicates there is a Low risk of groundwater flooding at the surface in the vicinity of the Site during a 1 in 100 year event.

The risk of flooding from artificial (man-made) sources such as reservoirs, sewers and canals has been assessed:

- The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
- Ordnance Survey (OS) data confirms there are no canals near to the Site.
- A sewer flooding history search was undertaken with the utility provider and using the Strategic Flood Risk Assessment (AECOM, 2015). This confirms no recorded incidences of sewer flooding at or within the vicinity of the Site

Recommendations / Next steps

Recommendations for mitigation are provided below, based upon the proposed development and the flood risk identified at the Site:

- As there is a risk of flooding from surface water (pluvial) sources, where flood depths are expected to be less than 0.3 m in depth, Finished Floor Levels (FFL) of the proposed development should be set at least 0.3 m above existing surrounding ground levels and ground levels should aim to slope away from buildings. Ground levels should be designed to channel any overland flows from off-site (to the west) away from the development and Site drainage systems.
- The raising of finished floor levels will also mitigate the Low risk of groundwater flooding.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff over the lifetime of the proposed development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

2. Introduction

Background and purpose

A site-specific flood risk assessment has been undertaken, to assess the flood risk to and from the development site. This assessment has been undertaken by firstly compiling information concerning the Site and the surrounding area. The information gathered was then used to construct a 'conceptual site model', including an understanding of the appropriateness of the development as defined in the NPPF (2019) and the source(s) of any flood risk present. Finally, a preliminary assessment of the steps that can be taken to manage any flood risk to the development was undertaken.

This report has been prepared with reference to the NPPF (2019) and NPPG (2014).

"The National Planning Policy Framework set out the Government's planning policies for England and how these are expected to be applied" (NPPF, 2019).

The NPPF (2019) and NPPG (2014) promote a sequential, risk based approach to the location of development. This also applies to locating a development within a Site which has a variable risk of flooding.

"This general approach is designed to ensure that areas at little or no risk of flooding from any source are developed in preference to areas at higher risk. The aim should be to keep development out of medium and high risk flood areas (Flood Zones 2 and 3) and other areas affected by other sources of flooding where possible" (NPPG, 2014).

The purpose of this report is to provide clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at the Site.

Report scope

In accordance with the requirements set out within NPPG 2014 (Paragraph: 030 Reference ID: 7-030-20140306), a thorough review of a commercially available flood risk report and EA supplied data indicating potential sources of flood risk to the Site from rivers and coastal sources, surface run-off (pluvial), groundwater and reservoirs, including historical flood information and modelled flood extent. Appropriate measures are recommended to manage and mitigate the flood risk to the property.

Information obtained from the Environment Agency and a review of the local Strategic Flood Risk Assessment (SFRA) is used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the National Planning Policy Framework (NPPF, 2019).

The existing and future flood risks to and from the Site from all flood sources is assessed in line with current best practice using the best available data. The risk to the development has been assessed over its expected lifetime, including appropriate allowances for the impacts of climate change. Residual risks that remain after the flood risk management and mitigation

measures are implemented, are considered with an explanation of how these risks can be managed to keep the users of the development safe over its lifetime.

An indication of whether the site will potentially increase flood risk elsewhere is provided, including where the proposed development increases the building footprint at the Site. A drainage strategy to control runoff can be commissioned separately if identified as a requirement within this report.

Report limitations

It is noted that the findings presented in this report are based on a desk study of information supplied by third parties. Whilst we assume that all information is representative of past and present conditions, we can offer no guarantee as to its validity and a proportionate programme of site investigations would be required to fully verify these findings.

The basemap used is the OS Street View 1:10,000 scale, however the Site boundary has been drawn using BlueSky aerial imagery to ensure the correct extent and proportion of the Site is analysed.

This report excludes consideration of potential hazards arising from any activities at the Site other than normal use and occupancy for the intended land uses. Hazards associated with any other activities have not been assessed and must be subject to a specific risk assessment by the parties responsible for those activities.

Datasets

The following table shows the sources of information that have been consulted as part of this report:

Table 1. Datasets consulted to obtain confirmation of sources of flooding and risk

Source of flooding	Datasets consulted				
	Commercial Flood Maps	SFRA	Environment Agency	Thames Water (Appendix B)	OS Data
Historical	X	X	X		
Fluvial/tidal	X	X	X		
Surface water (pluvial)	X	X	X		

Source of flooding	Datasets consulted				
	Commercial Flood Maps	SFRA	Environment Agency	Thames Water (Appendix B)	OS Data
Groundwater	X	X			
Sewer		X		X	
Culvert/bridges		X			X
Reservoir		X	X		

*The SFRA and local guidance have been used to inform this report as referenced in Section 6.

3. Site analysis

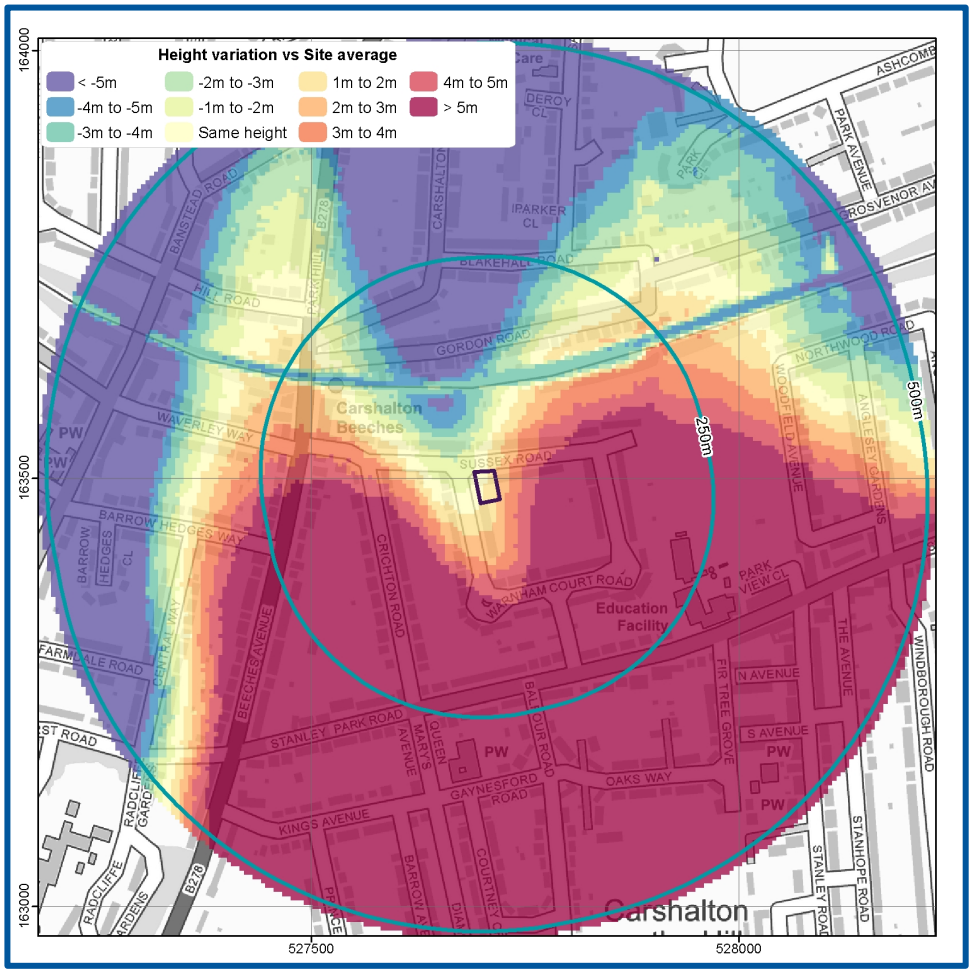
Site information

The Site is located in Carshalton in a setting of commercial and residential use, National Grid Reference (NGR) TL 20291 60888 (see Figure 1). Site plans and drawings are provided in Appendix A.

According to OS data the immediate area surrounding the Site is on a slope. Using a 1 km buffer around the Site, it is noted that, to the north, falls to c.50.3 mAOD. To the west land falls to 54.3 mAOD and to the east land rises slightly to c. 65.4 mAOD. To the south the land rises to c. 84.1 mAOD.

The general level of the Site is between 63 and 65.2 mAOD with the Site falling gradually in a north westerly direction. This is based on EA elevation data obtained for the Site to a 1m resolution with a vertical accuracy of ±150 mm.

Figure 1. Site Location and Relative Elevations (GeoSmart, 2020)



Development

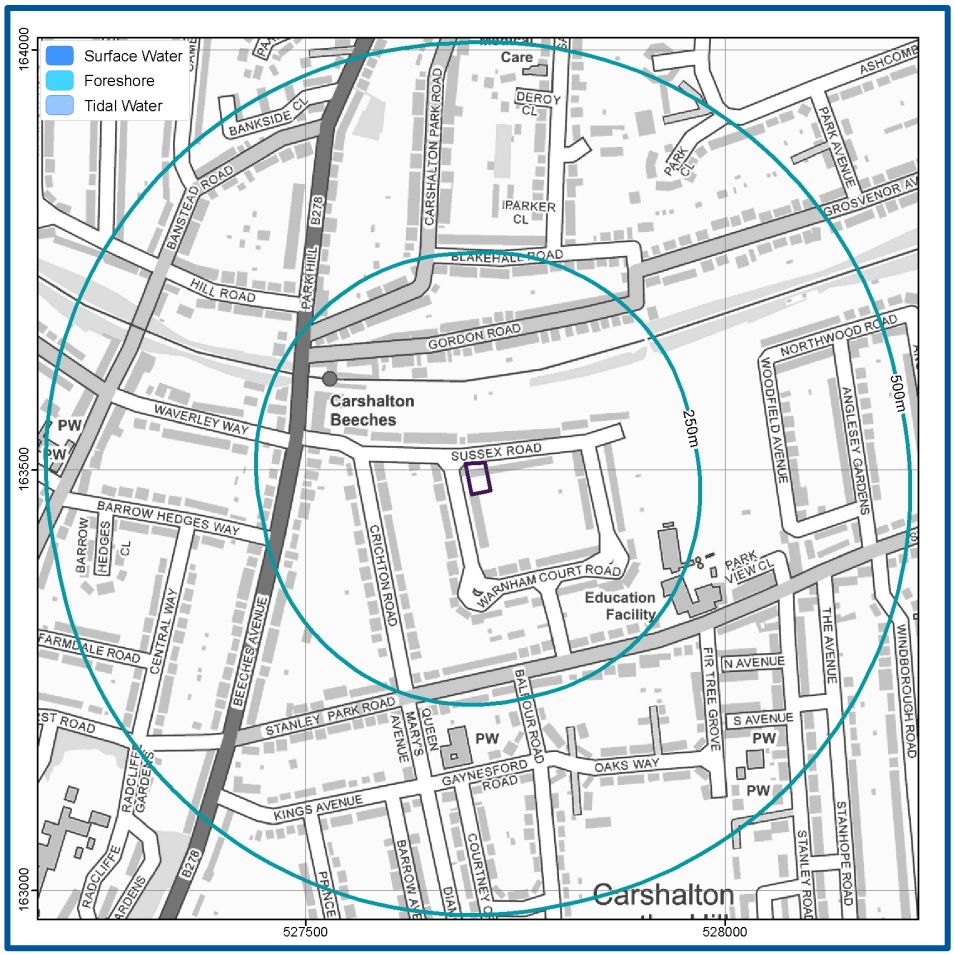
The Site is currently used within a residential capacity. Development proposals comprise the of two flats alongside the current property (see Appendix A).

The effect of the overall development will result in an increase in number of occupants and/or users of the building but will not result in the change of use, nature or times of occupation. According to Table 2 of the NPPG (2014), the vulnerability classification of the existing development is More Vulnerable and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

There are no mapped surface water features within 500 m of the Site (Figure 2).

Figure 2. Surface water features (EA, 2020)



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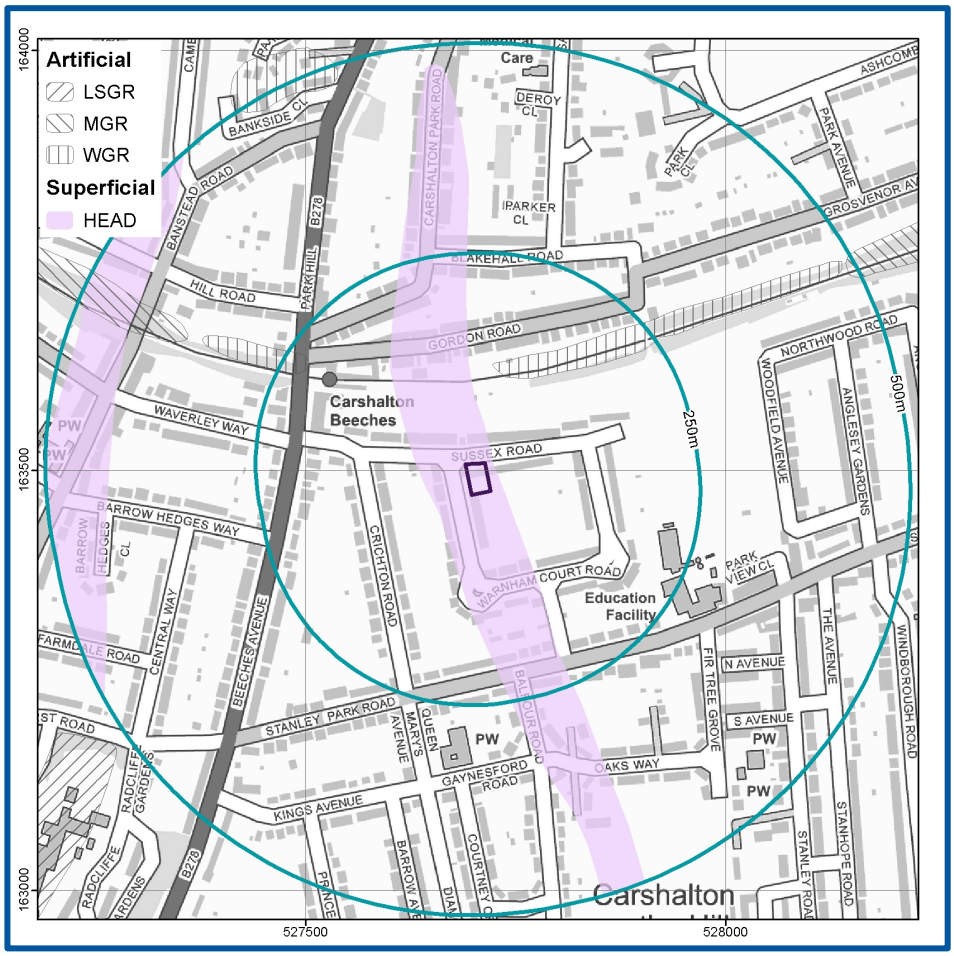
Proximity to relevant infrastructure:

There are no flood defences located within 500m of the Site.

Hydrogeological features

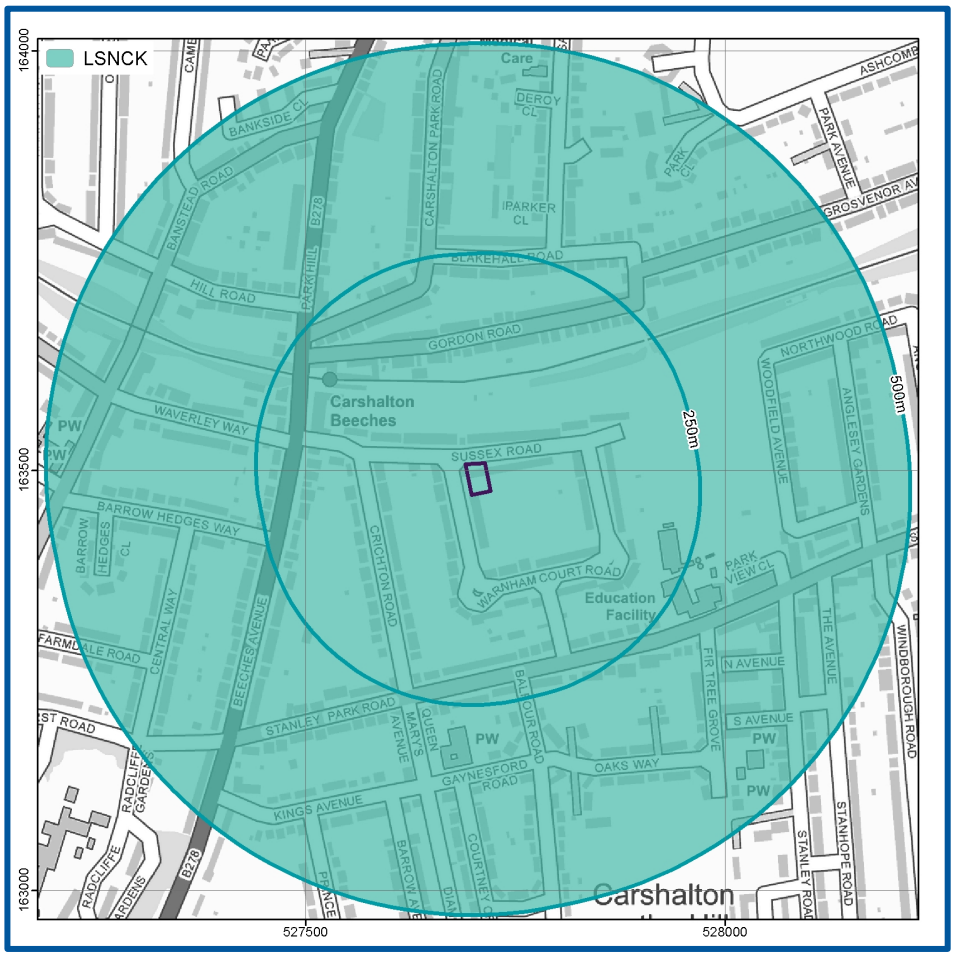
British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 3) consists of Head deposits (HEAD) (BGS, 2020) and is classified as a Secondary Undifferentiated Aquifer(EA, 2020).

Figure 3. Superficial Geology (BGS, 2020)



BGS mapping indicates the underlying bedrock geology (Figure 4) consists of Lewes Nodular Chalk Formation, Seaford Chalk Formation and Newhaven Chalk Formation (undifferentiated) (LSNCK) (BGS, 2020) and is classified as a Principal Aquifer (EA, 2020).

Figure 4. Bedrock Geology (BGS, 2020)



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The Site lies within an inner groundwater Source Protection Zone (SPZ I) (EA, 2020).

A review of the BGS borehole database (BGS, 2020) indicates there are no relevant/relevant boreholes within the vicinity of the Site.

The hydrogeological characteristics suggest there is potential for a groundwater table beneath the site.

Groundwater levels may rise in the bedrock and superficial aquifers in response to prolonged rainfall recharge which may cause an unusually high peak in groundwater levels during some years, subject to hydraulic continuity between the groundwater system and the Site.

4. Flood risk to the development

Historical flood events

No historic flood events have been recorded at the Site (EA, 2020).

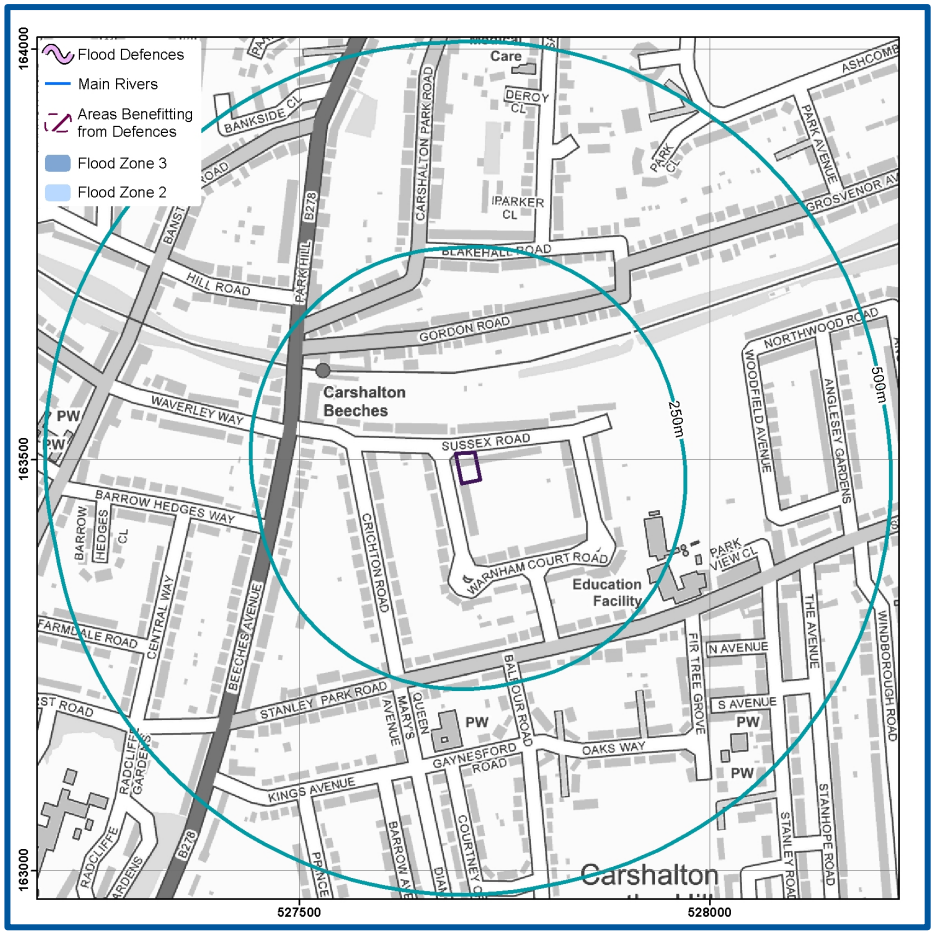
Guidance

The purpose of historic flood data is to provide information on where and why flooding may have occurred in the past. The absence of any recorded events does not mean that flooding has never occurred on Site or that flooding will never occur at the Site.

Rivers (fluvial) / Sea (coastal/tidal) flooding

According to the EA's Flood Map for Planning Purposes (Figure 5), the Site is located within fluvial and tidal Flood Zone 1 and is therefore classified as having a Low probability of fluvial and tidal (coastal) flooding.

Figure 5. EA Flood Map for Planning Purposes (EA, 2020)



Guidance

As defined in the NPPF (2019):

Ignoring the presence of any defences, land located in a Flood Zone 1 is considered to have a Low probability of flooding, with less than a 1 in 1000 annual probability of fluvial or coastal flooding in any one year.

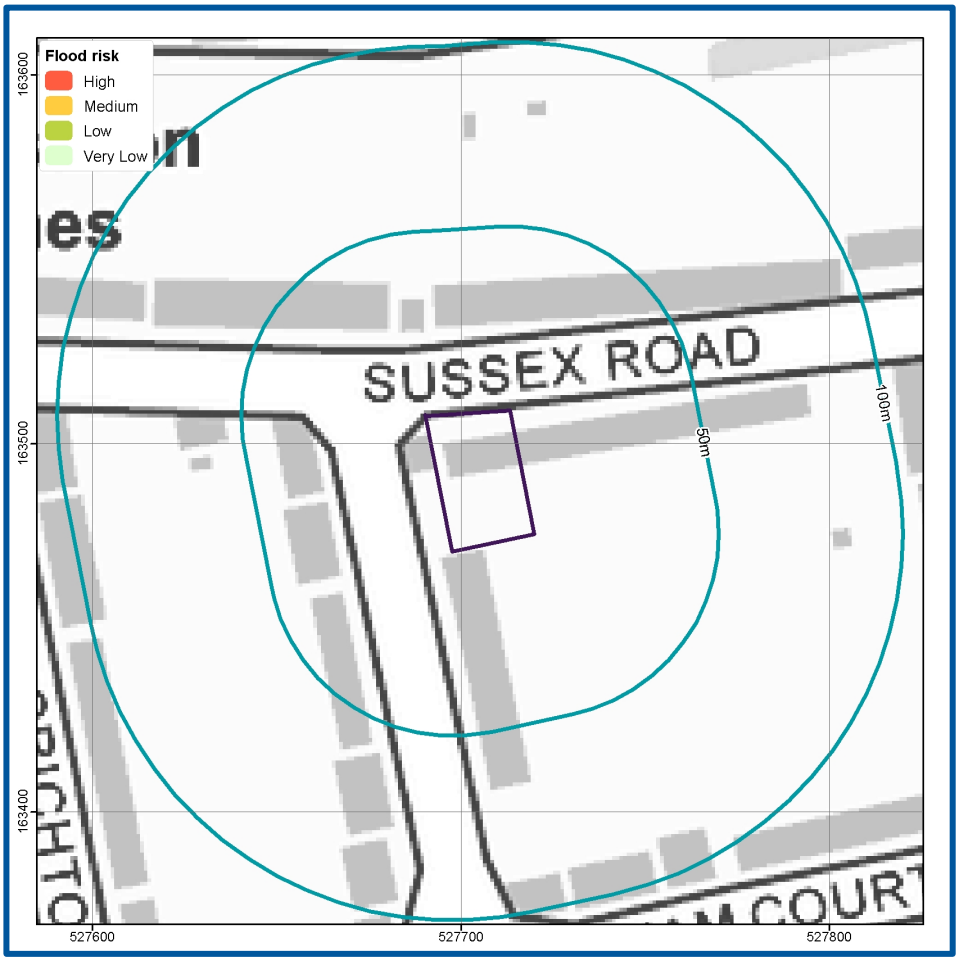
Development of all uses of land is appropriate in this zone (see glossary for terminology).

Flood risk including the benefit of defences

The type and condition of existing flood defences influence the 'actual' risk of fluvial flooding to the Site, albeit the long-term residual risk of flooding (ignoring the defences) should be considered when proposing new development.

According to the EA's Risk of Flooding from Rivers and the Sea (RoFRS) mapping (Figure 6), which considers the crest height, standard of protection and condition of defences, the flood risk from Rivers and the Sea is Negligible.

Figure 6. Risk of Flooding from Rivers and Sea map (EA, 2020)



Surface water (pluvial) flooding

Surface water flooding occurs when intense rainfall exceeds the infiltration capacity of the ground and overwhelms the drainage systems. It can occur in most locations even at higher elevations and at significant distances from river and coastal floodplains.

According to the EA's Risk of Flooding from Surface Water (pluvial) mapping, there is a Very Low to Medium risk of pluvial flooding at the Site.

Guidance

According to EA's surface water flood risk map the site is at:

- Very Low risk - chance of flooding of less than 1 in 1000 (0.1%).
- Low risk - chance of flooding of between a 1 in 1000 & 1 in 100 (0.1% and 1%).
- Medium risk - chance of flooding of between a 1 in 100 and 1 in 30 (1% and 3.3%).

Figure 7 confirms the extent and depth of flooding during a 1% AEP (1 in 100 year - medium risk) event. This confirms areas of the Site towards the western boundary which are at Medium risk of surface water flooding where depths could range between 0 m and 0.3 m above ground level.

Guidance

According to EA's surface water flood risk map the following advisory guidance applies to the site:

Flood Depth (m)

- 0.15 to 0.30 - Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas

Figure 7. Environment Agency Risk of Flooding from Surface Water Map (EA, 2020)

Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 100 year event confirms the Site is located on a potential overland flow route during a medium risk scenario.

During this event the majority of of flow velocities are greater than 0.25 m/s. The flows could potentiallyaffect the buildings and/or access routes to the Site.

Water may flow onto the Site from adjacent land to the south and should be managed, in addition to run-off generated on-site.

The Site may potentially transmit overland flows off site in a westerly direction.

A review of the Site plans, topography and the EA's Risk of Flooding from Surface Water Direction mapping indicates any overland flows on the Site would not be obstructed by the proposed development and occur across nonessential areas of the site. Localised depressions and accumulations cover a very small area of the site in non-essential areas.

The SFRA does not indicate reported incidents of historical surface water flooding within 100 m of the Site (AECOM, 2015). The SFRA confirms the Site is not located within a Critical Drainage Area (CDA)[1] (AECOM, 2015).

Climate change may lead to an increase in rainfall intensity which affects river levels, land and urban drainage systems. Rainfall intensity for small and urban catchments may increase from 5 to 20% (central estimate) or 10% to 40% (Upper estimate) over the period to 2115 (EA, 2020).

The Site is susceptible to overland flow and/or surface water flooding which may be increased as a result of climate change.

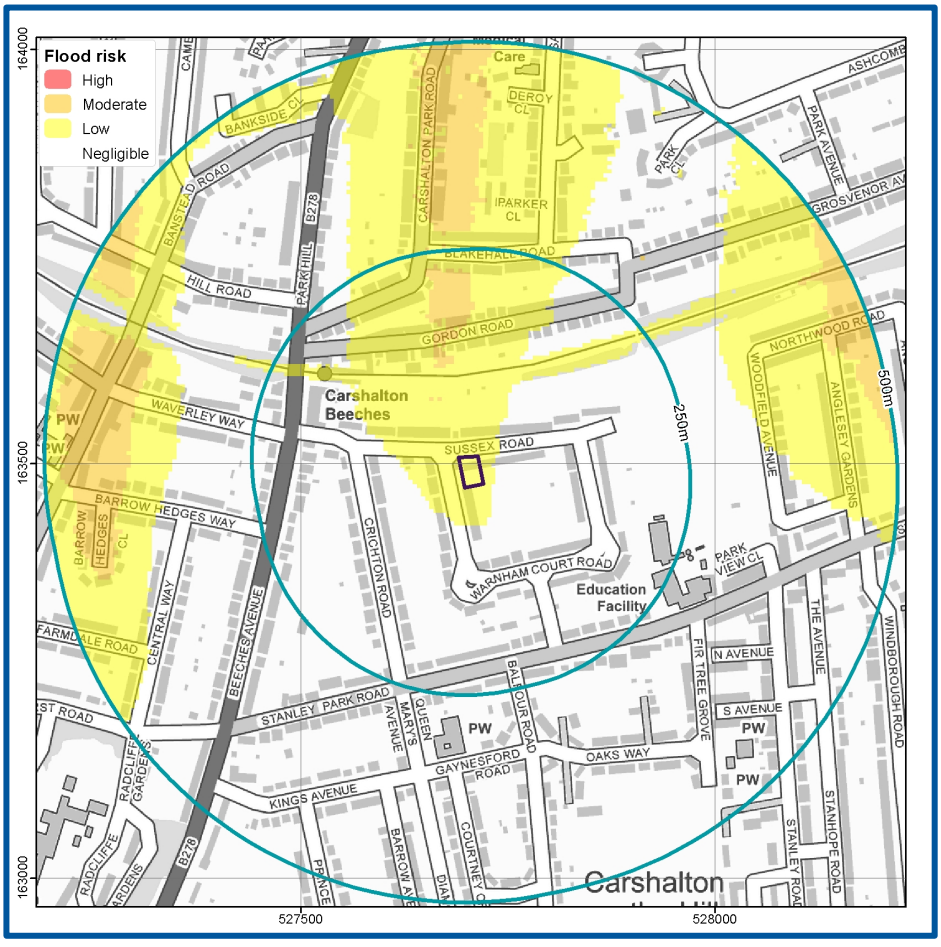
[1] A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2019). CDA's are specific to Flood Zone 1, defined as areas where runoff can and may have historically contributed to flooding downstream, although they are not necessarily areas where flooding problems may occur. Where a Site is located in Flood Zone 1 and within a CDA, a Flood Risk Assessment (FRA) is required and the Council may also request Sustainable Drainage Scheme (SuDS) features to be included within the proposed development.

Groundwater flooding

Groundwater flooding occurs when sub-surface water emerges from the ground at the surface or into Made Ground and structures. This may be as a result of persistent rainfall that recharges aquifers until they are full; or may be as a result of high river levels, or tides, driving water through near-surface deposits. Flooding may last a long time compared to surface water flooding, from weeks to months. Hence the amount of damage that is caused to property may be substantially higher.

Groundwater Flood Risk screening data (Figure 8) indicates there is a Low risk of groundwater flooding at surface in the vicinity from permeable bedrock and superficial deposits during a 1 in 100 year event. Mapped classes combine likelihood, possible severity and the uncertainty associated with predicting the subsurface system. The map is a national scale screening tool to prompt site-specific assessment where the impact of groundwater flooding would have significant adverse consequences. Mapping limitations and a number of local factors may reduce groundwater flood risk to land and property even where it lies within mapped groundwater flood risk zones, which do not mean that groundwater floods will occur across the whole of the risk area.

Figure 8. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2020)



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A site-specific assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including BGS borehole data and the EA's fluvial and tidal floodplain data (where available) to develop a conceptual groundwater model. The risk rating is refined further using the vulnerability of receptors including occupants and the existing and proposed site layout, including the presence of basements and buried infrastructure. The presence of any nearby or on-site surface water features such as drainage ditches, which could intercept groundwater have also been considered.

Based on a review of limited site specific data groundwater levels may rise in the bedrock and superficial aquifers in response to prolonged rainfall recharge events. The risks are higher for basements, buried infrastructure and soak-away systems which may be affected by high groundwater levels.

Guidance
Low Risk - There will be a remote possibility that incidence of groundwater flooding could lead to damage to property or harm to other sensitive receptors at, or near, this location.

Climate change predictions suggest an increase in the frequency and intensity of extremes in groundwater levels. Rainfall recharge patterns will vary regionally resulting in changes to average groundwater levels. A rise in peak river levels will lead to a response of increased groundwater levels in adjacent aquifers subject to the predicted climate change increases in peak river level for the local catchment. Sea level rises of between 0.4m and 1m are predicted by 2100, leading to a rise in average groundwater levels in the adjacent coastal aquifer systems, and potential increases in water levels in the associated drainage systems. The 'backing up' of groundwater levels from both coast and tidal estuary locations may extend a significant distance inland and affect infrastructure previously constructed above average groundwater levels.

The impact of climate change on groundwater levels beneath the Site is linked to the variation in rainfall recharge which is uncertain.

Flooding from Artificial Sources

Artificial sources of flood risk include waterbodies or watercourses that have been amended by means of human intervention rather than natural processes. Examples include reservoirs (and associated water supply infrastructure), docks, sewers and canals. The flooding mechanism associated with flood risk from artificial sources is primarily related to breach or failure of structures (reservoir, lake, sewer, canal, flood storage areas, etc.)

Sewer flooding

Records held by Thames Water indicate that there have been no incidences of flooding related to the surcharging of public sewers at the Site (Thames Water, 2020; Appendix B). The Strategic Flood Risk Assessment (SFRA) also has no records of sewer flooding incidences on Site (AECOM, 2015).

Guidance

Properties classified as "at risk" are those that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system either once or twice in the ten year reference period (Thames Water, 2015). Records held by Thames Water provide information relating to reported incidents, the absence of any records does not mean that the Site is not at risk of flooding.

Canal failure

According to Ordnance Survey (OS) mapping, there are no canals within 500 m of the Site.

Water supply infrastructure

Water supply infrastructure is comprised of a piped network to distribute water to private houses or industrial, commercial or institution establishments and other usage points. In urban areas, this represents a particular risk of flooding due to the large amount of water supply infrastructure, its condition and the density of buildings. The risks of flooding to properties from burst water mains cannot be readily assessed.

If more information regarding the condition and history of the water supply infrastructure within the vicinity of the Site is required, then it is advisable to contact the local water supplier Thames Water.

Culverts and bridges

The blockage of watercourses or structures by debris (that is, any material moved by a flowing stream including vegetation, sediment and man-made materials or refuse) reduces flow capacity and raises water levels, potentially increasing the risk of flooding. High water levels can cause saturation, seepage and percolation leading to failure of earth embankments or other structures. Debris accumulations can change flow patterns, leading to scour, sedimentation or structural failure.

Culverts and bridges have not been identified within 1 km of the Site.

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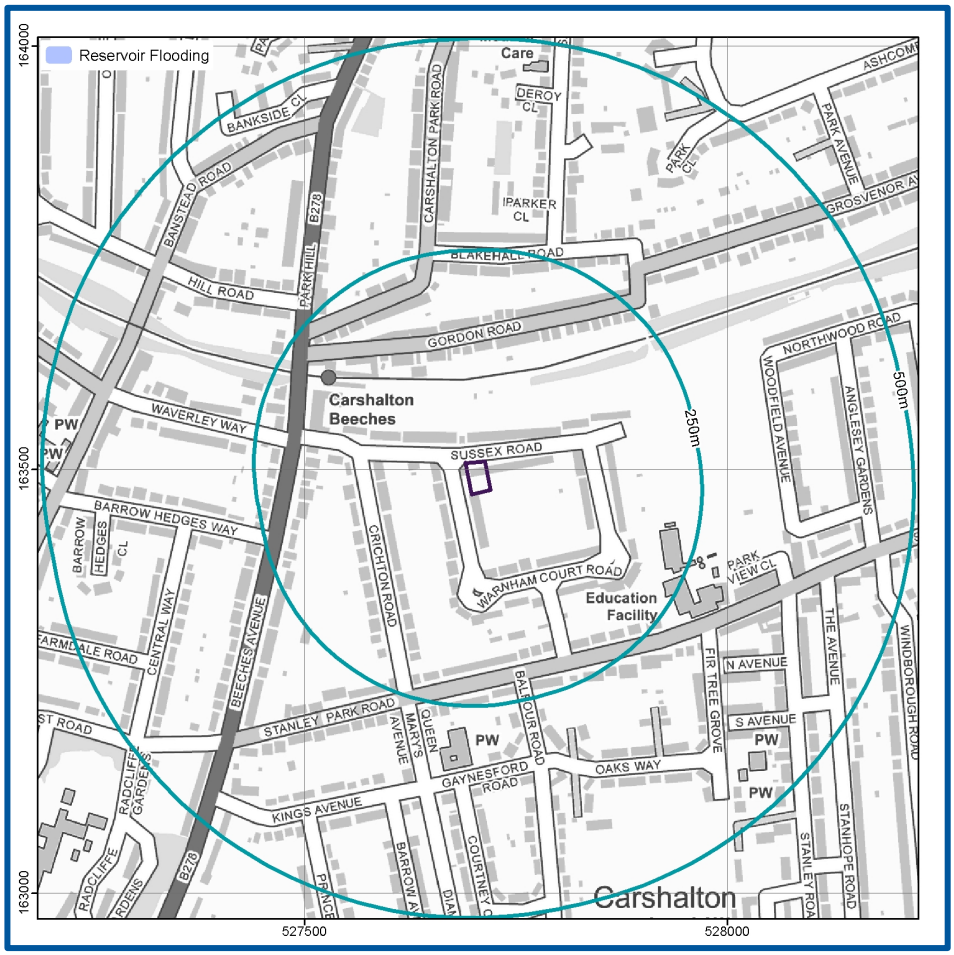
Reservoir flooding

According to the Environment Agency's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (EA, 2020).

Figure 9. EA Risk of Reservoir Flooding (EA, 2020)



Guidance

The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m^3 of water) and is based on the worst case scenario. Reservoir flooding is extremely unlikely to occur (Environment Agency, 2020).

5. Flood risk from the development

Floodplain storage

As the development is located within Flood Zone 1, there would be no losses in floodplain storage as a result of the development. Therefore, compensation for any loss in flood plain storage will not be required.

Drainage and run-off

The proposed development involves an increase of impermeable surfaces at the Site. An estimation of run-off is therefore required to permit effective site water management and prevent any increase in flood risk to off-site receptors from the Site.

Using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016), the potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated. The NPPF (2019) recommends the effects of climate change are incorporated into FRA's and the recently updated climate change guidance (published in 2016 and updated in 2019) confirms the requirements for inclusion.

As the proposed development is being changed to residential, the lifespan of the development and requirements for climate change should allow up to the 2115 scenario.

Table 2. Climate change rainfall allowances

Applies across all of England	Total potential change anticipated for 2010 to 2039	Total potential change anticipated for 2040 to 2059	Total potential change anticipated for 2060 to 2115
Upper end	10%	20%	40%
Central	5%	10%	20%

A method of investigating the run-off due to the proposed development can be calculated by multiplying the run-off per square metre by the impermeable area within the proposed development plan.

Sustainable Drainage System (SuDS)

It is recommended that attenuation of run-off is undertaken on site to compensate for proposed increases in impermeable surface areas. Attenuation may comprise the provision of storage within a Sustainable Drainage System (SuDS). SuDS can deliver benefits from improving the management of water quantity, water quality, biodiversity and amenity. Potential SuDS options are presented in the table below, subject to further investigation:

Table 3. SuDS features which may be feasible for the Site

Option	Description
Rainwater harvesting	Rainwater harvesting can collect run-off from the roofs for use in non-potable situations, using water butts for example.
Green roof	Having part/all of the roof as a green roof covered in vegetation can intercept and store a proportion of the rainfall to result in an overall reduction in the amount of surface water run-off generated from a building structure. They comprise a substrate (growth medium) layer which can be seeded with specially selected plants suitable for the local climatic conditions. Beneath the growth medium is a geotextile filter layer which filters out the substrate from entering the aggregate/geo-composite drainage layer below. At the very bottom of the green roofing, a waterproof membrane protects the roof structure below.
Permeable paving	Permeable pavements can be used for driveways, footpaths and parking areas to increase the amount of permeable land cover. Suitable aggregate materials (angular gravels with suitable grading as per CIRIA, 2007) will improve water quality due to their filtration capacity. Plastic geocellular systems beneath these surfaces can increase the void space and therefore storage but do not allow filtration unless they are combined with aggregate material and/or permeable geotextiles.
Swales	Shallow, wide and vegetated channels that can store excess run-off whilst removing any pollutants.
Soakaways	An excavation filled with gravel within the Site. Surface water run-off is piped to the soakaway.
Attenuation basins/pond	Dry basin or a permanent pond that is designed to hold excess water during a rainfall event.

It is assumed that any changes to the existing drainage system will be undertaken in accordance with best practice and that care will be taken to ensure the new development does not overload/block any existing drainage or flow pathways to/from the Site.

GeoSmart could provide a separate outline drainage strategy as required, through our SuDSmart Pro report range. A separate proposal could be provided upon request.

6. Suitability of the proposed development

The information below outlines the suitability of proposed development in relation to national and local planning policy.

National policy and guidance

The aims of the national planning policies are achieved through application of the Sequential Test and in some cases the Exception Test.

Guidance
Sequential test: The aim of this test is to steer new development towards areas with the lowest risk of flooding (NPPF, 2019). Reasonably available sites located in Flood Zone 1 should be considered before those in Flood Zone 2 and only when there are no reasonably available sites in Flood Zones 1 and 2 should development in Flood Zone 3 be considered. **Exception test:** In some cases, this may need to be applied once the Sequential Test has been considered. For the exception test to be passed it must be demonstrated that the development would provide wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.

Suitability of the proposed development, and whether the Sequential and Exception Tests are required, is based on the Flood Zone the Site is located within and the flood risk vulnerability classification of the existing and proposed development. Some developments may contain different elements of vulnerability and the highest vulnerability category should be used, unless the development is considered in its component parts.

This report has been produced to assess all development types, prior to any development. The vulnerability classification and Flood Zones are compared within Table 4 overleaf (Table 3 of the NPPG (2014)).

As the Site is located within Flood Zone 1, all types of development listed within the Table overleaf are acceptable according to National Policy.

Table 4. Flood risk vulnerability and flood zone 'compatibility (taken from NPPG, 2014)

Flood risk vulnerability classification		Essential infrastructure	Water compatible	Highly vulnerable	More vulnerable	Less vulnerable
Flood Zone	Zone 1 – low probability	✓	✓	✓	✓	✓
	Zone 2 – medium probability	✓	✓	Exception test required	✓	✓
	Zone 3a - high probability	Exception test required	✓	X	Exception test required	✓
	Zone 3b – functional flood plain	Exception test required	✓	X	X	X

Local policy and guidance

For this report, the Level 1 Strategic Flood Risk Assessment (SFRA) has been consulted. The SFRA was undertaken by (AECOM, 2015). Relevant information contained in this report for the Site area is outlined below:

- Where new development is permitted in flood risk areas, this should include appropriate resilience and resistance features, and mitigation measures including evacuation plans to address residual risk.
- Policy U2B will be enforced by London Borough of Sutton Council, where appropriate, by attaching planning conditions requiring an FRA to planning permissions. The level of detail required in the FRA is dependent on the size of the developments as well as its location within the district and a guide is outlined as follows:

  For development over 235m² impermeable area, a full FRA and Management and Maintenance plan will need to be submitted. The assessment will need to include calculations of the greenfield runoff rate, increased run-off rates and the associated volume of storm detention.
- A number of design strategies are detailed including the Water Exclusion Strategy and Water Entry Strategy. Resistance measures are aimed at preventing water ingress into

a building (Water Exclusion Strategy); they are designed to minimise the impact of floodwaters directly affecting buildings and to give occupants more time to relocate ground floor contents. These measures will probably only be effective for short duration, low depth flooding, i.e. less than 0.3m.For this report, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Guidance

Strategic Flood Risk Assessments are carried out by local authorities, in consultation with the Environment Agency, to assess the flood risk to the area from all sources both now and in the future due to climate change. They are used to inform planning decisions to ensure inappropriate development is avoided (NPPF, 2019).

7. Resilience and mitigation

Based on the available information mitigation measures outlined in the following sections are likely to help protect the development from flooding.

Rivers (fluvial) flood mitigation measures

As the Site is located in Flood Zone 1, fluvial mitigation measures are not required.

Surface water (pluvial) flood mitigation measures

As the Site is identified as at risk of pluvial flooding with flood depths of less than 0.3 m during the 100 year event, finished floor levels of the proposed development should be set a minimum of 0.3 m above existing ground levels.

In addition, the regular maintenance of any drains and culverts surrounding/on the Site should be undertaken to reduce the flood risk.

A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff from the proposed development.

Groundwater flood mitigation measures

As the Site is identified as being at Low risk of groundwater flooding, the following mitigation measures are recommended:

- Raising finished floor levels 0.3m above existing ground levels;
- Further Site Investigation into the areas at highest groundwater flood risk and any sensitive receptors on Site;
- Sump and Pump within lowered and basement areas; and
- Waterproofing of basement areas and raising of finished floor levels.

Reservoir flood mitigation measures

The Site is not a risk of flooding from reservoirs; therefore, mitigation measures are not required.

Other flood risk mitigation measures

As the Site is not identified as at risk from other sources, mitigation measures are not required.

Residual flood risk mitigation measures

The risk to the Site has been assessed from all sources of flooding and appropriate mitigation and management measures proposed to keep the users of the development safe over its lifetime. There is however a residual risk of flooding associated with the potential for failure of mitigation measures if regular maintenance and upkeep isn't undertaken. If mitigation measures are not implemented or maintained, the risk to the development will remain as the baseline risk.

Further flood mitigation information

More information on flood resistance, resilience and water entry can be found here: http://www.planningportal.gov.uk/uploads/br/flood_performance.pdf

www.knowyourfloodrisk.co.uk

8. Conclusions and recommendations

Table 5. Risk ratings following implementation and subsequent maintenance of mitigation measures

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) and Sea (coastal/tidal)	Low	N/A
Surface water (pluvial) flooding	Very Low to Medium	Low
Groundwater flooding	Low	Low
Other flood risk factors present	No	N/A

The table below provides a summary of where the responses to key questions are discussed in this report. Providing the recommended mitigation measures are put in place it is likely that flood risk to this Site will be reduced to an acceptable level.

Table 6. Summary of responses to key questions in the report

Key sources of flood risks identified	Surface water and groundwater (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	Yes (see Section 7).
Is any further work recommended?	Yes

Recommendations for mitigation are provided below, based upon the proposed development and the flood risk identified at the Site:

- As there is a risk of flooding from surface water (pluvial) sources, where flood depths are expected to be less than 0.3 m in depth, Finished Floor Levels (FFL) of the proposed development should be set at least 0.3 m above existing surrounding ground levels and ground levels should aim to slope away from buildings. Ground levels should be designed to channel any overland flows from off-site (to the west) away from the development and Site drainage systems.
- The raising of finished floor levels will also mitigate the Low risk of groundwater flooding.
- A Sustainable Drainage Strategy (SuDS) should be developed for the Site, for effective management of surface water runoff over the lifetime of the proposed development.

GeoSmart recommend the mitigation measures discussed within this report are considered as part of the proposed development where possible and evidence of this is provided to the Local Planning Authority as part of the planning application.

9. Further information

The following table includes a list of additional products by GeoSmart:

Additional GeoSmart Products			
✓	Additional assessment: SuDSmart Report		The SuDSmart Report range assesses which drainage options are available for a Site. They build on technical detail starting from simple infiltration screening and work up to more complex SuDS Assessments detailing alternative options and designs. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: FloodSmart Report		The FloodSmart Report range provides clear and pragmatic advice regarding the nature and potential significance of flood hazards which may be present at a site. Our consultants assess available data to determine the level of risk based on professional judgement and years of experience. Please contact info@geosmartinfo.co.uk for further information.
	Additional assessment: EnviroSmart Report		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective. Our EnviroSmart reports are designed to be the most cost effective solution for planning conditions. Each report is individually prepared by a highly experienced consultant conversant with Local Authority requirements. Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions. Please contact info@geosmartinfo.co.uk for further information.

10. References and glossary

References

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GeoSmart Information

Glossary

General terms

BGS	British Geological Survey
EA	Environment Agency
GeoSmart groundwater flood risk model	GeoSmart's national groundwater flood risk model takes advantage of all the available data and provides a preliminary indication of groundwater flood risk on a 50m grid covering England and Wales. The model indicates the risk of the water table coming within 1 m of the ground surface for an indicative 1 in 200 year return period scenario.
Dry-Island	An area considered at low risk of flooding (e.g. In a Flood Zone 1) that is entirely surrounded by areas at higher risk of flooding (e.g. Flood Zone 2 and 3)
Flood resilience	Flood resilience or wet-proofing accepts that water will enter the building, but through careful design will minimise damage and allow the re-occupancy of the building quickly. Mitigation measures that reduce the damage to a property caused by flooding can include water entry strategies, raising electrical sockets off the floor, hard flooring.
Flood resistance	Flood resistance, or dry-proofing, stops water entering a building. Mitigation measures that prevent or reduce the likelihood of water entering a property can include raising flood levels or installation of sandbags.
Flood Zone 1	This zone has less than a 0.1% annual probability of river flooding
Flood Zone 2	This zone has between 0.1 and 1% annual probability of river flooding and between 0.1% and 0.5 % annual probability sea flooding
Flood Zone 3	This zone has more than a 1% annual probability of river flooding and 0.5% annual probability of sea flooding
Functional Flood Plain	An area of land where water has to flow or be stored in times of flood.
Hydrologic model	A computer model that simulates surface run-off or fluvial flow. The typical accuracy of hydrologic models such as this is ±0.25m for estimating flood levels at particular locations.
OS	Ordnance Survey
Residual Flood Risk	The flood risk remaining after taking mitigating actions.
SFRA	Strategic Flood Risk Assessment. This is a brief flood risk assessment provided by the local council

SuDS	A Sustainable drainage system (SuDS) is designed to replicate, as closely as possible, the natural drainage from the Site (before development) to ensure that the flood risk downstream of the Site does not increase as a result of the land being developed. SuDS also significantly improve the quality of water leaving the Site and can also improve the amenity and biodiversity that a site has to offer. There are a range of SuDS options available to provide effective surface water management that intercept and store excess run-off. Sites over 1 Ha will usually require a sustainable drainage assessment if planning permission is required. The current proposal is that from April 2014 for more than a single dwelling the drainage system will require approval from the SuDS Approval Board (SABs).

Aquifer Types

Principal aquifer	These are layers of rock or drift deposits that have high intergranular and/or fracture permeability - meaning they usually provide a high level of water storage. They may support water supply and/or river base flow on a strategic scale.
Secondary A aquifer	Permeable layers capable of supporting water supplies at a local rather than strategic scale, and in some cases forming an important source of base flow to rivers.
Secondary B aquifer	Predominantly lower permeability layers which may store and yield limited amounts of groundwater due to localised features such as fissures, thin permeable horizons and weathering.
Secondary undifferentiated	Has been assigned in cases where it has not been possible to attribute either category A or B to a rock type due to the variable characteristics of the rock type.
Unproductive Strata	These are rock layers or drift deposits with low permeability that has negligible significance for water supply or river base flow.

NPPF (2019) terms

Exception test	Applied once the sequential test has been passed. For the exception test to be passed it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk and a site-specific FRA must demonstrate that the development will be safe for its lifetime taking account of the vulnerability of its users, without increasing flood risk elsewhere, and, where possible, will reduce flood risk overall.
Sequential test	Aims to steer new development to areas with the lowest probability of flooding.
Essential infrastructure	Essential infrastructure includes essential transport infrastructure, essential utility infrastructure and wind turbines.

Water compatible	Water compatible land uses include flood control infrastructure, water-based recreation and lifeguard/coastal stations.
Less vulnerable	Less vulnerable land uses include police/ambulance/fire stations which are not required to be operational during flooding and buildings used for shops/financial/professional/other services.
More vulnerable	More vulnerable land uses include hospitals, residential institutions, buildings used for dwelling houses/student halls/drinking establishments/hotels and sites used for holiday or short-let caravans and camping.
Highly vulnerable	Highly vulnerable land uses include police/ambulance/fire stations which are required to be operational during flooding, basement dwellings and caravans/mobile homes/park homes intended for permanent residential use.

Data Sources

Aerial Photography	Contains Ordnance Survey data © Crown copyright and database right 2020 BlueSky copyright and database rights 2020
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2020 Ordnance Survey data © Crown copyright and database right 2020
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water Features/Reservoir/ Flood Alert & Warning)	Environment Agency copyright and database rights 2020 Ordnance Survey data © Crown copyright and database right 2020
Flood Risk (Groundwater)	GeoSmart, BGS & OS GW5 (v2.3) Map (GeoSmart, 2020) Contains British Geological Survey materials © NERC 2020 Ordnance Survey data © Crown copyright and database right 2020
Location Plan	Contains Ordnance Survey data © Crown copyright and database right 2020
Topographic Data	OS LiDAR/EA Contains Ordnance Survey data © Crown copyright and database right 2020 Environment Agency copyright and database rights 2020

11. Appendices

GeoSmart Information

Appendix A

Site plans

GeoSmart Information

Appendix B

Thames Water sewer flooding report

Sewer Flooding
History Enquiry

GeoSmart Information Ltd

Search address supplied 160, Abbey Foregate
Carshalton,
SM5 3EH

Your reference 644447 PO: 88888

Our reference SFH/SFH Standard/2016_3227307

Received date **7 January 2016**

Search date **7 January 2016**

Thames Water Utilities Ltd

Property Searches
PO Box 3189
Slough SL1 4WW

DX 151280 Slough 13

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E searches@thameswater.co.uk
I www.thameswater-propertysearches.co.uk

Registered in England and Wales
No. 2366661, Registered office
Clearwater Court, Vastern Road
Reading RG1 8DB

Sewer Flooding

History Enquiry

Search address supplied: 160, Abbey Foregate, Carshalton, SM5 3EH

This search is recommended to check for any sewer flooding in a specific address or area

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(ii) any negligent or incorrect interpretation of the records searched;

(iii) and any negligent or incorrect recording of that interpretation in the search report

(iv) compensation payments

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Clearwater Court, Vastern Road
Reading RG1 8DB

Sewer Flooding

History Enquiry

History of Sewer Flooding

Is the requested address or area at risk of flooding due to overloaded public sewers?

The flooding records held by Thames Water indicate that there have been no incidents of flooding in the requested area as a result of surcharging public sewers.

For your guidance:

- A sewer is “overloaded” when the flow from a storm is unable to pass through it due to a permanent problem (e.g. flat gradient, small diameter). Flooding as a result of temporary problems such as blockages, siltation, collapses and equipment or operational failures are excluded.
- “Internal flooding” from public sewers is defined as flooding, which enters a building or passes below a suspended floor. For reporting purposes, buildings are restricted to those normally occupied and used for residential, public, commercial, business or industrial purposes.
- “At Risk” properties are those that the water company is required to include in the Regulatory Register that is presented annually to the Director General of Water Services. These are defined as properties that have suffered, or are likely to suffer, internal flooding from public foul, combined or surface water sewers due to overloading of the sewerage system more frequently than the relevant reference period (either once or twice in ten years) as determined by the Company’s reporting procedure.
- Flooding as a result of storm events proven to be exceptional and beyond the reference period of one in ten years are not included on the At Risk Register.
- Properties may be at risk of flooding but not included on the Register where flooding incidents have not been reported to the Company.
- Public Sewers are defined as those for which the Company holds statutory responsibility under the Water Industry Act 1991.
- It should be noted that flooding can occur from private sewers and drains which are not the responsibility of the Company. This report excludes flooding from private sewers and drains and the Company makes no comment upon this matter.
- For further information please contact Thames Water on Tel: 0800 316 9800 or website www.thameswater.co.uk

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GeoSmart Information

Appendix C

Environment Agency LiDAR ground elevation data

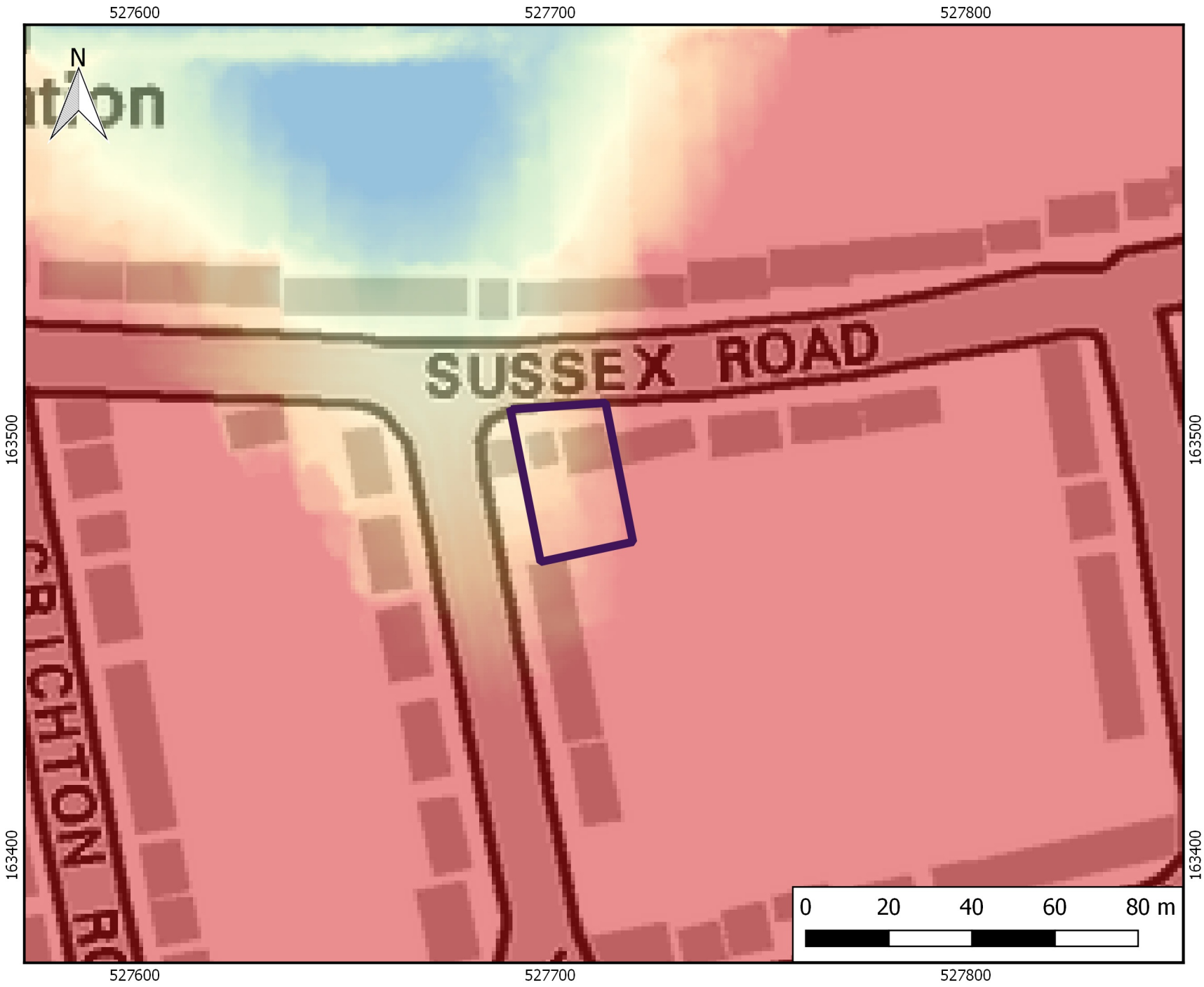

Figure C
Elevation on Site
(LIDAR Data)

Legend

- Site Boundary

TQ26se_DTM_1m

- 60
- 61.25
- 62.5
- 63.75
- 65

GeoSmart Information

Date 15/09/2020	Drawn
Scale 1:1,280	Checked
Original	Revision
File Reference	

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Tel: 01743 298 100

Email: info@geosmartinfo.co.uk

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GeoSmart Information

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The Property Ombudsman scheme

Milford House

43-55 Milford Street

Salisbury

Wiltshire SP1 2BP

Tel: 01722 333306

Fax: 01722 332296

Email: admin@tpos.co.uk

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- Normally deal with it fully and provide a final response, in writing, within 20 working days of receipt.
- Keep you informed by letter, telephone or e-mail, as you prefer, if we need more time.
- Provide a final response, in writing, at the latest within 40 working days of receipt.
- Liaise, at your request, with anyone acting formally on your behalf.

If you are not satisfied with our final response, or if we exceed the response timescales, you may refer the complaint to The Property Ombudsman scheme (TPOs): Tel: 01722 333306, E-mail: admin@tpos.co.uk.

We will co-operate fully with the Ombudsman during an investigation and comply with his final decision. Complaints should be sent to:

Martin Lucass

Commercial Director

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

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martinlucass@geosmartinfo.co.uk

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http://geosmartinfo.co.uk/knowledge-hub/cdm-2015/

Data use and limitations can be found on our website:

http://geosmartinfo.co.uk/data-limitations/