

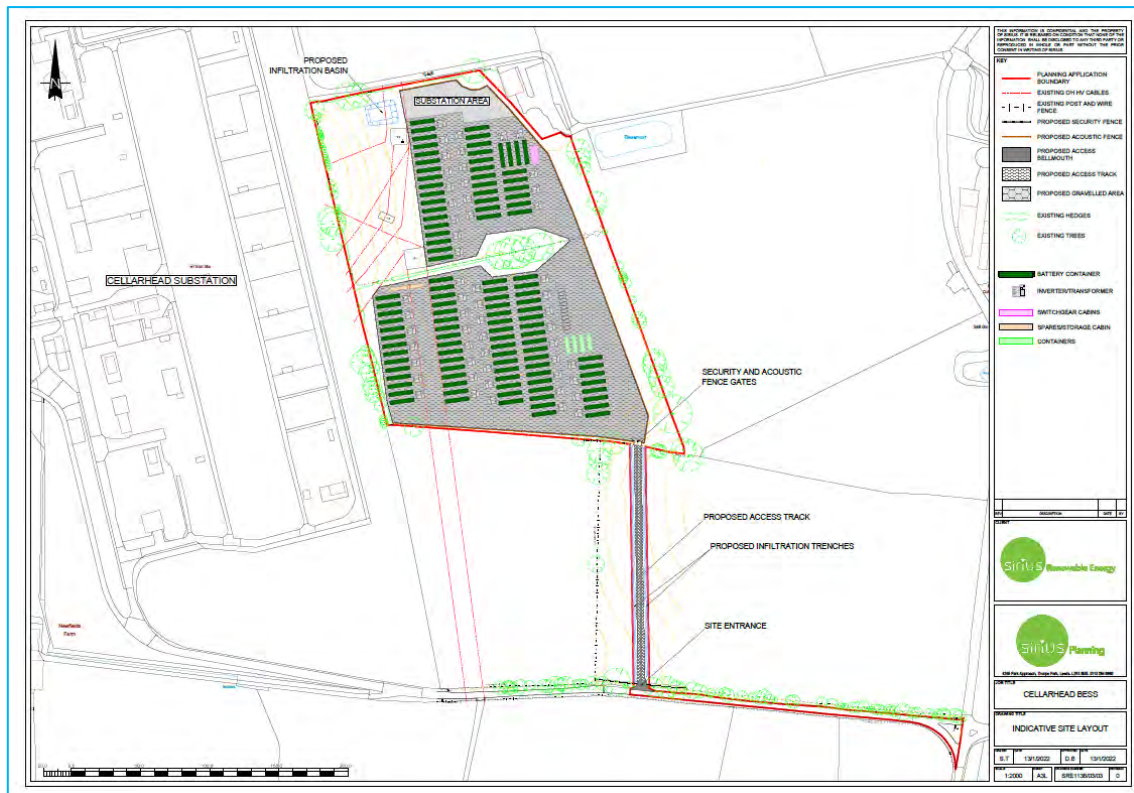


Figure 2 - Statutory Plan

3.2 Existing Development

The Site currently comprises several parcels of agricultural land and covers approximately 5.40 hectares (ha).

3.3 Proposed Development

The Proposed Development is for development of a 280MVA Battery Energy Storage System (BESS) and associated infrastructure (see Appendix 1). Further details with regard to the Proposed Development can be found in the accompanying information submitted with the planning application.

3.4 Catchment Hydrology / Drainage

Unnamed watercourses are located approximately 500m to the west of the Site and 1km to the south of the Site. A small reservoir is located adjacent to the eastern boundary. There is a drain around the perimeter of the adjacent substation.

3.5 Ground Levels

The Site is relatively flat with an approximate ground level of 240 metres Above Ordnance Datum (mAOD).

3.6 Ground Conditions

The British Geological Survey (BGS) map shows that the bedrock deposits consist of the Chester Formation - sandstone and conglomerate, interbedded. Sedimentary bedrock formed approximately 247 to 250 million years ago in the Triassic Period in a local environment previously dominated by rivers. There are no superficial deposits. BGS borehole records shows there are no boreholes are present.

Information from the National Soil Resources Institute details the Site area as being situated on slowly permeable seasonally wet acid loamy and clayey soils. The Wallingford Winter Rain Acceptance Potential (WRAP) map indicates that the Site lies within WRAP Class 4: clayey, or loamy over clayey soils with an impermeable layer at shallow depth.

Soakaway tests were carried out on the Site to BRE Digest 365 Guidelines on 20th December 2021 (see Appendix 2). The soakaway tests revealed that the ground conditions across the Site show considerable variability, largely associated with the presence, or absence of till at the Site. In view of this, the drainage characteristics across the Site have also shown to be variable.

4.0 FLOOD RISK

4.1 Sources of Flooding

All sources of flooding have been considered, these are; fluvial (river) flooding, tidal (coastal) flooding, groundwater flooding, surface water (pluvial) flooding, sewer flooding and flooding from artificial drainage systems/infrastructure failure.

4.2 Environment Agency Flood Zones

A review of the Environment Agency's Flood Zones indicates that the Site is located within Flood Zone 1 and therefore has a 'low probability' of flooding as shown in Figure 3, with less than a 1 in 1000 annual probability of river in any year (<0.1%).

The Flood Zones are the current best information on the extent of the extremes of flooding from rivers or the sea that would occur without the presence of flood defences, because these can be breached, overtopped and may not be in existence for the lifetime of the development. They show the worst-case scenario.

The Environment Agency Flood Zones and acceptable development types are explained in Table 1. Table 1 shows that all development types are generally acceptable in Flood Zone 1.

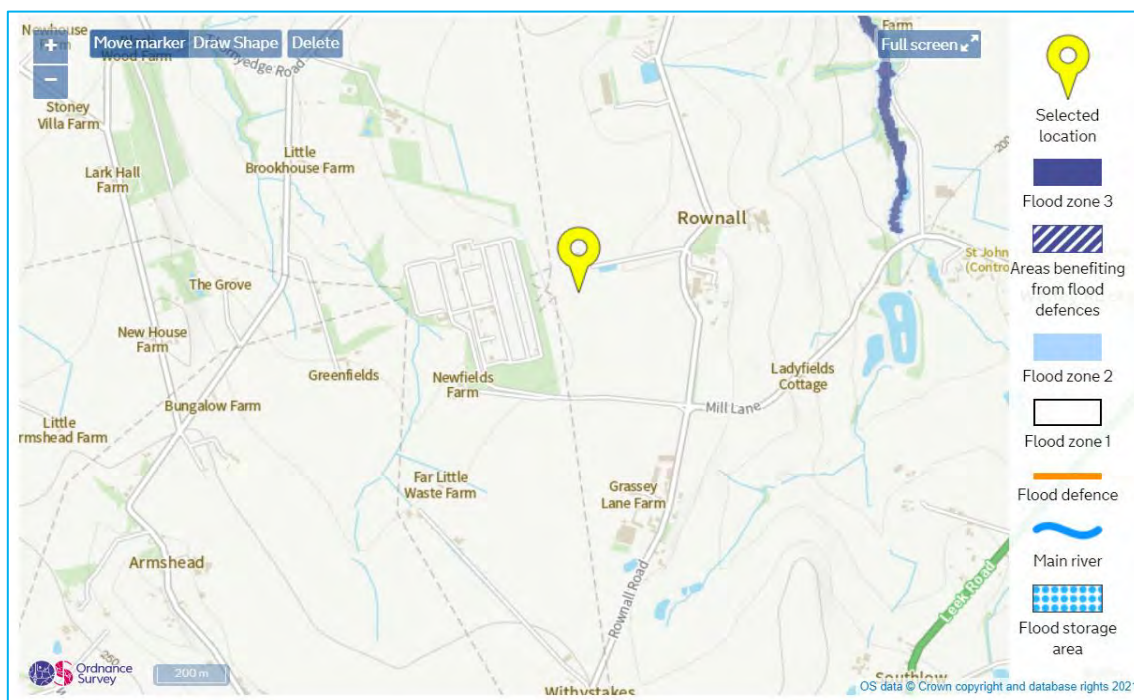


Figure 3 - Environment Agency Flood Zones

Table 1 - Environment Agency Flood Zones and Appropriate Land Use

Flood Zone	Probability	Explanation	Appropriate Land Use
Zone 1	Low	Less than 1 in 1000 annual probability of river or sea flooding in any year (<0.1%)	All development types generally acceptable
Zone 2	Medium	Between a 1 in 100 and 1 in 1000 annual probability of river flooding (1% - 0.1%) or between a 1 in 200 and 1 in 1000 annual probability of sea flooding (0.5% 0.1%) in any year	Most development type are generally acceptable
Zone 3a	High	A 1 in 100 or greater annual probability of river flooding (>1%) or a 1 in 200 or greater annual probability of flooding from the sea (>0.5%) in any year	Some development types not acceptable
Zone 3b	'Functional Floodplain'	Land where water has to be flow or be stored in times of flood. SFRAs should identify this zone (land which would flood with an annual probability of 1 in 20 (5%) or greater in any year or is designed to flood in an extreme (0.1% flood, or at another probability to be agreed between the LPA and the Environment Agency, including water conveyance routes)	Some development types not acceptable

4.3 Flood Vulnerability

In the Planning Practice Guidance to the NPPF, appropriate uses have been identified for the Flood Zones. Applying the Flood Risk Vulnerability Classification in the Planning Practice Guidance to the NPPF, the proposed use is classified as 'less vulnerable' or 'essential infrastructure'. Table 2 of this report and the Planning Practice Guidance to the NPPF states that 'less vulnerable' and 'essential infrastructure' uses are appropriate within Flood Zones 1 after the completion of a satisfactory FRA.

Table 2 - Flood Risk Vulnerability and Flood Zone 'Compatibility'

Flood Risk Vulnerability Classification	Essential Infrastructure	Water Compatible	Highly Vulnerable	More Vulnerable	Less Vulnerable
Zone 1	✓	✓	✓	✓	✓
Zone 2	✓	✓	Exception test required	✓	✓
Zone 3a	Exception test required	✓	✗	Exception test required	✓
Zone 3b 'Functional Floodplain'	Exception test required	✓	✗	✗	✗

Key: ✓: Development is appropriate, ✗: Development should not be permitted.

4.4 Historic Flooding

Environment Agency data shows that the Site has not historically flooded. There are no records of anecdotal information of flooding at the Site including within the British Hydrological Society "Chronology of British Hydrological Events⁴". No other historical records of flooding for the Site have been recorded. Therefore, it has been concluded that the Site has not flooded within the recent past.

4.5 Existing and Planned Flood Defence Measures

Environment Agency data confirms that the Site is not protected against flooding by existing flood defence measures (see Figure 3).

4.6 Climate Change

Projections of future climate change, in the UK, indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF recommends that the effects of climate change are incorporated into FRA's. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the flood risk assessments: climate change allowances guidance⁵.

Table 3 shows peak river flow allowances by river basin district. The flood risk assessments: climate change allowances guidance recommends that for 'less vulnerable' uses in Flood Zone 1 that the central allowances are used. Therefore, the design flood level for the Site is the 1 in 100 year (+31%) event.

Table 3 - Peak River Flow Allowances by River Basin District (use 1961 to 1990 baseline)

River Basin District	Allowance Category	2020s	2050s	2080s
Dove Management Catchment	Upper	+28%	+39%	+62%
	Higher	+17%	+24%	+40%
	Central	+13%	+18%	+31%

4.7 Fluvial (river) Flooding

The Site will not be inundated with floodwater for all events up to and including the 1 in 100 year (+31%) and 1 in 1000 year events. The Site will be flood free during the 1 in 100 year (+31%) and 1 in 1000 year events. The Site is not located within the vicinity of fluvial flooding sources and the risk of fluvial flooding is considered to be **not significant**.

4.8 Tidal (coastal) Flooding

The Site is not located within the vicinity of tidal flooding sources and the risk of tidal flooding is considered to be **not significant**.

4.9 Groundwater Flooding

Groundwater flooding is defined as the emergence of groundwater at the ground surface or the rising of groundwater into man-made ground under conditions where the normal range of groundwater levels is exceeded.

Groundwater flooding tends to occur sporadically in both location and time. When groundwater flooding does occur, it tends to mostly affect low-lying areas, below surface infrastructure and buildings (for example, tunnels, basements and car parks) underlain by permeable rocks (aquifers).

Site ground conditions suggest a low potential for groundwater flooding, it is unlikely that rapid rises in groundwater levels would be facilitated through these deposits. Additionally, the topography of the Site indicates that it is conducive to good drainage. A review of current and historical maps identified no springs within 500m of the Site. The natural or anthropogenic drainage network in the area does not suggest that large yielding springs are present in the area surrounding the Site and also

⁵ <https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances#high-allowances>

no below surface buildings are proposed for the Site. The risk of flooding from groundwater flooding is considered to be **not significant**.

4.10 Surface Water (pluvial) Flooding

The Site is not situated near to large areas of poor permeability which may result in surface water flooding. The Environment Agency Surface Water flood map shows that the Site has a very low risk of surface water flooding (see Figure 4) with a chance of flooding of less than 1 in 1000 (0.1%) years.

Given the scale and nature of the proposed development and the size and location of the surface water flooding sources it has been concluded that surface water flooding poses a low flood risk to the Site and the risk of surface water flooding is considered to be **not significant**.

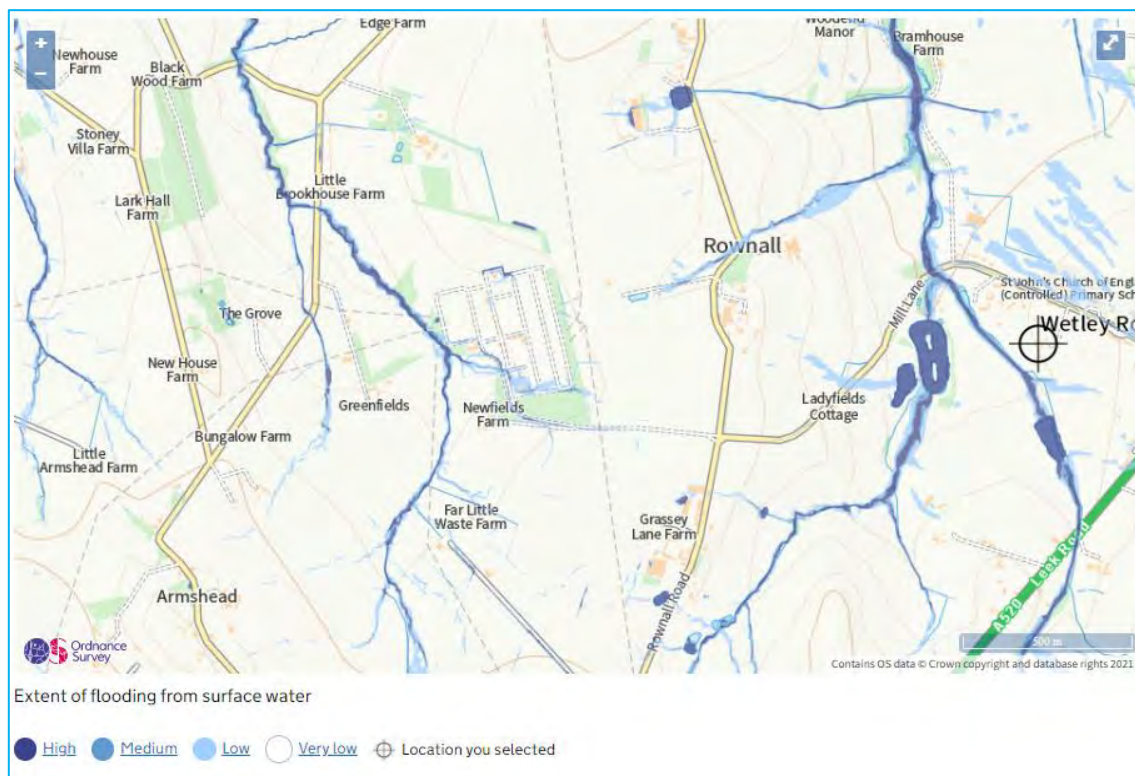


Figure 4 - Environment Agency Surface Water Flood Map

4.11 Sewer Flooding

Sewer flooding occurs when urban drainage networks become overwhelmed and maximum capacity is reached. This can occur if there is a blockage in the network causing water to back up behind it or if the sheer volume of water draining into the system is too great to be handled. Sewer flooding tends to occur sporadically in both location and time such flood flows would tend to be confined to the streets around the development. Flood flows could also be generated by burst water mains, but these would tend to be of a restricted and much lower volume than weather generated events and so can be discounted for the purposes of this assessment. There are no public sewers located within the vicinity of the Site therefore, the risk of flooding from sewer flooding is considered to be **not significant**.

4.12 Flooding from Artificial Drainage Systems/Infrastructure Failure

There are no other nearby artificial water bodies, reservoirs, water channels and artificial drainage systems that could be considered a flood risk to the Site. The Environment Agency Reservoir flood

map shows that the Site is not at risk of flooding from reservoir failure (see Figure 5). The risk of flooding from artificial drainage systems/infrastructure failure is considered to be **not significant**.

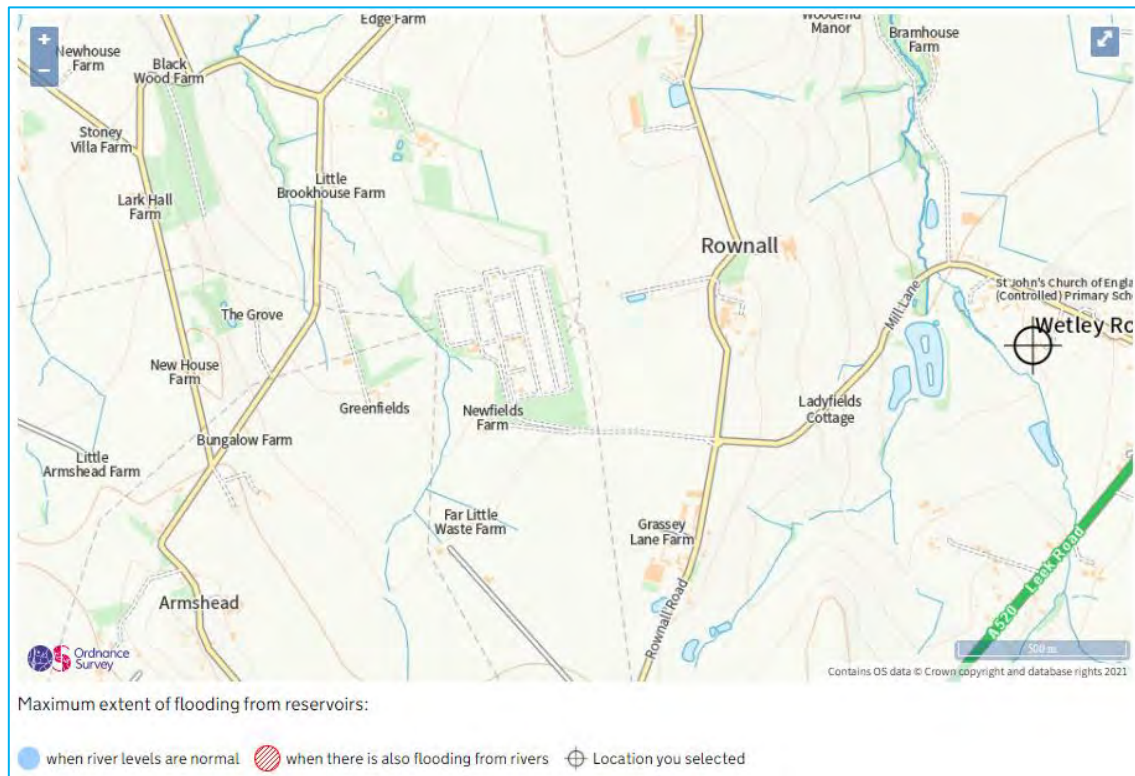


Figure 5 - Environment Agency Reservoir Flood Map

4.13 Summary of Site-Specific Flood Risk Assessment

A summary of the sources of flooding and a review of the risk posed by each source at the Site is shown in Table 4.

Table 4 - Risk Posed by Flooding Sources

Sources of Flooding	Potential Flood Risk	Potential Source	Probability/Significance
Fluvial Flooding	No	None Reported	None
Tidal Flooding	No	None Reported	None
Groundwater Flooding	No	None Reported	None
Surface Water Flooding	No	None Reported	None
Sewer Flooding	No	None Reported	None
Flooding from Artificial Drainage Systems/Infrastructure Failure	No	None Reported	None

There will be no net loss in flood storage capacity or impact on movement of floodwater across the Site. The overall direction of the movement of water will be maintained within the developed Site and surrounding area. The conveyance routes (flow paths) will not be blocked or obstructed.

The proposed use of the Site is 'less vulnerable'/'essential infrastructure', both uses are appropriate within Flood Zone 1. In conclusion, the flood risk to the Site can be considered to be limited, with a

very low annual probability of flooding and from all sources. The Site is unlikely to flood except in very extreme conditions.

5.0 SURFACE WATER DRAINAGE

5.1 Surface Water Management Overview

It is recognised that consideration of flood issues should not be confined to the floodplain. The alteration of natural surface water flow patterns through developments can lead to problems elsewhere in the catchment, particularly flooding downstream. For example, replacing vegetated areas with roofs, roads and other paved areas can increase both the total and the peak flow of surface water runoff from the development site. Changes of land use on previously developed land can also have significant downstream impacts where the existing drainage system may not have sufficient capacity for the additional drainage.

An assessment of the surface water runoff rates has been undertaken, in order to determine the surface water options and attenuation requirements for the Site. The assessment considers the impact of the Proposed Development compared to current conditions. Therefore, the surface water attenuation requirement for the developed site can be determined and reviewed against existing arrangements.

The requirement for managing surface water runoff from developments depends on the predeveloped nature of the site. If it is an undeveloped greenfield site, then the impact of the development will need to be mitigated so that the runoff from the site replicates the natural drainage characteristics of the pre-developed site. The surface water drainage arrangements for any development site should be such that the volumes and peak flow rates of surface water leaving a developed site are no greater than the rates prior to the proposed development unless specific offsite arrangements are made and result in the same net effect.

It should be acknowledged that the satisfactory collection, control and discharge of surface water runoff are now a principle planning and design consideration. This is reflected in recently implemented guidance as well as the new Defra non-statutory technical standards for SuDS.

5.2 Climate Change

Projections of future climate change in the UK indicate more frequent, short-duration, high intensity rainfall and more frequent periods of long duration rainfall. Guidance included within the NPPF (see Section 14) recommends that the effects of climate change are incorporated into Surface Water Drainage Assessments. Recommended precautionary sensitivity ranges for peak rainfall intensities and peak river flows are outlined in the associated Planning Practice Guidance to the NPPF⁶.

The recommended national precautionary sensitivity range for peak rainfall intensity are summarised in Table 5. The proposals will take into account a 40% increase in rainfall intensity due to climate change.

Table 5 - Peak Rainfall Intensity Allowance in Small and Urban Catchment (use 1961 to 1990 baseline)

Parameter	2020s	2050s	2080s
Upper end	+10%	+20%	+40%
Central	+5%	+10%	+20%

⁶ Communities and Local Government (2014) Planning Practice Guidance - Flood Risk and Coastal Change.

5.3 Opportunities for Discharge of Surface Water

Possible receptors for runoff generated onsite have been assessed in line with the prioritisation set out in the Defra non-statutory technical standards for SuDS. There are four possible options to discharge the surface water. The Runoff Destination is (in order of preference):

- a) To ground;
- b) To surface water body;
- c) To road drain or surface water sewer;
- d) To combined sewer

It is necessary to identify the most appropriate method of controlling and discharging surface water. The design should seek to improve the local runoff profile by using systems that can either attenuate runoff and reduce peak flow rates or positively impact on the existing surface water runoff.

5.3.1 Discharge to Ground

In determining the future surface runoff from the Site, the potential of using infiltration has been considered. An overview of the general ground conditions may be used to gauge if there is potential for their application. As detailed previously, information from the National Soil Resources Institute details the Site area as being situated on slowly permeable seasonally wet acid loamy and clayey soils.

Soakaway tests were carried out on the Site to BRE Digest 365 Guidelines on 20th December 2021. The soakaway tests revealed that the ground conditions across the Site show considerable variability, largely associated with the presence, or absence of till at the Site. In view of this, the drainage characteristics across the Site have also shown to be variable. The results of the soakaway tests are shown in Appendix 2.

The granular soils encountered in trial pits TP01 and TP02 are considered representative of residual Chester Formation strata, the soils displayed poor, borderline good drainage characteristics. The cohesive and granular soils encountered in TP03, considered representative of Till deposits overlying residual Morridge Formation strata, were found to be practically impermeable.

In view of the above information, it will be possible to utilise infiltration as a means of disposal of surface water runoff at the Site. However, it will be necessary to ensure that the infiltration features are placed in areas of the Site underlain by Chester Formation strata and where the Till is absent. At this stage, it is proposed that the surface water runoff from the Site can be discharged via infiltration SuDS methods.

5.3.2 Discharge to Surface Water Body

Should infiltration be found to be unsuitable, the next option is discharge to a surface water body. There is a drain around the perimeter of the adjacent substation. Therefore, it may be possible to discharge surface water runoff from the Site into the perimeter drain therefore, it would be possible to discharge to a surface water body, if this option was required. However, at this stage this option is not required.

5.3.3 Discharge to Road Drain or Surface Water Sewer

There are no public sewers located within the vicinity of the Site therefore, it would not be possible to discharge to the public sewers.