

FloodSmart



Flood Risk Assessment

Site Address

Princedom Street
Harpurhey
Manchester
M9 4GP

Date

2021-11-23

Report Status

FINAL

Grid Reference

SD 86426, 01682

Site Area

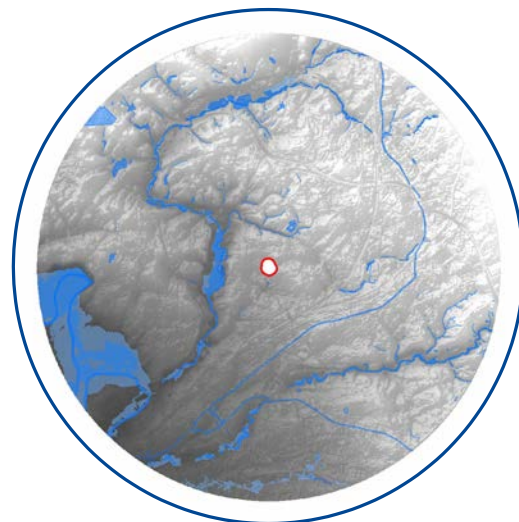
0.48 ha

Report Prepared for

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Report Reference

74481R1



RISK - Very Low to Low

The Site is located within fluvial and tidal Flood Zone 1 (low probability) and within an area defined as being at Very Low risk of fluvial flooding. The Site has a Very Low to Low risk of surface water or pluvial flooding and a Negligible 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) (2021) 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) flooding	Very Low	N/A
Surface water (pluvial) flooding	Very Low to Low	N/A
Groundwater flooding	Negligible	N/A
Other flood risk factors present	No	N/A
Is any other further work recommended?	No	Yes (see below)

N/A = mitigation not required

Summary of existing and proposed development

The Site is currently used within a greenfield capacity as a parkland / greenfield site within an urban setting.

Development proposals comprise the construction of 22 new semi-detached dwellings with associated access off Princedom Street and with landscaping to the rear of each property.

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 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 Very Low 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 Low.

Groundwater Flood Risk screening data indicate that there is a Negligible 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:

- o The EA's Risk of Flooding from Reservoir map confirms the Site is not at risk of reservoir flooding.
- o Ordnance Survey (OS) data confirm that there are no canals near to the Site.
- o A sewer flooding history search was undertaken using the Strategic Flood Risk Assessment (JBA Consulting, 2010). This confirms no recorded incidences of sewer flooding at or within the vicinity of the Site

The risk of flooding from artificial sources is considered to be Negligible.

Recommendations / Next steps

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

The regular maintenance and cleaning of all surface water drains should be undertaken to minimise any risks.

A Sustainable Drainage Strategy (SuDS) is being developed for the Site by GeoSmart ref: 74481.01R1 to effectively manage surface water run-off over the lifetime of the proposed development. The SuDS recommendations should be adopted within the final development design.

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 (2021) 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 (2021) 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, 2021).

The NPPF (2021) 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 EA and a review of the Manchester City Council Strategic Flood Risk Assessment (SFRA) are used to ascertain local flooding issues and, where appropriate, identify information to support a Sequential and/or Exception test required as part of the NPPF (2021).

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 separate SuDS report has been undertaken by Geosmart (ref: 74481.01R1) to effectively manage surface water runoff.

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	OS Data
Historical	X	X	X	
Fluvial/tidal	X	X	X	
Surface water (pluvial)	X	X	X	
Groundwater	X	X		

Source of flooding	Datasets consulted			
	Commercial Flood Maps	SFRA*	Environment Agency	OS Data
Sewer		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.

The ground levels on the Site are between 76.3 and 77.7 mAOD with the Site falling gradually in a southerly direction. This is based on EA elevation data obtained for the Site to a 1 m resolution with a vertical accuracy of ± 0.15 m (Appendix B).

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Development

The Site is currently used as a parkland / greenfield site within an urban setting.

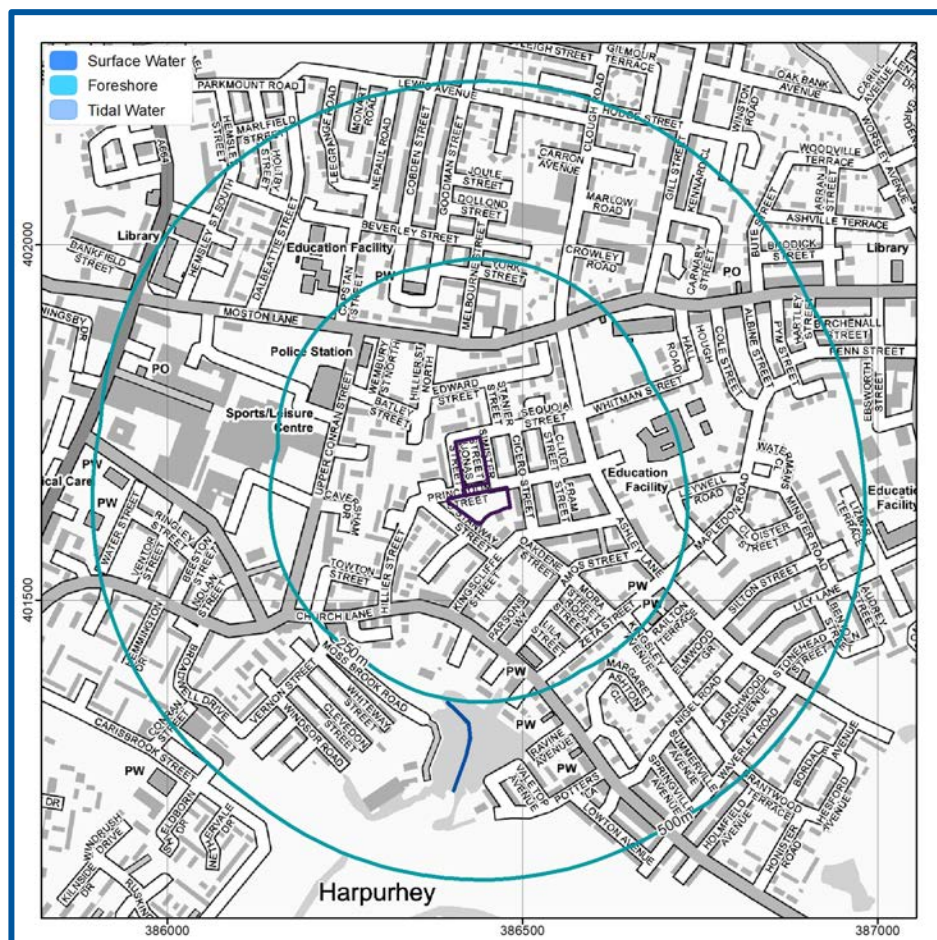
Development proposals comprise the construction of 22 new semi-detached dwellings with associated access off Princedom Street and with landscaping to the rear of each property. Site plans are included within Appendix A.

The effect of the overall development will result in an increase in number of occupants and/or users of the Site and will 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 Less Vulnerable and proposed development is More Vulnerable. The estimated lifespan of the development is 100 years.

Hydrological features

According to Ordnance Survey (OS) mapping included in the following figure, a single surface water feature is located within 500 m of the Site.

Figure 2. Surface water features (EA, 2021)

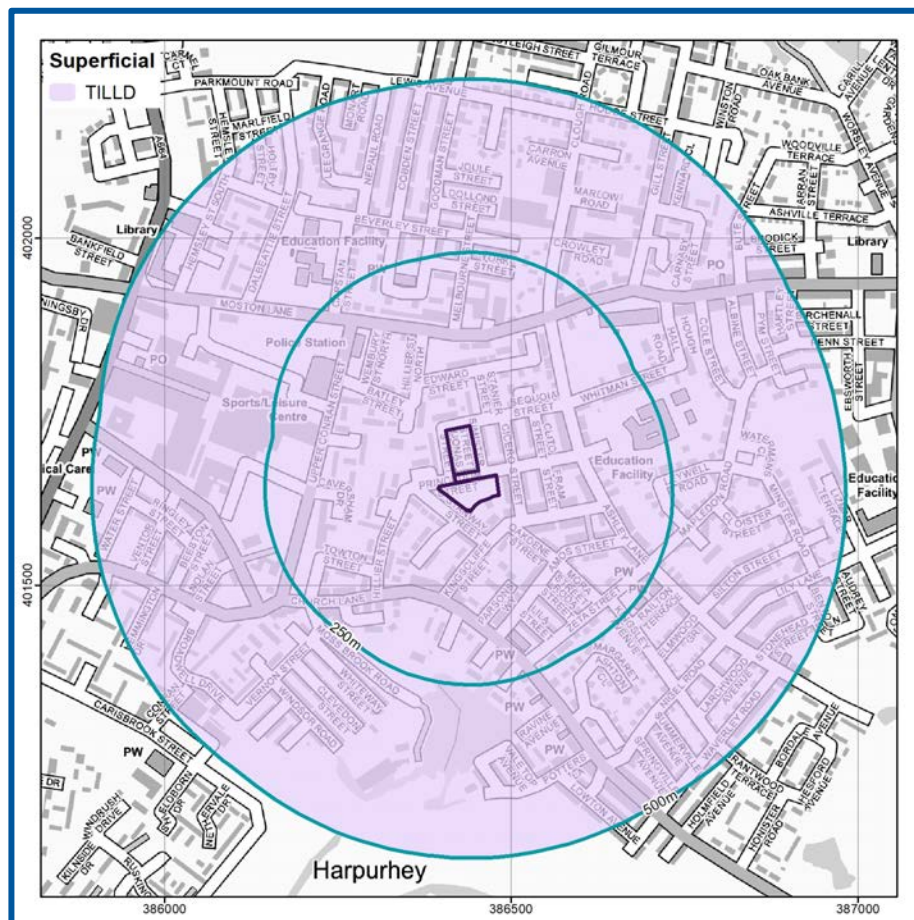


There is an unnamed water course c. 250 m to the south of the Site.

Hydrogeological features

British Geological Survey (BGS) mapping indicates the underlying superficial geology (Figure 3) consists of Till (TILLD) (BGS, 2021) which is classified as a Secondary Undifferentiated Aquifer (EA, 2021).

Figure 3. Superficial Geology (BGS, 2021)



BGS mapping indicates the underlying bedrock geology (Figure 4) consists of the Manchester Marls Formation (MM) which comprises of Mudstone (BGS, 2021) and is classified as a Secondary (B) Aquifer (EA, 2021).

Figure 4. Bedrock Geology (BGS, 2021)



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The Site does not lie within a groundwater Source Protection Zone (SPZ) (EA, 2021).

A review of the BGS borehole database (BGS, 2021) indicates the nearest and most relevant borehole record (ref: SD80SE45) is c. 95 m to the north east of the Site boundary at an elevation of approximately 80.77 mAOD; the corresponding borehole log indicates black soil to a depth of 0.30 m below ground level (bgl), sandy marl to 1.22 m bgl, yellow clay to 3.05 m bgl, brown clay to 3.96 m bgl, fine sand to 4.57 m bgl, stiff brown clay to 7.16 m bgl, fine loamy sand to 7.31 m bgl, brown sandy loam to 8.22 m bgl, stiff brown clay to 9.75 m bgl, fine sandy loam to 10.97 m bgl, sand to 23.16 m bgl and then soft loamy clay to 26.51 m bgl where the borehole record ends. No water strikes were identified within the borehole record.

The hydrogeological characteristics suggest there is potential for shallow groundwater to be present beneath the Site (potentially including perched water within the Till).

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

According to the EA's historical flood map no historical flood events have been recorded at the Site (EA, 2021).

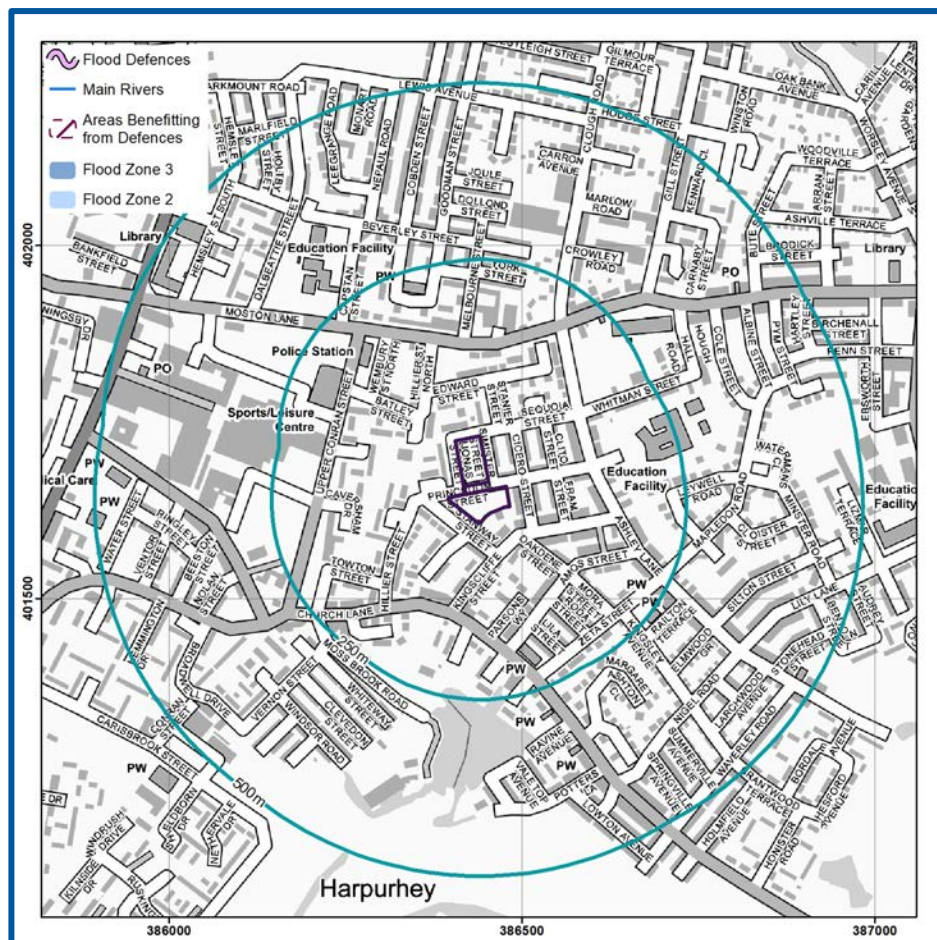
According to the SFRA, there have been no records of historical flooding at the Site.

The purpose of historical 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 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 Flood Zone 1 and is therefore classified as having a Low probability of fluvial flooding. The Site lies approximately 815 m to the east of the nearest land within Flood Zones 2 and 3.

Figure 5. EA Flood Map for Planning Purposes (EA, 2021)



Guidance

As defined in the NPPF (2021):

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 Very Low.

Figure 6. Risk of Flooding from Rivers and Sea map (EA, 2021)



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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) flood mapping, the Site is at a variable risk of pluvial flooding ranging from Very Low to Low.

The majority of the Site is at Very Low risk of pluvial flooding, however, areas to the north west adjacent to Jonas Street are at Low risk of pluvial flooding.

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%).

The Site lies immediately adjacent to areas at medium risk where flood depths could be up to 0.3 m, however, flooding is likely to be contained within the highway (Jonas Street) and is therefore unlikely to affect the Site.

Figure 7. EA Medium surface water flood risk map (EA, 2021)



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Guidance

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

Flood Depth

- 0.15 to 0.3 m - Flooding would: typically exceed kerb height, likely exceed the level of a damp-proof course, cause property flooding in some areas.

Analysis of OS mapping, ground elevation data and the EA's pluvial flow route mapping in the 1 in 1000-year event confirms the Site is not located on a potential overland flow route during a Low risk scenario.

The SFRA does not indicate reported incidents of historical surface water flooding within 100 m of the Site. However, the SFRA does confirm that the Site is located within a Critical Drainage Area (CDA)¹ (JBA Consulting, 2011).

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, 2021). The increase in surface water flood risk is best represented by the 1 in 1000-year pluvial flood extent but according to the mapping this is unlikely to impact the Site.

On-Site surface water drainage systems should be designed appropriately to manage the run-off.

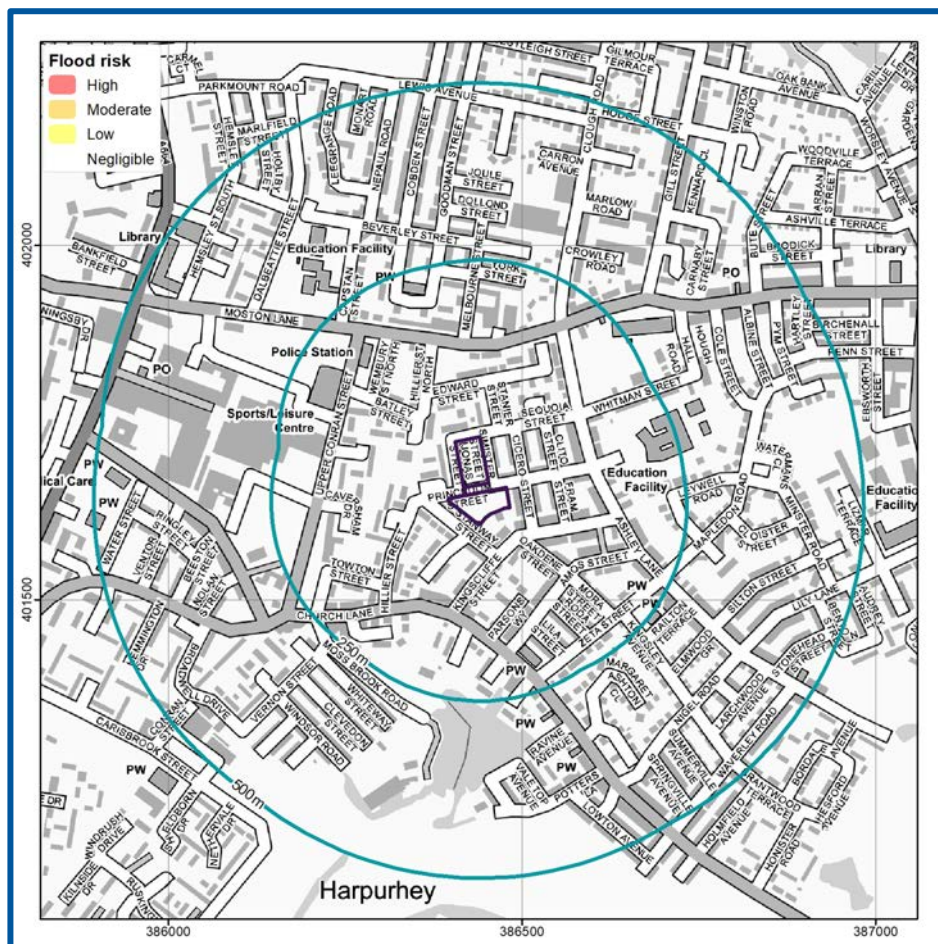
¹ A Critical Drainage Area (CDA) is an area that has critical drainage problems and which has been notified to the local planning authority as such by the Environment Agency in line with the National Planning Policy Framework (NPPF, 2021). CDA's are specific to Flood Zone 1, defined as areas where runoff 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 Negligible risk of groundwater flooding at surface in the vicinity from permeable bedrock and superficial deposits during a 1 in 100-year event.

Figure 8. GeoSmart GW5 Groundwater Flood Risk Map (GeoSmart, 2021)



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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.

The SFRA does not indicate reported incidents of historical groundwater flooding within 20 m of the Site (JBA Consulting, 2010).

Further assessment has been undertaken to refine the groundwater risk screening information on the basis of site-specific datasets (see Section 3) including relevant BGS borehole records, 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 based in the proposed Site layout, including the presence of any basements and / or 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.

Site specific assessment suggests that groundwater levels are unlikely to reach the surface at the Site.

The presence of local drainage features is likely to intercept the groundwater.

Available BGS borehole records indicate that shallow groundwater has not been encountered within close proximity to the Site.

The risks are higher for basements, buried infrastructure and soak-away systems which may be affected by high groundwater levels.

On the basis of the site-specific assessment the groundwater flood risk is still considered to be Negligible.

Guidance

Negligible 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.

Based on the available evidence the resulting increase to groundwater flood risk is not considered significant.

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

The SFRA does not state that the area surrounding the Site is at risk from sewer flooding (JBA Consulting, 2010).

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. Records held by the sewage utility company 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 (United Utilities Property Searches).

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.

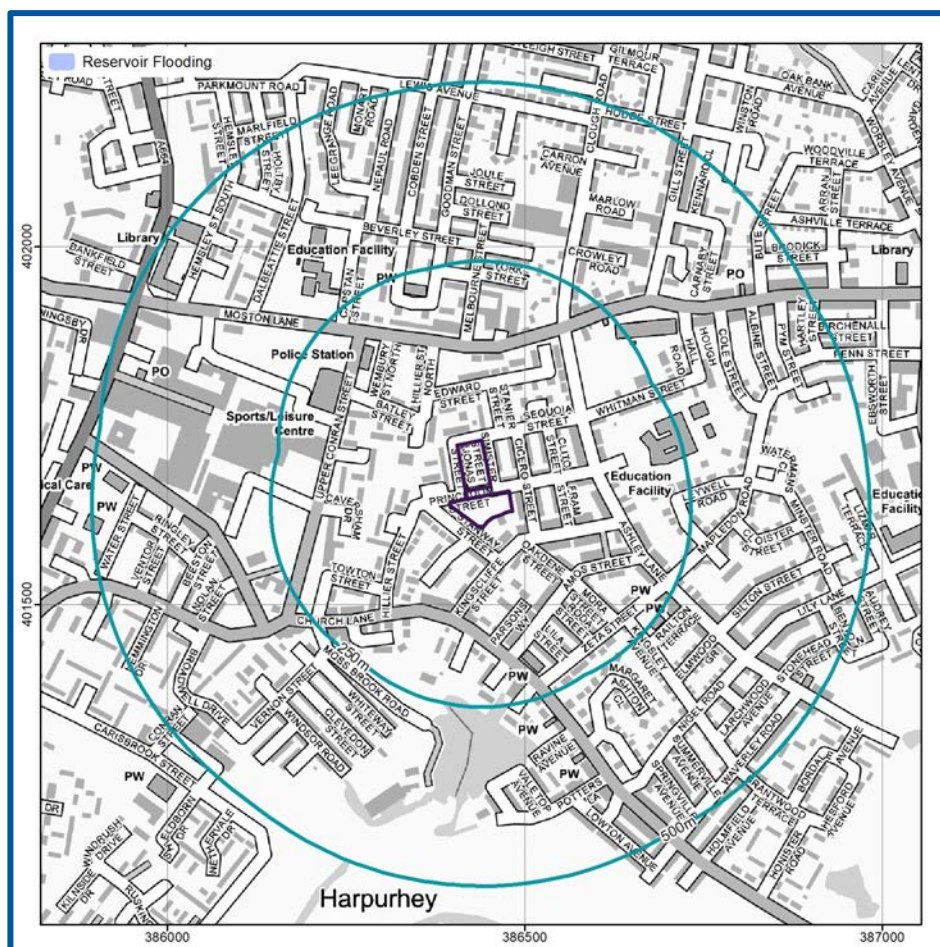
Culverts and bridges have not been identified within 500 m of the Site.

The SFRA has not identified any historical drainage issues within the Site area (JBA Consulting, 2010).

Reservoir flooding

According to the EA's Risk of Flooding from Reservoir mapping the Site is not at risk of flooding from reservoirs (Figure 9) (EA, 2021).

Figure 9. EA Risk of Reservoir Flooding (EA, 2021)



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The risk of reservoir flooding is related to the failure of a large reservoir (holding over 25,000 m³ of water) and is based on the worst-case scenario. Reservoir flooding is extremely unlikely to occur (EA, 2021).

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.

Drainage and run-off

The proposed development involves an increase in the coverage of impermeable surfaces at the Site. As a result, the rate and volume of runoff from the development is likely to increase over its lifetime. Therefore, an estimation of run-off is required to permit effective Site water management and prevent any increase in flood risk to off-Site receptors from the Site, over the lifetime of the proposed development.

The potential surface water run-off generated from the Site during a 1 in 100 year return period should be calculated, using FEH 2013 rainfall data from the online Flood Estimation Handbook (FEH), developed by NERC (2009) and CEH (2016).

The NPPF (2021) recommends the effects of climate change are incorporated into FRA's and the recently updated climate change guidance (published in 2016 and updated in 2021) confirms the requirements for inclusion within FRA's.

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%

Sustainable Drainage System (SuDS)

A separate SuDS strategy is being prepared by GeoSmart ref 74481.01R1 to effectively manage surface water runoff over the expected lifetime of the proposed development.

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, 2021). 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 3 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 3. 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, several documents have been consulted for local policy and guidance and relevant information is outlined below:

Manchester Core Strategy 2012 - 2027 (Manchester City Council, 2012):

Policy H1 – Housing provision

- Development Sites must take into account any environmental constraints, this includes the risk of flooding.
- Developments must promote and provide provisions to aid the green infrastructure, this can be achieved through design and drainage features.
- Climate change predictions suggest that the risk of flooding is likely to increase within parts of the city over the next century. It is vital therefore that new development is properly protected and incorporates drainage and other measures to reduce its impact upon the local ecosystem, including SUDS (Sustainable Drainage Systems) where practical.

Manchester Strategic Flood Risk Assessment (JBA Consulting, 2010):

- Developments should aim to incorporate SuDS features into their design to ensure that they sustainably manage surface water run-off over their expected lifetime.
- Manchester, Salford and Trafford contain over 250km of inland designated Main Rivers, which the Environment Agency has permissive powers to maintain. Fluvial flood risk is high in Manchester and the surrounding areas therefore mitigation measures must be utilized if the Site is proposed to be affected.

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, 2021).

7. Resilience and mitigation



Based on the flood risk identified at the Site, the national and local policies and guidance and proposed development, the mitigation measures outlined within this section of the report are likely to help protect the development from flooding.

Sea (coastal/tidal) flood mitigation measures

As the Site is not identified as being at risk of flooding from the sea, mitigation measures are not required.

Rivers (fluvial) flood mitigation measures

As the Site is not identified as being at risk of flooding from fluvial sources, mitigation measures are not required.

Surface water (pluvial) flood mitigation measures

As the Site is not identified as being at risk of pluvial flooding, mitigation measures are not required.

However, the regular maintenance and cleaning of surface water drains should be undertaken to minimise any future risks.

Groundwater flood mitigation measures

As the Site is not identified as being at risk of groundwater flooding, mitigation measures are not required.

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 4. Risk ratings following implementation and subsequent maintenance of mitigation measures

Source of Flood Risk	Baseline	After Mitigation
River (fluvial) and Sea (coastal/tidal) flooding	Very Low	N/A
Surface water (pluvial) flooding	Very Low to Low	N/A
Groundwater flooding	Negligible	N/A
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 5. Summary of responses to key questions in the report

Key sources of flood risks identified	None (see Section 4).
Are standard mitigation measures likely to provide protection from flooding to/from the Site?	N/A (see Section 7).
Is any further work recommended?	Yes
<p>Recommendations for mitigation are provided below, based upon the proposed development and the flood risk identified at the Site:</p> <p>The regular maintenance and cleaning of all surface water drains should be undertaken to minimise any future flood risks.</p> <p>A Sustainable Drainage Strategy (SuDS) is being developed for the Site by GeoSmart ref: 74481.01 to effectively manage surface water run-off over the lifetime of the proposed</p>	

development. The SuDS recommendations should be adopted within the final development design.

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:		Provides a robust desk-based assessment of potential contaminated land issues, taking into account the regulatory perspective.
	EnviroSmart Report		<p>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.</p> <p>Ideal for pre-planning or for addressing planning conditions for small developments. Can also be used for land transactions.</p> <p>Please contact info@geosmartinfo.co.uk for further information.</p>

10. References and glossary



References

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Ordnance Survey Mapping (2021). © Crown copyright. All rights reserved. Licence number AL 100054687. For full terms and conditions visit: www.ordnancesurvey.co.uk

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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 $\pm 0.25\text{m}$ 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 (2021) 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 2021 BlueSky copyright and database rights 2021
Bedrock & Superficial Geology	Contains British Geological Survey materials © NERC 2021 Ordnance Survey data © Crown copyright and database right 2021
Flood Risk (Flood Zone/RoFRS/Historic Flooding/Pluvial/Surface Water)	Environment Agency copyright and database rights 2021 Ordnance Survey data © Crown copyright and database right 2021

Features/Reservoir/ Flood Alert & Warning)	
Flood Risk (Groundwater)	<p>GeoSmart, BGS & OS</p> <p>GW5 (v2.4) Map (GeoSmart, 2021)</p> <p>Contains British Geological Survey materials © NERC 2021</p> <p>Ordnance Survey data © Crown copyright and database right 2021</p>
Location Plan	<p>Contains Ordnance Survey data © Crown copyright and database right 2021</p>
Topographic Data	<p>OS LiDAR/EA</p> <p>Contains Ordnance Survey data © Crown copyright and database right 2021</p> <p>Environment Agency copyright and database rights 2021</p>

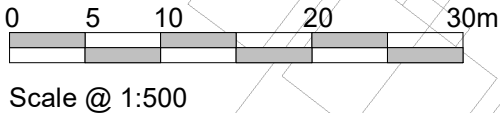
11. Appendices



Appendix A



Site plans



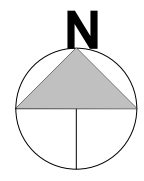
House Type Schedule Option 3		
Key	Name	Count
<div><div></div><div></div></div>	Dallington - 3B5P - NDSS	22

- Boundary Key**
- 1800mm - 600mm Masonry dwarf wall, with piers and timber infills
 - 1800mm - Timber fence with timber gates
 - 900mm - Metal powder coated railings
 - 900mm - Masonry dwarf wall, with piers and metal powder coated railing infills

- NOTES**
- All dimensions and levels are to be checked on site.
 - Any discrepancies are to be reported to the architect before any work commences
 - This drawing shall not be scaled to ascertain any dimensions. Work to figured dimensions only.
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Client notified of duties:
Principal Designer:
Unless noted below, all known hazards have been highlighted on the drawing:

- Layout subject to comments by LPA, topographical line and level survey, acoustic consultant design, tree survey, ecological surveys, statutory infrastructure layouts, title deeds etc.
- Site boundary indicative and to be confirmed



Site Boundary (0.5 Ha)

P3	11.12.2020	DAL	CK
Boundary Treatment Shown, Site boundary omitted for clarity			
P2	09.12.2020	DAL	CK
Amended to all three beds and reduced parking			
P1	19.11.2020	DAL	CK
Initial Issue			

REV	Date	Drawn by:-	Checked by:-
Status	Purpose of Issue		
S2	For Information		

drawing stage **Stage 3**

client

Mosscares St Vincents

project

Princesdom Road, Harpurhey

drawing title

Site - Proposed - Option 2

date	19.11.2020	drawn	DAL
scale @ A3	1 : 500	checked	CK

Appendix B



Environment Agency LiDAR ground elevation data

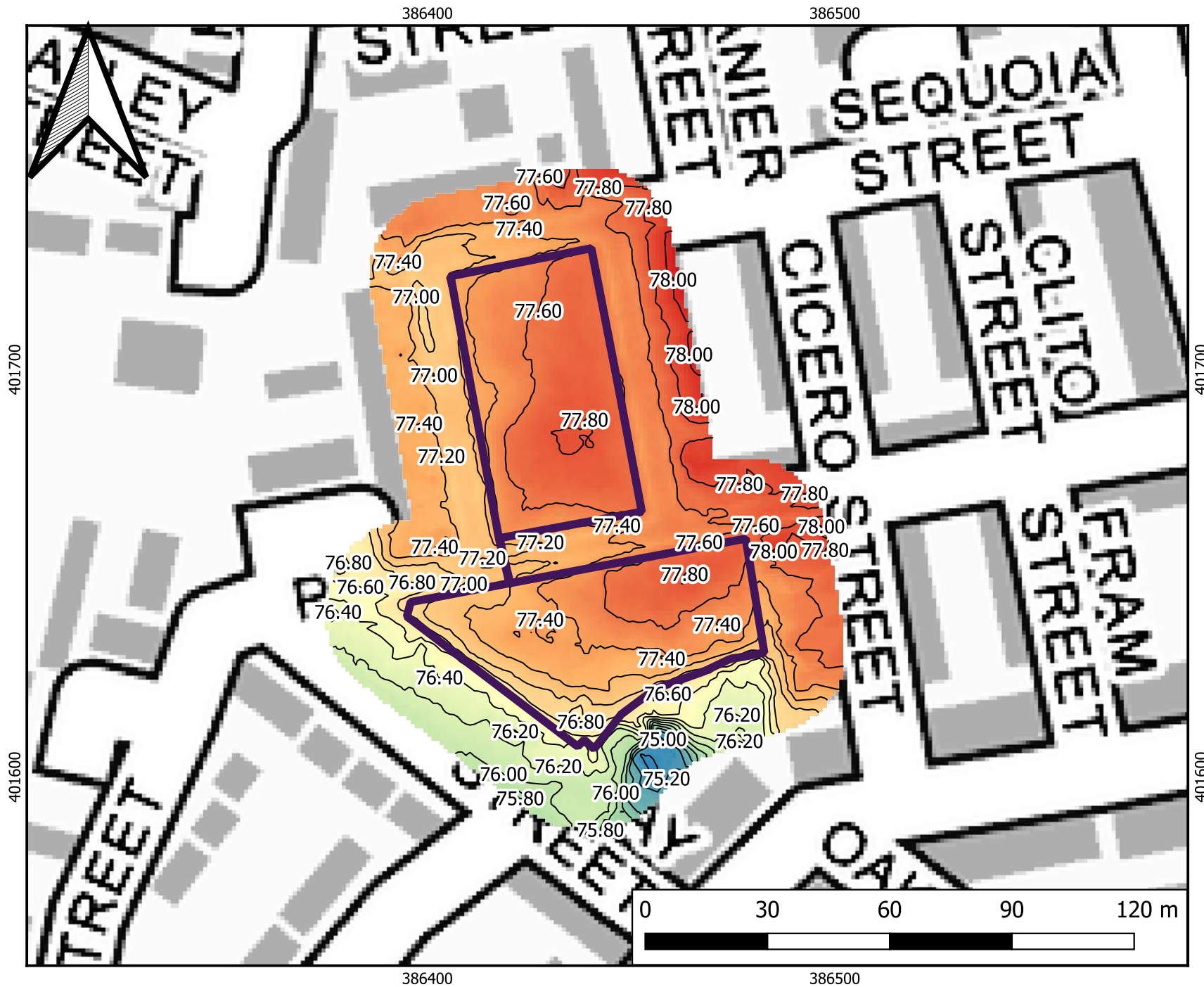


Figure D.1
Elevation on Site
(LIDAR Data)

Legend

- Site Boundary
- Elevation (mAOD)
 - 74.9270
 - 75.7248
 - 76.5225
 - 77.3202
 - 78.1180

Date 19/11/2021	Drawn
Scale 1:1,304.509213	Checked
Original	Revision
File Reference	

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Email: info@geosmartinfo.co.uk

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- promotes the best practice and quality standards within the industry for the benefit of consumers and property professionals.
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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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- Acknowledge it within 5 working days of receipt.
- 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.
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Alan White

Operations Manager

GeoSmart Information Limited

Suite 9-11, 1st Floor,

Old Bank Buildings,

Bellstone, Shrewsbury, SY1 1HU

Tel: 01743 298 100

alanwhite@geosmartinfo.co.uk

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