Environmental Statement

Volume 3, Appendix 11-2: Flood Risk Assessment and Outline Drainage Strategy – Lime Down A (Tracked)

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Appendix 11-2: Flood Risk Assessment and Outline Drainage Strategy – Lime Down A

For: Lime Down Solar Park Ltd

Site: Lime Down Solar Park

Date: 09/07/2026

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~~Issue-04~~

Issue-05

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1. Site Details

1.1.1 The aim of this section of the report is to outline key environmental information associated with the baseline environment of Lime Down A.

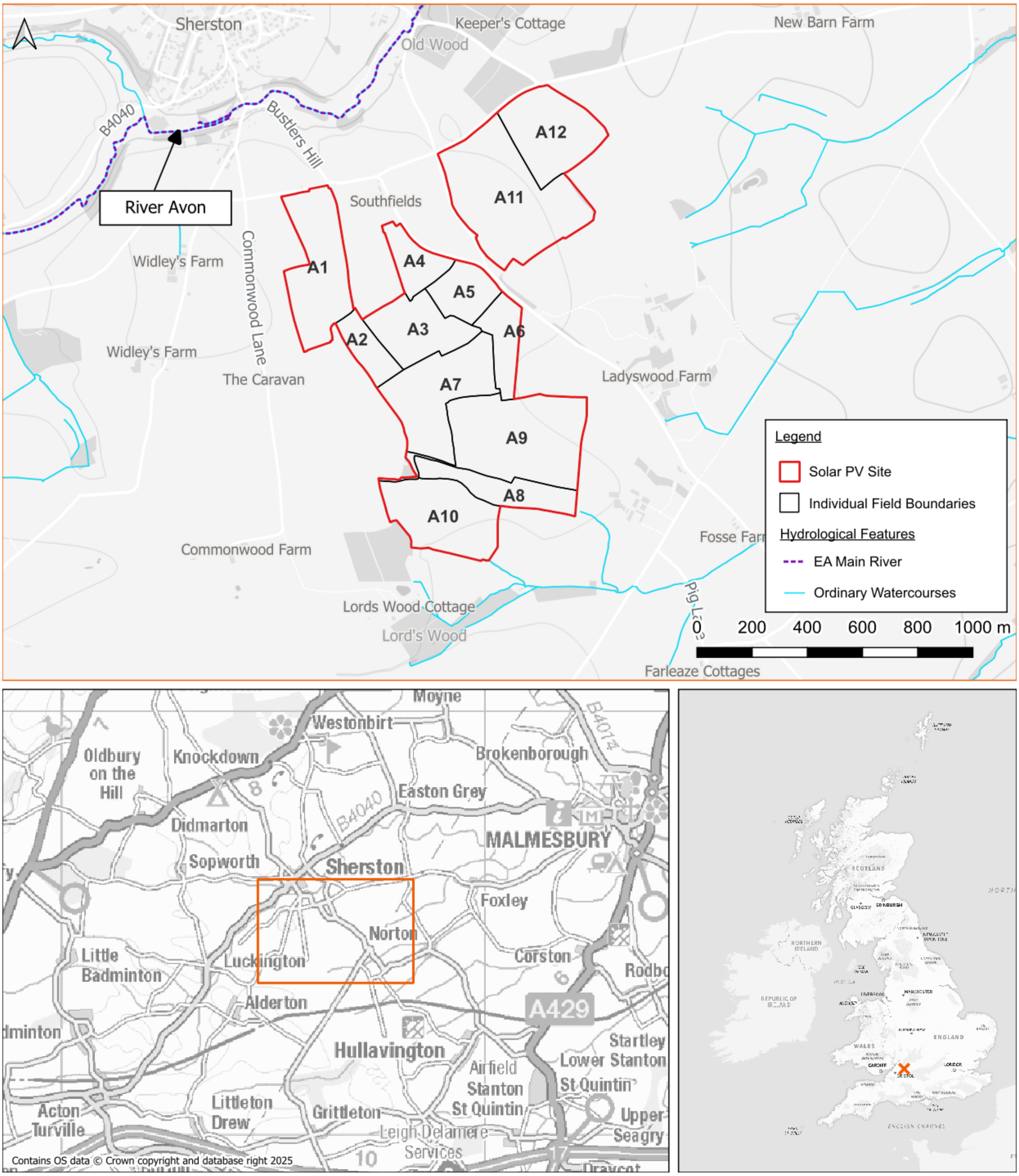


Figure 1: Site Location

1.2 Site Location

1.2.1 Lime Down A is located in an agricultural area, approximately 500m to the south of Sherston, a village west of Malmesbury, Wiltshire. The furthest point north is at grid reference 386500E, 185700N, and the furthest point south is at 386000E, 183900N.

1.3 Existing Site Conditions

1.3.1 Online mapping (including Google Maps/Google Streetview imagery[i] accessed 28/05/2025) shows that Lime Down A is greenfield comprising agricultural fields. Additionally, no watercourses are located within Lime Down A.

1.4 Topography

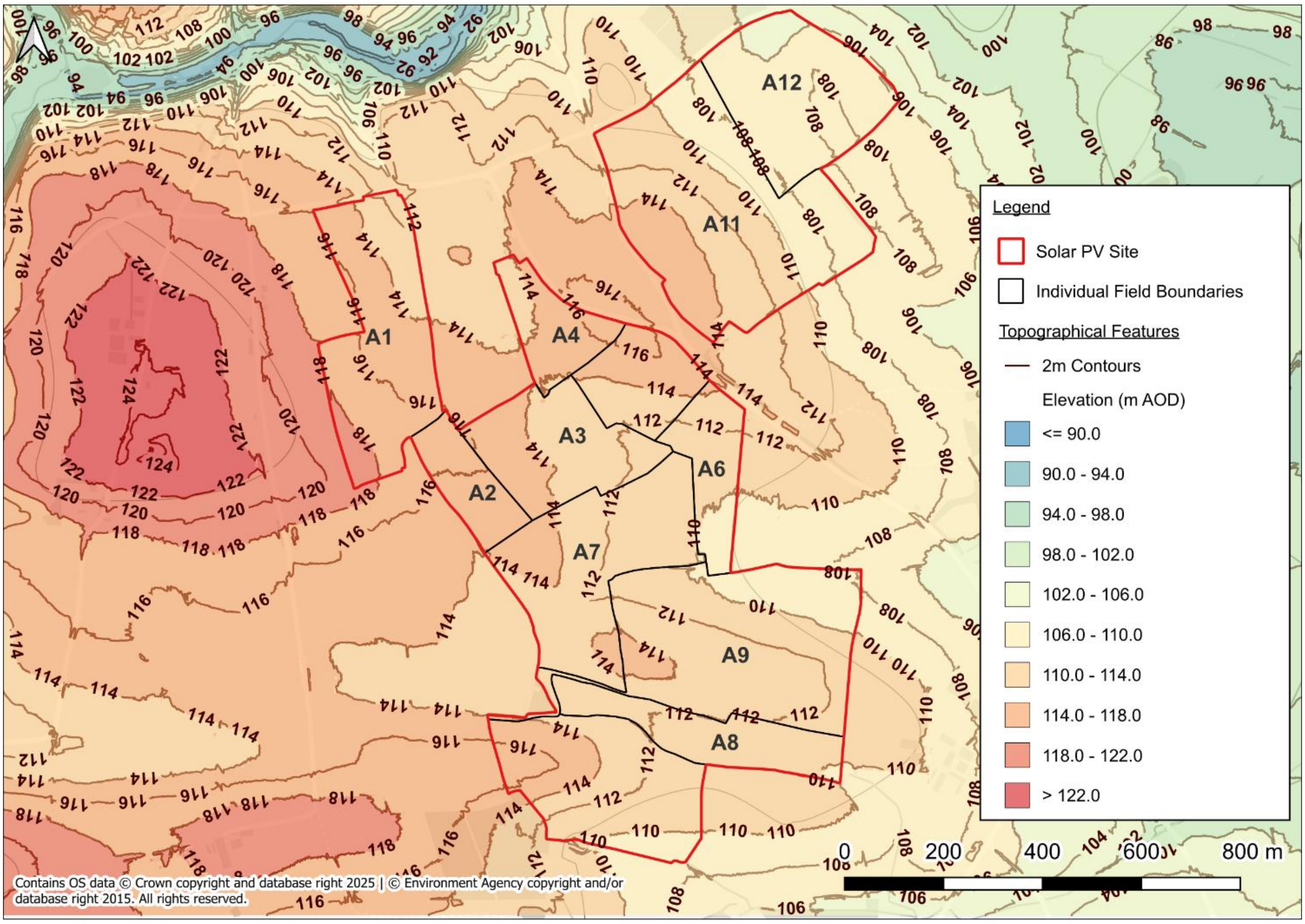


Figure 2: LiDAR Plan

1.4.1 Topographic levels to metres Above Ordnance Datum (m AOD) have been derived from a 1m resolution Environment Agency (EA) composite 'Light Detecting and Ranging' (LiDAR) Digital Terrain Model (DTM). A review of LiDAR ground elevation data shows that Lime Down A has a topographic highpoint of approximately 119m AOD along the northwest boundary. The elevation then slopes to the east and southeast. The lowest elevation at Lime Down A is approximately 108m AOD along the southeast boundary (Figure 2).

1.5 Hydrology

1.5.1 The nearest EA Main River is the River Avon situated approximately 240m north of Lime Down A, which is discussed further in Section 2.0. There are also two unnamed land drainage ditches that are adjacent to the southern boundary.

1.5.2 The River Avon flows in a northeasterly direction towards Malmesbury before flowing in a southerly direction. The two unnamed land drainage ditches flow in a southerly direction.

1.5.3 Main Rivers fall within the responsibility of the EA to maintain, whereas Ordinary Watercourses fall within the responsibility of the Lead Local Flood Authority (LLFA) (Wiltshire Council).

1.6 Water Framework Directive Status

1.6.1 Lime Down A is located within the Avon Bristol and North Somerset Streams, specifically the Sherston Avon Water Body and the Tributary (source to conf Sherston Avon) Water Body Catchment.

1.6.2 The Sherston Avon Water Body Catchment has a Cycle 3 ecological status of Poor in 2019 and 2022 and a failing chemical status in 2019 (no data in 2022). The Tributary (source to conf Sherston Avon) has a Cycle 3 ecological status of Good in 2019 and 2022 and a failing chemical status in 2019 (no data in 2022).

1.6.3 A summary of the Water Body Classifications can be found in Annex A.

1.7 Geology

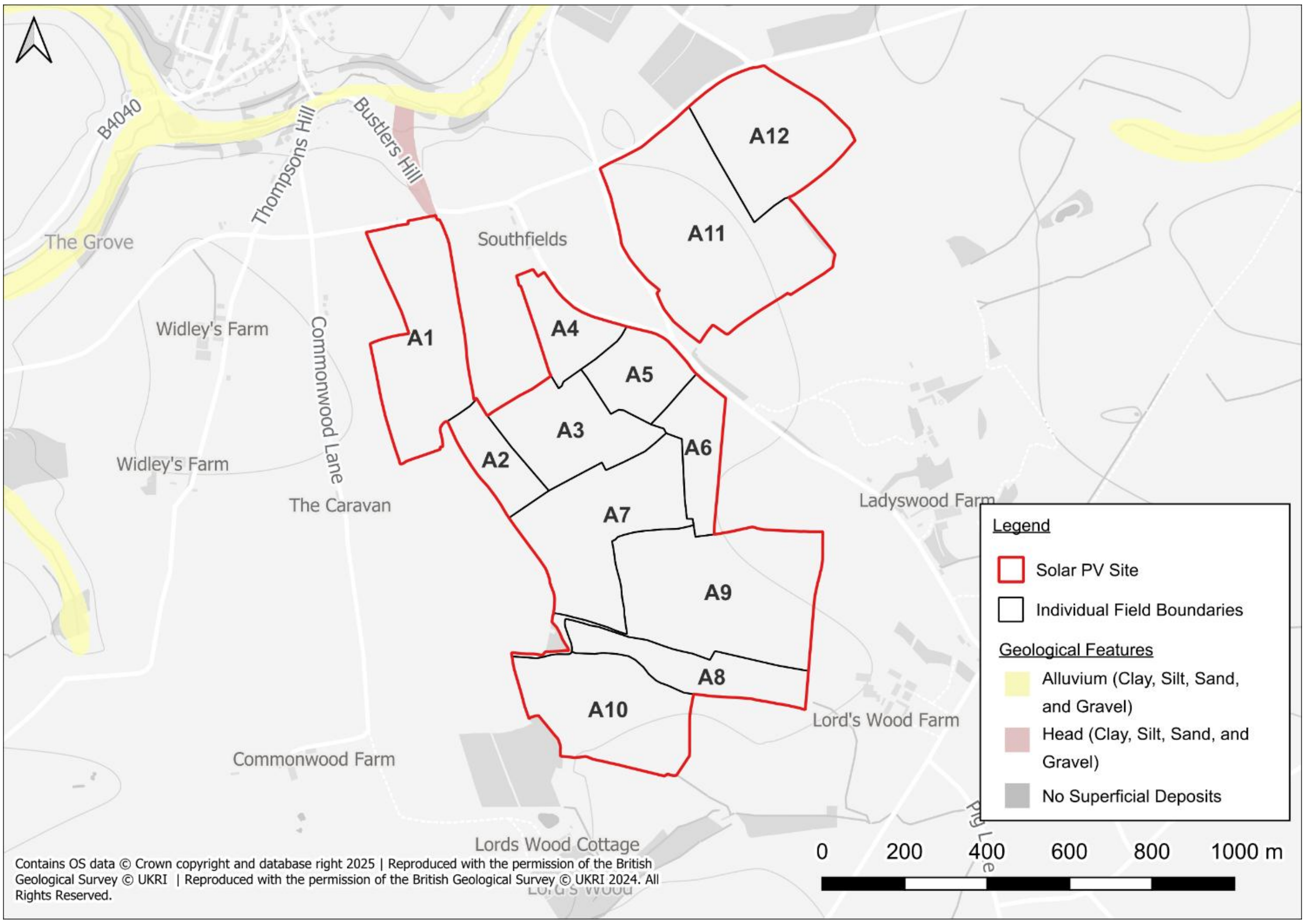


Figure 3: Superficial Deposits

1.7.1 Reference to the British Geological Survey[ii] (BGS) online mapping (1:50,000 scale) indicates that Lime Down A is underlain by no superficial deposits (Figure 3). The underlying bedrock at Lime Down A comprises Forest Marble Formation consisting of mudstone.

1.7.2 The geological mapping is available at a scale of 1:50,000 and as such may not be accurate on a site-specific basis.

1.7.3 The closest historical BGS borehole record (BGS Ref: ST88SE9) is located in the centre of Lime Down A (Eastings and Northings: 386700, 184920). The borehole record indicates that the following geology was encountered:

- Clay to 8.8m below ground level (bgl); and
- Blue Stone from 8.8 to 9.7m bgl.

1.7.4 No water strikes were encountered.

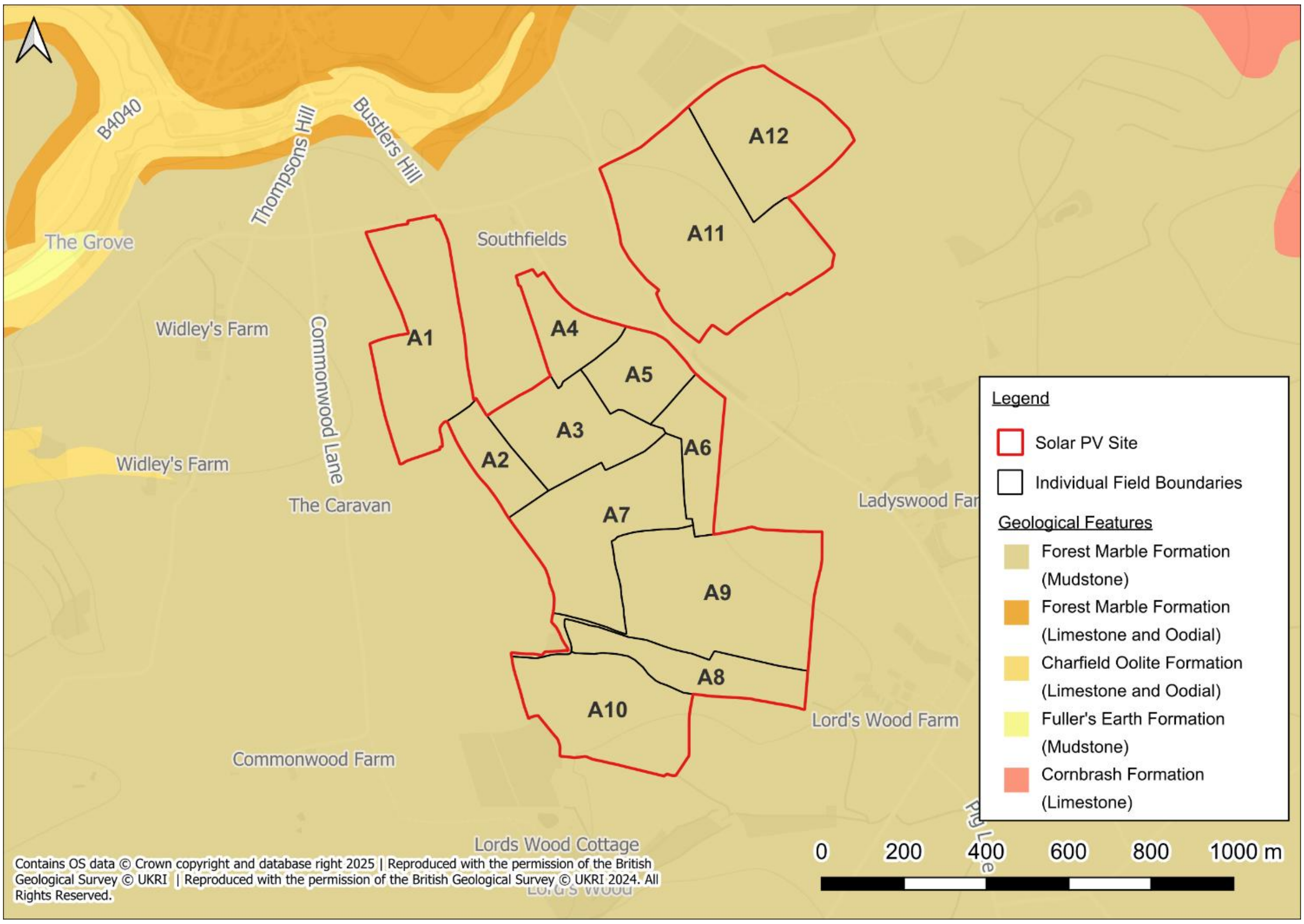


Figure 4: Bedrock Deposits

1.8 Hydrogeology

1.8.1 According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping[iii] [accessed 28/05/2025], the Forest Marble Formation is classified as a Principal Aquifer.

1.8.2 The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 28/05/2025], indicates that Lime Down A is located wholly within a Groundwater Source Protection Zone. Lime Down A falls within the Source Protection Zone II Subsurface Activity area.

1.9 Proposed Site Conditions

1.9.1 Lime Down A proposes a ground mounted solar photo-voltaic plant and associated electrical infrastructure and access. See Chapter 3: Scheme Description of the ES.

1.9.2 An **Outline Landscape and Ecological Management Plan (Outline LEMP) [EN010168/APP/7.18]** has been developed to support the DCO application, and details that the vast majority of the Site is proposed to be utilised for solar panels, supporting infrastructure, internal access and peripheral areas will comprise landscaped buffers in line with the embedded mitigation described throughout the ES.

1.9.3 The impermeable substation access roads are required to provide a robust, all weather access route to the compounds at Lime Down. These routes will need to accommodate exceptional loads associated with transformer delivery, installation and maintenance. The proposed transformers weights have individual weights of approximately 180-200tn, these loads will generate high axial loads to the load bearing track surface. In addition, these impermeable substation access tracks are needed for reliable year-round access/egress for emergency vehicles, including fire services. The use of the impermeable tracks in the substation route reflects both the operational requirements of the electrical infrastructure and the need to maintain a safe and resilient emergency access corridor throughout the lifespan of the project.

~~1.9.3~~1.9.4 Where a 132kV substation is proposed within this area, the detailed design will include a controlled drainage strategy for the substation compound. This will include sealed drainage or sealed drainage components where required, together with suitable treatment, interception, containment and isolation measures to prevent spills, leaks or firewater from affecting ground or controlled waters. The drainage principles for substations are set out in the **Firewater Containment and Drainage Strategy – Lime Down Substation [EN010168/EXAM/9.9],** which is the governing reference for containment and release matters.

2. Assessment of Flood Risk

2.1.1 The aim of this section of the report is to assess and summarise the existing flood risk at Lime Down A.

2.2 Tidal Flood Risk

2.2.1 Lime Down A is situated at a minimum of approximately 108m AOD and is significantly above sea level. Therefore, there is **Negligible** risk from tidal flooding.

2.3 Fluvial Flood Risk

2.3.1 According to the EA's Flood Map for Planning (updated in March 2025)[iv], Lime Down A is situated wholly in Flood Zone 1, meaning it is an area considered to have <0.1% annual probability of flooding from rivers or the sea. Flood maps are included as Figure 5 below and **ES Volume 2, Figure 11-1: Lime Down Fluvial and Surface Water Flood Risk Map [EN010168/EXAM/6.2] (Rev 2)** submitted at Deadline 3 of Examination.

2.3.2 The nearest EA Main River is the River Avon situated approximately 240m north of Lime Down A. There are also two unnamed land drainage ditches that are adjacent to the southern boundary. The River Avon flows in a northeasterly direction towards Malmesbury before flowing in a southerly direction. The two unnamed land drainage ditches flow in a southerly direction.

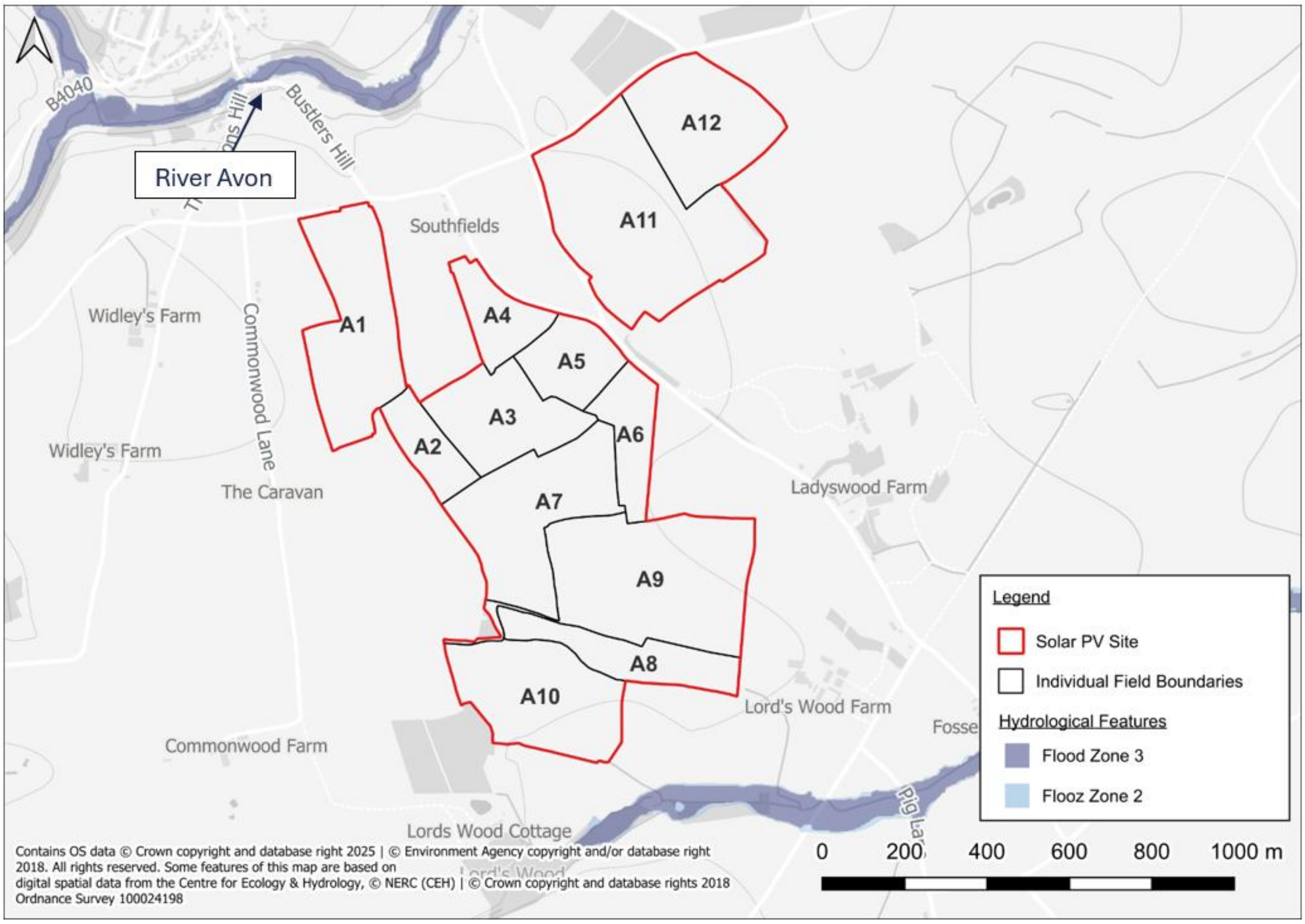


Figure 5: EA's Flood Map for Planning

2.3.3 Fluvial flooding could occur if the land drainage ditches overtopped their banks during or following an extreme rainfall event. However, any out of channel flooding will likely flow to the southeast following local topography.

2.3.4 It is worth noting that the EA Flood Map for Planning extents, which show the potential flood extents of the watercourse south of Lime Down A appear to not cover the whole area. Flow paths identified on the EA's Long Term Flood Risk Map (Surface Water)[v] identify the potential flood extent of the watercourses to the south and the on-site land drainage ditches. These maps (updated in January 2025) are considered to effectively illustrate the potential extent of fluvial flooding, as illustrated in Figure 5.

2.3.5 The EA 'Historical Flood Map' indicates that there have been no incidents of flooding at Lime Down A. The nearest flood extent is approximately 200m north associated with the River Avon which occurred in 1925.

2.3.6 There is no site-specific information within third party reports relating to fluvial flood risk.

2.3.7 To estimate flood levels for a 1% Annual Exceedance Probability (AEP) event with a 71% climate change allowance[vi], Manning's open channel flow formula was applied. A detailed explanation of the calculation, including sources of data and the chosen coefficients, is provided in Annex B. This method was selected as it provides a practical estimate of flow characteristics based on channel shape, roughness, and gradient, particularly where detailed hydraulic modelling has not been undertaken. Cross-sectional data from EA LiDAR, captured in Q1 2020 and detailed in Annex B, informed the calculations. The estimated flood levels suggest limited extents, expected to be smaller than those shown on the EA's 0.1% surface water mapping. This mapping is referenced for context only and was not used as an input to the calculation. The estimated flood extents derived from the Manning's assessment are anticipated to be more limited in extent than those indicated by the EA's 0.1% AEP surface water mapping. The EA mapping has therefore been used as a precautionary indication of potential exceedance flow routes and extents only, with the 1% AEP plus climate change Manning's assessment adopted as the basis for the design event assessment.

2.3.8 It is noted that the Manning's calculation was completed prior to the release of updated NaFRA2 mapping in January 2025. The revised mapping shows a reduction in surface water flood extents across the Site. This supports the view that the current Manning's calculation remains conservative, and there is no requirement to update it.

2.3.9 Based on the analysis, the surface water flood maps offer a suitable and conservative basis for assessing fluvial flood risk at Lime Down A. A more detailed exploration of surface water flood risks can be found in Section 2.4.

Consultation

2.3.10 The EA were consulted in October 2024 for any site-specific flood data and modelling; a response was received on the 13/11/24 and is included as Annex C. Product 4 data received for the area has been produced using the EA's National Generalised Model- JFLOW. This modelling is fit for the purpose of the Flood Zones; However, it is not based on a specific channel survey. The basic JFLOW water depths for the 1% Annual Exceedance Probability event and the 0.1% Annual Exceedance Probability Event are also included in Annex C. The JFLOW mapping finds that at Lime Down A, there are no flood depth on Site during both the 1% Annual Exceedance Probability scenario and the 0.1% Annual Exceedance Probability scenario, with corresponds with Lime Down A being situated wholly within Flood Zone 1.

2.3.11 Consultation has been undertaken throughout the EIA process with the EA and Wiltshire Council. Comments and recommendations received have been noted and applied throughout this Flood Risk Assessment and Outline Drainage Strategy. A record of consultation and the Applicant's responses are included in **ES Volume 1, Chapter 11: Hydrology, Flood Risk and Drainage [EN010168/APP/6.1].**

2.3.12 Lime Down A is not located within an Internal Drainage Board (IDB).

Summary

2.3.13 Lime Down A is considered to be at **Low** risk of fluvial flooding.

2.4 Surface Water Flood Risk

2.4.1 The EA's National Flood Risk Assessment Mapping (NaFRA), known as the Long-Term Flood Risk Map (Surface Water), was updated in January 2025. The NaFRA mapping provides an updated view of surface water flooding across the Site, however it should be noted that at the time of writing, the NaFRA mapping only delivers climate change insight up to the year 2060.

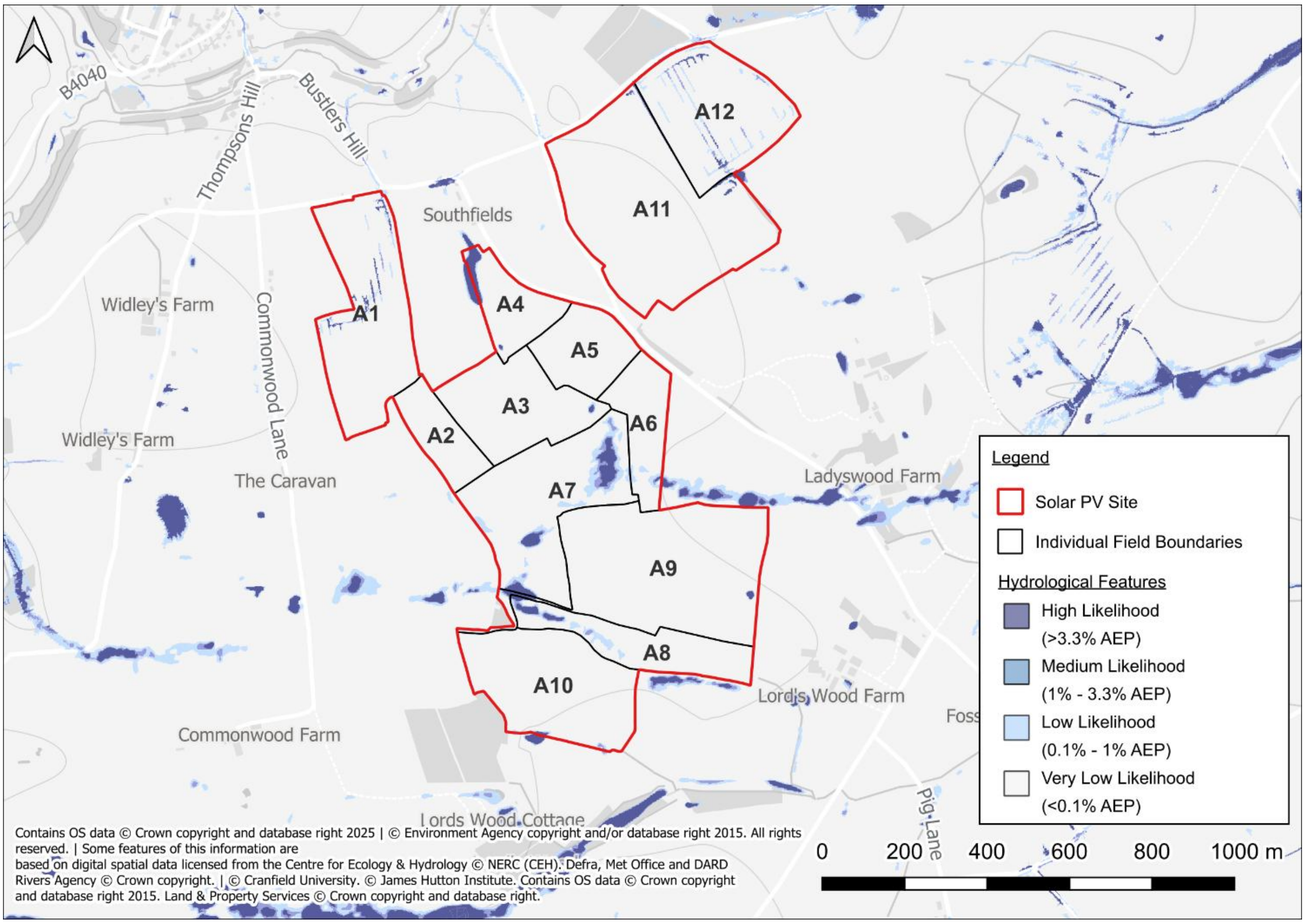


Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)

2.4.2 According to the EA's Long Term Flood Risk Map (Surface Water) the majority of Lime Down A is at Very Low risk of surface water flooding, meaning it has a <0.1% annual probability of flooding. However, there are areas of Low to High risk (0.1 - >3.3% annual chance of flooding), particularly across Fields A4, and A6 – A9.

2.4.3 As described in the fluvial section above, the surface water flooding extents largely match the courses of the unnamed land drainage ditches which flow adjacent to the southern boundary.

2.4.4 Depths are predicted to remain below 300mm during all scenarios across the majority of Lime Down A, with some very small, isolated areas in Fields A1 and A12 expected to reach depths between 300mm – 600mm. Depths of below 300mm are considered passible by vehicles and people, therefore Lime Down

A is deemed passible.

2.4.5 There is no indication within relevant third-party reports (listed in 'Sources of Information' on the main body of **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**) to suggest that Lime Down A has historically experienced surface water flooding.

2.4.6 Based on the above and considering the embedded mitigation as part of the design of the solar panels, the overall risk of surface water flooding is considered to be **Low**. The proposed solar panels will be raised above surrounding ground levels and will be appropriately waterproofed thereby reducing the potential to be impacted in the event of surface water flooding.

2.4.7 In addition to the solar panels, smaller electrical components such as conversion units, where present, are minor in scale and will be protected through elevation or localised resilience measures, consistent with the approach outlined in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3].**

2.4.8 The impact of the Scheme on surface water risk is covered in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]** to ensure that surface water risk is not exacerbated through appropriate Sustainable Drainage Systems (SuDS) measures.

2.5 Groundwater Flood Risk

2.5.1 The geology is identified above in Section 1.0.

2.5.2 There is no information within relevant third party reports (listed 'Sources of Information' on the Covering Report) to suggest that Lime Down A has experienced historical groundwater flooding.

2.5.3 The 2019 Wiltshire Strategic Flood Risk Assessment (SFRA) Data Explorer Map[vii] indicates that Lime Down A is within an area of no risk of groundwater flooding.

2.5.4 No buildings and no basement levels are identified on plans which may otherwise be at increased risk from groundwater seepage.

2.5.5 It can be concluded that the risk of groundwater flooding is **Low** and no site-specific mitigation measures are required.

2.6 Sewer Flooding

2.6.1 No site-specific incidents of sewer flooding have been identified from relevant third-party reports.

2.6.2 On the basis of Lime Down A's rural setting, the presence of sewerage infrastructure is unlikely. Utility records have been checked, and no public sewers are identified as within Lime Down A.

2.6.3 It can therefore be concluded that the risk of sewer flooding is **Negligible**, therefore, no site-specific mitigation measures are required.

2.7 Reservoir and Canal Flooding

2.7.1 There are no canals within the vicinity of Lime Down A and, therefore, there is Negligible associated risk.

2.7.2 The EA 'Flood Risk from Reservoirs' map shows that Lime Down A is not at risk of flooding from reservoirs.

2.7.3 It can therefore be concluded that there is **Negligible** risk of flooding from artificial sources, therefore, no site-specific mitigation measures are required.

2.8 Residual Flood Risks

2.8.1 A residual risk is an exceedance event, such as the 1 in 1000 year (0.1% AEP) flood event that would overtop the land drainage ditches and potentially impact Lime Down A. As the probability of a 1 in 1000 year flood event occurring is 0.1% in any given year, the probability is low and, therefore, no further mitigation beyond what is proposed is required.

2.8.2 In the event of the defences failing or an exceedance event occurring, the residual risk to people working or present in the vicinity, as construction workers, residents, or Public Right of Way (PRoW) users, within Lime Down A can be managed through the implementation of an appropriate Outline CEMP This plan will recognise the residual risks and outline the actions to be taken by staff in the event of a flood to ensure that occupants are placed in a place of safety.

2.9 Summary of Flood Risk

2.9.1 It can be concluded that the risk to Lime Down A from all sources of flooding is **Negligible** to **Low**, however, it would be prudent to include the below mitigation measures.

2.10 Embedded Mitigation

2.10.1 Embedded Mitigation is detailed in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**.

2.10.2 During the construction phase, temporary works and construction activities will be managed to maintain existing floodplain storage, floodplain capacity and overland flood flow routes. Temporary compounds, plant and material storage will be located outside areas identified as potentially susceptible to flooding where reasonably practicable, and construction activities will be undertaken in accordance with the **Outline CEMP [REP2-019]** to ensure flood risk is not increased elsewhere.

2.11 Impact on Off-Site Flood Risk

2.11.1 The solar panels and associated electrical infrastructure, including inverters, transformers, cabling, and substations, will, where possible, be located outside the flood extent. If this is not feasible, they will be elevated with appropriate freeboard above the local flood level. These components will be installed on concrete foundations or pads mounted on frames, allowing floodwater to flow freely underneath. This approach prevents any loss of floodplain volume and ensures there is no increase in flood risk elsewhere – areas where panels are proposed in Flood Zones 2 / 3 have undergone the appropriate floodplain storage calculations – see **ES Volume 3, Appendix 11-6 and 11-8: Flood Risk Assessment and Outline Drainage Strategy – Lime Down D and Lime Down E2 [EN010168/APP/6.3]**. The components are insignificant in size with detailed dimensions provided in **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**. Additionally, any units incorporating hardstanding surfaces will feature SuDS measures to mitigate any increase in surface water runoff. Together, these measures ensure the Scheme does not contribute to an increase in flood risk.

2.11.2 Surface water management has been considered in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**.

3. Outline Drainage Strategy

3.1 Introduction

3.1.1 Lime Down A forms part of the wider Scheme and includes Solar PV Panelled Areas, one 132kV Substation with associated access track, and nine Conversion Units / 33kV Sub-distribution Switch Rooms. This section provides the Outline Drainage Strategy for Lime Down A. It identifies the areas requiring formal drainage consideration, sets out the basis of the runoff and attenuation calculations, and demonstrates that a feasible drainage solution can be accommodated within the assessed design envelope. Excluding the 132kV Substation, the 132kV Substation access track where conservatively assessed as hardstanding surfaces, and the nine Conversion Unit / 33kV Sub-distribution Switch Room equipment pads, Lime Down A will remain largely permeable following development. Solar PV infrastructure is not treated as contributing to the overall extent of positively drained hardstanding surfaces for the purposes of this Outline Drainage Strategy.

3.1.2 For the purpose of this assessment, this Outline Drainage Strategy is split as follows:

- A description of surface water drainage from the Solar PV Panelled Areas, excluding the 132kV Substation, the 132kV Substation access track where conservatively assessed as hardstanding surfaces, and the nine Conversion Units / 33kV Sub-distribution Switch Rooms; and
- An outline drainage strategy for the positively drained hardstanding surfaces, comprising the 132kV Substation, the 132kV Substation access track where conservatively assessed as hardstanding surfaces, and the nine Conversion Units / 33kV Sub-distribution Switch Rooms. The detailed drainage layout, final SuDS components, conveyance routes, levels, outfalls, flow controls, treatment train, isolation arrangements and maintenance regime will be confirmed at detailed design and secured through the relevant DCO drainage requirement.

3.2 Solar PV Panelled Areas

3.2.1 Solar PV panelled areas are not treated as formal impermeable drainage catchments within this Outline Drainage Strategy. The panels are elevated above ground level, drain to the existing ground, are not sealed into a drainage network, and do not create a connected impermeable surface.

3.2.2 This approach is supported by national policy and the submitted evidence base. **NPS EN-3 paragraph 2.10.84** recognises that solar PV panels drain to the existing ground and that the drainage impact will not, in general, be significant. This position is also addressed in **ES Volume 1, Chapter 11: Hydrology, Flood Risk and Drainage [REP1-017], ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy - Covering Report [REP1-037]** and the **Applicant's Response to the Lead Local Flood Authority on Hydraulic Modelling Requirements [REP2-045]**.

3.2.3 The Applicant's review of the relevant research and guidance confirms that, where vegetated ground cover is established and maintained, soil compaction is avoided or remediated, and connected preferential flow routes are not created, solar PV panels are not predicted to increase surface water runoff rates or volumes in a manner that requires formal attenuation.

3.2.4 The principal effect of the panels is local redistribution of rainfall within the same field, including potential concentration at panel drip-lines. This does not generate additional rainfall volume. Whether redistributed rainfall becomes runoff is governed by the condition of the receiving ground, including vegetation cover, soil structure, compaction, surface roughness, slope and hydrological connectivity.

3.2.5 Those controlling factors are addressed through the embedded mitigation secured for the Scheme.

Construction phase controls are secured through **the Outline Construction Environmental Management Plan [REP2-019]** and **Outline Soil Resources Management Plan [APP-280]**, including controls on construction trafficking, soil handling, temporary drainage, decompaction and reinstatement. Operational ground cover and land management controls are secured through the **Outline Landscape and Ecological Management Plan [APP-283]** and **Outline Operational Environmental Management Plan [REP2-021],** including the establishment and maintenance of vegetated ground cover beneath and between the arrays.

3.2.6 On this basis, no formal attenuation storage is proposed for the solar PV panelled areas. Additional built SuDS across the panelled fields would not be proportionate, as the policy and evidence base indicate that solar PV panels do not materially increase surface water runoff where the relevant ground condition, vegetation and flow connectivity controls are secured. The Outline Drainage Strategy for these areas is therefore to maintain diffuse drainage to the existing ground, preserve existing field-scale flow behaviour, protect existing drainage features, and manage soil and vegetation condition through the secured construction and operational controls. Internal access tracks within the Solar PV Panelled Areas will be formed using permeable materials and, where practicable, maintained at existing ground levels. These tracks are not treated as positively drained hardstanding surfaces requiring formal attenuation, except where specifically and conservatively assessed within this Outline Drainage Strategy, such as the 132kV Substation access track.

3.3 Outline Drainage Strategy – Proposed Hardstanding Surfaces

3.3.1 Lime Down A currently comprises agricultural land. For the purposes of the runoff calculations, the undeveloped areas are treated as greenfield and permeable, with existing field drainage and local drainage features forming part of the baseline drainage regime. Table 1 identifies the assessed hardstanding surfaces within Lime Down A. These areas have been included within this Outline Drainage Strategy because they would either be positively drained or have been conservatively assessed as requiring positive drainage.

Table 1: Proposed Hardstanding Surfaces

Hardstanding Infrastructure	Hardstanding Area (m^2)
132kV Substation	5,081
132kV Substation Access Track	1,398
9 x Conversion Units / 33kV Sub-Distribution Switch Rooms	675 (9 × 75 m^2)

3.3.2 The assessed hardstanding surfaces have been identified using the indicative infrastructure areas currently proposed for Lime Down A, or, where the final equipment layout is not fixed, the relevant maximum design parameters set out in **ES Volume 1, Chapter 3: The Scheme [APP-055].** Where the Works Plan envelope or indicative infrastructure area is smaller than the relevant Chapter 3 maximum parameter, the assessed area has been limited to the area that can feasibly be accommodated within Lime Down A. This provides a conservative but realistic basis for demonstrating that the required drainage infrastructure can be delivered within the assessed design envelope.

3.3.3 The assessed hardstanding surfaces have the potential to increase surface water runoff rates and volumes if unmanaged. Surface water runoff from these areas will therefore be controlled so that the Scheme does not result in a material increase in flood risk on-site or elsewhere.

3.3.4 Wiltshire Council Sustainable Drainage Systems (SuDS) Guidance states the following:

"With regards the control of surface water discharges from new development, Wiltshire Council requires post development discharges from greenfield sites to provide 30% betterment over pre-development

discharges for all storm events between the 1 in 1year and 1 in 100year return period events."

3.3.5 A fixed detailed drainage layout drawing or sketch is not submitted at this outline stage. The purpose of this Outline Drainage Strategy is to demonstrate that a feasible drainage solution can be accommodated within Lime Down A based on the assessed hardstanding surfaces, greenfield runoff rates, controlled discharge rates, indicative attenuation volumes, SuDS options and maintenance principles. The detailed drainage design, including the final layout, levels, outfall arrangement and maintenance access, will be submitted and approved in accordance with the relevant DCO drainage requirement before the relevant part of the authorised development commences.

3.4 Drainage Hierarchy

3.4.1 The proposed surface water drainage strategy has been prepared in accordance with the drainage hierarchy set out in the National Standards for Sustainable Drainage Systems (SuDS) and in line with Paragraph 080 of the National Planning Practice Guidance (NPPG): Flood Risk and Coastal Change. The hierarchy prioritises reuse and infiltration where feasible, followed by discharge to an above-ground surface water body, discharge to a surface water sewer or other surface water drainage system, and finally discharge to a combined sewer.

3.4.2 The following drainage hierarchy review considers normal operation. In the event of a potential pollution incident, including a firewater scenario where relevant, the drainage system would be isolated and managed in accordance with the relevant containment strategy. Firewater management is discussed further below.

3.4.3 The hierarchy establishes the following order of preference for runoff destinations:

- Priority 1: Collect surface water for reuse within the development (e.g. irrigation or non-potable supply).
- Priority 2: Infiltrate runoff to the ground, where ground conditions and groundwater levels permit.
- Priority 3: Discharge runoff to an above-ground surface water body such as a watercourse, pond or wetland.
- Priority 4: Discharge runoff to a surface water sewer, highway drain or other drainage system.
- Priority 5: Discharge runoff to a combined sewer.

3.4.4 Where higher levels of the hierarchy cannot be achieved, proportionate justification must be provided to demonstrate compliance with national policy while ensuring effective flood risk management and long-term sustainability.

Priority 1: Surface Water Collected for non-Potable Use

3.4.5 Rainwater harvesting has been considered for the proposed development. However, Lime Down A does not include a sustained non-potable demand capable of receiving and using runoff from the positively drained hardstanding surfaces during design rainfall events. Reuse therefore cannot provide the sole means of disposal, and a secondary discharge route is required.

Priority 2: Surface Water Infiltrated to Ground

3.4.6 Where surface water collected for non-potable use (Priority 1) cannot be the sole method of disposal, the next consideration is infiltration (soakaways and permeable surfaces).

3.4.7 As described above, the site is not underlain by superficial deposits and the underlying bedrock comprises the Forest Marble Formation, consisting of mudstone. Soilscapes mapping describes the majority of the Site, including the area where the 132kV Substation is proposed, as having "lime-rich loamy and clayey soils with impeded drainage".

3.4.8 In line with the National Standards for SuDS, infiltration should only be used where ground conditions are suitable, groundwater is protected, and land stability is not compromised. The available ground condition information indicates that infiltration potential is likely to be limited, with impeded drainage soils and mudstone bedrock reducing the likelihood of reliable long-term soakaway performance.

3.4.9 Infiltration is therefore not considered suitable as the primary method of surface water disposal for the 132kV Substation drainage catchment. This avoids relying on soakaways where ground conditions are unlikely to provide adequate infiltration capacity, particularly during prolonged or high intensity rainfall.

3.4.10 This does not preclude the use of permeable surfaces, shallow filter drains or local French drain arrangements as source-control features for small, discrete areas of supporting infrastructure, where appropriate. Such features would manage small volumes locally and would not be relied upon as the primary outfall for the 132kV Substation drainage catchment.

3.4.11 Surface water from the 132kV Substation and other positively drained hardstanding surfaces will therefore be managed through a controlled drainage system, with attenuation and restricted discharge to an appropriate receiving drainage feature or watercourse.

Priority 3: Discharge to an Above Ground Surface Water Body

3.4.12 Where surface water collected for non-potable use (Priority 1) cannot be the sole method of disposal, and infiltration to ground (Priority 2) has been demonstrated to be unsuitable, discharge to an above ground waterbody should be the next consideration.

3.4.13 The nearest watercourse is an unnamed land drain located adjacent to the southern boundary of Lime Down A. Discharge to this watercourse at controlled rates is considered feasible by gravity, subject to detailed design of the outfall arrangement and any necessary approvals.

Priority 4: Discharged to a Surface Water Sewer, or Another Piped Surface Water Drainage System

3.4.14 As described above, discharge to the unnamed land drain appears feasible; therefore, a connection to a public surface water sewer is not proposed. Should detailed design demonstrate that direct discharge to the watercourse is not feasible, alternative lower-priority destinations would be reviewed in accordance with the drainage hierarchy and subject to the relevant approvals.

Priority 5: Discharge to a Combined Sewer

3.4.15 As described above, discharge to the unnamed land drain appears feasible; therefore, discharge to a combined sewer is not proposed.

3.5 Surface Water Discharge

3.5.1 In accordance with the 2025 National Standards for SuDS in England Guidance, runoff destinations have been assessed following the required hierarchy.

3.5.2 As infiltration is not considered suitable as the primary discharge route for the 132kV Substation drainage catchment, runoff from the positively drained hardstanding surfaces will be attenuated on site and discharged at controlled rates to the unnamed land drain in line with greenfield runoff principles and the LLFA requirement for 30% betterment. This is subject to the use of minimum practical flow controls where very small catchments would otherwise require flow control orifices that would be at unacceptable risk of blockage.

3.5.3 Greenfield runoff rates have been calculated for each assessed hardstanding surfaces using the FEH Statistical (2025) method and are summarised in Table 2. The proposed discharge rates and associated attenuation volumes are indicative and have been prepared using the indicative infrastructure areas currently proposed, or the maximum relevant design parameters set out in **ES Volume 1, Chapter 3: The Scheme [APP-055]** where the final equipment layout is not fixed. Where the Works Plan envelope or indicative infrastructure area is smaller than the relevant Chapter 3 maximum parameter, the assessed area has been limited to the area that can feasibly be accommodated within Lime Down A. Greenfield calculation input parameters and results are provided in Annex D.

3.5.4 This approach demonstrates that a feasible drainage solution can be accommodated within Lime Down A and that peak runoff from positively drained hardstanding surfaces can be controlled so that the Scheme does not result in a material increase in flood risk on-site or elsewhere.

3.5.5 The attenuation volumes are indicative and are provided to demonstrate the feasibility of the Outline Drainage Strategy. The final drainage design may rationalise the number, location and form of SuDS components, provided the detailed design remains within the assessed design envelope and achieves the drainage principles secured through the relevant DCO drainage requirement.

Table 2: Greenfield Runoff Rates

Infrastructure	1 in 2 year (l/s)	1 in 30 year (l/s)	1 in 100 year (l/s)	1 in 2 year +30% betterment (l/s)	Proposed Discharge Rate (l/s)	Attenuation (m^3)
132kV Substation	1.6	3.4	4.3	1.1	1.1	598.8
132kV Substation Access Track	0.5	1.0	1.2	0.4	1.0*	123.0
Conversion Unit / 33kV Sub-Distribution Switch Room, per unit	0.2	0.5	0.6	0.1	0.1	6.1**

* For very small drainage catchments, the calculated 30% betterment discharge rate may require a flow control orifice below the minimum practical size, which would increase blockage risk and reduce long-term reliability. A minimum practical flow control rate of 1.0 l/s has therefore been adopted for the 132kV Substation access track catchment. The final flow control arrangement will be confirmed at detailed design, with appropriate blockage protection, maintenance access and upstream attenuation.

** The Conversion Unit / 33kV Sub-distribution Switch Room attenuation volume is calculated on a per-unit basis. For Lime Down A, each unit requires approximately 6.1m^3 of indicative local storage, to be provided through source-control SuDS such as perimeter French drains, filter drains or equivalent features. Nine units are proposed at Lime Down A, giving a cumulative indicative local storage requirement of approximately 54.9m^3.

3.6 Sustainable Drainage Systems

3.6.1 The SuDS appraisal approach outlined in the SuDS Manual (C753) has been applied to determine the most suitable methods for achieving sustainable surface water attenuation and conveyance to support the proposed development. The SuDS options summarised in Table 3 below have been considered:

Table 3: SuDS Options for Proposed Development

SuDS Measure	Amenity Benefit	Biodiversity Benefit	Suitability for Proposed Development	Reasoning
Soakaways	Although soakaways are typically below ground, they can contribute to amenity by allowing the land above to be used for landscaping or recreation. When integrated with visible SuDS features or planting, they can enhance the visual quality of a site and support multifunctional, attractive spaces.	Soakaways support biodiversity indirectly by promoting groundwater recharge and maintaining natural hydrological conditions. When combined with vegetated SuDS components, they can enhance habitat connectivity and contribute to ecological networks across a site.	✗	As described above, the use of soakaways is not considered to be feasible.
Swales, Detention Basins and Ponds	Swales, detention basins and ponds contribute positively to site amenity by providing visually attractive, multifunctional spaces that enhance the quality and character of a development. These features can be integrated within the landscape as green corridors, linking open spaces and promoting interaction between people and water. When appropriately designed, they offer opportunities for recreation, education and visual interest,	Swales, detention basins and ponds deliver significant biodiversity value through the provision of varied and connected habitats. Swales function as linear green corridors, enabling wildlife movement and supporting diverse vegetation. Detention basins create temporary wetland conditions that benefit a range of species, while ponds provide permanent aquatic and marginal habitats supporting invertebrates, amphibians and birds. Collectively, these features enhance habitat	✓	Sufficient space is available on site to utilise a pond, basin or swale as an above ground attenuation feature. In order to facilitate gravity drainage, attenuation features should be located towards the topographic lower levels.

	creating a more appealing and liveable environment.	diversity, strengthen ecological connectivity and contribute to the establishment of a resilient green-blue network across the site.		
Filter Drains/ Strips	Filter drains and filter strips can contribute to site amenity by creating attractive, vegetated edges that soften hard surfaces and integrate drainage within the landscape. When aligned along roads or paths, they form part of functional green corridors that enhance visual quality and support a sense of place.	These features provide ecological value through vegetated zones that support invertebrates and small fauna. When linked with other SuDS components, they strengthen habitat connectivity and contribute to the wider green-blue network promoted within the SuDS approach.	✓	Filter drains are trenches filled with stone/gravel that create temporary subsurface storage for the filtration, attenuation, and conveyance of surface water runoff. Ideally, filter drains receive lateral inflow from adjacent impermeable surfaces pretreated over a filter strip. Filter drains can help manage peak flows by naturally limiting rates of conveyance through the filter medium and by providing attenuation storage when the rate of flow at the outlet is controlled.
Bioretention Systems	Bioretention systems, including rain gardens and bioretention planters, provide attractive, vegetated features that enhance the streetscape and create visually appealing focal points within developments. They contribute to high-quality, multifunctional spaces by integrating drainage into the landscape and improving the relationship between people, water and planting.	These systems deliver biodiversity value through diverse planting and soil conditions that support pollinators, invertebrates and small fauna. They also play a key role in improving water quality by filtering and treating pollutants from surface runoff before infiltration or discharge. Collectively, they enhance ecological connectivity and contribute to the wider green-blue infrastructure.	✓	Bioretention systems (including rain gardens and raised box planters) are shallow landscaped depressions that can reduce runoff rates and volumes and treat pollution. They also provide attractive landscape features and biodiversity. Bioretention systems can help reduce flow rates from a site by promoting infiltration / evapotranspiration and providing some attenuation storage. Bioretention systems can also provide very effective treatment functionality. Bioretention systems are a very flexible surface water management component that can be integrated into a wide variety of developments / densities using different shapes, materials, planting, and dimensions.

				Bioretention systems (including rain gardens) should be considered within the detailed drainage design stage.
Rainwater Harvesting	Rainwater harvesting systems can contribute to site amenity by visibly demonstrating sustainable water management and promoting environmental awareness. When integrated within building or landscape design, they can enhance the character of a development by supporting water features, irrigation, or other non-potable uses that add functional and aesthetic value to spaces.	By reducing surface water runoff, rainwater harvesting systems help protect downstream SuDS features and receiving watercourses from pollution and erosion. Stored water can also be used to support planting and green infrastructure, indirectly benefiting biodiversity through improved vegetation health and habitat provision.	X	The attenuation benefits provided through the use of rainwater harvesting are considered to be limited and would only be realised when the tanks were not full. Water usage on site is unlikely to be significant and therefore the benefit of retaining water is limited.
Green Roofs	Green roofs enhance the visual quality of buildings and contribute to the creation of more attractive and liveable urban environments. They can provide accessible or visual green spaces within dense developments, offering opportunities for recreation, relaxation, and improved wellbeing while demonstrating sustainable design in practice.	Green roofs support biodiversity by providing valuable habitats for invertebrates, birds, and pollinators, particularly where native or species-rich planting is used. They also improve water quality and reduce runoff rates by capturing, filtering, and slowly releasing rainfall, supporting the wider SuDS objectives of managing water quantity, quality, and ecology.	X	Green roofs are not identified on development plans. Given the nature of the Scheme, green roofs are not considered a practical option. The benefits achieved through installing a green roof would be disproportionate to the significant ongoing maintenance and construction costs involved.
Porous/ Permeable Surfacing (infiltration)	Porous and permeable surfaces can enhance the quality and functionality of developed areas by integrating	Infiltration-based permeable surfaces promote natural groundwater recharge and improve water quality by	X	Controlled drainage measures, including sealed surfacing or sealed drainage components where required, can be incorporated within the substation areas to

	drainage directly into hardstanding such as car parks, footpaths and access roads. They maintain a natural appearance, reduce surface water ponding, and contribute to safer, more attractive public spaces while supporting the seamless integration of SuDS within the built environment.	filtering and retaining pollutants within the sub-base before infiltration. When combined with adjacent vegetated SuDS features, they can contribute to habitat connectivity and support the wider green-blue network across a site.		prevent uncontrolled infiltration of spills, leaks or firewater into ground or controlled waters. The detailed drainage design should include appropriate treatment, interception, containment and isolation measures proportionate to the substances stored and the sensitivity of the receiving environment. The drainage principles are set out in the **Firewater Containment and Drainage Strategy – Lime Down Substation [REP3-120].**
Porous/ Permeable Surfacing (Lined)	Lined porous and permeable surfaces provide an attractive, functional drainage solution that manages runoff close to source while maintaining the appearance and usability of hardstanding areas such as car parks, courtyards and footpaths. They support high-quality, multi-functional urban design by integrating water management within the built environment without detracting from site amenity.	Lined permeable surfacing may be suitable where containment is required and infiltration to ground is not appropriate. It can provide source control, treatment and temporary storage while preventing uncontrolled infiltration to ground or controlled waters. The final use of lined permeable surfacing will be confirmed at detailed design and coordinated with the substation containment strategy. Although infiltration is prevented, lined permeable surfaces still contribute to SuDS objectives by providing effective pollutant removal through filtration and sedimentation within the surface and sub-base layers. By controlling and treating	✓	Fixed areas of the substation area are not yet available and therefore accurate permeable surfacing storage estimates must be calculated at the detailed design stage. Typically, the storage offered can be calculated by multiplying the surface area of the permeable surfacing (m^2) by the proposed depth (m) by a porosity ratio of 0.3.

		runoff before discharge to other SuDS components, they protect downstream water quality and can indirectly support biodiversity by maintaining cleaner flows to connected green-blue infrastructure.		
Underground Attenuation Tanks / Geocellular Storage / Oversized Pipes	Underground attenuation tanks and geocellular storage systems provide essential runoff control while preserving the use and appearance of surface areas. By locating storage below ground, they enable land above to be used for landscaping, parking, or recreation, supporting efficient land use and maintaining overall site amenity.	These systems offer limited direct biodiversity value but can contribute indirectly by facilitating above-ground green spaces and protecting downstream SuDS features. When designed with pre-treatment measures, they assist in pollutant removal, improving water quality prior to discharge and supporting the performance of connected ecological SuDS components.	✗	Underground attenuation storage is not proposed, as alternative SuDS features have been selected that provide sufficient on-site attenuation while offering additional water quality, amenity, and biodiversity benefits.

3.7 Attenuation Storage

Extreme Rainfall

3.7.1 Attenuation storage will be required to manage surface water runoff from the positively drained hardstanding surfaces and achieve the controlled discharge rates set out below. A combination of SuDS features, and flow control devices is proposed to manage surface water runoff at Lime Down A.

3.7.2 The hardstanding surfaces requiring positive drainage have been identified using either the indicative area of the infrastructure proposed at Lime Down A, or, where the final equipment layout is not fixed, the relevant maximum design parameters for that equipment set out in **ES Volume 1, Chapter 3: The Scheme [APP-055]**. Where the Works Plan envelope or indicative infrastructure area is smaller than the relevant Chapter 3 maximum parameter, the assessed area has been limited to the area that can feasibly be accommodated within Lime Down A. The calculations are therefore conservative and are provided for illustrative purposes to demonstrate that a feasible drainage solution can be accommodated within Lime Down A and within the assessed design envelope.

3.7.3 Greenfield runoff rates have been calculated for each assessed hardstanding surface. The proposed discharge rates have then been restricted in accordance with the LLFA drainage requirement, with attenuation storage sized to manage runoff up to and including the 1% AEP plus 45% climate change event.

3.7.4 The larger hardstanding surfaces, including the 132kV Substation Area and associated access track where conservatively assessed as hardstanding surfaces, will be collected and conveyed to formal attenuation and flow control features prior to discharge at the restricted rate.

3.7.5 The nine Conversion Units / 33kV Sub-distribution Switch Rooms comprise small, discrete areas of supporting electrical infrastructure. Switchgear comprises electrical disconnect switches, fuses and circuit breakers used to control, protect and isolate electrical equipment. For the purposes of this assessment, runoff calculations have been based on the maximum 15m by 5m footprint for Integrated Conversion Units / 33kV Sub-distribution Switch Rooms defined in **ES Volume 1, Chapter 3: The Scheme [APP-055]**, equivalent to 7 m^2per unit. This provides a conservative basis for assessment.

3.7.6 For an individual 75m^2 unit, the calculated runoff rate is very low, with a proposed discharge rate of approximately 0.1l/s and an indicative local storage volume of approximately 6.1m^3. Across Lime Down A, the cumulative assessed area of the nine Conversion Units / 33kV Sub-distribution Switch Rooms is 675m^2. The calculated cumulative greenfield runoff rates are 0.2l/s for the 1 in 2 year event, 0.5l/s for the 1 in 30 year event and 0.6l/s for the 1 in 100 year event. The indicative local storage volume is approximately 6.1m^3 per unit, giving a cumulative indicative local storage requirement of approximately 54.9m^3 across the nine units.

3.7.7 Given the small contributing area, low calculated runoff volumes and dispersed nature of the infrastructure, it is not considered proportionate to provide long piped drainage connections from each unit to a formal outfall. Runoff from each unit will therefore be managed locally using a perimeter French drain, filter drain or equivalent source-control SuDS arrangement. These features will provide local storage and source control around the equipment pads and will not be relied upon as strategic attenuation basins or as part of a wider piped drainage network.

3.7.8 Final dimensions, aggregate specification, freeboard and maintenance requirements for the French drains will be confirmed at detailed design, having regard to the final equipment layout and local ground conditions. This approach is consistent with the drainage hierarchy and source control principles set out in CIRIA C753: The SuDS Manual, and avoids creating unnecessary point discharges from small, isolated areas of supporting electrical infrastructure.

3.7.9 Hydraulic calculations carried out in Causeway Flow demonstrate that the illustrative drainage approach has sufficient capacity to manage runoff from the assessed hardstanding surfaces up to and including the 1% AEP plus 45% climate change event. The calculations are not intended to fix the final drainage layout, but demonstrate that the required attenuation and flow control can be delivered within Lime Down A. Key details for the proposed attenuation storage and flow control required to manage surface water runoff are summarised in the tables below. Hydraulic calculations are provided in Annex E.

Table 4: 132kV Substation Area Attenuation Storage

Contributing Area	5,081m^2
Flow Rate	1.1/s
Flow Control	HydroBrake
Flow Control Design Head	1.0m
Estimated Required Volume (1 in 100 year +45%CC)	598.8m^3

Table 5: 132kV Access Tracks Attenuation Storage

Contributing area	1,398m^2
Flow Rate	1.0l/s
Flow Control	HydroBrake
Flow Control Design Head	0.75m
Estimated Required Volume (1 in 100 year +45%CC)	123.0m^3

Table 6: Conversion Unit/33kV Distribution Switch Room Attenuation Storage

Contributing Area	75m^2 (per unit)
Flow Rate	0.1l/s
Flow Control	HydroBrake
Flow Control Design Head	0.75m
Estimated Required Volume (1 in 100 year +45%CC)	6.1m^3 (per unit)

<u>Everyday Rainfall</u>

3.7.10 In addition to managing extreme rainfall events, measures should be implemented to ensure runoff generated during more frequent everyday rainfall events is sustainably managed. For these events, where practicable, the volume of runoff generated from the first 5mm of rainfall should not leave the Site.

Table 7: 132kV Substation Area Everyday Rainfall*

Contributing Area	5,081m^2

Rainfall Depth	0.005m
Runoff Volume	25.4m^3
Required Additional Depth	0.05m

Table 8: 132kV Access Tracks Everyday Rainfall*

Contributing Area	1,398m^2
Rainfall Depth	0.005m
Runoff Volume	6.9m^3
Required Additional Depth	0.05m

Table 9: Conversion Unit/33kV Distribution Switch Room Everyday Rainfall*

Contributing Area	75m^2
Rainfall Depth	0.005m
Runoff Volume	0.4m^3
Required Additional Depth	0.~~08m~~4m

**The calculations above assume that the storage is provided within a basin for the purposes of illustration. The final form of storage may differ depending on the detailed layout and may include other SuDS components capable of providing equivalent storage and treatment.*

3.7.11 As shown in the tables above, the everyday rainfall volumes are limited and can be accommodated within the proposed SuDS features by providing the required additional storage depth. This allows the first 5 mm of rainfall to be retained and managed within the drainage system, through infiltration where local ground conditions permit, evaporation, evapotranspiration, or subsequent controlled release depending on the final SuDS arrangement.

3.8 Preferred Drainage Scheme

3.8.1 The viable SuDS features and associated hydraulic calculations have been reviewed above. The final extent and arrangement of hardstanding surfaces will be confirmed at detailed design; however, the calculations presented in this report have been prepared using the indicative infrastructure areas currently proposed, or the maximum relevant design parameters set out in **ES Volume 1, Chapter 3: The Scheme [APP-055]** where the final equipment layout is not fixed. The calculations are therefore conservative and are provided to demonstrate that a feasible drainage solution can be accommodated within Lime Down A and within the assessed design envelope. ~~A fixed detailed drainage layout drawing or sketch is not submitted at this outline stage, as the final drainage layout will depend on the detailed design of the 132kV Substation, access and associated equipment.~~

3.8.2 Greenfield runoff rates have been calculated for the assessed hardstanding surfaces and the proposed discharge rates have been restricted in accordance with the LLFA drainage requirement. The identified receiving watercourse is an unnamed land drain adjacent to the southern boundary of Lime Down A, with the indicative cumulative controlled discharge rates provided within Tables 4, 5 and 6. The proposed SuDS features will attenuate surface water runoff from the positively drained hardstanding surfaces up to and including the 1% AEP plus 45% climate change event. The final drainage design will confirm the detailed layout, attenuation volumes, flow controls, outfall arrangement, treatment train, isolation measures and maintenance requirements, and will ensure that peak runoff from positively drained hardstanding surfaces are controlled so that the Scheme does not result in a material increase in flood risk on-site or elsewhere.

3.8.3 The drainage strategy is necessarily proportionate to the current stage of design. As such, an outline drainage sketch is provided in Annex F, however, a fixed detailed drainage layout drawing will not be submitted at this outline stage, as the final drainage layout will depend on the detailed design of the site.

3.8.4 The final technology, equipment layout, finished levels, drainage catchments and configuration of the drainage system remain subject to detailed design. It is therefore neither possible nor appropriate at this stage to define separate drainage arrangements, dimensions and attenuation volumes for each individual item of infrastructure. For the purposes of demonstrating feasibility, the Causeway Flow calculation applies the total assessed hardstanding area and the committed restricted discharge rate to determine the indicative attenuation storage requirement. The generic tank shown within the calculation is a nominal software storage unit used solely to derive the required storage volume and does not represent a proposed tank or other drainage feature. The dimensions assigned to that unit should therefore not be interpreted as proposed drainage dimensions.

3.8.5 The assessment conservatively assumes that runoff from the identified hardstanding areas is managed through a controlled drainage system and demonstrates that sufficient attenuation can be provided within the available land using one or more appropriate SuDS or other attenuation features. Undertaking separate calculations and fixing dimensions for each component at this stage would imply a degree of design certainty that does not exist, unnecessarily constrain the subsequent optimisation of the Scheme and would not materially improve the assessment of flood risk. The final drainage arrangement, including the contributing catchments, conveyance system, storage type, dimensions and required volumes, will be recalculated and verified against the final technology and layout at detailed design stage. It will remain subject to the discharge limits, design standard and drainage principles established by this strategy and secured through Requirement 5 of the **Draft Development Consent Order [REP4-004]**.

3.9 Event Exceedance

3.9.1 The illustrative SuDS approach has been sized to manage surface water runoff from the positively drained hardstanding surfaces up to and including the 1% AEP plus 45% climate change event. Storm events in excess of this design event may result in temporary shallow exceedance flooding within lower-risk areas of Lime Down A.

3.9.2 Finished levels for sensitive electrical infrastructure and equipment plinths will be set above surrounding ground levels where practicable. Exceedance routes will be confirmed at detailed design and will direct residual flows away from critical equipment, buildings and access points where practicable, so that exceedance flooding does not result in a material increase in flood risk on-site or elsewhere.

3.10 Surface Water Treatment

3.10.1 In accordance with DEFRA's National standards for sustainable drainage systems and the Simple Index Approach as described in C753 The SuDS Manual (2015), other roofs have a 'low' pollution hazard level, with commercial yards classified as having a 'medium' pollution hazard level. The table below shows the pollution hazard indices for each land use.

Table 10: Pollution Hazard Indices

Land Use	Pollution Hazard Level	Total Suspended Solids (TSS)	Metals	Hydrocarbons

Other Roofs (typically commercial/industrial roofs)	Low	0.5	0.2**	0.4
Commercial Yard and Delivery Areas, Non-residential Car Parking and all roads except Low Traffic Roads	Medium	0.7	0.6	0.7

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 26.2

* Indices values range from 0-1.

** up to 0.8 where there is potential for metals to leach from the roof

3.10.2 Runoff from positively drained hardstanding surfaces will be routed through an appropriate SuDS treatment train before controlled discharge. Table 11 below demonstrates the mitigation indices for typical SuDS components that may be used within the final drainage design.

Table 11: SuDS Mitigation Indices

	Mitigation Indices		
Type of SuDS	**Total Suspended Solids (TSS)**	**Metals**	**Hydrocarbons**
Permeable Surfacing	0.7	0.6	0.7
Swale	0.5	0.6	0.6
Detention basin	0.5	0.5	0.6
Pond	0.7	0.7	0.5

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' -Table 26.3

3.10.3 It is concluded that a suitable combination of SuDS components, such as detention basins, ponds, swales, lined permeable surfacing and/or filter drains, can provide sufficient treatment for the assessed pollution hazard indices. The final treatment train will be confirmed at detailed design and will be coordinated with the required attenuation, isolation and maintenance arrangements.

3.11 Firewater Consideration

3.11.1 The firewater containment and pollution control principles apply to the 132kV Substation drainage at Lime Down A only. Detailed design will identify the appropriate containment, isolation and treatment measures for the substation compound, in accordance with the principles set out in **Firewater Containment and Drainage Strategy - Lime Down Substation (Rev 2) [REP3-120].**

3.11.2 The principal potential pathway for contaminated firewater or polluted runoff from the 132kV Substation Area would be through the proposed surface water drainage system or any uncontrolled discharge to ground. The drainage system will therefore be designed so that it can be isolated in the event of a pollution incident or firewater containment scenario. Where required, this will include lined drainage components, controlled outfalls and shut-off valves to prevent uncontrolled discharge from the substation drainage system to ground or surface water receptors.

3.11.3 In the event of a fire or pollution incident, the relevant outfall valve would be closed and retained water would be held within the drainage system. The retained water would then be sampled and tested to determine the appropriate disposal route. Depending on the results, this may comprise treatment and controlled discharge subject to the relevant approval, or removal from Site by tanker.

3.11.4 The detailed containment volume, valve arrangement, testing procedure, treatment requirements and maintenance regime will be confirmed through detailed design and will be consistent with the substation firewater containment strategy.

3.11.5 This does not alter the outline drainage assessment, which demonstrates that normal operational surface water runoff can be managed without increasing flood risk.

3.12 Maintenance

3.12.1 Routine inspections and maintenance of the surface water drainage system is required to ensure that the drainage infrastructure continues to operate effectively for the lifetime of the development, without increasing flood risk on or off site.

3.12.2 Maintenance of surface water drainage features will be the responsibility of the undertaker or operator. Maintenance of the operational drainage system will be carried out in accordance with the final drainage design and the principles set out in **Outline Operational Environmental Management Plan [REP3-094].** Firewater-related inspection, testing and maintenance requirements for the 132kV Substation drainage system will be confirmed in accordance with **Firewater Containment and Drainage Strategy - Lime Down Substation [REP3-120].**

3.12.3 The final maintenance arrangements will be confirmed at detailed design and will reflect the final drainage components, flow controls, treatment measures, isolation valves and outfall arrangements and, any minimum practical flow control requirements.

4. Conclusions and Recommendations

4.1.1 Lime Down A comprises land for a ground mounted Solar PV Panels and associated Scheme including internal access tracks, inverters, transformers, cabling and substations.

4.2 Conclusions

Flood Risk

4.2.1 Lime Down A is situated wholly in Flood Zone 1, meaning it is an area considered to have <0.1% annual probability of flooding from rivers or the sea.

4.2.2 The majority of Lime Down A is at Very Low risk of surface water flooding; however, there are areas of Very Low to High risk, particularly across Fields A4, and A6 – A9. Depths are associated with the land drainage ditches / watercourses present across / in the vicinity of the Site and largely remain <300mm.

4.2.3 The risk of flooding from all sources has been assessed and the flood risk is considered to be **Negligible to Low** and, therefore, does not require site-specific mitigation measures.

4.2.4 The solar panels and other electrical infrastructure, including inverters, transformers, cabling and substations, which is to be sat on a concrete foundation/pad that will be mounted on frames and raised above ground level allowing flood water to flow freely underneath. Therefore, there will be no loss of floodplain volume as a result of the Scheme.

Outline Drainage Strategy

4.2.5 Solar PV panelled areas are not treated as formal impermeable drainage catchments within this Outline Drainage Strategy. The panels are elevated above ground level, drain to the existing ground, are not sealed into a drainage network, and do not create a connected impermeable surface.

4.2.6 Greenfield runoff rates have been calculated for the assessed hardstanding surfaces and the proposed discharge rates have been restricted in accordance with the LLFA drainage requirement. The identified receiving watercourse is an unnamed land drain adjacent to the southern boundary of Lime Down A, with the indicative cumulative controlled discharge rates provided within Tables 4, 5 and 6. The proposed SuDS features will attenuate surface water runoff from the positively drained hardstanding surfaces up to and including the 1% AEP plus 45% climate change event. In addition, the everyday rainfall volumes are limited and can be accommodated within the proposed SuDS features by providing the required additional storage depth.

4.2.7 It is concluded that a suitable combination of SuDS components, such as detention basins, ponds, swales and/or permeable surfacing, can provide sufficient treatment for the assessed pollution hazard indices.

4.2.8 In the event of a firewater incident, the drainage system will be designed so that it can be isolated in the event of a pollution incident or firewater containment scenario.

4.3 Recommendations

4.3.1 Embedded Mitigation is detailed in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**, from which this FRA has informed.

Annexes

Annex A- Water Body Catchment Classifications Summaries

Sherston Avon Water Body Catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Poor	Poor	Poor	Good	2027 - Low Confidence	Disproportionately expensive: Disproportionate burdens
Biological Quality Elements	Poor	Poor	Poor	Good	2027 - Low Confidence	Disproportionately expensive: Disproportionate burdens
Invertebrates	High	High	High	Good	2027 - Low Confidence	
Macrophytes and Phytobenthos Combined	Poor	Poor	Poor	Good	2027 - Low Confidence	Disproportionately expensive: Disproportionate burdens
Physio-Chemical Quality Elements	Moderate	Moderate	Good	Good	2027 - Low Confidence	Disproportionately expensive: Disproportionate burdens
Acid Neutralising Capacity	N/A	N/a	N/A	Good	2015	
Ammonia (Phys-Chem)	High	High	High	Good	2015	
Dissolved Oxygen	Moderate	Moderate	N/A	Good	2015	
Phosphate	Good	Good	Good	Good	2027	Disproportionately expensive: Disproportionate burdens
Temperature	High	High	High	Good	2015	
pH	High	High	High	Good	2015	
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	2015	
Supporting Elements (surface Water)	N/A	N/A	N/A	N/A	N/A	
Mitigation Measures Assessment	N/A	N/A	N/A	N/A	N/A	
Specific Pollutants	N/A	N/A	N/A	N/A	N/A	
Iron	N/A	N/A	N/A	N/A	N/A	
Maganese	N/A	N/A	N/A	N/A	N/A	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	N/A	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexabromocyclododecane	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate	Good	Good	N/A	Good	2015	
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	N/A	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	Did not require assessment

Tributary (source to conf River Sherston Avon) Catchment Classification Summary

Classification Item	2019 Classification		2022 Classification	Cycle 3 Objectives		
	Cycle 2	Cycle 3	Cycle 3	Status	Year	Reasons
Ecological	Good	Good	Good	Good	2015	
Biological Quality Elements	Good	Good	Good	Good	2015	
Invertebrates	Good	Good	Good	Good	2015	
Macrophytes and Phytobenthos Combined	Good	Good	Good	Good	2015	
Physio-Chemical Quality Elements	Good	Good	Good	Good	2015	
Acid Neutralising Capacity	N/A	N/A	N/A	Good	2015	
Ammonia (Phys-Chem)	Good	Good	Good	Good	2015	
Dissolved Oxygen	High	High	High	Good	2015	
Phosphate	Good	Good	Good	Good	2015	
Temperature	High	High	High	Good	2015	
pH	High	High	High	Good	2015	
Hydromorphological Supporting Elements	Supports Good	Supports Good	Supports Good	Supports Good	2015	
Supporting Elements (surface Water)	N/A	N/A	N/A	N/A	N/A	
Mitigation Measures Assessment	N/A	N/A	N/A	N/A	N/A	
Specific Pollutants	N/A	N/A	N/A	N/A	N/A	
Iron	N/A	N/A	N/A	N/A	N/A	
Maganese	N/A	N/A	N/A	N/A	N/A	
Chemical	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority Hazardous Substances	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Benzo(a)pyrene	Good	Good	N/A	Good	2015	
Dioxins and dioxin-like compounds	N/A	Good	N/A	Good	2015	
Heptachlor and cis-Heptachlor Epoxide	Good	Good	N/A	Good	2015	
Hexabromocyclododecane	Good	Good	N/A	Good	2015	
Hexachlorobenzene	Good	Good	N/A	Good	2015	
Hexachlorobutadiene	Good	Good	N/A	Good	2015	
Mercury and Its Compounds	Fail	Fail	N/A	Good	2040	Natural conditions: Chemical status recovery time
Perfluorooctane sulphonate (PFOS)	Good	Good	N/A	Good	2015	
Polybrominated diphenyl ethers (PBDE)	Fail	Fail	N/A	Good	2063	Natural conditions: Chemical status recovery time
Priority substances	Good	Good	N/A	Good	2015	
Cypermethrin (Priority)	Good	Good	N/A	Good	2015	
Fluoranthene	Good	Good	N/A	Good	2015	
Other Pollutants	N/A	N/A	N/A	N/A	2015	Did not require assessment

Annex B – Manning's Open Channel Flow Mapping

317212 Lime Down Solar A

Manning's Open Channel Flow Calculation

Methodology

Cross-sections through the floodplain were extracted from Environment Agency (EA) LiDAR DTM data (flown March 2020) at the locations shown in Figure 1. These cross-sections can be considered representative of the channel and general floodplain adjacent to the site and at the location of the proposed development. The cross-sections were imported into Flood Modeller and the "tabulate cross section properties" tool was utilised to establish the level-flow relationship for the channel and wider floodplain. This tool utilises the Manning's open channel flow equation. Manning's 'n' roughness was set to $0.03s/m^{1/3}$ for the channel and $0.04s/m^{1/3}$ for the floodplain. These values were chosen based on Chow (1959)* and aerial imagery. The channel slope was set for each cross-section based on underlying LiDAR.

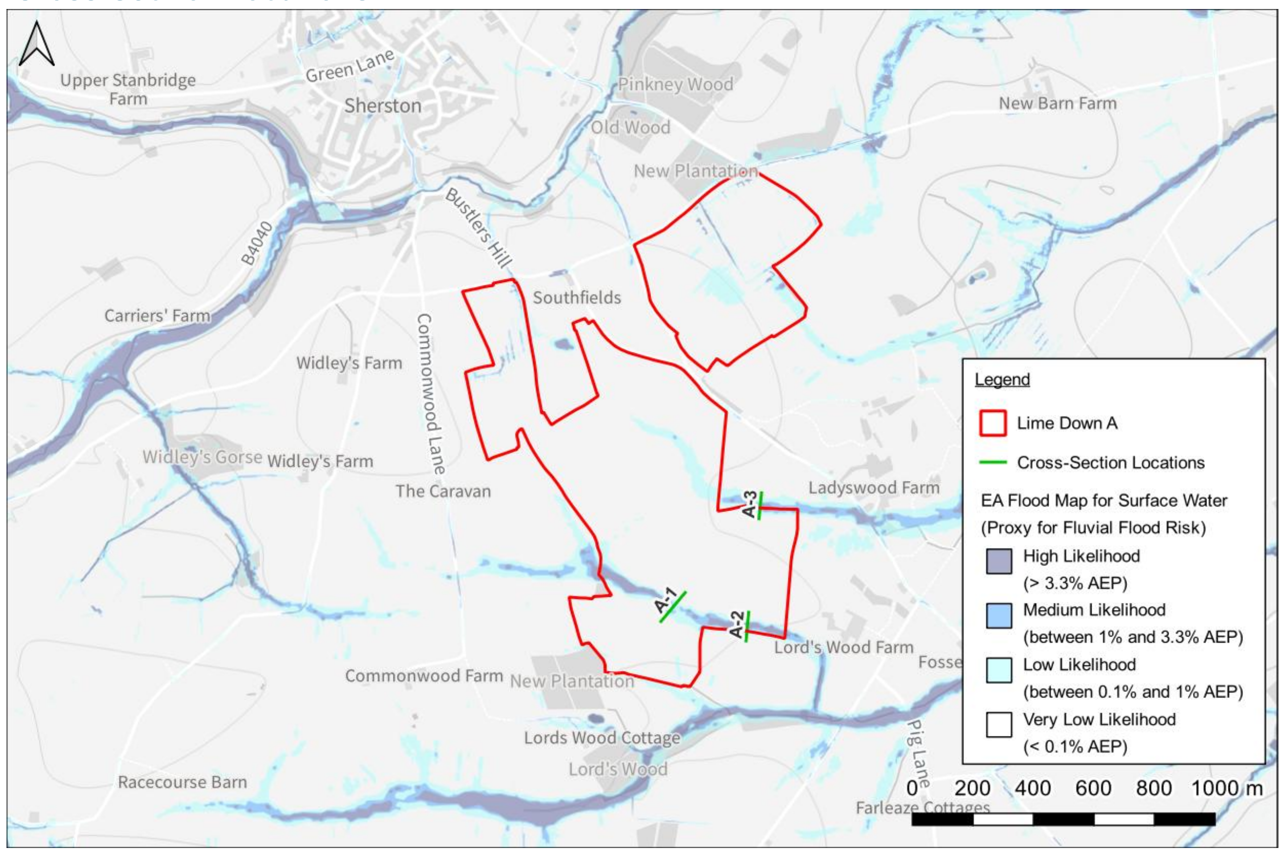
In the absence of detailed flood extent data covering the site, the extents of the EA surface water flood map (0.1% AEP event, present day) have been compared to underlying LiDAR data to provide an estimate of water levels. The surface water flood map has been used as a proxy for fluvial flooding given the similarity to the EA Flood Zone 2 extent and the additional detail it affords. The EA has since released the NaFRA2 mapping, however, a review of the flood extents indicates they are smaller across much of the study area. As such, the calculations presented here can be considered conservative.

Within this excel workbook, the xlookup function has been used along with the Flood Modeller level-flow relationship for the cross-sections to determine the equivalent flow for each estimated water level, rounding up where a direct match is not found. The appropriate climate change uplifts have then been applied to these flows and a second xlookup used to determine the equivalent level for the increased flow.

Cross-sections have been located at suitable locations throughtout the proposed development. Whilst it is acknowledged that the Manning's open channel flow equation used to determine the level-flow relationship does not constitute detailed hydraulic modelling, the calculation can still be considered suitable to demonstrate the scale of the changes in water level that can be expected when considering a +71% uplift in flows (Avon Bristol and North Somerset Streams Management Catchment, 2080's higher allowance).

*Chow, V.T. (1959). Open-Channel Hydraulics. New York, NY: McGraw-Hill.

Cross-Section Locations



Calculated Flows and Levels

Cross-Section	Level Description	Estimated Flood Level (m AOD)	Estimated Equivalent Flow (m^3/s)	Flow +71% CC Uplift (m^3/s)	Equivalent Flood Level (m AOD)
A-1	0.1% AEP EA FMfSW water level	112.00	9.3	15.9	112.05 (+54mm)
A-2	0.1% AEP EA FMfSW water level	110.80	11.4	19.6	110.91 (+111mm)
A-3	0.1% AEP EA FMfSW water level	108.70	3.6	6.1	108.75 (+54mm)

Tabulated Cross-Section Properties // A-1

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-1	0.000	111.731	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0158
A-1	0.000	111.743	0.011	0.100	0.423	0.004	0.003	0.698	0.700	0.0158
A-1	0.003	111.754	0.023	0.160	0.475	0.016	0.020	1.396	1.400	0.0158
A-1	0.009	111.767	0.036	0.253	0.533	0.036	0.072	1.541	1.547	0.0158
A-1	0.019	111.781	0.049	0.327	0.568	0.057	0.148	1.686	1.694	0.0158
A-1	0.031	111.794	0.063	0.388	0.592	0.080	0.248	1.831	1.841	0.0158
A-1	0.047	111.807	0.076	0.443	0.612	0.105	0.372	1.975	1.989	0.0158
A-1	0.053	111.812	0.081	0.458	0.675	0.117	0.425	2.481	2.495	0.0158
A-1	0.055	111.813	0.082	0.458	0.855	0.120	0.437	4.106	4.121	0.0158
A-1	0.058	111.815	0.084	0.450	0.916	0.129	0.463	5.265	5.280	0.0158
A-1	0.064	111.818	0.087	0.431	0.984	0.148	0.510	7.589	7.605	0.0158
A-1	0.064	111.818	0.087	0.431	0.984	0.148	0.510	7.589	7.605	0.0158
A-1	0.078	111.823	0.092	0.405	0.927	0.192	0.620	9.863	9.880	0.0158
A-1	0.089	111.826	0.095	0.391	0.949	0.227	0.706	13.091	13.109	0.0158
A-1	0.093	111.827	0.096	0.386	0.928	0.240	0.738	13.617	13.635	0.0158
A-1	0.107	111.830	0.099	0.377	0.893	0.284	0.853	15.609	15.627	0.0158
A-1	0.107	111.830	0.099	0.377	0.893	0.284	0.853	15.609	15.627	0.0158
A-1	0.117	111.832	0.101	0.370	0.883	0.317	0.934	17.755	17.775	0.0158
A-1	0.117	111.832	0.101	0.370	0.883	0.317	0.934	17.755	17.775	0.0158
A-1	0.122	111.833	0.102	0.364	0.878	0.336	0.973	19.171	19.191	0.0158
A-1	0.144	111.836	0.105	0.361	0.865	0.398	1.146	22.359	22.380	0.0158
A-1	0.158	111.838	0.107	0.357	0.827	0.444	1.261	23.397	23.418	0.0158
A-1	0.158	111.838	0.107	0.357	0.850	0.444	1.261	24.702	24.723	0.0158
A-1	0.165	111.839	0.108	0.352	0.825	0.469	1.315	25.224	25.246	0.0158
A-1	0.165	111.839	0.108	0.352	0.825	0.469	1.315	25.224	25.246	0.0158
A-1	0.246	111.846	0.115	0.377	0.784	0.654	1.964	27.846	27.868	0.0158
A-1	0.288	111.849	0.118	0.389	0.778	0.740	2.295	28.976	29.000	0.0158
A-1	0.334	111.852	0.121	0.403	0.776	0.828	2.660	30.068	30.092	0.0158
A-1	0.334	111.852	0.121	0.403	0.776	0.828	2.660	30.068	30.092	0.0158
A-1	0.419	111.857	0.126	0.423	0.798	0.990	3.338	34.501	34.526	0.0158
A-1	0.419	111.857	0.126	0.423	0.813	0.990	3.338	35.806	35.831	0.0158
A-1	0.580	111.865	0.134	0.451	0.788	1.287	4.623	38.586	38.614	0.0158
A-1	0.627	111.867	0.136	0.459	0.793	1.366	4.995	39.950	39.979	0.0158

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-1	0.632	111.868	0.137	0.450	0.771	1.406	5.037	40.553	40.582	0.0158
A-1	0.632	111.868	0.137	0.450	0.771	1.406	5.037	40.553	40.582	0.0158
A-1	1.054	111.882	0.151	0.527	0.790	1.998	8.397	44.045	44.077	0.0158
A-1	1.054	111.882	0.151	0.527	0.790	1.998	8.397	44.045	44.077	0.0158
A-1	1.303	111.889	0.158	0.563	0.801	2.313	10.380	45.823	45.857	0.0158
A-1	1.383	111.891	0.160	0.575	0.804	2.405	11.019	46.089	46.123	0.0158
A-1	1.868	111.902	0.171	0.640	0.823	2.918	14.883	47.295	47.331	0.0158
A-1	2.060	111.906	0.175	0.662	0.839	3.111	16.415	48.914	48.951	0.0158
A-1	2.110	111.907	0.176	0.668	0.853	3.160	16.809	50.674	50.711	0.0158
A-1	2.210	111.909	0.178	0.677	0.863	3.263	17.613	51.956	51.994	0.0158
A-1	2.422	111.914	0.183	0.687	0.857	3.528	19.298	53.906	53.945	0.0158
A-1	3.200	111.928	0.197	0.746	0.854	4.292	25.501	55.231	55.273	0.0158
A-1	3.331	111.930	0.199	0.757	0.858	4.402	26.539	55.537	55.580	0.0158
A-1	3.463	111.932	0.201	0.767	0.862	4.514	27.593	55.851	55.894	0.0158
A-1	4.149	111.942	0.211	0.816	0.878	5.082	33.057	57.689	57.734	0.0158
A-1	4.660	111.949	0.218	0.849	0.888	5.490	37.130	59.007	59.054	0.0158
A-1	5.126	111.955	0.224	0.877	0.897	5.847	40.842	60.050	60.099	0.0158
A-1	5.528	111.960	0.229	0.899	0.911	6.152	44.050	61.981	62.032	0.0158
A-1	5.947	111.965	0.234	0.920	0.919	6.465	47.390	63.260	63.311	0.0158
A-1	6.383	111.970	0.239	0.941	0.926	6.785	50.859	64.541	64.593	0.0158
A-1	7.356	111.982	0.251	0.972	0.912	7.564	58.611	65.300	65.355	0.0158
A-1	8.611	111.994	0.263	1.031	0.926	8.352	68.616	66.059	66.117	0.0158
A-1	9.270	112.000	0.269	1.059	0.934	8.750	73.866	66.755	66.814	0.0158
A-1	10.148	112.008	0.277	1.092	0.944	9.289	80.865	68.036	68.098	0.0158
A-1	11.065	112.016	0.285	1.125	0.953	9.839	88.167	69.319	69.383	0.0158
A-1	12.174	112.025	0.294	1.163	0.963	10.468	97.003	70.446	70.512	0.0158
A-1	13.332	112.034	0.303	1.200	0.973	11.107	106.231	71.574	71.643	0.0158
A-1	14.675	112.044	0.313	1.241	0.983	11.829	116.934	72.785	72.856	0.0158
A-1	15.078	112.047	0.316	1.252	0.985	12.048	120.147	73.225	73.297	0.0158
A-1	16.041	112.054	0.323	1.277	0.992	12.565	127.819	74.492	74.566	0.0158
A-1	16.761	112.059	0.328	1.295	0.998	12.939	133.555	75.285	75.362	0.0158
A-1	17.202	112.062	0.331	1.307	1.000	13.166	137.072	75.689	75.766	0.0158
A-1	18.624	112.071	0.340	1.345	1.009	13.851	148.398	76.510	76.589	0.0158
A-1	20.095	112.080	0.349	1.382	1.017	14.543	160.121	77.332	77.412	0.0158
A-1	21.958	112.091	0.360	1.426	1.028	15.400	174.966	78.502	78.584	0.0158
A-1	23.359	112.099	0.368	1.457	1.035	16.031	186.130	79.328	79.411	0.0158
A-1	24.801	112.107	0.376	1.488	1.042	16.669	197.621	80.155	80.240	0.0158
A-1	25.181	112.109	0.378	1.496	1.052	16.831	200.646	81.609	81.693	0.0158
A-1	25.372	112.110	0.379	1.500	1.053	16.913	202.166	81.735	81.820	0.0158
A-1	25.372	112.110	0.379	1.500	1.053	16.913	202.166	81.735	81.820	0.0158
A-1	26.532	112.116	0.385	1.524	1.073	17.412	211.415	84.754	84.840	0.0158
A-1	26.925	112.118	0.387	1.531	1.078	17.582	214.545	85.470	85.556	0.0158
A-1	28.528	112.126	0.395	1.561	1.090	18.274	227.318	87.322	87.409	0.0158
A-1	30.179	112.134	0.403	1.590	1.100	18.980	240.473	89.173	89.262	0.0158
A-1	30.179	112.134	0.403	1.590	1.100	18.980	240.473	89.173	89.262	0.0158
A-1	30.385	112.135	0.404	1.593	1.110	19.070	242.112	90.846	90.935	0.0158
A-1	31.230	112.139	0.408	1.607	1.122	19.437	248.844	92.968	93.058	0.0158
A-1	31.444	112.140	0.409	1.610	1.124	19.530	250.548	93.315	93.405	0.0158
A-1	32.075	112.143	0.412	1.619	1.135	19.813	255.576	95.579	95.670	0.0158
A-1	32.075	112.143	0.412	1.619	1.135	19.813	255.576	95.579	95.670	0.0158
A-1	34.497	112.154	0.423	1.652	1.144	20.879	274.881	98.174	98.266	0.0158
A-1	34.959	112.156	0.425	1.659	1.144	21.076	278.559	98.336	98.428	0.0158
A-1	38.528	112.171	0.440	1.708	1.146	22.561	306.999	99.704	99.798	0.0158
A-1	42.293	112.186	0.455	1.758	1.145	24.060	336.998	100.175	100.271	0.0158
A-1	46.239	112.201	0.470	1.809	1.146	25.567	368.443	100.646	100.744	0.0158
A-1	50.358	112.216	0.485	1.860	1.147	27.080	401.262	101.117	101.217	0.0158
A-1	51.202	112.219	0.488	1.870	1.157	27.386	407.988	102.951	103.052	0.0158
A-1	52.838	112.225	0.494	1.887	1.160	28.006	421.023	103.846	103.948	0.0158
A-1	56.753	112.238	0.507	1.931	1.161	29.394	452.221	104.338	104.441	0.0158
A-1	60.803	112.252	0.521	1.975	1.163	30.788	484.489	104.828	104.933	0.0158
A-1	64.989	112.265	0.534	2.019	1.166	32.189	517.846	105.320	105.426	0.0158
A-1	68.530	112.276	0.545	2.055	1.169	33.351	546.057	105.940	106.048	0.0158
A-1	72.160	112.287	0.556	2.090	1.173	34.520	574.985	106.561	106.670	0.0158
A-1	73.165	112.290	0.559	2.100	1.181	34.842	582.993	108.205	108.315	0.0158
A-1	76.475	112.300	0.569	2.129	1.183	35.928	609.370	108.815	108.926	0.0158
A-1	79.959	112.310	0.579	2.160	1.186	37.018	637.132	109.424	109.536	0.0158
A-1	84.560	112.323	0.592	2.199	1.192	38.450	673.791	110.784	110.898	0.0158
A-1	87.417	112.331	0.600	2.222	1.198	39.342	696.559	112.123	112.237	0.0158
A-1	93.007	112.346	0.615	2.267	1.204	41.034	741.101	113.491	113.607	0.0158
A-1	97.205	112.357	0.626	2.299	1.208	42.289	774.544	114.641	114.759	0.0158
A-1	97.975	112.359	0.628	2.304	1.209	42.518	780.682	114.861	114.979	0.0158
A-1	100.638	112.366	0.635	2.323	1.215	43.326	801.903	116.233	116.351	0.0158
A-1	104.654	112.376	0.645	2.352	1.217	44.492	833.900	116.811	116.931	0.0158
A-1	108.127	112.384	0.653	2.377	1.225	45.492	861.573	118.540	118.660	0.0158
A-1	111.657	112.393	0.662	2.401	1.233	46.507	889.705	120.268	120.389	0.0158
A-1	112.245	112.395	0.664	2.401	1.230	46.747	894.389	120.425	120.545	0.0158
A-1	115.841	112.404	0.673	2.425	1.233	47.775	923.043	121.159	121.280	0.0158
A-1	119.491	112.412	0.681	2.448	1.235	48.808	952.126	121.892	122.013	0.0158
A-1	124.802	112.424	0.693	2.482	1.237	50.274	994.444	122.441	122.564	0.0158
A-1	130.222	112.436	0.705	2.517	1.239	51.746	1037.632	122.990	123.113	0.0158
A-1	135.757	112.448	0.717	2.551	1.241	53.225	1081.738	123.540	123.664	0.0158
A-1	136.229	112.449	0.718	2.554	1.241	53.349	1085.499	123.549	123.673	0.0158
A-1	143.407	112.464	0.733	2.598	1.244	55.206	1142.694	124.127	124.252	0.0158
A-1	150.766	112.479	0.748	2.642	1.247	57.073	1201.330	124.705	124.831	0.0158
A-1	158.297	112.494	0.763	2.685	1.250	58.948	1261.340	125.283	125.410	0.0158

Tabulated Cross-Section Properties // A-2

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-2	0.000	110.240	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0028
A-2	0.000	110.258	0.018	0.057	0.192	0.004	0.004	0.413	0.416	0.0028
A-2	0.001	110.276	0.036	0.091	0.215	0.015	0.025	0.827	0.832	0.0028
A-2	0.004	110.294	0.054	0.119	0.230	0.033	0.075	1.240	1.248	0.0028

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-2	0.008	110.311	0.071	0.141	0.241	0.058	0.155	1.649	1.659	0.0028
A-2	0.015	110.328	0.088	0.163	0.249	0.090	0.276	2.058	2.070	0.0028
A-2	0.023	110.345	0.105	0.183	0.257	0.128	0.443	2.467	2.482	0.0028
A-2	0.035	110.362	0.122	0.203	0.263	0.173	0.664	2.876	2.893	0.0028
A-2	0.050	110.379	0.139	0.221	0.269	0.226	0.944	3.284	3.304	0.0028
A-2	0.068	110.396	0.156	0.239	0.275	0.285	1.287	3.693	3.715	0.0028
A-2	0.094	110.416	0.176	0.259	0.280	0.364	1.779	4.182	4.207	0.0028
A-2	0.126	110.436	0.196	0.278	0.285	0.452	2.375	4.671	4.699	0.0028
A-2	0.131	110.439	0.199	0.280	0.297	0.467	2.475	5.140	5.168	0.0028
A-2	0.136	110.442	0.202	0.282	0.315	0.484	2.578	5.937	5.966	0.0028
A-2	0.138	110.443	0.203	0.282	0.327	0.490	2.614	6.441	6.470	0.0028
A-2	0.144	110.446	0.206	0.281	0.378	0.513	2.726	9.093	9.123	0.0028
A-2	0.144	110.446	0.206	0.281	0.378	0.513	2.726	9.093	9.123	0.0028
A-2	0.147	110.447	0.207	0.281	0.384	0.522	2.774	9.583	9.613	0.0028
A-2	0.155	110.450	0.210	0.279	0.418	0.555	2.926	12.221	12.251	0.0028
A-2	0.155	110.450	0.210	0.279	0.418	0.555	2.926	12.221	12.251	0.0028
A-2	0.158	110.451	0.211	0.278	0.422	0.568	2.981	12.831	12.861	0.0028
A-2	0.181	110.458	0.218	0.272	0.421	0.668	3.426	15.729	15.761	0.0028
A-2	0.193	110.461	0.221	0.269	0.417	0.717	3.648	16.845	16.877	0.0028
A-2	0.197	110.462	0.222	0.269	0.417	0.734	3.726	17.302	17.334	0.0028
A-2	0.201	110.463	0.223	0.268	0.417	0.751	3.806	17.822	17.855	0.0028
A-2	0.210	110.465	0.225	0.266	0.428	0.789	3.973	19.989	20.023	0.0028
A-2	0.215	110.466	0.226	0.265	0.426	0.809	4.057	20.505	20.539	0.0028
A-2	0.230	110.469	0.229	0.263	0.419	0.873	4.341	21.751	21.785	0.0028
A-2	0.235	110.470	0.230	0.262	0.418	0.895	4.436	22.303	22.338	0.0028
A-2	0.263	110.475	0.235	0.260	0.405	1.010	4.965	24.017	24.052	0.0028
A-2	0.269	110.476	0.236	0.260	0.402	1.035	5.088	24.215	24.250	0.0028
A-2	0.283	110.478	0.238	0.261	0.397	1.083	5.345	24.608	24.643	0.0028
A-2	0.297	110.480	0.240	0.262	0.393	1.133	5.612	25.020	25.056	0.0028
A-2	0.304	110.481	0.241	0.262	0.393	1.158	5.737	25.503	25.539	0.0028
A-2	0.317	110.483	0.243	0.262	0.392	1.210	5.995	26.550	26.587	0.0028
A-2	0.374	110.490	0.250	0.266	0.385	1.404	7.060	28.872	28.910	0.0028
A-2	0.389	110.492	0.252	0.266	0.380	1.462	7.358	29.177	29.216	0.0028
A-2	0.480	110.501	0.261	0.277	0.371	1.731	9.066	30.484	30.524	0.0028
A-2	0.513	110.504	0.264	0.281	0.375	1.824	9.687	31.801	31.842	0.0028
A-2	0.523	110.505	0.265	0.282	0.376	1.856	9.892	32.324	32.365	0.0028
A-2	0.546	110.507	0.267	0.284	0.383	1.923	10.313	34.385	34.426	0.0028
A-2	0.560	110.509	0.269	0.281	0.381	1.994	10.587	36.032	36.074	0.0028
A-2	0.560	110.509	0.269	0.281	0.381	1.994	10.587	36.032	36.074	0.0028
A-2	0.564	110.510	0.270	0.278	0.375	2.030	10.650	36.255	36.297	0.0028
A-2	0.642	110.516	0.276	0.285	0.372	2.251	12.130	37.594	37.638	0.0028
A-2	0.681	110.519	0.279	0.288	0.372	2.366	12.861	38.768	38.811	0.0028
A-2	0.888	110.531	0.291	0.311	0.368	2.853	16.790	39.169	39.215	0.0028
A-2	1.126	110.544	0.304	0.337	0.370	3.345	21.279	39.571	39.619	0.0028
A-2	1.487	110.561	0.321	0.370	0.374	4.025	28.110	40.445	40.495	0.0028
A-2	1.580	110.565	0.325	0.377	0.380	4.190	29.851	41.737	41.788	0.0028
A-2	1.967	110.581	0.341	0.405	0.380	4.860	37.174	42.101	42.155	0.0028
A-2	2.417	110.597	0.357	0.436	0.386	5.537	45.671	42.465	42.522	0.0028
A-2	2.907	110.613	0.373	0.467	0.392	6.219	54.928	42.829	42.888	0.0028
A-2	3.167	110.622	0.382	0.479	0.394	6.609	59.846	43.868	43.929	0.0028
A-2	3.768	110.639	0.399	0.511	0.400	7.382	71.217	44.431	44.494	0.0028
A-2	4.416	110.657	0.417	0.541	0.405	8.164	83.454	44.994	45.060	0.0028
A-2	4.814	110.667	0.427	0.557	0.408	8.639	90.972	45.533	45.601	0.0028
A-2	5.228	110.678	0.438	0.573	0.411	9.120	98.793	46.072	46.142	0.0028
A-2	5.679	110.689	0.449	0.590	0.414	9.630	107.326	46.613	46.685	0.0028
A-2	6.148	110.700	0.460	0.606	0.417	10.146	116.190	47.154	47.228	0.0028
A-2	6.683	110.712	0.472	0.624	0.420	10.715	126.298	47.699	47.774	0.0028
A-2	7.238	110.724	0.484	0.641	0.423	11.291	136.790	48.244	48.321	0.0028
A-2	8.079	110.741	0.501	0.667	0.427	12.115	152.681	48.805	48.885	0.0028
A-2	8.386	110.747	0.507	0.676	0.431	12.411	158.479	49.635	49.716	0.0028
A-2	8.962	110.758	0.518	0.691	0.441	12.969	169.370	51.840	51.923	0.0028
A-2	8.962	110.758	0.518	0.691	0.441	12.969	169.370	51.840	51.923	0.0028
A-2	9.231	110.763	0.523	0.698	0.444	13.230	174.440	52.634	52.719	0.0028
A-2	9.558	110.769	0.529	0.705	0.448	13.549	180.627	53.689	53.775	0.0028
A-2	9.724	110.772	0.532	0.709	0.451	13.712	183.772	54.435	54.522	0.0028
A-2	9.724	110.772	0.532	0.709	0.451	13.712	183.772	54.435	54.522	0.0028
A-2	9.892	110.775	0.535	0.713	0.456	13.877	186.939	55.724	55.811	0.0028
A-2	10.061	110.778	0.538	0.716	0.462	14.046	190.139	57.272	57.361	0.0028
A-2	10.119	110.779	0.539	0.717	0.464	14.104	191.224	57.852	57.941	0.0028
A-2	10.886	110.792	0.552	0.731	0.479	14.887	205.723	62.704	62.795	0.0028
A-2	10.947	110.793	0.553	0.732	0.480	14.950	206.875	63.075	63.165	0.0028
A-2	11.131	110.796	0.556	0.735	0.482	15.141	210.349	63.919	64.010	0.0028
A-2	11.255	110.798	0.558	0.737	0.483	15.269	212.697	64.311	64.402	0.0028
A-2	11.255	110.798	0.558	0.737	0.483	15.269	212.697	64.311	64.402	0.0028
A-2	11.442	110.801	0.561	0.740	0.483	15.462	216.231	64.640	64.732	0.0028
A-2	12.350	110.815	0.575	0.754	0.483	16.377	233.396	66.025	66.117	0.0028
A-2	13.300	110.829	0.589	0.768	0.485	17.314	251.337	67.803	67.897	0.0028
A-2	13.369	110.830	0.590	0.769	0.485	17.382	252.641	67.933	68.026	0.0028
A-2	13.647	110.834	0.594	0.773	0.491	17.658	257.902	70.035	70.129	0.0028
A-2	13.858	110.837	0.597	0.776	0.494	17.869	261.896	71.107	71.201	0.0028
A-2	13.858	110.837	0.597	0.776	0.494	17.869	261.896	71.107	71.201	0.0028
A-2	14.495	110.846	0.606	0.783	0.493	18.514	273.923	72.131	72.225	0.0028
A-2	14.709	110.849	0.609	0.785	0.496	18.732	277.975	73.229	73.323	0.0028
A-2	15.778	110.863	0.623	0.798	0.494	19.764	298.168	74.258	74.353	0.0028
A-2	16.468	110.872	0.632	0.806	0.493	20.436	311.217	75.031	75.127	0.0028
A-2	17.248	110.882	0.642	0.814	0.494	21.194	325.965	76.461	76.556	0.0028
A-2	17.649	110.887	0.647	0.818	0.494	21.577	333.538	77.059	77.154	0.0028
A-2	18.348	110.895	0.655	0.827	0.494	22.197	346.744	77.794	77.889	0.0028
A-2	19.800	110.911	0.671	0.844	0.495	23.451	374.176	78.917	79.014	0.0028
A-2	19.892	110.912	0.672	0.845	0.498	23.530	375.927	80.249	80.345	0.0028
A-2	19.985	110.913	0.673	0.846	0.502	23.611	377.683	81.580	81.677	0.0028
A-2	20.102	110.915	0.675	0.846	0.502	23.775	379.886	82.113	82.210	0.0028
A-2	20.463	110.919	0.679	0.849	0.503	24.105	386.714	83.179	83.275	0.0028
A-2	22.403	110.938	0.699	0.871	0.501	25.730	423.370	83.456	83.553	0.0028
A-2	24.438	110.958	0.718	0.893	0.499	27.360	461.832	83.733	83.831	0.0028

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-2	26.403	110.977	0.737	0.913	0.497	28.913	498.962	84.188	84.287	0.0028
A-2	28.448	110.995	0.755	0.933	0.497	30.475	537.626	84.644	84.742	0.0028
A-2	28.901	110.999	0.759	0.938	0.497	30.814	546.179	85.015	85.114	0.0028
A-2	30.942	111.017	0.777	0.956	0.500	32.361	584.753	86.830	86.930	0.0028
A-2	31.875	111.025	0.785	0.964	0.503	33.061	602.377	88.279	88.379	0.0028
A-2	32.465	111.030	0.790	0.969	0.504	33.504	613.540	88.914	89.014	0.0028
A-2	33.312	111.039	0.799	0.971	0.504	34.313	629.545	90.773	90.873	0.0028
A-2	33.445	111.040	0.800	0.972	0.504	34.404	632.053	90.795	90.896	0.0028
A-2	34.922	111.051	0.811	0.986	0.506	35.405	659.957	91.299	91.400	0.0028
A-2	36.431	111.062	0.822	1.001	0.507	36.412	688.476	91.804	91.905	0.0028
A-2	38.874	111.079	0.839	1.023	0.508	38.006	734.646	92.140	92.242	0.0028
A-2	41.393	111.097	0.857	1.045	0.510	39.606	782.255	92.477	92.579	0.0028
A-2	43.987	111.114	0.874	1.067	0.511	41.212	831.282	92.813	92.915	0.0028
A-2	46.604	111.131	0.891	1.089	0.513	42.792	880.739	93.065	93.168	0.0028
A-2	49.292	111.148	0.908	1.111	0.514	44.376	931.523	93.317	93.421	0.0028
A-2	52.049	111.165	0.925	1.132	0.516	45.965	983.640	93.569	93.673	0.0028
A-2	54.874	111.182	0.942	1.154	0.517	47.558	1037.029	93.821	93.926	0.0028
A-2	57.534	111.198	0.958	1.173	0.519	49.030	1087.283	94.157	94.262	0.0028
A-2	60.252	111.213	0.973	1.193	0.521	50.508	1138.647	94.494	94.599	0.0028
A-2	63.025	111.229	0.989	1.212	0.523	51.991	1191.064	94.830	94.936	0.0028
A-2	65.359	111.242	1.002	1.228	0.525	53.227	1235.163	95.334	95.440	0.0028
A-2	67.732	111.255	1.015	1.243	0.527	54.470	1280.021	95.839	95.945	0.0028

Tabulated Cross-Section Properties // A-3

(Calculated by Flood Modeller)

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-3	0.000	108.253	0.000	0.000	0.000	0.000	0.000	0.000	0.000	0.0076
A-3	0.000	108.265	0.012	0.073	0.296	0.001	0.001	0.226	0.227	0.0076
A-3	0.001	108.278	0.025	0.116	0.333	0.006	0.007	0.451	0.454	0.0076
A-3	0.002	108.290	0.037	0.152	0.356	0.013	0.022	0.677	0.681	0.0076
A-3	0.004	108.302	0.049	0.184	0.373	0.022	0.047	0.902	0.908	0.0076
A-3	0.007	108.315	0.062	0.214	0.388	0.035	0.086	1.128	1.135	0.0076
A-3	0.012	108.327	0.074	0.241	0.400	0.050	0.139	1.353	1.362	0.0076
A-3	0.018	108.340	0.087	0.267	0.410	0.068	0.210	1.579	1.589	0.0076
A-3	0.026	108.352	0.099	0.292	0.419	0.089	0.300	1.805	1.816	0.0076
A-3	0.037	108.365	0.112	0.321	0.429	0.114	0.420	2.004	2.017	0.0076
A-3	0.049	108.378	0.125	0.347	0.438	0.141	0.564	2.204	2.218	0.0076
A-3	0.063	108.390	0.137	0.373	0.445	0.170	0.728	2.380	2.396	0.0076
A-3	0.080	108.403	0.150	0.397	0.452	0.201	0.916	2.556	2.574	0.0076
A-3	0.098	108.415	0.162	0.420	0.459	0.234	1.128	2.732	2.751	0.0076
A-3	0.119	108.428	0.175	0.442	0.465	0.269	1.366	2.908	2.929	0.0076
A-3	0.142	108.440	0.187	0.464	0.470	0.306	1.631	3.084	3.107	0.0076
A-3	0.167	108.453	0.200	0.485	0.475	0.345	1.924	3.260	3.285	0.0076
A-3	0.195	108.465	0.212	0.505	0.480	0.387	2.246	3.436	3.463	0.0076
A-3	0.226	108.478	0.225	0.524	0.485	0.431	2.597	3.612	3.641	0.0076
A-3	0.259	108.490	0.237	0.544	0.489	0.477	2.980	3.788	3.818	0.0076
A-3	0.282	108.497	0.244	0.557	0.532	0.506	3.238	4.541	4.572	0.0076
A-3	0.292	108.500	0.247	0.559	0.603	0.522	3.354	5.955	5.986	0.0076
A-3	0.340	108.512	0.259	0.567	0.591	0.599	3.905	6.390	6.422	0.0076
A-3	0.395	108.525	0.272	0.580	0.586	0.682	4.544	6.825	6.859	0.0076
A-3	0.400	108.526	0.273	0.581	0.586	0.688	4.598	6.860	6.893	0.0076
A-3	0.435	108.533	0.280	0.587	0.615	0.740	4.998	7.973	8.007	0.0076
A-3	0.461	108.538	0.285	0.589	0.635	0.783	5.296	8.925	8.959	0.0076
A-3	0.500	108.545	0.292	0.588	0.665	0.851	5.752	10.675	10.710	0.0076
A-3	0.532	108.550	0.297	0.587	0.666	0.907	6.114	11.472	11.508	0.0076
A-3	0.539	108.551	0.298	0.587	0.666	0.918	6.191	11.616	11.652	0.0076
A-3	0.636	108.564	0.311	0.589	0.656	1.079	7.305	13.145	13.183	0.0076
A-3	0.711	108.573	0.320	0.591	0.660	1.205	8.177	14.733	14.772	0.0076
A-3	0.798	108.582	0.329	0.597	0.636	1.338	9.174	14.921	14.961	0.0076
A-3	0.902	108.591	0.338	0.611	0.638	1.476	10.370	15.774	15.815	0.0076
A-3	1.016	108.600	0.347	0.626	0.640	1.622	11.675	16.627	16.669	0.0076
A-3	1.055	108.603	0.350	0.631	0.656	1.673	12.130	17.749	17.792	0.0076
A-3	1.069	108.604	0.351	0.632	0.656	1.691	12.288	17.838	17.881	0.0076
A-3	1.126	108.608	0.355	0.638	0.672	1.766	12.936	19.270	19.313	0.0076
A-3	1.155	108.610	0.357	0.639	0.697	1.806	13.271	21.066	21.109	0.0076
A-3	1.215	108.614	0.361	0.642	0.699	1.892	13.968	21.974	22.018	0.0076
A-3	1.263	108.617	0.364	0.645	0.702	1.959	14.515	22.784	22.829	0.0076
A-3	1.329	108.621	0.368	0.647	0.712	2.053	15.277	24.394	24.440	0.0076
A-3	1.363	108.623	0.370	0.648	0.719	2.103	15.670	25.414	25.460	0.0076
A-3	1.363	108.623	0.370	0.648	0.719	2.103	15.670	25.414	25.460	0.0076
A-3	1.396	108.625	0.372	0.648	0.726	2.155	16.046	26.517	26.564	0.0076
A-3	1.465	108.629	0.376	0.647	0.725	2.264	16.842	27.892	27.939	0.0076
A-3	1.577	108.635	0.382	0.647	0.722	2.437	18.123	29.788	29.836	0.0076
A-3	1.636	108.638	0.385	0.647	0.720	2.528	18.801	30.731	30.779	0.0076
A-3	1.715	108.642	0.389	0.647	0.714	2.653	19.715	31.724	31.773	0.0076
A-3	1.836	108.647	0.394	0.653	0.708	2.813	21.102	32.438	32.487	0.0076
A-3	1.861	108.648	0.395	0.654	0.706	2.846	21.390	32.543	32.593	0.0076
A-3	2.180	108.660	0.407	0.671	0.697	3.247	25.054	34.292	34.343	0.0076
A-3	2.180	108.660	0.407	0.671	0.707	3.247	25.054	35.299	35.350	0.0076
A-3	2.259	108.663	0.410	0.674	0.704	3.353	25.958	35.916	35.967	0.0076
A-3	2.376	108.667	0.414	0.679	0.704	3.499	27.303	36.863	36.915	0.0076
A-3	2.467	108.670	0.417	0.683	0.703	3.610	28.351	37.519	37.571	0.0076
A-3	2.529	108.672	0.419	0.686	0.705	3.686	29.066	38.223	38.275	0.0076
A-3	2.623	108.675	0.422	0.690	0.708	3.803	30.148	39.294	39.346	0.0076
A-3	2.682	108.677	0.424	0.691	0.714	3.883	30.819	40.761	40.814	0.0076
A-3	2.715	108.678	0.425	0.692	0.715	3.924	31.199	41.083	41.136	0.0076
A-3	2.886	108.683	0.430	0.698	0.715	4.132	33.171	42.523	42.577	0.0076
A-3	3.066	108.688	0.435	0.705	0.715	4.349	35.240	43.858	43.912	0.0076
A-3	3.246	108.693	0.440	0.710	0.707	4.569	37.300	44.455	44.509	0.0076
A-3	3.364	108.696	0.443	0.715	0.714	4.705	38.666	45.999	46.054	0.0076
A-3	3.405	108.697	0.444	0.717	0.724	4.752	39.129	47.548	47.603	0.0076
A-3	3.528	108.700	0.447	0.721	0.724	4.896	40.546	48.419	48.475	0.0076
A-3	3.528	108.700	0.447	0.721	0.724	4.896	40.546	48.419	48.475	0.0076

Node	Flow (m^3/s)	Stage (m AOD)	Depth (m)	Velocity (m/s)	Froude no.	Area (m^2)	Conveyance (m^3/s)	Width (m)	W Perim. (m)	Slope
A-3	3.570	108.701	0.448	0.722	0.730	4.944	41.034	49.626	49.681	0.0076
A-3	3.570	108.701	0.448	0.722	0.730	4.944	41.034	49.626	49.681	0.0076
A-3	3.867	108.708	0.455	0.730	0.729	5.300	44.437	51.858	51.914	0.0076
A-3	3.867	108.708	0.455	0.730	0.729	5.300	44.437	51.858	51.914	0.0076
A-3	4.135	108.714	0.461	0.736	0.728	5.617	47.520	53.921	53.978	0.0076
A-3	4.604	108.723	0.470	0.751	0.717	6.134	52.908	54.911	54.969	0.0076
A-3	5.123	108.733	0.480	0.769	0.711	6.661	58.872	55.902	55.960	0.0076
A-3	5.123	108.733	0.480	0.769	0.711	6.661	58.872	55.902	55.960	0.0076
A-3	5.346	108.737	0.484	0.776	0.711	6.886	61.442	56.707	56.766	0.0076
A-3	5.404	108.738	0.485	0.778	0.714	6.943	62.104	57.377	57.436	0.0076
A-3	5.462	108.739	0.486	0.780	0.724	7.001	62.772	59.145	59.204	0.0076
A-3	5.520	108.740	0.487	0.782	0.724	7.060	63.445	59.404	59.463	0.0076
A-3	5.820	108.745	0.492	0.790	0.730	7.363	66.890	61.617	61.676	0.0076
A-3	5.943	108.747	0.494	0.794	0.733	7.487	68.298	62.557	62.616	0.0076
A-3	6.039	108.749	0.496	0.793	0.729	7.613	69.404	63.066	63.125	0.0076
A-3	6.364	108.754	0.501	0.802	0.729	7.931	73.139	64.194	64.255	0.0076
A-3	7.123	108.765	0.512	0.824	0.727	8.647	81.868	66.099	66.160	0.0076
A-3	7.123	108.765	0.512	0.824	0.733	8.647	81.868	67.106	67.167	0.0076
A-3	7.580	108.771	0.518	0.837	0.731	9.052	87.120	67.704	67.765	0.0076
A-3	8.302	108.780	0.527	0.859	0.730	9.664	95.409	68.429	68.490	0.0076
A-3	8.804	108.786	0.533	0.873	0.737	10.082	101.177	70.524	70.585	0.0076
A-3	8.889	108.787	0.534	0.876	0.743	10.153	102.155	71.712	71.773	0.0076
A-3	8.974	108.788	0.535	0.878	0.748	10.225	103.140	72.900	72.962	0.0076
A-3	9.147	108.790	0.537	0.882	0.749	10.371	105.129	73.358	73.420	0.0076
A-3	9.666	108.796	0.543	0.894	0.746	10.813	111.091	73.887	73.949	0.0076
A-3	10.298	108.803	0.550	0.909	0.747	11.335	118.350	75.230	75.292	0.0076
A-3	10.582	108.806	0.553	0.915	0.747	11.561	121.621	75.495	75.557	0.0076
A-3	10.871	108.809	0.556	0.922	0.753	11.789	124.942	77.041	77.103	0.0076
A-3	11.654	108.817	0.564	0.939	0.752	12.410	133.939	78.096	78.158	0.0076
A-3	12.801	108.828	0.575	0.964	0.751	13.274	147.120	78.885	78.947	0.0076
A-3	13.666	108.836	0.583	0.983	0.751	13.907	157.058	79.640	79.702	0.0076
A-3	14.562	108.844	0.591	1.001	0.751	14.548	167.359	80.395	80.458	0.0076
A-3	14.790	108.846	0.593	1.006	0.752	14.709	169.975	80.613	80.675	0.0076
A-3	15.135	108.849	0.596	1.012	0.757	14.953	173.941	82.114	82.177	0.0076
A-3	16.053	108.857	0.604	1.028	0.758	15.614	184.494	83.182	83.245	0.0076
A-3	16.923	108.864	0.611	1.045	0.758	16.198	194.492	83.573	83.636	0.0076
A-3	18.081	108.873	0.620	1.067	0.758	16.951	207.804	83.909	83.972	0.0076
A-3	19.277	108.882	0.629	1.089	0.758	17.708	221.546	84.244	84.308	0.0076
A-3	20.512	108.891	0.638	1.111	0.759	18.468	235.734	84.580	84.644	0.0076
A-3	21.183	108.896	0.643	1.121	0.762	18.893	243.446	85.587	85.651	0.0076
A-3	22.767	108.907	0.654	1.148	0.763	19.837	261.658	86.090	86.154	0.0076
A-3	24.409	108.918	0.665	1.174	0.765	20.787	280.521	86.594	86.658	0.0076

Annex C – EA Product Data

[redacted]

[redacted]

- Lime Down C2: SPZ2c and SPZ3
- Lime Down D: SPZ1c and SPZ2c and SPZ3
- Lime Down E1: SPZ1c and SPZ2c
- Lime Down E2: SPZ1c and SPZ2c

The aquifer designations in the areas given are,

- Alluvium – Secondary A Aquifer with Medium to High Vulnerability
- Forest Marble limestone member - Principal Aquifer with High Vulnerability
- Forest Marble mudstone member - Secondary A Aquifer with High Vulnerability
- Cornbrash - Secondary A Aquifer with High Vulnerability
- Kellaways Clay – Unproductive Strata

Provision of FRA Product 4

Thank you for your recent request to use Environment Agency flood data. The information is attached.

If you have requested this information to help inform a development proposal, then you should note the information on GOV.UK on the use of Environment Agency Information for Flood Risk Assessments and our attached advisory text.
https://www.gov.uk/planning-applications-assessing-flood-risk
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Further details about the Environment Agency information supplied and the permitted use of this information can be found on the GOV.UK website:
https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather
http://www.nationalarchives.gov.uk/doc/open-government-licence/version/3

We respond to requests under the Freedom of Information Act 2000 (FOIA) and Environmental Information Regulations 2004 (EIR).

If you are not satisfied with our response to your request for information you can contact us within 2 calendar months to ask for our decision to be reviewed.

We really value your thoughts on how we are doing and will always make changes where we can to improve our service. Please click on the link below and fill in our survey.
http://www.smartsurvey.co.uk/s/EnvironmentAgencyCustomerSurvey/?a=DC *Thank you.*

Kind regards

[redacted]

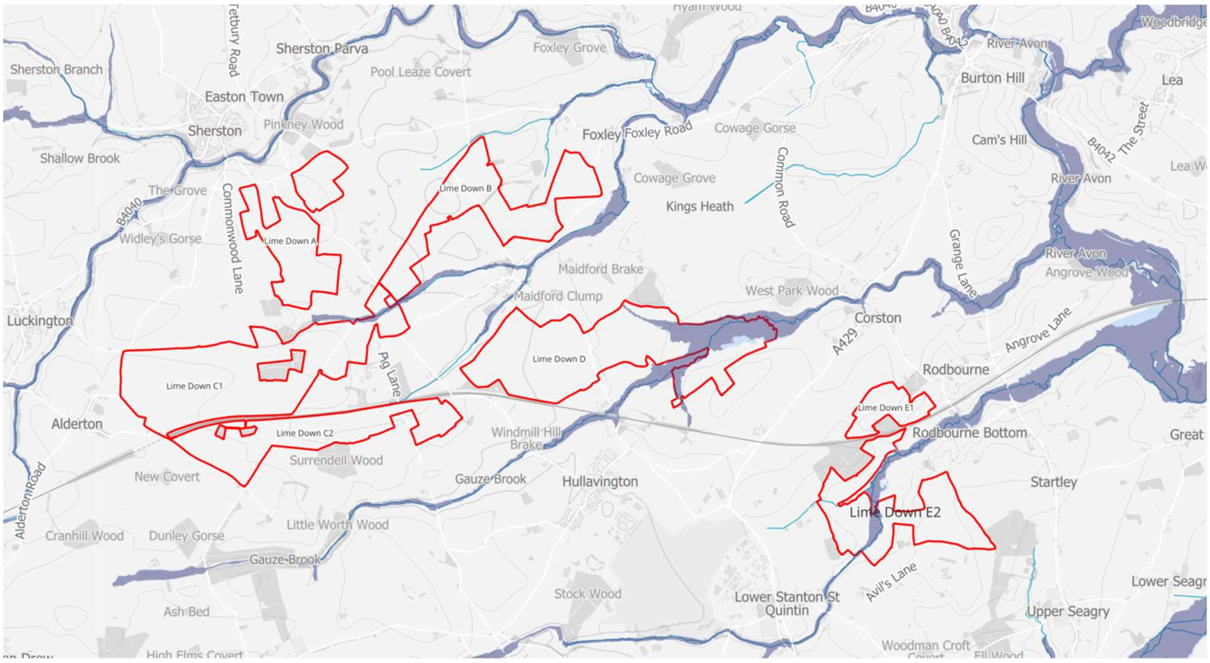
Environment Agency, Wessex Enquiries, Customer & Engagement Team

[redacted] Wessex Enquiries

[redacted] mabbett.eu>
Sent: 15 October 2024 14:01
To: Enquiries, Unit <enquiries@environment-agency.gov.uk>
Subject: 317212 Lime Down Data Request

To whom it may concern,

Mabbett & Associates Ltd have been instructed to undertake a Flood Risk Assessment and Drainage Strategy in support of a proposed solar site in Wiltshire, known as the site hereon. I attach a site location plan and the site details below. The site has been split into parcels which can be seen below (Lime Down A, B, C1, C2, D, E1 and E2).



According to the EA online Flood M Planning, the Site is shown to be located within Flood Zones 1, 2 and 3, however we would be grateful if you could provide **any nearby modelled flood level data** in order to inform our assessment of the Site.

It would therefore be useful if you are able to confirm/provide the followiap forng where available:

Site Details

Site Name Lime Down SOlar

Address Lime Down A: SN16 0PU (NGR: 385982, 184814)

Lime Down B: SN16 0JS (NGR: 388179, 185419)

Lime Down C1: SN14 6NL (NGR: 385300, 183486)

Lime Down C2: SN16 0JZ (NGR: 386684, 182717)

Lime Down D: SN14 6EU (NGR: 389526, 183654)

Lime Down E1: SN16 0EX (NGR: 392655, 183066)

Lime Down E2: SN14 6DA (NGR: 393123, 181766)

Data Request

Please provide any of the following information to enable us to complete our assessment:

Historical Flooding Information

- Any records, photographs, flood extents from known historic events in the area

Technical Data

- Any hydraulic models covering the site
- Raw and processed results for the model(s) above
    - Hydraulic modelling report for the model(s) above
    - Modelled floodplain levels and flows for node points within and in the immediate vicinity of the Site taking into account the most recent climate change allowances (where these have been modelled);
- Hydrology report and/or flood estimation calculation records for the model(s) above
- Survey data used to build the model or inform nearby studies

Supporting Data

- Flood/coastal defence survey data
- Operational procedures for hydraulic structures
- Section 19 flood investigation reports
- The date and type of modelling that flood levels have been derived from;
- The technical report summarising the modelling methodology;
- Confirmation that the data is appropriate/relevant to inform flood risk within the Site;
- Details of any flood defences within the vicinity of the Site (i.e type, crest levels, Standard of Protection, condition, etc) and any associated breach and/or overtopping flood extents and depths;
- Hazard mapping detailing the depth, velocity and associated hazard rating for the Site;
- Any information in relation to surface water flooding including confirmation is located within or outside of a Critical Drainage Area;
- Any information in relation to on-Site drainage;
- Any information in relation to groundwater flooding in the area. Where possible, please provide borehole locations and ground water levels;
- Details of sensitive aquifers and known contamination issues;
- Any information/mapping of historical flooding events on Site from all sources of flooding (i.e fluvial, tidal, surface water, groundwater, sewer, reservoir, canal, etc).

Where available please can you provide flood levels, estimated return periods, photographs and other such data that may be relevant to our assessment;

We trust this request is acceptable but please do not hesitate to contact us if you require any further information to assist with your response or wish to discuss the Site in further detail.

We look forward to hearing from you.

Thanks,

[redacted]

Consultant | Water Environment Team

[redacted]

IOSH & IEMA Training Course Provider

Anglesey | Belfast | Cardiff | Carlisle | Dublin | Dundee | Edinburgh | Forres | Glasgow | Inverness | Leicester | Manchester | Winchester

[redacted]

Our ref: 381197-WX
Date: 4th November 2024

Thank you for your enquiry which was received on 15th October 2024. We respond to requests under the Freedom of Information Act 2000 and Environmental Information Regulations 2004.

Abstract

Name	Product 4
Description	Flood Risk Information for land at **Lime Down** NGR: ST9009082825
Licence	Open Government Licence
Information Warnings	*The mapping of features provided as a background in this product is © Ordnance Survey. It is provided to give context to this product. The Open Government Licence does not apply.*
Attribution	Contains Environment Agency information © Environment Agency and/or database rights. Contains Ordnance Survey data © Crown copyright 2023 Ordnance Survey *AC0000807064*.

Open Data

The following Environment Agency published datasets are now available on the weblink below as part of the Government's 'Open Data' project and are available for you to download free of charge.

Environment Agency published datasets: https://data.gov.uk/data/search?publisher=environment-agency&unpublished=false

You will need to search and select the name of the following datasets to take you directly to the weblink to enable you to download the data:

- Flood Map for Planning (Rivers and the Sea) – Flood Zones 2 and 3
- Flood Map for Planning (Rivers and Sea) – Areas Benefiting from Defences
- Flood Map for Planning (Rivers and Sea) Spatial Flood Defences
- Flood Map for Planning (Rivers and Sea) Flood Storage Areas
- Recorded Flood Outlines
- Historic Flood Map
- Risk of Flooding from Surface Water Extent for:
  - → 3 percent annual chance
  - → 1 percent annual chance
  - → 0.5 percent annual chance

You can also access the Flood Map for Planning here: https://flood-map-for-planning.service.gov.uk/

You can also access the Risk of Flooding from Surface Water maps and Risk of Flooding from Reservoirs information here: https://flood-warning-information.service.gov.uk/long-term-flood-risk/map

Recorded Historic Flood Events

We no longer produce pdf copies of the Historic Flood Map. This information is available to search, select, and download free of charge as part of the Government's 'open data' as

- Recorded Flood Outlines
- the Historic Flood Map

Our historic records indicate that there was flooding in the area in **1925** (fluvial), **1932** (fluvial), **1954** (fluvial), **1979** (fluvial), **1999** (fluvial/unconfirmed source), **2007** (fluvial), **2009** (fluvial), **2012** (fluvial/unconfirmed source) and **2013** (fluvial).

Additionally, our historic records show a record of possible flooding pre 2012 for the area, however we are currently unable to confirm the date and source of this.

Please note - we cannot guarantee that this is an exhaustive list of all past flood events in this location. All reasonable care has been taken to ensure that the historical flood event data is as accurate as possible. The Environment Agency will update its records if new evidence emerges.

Modelled Fluvial Water Levels

We have not carried out any detailed fluvial flood risk modelling in this location.

The fluvial Flood Map in this area has been produced using our National Generalised Model (JFLOW). This modelling is fit for the purpose of the Flood Zones. However, it is not based on a specific channel survey. Neither water depths nor water levels were outputs specified when we commissioned this generalised modelling for the Flood Zones. Whilst the modelling process does provide some information on depth of water, it would have been possible to produce the flood extents without storing the water depth values, since water depth is only a 'by-product' of the calculation process. As this type of modelling was developed, tested and reviewed for production of the Flood Zone extents only, we have no information on the accuracy of the water depth data. Water depth or level outputs from this model are only suitable to be used for decision making at a broad catchment scale and is not fit for the purpose of a site-specific flood risk assessment.

For your information we have supplied maps showing the water depths derived from JFLOW for the 1% AEP (100yr) and 0.1% AEP (1000yr) fluvial modelled flood scenarios.

Please note - The Environment Agency is currently carrying out a project to update the National Generalised model (JFLOW). The New National Model outputs are expected in Spring 2025. Our published flood risk information for this area will be updated using outputs from the New National Model and this is expected to take place in late 2025 (current programme which may change). This will be carried out as part of the National project to update our National flood risk mapping and modelling information across England and will incorporate outputs from detailed local models together with updated National modelling.
New National Model Details.

The New National Modelling (NNM) is a set of models for rivers, surface water and the sea covering the whole of England. The NNM has been created to fill in gaps where we don't have local hydraulic models, our local models require updating or we need additional model scenarios such as climate change runs.

Please also note - we are currently carrying out a National project to update our flood risk information for the whole of England. We will be updating our flood risk information in 2025 as part of the new National Flood Risk Assessment (NaFRA2). This will include the data displayed on the Check Your Long-Term Flood Risk service and the data displayed in the Flood Map for Planning (Rivers and Sea).

This should result in improvements to our mapping products, especially where we do not currently have any detailed local modelling. This means there will be some changes to our flood risk information in many areas when the new data is published.

You can find further information on the NaFRA2 project here: https://www.gov.uk/guidance/updates-to-national-flood-and-coastal-erosion-risk-information

For more information on climate change allowances please see the guidance on the Gov.UK website here: Flood risk assessments: climate change allowances - GOV.UK. **Please be aware that this information is subject to change, please check the guidance regularly.**

Environmental Permit for Flood Risk Activities

In addition to any other permission(s) that you may have already obtained e.g. planning permission, you may need an environmental permit for flood risk activities (formerly known as Flood Defence Consent prior to 06 April 2016) if you want to do work:

- in, under, over or near a main river (including where the river is in a culvert)
- on or near a flood defence on a main river
- in the flood plain of a main river
- on or near a sea defence

For further information and to check whether a permit is required please visit: https://www.gov.uk/guidance/flood-risk-activities-environmental-permits.

For any further advice, please email Blandford.frap@environment-agency.gov.uk.

Ordinary Watercourse

Some of the watercourses adjoining this site are classed as an “Ordinary Watercourse” not a “Main River” under our control. Works to ordinary watercourses may require consent from either the Lead Local Flood Authorities or the Local Drainage Board.

Flood Asset Information

Please find enclosed details of Flood Assets within the area. This information has been taken from our Asset Information Management System database (AIMS).

Please note that flood defences can increase water levels elsewhere eg through channels being restricted by defences, or because defences prevent flood water flowing back into the river channel.

Planning

If you have questions regarding the planning nature of your enquiry, or require advice on floor levels, please contact our Sustainable Places team on wx.sp@environment-agency.gov.uk. Please be aware that we now charge for planning advice when consulted on pre-application enquiries. This new approach provides advice to developers in two ways. Firstly, there is the provision of ‘free’

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

advice available to everyone where we give a preliminary opinion on a proposed development. This sets out the environmental constraints together with any issues this raises for us. Should you wish us to review in detail any of these issues then we can do this through a chargeable scheme aimed at recovering our costs.

Strategic Flood Risk Assessment (SFRA)

When preparing a FRA to support a development proposal in this location you should refer to Wiltshire Council's SFRA Reports Level 1 which is available to download via the following link: https://www.wiltshire.gov.uk/media/5691/Strategic-Flood-Risk-Assessment-Level-1/pdf/Wiltshire_Council_Level_1_SFRA_v5.0.pdf?m=637459765054370000

The Wiltshire Council Local Plan is available via this link: https://www.wiltshire.gov.uk/planning-policy-local-plan-review-consultation

Further Information

We advise that you also contact the drainage engineer/ flood risk management team at Wiltshire Council by email: drainage@wiltshire.gov.uk, or by phone: 0300 456 0105, based at: Bythesea Road, Trowbridge, Wiltshire, BA14 8JN, as they may be able to provide further advice with respect to localised flooding and drainage issues.

Further details about the Environment Agency information supplied can be found on our website: https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather

We hope you find this information helpful. It is provided subject to the attached notice 'Use of Environment Agency Information for Flood Risk Assessments', which we strongly recommend you read.

Yours sincerely

[redacted]

Customer & Engagement, Wessex
Rivers House, East Quay, Bridgwater, Somerset, TA6 4YS
Email: wessexenquiries@environment-agency.gov.uk

Enc: Use of Environment Agency Information for Flood Risk Assessments (below)
381197-WX 100yr JFLOW Depth Map (1%AEP)
381197-WX 1000yr JFLOW Depth Map (0.1%AEP)
381197-WX Defence Map
381197-WX Defence Data

Use of Environment Agency Information for Flood Risk Assessments (FRAs)

Important
Use of Environment Agency data: you should note that

1. Information supplied by the Environment Agency may be used to assist in producing a Flood Risk Assessment (FRA) where one is required, but the use of Environment Agency information does not constitute such an assessment on its own.

2. As part of your data request, we have provided all of the modelled data we hold for your location. Please note that some of our modelled information may have been produced for purposes other than for flood zone generation. This may mean that some of the modelled data you have been provided with has a lower confidence level, and has not been used in producing our flood map, nor definitively reflects the predicted flood water level at the property/development site scale. To check the suitability of the use of this information in your FRA please contact your local Partnership & Strategic Overview (PSO) team.

3. This information covers flood risk from main rivers and the sea, and you will need to consider other potential sources of flooding, such as groundwater or surface water runoff. The information produced by the Local Planning Authority and the Lead Local Flood Authority (LLFA) may assist in assessing other sources of flood risk.

4. Where a planning application requires a FRA and this is not submitted or deficient, the Environment Agency may well raise an objection.

5. For more significant proposals in higher flood risk areas, we would be pleased to discuss details with you ahead of making any planning application, and you should also discuss the matter with your Local Planning Authority.

Pre-Planning Advice from the Environment Agency
If you have requested this information to help inform a development proposal, then we recommend that you undertake a formal pre-application enquiry using the form available from our website:

Pre-application Preliminary Opinion:
https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion

Pre-application Charged Service:
https://www.gov.uk/government/publications/planning-advice-environment-agency-standard-terms-and-conditions

Depending on the enquiry we may also provide advice on other issues related to our responsibilities, including flooding, waste, land contamination, water quality, biodiversity, navigation, pollution, water resources, foul drainage or Environmental Impact Assessment.

Flood Risk Assessment (FRA) Guidance
You should refer to the Planning Practice Guidance of the National Planning Policy Framework (NPPF) and the Environment Agency's Flood Risk Standing Advice for information about Flood Risk Assessment (FRA) for new development in the different Flood Zones. These documents can be accessed via:

National Planning Policy Framework Planning Practice Guidance:
http://planningguidance.planningportal.gov.uk/

Environment Agency advice on FRAs:

https://www.gov.uk/flood-risk-assessment-for-planning-applications#when-to-follow-standing-advice

https://www.gov.uk/government/publications/planning-applications-assessing-flood-risk

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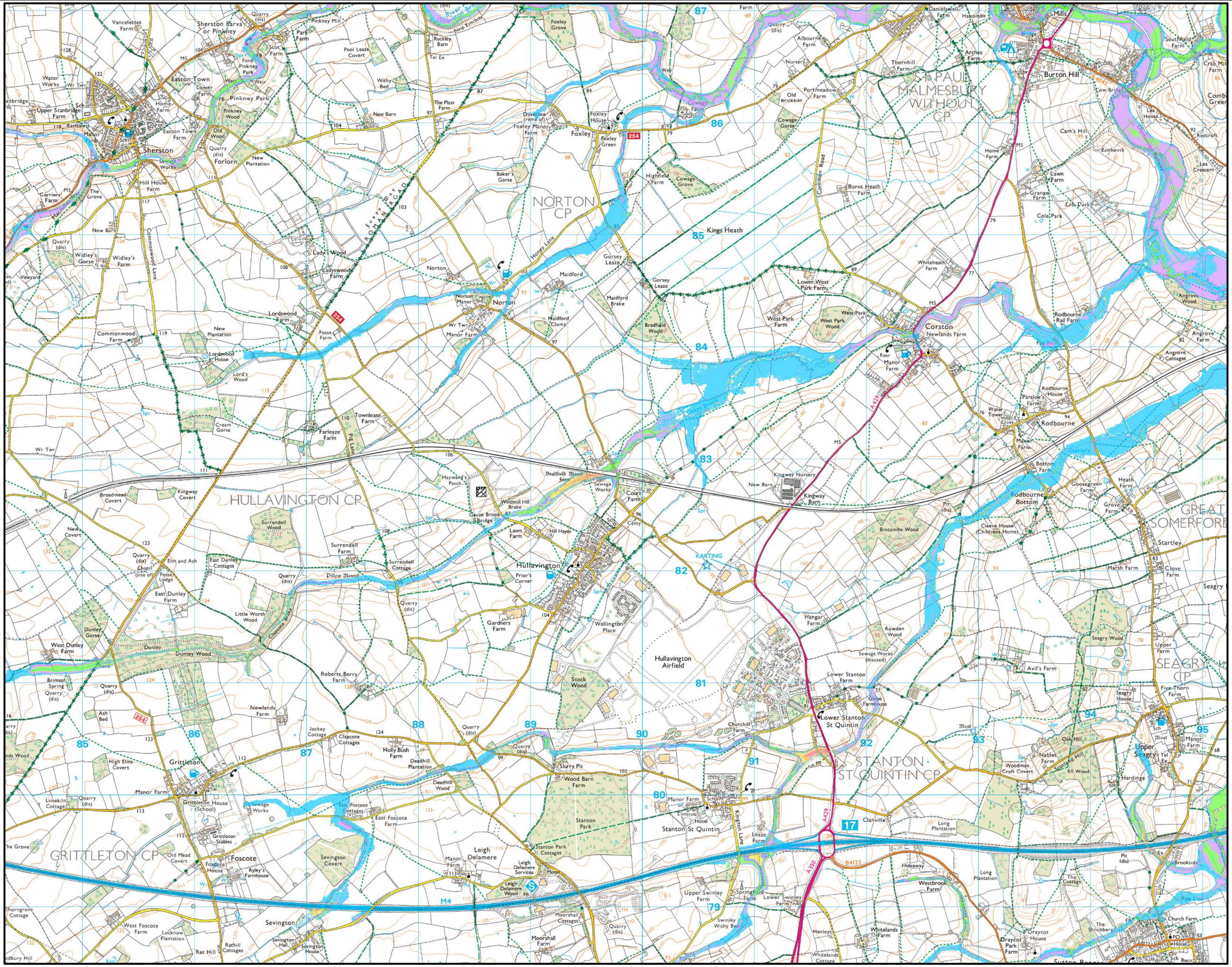
Email: wessexenquiries@environment-agency.gov.uk
www.environment-agency.gov.uk

381197-WX - JFLOW Fluvial Water depths (m) Without Flood Defences. 100 year (1% AEP) centred on land at Lime Down [390090,182825].
Created 01.11.2024



Environment Agency

Scale 1:50,000

N
W E
S

Legend

100yr JFLOW Depth

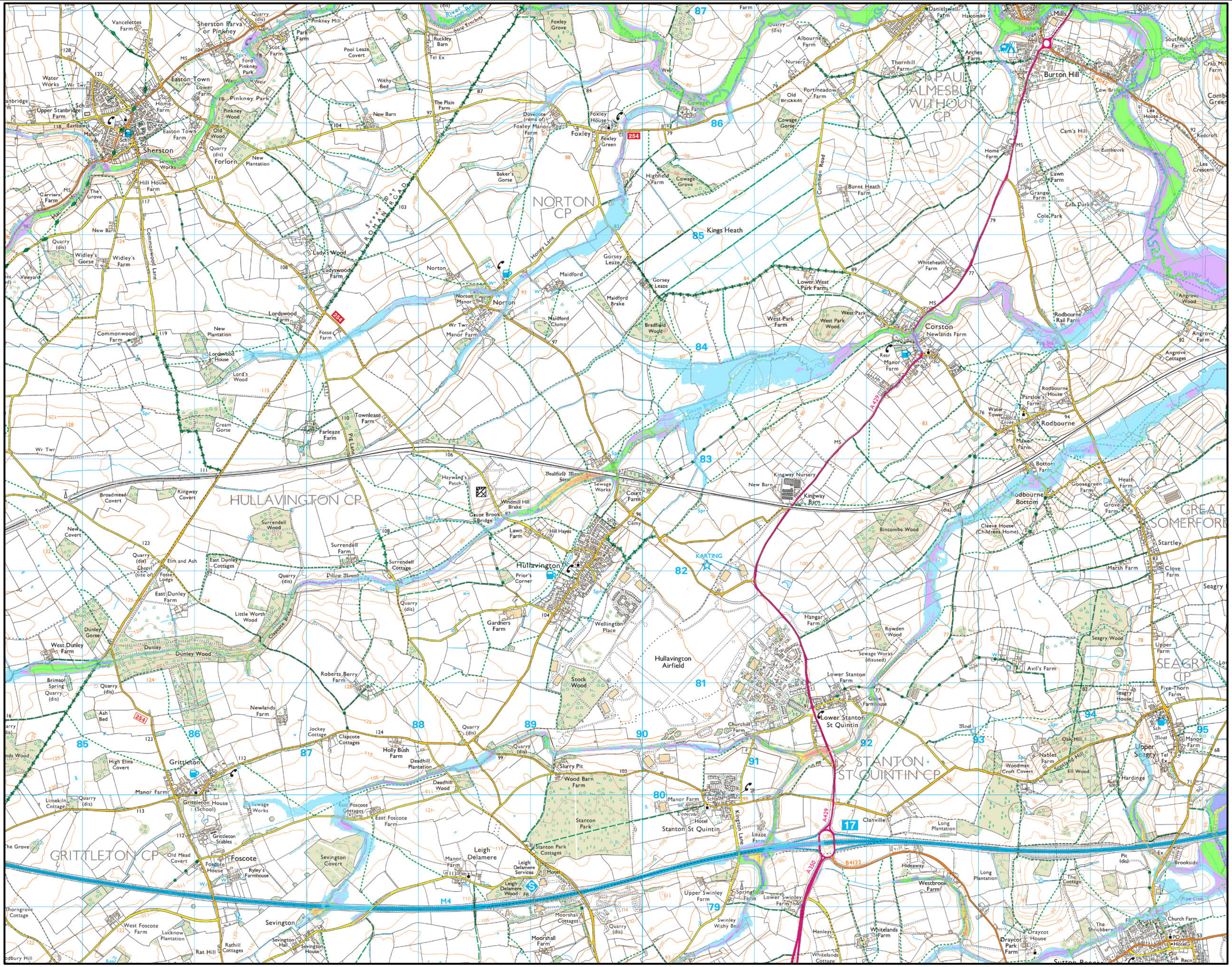
Metres

- 0 - 0.5
- 0.500000000 - 1
- 1.000000001 - 2
- 2.000000001 - 3
- 3.000000001 - 4
- 4.000000001 - 5
- 5.000000001 - 10
- 10.00000001 - 100

Information Warning
We do not recommend the use of water depths/levels derived from JFLOW for site specific investigations such as Flood Risk Assessments.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

381197-WX - JFLOW Fluvial Water depths (m) Without Flood Defences. 1000 year (0.1% AEP) centred on land at Lime Down [390090,182825].
Created 01.11.2024



Environment Agency

Scale 1:50,000

N
W E
S

Legend

1000yr JFLOW Depth

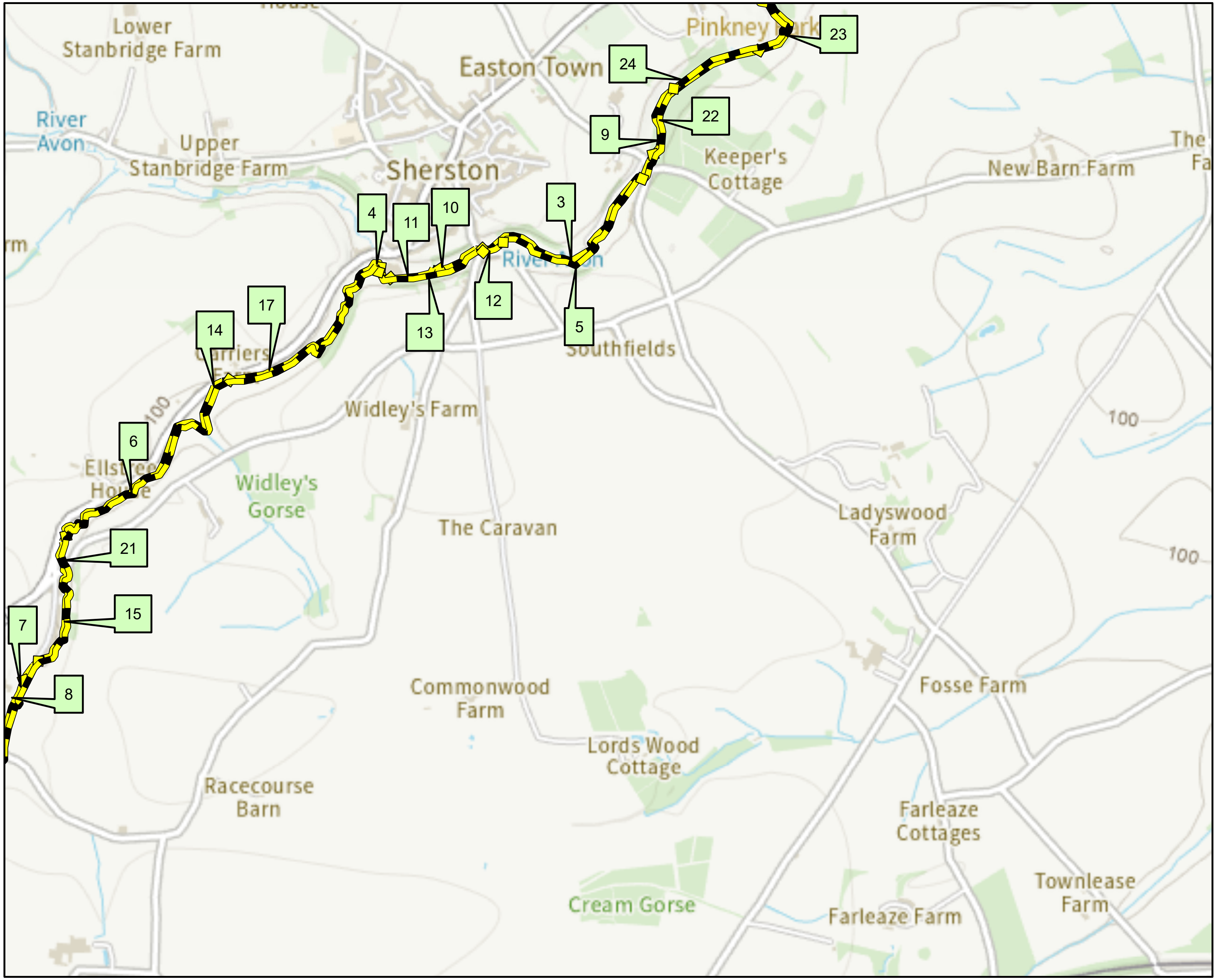
Metres

- 0 - 0.5
- 0.500000000 - 1
- 1.000000001 - 2
- 2.000000001 - 3
- 3.000000001 - 4
- 4.000000001 - 5
- 5.000000001 - 10
- 10.00000001 - 100

Information Warning
We do not recommend the use of water depths/levels derived from JFLOW for site specific investigations such as Flood Risk Assessments.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Current Flood Defences centered on NGR ST 85982 84814 Created 22/10/2024 Ref: 381197-WX



Environment Agency

Scale: 1:20,000

N E S W

Legend

Defences

- Barrier Beach
- Beach
- Bridge Abutment
- Cliff
- Demountable Defence
- Dunes
- Embankment
- Engineered High Ground
- Flood Gate
- Natural High Ground
- Promenade
- Quay
- Spillway
- Wall

This data has been extracted from the Asset Information Management System (AIMS OM) which was created to draw various data sources into one database and has been populated with information of varying quality.

Contact Us: National Customer Contact Centre, PO Box 544, Rotherham, S60 1BY. Tel: 03708 506 506 (Mon-Fri 8-6). Email: enquiries@environment-agency.gov.uk

Product 4 - AIMS Information **381197-WX** **Date:** **22/10/2024**

Map Ref	Asset ID	Asset Type	Right or left bank	Asset Description	Approx length (m)	Actual fluvial downstream crest level (mAOD)	Actual fluvial downstream crest level accuracy	Actual fluvial upstream crest level (mAOD)	Actual fluvial upstream crest level accuracy	Actual fluvial coastal crest level (mAOD)	Actual fluvial coastal crest level accuracy	NGR	Most recent inspection	Overall condition
3	40115	Natural High Ground	Left	Natural Bank	878.51	DNR	DNR	DNR	DNR	DNR	DNR	ST8592785717	07/04/2009	2 - Good
4	40116	Natural High Ground	Left	Stone wall	63.60	DNR	DNR	DNR	DNR	DNR	DNR	ST85158562	07/04/2009	2 - Good
5	40419	Natural High Ground	Right	Natural Bank	714.43	DNR	DNR	DNR	DNR	DNR	DNR	ST85898565	07/04/2009	2 - Good
6	40420	Natural High Ground	Left	Natural Bank	959.72	DNR	DNR	DNR	DNR	DNR	DNR	ST84218478	19/12/2007	3 - Fair
7	4605	Natural High Ground	Left	Natural channel with masonry retaining wall	89.38	DNR	DNR	DNR	DNR	DNR	DNR	ST8389484163	23/10/1996	3 - Fair
8	4606	Natural High Ground	Left	Natural Bank	1229.01	DNR	DNR	DNR	DNR	DNR	DNR	ST83618359	19/12/2007	3 - Fair
9	4730	Natural High Ground	Left	Natural Bank	275.81	DNR	DNR	DNR	DNR	DNR	DNR	ST8615986133	07/04/2009	3 - Fair
10	4731	Natural High Ground	Left	Natural channel with stone retaining wall	181.67	DNR	DNR	DNR	DNR	DNR	DNR	ST85438562	07/04/2009	2 - Good
11	4849	Natural High Ground	Left	Natural Bank	189.57	DNR	DNR	DNR	DNR	DNR	DNR	ST8525585581	07/04/2009	2 - Good
12	4851	Natural High Ground	Right	Stone Wall	83.61	DNR	DNR	DNR	DNR	DNR	DNR	ST85568567	07/04/2009	2 - Good
13	4852	Natural High Ground	Right	Natural Bank	425.87	DNR	DNR	DNR	DNR	DNR	DNR	ST85348558	07/04/2009	2 - Good
14	4853	Natural High Ground	Left	Natural channel with gabion retaining wall	35.34	DNR	DNR	DNR	DNR	DNR	DNR	ST8458185202	23/10/1996	2 - Good
15	4854	Natural High Ground	Left	Masonry Wall	537.87	DNR	DNR	DNR	DNR	DNR	DNR	ST84028445	23/10/1996	3 - Fair
17	88456	Natural High Ground	Left	Natural Bank	825.00	DNR	DNR	DNR	DNR	DNR	DNR	ST8491285333	19/12/2007	3 - Fair
21	89868	Natural High Ground	Right	Natural Bank	3685.06	DNR	DNR	DNR	DNR	DNR	DNR	ST8404084431	19/12/2007	3 - Fair
22	98384	Natural High Ground	Right	Natural Bank	708.60	DNR	DNR	DNR	DNR	DNR	DNR	ST8619186219	07/04/2009	3 - Fair
23	98385	Natural High Ground	Right	Natural channel with stone retaining wall	561.70	DNR	DNR	DNR	DNR	DNR	DNR	ST86538659	07/04/2009	3 - Fair
24	98386	Natural High Ground	Left	Natural channel with masonry retaining wall	1001.16	DNR	DNR	DNR	DNR	DNR	DNR	ST8650586598	07/04/2009	2 - Good

Notes

* Overall Condition has been taken from the most recent inspection
* Inspections are of a purely visual nature and do not necessarily reflect the true condition of the asset
* Condition: 1 = very good, Condtion 2 = good, Condition 3 = fair, Condition 4 = poor, Condition 5 = very poor
* Crest level accuracy: 1 = ± 0.01 to 0.05m, 2 = ± 0.05 to 0.15m, 3 = ± 0.15 to 0.75m, 4 = ± 0.75 or greater
* DNR = data not recorded

Annex D – Greenfield Calculations

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

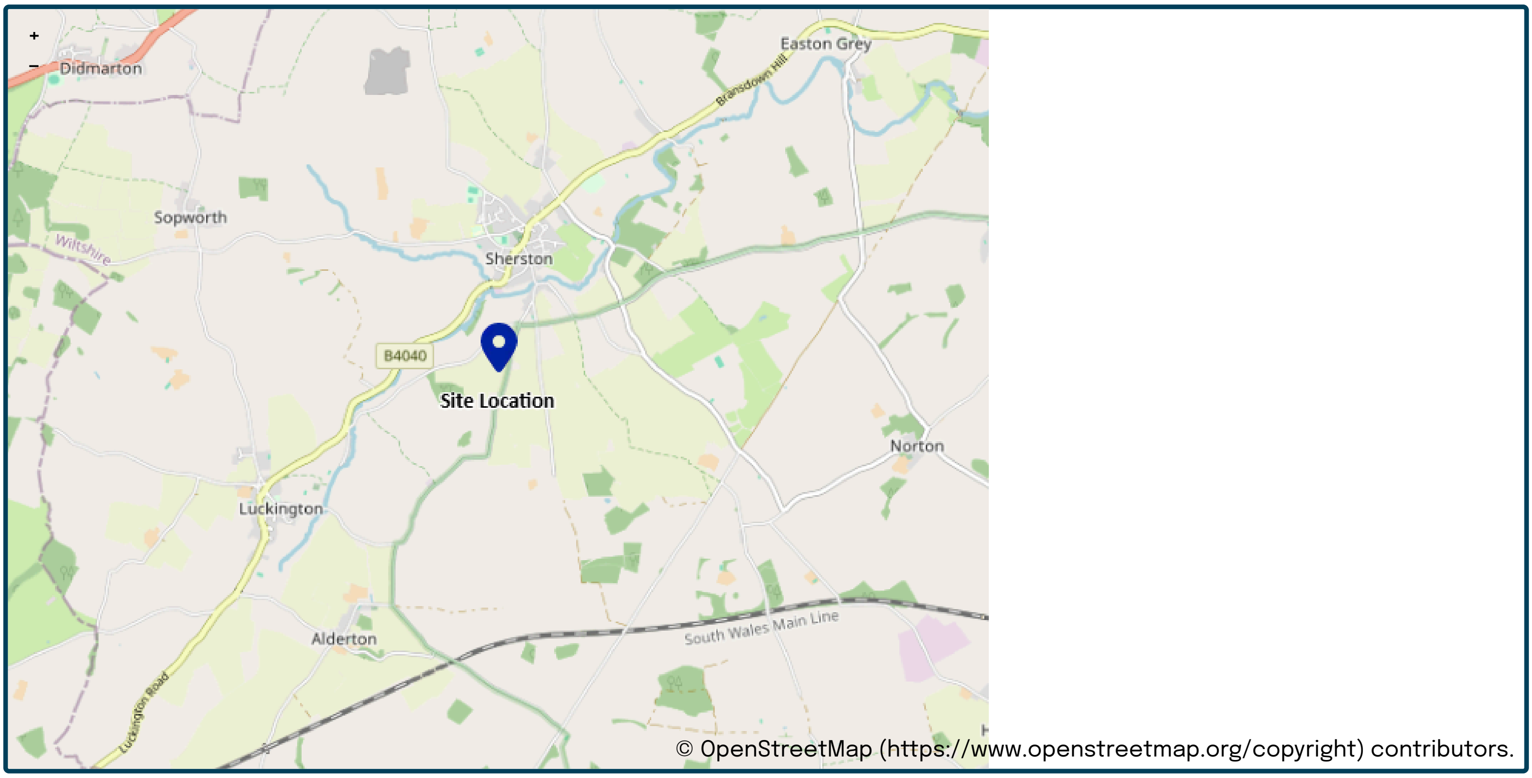
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	08/07/2026
Calculated by	GH
Reference	317212
Model version	2.2.3

Location

Site name	Lime Down A
Site location	



Site easting (British National Grid)	385203
Site northing (British National Grid)	184780

Site details

Total site area (ha)	0.1398 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	875 mm		
BFIHOST19scaled	0.583		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	0.5 l/s		
QBar (FEH statistical 2025) (l/s)	0.5 l/s		

Growth curve factors

	My value		Map value
Hydrological region	8		8
1 year growth factor	0.78		
2 year growth factor	0.93		
10 year growth factor	1.49		
30 year growth factor	1.95		
100 year growth factor	2.43		
200 year growth factor	2.78		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.4 l/s
Flow rate 2 year (l/s)	0.5 l/s
Flow rate 10 years (l/s)	0.7 l/s
Flow rate 30 years (l/s)	1.0 l/s
Flow rate 100 years (l/s)	1.2 l/s
Flow rate 200 years (l/s)	1.4 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

Greenfield runoff rate estimation tool

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

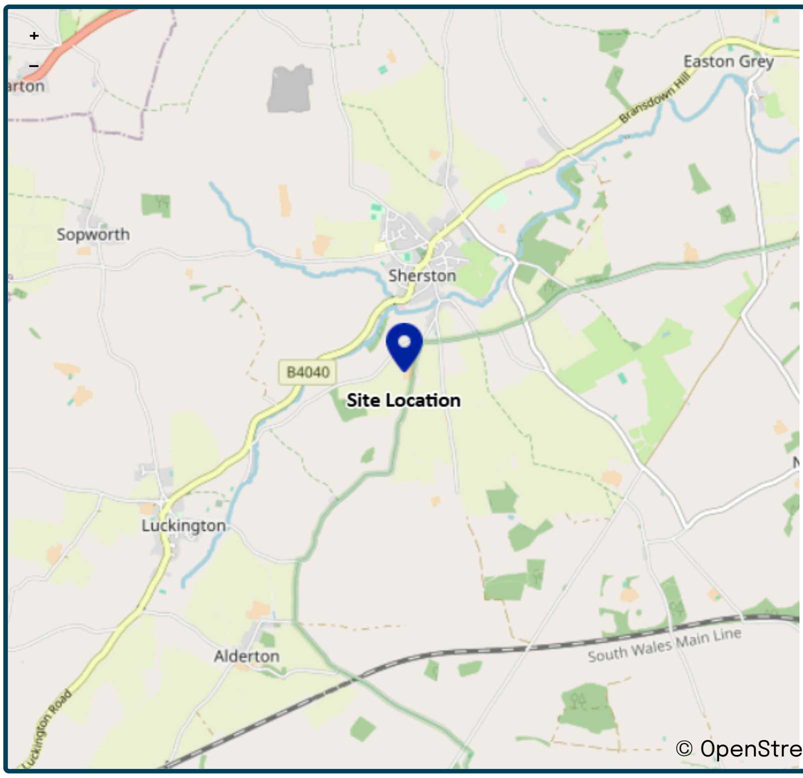
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance "Rainfall runoff management for developments", SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	22/06/2026
Calculated by	GH
Reference	317212
Model version	2.2.3

Location

Site name	Lime Down A
Site location	



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Site easting (British National Grid)	385224
Site northing (British National Grid)	184919

Site details

Total site area (ha)	0.067 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	875 mm		
BFIHOST19scaled	0.583		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	0.2 l/s		
QBar (FEH statistical 2025) (l/s)	0.2 l/s		

Growth curve factors

	My value		Map value
Hydrological region	8		8
1 year growth factor	0.78		
2 year growth factor	0.93		
10 year growth factor	1.49		
30 year growth factor	1.95		
100 year growth factor	2.43		
200 year growth factor	2.78		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.2 l/s
Flow rate 2 year (l/s)	0.2 l/s
Flow rate 10 years (l/s)	0.4 l/s
Flow rate 30 years (l/s)	0.5 l/s
Flow rate 100 years (l/s)	0.6 l/s
Flow rate 200 years (l/s)	0.7 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

Greenfield runoff rate estimation tool

hr wallingford

www.uksuds.com | Greenfield runoff rate estimation tool (https://www.uksuds.com/)

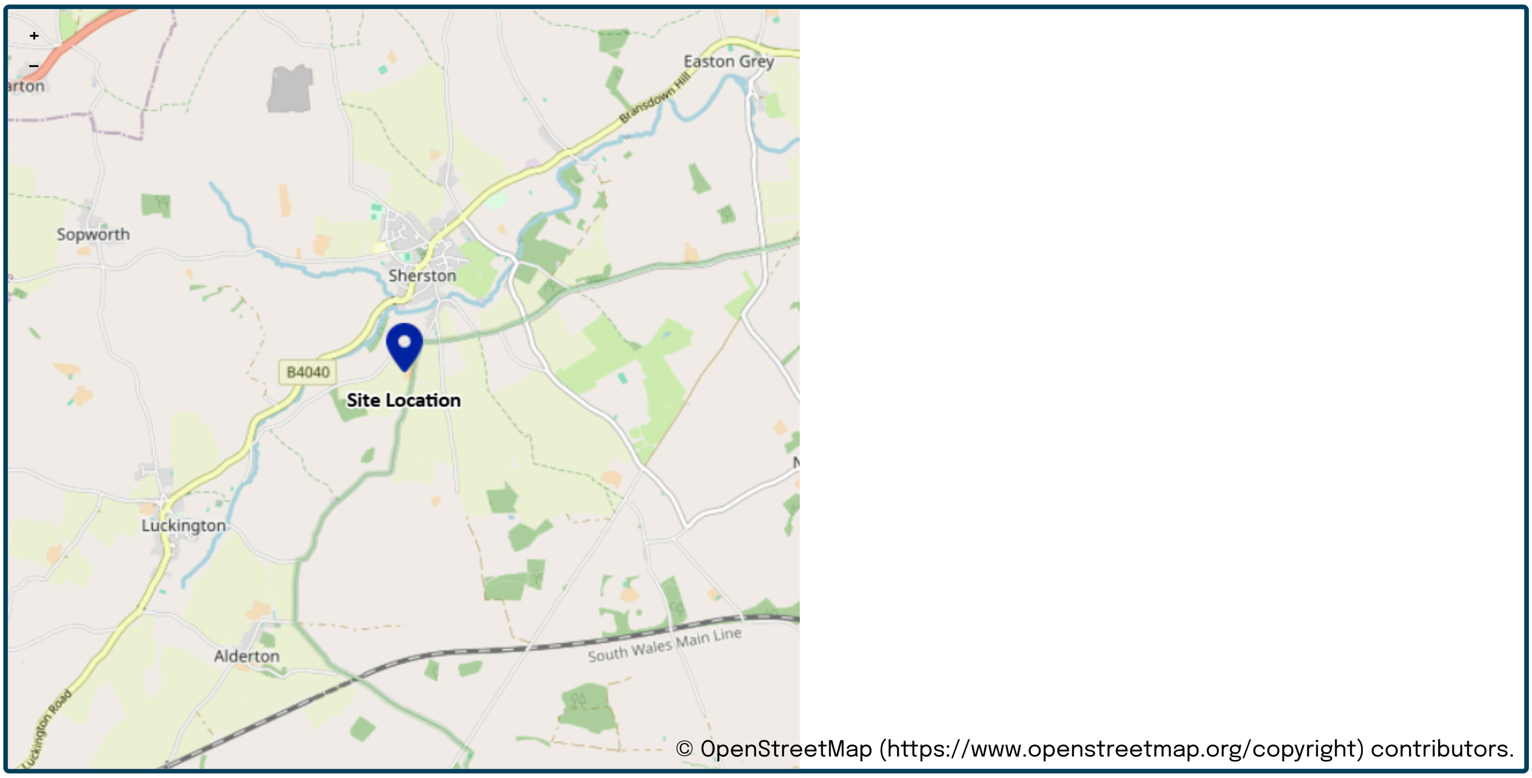
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). This information on greenfield runoff rates may be the basis for setting consents for the drainage of surface water runoff from sites.

Project details

Date	22/06/2026
Calculated by	GH
Reference	317212
Model version	2.2.3

Location

Site name	Lime Down A
Site location	



Site easting (British National Grid)	385224
Site northing (British National Grid)	184919

Site details

Total site area (ha)	0.5 ha

Greenfield runoff

Method

Method	FEH statistical (2025)

FEH statistical (2025)

	My value		Map value
SAAR9120 (mm)	875 mm		
BFIHOST19scaled	0.583		
QMed-QBar conversion	1.075		1.075
QMed (l/s)	1.6 l/s		
QBar (FEH statistical 2025) (l/s)	1.8 l/s		

Growth curve factors

	My value		Map value
Hydrological region	8		8
1 year growth factor	0.78		
2 year growth factor	0.93		
10 year growth factor	1.49		
30 year growth factor	1.95		
100 year growth factor	2.43		
200 year growth factor	2.78		

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	1.4 l/s
Flow rate 2 year (l/s)	1.6 l/s
Flow rate 10 years (l/s)	2.6 l/s
Flow rate 30 years (l/s)	3.4 l/s
Flow rate 100 years (l/s)	4.3 l/s
Flow rate 200 years (l/s)	4.9 l/s

Please note runoff estimation is subject to significant uncertainty. Results are therefore normally reported to only 1 decimal place. Where 2 decimal places are provided, this does not indicate accuracy to this level, it has been adopted to prevent 'zero' figures from being reported. Outputs less than 0.01 l/s are reported as 0.01 l/s.

Disclaimer

Annex E – Hydraulic Calculations

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Storage	0.140	5.00	100.000	1200	0.000	0.000	0.750	99.250

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Rainfall Events	Singular	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Starting Level (m)			

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	45	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	99.250	Product Number	CTL-SHE-0050-1000-0750-1000
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.0	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.250
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	120.0	120.0	0.750	223.3	228.9

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	930	99.974	0.724	7.4	123.0434	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	1.0	123.9

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Storage	0.008	5.00	100.000	1200	0.000	0.000	0.750	99.250

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Rainfall Events	Singular	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Starting Level (m)			

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	45	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	99.250	Product Number	CTL-SHE-0014-1000-0750-1000
Design Depth (m)	0.750	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	0.1	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.250
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	900

Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	1.0	1.0	0.750	24.9	26.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
960 minute winter	Storage	915	99.842	0.592	0.4	6.1706	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
960 minute winter	Storage	Hydro-Brake®	0.1	10.1

Design Settings

Rainfall Methodology	FEH-22	Minimum Velocity (m/s)	1.00
Return Period (years)	100	Connection Type	Level Soffits
Additional Flow (%)	0	Minimum Backdrop Height (m)	0.200
CV	1.000	Preferred Cover Depth (m)	1.200
Time of Entry (mins)	5.00	Include Intermediate Ground	✓
Maximum Time of Concentration (mins)	30.00	Enforce best practice design rules	✓
Maximum Rainfall (mm/hr)	50.0		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)
Storage	0.500	5.00	100.000	1200	0.000	0.000	1.000	99.000

Simulation Settings

Rainfall Methodology	FEH-22	Skip Steady State	x	Check Discharge Rate(s)	x
Rainfall Events	Singular	Drain Down Time (mins)	1440	Check Discharge Volume	x
Winter CV	1.000	Additional Storage (m³/ha)	0.0		
Analysis Speed	Normal	Starting Level (m)			

Storm Durations

15	30	60	120	180	240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	45	0	0

Node Storage Online Hydro-Brake® Control

Flap Valve	x	Objective	(HE) Minimise upstream storage
Replaces Downstream Link	x	Sump Available	✓
Invert Level (m)	99.000	Product Number	CTL-SHE-0049-1100-1000-1100
Design Depth (m)	1.000	Min Outlet Diameter (m)	0.075
Design Flow (l/s)	1.1	Min Node Diameter (mm)	1200

Node Storage Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	99.000
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	

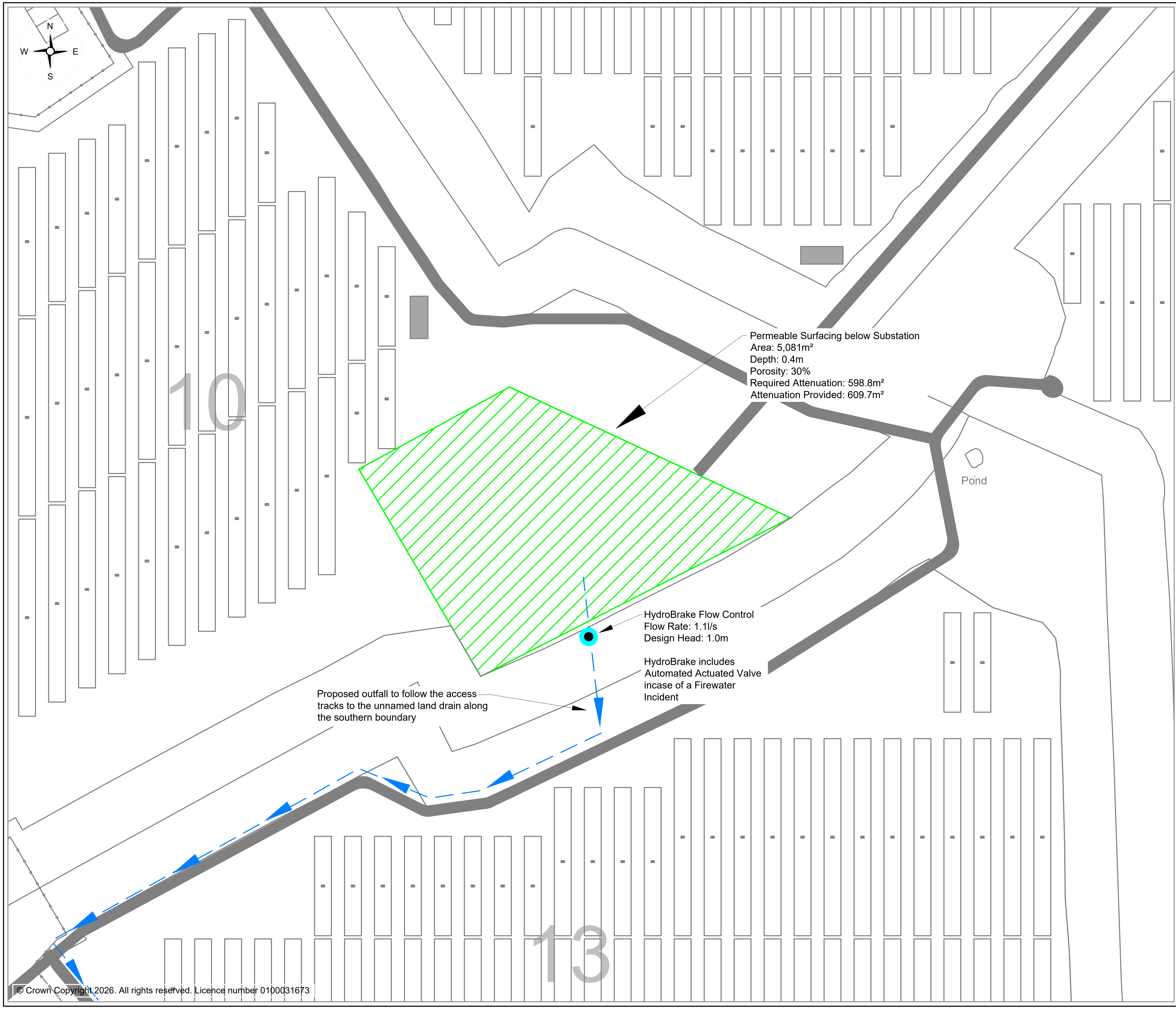
Depth (m)	Area (m²)	Inf Area (m²)	Depth (m)	Area (m²)	Inf Area (m²)
0.000	475.0	475.0	1.000	735.1	749.2

Results for 100 year +45% CC Critical Storm Duration. Lowest mass balance: 99.99%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
1440 minute winter	Storage	1440	99.992	0.992	19.6	598.8827	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	Outflow (l/s)	Discharge Vol (m³)
1440 minute winter	Storage	Hydro-Brake®	1.1	165.4

Annex F – Outline Drainage Sketch



Legend:

- 132kV Substation
- Proposed Surface Water Flow Route
- Proposed HydroBrake with inclusion of Automated Vlave

All Dimensions to be checked on site and not scaled from this drawing.
This drawing is conceptual and not for construction
This drawing is for planning only
All services to be checked on site and not scaled from this drawing

Arthian

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Inverness,
IV1 1SN
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+44 (0) 141 227 2300
https://www.arthian.com

Client: **Island Green Power**

Site: **Lime Down**

Drawing Title: **Lime Down A Drainage Sketch**

Date:	Scale:	Paper Size:
05 Aug 2026	1:1000	A3 (297 x 420mm)

Drawn By:	Checked By:	Status:	Final Revision:
GH	JR	Final v1	-

CAD Ref:	Drawing No: / Client Ref:
317212 11.2_Drainage_Layout	**Figure 1**

Annex G – SuDS Maintenance Schedule

Bioretention Systems Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular inspections	Inspect infiltration surfaces for silting and ponding, record de-watering time of the facility and assess standing water levels in underdrain (if appropriate) to determine if maintenance is necessary	Quarterly
	Check operation of underdrains by inspection of flows after rain	Annually
	Assess plants for disease infection, poor growth, invasive species etc and replace as necessary	Quarterly
	Inspect inlets and outlets for blockage	Quarterly
Regular maintenance	Remove litter and surface debris and weeds	Quarterly (or more frequently for tidiness or aesthetic reasons)
	Replace any plants, to maintain planting density	As required
	Remove sediment, litter and debris build-up from around inlets or from forebays	Quarterly to biannually
Occasional maintenance	Infill any holes or scour in the filter medium, improve erosion protection if required	As required
	Repair minor accumulations of silt by raking away surface mulch, scarifying surface of medium and replacing mulch	As required
Remedial actions	Remove and replace filter medium and vegetation above	As required but likely to be > 20 years

Table extract taken from the CIRIA C753 publication ‘The SuDS Manual’ – Table 18.3

Detention Basins Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly
	Cut grass - for spillways and access routes	Monthly (during growing season), or as required
	Cut grass - meadow grass in and around basin	Half yearly (spring – before nesting season, and autumn)
	Manage other vegetation and remove nuisance plants	Monthly (at start, then as required)
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect banksides, structures, pipework etc for evidence of physical damage	Monthly
	Inspect inlets and facility surface for silt accumulation. Establish appropriate silt removal frequencies.	Monthly (for first year), then annually or as required
	Check any penstocks and other mechanical devices	Annually
	Tidy all dead growth before start of growing season	Annually
	Remove sediment from inlets, outlet and forebay	Annually (or as required)
	Manage wetland plants in outlet pool – where provided	Annually (as set out in Chapter 23)
Occasion Maintenance	Reseed areas of poor vegetation growth	As required
	Prune and trim any trees and remove cuttings	Every 2 years, or as required
	Remove sediment from inlets, outlets, forebay and main basin when required	Every 5 years, or as required (likely to be minimal requirements where effective upstream source control is provided)
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realignment of rip-rap	As required
	Repair/rehabilitation of inlets, outlets and overflows	As required
	Relevel uneven surfaces and reinstate design levels	As required

Table extract taken from the CIRIA C753 publication ‘The SuDS Manual’ – Table 22.1

Filter Drains Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter (including leaf litter) and debris from filter drain surface, access chambers and pre-treatment devices	Monthly, or as required
	Inspect filter drain surface, inlet/outlet pipework and control systems for blockages, clogging, standing water and structural damage	Monthly
	Inspect pre-treatment systems, inlets and perforated pipework for silt accumulation, and establish appropriate silt removal frequencies	Six Monthly
	Remove sediment from pre-treatment devices	Six monthly, or as required
Occasional Maintenance	Remove or control tree roots where they are encroaching the sides of the filter drain, using recommended methods (eg NJUG, 2007 or BS 3998:2010)	As required
	At locations with high pollution loads, remove surface geotextile and replace, and wash or replace overlying filter medium	Five yearly, or as required
	Clear perforated pipework of blockages	As required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 16.1

Filter Strip Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris, leaf litter, and other accumulated material from the filter strip surface	Monthly, or as required
	Inspect the filter strip for bare patches, erosion, rutting, ponding, channel formation, and signs of compaction	Monthly
	Check inflow areas, level spreaders, and downstream outfalls to ensure runoff is evenly distributed across the strip	Monthly
	Mow vegetation to maintain an appropriate grass height and remove arisings where necessary	3 to 6 times per year during the growing season
	Inspect vegetation cover and re-seed sparse or damaged areas	Six Monthly
	Remove accumulated sediment at the upstream edge and other areas where deposition occurs	Six Monthly, or as required
Occasional Maintenance	Aerate compacted ground to restore infiltration performance	As required
	Re-grade the surface where flow paths have become concentrated or bypassed sections have developed	As required
	Undertake partial or complete re-seeding where vegetation cover has significantly deteriorated	As required

Green Roofs Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Inspections	Inspect all components including soil substrate, vegetation, drains, irrigation systems (if applicable), membranes and roof structure for proper operation, integrity of waterproofing and structural stability	Annually and after severe storms
	Inspect soil substrate for evidence of erosion channels and identify any sediment sources	Annually and after severe storms
	Inspect drain inlets to ensure unrestricted runoff from the drainage layer to the conveyance or roof drain system	Annually and after severe storms
	Inspect underside of roof for evidence of leakage	Annually and after severe storms
Regular Maintenance	Remove debris and litter to prevent clogging of inlet drains and interference with plant growth	Six monthly and annually or as required
	During establishment (ie year one), replace dead plants as required	Monthly (but usually responsibility of manufacturer)
	Post establishment, replace dead plants as required (where > 5% of coverage)	Annually (in autumn)
	Remove fallen leaves and debris from deciduous plant foliage	Six monthly or as required
	Remove nuisance and invasive vegetation, including weeds	Six monthly or as required
	Mow grasses, prune shrubs and manage other planting (if appropriate) as required - clippings should be removed and not allowed to accumulate	Six monthly or as required
Remedial Actions	If erosion channels are evident, these should be stabilized with extra soil substrate similar to the original material, and sources of erosion damage should be identified and controlled	As required
	If drain inlet has settled, cracked or moved, investigate and repair as appropriate	As required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 12.5

Headwall Outfall Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris, sediment and vegetation from around headwalls, flap valves and outfalls	Monthly (or as required)
	Visual inspection of headwalls, outfall structures and surrounding banks for damage or erosion	Monthly
	Check for blockage or restriction at outfall and through flap valve	Monthly
	Ensure flap valves open and close freely and are not jammed	Monthly
	Inspect watercourse immediately upstream and downstream for signs of scour, deposition or pollution	Monthly
	Inspect structural condition of concrete, masonry or prefabricated elements	Half yearly
	Check protection measures such as rip-rap, gabions or aprons	Half yearly
Occasional Maintenance	Clear accumulated silt or debris from outfall channel and apron	Annually (or as required)
	Lubricate flap valve hinges and moving parts where applicable	Annually
	Vegetation management to maintain clear access and flow paths	Annually
	Replace damaged or corroded flap valves	As required
	Reinstate scour protection where displaced or degraded	As required
Remedial Actions	Clearance following flooding, blockage or pollution incident	As required
	Stabilise banks and reinstate channel morphology at outfall location if their failure occurs	As required

Infiltration Basins Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris and trash	Monthly
	Cut grass - for landscaped areas and access routes	Monthly (during growing season) or as required
	Cut grass - meadow grass in and around basin	Half yearly: spring (before nesting season) and autumn
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
Occasional Maintenance	Reseed areas of poor vegetation growth	Annually, or as required
	Prune and trim trees and remove cuttings	As required
	Remove sediment from pre-treatment system when 50% full	As required
Remedial Actions	Repair erosion or other damage by reseeding or re-turfing	As required
	Realign the rip-rap	As required
	Repair or rehabilitate inlets, outlets and overflows	As required
	Rehabilitate infiltration surface using scarifying and spiking techniques if performance deteriorates	As required
	Relevel uneven surfaces and reinstate design levels	As required
Monitoring	Inspect inlets, outlets and overflows for blockages, and clear if required	**Monthly**
	Inspect banksides, structures, pipework etc for evidence of physical damage	**Monthly**
	Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies	**Half yearly**
	Inspect infiltration surfaces for compaction and ponding	Monthly

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 13.2

Pervious Pavements Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Brushing and vacuuming (standard cosmetic sweep over whole surface)	Once a year, after autumn leaf fall, or reduced frequency as required, based on site-specific observations of clogging or manufacturer's recommendations – pay particular attention to areas where water runs onto pervious surface from adjacent impermeable areas as this area is most likely to collect the most sediment
Occasional Maintenance	Stabilise and mow contributing and adjacent areas	As required
	Removal of weeds or management using glyphospate applied directly into the weeds by an applicator rather than spraying	As required - once per year on less frequently used pavements
Remedial Actions	Remediate any landscaping which, through vegetation maintenance or soil slip, has been raised to within 50 mm of the level of the paving	As required
	Remedial work to any depressions, rutting and cracked or broken blocks considered detrimental to the structural performance or a hazard to users, and replace lost jointing material	As required
	Rehabilitation of surface and upper substructure by remedial sweeping	Every 10 to 15 years or as required (if infiltration performance is reduced due to significant clogging)
Monitoring	Initial inspection	Monthly for three months after installation
	Inspect for evidence of poor operation and/or weed growth - if required, take remedial action	Three-monthly, 48 h after large storms in first six months
	Inspect silt accumulation rates and establish appropriate brushing frequencies	Annually
	Monitor inspection chambers	Annually

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 20.15

Pipes Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	**Inlets, outlets and surface control structures –** Inspect surface structures, removing obstructions and silts as necessary. Check there is no physical damage. Strim Vegetation 1 m min. surround to structures and keep hard aprons free from silt and debris.	Monthly
	Inspect chambers and below-ground control chambers – Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt. Undertake inspection after leaf fall in autumn.	Monthly
Occasional Maintenance	Check topsoil levels are 20mm above edges of baskets and chambers to avoid mover damage.	As necessary
Remedial Works	Unpack stone in basket features and unblock or repair and repack stone as design detail as necessary.	As required
	Repair physical damage if necessary.	As required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Box B.2

Pipes, Gullies, Catchpits, and Manholes Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter, debris, leaves and floatables from grating and chamber	Monthly (or as required)
	Visual inspection of grating, cover and frame for damage or displacement	Monthly
	Check for evidence of blockage, surcharge, standing water, or odours	Monthly
	Inspect inlet and outlet pipes for blockage, damage or silt build-up	Monthly
	Check chamber walls and benching for cracks or structural deterioration	Half yearly
	Measure silt and debris accumulation within the sump	Half yearly
	Ensure grating slots and covers are clear and safe for traffic/pedestrians	Half yearly
Occasional Maintenance	Structural repair to chamber, benching or pipe connections	As required
	Replace damaged or corroded gratings, covers or frames	As required
	Remove silt and debris from sump once 50% of sump depth is full	Annually (or as required)
	Jet and cleanse inlet pipework	Annually (or as required)
Remedial Actions	Clearance following flooding, pollution incident, or blockage occurrence	As required
	Upgrade or modify catchpits if capacity is observed as insufficient	As required

Ponds and Wetlands Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly (or as required)
	Cut the grass - public areas	Monthly (during growing season)
	Cut the meadow grass	Half yearly (spring, before nesting season, and autumn)
	Inspect marginal and bankside vegetation and remove nuisance plants (for first 3 years)	Monthly (at start, then as required)
	Inspect inlets, outlets, banksides, structures, pipework etc for evidence of blockage and/or physical damage	Monthly
	Inspect water body for signs of poor water quality	Monthly (May - October)
	Inspect silt accumulation rates in any forebay and in main body of the pond and establish appropriate removal frequencies; undertake contamination testing once some build-up has occurred, to inform management and disposal options	Half yearly
	Check any mechanical devices, eg penstocks	Half yearly
	Hand cut submerged and emergent aquatic plants (at minimum of 0.1m above pond base; include max 25% of pond surface)	Annually
	Remove 25% of bank vegetation from water's edge toa minimum of 1 m above water level	Annually
	Tidy all dead growth (scrub clearance) before start of growing season (Note: tree maintenance is usually part of overall landscape management contract)	Annually
	Remove sediment from any forebay	Every 1-5 years, or as required
	Remove sediment and planting from one quadrant of the main body of ponds without sediment forebays.	Every 5 years, or as required
Occasional Maintenance	Remove sediment from the main body of big ponds when pool volume is reduced by 20%	With effective pre-treatment, this will only be required rarely, eg every 25-50 years
Remedial Actions	Repair erosion or other damage	As required
	Replant, where necessary	As required
	Aerate pond when signs of eutrophication are detected	As required
	Realign rip-rap or repair other damage	As required
	Repair / rehabilitate inlets, outlets and overflows.	As required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 23.1

Soakaway Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Inspection for sediment and debris in pre-treatment components and flood of inspection tube or chamber and inside of concrete manhole rings	Annually
	Cleaning of gutters and any filters on downpipes	Annually (or as required based on inspections)
	Trimming any routes that may be causing blockages	Annually (or as required)
Occasional Maintenance	Inspection for sediment and debris in pre-treatment components and flood of inspection tube or chamber and inside of concrete manhole rings	As required, based on inspections
Remedial Actions	Reconstruct soakaway and/or replace or clean void fill, if performance deteriorates or failure occurs	As Required
	Replacement of clogged geotextile (will require reconstruction of soakaway)	As Required
Monitoring	Inspect silt traps and note rate of sediment accumulation	Monthly in the first year and then annually
	Check soakaway to ensure emptying is occurring	Annually

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 13.1

Attenuation Storage Tanks Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular maintenance	Inspect and identify any areas that are not operating correctly. If required, take remedial action	Monthly for 3 months, then annually
	Remove debris from the catchment surface (where it may cause risks to performance)	Monthly
	For systems where rainfall infiltrates into the tank from above, check surface of filter for blockage by sediment, algae or other matter; remove and replace surface infiltration medium as necessary.	Annually
	Remove sediment from pre-treatment structures and/ or internal forebays	Annually, or as required
Remedial actions	Repair/rehabilitate inlets, outlet, overflows and vents	As required
Monitoring	Inspect/check all inlets, outlets, vents and overflows to ensure that they are in good condition and operating as designed	Annually
	Survey inside of tank for sediment build-up and remove if necessary	Every 5 years or as required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 21.3

Swales Maintenance Schedule

Maintenance Schedule	Required Action	Typical Frequency
Regular Maintenance	Remove litter and debris	Monthly, or as required
	Cut grass - to retain grass height within specified design range	Monthly (during growing season), or as required
	Manage other vegetation and remove nuisance plants	Monthly at start, then as required
	Inspect inlets, outlets and overflows for blockages, and clear if required	Monthly
	Inspect infiltration surfaces for ponding, compaction, silt accumulation, record areas where water is ponding for > 48 hours	Monthly, or when required
	Inspect vegetation coverage	Monthly for 6 months, quarterly for 2 years, then half yearly
	Inspect inlets and facility surface for silt accumulation, establish appropriate silt removal frequencies	Half yearly
Occasional Maintenance	Reseed areas of poor vegetation growth, alter plant types to better suit conditions, if required	As required or if bare soil is exposed over 10% or more of the swale treatment area
Remedial Actions	Repair erosion or other damage by re-turfing or Reseeding	As required
	Relevel uneven surfaces and reinstate design levels	As required
	Scarify and spike topsoil layer to improve infiltration performance, break up silt deposits and prevent compaction of the soil surface	As required
	Remove build-up of sediment on upstream gravel trench, flow spreader or at top of filter strip	As required
	Remove and dispose of oils or petrol residues using safe standard practices	As required

Table extract taken from the CIRIA C753 publication 'The SuDS Manual' – Table 17.1

[redacted]
[iii] https://magic.defra.gov.uk/
[iv] https://flood-map-for-planning.service.gov.uk/
[v] https://check-long-term-flood-risk.service.gov.uk/postcode
[vi] https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow
[vii] [redacted]