



JBA
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FRA for land at Plex Moss Lane

2015s3315 - FINAL Report

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Contract

This report describes work commissioned by Stuart Bate, on behalf of Sefton Council, by a letter dated 21 September 2015. Sefton Council's representative for the contract was Andrea O'Connor. Ed Blackburn and Howard Keeble of JBA Consulting carried out this work.

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Abbreviations

AEP.....	Annual Exceedance Probability
ARFQ	Advanced Request for Quotation
AStGWF.....	Areas Susceptible to Ground Water Flooding
AStSWF	Areas Susceptible to Surface Water Flooding
CDA	Critical Drainage Area
EA	Environment Agency
FEH.....	Flood Estimation Handbook
FFL.....	Finished Floor Level
FRA.....	Flood Risk Assessment
IH	Institute of Hydrology
NPPF	National Planning Policy Framework
PPG	Planning Practice Guidance
SFRA	Strategic Flood Risk Assessment
SuDS.....	Sustainable Drainage Systems
SWMP.....	Surface Water Management Plan
uFMfSW	updated Flood Map for Surface Water
UU	United Utilities

Definitions

Flood Zones

The following table is a reproduction of Table 1 of the Planning Practice Guidance¹. These refer to the probability of river and sea flooding (disregarding sea defences) as shown on the EA Flood Map for Planning (Rivers and Sea).

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

¹ <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-1-flood-zones/>

1 Introduction

1.1 Overview

This report has been prepared in response to task (i) of Sefton Council's Advanced Request for Quotation (ARFQ) (Contract Number 9ZQD-D30FN5) which requires the following:

- Undertake a Site Flood Risk Assessment (FRA) for land at Plex Moss Lane, Ainsdale, which is a proposed Gypsy and Traveller allocation in the draft Local Plan.

The proposed allocation site covers an area of approximately 1 ha and is located entirely within Flood Zone 2. The site is at fluvial flood risk from Fine Jane's Brook and is in an area densely covered with land drains designated as Ordinary Watercourses. The development is considered appropriate in this flood zone according to the National Planning Policy Framework (NPPF).

1.2 Information provided

The following information, from Sefton Council's Strategic Flood Risk Assessment (SFRA) and Surface Water Management Plan (SWMP), has been provided:

- EA Flood Zone Mapping
- EA Modelled Flood Levels
- Areas Susceptible to Ground Water Flooding
- Areas Susceptible to Surface Water Flooding
- updated Flood Map for Surface Water
- LiDAR
- SWMP Surface Water Flood Mapping

1.3 Scope of FRA

The assessment of flood risk is based on flood and hazard mapping products provided by Sefton Council and includes consideration of safe access and egress in times of flood. Owing to tight timescales for this study, direct consultation with the Environment Agency (EA) and United Utilities (UU) has not been possible.

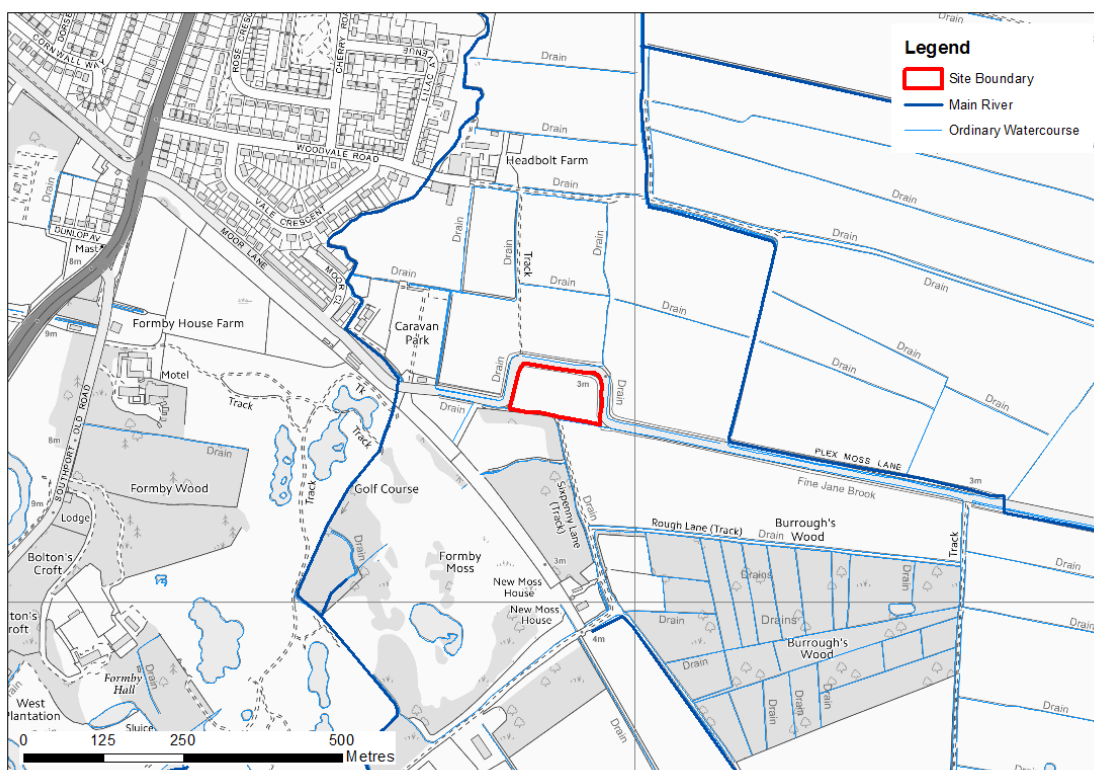
In accordance with the ARFQ this FRA addresses Part 2 of the Exception Test.

It should be noted that no site investigation or contaminated land results are available at this initial stage. This assessment has therefore been prepared in order to quantify likely attenuation volumes required onsite to ensure that development of the proposed Gypsy and Traveller site does not increase flood risk elsewhere. It should also be noted that this assessment does not include consideration of contamination issues, detailed drainage or the design of Sustainable Drainage Systems (SuDS).

2 Development description and location

The proposed allocation is for a Gypsy and Traveller site at Plex Moss Lane, Ainsdale (Figure 2-1). Interrogation of OS mapping indicates that the allocation site covers an area of approximately 1 ha of Greenfield land. The site is bounded by Plex Moss Lane to the west, north and east and access is via a track off the lane to the south western corner of the plot. Drains designated as Ordinary Watercourses follow the northern side of Plex Moss Lane around the site. Although mapping also shows drains running on the southern side of the lane along the site boundary, the site visit on 30 September 2015 determined that no drains exist on this side of the road (Figure 2-2 below).

Figure 2-1 Site location



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The site visit noted that the majority of drains and watercourses in the vicinity of the allocation site are well maintained (Figure 2-3 below). It was further observed that the road level of Plex Moss Lane around the site is higher than the site itself (Figure 2-4 below). Interrogation of LiDAR data provided for this study indicates that the road is approximately 0.9 to 1 m above site ground levels (Figure 2-5 below). It is likely, therefore, that any surface water runoff from the north will be intercepted by surrounding drains and prevented from flowing onto the site by the raised road level.

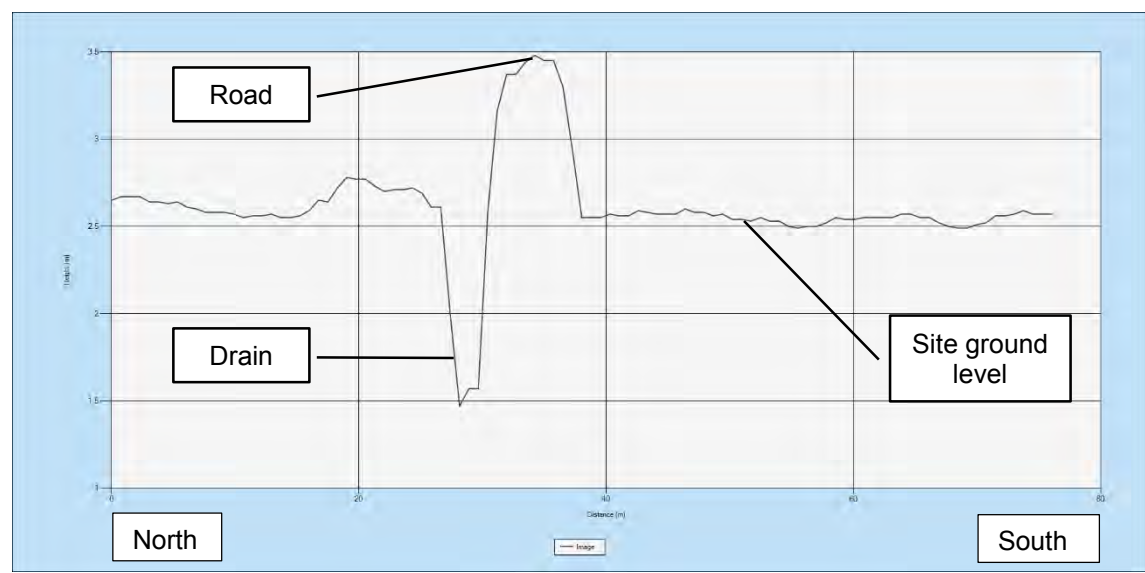
Figure 2-2 Absence of drain to south of lane



Figure 2-3 Maintained watercourses



Figure 2-4 Drain, road and site LiDAR cross section



There are no layout plans for the proposed Gypsy and Traveller site, however the proposed allocation is based on a maximum of eight permanent pitches. Assuming typical caravan dimensions of 10.7 m by 3.7 m (equivalent to 35 feet by 12 feet), the total impermeable area following development is likely to be only 316.7 m², or 0.032 ha. For the purposes of this assessment it is assumed that all access and parking areas will be created using permeable (gravelled) surfaces. It is further assumed that hard standings will be provided for the placement of static caravans and that caravans will be situated on raised blocks above the hard standing. The level of hard standings and raised blocks is to be determined by predicted flood levels on site and will include an appropriate degree of freeboard.

In accordance with NPPF Planning Practice Guidance (PPG) Table 2², the flood risk vulnerability classification for this development is 'Highly Vulnerable'.

The allocation site is not within a designated EA Flood Warning Area (FWA).

2.1 Flood History

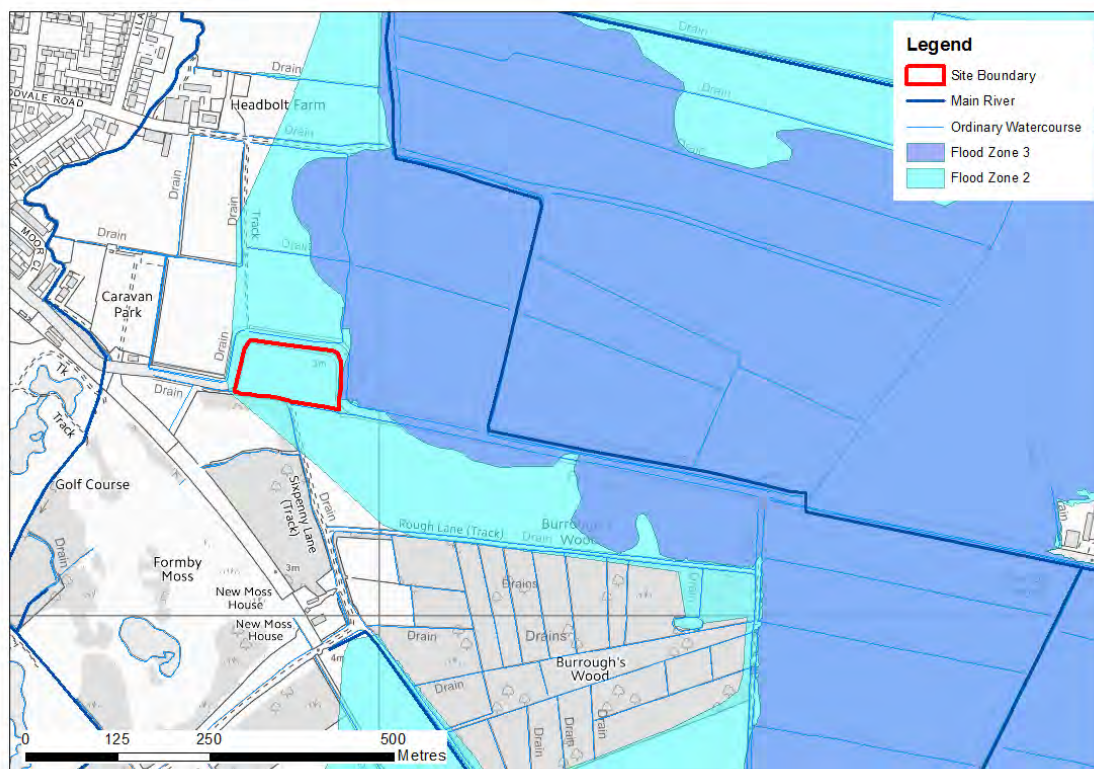
The Sefton Strategic Flood Risk Assessment (SFRA) does not have any details of flood history at the allocation site. The allocation site is not covered by the EA Historic Flood Map. Discussion with the land owner also suggests that the site has not suffered any flooding during his period of occupancy.

² <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-2-flood-risk-vulnerability-classification/>

3 Fluvial Flood Risk

The proposed allocation site is within EA Flood Zone 2 (Figure 3-1 below). The site is therefore assessed as having between a 1 in 100 and 1 in 1,000 annual probability of river flooding (between 1% and 0.1% Annual Exceedance Probability (AEP)).

Figure 3-1 EA Fluvial Flood Mapping



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As identified in Section 2, the flood risk vulnerability classification for this development is 'Highly Vulnerable'. NPPF guidance (Table 3³) states that 'Highly Vulnerable' development, and therefore the proposed Gypsy and Traveller allocation at Plex Moss Lane, is appropriate in Flood Zone 2 provided that the Exception Test is passed. Following the requirements of the ARFQ, Part 2 of the Exception Test is considered below. It is assumed that Part 1 of the Exception Test is to be covered by Sefton Council in the draft Local Plan.

The allocation site is at risk of fluvial flooding from the Main River Fine Jane's Brook which runs from north to south to the east of the site and is a tributary of Downholland Brook. Downholland Brook then joins the River Alt approximately 6.5 km downstream of the allocation site. The reaches of Fine Jane's Brook shown in Figure 3-1 above are provided with defences in the form of maintained channels with a 1 in 50 year (2% AEP) design standard of protection. A second Main River, Sandy Brook, runs from north to south to the west of the site but EA mapping does not indicate any fluvial flood risk from this watercourse to the development.

It is noted that the site is also in an area densely covered with drains designated as Ordinary Watercourses.

The allocation site is not covered by the EA Historic Flood Map.

The allocation site is not within a designated EA Flood Warning Area (FWA).

³ <http://planningguidance.planningportal.gov.uk/blog/guidance/flood-risk-and-coastal-change/flood-zone-and-flood-risk-tables/table-3-flood-risk-vulnerability-and-flood-zone-compatibility/>

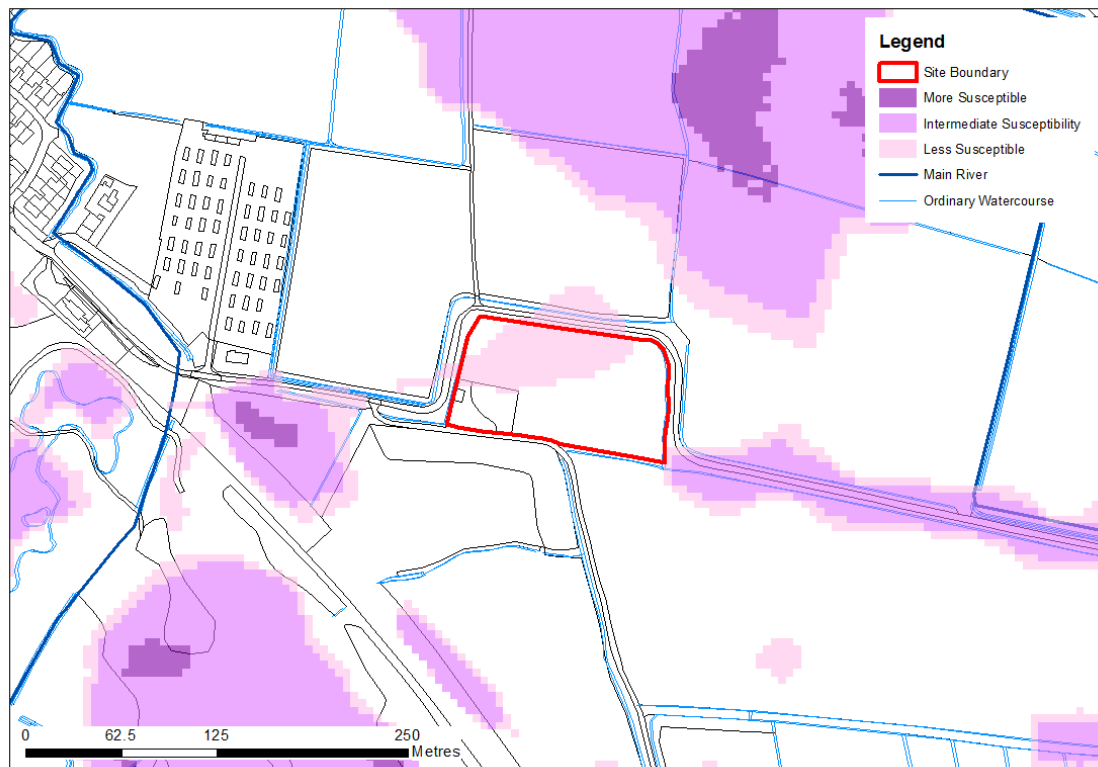
The proposed development is for a Gypsy and Traveller site consisting of up to eight permanent pitches. It is assumed that hard standings will be provided for the placement of static caravans and that caravans will be situated on raised blocks above the hard standing.

EA modelled flood levels for Fine Jane's Brook have been provided by Sefton Council (Appendix A). These indicate that the 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) flood levels in the vicinity of the allocation site are 2.6 mAOD and 2.82 mAOD respectively. Average site ground levels have been estimated from LiDAR to be 2.55 mAOD. Flood depths at the site for the 1 in 1000 year (0.1% AEP) event are therefore estimated to be 0.27 m. The raised level of Plex Moss Lane above the floodplain and the allocation site is likely to prevent the site from being inundated in an event greater than 1 in 100 years (1%).

4 Surface Water Flood Risk

Areas Susceptible to Surface Water Flooding (AStSWF) mapping indicates that part of the allocation site and the access route along Plex Moss Lane are classified as Less Susceptible to flooding from a 1 in 200 year (0.5% AEP) storm event (Figure 4-1 below). Flood depths are estimated to be in the range 0.1 m to 0.3 m deep in these areas.

Figure 4-1 Areas Susceptible to Surface Water Flooding

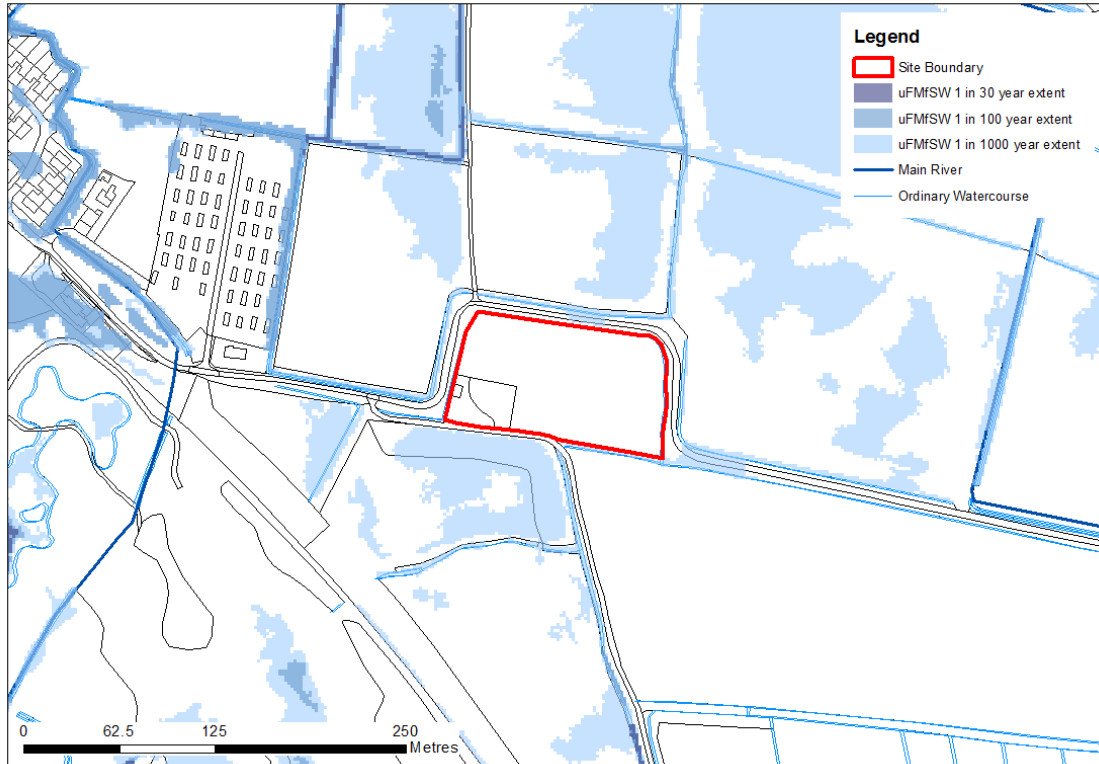


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The updated Flood Map for Surface Water (uFMfSW) indicates that the allocation site is unlikely to be at risk of surface water flooding (Figure 4-2 below). This supports the site visit observation that any surface water runoff from the north will be intercepted by surrounding drains and prevented from flowing onto the site by the raised level of Plex Moss Lane. It should be noted that no uFMfSW flood depth data has been provided at this stage.

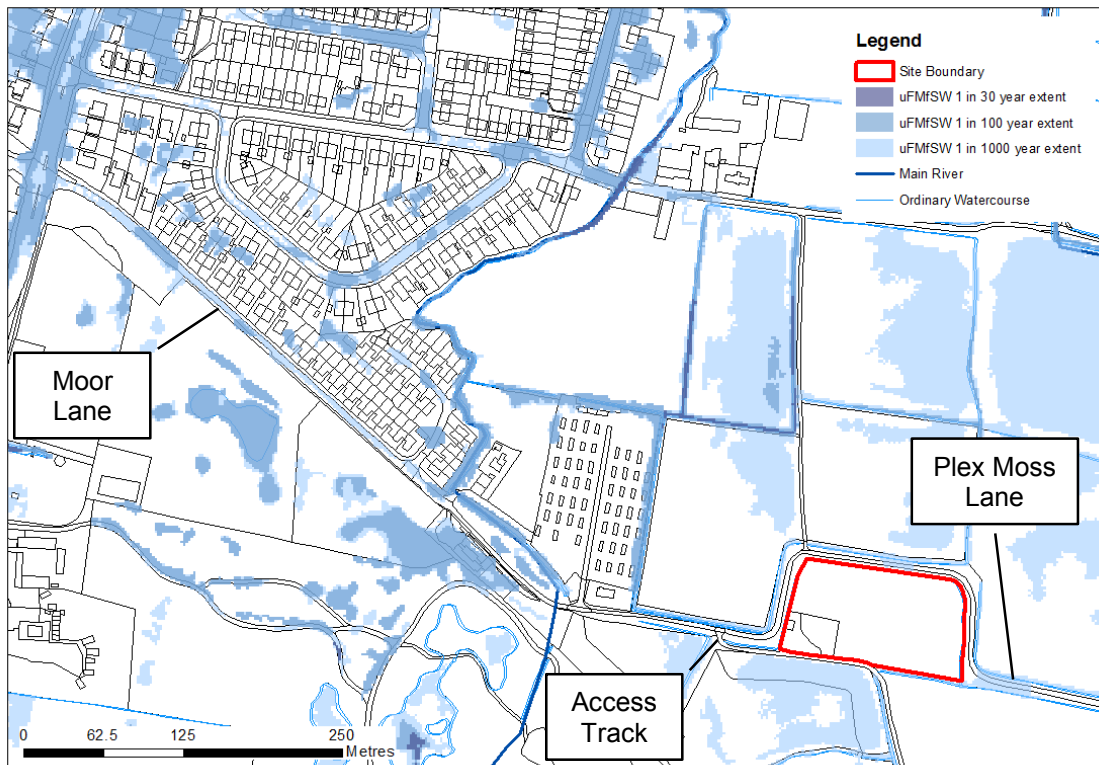
Although the private access track from Plex Moss Lane to the site is not shown to be at risk of surface water flooding, uFMfSW mapping indicates that parts of Plex Moss Lane to the east, and Moss Lane to the west, could be at risk from surface water in a 1 in 100 year (1% AEP) event (Figure 4-3 below). However, it is noted that pedestrian access on the footpath along Moor Lane may remain dry during surface water storm events.

Figure 4-2 Updated Flood Map for Surface Water



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Figure 4-3 uFMfSW Access and Egress



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SWMP mapping does not extend to cover the entire allocation site at Plex Moss Lane. It is therefore not possible to fully assess surface water flood risk to the site using this dataset.

It is noted that the allocation site is not within a designated Critical Drainage Area (CDA).

5 Other Sources of Flood Risk

5.1 Tidal

Tidal flood risk mapping from the Sefton SFRA indicates that the allocation site is not at risk of tidal flooding.

5.2 Groundwater

Areas Susceptible to Ground Water Flooding (AStGWF) mapping indicates that the allocation site is located within an area considered to be susceptible to groundwater emergence. The relevant 1 km grid square covering the site suggests that between 50 to 75% of the grid square area could be susceptible to groundwater emergence from superficial deposits. It should be noted that the AStGWF dataset does not take account of the chance of flooding from groundwater rebound.

5.3 Reservoir

Reservoir inundation mapping from the Sefton SFRA indicates that the allocation site is not at risk from uncontrolled releases from reservoirs.

5.4 Canal

Canal risk mapping from the Sefton SFRA indicates that the allocation site is not at risk of flooding from canals.

6 Flood Risk Management measures

6.1 Finished Floor Levels

In accordance with Sefton SFRA requirements, ground floor levels of 'More Vulnerable' development should be 600 mm above the 1 in 100 year (1% AEP) fluvial flood level. EA modelled data indicates that the 1 in 100 year (1% AEP) fluvial level is predicted to be 2.60 mAOD. The Finished Floor Level (FFL) of any caravans on site should therefore be raised to at least 3.20 mAOD, which is also above the 1 in 1000 year (0.1% AEP) flood level of 2.82 mAOD, to mitigate against fluvial flood risk. This equates to approximately 0.65 m above average ground levels on site and will ensure caravans are not at risk of flotation. It should be noted that EA modelled levels do not take into account the presence of flood defences on Fine Jane's Brook.

For all new development, the Sefton SFRA states that it is good practice and it is recommended to have FFLs at least 0.3 m above the finished ground level. In addition to this general guidance, developers should review the depth outputs from the SWMP for the 1 in 100 annual probability event, and use this information so that their development proposals specify floor levels that are at least 300mm higher. In absence of SWMP outputs covering the allocation site, it is recommended that FFLs are set at least 0.3 m above site ground level to mitigate against surface water flood risk. This will be exceeded by the fluvial FFL requirements discussed above.

Raised FFLs will also help to mitigate against any potential Groundwater emergence at the allocation site.

6.2 Safe Access and Egress

Safe access and egress should be provided where possible for proposed developments. Safe access is considered to be dry for 'More Vulnerable' or 'Highly Vulnerable' development unless under exceptional circumstances.

Fluvial flood mapping indicates that the access track off Plex Moss Lane is partially covered by Flood Zone 2. As indicated in Section 3, the 1 in 1000 year (0.1% AEP) modelled fluvial flood level is 2.82 mAOD. In accordance with the above paragraph, the access track should be raised above 2.82 mAOD to ensure that access and egress routes remain dry up to the 1 in 1000 year (0.1% AEP) fluvial flood event.

Although available mapping indicates that the access track off Plex Moss Lane is likely to remain dry during surface water storm events, parts of Plex Moss Lane to the east, and Moss Lane to the west, could be at risk of inundation from surface water in a 1 in 100 year (1% AEP) event. However, it is noted that pedestrian access on the footpath along Moor Lane may remain dry during surface water storm events.

7 Surface Water Management

In accordance with PPG, this report assesses the volumes of surface water runoff likely to be generated by the proposed development. Proposals for surface water management are made to ensure any increased runoff does not cause flood risk elsewhere, in accordance with Sefton SFRA requirements for greenfield sites where development should restrict runoff to existing runoff rates and where possible volumes. Allowances have been made for the impact of climate change on increasing rainfall.

Based on the assumptions outlined in Section 2 the proposed development of eight permanent pitches is likely to result in an impermeable area of approximately 0.032 ha. This is equivalent to less than 1% of the total site area.

Detailed ground investigation results were not available at the time of writing this FRA. Furthermore, indicative SuDS suitability mapping from the SFRA suggests that the allocation site is likely to have very low potential for SuDS due to the possibility of groundwater emergence at the site. This is supported by anecdotal evidence from the landowner that site ground conditions consist of peat underlain with clay. We have therefore based our review on providing a fully compensated surface water management scheme on site to restrict surface water runoff from the development. A conventional piped surface water drainage system including a combination of storage tanks or oversized pipes is envisaged at this stage as a means of regulating surface water discharge to the sewer network.

7.1 Greenfield Runoff Rate

Greenfield runoff rates have been estimated for the allocation site in accordance with EA guidance Rainfall runoff management for developments using the drainage tools provided on the UK SuDS Tools Website⁴. The EA guidance indicates that two methods of calculating Greenfield runoff peak flow rates can be used, the Institute of Hydrology (IH) Report 124 method, or the Flood Estimation Handbook (FEH) statistical method. Further details of the strengths and weaknesses of these methods are available in the EA guidance. Runoff rates (l/s) for the allocation site estimated using both methods are provided in Table 6-1 below for comparison. A Greenfield runoff calculation record is provided in Appendix B.

Table 6-1 Estimated Greenfield runoff rates (l/s)

Method	IH124	FEH
QBAR*	1.38	3.49
1 in 1 year	5.00**	5.00
1 in 30 years	5.00**	5.92
1 in 100 years	5.00**	7.25

*QBAR - Mean Annual Flood flow rate.

** Note that a minimum flow of 5 l/s has been applied in this instance in accordance with EA guidance.

As the IH124 method produces the most conservative results, it is recommended that these discharge flow rate constraints are applied at this stage. Permissible discharge rates for the site will need to be agreed with the relevant authority at detailed design.

7.2 Surface Water Risks

Rainfall depths for the 30 year and 100 year rainfall events at the site were abstracted from the FEH CD-ROM. The rainfall depths were increased by an allowance of 30% to account for the effects of climate change (Table 6-2 below).

⁴ <http://geoservergisweb2.hrwallingford.co.uk/uksd/2015s3315-PlexMossLaneFRAFINALReport.docx>

Table 6-2 Design rainfall depths

Duration (hours)	30-year rainfall (mm)	30-year rainfall plus 30% (mm)	100-year rainfall (mm)	100-year rainfall plus 30% (mm)
0.25	23.1	30.0	34.0	44.2
0.5	27.2	35.4	39.4	51.2
0.75	30.0	39.0	42.9	55.8
1	32.2	41.8	45.6	59.3
1.5	35.5	46.1	49.7	64.6
2	38.0	49.4	52.8	68.7
3	41.9	54.5	57.6	74.8
4	44.9	58.4	61.2	79.5
6	49.5	64.4	66.6	86.6
8	53.1	69.0	70.8	92.1
10	56.0	72.8	74.3	96.5
12	58.5	76.1	77.2	100.3
18	65.3	84.9	85.1	110.6
24	70.6	91.8	91.2	118.6
36	78.8	102.5	100.6	130.8
48	85.2	110.8	107.9	140.2

Likely attenuation volumes for the proposed development are provided in Table 6-3 below. These values are based on limiting discharge to 5 l/s for both the 1 in 30 year and 1 in 100 year climate change events in accordance with the Greenfield runoff rates estimated in Section 6-1.

Table 6-3 Estimated attenuation volumes (m³)

Design event (including climate change)	Critical storm duration Hours	Inflow volume m ³	Outflow volume m ³	Attenuation required m ³	Time to empty (assuming no infiltration) Hours
1 in 30 year rainfall plus 30%	0.25	10	2	7	0.8
1 in 100 year rainfall plus 30%	0.25	14	2	12 (5 m ³ of exceedance storage)	1.3

The attenuation volumes estimated above assume a gravity outfall to an adjacent Ordinary Watercourse or Main River. The final point of discharge is to be determined at detailed design.

7.3 Outline Drainage Strategy

In accordance with Table 6-2 and in the absence of any infiltration drainage for impermeable areas, the total attenuation required for the proposed development for 1 in 30 year and 1 in 100 year design events including climate change are estimated to be 7 m³ and 12 m³ respectively. These volumes are based on a discharge rate of 5 l/s. As estimated attenuation volumes are relatively small, it is anticipated that the drainage system could be designed to provide sufficient storage for the 1 in 100 year design event including climate change. Attenuation storage is likely to be accommodated beneath ground level in storage tanks or oversized pipes. Owing to the availability

of open space on site, an attenuation pond could be utilised. However, as groundwater depths could be shallow in this area, a fully sealed system is likely to be required.

Owing to the absence of ground investigations and percolation tests to date, a fully attenuated surface water system has been appraised at this outline planning stage. However, opportunities for SuDS should be fully investigated at detailed design stage.

Sewer maps have not been obtained at this stage. However, the nearest public sewers are likely to serve housing on Moor Lane, approximately 350 m to the West of the site. It is assumed that site surface water will discharge to an adjacent Ordinary Watercourse or Main River. Consent to discharge will need to be obtained from the relevant authority at detailed design.

8 Exception Test

8.1 Exception Test

Exception Test requirements are given in Paragraph 102⁵ of NPPF as follows.

For the Exception Test to be passed:

1. it must be demonstrated that the development provides wider sustainability benefits to the community that outweigh flood risk, informed by a Strategic Flood Risk Assessment where one has been prepared; and
2. a site-specific flood risk assessment 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.

As stated previously, the ARFQ for this assessment only requires the FRA to address Part 2 of the Exception Test. It is assumed that Part 1 of the Exception Test is to be covered by Sefton Council in the draft Local Plan.

Mitigation measures including FFLs and safe access and egress outlined in Sections 3 and 4 will ensure that the proposed Gypsy and Traveller allocation at Plex Moss Lane will be safe for the lifetime of the development.

Minimal increase in impermeable areas, along with surface water management measures provided in the Outline Drainage Strategy (Section 6.3) will ensure that flood risk is not increased elsewhere following development of the site.

Taking into account the mitigation measures outlined above, and in combination with effective on site surface water management, it is considered that development of the proposed allocation site passes Part 2 of the Exception Test.

⁵ http://planningguidance.planningportal.gov.uk/blog/policy/achieving-sustainable-development/delivering-sustainable-development/10-meeting-the-challenge-of-climate-change-flooding-and-coastal-change/#paragraph_102

9 Conclusion and Discussion

This report has been prepared in response to task (i) of Sefton Council's ARFQ (Contract Number 9ZQD-D30FN5) which requires a site FRA for a proposed Gypsy and Traveller allocation on land at Plex Moss Lane, Ainsdale.

The proposed allocation site covers an area of approximately 1 ha and is located entirely within Flood Zone 2. The site is at fluvial flood risk from Fine Jane's Brook and is in an area densely covered with drains and ditches designated as Ordinary Watercourses.

There are no layout plans for the proposed Gypsy and Traveller site but the proposed allocation is based on a maximum of eight permanent pitches. Assuming typical caravan dimensions of 10.7 m by 3.7 m (equivalent to 35 feet by 12 feet), the total impermeable area following development is likely to be only 316.7 m², or 0.032 ha. For the purposes of this assessment it is assumed that all access and parking areas will be created using permeable surfaces. It is further assumed that hard standings will be provided for the placement of static caravans and that caravans will be situated on raised blocks above the hard standing.

The proposed allocation site is within EA Flood Zone 2 and is therefore assessed as having between a 1 in 100 and 1 in 1,000 annual probability of fluvial flooding (between 1% and 0.1% AEP) from Fine Jane's Brook.

EA modelled flood levels for Fine Jane's Brook indicate that the 1 in 100 year (1% AEP) and 1 in 1000 year (0.1% AEP) flood levels in the vicinity of the allocation site are 2.6 mAOD and 2.82 mAOD respectively. Flood depths at the site for the 1 in 1000 year (0.1% AEP) event have been estimated as 0.27 m.

AStSWF mapping indicates that part of the allocation site and the access route along Plex Moss Lane are classified as Less Susceptible to flooding from a 1 in 200 year (0.5% AEP) storm event. Flood depths are estimated to be in the range 0.1 m to 0.3 m deep in these areas.

The uFMfSW indicates that the allocation site is unlikely to be at risk of surface water flooding. Although the private access track from Plex Moss Lane to the site is not shown to be at risk of surface water flooding, uFMfSW mapping indicates that parts of Plex Moss Lane to the east, and Moss Lane to the west, could be at risk of inundation from surface water in a 1 in 100 year (1% AEP) event. However, it is noted that pedestrian access on the footpath along Moor Lane may remain dry during surface water storm events.

SWMP mapping does not extend to cover the entire allocation site at Plex Moss Lane. It is therefore not possible to assess surface water flood risk to the site using this dataset.

AStGWF mapping indicates that the allocation site is located within an area considered to be susceptible to groundwater emergence. The site is not assessed to be at risk of flooding from other sources including tidal, reservoirs and canals.

Attenuation requirements for the 1 in 30 year and 1 in 100 year design events including climate change are estimated to be 7 m³ and 12 m³ respectively. As these attenuation volumes are relatively small, it is anticipated that the drainage system could be designed to provide sufficient storage for the 1 in 100 year design event including climate change. Attenuation storage is likely to be accommodated beneath ground level in storage tanks or oversized pipes. Owing to the availability of open space on site, an attenuation pond could be utilised. However, as groundwater depths could be shallow in this area, a fully sealed system is likely to be required.

Owing to the absence of ground investigations and percolation tests to date, a fully attenuated surface water system has been appraised at this outline planning stage. However, opportunities for SuDS should be fully investigated at detailed design stage.

The ARFQ for this assessment only requires the FRA to address Part 2 of the Exception Test. It is assumed that Part 1 of the Exception Test is to be covered by Sefton Council in the draft Local Plan.

Mitigation measures including FFLs and safe access and egress should ensure that the proposed Gypsy and Traveller allocation at Plex Moss Lane, Ainsdale will be safe for the lifetime of the development.

Minimal increase in impermeable areas, along with surface water management measures provided in the Outline Drainage Strategy should ensure that flood risk is not increased elsewhere following development of the site.

Taking into account the mitigation measures outlined above, and in combination with effective on site surface water management, it is considered that development of the proposed allocation site passes Part 2 of the Exception Test.

Appendices

- A EA modelled flood levels**
- B Greenfield runoff estimation record**

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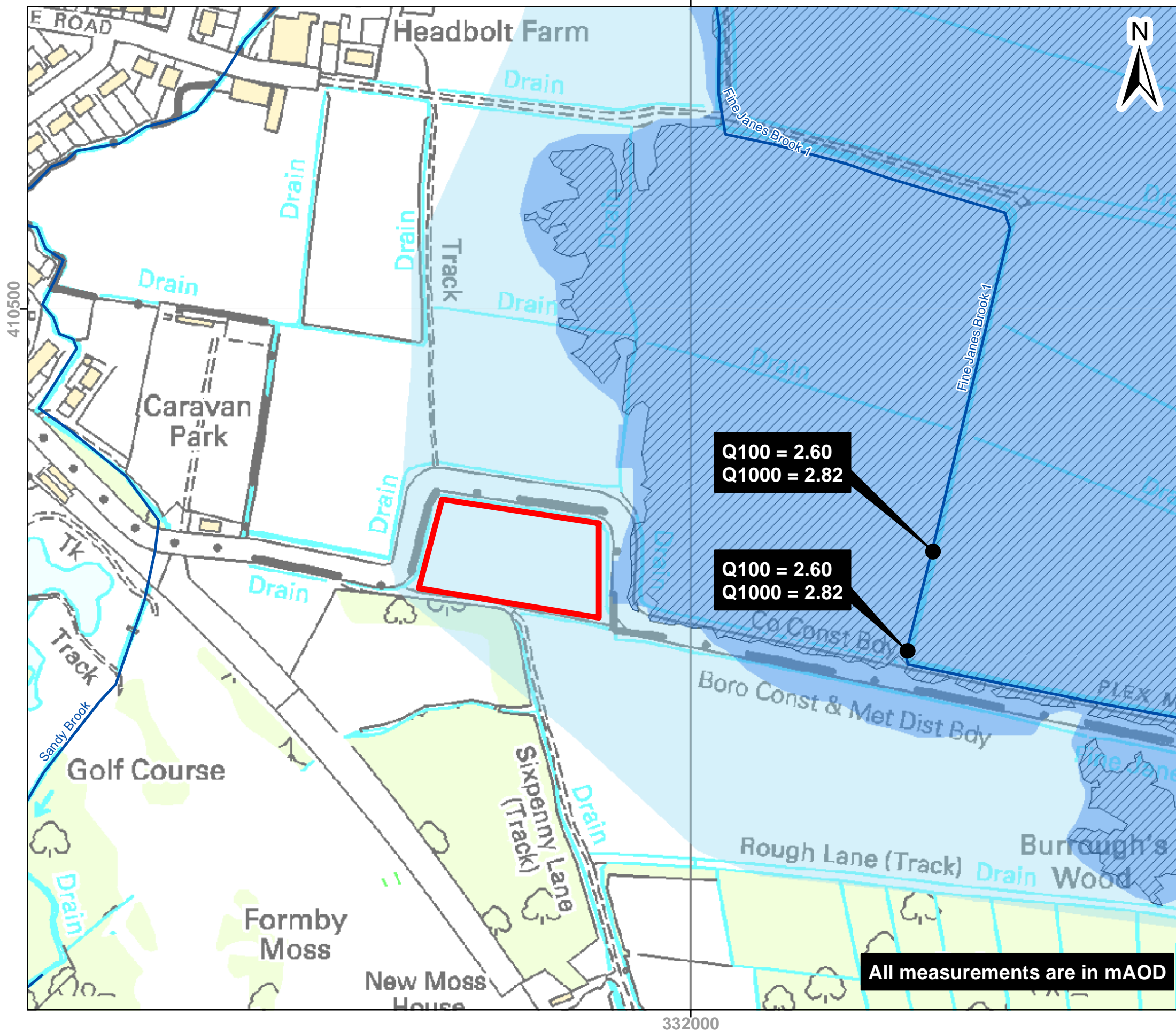


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Fluvial Flood Level Map: Plex Moss Lane, Ainsdale

Produced: 12 October 2015
 Our Ref: CL4957HR
 NGR: SD 31877 10328



Key

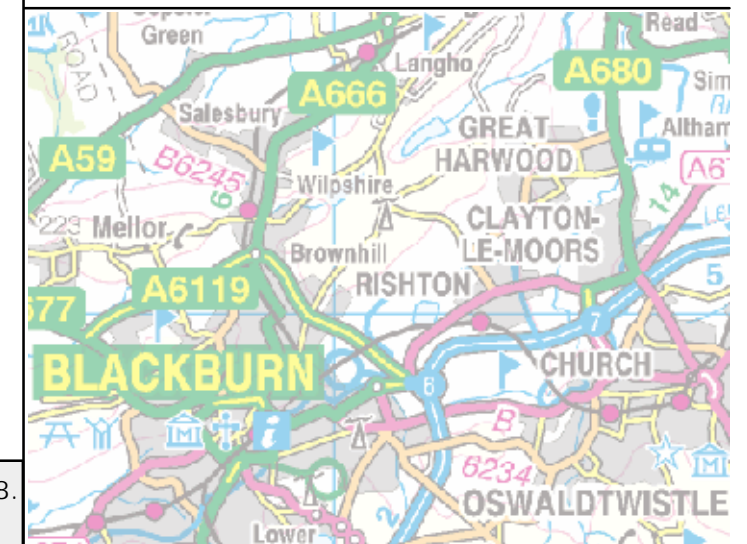
-  Main River
-  Flood Zone 3
-  Flood Zone 2
-  Areas Benefiting from Defences

Flood Zone 3 shows the area that could be affected by flooding:

- from the sea with a 1 in 200 or greater chance of happening each year
- or from a river with a 1 in 100 or greater chance of happening each year.

Flood Zone 2 shows the extent of an extreme flood from rivers or the sea with up to a 1 in 1000 chance of occurring each year.

ABDs (Areas Benefiting from Defences) show the area benefiting from defences during a 1 in 200 tidal, or 1 in 100 fluvial flood event.



All measurements are in mAOD

Site name: The Paddock
Site location: Plex Moss Lane

Site coordinates
Latitude: 53.58521° N
Longitude: 3.03056° W
Reference: gctbg4chqz4s / 1
Date: 6 Oct 2015

This is an estimation of the greenfield runoff rate limits that are needed to meet normal best practice criteria in line with Environment Agency guidance "Preliminary rainfall runoff management for developments", W5-074/A/TR1/1 rev. E (2012) and the CIRIA SUDS Manual (2007). It is not to be used for detailed design of drainage systems. It is recommended that every drainage scheme uses hydraulic modelling software to finalise volume requirements and design details before drawings are produced.

Site characteristics

Total site area	1	ha
Significant public open space	0	ha
Area positively drained	1	ha

Methodology

Greenfield runoff method	IH124
Qbar estimation method	Calculate from SPR and SAAR
SPR estimation method	Specify SPR manually
SOIL type	1
HOST class	N/A
SPR	0.24

Hydrological characteristics

	Default	Edited	
SAAR	837	837	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.86	0.86	
Hydrological region	10	10	
Growth curve factor: 1 year	0.87	0.87	
Growth curve factor: 10 year	1.38	1.38	
Growth curve factor: 30 year	1.7	1.7	
Growth curve factor: 100 year	2.08	2.08	

Greenfield runoff rates

	Default	Edited	
Qbar	0.21	1.38	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.00	5.00	l/s
1 in 100 years	5.00	5.00	l/s

Please note that a minimum flow of 5 l/s applies to any site

Site name: The Paddock
Site location: Plex Moss Lane

Site coordinates
Latitude: 53.58521° N
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Site characteristics

Total site area	1	ha
Significant public open space	0	ha
Area positively drained	1	ha

Methodology

Greenfield runoff method	FEH	
Qmed estimation method	Calculate from BFI and SAAR	
BFI and SPR estimation method	Specify BFI manually	
HOST class	N/A	
BFI / BFIHOST	0.60	
Qmed	3.242	l/s
Qbar / Qmed Conversion Factor	1.075	

Hydrological characteristics

	Default	Edited	
SAAR	837	837	mm
M5-60 Rainfall Depth	20	20	mm
'r' Ratio M5-60/M5-2 day	0.4	0.4	
FEH/FSR conversion factor	0.86	0.86	
Hydrological region	10	10	
Growth curve factor: 1 year	0.87	0.87	
Growth curve factor: 10 year	1.38	1.38	
Growth curve factor: 30 year	1.7	1.7	
Growth curve factor: 100 year	2.08	2.08	

Greenfield runoff rates

	Default	Edited	
Qbar	3.49	3.49	l/s
1 in 1 year	5.00	5.00	l/s
1 in 30 years	5.92	5.92	l/s
1 in 100 years	7.25	7.25	l/s

Please note that a minimum flow of 5 l/s applies to any site