Salford City Council

Non-Technical Summary

GMSF Allocation: Land North of Irlam Station
Irlam

M28 0AZ

Date: 9th September 2020

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NON-TECHNICAL SUMMARY
IRLAM / CADISHEAD STRATEGIC ALLOCATION

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1.0 Introduction

An area of land to the North or Irlam Station has been identified as a possible strategic site allocation for housing in the Greater Manchester Spatial Framework The land is located in an area where peat deposits could potentially make development difficult, or unfeasible.

A number of investigations have been undertaken including a desk study and an intrusive site investigation.

The aim of this report is to provide a non-technical summary of these reports.

2.0 Limitations

This report must be read in conjunction with the main reports listed in section 3 below. The limitations specified in the main reports also apply to this report. This report is not intended to be relied upon for any purposes other than a summary of the main reports.

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3.0 Sources of Information

The following reports have been summarised within this document;

1. Preliminary Risk Assessment, March 2019, Ref: UV/0088926-01-0010, Urban Vision Partnership Ltd.
2. Site Investigation Factual Report, October 2019, Ref: YG0134-19, Your Environment (This report is appended to the Ground Investigation Report below rather than published separately).
3. Ground Investigation Report, July 2020, Ref: IRL-CAP-00-XX-RP-GE-0001 Rev P02, Capita

In addition, the appendices of the above reports have been considered where relevant.

4.0 Preliminary Risk Assessment (March 2019)

PURPOSE OF THE DOCUMENT

The purpose of the Preliminary Risk Assessment (PRA) is to review available sources of information and provide a desk-based assessment of the suitability of the site for development as housing. Areas covered include;

- Potential for ground contamination from historic or contemporary uses
- Potential for ground gas to present a risk to future development
- Potential for contaminants to be mobilised and impact the wider environment as a result of any development
- Determine geotechnical constraints
- Determine the requirements for further investigation

The report was completed in March 2019.

KEY FINDINGS – CONTAMINATION

The main historic uses on the site is agriculture, with the land heavily drained to allow crop growth. A tramway extended into the south of the site from c. 1848 to c. 1951 potentially used to transport clay and marl (soil improver), 'night-soil' from Manchester and steel slag from the Iron and Steel Works located south of the site.

The PRA suggests a **MODERATE** risk of ground contamination due to the previous uses. Contaminant are likely to include; heavy metals (Arsenic, Lead etc); pesticides; asbestos (due to demolished former buildings); hydrocarbons (from local fuel storage on farms, and industrial waste).

This type of ground contamination is not unusual within many development sites, and standard remediation techniques would be expected to ensure there was no further risk to the end user.

Until proven otherwise, the PRA suggests a **HIGH** risk or ground gas (Methane and Carbon-Dioxide) affecting future development, due to the underlying peat. At present, any gas generated by the peat will travel unimpeded to the air, however placing a building on top of the peat will impede this and change the way any gas migrates.

The PRA considers there is a **MODERATE** to **LOW** risk of mobile contaminants impacting underlying groundwater.

KEY FINDINGS – GEO-TECHNICAL CONSTRAINTS

The site is underlain by peat of varying thicknesses. Peat is not a suitable founding medium due to the potential for expansion and shrinkage, leading to differential settlement. The depth to founding strata is likely to be variable.

Using records from several historic British Geological Society boreholes, peat depths were found to range from 0.9m to 5.9m, however the PRA identified that there are large areas of the site not covered by the boreholes.

RECOMMENDATIONS FOR FURTHER WORK

In order to develop the site for housing a detailed site investigation will be required, and due to the size of the site (66.5Ha) this would involve around 300-500 sampling points. The site will be subject to a masterplan developed with the local community and stakeholders, and therefore the specific details of any future development (such as the design and layout) are unknown and likely to depend on many factors, As such it would be difficult to design a detailed site investigation at this stage.

Having regard the findings of the PRA, any contamination issues, including ground gas, are unlikely in themselves to be a significant constraint. The presence of gross significant contamination is not expected, as such relatively standard remediation measures and gas protection are likely to be required.

The peat depths however have the potential to cause a significant constraint on future development. If peat is found to extend to significant depths over large areas of the site, development may be unviable.

As such a reduced density site investigation is considered appropriate at this time principally aimed at determining the depth of peat across the site.

5.0 Site Investigation Factual Report (October 2019)

PURPOSE OF THE DOCUMENT

The site investigation factual report prepared by Your Environment presents the findings of a site investigation with the main aim of determining peat depths across the site. This report is published as an appendix to the Ground Investigations Report. The site investigation, undertaken between 16th and 23rd September 2019, consisted of 20 No. boreholes (windowless samples) logged to determine the nature and depth of various strata.

Geotechnical testing was undertaken in each borehole consisting of standard penetration testing, sulphates, pH testing, particle size distribution and sedimentation. This is a standard screening suite of geotechnical tests used to determine the general bearing capacity of the soils.

RATIONALE

As with any site investigation more sampling points will give a greater extent of information, however, there are a number of constraining factors.

Most of the land is actively farmed with crops growing throughout the year. Further, there are a large number of shallow field drains across the site to drain the peat and below ground utilities infrastructure. It was necessary to work around the constraints and design a site investigation which could be undertaken in a reasonable period of time (during a crop rotation) and avoided the potential to damage any sub-surface features.

The location and number of boreholes reflects the limitations; however, it was considered that this information would allow for a reasonable assessment to be made at this stage in the planning process (i.e. determining whether a site could be allocated).

As the desk study did not highlight any particular potential ‘hot-spots’, a non-targeted grid was used to position 20 boreholes across the site. The final positions of the boreholes were adjusted in consultation with the landowners using their knowledge of drain positions and avoiding crops.

Due to local site conditions it was not possible to advance BH20.

Ten of the boreholes (spread across the site) were installed with gas monitoring wells (see figure 1 below). Monitoring wells were installed in the following boreholes; BH3; BH4; BH6; BH7; BH8; BH13; BH14; BH16; BH17; BH18.

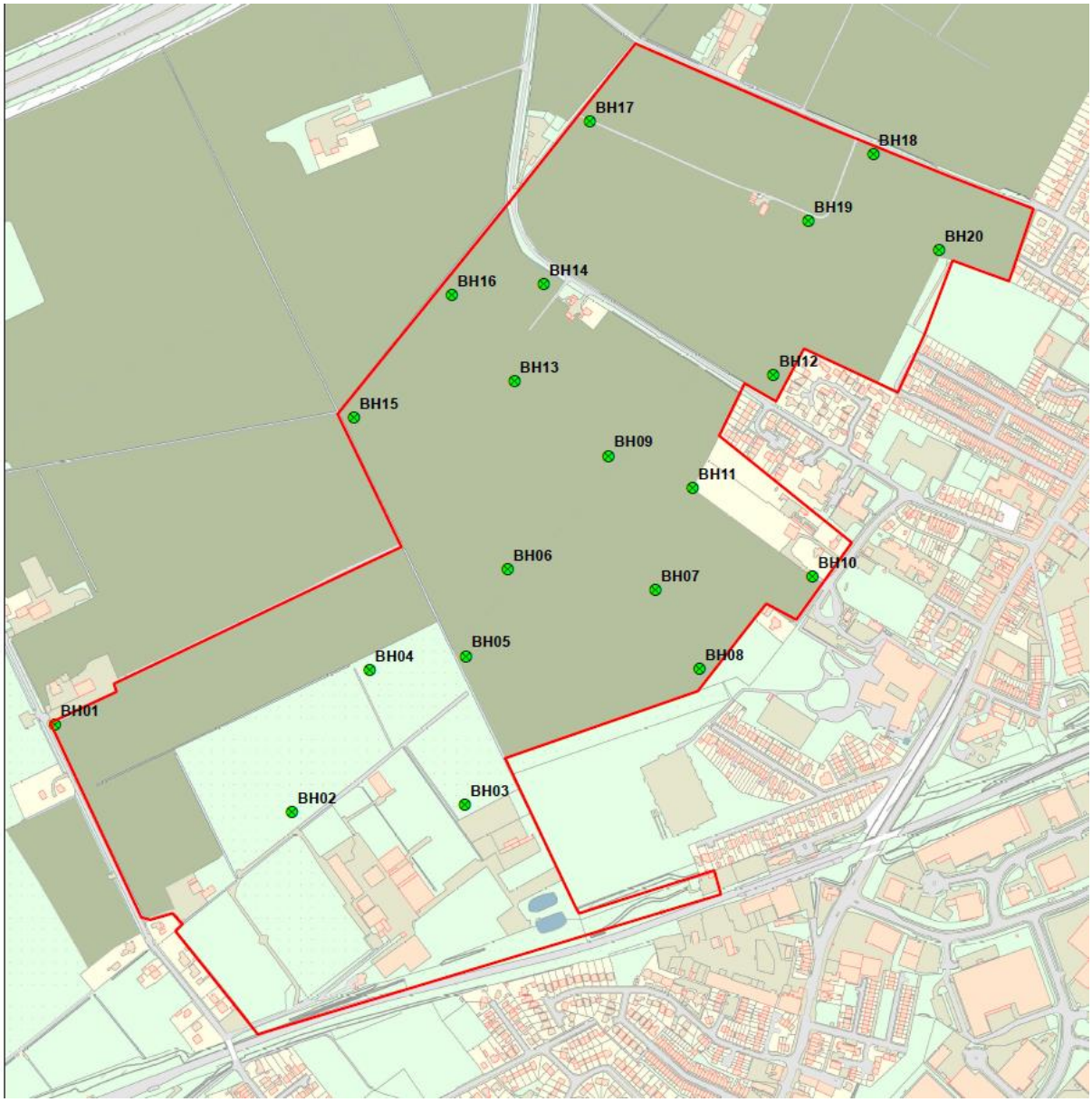

FIGURE 1: MAP OF BOREHOLES

KEY FINDINGS

The boreholes logs showed the following;

Stratum	Minimum Depth	Maximum Depth
Topsoil	0.2m	0.8m
Peat	0.2m – 1.1m	0.2m – 4.95m

The logs showed the peat was underlain by sandy clay (of varying consistency and stiffness) to the end of the boreholes (5.45m).

Ground gas monitoring maximum carbon dioxide (CO_2) concentration of 4.6 % v/v and maximum methane (CH_4) of 0.5% v/v. Whilst only one round of gas monitoring has been undertaken, the results. show the highest concentrations of methane an carbon dioxide occur where peat depths are thickest, and there were no or negligible concentrations in other areas.

The concentrations monitored would tend to suggest a maximum 'characteristic situation' (CS) as CS3, meaning gas protection would be required for properties in this area in the form of a ventilated sub-floor and gas proof membrane. This is a standard construction technique not uncommon on many development sites.

Further ground gas monitoring will be required at the detailed design (planning) stage. It is not appropriate to design a detailed ground gas investigation until more information is known about the layout, building types, the location of roads and services.

6.0 Ground Investigation Report (July 2020)

PURPOSE OF THE REPORT

The Ground Investigation Report was produced by Capita in July 2020 to provide an interpretative assessment of the Site Investigation Factual Report (above). In particular to;

1. Provide an outline indication of the peat depths across the site;

2. Identify possible treatment/construction solutions for foundations to the development including access roads and areas of hardstanding; and

3. Monitoring of ground gas to determine whether its treatment might add further significant costs.

The detailed design and layout of any development is yet to be determined, and it is not the intention of (nor would it be possible for) the Ground Investigation Report to determine the exact nature or extent of any remediation required to enable development.

The report is intended to provide guidance on the feasibility of allocating the site as a strategic housing site within the Greater Manchester Spatial Framework (GMSF).

RATIONALE

As described above the site is known to be underlain by peat of varying depths. Peat has the potential for differential settlement to occur when building structures, and in some cases either requires removal from site, or soil stabilisation / treatment.

Where peat is at depth (generally greater than 4m) there is a potential for ground gas (methane CH4 and Carbon Dioxide CO2) to be generated. On the undeveloped land the gas will naturally vent to air and does not present a risk to property or human health. Development on such land has the potential to allow ground gas to build up within confined spaces (rooms), or to change the migration pathways and create a risk off-site. As such, mitigation may be required.

GROUND GEOLOGY

Made Ground (soils and deposits placed as a result of human activity) is expected in localised areas of the site (principally relating to the railway towards the south of the site, and a former tramway extending into the central southern section of the site). Whilst not sampled this is likely to contain reworked natural ground and engineering fill (see Phase 1 PRA for detail).

The remainder of the site is not expected to contain made ground.

The superficial deposits (the youngest geological deposits) generally consist of natural soils (clay, sands and gravels) together with peat underlying the majority of the site.

Solid geology (beneath the superficial deposits) is expected to be Wilmslow Sandstone.

HYDROGEOLOGY

Glaze Brook (a main river) is located approximately 800m west of the site. The Manchester Ship Canal is located 1.2km south of the site. Several underground and open drainage ditches traverse the site. The shallow drains run to open ditches at the edges of the agricultural fields.

The site is located in Flood Zone 1 (defined as having a 1 in 1000-year chance of flooding), although there are likely to be areas of perched groundwater within the site with potential for localised groundwater flooding depending on climatic conditions.

The bedrock is classified as a principal aquifer, defined as “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”.

GROUND CONDITIONS

Table 5.1 within the Ground Investigation Report describes the ground conditions encountered during the drilling of the 19no. boreholes. The boreholes were drilled to a depth between 5.45 and 6.45 metres below ground level (mbgl).

Peat was found to range in depths between 0.70 and 4.45mbgl with a typical thickness between 1.0 and 2.0mbgl. The peat thickness tends to increase towards the north east of the site.

Organic clay was found beneath the peat in the south and southwest of the site at depths ranging from 0.2 and 1.1mbgl described as dark brown, silty and sandy and noted to be very soft.

Glacial sand was recorded within a number of boreholes (not all) underlying the peat ranging in depths between 1.5 and 6.45mbgl with clay recorded in the majority of boreholes from 1.2 to 6.45mbgl.

GEOTECHNICAL PROPERTIES

Standard Penetration Tests (SPT) were undertaken in all boreholes within the various strata. The higher the SPT value, the firmer the strata. The test is used to give an indication of the bearing capacity of the strata.

Within the peat SPT ‘N’ values were all 0 (as would be expected). Within the clay SPT ‘N’ values ranged between 4 and 39 across the site. The sand recorded ‘N’ values ranging from 0 – 21.

Soil samples were taken and Atterberg limit and particle size distribution calculated from the samples. Atterberg limits are used to determine the way in which moisture affects bearing capacity, and particle size distribution is used to give an indication of the makeup of the soils.

It is noted that bedrock was not encountered during the site investigation.

GROUND GAS

A single round of ground gas monitoring has been undertaken to give a general indication of the risk across the site. The gas monitoring is not intended to give a final determination of risk as this can only be reasonably achieved once the final layout and design is known.

The monitoring revealed elevated concentrations of methane (CH_4) in one borehole and Carbon Dioxide (CO_2) in a number of boreholes. The concentrations combined with the flow rate can be used to determine a 'Gas Screening Value' (GSV) for the site to determine the nature of any mitigation required.

In this case the highest GSV is Characteristic Situation 3 (CS3). Mitigation is relatively standard in the form of ventilated sub floor voids and gas membranes for new development.

There is also considered a potential that 'gas trenches' may be required to prevent new development from forcing gas to migrate elsewhere on site and potentially into unprotected buildings.

Significantly more gas monitoring will be required during future site investigations, and this may result in a lower classification on certain sites.

GEOTECHNICAL CONCLUSIONS

The investigation found significant thickness of peat, organic clays and sands which were determined to be of low strength and highly compressible. There is a potential risk of ground gas and the possibility of localised ground contamination.

A Contour Plot has been produced of peat depths across the site (appendix A of the main report and appended to this report) which shows a general trend of increasing peat depths from the southwest to the northeast of the site.

Whilst the data is relatively limited, there is currently no reason to conclude the site cannot be developed as intended, using alternative foundation technologies which exist. A number of ground improvement technologies are discussed within the main report including, soil mixing, vibrated concrete columns and piled foundations.

Ground improvement that involves the removal of the weaker material and replacement with engineered fill to provide a development platform. This is potentially the costliest, and least sustainable option as it would involve the excavation and removal of significant quantities of material from the site.

Of the other options and depending on the results of detailed site investigations at a later stage, it is likely a mix of technologies would be used across the site, depending on local conditions. This will need assessing at the detailed design stage.

Soil mixing is likely to be the preferred method for this site. This is a method of improving the bearing capacity of soils by addition of material with a greater bearing capacity. This technology is used across a number of sites.

Roads and buried services are likely to be affected by differential settlement (depending on their final location). Roadways are likely to require soil mixing to form a suitable slab, and drainage services will likely require flexible connectors.

It is not possible to undertake a further detailed site investigation at this stage in the planning process. This will be required when a layout is known as it will be necessary to target further investigations depending on (for example) where buildings are to be founded, and where areas of open space will be placed.

The more onerous foundation solutions have the potential to increase costs. Where peat depths are greater, or buildings bigger this will rise. There is however potential to offset some of these costs elsewhere within the development (for example reducing the need to import material).

RECOMMENDATIONS FOR FURTHER INVESTIGATION

Further detailed site investigation would not be reasonable at this time. Further, it is not considered necessary at this stage of the process. It is considered that sufficient information is known at this time to determine whether the site can be allocated within GMSF for housing development.

Once detailed plans are developed, further detailed site investigation will be required on a site by site basis, including;

- Soil testing for possible land contamination and development of a remediation strategy
- Ground gas monitoring (minimum 6 rounds over 3 months)
- Groundwater monitoring (depending on location)
- Detailed geotechnical testing

It is considered the next round of investigation be undertaken at the detailed design stage (master planning/planning application). The next phases of investigation should be used to design specific foundations and confirm depths of soil stabilisation required. The investigation will depend on the ground improvement techniques selected but if deep soil mixing is the preferred solution then a more detailed understanding of depths of peat will be required in those areas.

7.0 Conclusions & Limitations

The site is being considered for allocation with the GMSF as a strategic site for new housing. At the revised draft stage (January 2019) the GMSF identified the delivery of (up to) 1,600 homes on the site. Generally low rise residential (houses) with a desire for some medium rise properties (apartments) closest to Irlam Station is the assumed form of development.

A preliminary risk assessment concluded that ground contamination is unlikely to be a barrier to development, although some remediation may be required. A risk from ground gas was also identified, which again may require mitigation in the form of ventilated sub-floor and gas protection membranes.

The site is known to be underlain by peat which presents engineering difficulties for development due to compressibility of the material leading to differential settlement. Where peat depths are significant it may be difficult to develop the land.

A non-targeted site investigation has been conducted to determine the geotechnical properties of the ground and undertake limited ground gas monitoring.

The investigation has NOT revealed any significant peat depths which will make development impossible. A number of technologies now exist to develop land on the type of ground encountered during the site investigation.

The ground conditions are more onerous than a conventional development on greenfield land, however the vast majority of the site has ground conditions that can be dealt with using ‘off the shelf’ techniques to stabilise the ground.

Alternatively, in some areas where the peat is particularly shallow the problems can be overcome using conventional foundations extended to a slightly greater depth. (the cut off for this is around 1m but can be fine-tuned at detailed design- it may well be different for houses and low-rise apartments).

The development programme is likely to be longer than a traditional build, but unlikely to be prohibitive. With respect to increased costs of development these are not considered to be prohibitive. Notwithstanding this, further work is being undertaken to understand the cost implications of the construction methods discussed.

It is considered the extent of the investigations to date have minimised the risk sufficiently to confirm the development potential across the site. Whilst there remains a possibility of localised risks, it is considered this could be dealt with at the detailed design stage.

8.0 Glossary

Term	Definition
Atterberg Limit Test	A test to determine the way in which water affects a soils property. In particular the plasticity limit (the point at which soils behave as a plastic) and the liquid limit (the point at which soils behave as a liquid).
Competent Strata	The point in the soils where the geo-technical testing indicates the ground has sufficient bearing capacity for the foundation design. This will vary depending not only on the make-up of the soils, but also the type, size and foundation design of the building.
Made Ground	Ground deposited as a result of human activity. Made ground is more likely to contain contaminants.
SPT	Standard Penetration Tests. Used to give an indication of the bearing capacity of soils. The number of 'blows' taken to strike a standard cone into the soil. Measured as 'N' values ranging from 0 (very weak soil) to 50 (very strong soil).
Windowless Borehole	A method of drilling using a mobile rig. A 'tube' is driven into the ground and then the casing withdrawn, bringing a 'core' of soil for testing and analysis.
Gas Monitoring Well	An installation within the completed borehole consisting of a sealed casing, with slotted vents in the 'response zone' allowing ground gas to enter the casing. A monitoring head is installed at the surface to allow monitoring of ground gasses.

9.0 Appendix A: Contour Plot of Peat Depths