



# Lime Down

## Solar Park

# Environmental Statement

## Volume 3, Appendix 11-4: Flood Risk Assessment and Outline Drainage Strategy – Lime Down C1 (Tracked)

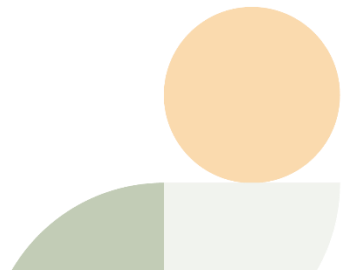
~~August~~October 2026

Revision 56

Planning Inspectorate Reference: EN010168

Document Reference: APP/6.3

APFP Regulation 5(2)(a)



# Appendix 11-4: Flood Risk Assessment and Outline Drainage Strategy – Lime Down C1

For: Lime Down Solar Park Ltd

Site: Lime Down Solar Park

Date: ~~05/08~~25/09/2026

Document Ref: 317212-04

~~Issue-05~~Issue-06

[www.arthian.com](http://www.arthian.com)

# Contents

|                                                              |           |
|--------------------------------------------------------------|-----------|
| <b>1. Site Details .....</b>                                 | <b>5</b>  |
| 1.2 Site Location.....                                       | 6         |
| 1.3 Existing Site Conditions.....                            | 6         |
| 1.4 Topography.....                                          | 6         |
| 1.5 Hydrology .....                                          | 6         |
| 1.6 Water Framework Directive Status .....                   | 7         |
| 1.7 Geology .....                                            | 7         |
| 1.8 Hydrogeology.....                                        | 8         |
| 1.9 Proposed Site Conditions.....                            | 8         |
| <b>2. Assessment of Flood Risk .....</b>                     | <b>10</b> |
| 2.2 Tidal Flood Risk.....                                    | 10        |
| 2.3 Fluvial Flood Risk .....                                 | 10        |
| 2.4 Surface Water Flood Risk .....                           | 12        |
| 2.5 Groundwater Flood Risk.....                              | 16        |
| 2.6 Sewer Flooding .....                                     | 16        |
| 2.7 Reservoir and Canal Flooding.....                        | 16        |
| 2.8 Residual Flood Risks .....                               | 16        |
| 2.9 Summary of Flood Risk.....                               | 17        |
| 2.10 Embedded Mitigation .....                               | 17        |
| 2.11 Impact on Off-Site Flood Risk.....                      | 17        |
| <b>3. Outline Drainage Strategy .....</b>                    | <b>19</b> |
| 3.2 Solar PV Panelled Area .....                             | 19        |
| 3.3 Drainage Strategy – Proposed Hardstanding Surfaces ..... | 20        |
| 3.4 Drainage Hierarchy .....                                 | 21        |
| 3.5 Sustainable Drainage Systems .....                       | 24        |
| 3.6 Attenuation Storage .....                                | 30        |
| 3.7 Preferred Drainage Scheme.....                           | 32        |
| 3.8 Event Exceedance.....                                    | 33        |
| 3.9 Surface Water Treatment .....                            | 34        |
| 3.10 Firewater Consideration .....                           | 35        |
| 3.11 Maintenance .....                                       | 35        |
| <b>4. Conclusions and Recommendations .....</b>              | <b>37</b> |
| 4.1 Conclusions .....                                        | 37        |
| 4.2 Recommendations .....                                    | 38        |

## Figures

|                              |   |
|------------------------------|---|
| Figure 1: Site Location..... | 5 |
|------------------------------|---|

|                                                                               |    |
|-------------------------------------------------------------------------------|----|
| Figure 2: LiDAR Plan .....                                                    | 6  |
| Figure 3: Superficial Deposits .....                                          | 7  |
| Figure 4: Bedrock Deposits .....                                              | 8  |
| Figure 5: EA's Flood Map for Planning .....                                   | 10 |
| Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water) ..... | 13 |
| Figure 7: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water) ..... | 14 |
| Figure 8: Water Level and Depths Map .....                                    | 15 |

## Tables

|                                                                      |    |
|----------------------------------------------------------------------|----|
| Table 1: Hardstanding Surfaces .....                                 | 20 |
| Table 2: Greenfield Runoff Rates .....                               | 24 |
| Table 3: SuDS Options for Proposed Development .....                 | 25 |
| Table 4: 132kV Substation Compound* .....                            | 31 |
| Table 5: 132kV substation Access Track* .....                        | 31 |
| Table 6: Conversion Units / 33kV Sub Distribution Switch Room* ..... | 31 |
| Table 7: 132kV Substation Compound* .....                            | 32 |
| Table 8: 132kV Substation Access Track* .....                        | 32 |
| Table 9: Conversion Units / 33kV Sub Distribution Switch Room* ..... | 32 |
| Table 10: Pollution Hazard Indices .....                             | 34 |
| Table 11: SuDS Mitigation Indices .....                              | 34 |

## Annexes

|                                                                               |                    |
|-------------------------------------------------------------------------------|--------------------|
| <a href="#">Annex A- Water Body Catchment Classifications Summaries .....</a> | <a href="#">39</a> |
| <a href="#">Annex B – Manning’s Open Channel Flow Mapping.....</a>            | <a href="#">43</a> |
| <a href="#">Annex C – EA Product Data .....</a>                               | <a href="#">44</a> |
| <a href="#">Appendix D – Greenfield Runoff Calculations .....</a>             | <a href="#">45</a> |
| <a href="#">Appendix E – Causeway Flow Calculations .....</a>                 | <a href="#">46</a> |
| <a href="#">Annex F – SuDS Maintenance Schedule .....</a>                     | <a href="#">47</a> |
| <a href="#">Annex F – SuDs Maintenance Schedule .....</a>                     | <a href="#">48</a> |
| <a href="#">Annex A- Water Body Catchment Classifications Summaries .....</a> | <a href="#">40</a> |
| <a href="#">Annex B – Manning’s Open Channel Flow Mapping.....</a>            | <a href="#">44</a> |
| <a href="#">Annex C - EA Product Data .....</a>                               | <a href="#">45</a> |
| <a href="#">Appendix D – Greenfield Runoff Calculations .....</a>             | <a href="#">46</a> |
| <a href="#">Appendix E – Causeway Flow Calculations .....</a>                 | <a href="#">47</a> |
| <a href="#">Annex F – Outline Drainage Sketch .....</a>                       | <a href="#">48</a> |
| <a href="#">Annex G – SuDs Maintenance Schedule .....</a>                     | <a href="#">49</a> |

# 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 C1.

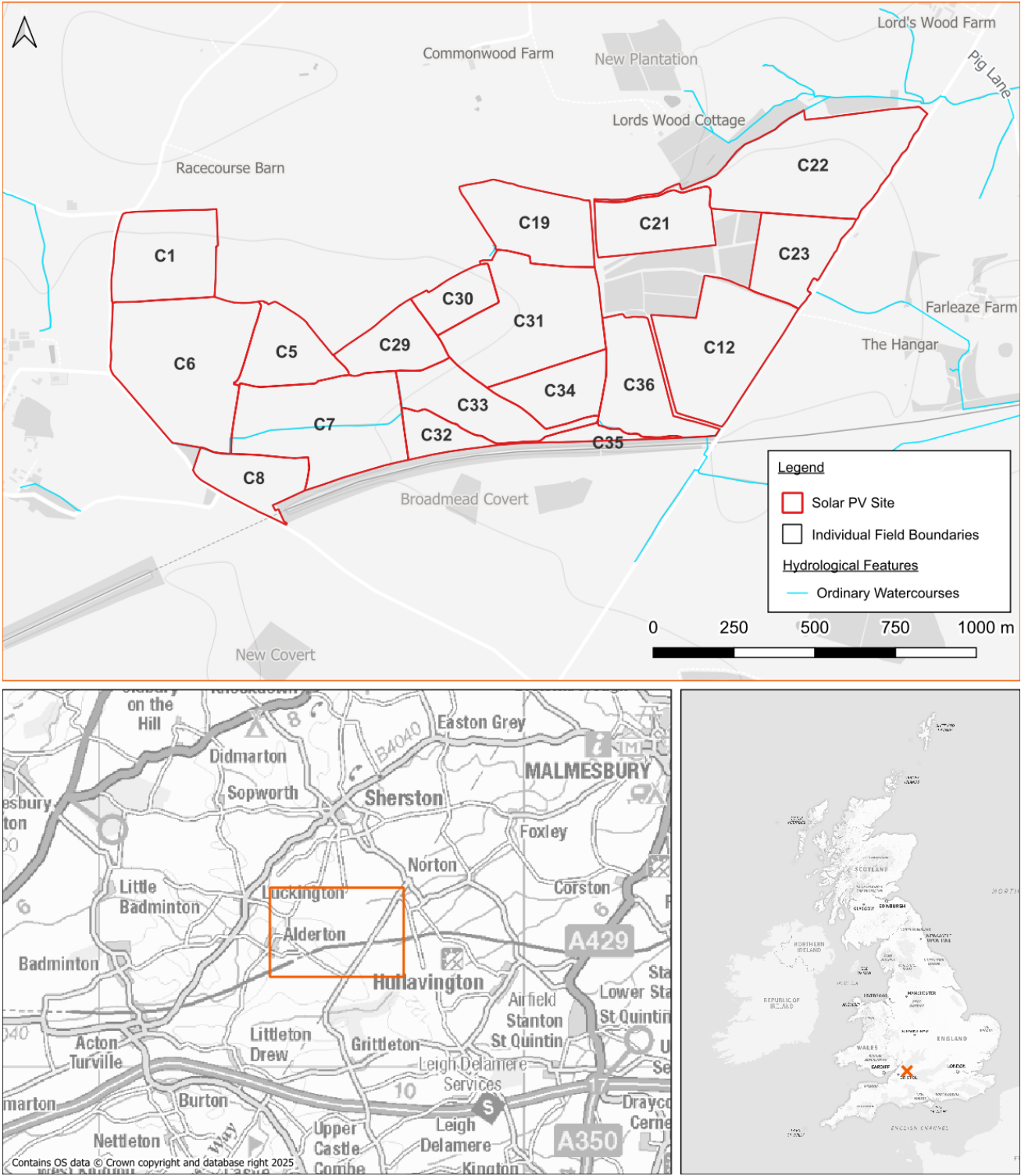


Figure 1: Site Location

## 1.2 Site Location

1.2.1 Lime Down C1 is located approximately 450m east of Alderton, a village in Wiltshire, and is also situated about 3.5km north of the M4 motorway. The Site is centred at National Grid Reference 384400N, 183100E.

## 1.3 Existing Site Conditions

1.3.1 Online mapping (including Google Maps / Google Streetview imagery<sup>i</sup> (accessed May 2025) shows that Lime Down C1 comprises agricultural / arable fields. Additionally, it is noted that Lime Down C1 is subdivided into 18 smaller fields.

## 1.4 Topography

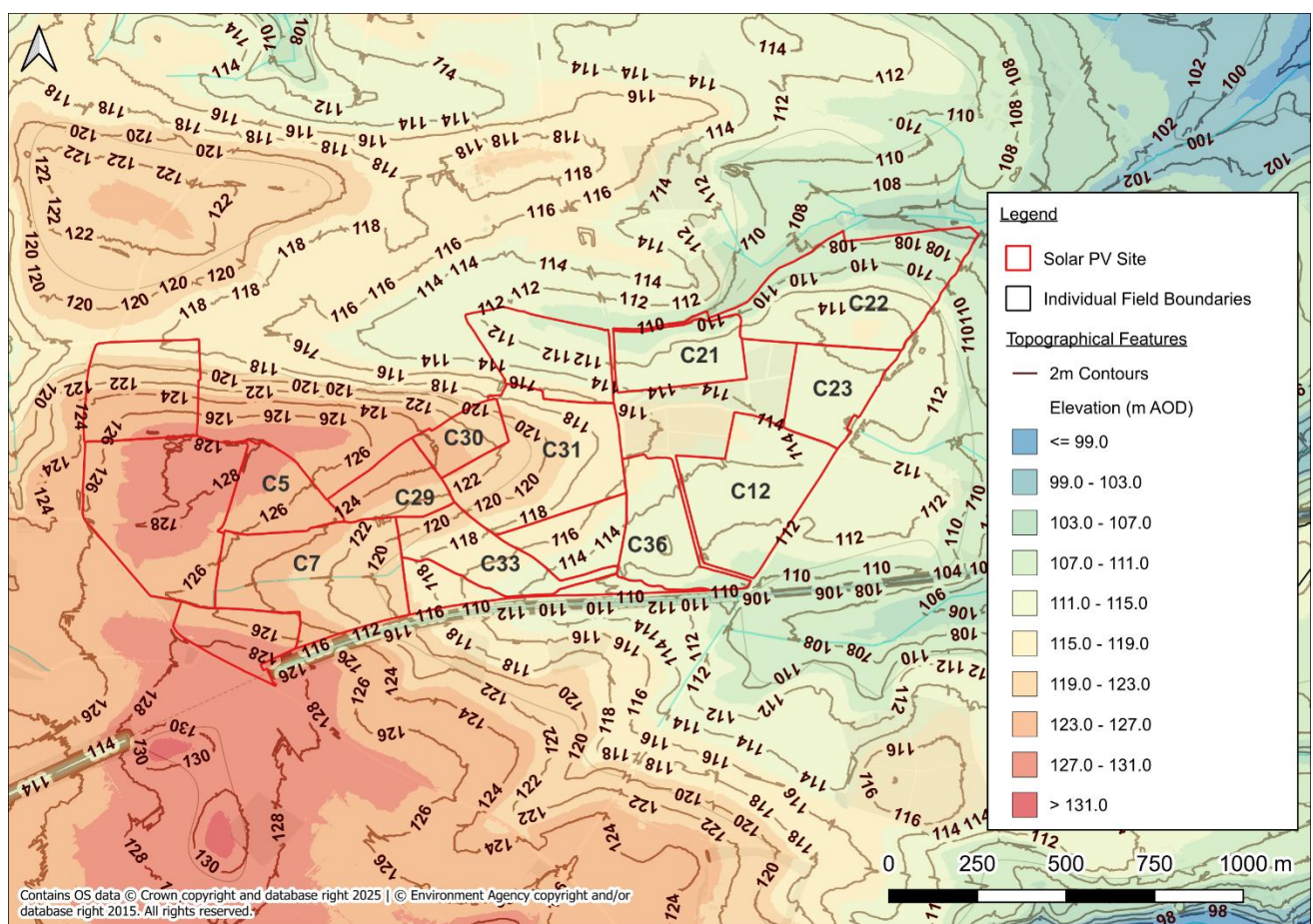


Figure 2: LiDAR Plan

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 C1 slopes from approximately 128m AOD in the west to approximately 102m AOD in the east (Figure 2).

## 1.5 Hydrology

1.5.1 The nearest watercourses are various unnamed land drainage ditches located within the Lime Down C1

boundary and within a 200m distance of the Site. The land drainage ditches generally flow in a north-easterly direction that follows the local topography.

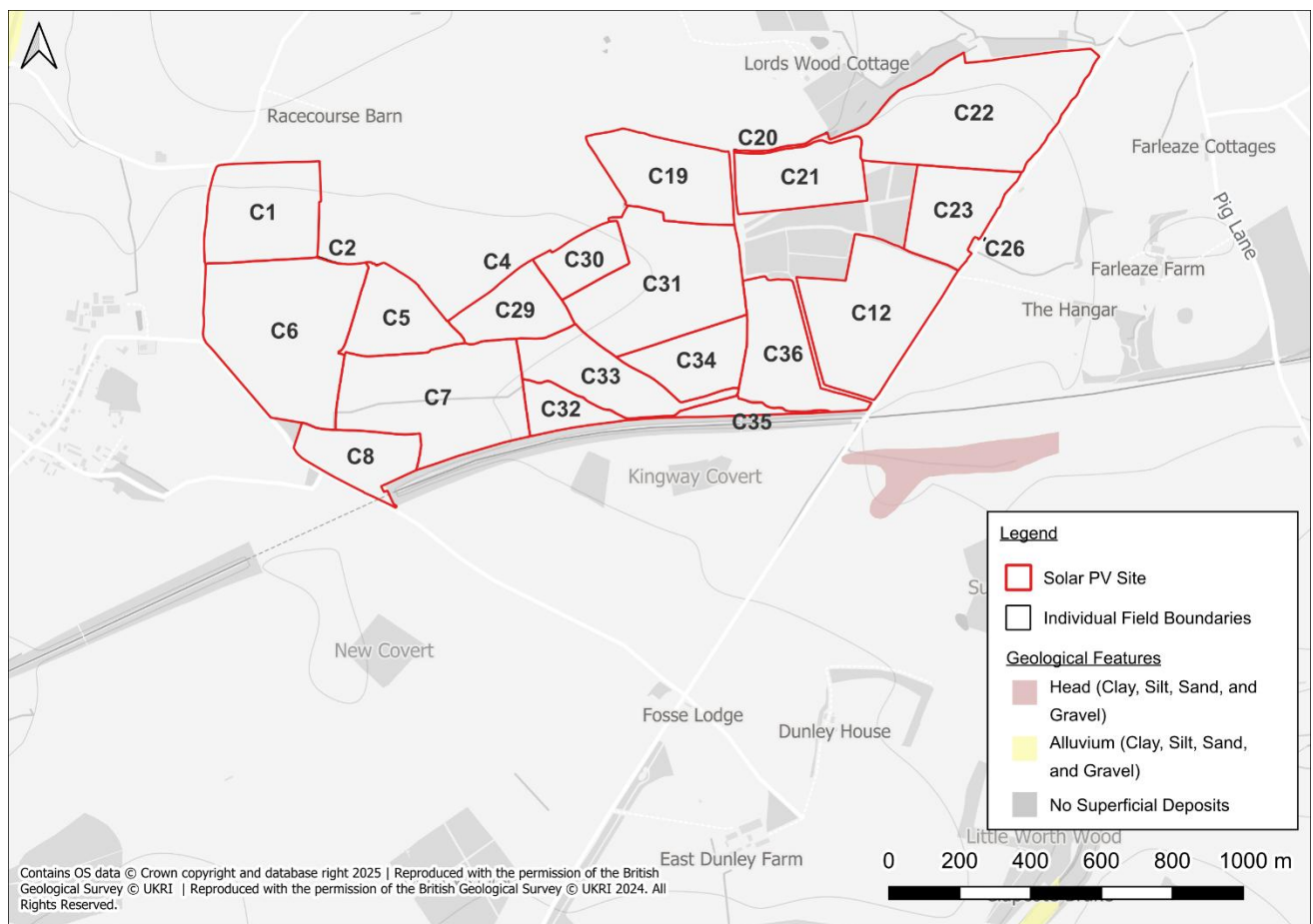
1.5.2 All land drainage ditches are under the jurisdiction of the Wiltshire Council Lead Local Flood Authority.

## 1.6 Water Framework Directive Status

1.6.1 Lime Down C1 is located within the Avon Bristol Rural Catchment, within the Luckington Brook Water Body Catchment and the Tributary – Source to Sherston Avon Water Body catchment within the Shertson Avon Water Body Catchment.

1.6.2 The Luckington Brook Water Body catchment has a Cycle 3 Ecological status of Good in 2019 and 2022 and a Fail chemical status in 2019 (no data in 2022). The Tributary – Source to Sherston Avon Water Body catchment has a Cycle 3 Ecological status of Good in 2019 and 2022 and a Fail chemical status in 2019 (no data in 2022). Shertson Avon Water Body catchment has a Cycle 3 Ecological status of Poor in 2019 and 2022 and a Fail chemical status in 2019 (no data in 2022). A summary of the Water Body Classifications for the catchments are included as Annex A.

## 1.7 Geology



**Figure 3: Superficial Deposits**

1.7.1 Reference to the British Geological Survey online mapping<sup>ii</sup> (1:50,000 scale) indicates that Lime Down C1

is not underlain by any superficial deposits (see Figure 3). Lime Down C1 is identified as being underlain by the Forest Marble Formations bedrock deposits (Figure 4).

- 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 There are no legible British Geological Survey boreholes located at Lime Down C1.

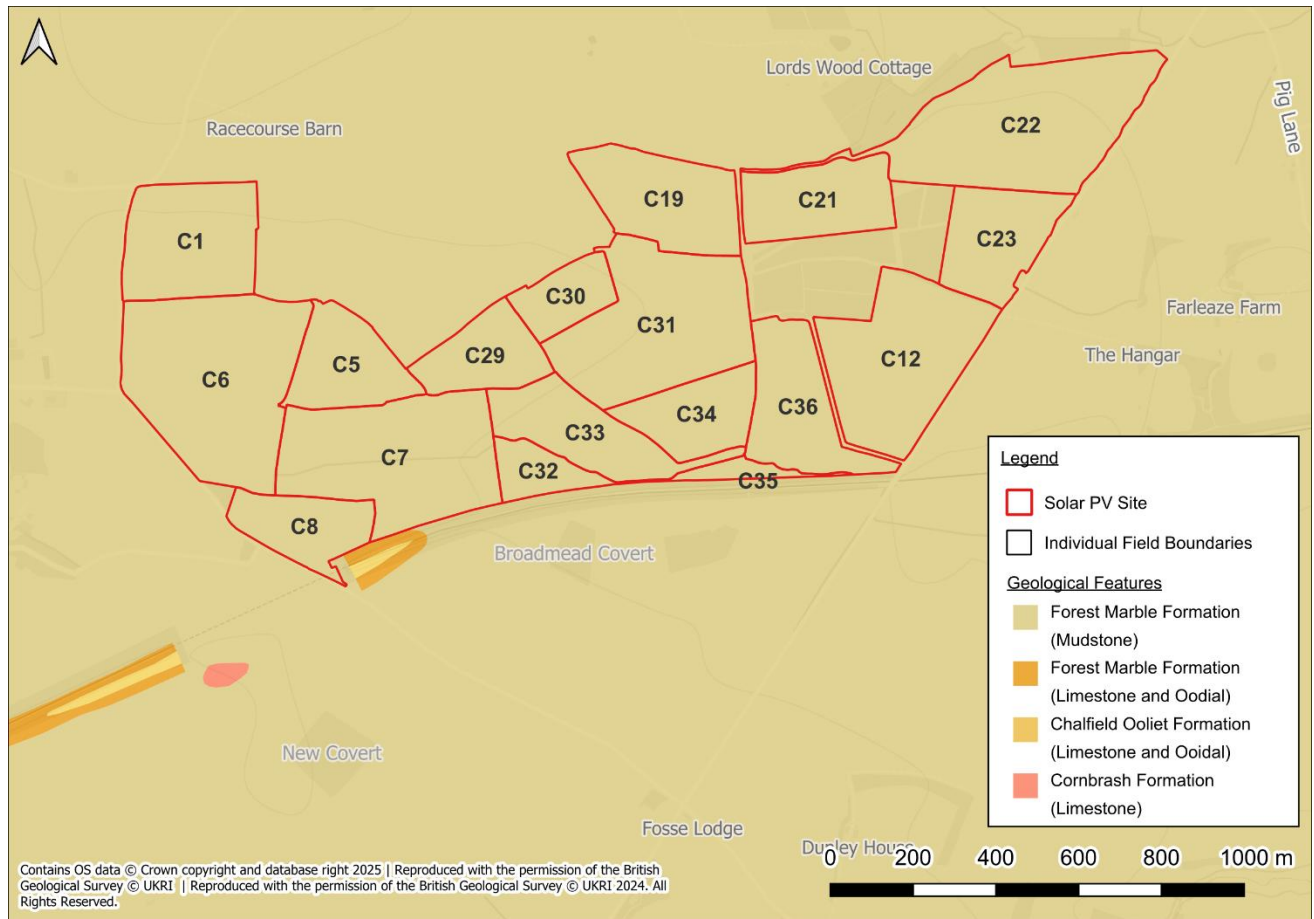


Figure 4: Bedrock Deposits

## 1.8 Hydrogeology

- 1.8.1 According to the EA's Aquifer Designation data, obtained from MAGIC Map's online mapping [accessed 02/06/25] the underlying bedrock of Forest Marble Formation is described as a Secondary A Aquifer.
- 1.8.2 The EA's 'Source Protection Zones' data, obtained from MAGIC Map's online mapping [accessed 02/06/25], indicates that Lime Down C1 is located within a Groundwater Source Protection Zone.

## 1.9 Proposed Site Conditions

- 1.9.1 Lime Down C1 comprises ground-mounted Solar PV Panels, a proposed substation, and associated electrical infrastructure and access. See **ES Volume 1, Chapter 3: The Scheme [EN010168/APP/6.1]**.
- 1.9.2 An **Outline Landscape and Ecological Mitigation Plan (LEMP) [EN010168/APP/7.18]** has been

developed to support the DCO application. The plan confirms that the vast majority of the Site will be used for Solar PV Panels, supporting infrastructure, and internal access, with peripheral areas comprising 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.
- 1.9.4 Where a 132kV or 400 kV 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

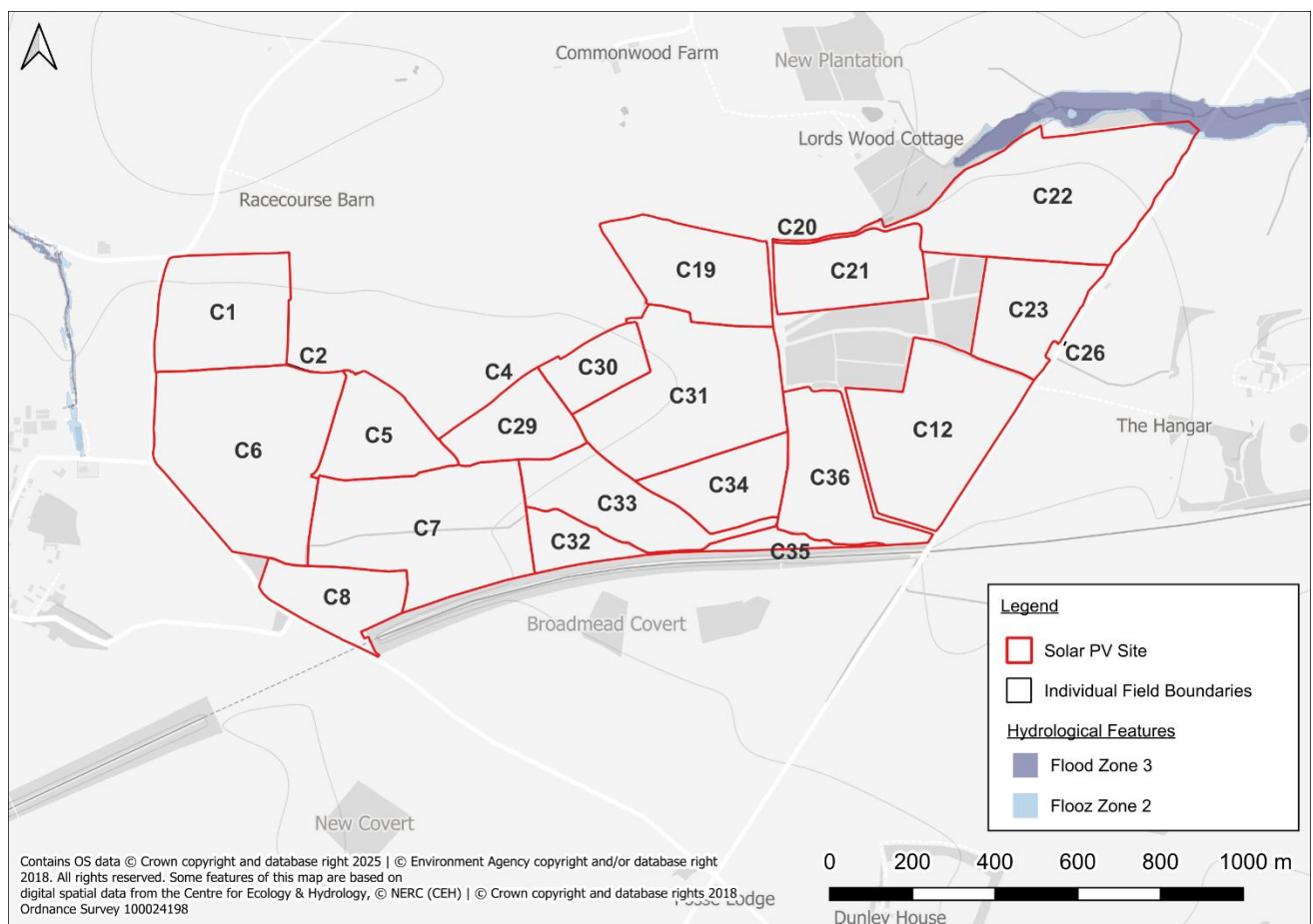
2.1.1 The aim of this Section of the report is to assess and summarise the existing flood risk at Lime Down C1.

### 2.2 Tidal Flood Risk

2.2.1 Lime Down C1 is situated at a minimum of approximately 102m 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)<sup>iii</sup>, Lime Down C1 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), with the exception of Field C22 of which the north-easternmost extent is within Flood Zone 2/3. Flood maps are included as Figure 5 below and **ES Volume 2, Figure 11-3: Lime Down C1: Fluvial and Surface Water Risk Map [EN010168/EXAM/6.2] (Rev 2)** produced at Deadline 3 of Examination.



**Figure 5: EA's Flood Map for Planning**

2.3.2 The EA's 'Historical Flood Map' shows no recorded incidents of historical flooding at Lime Down C1; however, this does not confirm that the Site has never flooded—only that no documented records exist.

- 2.3.3 The Flood Zone 3 extent adjacent to Field C22 is associated with an unnamed land drainage ditch. There is a wider network of land drainage ditches both on-site and within 200m of the Site; however, these are not shown on the EA's fluvial flood extent mapping. This is due to the rural nature of the area and the fact that these land drainage ditches are classified as ordinary watercourses and have not been modelled to determine their fluvial flood extents. However, fluvial flooding could occur if the land drainage ditches overtop their banks during or following an extreme rainfall event.
- 2.3.4 There is no site-specific information in third-party reports regarding fluvial flood risk at Lime Down C1 or in the immediate vicinity.
- 2.3.5 In the absence of specific fluvial flood data, a combination of methods has been used to assess potential fluvial flood risk. Flow paths identified on the EA's Long Term Flood Risk Map (Surface Water)<sup>iv</sup> identify the potential flood extent of the land drainage ditch that flows through Lime Down C1 and the neighbouring land drainage ditches. These maps (updated in January 2025) are considered to effectively illustrate the potential extent of fluvial flooding, as indicated in Figure 5.
- 2.3.6 To estimate flood levels for a 1% Annual Exceedance Probability (AEP) event with a 71% climate change allowance<sup>v</sup>, 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.
- 2.3.7 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.
- 2.3.8 Based on the analysis, the surface water flood maps offer a suitable and conservative basis for assessing fluvial flood risk at Lime Down C1. A more detailed exploration of surface water flood risks can be found in Section 2.4.
- 2.3.9 Lime Down C1 is not located within a Flood Warning Area.

### **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 C1, flood depths in the area identified as Flood Zone 3 are below 0.5m in depths during both the 1% Annual Exceedance Probability scenario and the 0.1% Annual Exceedance Probability Scenario, with the remainder of Lime Down C1 shown to not expect any flood depths.

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 Drainage Strategy. A record of consultation and The Applicant's responses are included in ES Chapter 11: Hydrology, Flood Risk and Drainage.

2.3.12 Lime Down C1 is not located within an Internal Drainage Board (IDB).

### **Summary**

2.3.13 Lime Down C1 is therefore 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.

2.4.2 According to the EA's Long Term Flood Risk Map (Surface Water) the majority of Lime Down C1 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 at Fields C6 – C7, across the northern boundaries of Fields C19, C21, and C23 and across Fields C32 – C36.

2.4.3 As described in the Fluvial Flooding Section above, the surface water flooding extents largely match the courses of the unnamed land drainage ditches which flow throughout and bordering Lime Down C1; However, there are some areas of ponding that are not associated with the various land drainage ditches on-site.

2.4.4 With reference to the depth mapping provided by the NaFRA data, flood depths are anticipated to be low, with depths remaining largely below 300mm which is considered passable to people and vehicles. Some depths between 300mm and 600mm are anticipated in some of the Fields referenced above, however these are largely isolated areas and can be associated with the existing land drainage ditches. Depths are not shown to exceed 600mm anywhere within Lime Down C1.

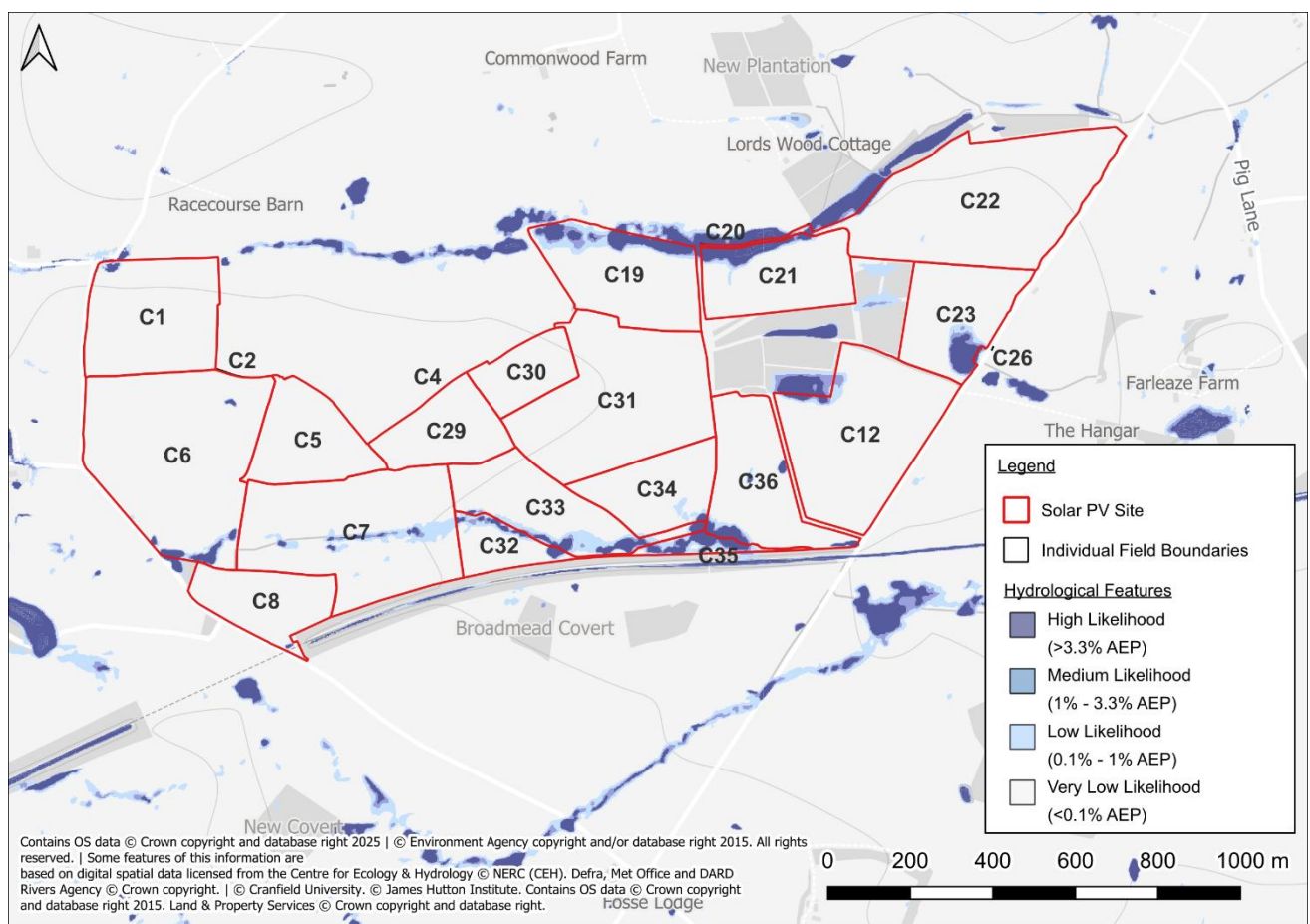
2.4.5 There is no indication within relevant third-party reports (listed in 'Sources of Information' in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**) to suggest that Lime Down C1 has historically experienced surface water flooding.

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 Associated electrical infrastructure, such as inverters, transformers, cabling and substations, will be located outside mapped flood extents where feasible, or otherwise elevated above the design flood level with appropriate freeboard, in line with the embedded mitigation strategy outlined in **Appendix 11.1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**.

2.4.8 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 set out in the Covering Report. The potential for the development to exacerbate surface water flood risk off-site is also addressed through the use of appropriate SuDS features, as described in the Covering Report.



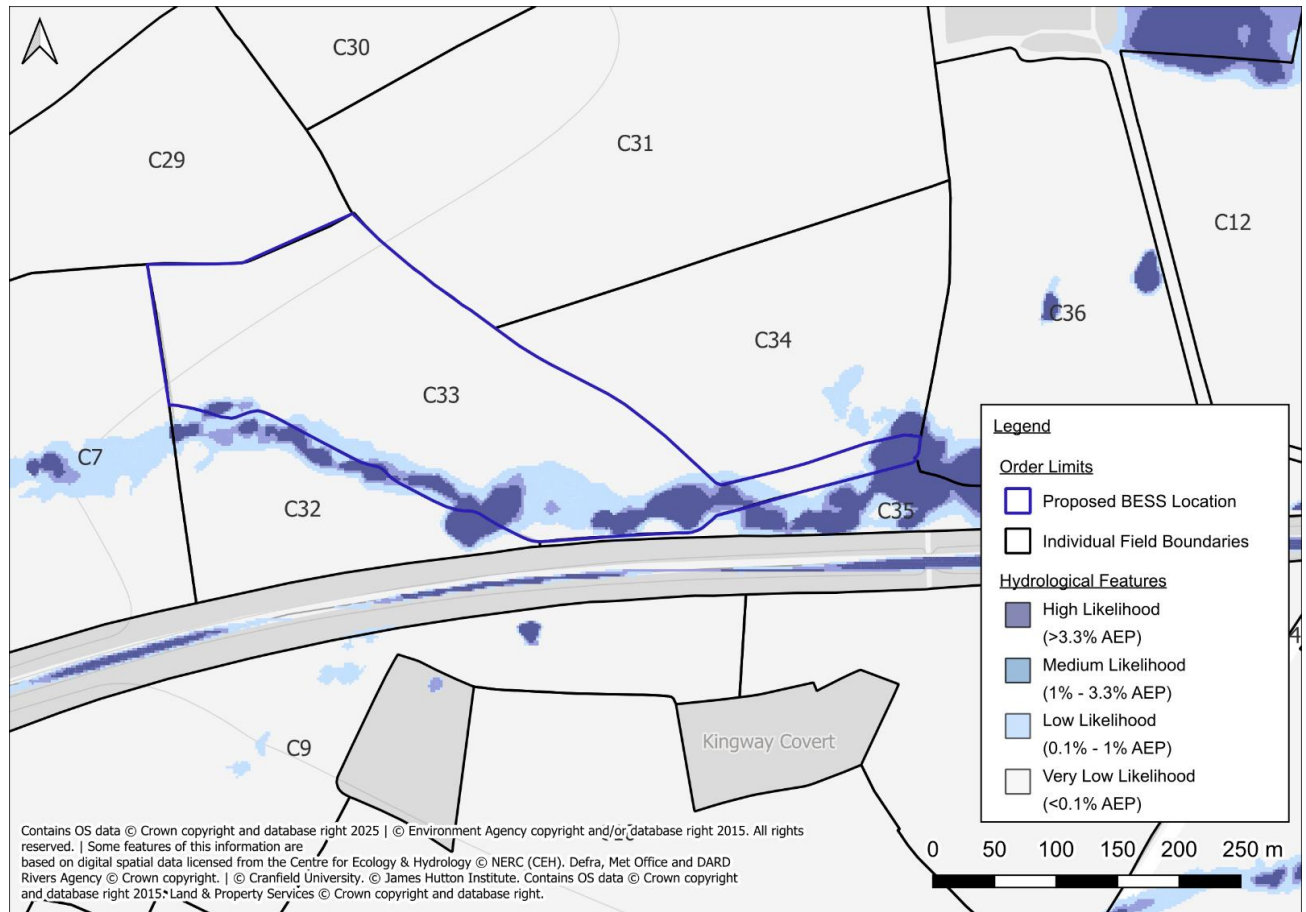
**Figure 6: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)**

### **Proposed Substation in Field C33**

2.4.9 A substation is proposed within Field C33. The location has been selected to achieve technical requirements for electrical efficiency, providing a centralised connection to the generation areas and effective integration with the internal cable corridors across Lime Down C1.

2.4.10 According to the Environment Agency's Long Term Flood Risk Map (NaFRA, updated January 2025), Field

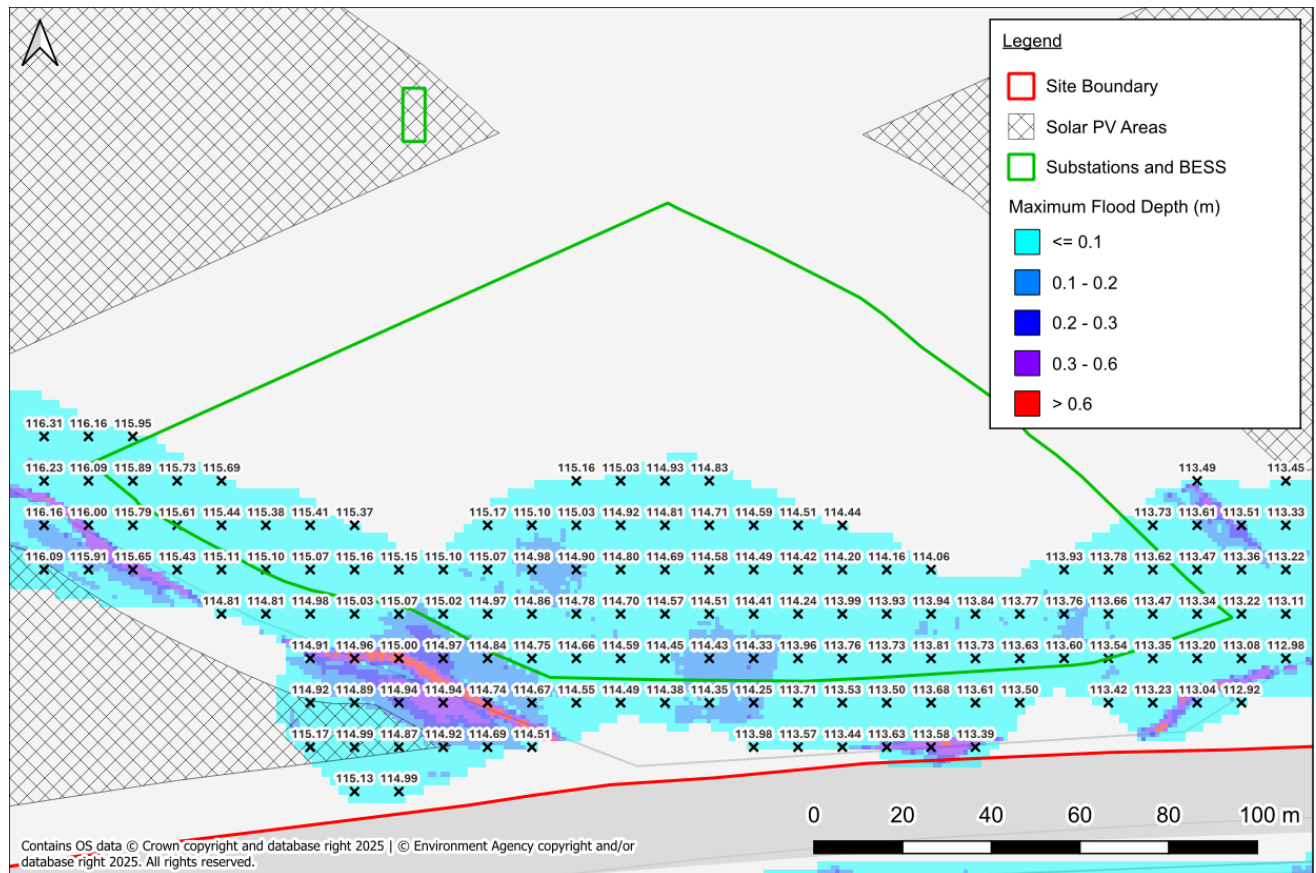
C33 contains a narrow corridor of elevated surface water flood risk (**see Figure 7**). Areas along the south-western boundary and through the southern part of the field are classified as High Risk (greater than 3.3% annual probability of flooding), associated with an existing land drainage ditch that runs broadly parallel to the adjacent railway line. The remainder of Field C33 is identified as being at Very Low to Low risk.



**Figure 7: EA's Long-Term Flood Risk Map (Flood Risk from Surface Water)**

- 2.4.11 NaFRA flood depth mapping indicates that depths along the flow route are predominantly shallow, generally remaining below 300mm and not exceeding 600mm. These depths can be managed through standard design interventions and are not expected to constrain development of essential infrastructure, subject to appropriate mitigation.
- 2.4.12 Flood extents have been compared against EA LiDAR to estimate likely flood depths in more detail, adopting the 0.1% AEP event to provide a factor of safety. As illustrated in **Figure 8**, the northern extent of the proposed substation area remains free of flooding, while the southern extent is predicted to experience flood depths up to 200mm. Such depths are considered passable for pedestrians and vehicles, ensuring that access and functionality would be retained under the assessed conditions.
- 2.4.13 At detailed design stage, should any substation infrastructure be required within areas affected by mapped surface water flow paths, further site specific assessment will be undertaken to confirm that flood risk is not increased elsewhere and that any necessary mitigation measures, including compensatory storage where required, are incorporated into the detailed design. These measures will

be secured through Requirement 5, with drainage measures secured through Requirement 11.



**Figure 8: Water Level and Depths Map**

2.4.14 At this stage of design, the final platform location, elevation, and layout have not been finalised, which is appropriate given the stage of the DCO application. The final design will be confirmed post-consent and guided by the following embedded mitigation commitments:

- The substation infrastructure will be located preferentially outside the mapped surface water flow route where practicable, with preference given to higher ground within Field C33 where flood risk is negligible.
- The platform will be raised above surrounding ground levels, incorporating sufficient freeboard above predicted flood depths to ensure continued operation during extreme events.
- Where necessary, localised surface water management measures will be included, such as permeable drainage, minor regrading, or intercept ditches to direct overland flows away from critical infrastructure.
- All sensitive equipment will be constructed to be water resilient, with transformers, switchgear, and control systems elevated or sealed in accordance with best practice and relevant guidance.
- The final platform levels, drainage measures, and any required flood mitigation measures will be confirmed through the detailed design process and secured through Requirement 5, with drainage measures secured through Requirement 11.

2.4.15 On the basis of the mapped flood risk, predicted depths, and the ability to avoid or mitigate risks through

embedded design, the flood risk to the proposed substation is considered low and manageable. This approach aligns with the requirements of NPS EN-1, the NPPF (2024), and the CIRIA SuDS Manual (C753) for essential infrastructure.

- 2.4.16 The wider Lime Down C1 development, including the Solar PV Panels and associated infrastructure, incorporates embedded mitigation by raising equipment above ground level and applying appropriate Sustainable Drainage Systems (SuDS) measures to ensure there is no increase in flood risk on- or off-site. Further details of the surface water management strategy are provided in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**.

## **2.5 Groundwater Flood Risk**

- 2.5.1 The geology is identified above in Section 1.0. There were no legible boreholes in the near vicinity.
- 2.5.2 The Wiltshire SFRA map (listed under ‘Sources of Information’ in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**) indicates that there is no risk of surface water flooding on Site, owing to the characteristics of the local geological deposits.
- 2.5.3 No buildings and no basement levels are identified on plans which may otherwise be at increased risk from groundwater seepage.
- 2.5.4 It can be concluded that the risk of groundwater flooding is **Low** and no 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 C1’s rural setting, the presence of sewerage infrastructure is unlikely. Utility records have been checked and there are no public sewers identified within Lime Down C1.
- 2.6.3 It can therefore be concluded that the risk of sewer flooding is **Negligible**.

## **2.7 Reservoir and Canal Flooding**

- 2.7.1 There are no canals within the vicinity of Lime Down C1 and, therefore, there is **Negligible** associated risk.
- 2.7.2 The EA ‘Flood Risk from Reservoirs’ map shows that Lime Down C1 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 C1. 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 additional mitigation beyond the embedded mitigation measures of the Scheme 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 C1 can be managed through the implementation of an appropriate Site management plan. 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 C1 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 PV Panels and associated electrical infrastructure, including inverters, transformers, cabling, and substations, will, where possible, be located outside areas at elevated flood risk. Where this is not feasible, these components will be installed on raised concrete pads or steel frames with appropriate freeboard above predicted flood levels, allowing floodwater to pass freely beneath. This ensures there is no loss of floodplain volume and no increase in flood risk elsewhere.
- 2.11.2 The proposed substation within Field C33 will be located sequentially within the field to avoid the identified surface water flow path and will be raised above ground level in line with the design approach for flood-resilient infrastructure. Further detail is provided in Section 2.4 of this report.
- 2.11.3 Where panels or other infrastructure are located in Flood Zones 2 or 3, the approach has been informed by floodplain compensation calculations – see **ES Volume 3, Appendix 11-6 and Appendix 11-8 [EN010168/APP/6.3]**. These components are minor in scale, with dimensions detailed in Chapter 3: Scheme Description.
- 2.11.4 In addition, any infrastructure incorporating impermeable surfacing will include appropriate Sustainable Drainage Systems to manage runoff. Together, these measures ensure the Scheme does not result in increased flood risk on- or off-site.

2.11.5 Surface water management has been addressed in **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy – Covering Report [EN010168/APP/6.3]**, which confirms that runoff will be controlled and discharged at greenfield rates or better.

### 3. Outline Drainage Strategy

3.1.1 Lime Down C1 forms part of the wider Scheme and includes Solar PV Panelled Areas, one 132kV Substation with associated access track, and fifteen Conversion Units / 33kV Sub-distribution Switch Rooms. This section provides the Outline Drainage Strategy for Lime Down C1. 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 fifteen Conversion Unit / 33kV Sub-distribution Switch Room equipment pads, Lime Down C1 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 and the fifteen 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 fifteen 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 Area

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 [REP3-015]**, **ES Volume 3, Appendix 11-1: Flood Risk Assessment and Outline Drainage Strategy - Covering Report [REP3-039]** 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 [REP3-092]** and **Outline Soil Resources Management Plan [REP3-098]**, 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 [REP3-100]** and **Outline Operational Environmental Management Plan [REP3-094]**, 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.

3.2.7 The measures described above also represent the application of Natural Flood Management (NFM) principles where practicable, in accordance with NPS EN-1 paragraphs 5.8.12, 5.8.15 (bullet 8) and 5.8.32. At Lime Down C1, these measures include retaining permeable vegetated ground, maintaining diffuse drainage and existing field-scale flow routes, managing soil compaction and vegetation condition, and using permeable access tracks and source-control SuDS where appropriate. These measures complement the formal attenuation provided for positively drained infrastructure. No reliance is placed on unquantified NFM benefits to provide the attenuation storage or restricted discharge rates identified within this Outline Drainage Strategy. Further information on why NFM is not deemed appropriate for the Scheme are provided in 9.66 Lime Down D - Natural Flood Management Viability Report [REP5-109].

**3.3 Drainage Strategy – Proposed Hardstanding Surfaces**

- 3.3.1 Lime Down C1 currently comprises agricultural land. For the Purpose 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 C1. 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: Hardstanding Surfaces**

| Hardstanding Infrastructure                               | Hardstanding Area (m <sup>2</sup> ) |
|-----------------------------------------------------------|-------------------------------------|
| 132kV substation compound                                 | 9,000                               |
| 132kV substation access track                             | 3,558                               |
| 15 x Conversion Units / 33kV Sub Distribution Switch Room | 1,125 (15 x 75m <sup>2</sup> )      |

- 3.3.2 The assessed hardstanding surfaces have been identified using the indicative infrastructure areas currently proposed for Lime Down C1, 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 C1. 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<sup>1</sup> 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.”*

### 3.4 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.

#### 3.4.5 **Priority 1: Surface Water Collected for non-Potable Use**

~~3.4.6~~ Rainwater harvesting has been considered for the proposed development: and may be incorporated at detailed design to provide water for operational use, including potable use where appropriate and subject to the necessary treatment and water quality requirements. However, Lime Down C1 does not include a sustained non-potable demand capable of reliably receiving and using runoff from the positively drained hardstanding surfaces during design rainfall events. Reuse-Rainwater harvesting is therefore not relied upon for attenuation or flood storage and reuse cannot provide the sole means of surface water disposal, ~~and~~. A secondary discharge route ~~is~~ and the required:

~~3.4.73.4.6~~ attenuation storage are therefore provided independently of any rainwater harvesting provision.

#### **Priority 2: Surface Water Infiltrated to Ground**

~~3.4.83.4.7~~ 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).

~~3.4.93.4.8~~ As described above, the Site is not underlain by superficial deposits and the underlying bedrock comprises the Forest Marble Formation, consisting of mudstone. Soils 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”.

~~3.4.103.4.9~~ 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.

~~3.4.113.4.10~~ 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.

~~3.4.123.4.11~~ 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.

~~3.4.133.4.12~~ 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.

#### **3.4.143.4.13 Priority 3: Discharge to an Above Ground Surface Water Body**

**3.4.153.4.14** 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.

**3.4.163.4.15** The nearest watercourse is an unnamed land drain located within the southern extent of Lime Down C1. Discharge to this watercourse at controlled rates is considered feasible by gravity, subject to detailed design of the outfall arrangement and any necessary approvals.

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

**3.4.183.4.17** 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.

#### **3.4.193.4.18 Priority 5: Discharge to a Combined Sewer**

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

#### **3.4.213.4.20 Surface Water Discharge**

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

**3.4.233.4.22** 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.

**3.4.243.4.23** 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 [EN010168/APP/6.1] where the final equipment layout is not fixed. Greenfield calculation input parameters and results are provided in Appendix D.

**3.4.253.4.24** This approach demonstrates that a feasible drainage solution can be accommodated within Lime Down C1 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. 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 <sup>3</sup> ) |
|------------------------------------------------------|-------------------|--------------------|---------------------|-----------------------------------|-------------------------------|-------------------------------|
| 132kV substation compound                            | 3.4               | 7.1                | 8.9                 | 8.9                               | 2.3                           | 1,065.3                       |
| 132kV substation access track                        | 1.3               | 2.8                | 3.5                 | 3.5                               | 0.9*                          | 415.0                         |
| Conversion Units / 33kV Sub Distribution Switch Room | 0.5               | 1.0                | 1.2                 | 1.2                               | 0.4                           | 3.1**                         |

\* For 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. Minimum practical flow control rates may therefore be adopted where required. 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 C1, each unit requires approximately 3.1m<sup>3</sup> of indicative local storage, to be provided through source-control SuDS such as perimeter French drains, filter drains or equivalent features. Fifteen units are proposed at Lime Down C1, giving a cumulative indicative local storage requirement of approximately 46.5m<sup>3</sup>.

### 3.5 Sustainable Drainage Systems

- 3.5.1 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**

| <b>SuDS Measure</b>                | <b>Amenity Benefit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Biodiversity Benefit</b>                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                | <b>Suitability for Proposed Development</b> | <b>Reasoning</b>                                                                                                                                                                                                                      |
|------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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.                                                                                                                                                                                                                                                      | X                                           | 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, creating a more appealing and liveable environment. | 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 diversity, strengthen ecological | ✓                                           | 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. |

|                          |                                                                                                                                                                                                                                                                                                                                                                                   |                                                                                                                                                                                                                                                                                                                                                                                                          |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
|--------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                          |                                                                                                                                                                                                                                                                                                                                                                                   | connectivity and contribute to the establishment of a resilient green-blue network across the site.                                                                                                                                                                                                                                                                                                      |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                           |
| Filter Drains/<br>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 | <del>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.</del><br><u>Rainwater harvesting may be incorporated at detailed design to provide water for operational use, including potable use where appropriate and subject to the necessary treatment and water quality requirements. However, there is no sustained water demand that can be relied upon to ensure storage capacity is available during design rainfall events. Rainwater harvesting is therefore not relied upon for attenuation or flood storage, and the required attenuation storage and discharge controls are provided independently of any rainwater harvesting provision.</u> |
| 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                                                                                                 | 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                     | 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.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                               |

|                                                     |                                                                                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                                                                                                         |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
|-----------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
|                                                     | wellbeing while demonstrating sustainable design in practice.                                                                                                                                                                                                                                                                                                                                             | objectives of managing water quantity, quality, and ecology.                                                                                                                                                                                                                                                                                                                                                                                            |   |                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                            |
| Porous/<br>Permeable<br>Surfacing<br>(infiltration) | Porous and permeable surfaces can enhance the quality and functionality of developed areas by integrating 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.     | Infiltration-based permeable surfaces promote natural groundwater recharge and improve water quality by 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.                                                                                                            | X | Controlled drainage measures, including sealed surfacing or sealed drainage components where required, can be incorporated within the substation areas to 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 <b>Firewater Containment and Drainage Strategy – Lime Down Substation [REP3-120]</b> . |
| Porous/<br>Permeable<br>Surfacing<br>(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. | 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 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. | ✓ | 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 <sup>2</sup> ) by the proposed depth (m) by a porosity ratio of 0.3.                                                                                                                                                                                                                                                 |

|                                                                       |                                                                                                                                                                                                                                                                                                                                           |                                                                                                                                                                                                                                                                                                                                                                        |   |                                                                                                                                                                                                                           |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| 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. | X | 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. |
|-----------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|---|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|

### 3.6 Attenuation Storage

- 3.6.1 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 C1.
- 3.6.2 The hardstanding surfaces requiring positive drainage have been identified using either the indicative area of the infrastructure proposed at Lime Down C1, or, where the final equipment layout is not fixed, the maximum design parameters for that equipment set out in **ES Volume 1, Chapter 3: The Scheme [APP-055]**. The calculations are therefore conservative and are provided for illustrative purposes to demonstrate that a feasible drainage solution can be accommodated within Lime Down C1 and within the assessed design envelope.
- 3.6.3 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.
- 3.6.4 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.
- 3.6.5 The fifteen 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 15 m by 5 m footprint for Integrated Conversion Units / 33kV Sub-distribution Switch Rooms defined in **ES Volume 1, Chapter 3: The Scheme [APP-055]**, equivalent to 75 m<sup>2</sup> per unit. This provides a conservative basis for assessment.
- 3.6.6 For an individual 75 m<sup>2</sup> unit, the calculated runoff rate is very low, with a proposed discharge rate of approximately 0.41 l/s and an indicative local storage volume of approximately 3.4 m<sup>3</sup>. Across Lime Down C1, the cumulative assessed area of the fifteen Conversion Units / 33kV Sub-distribution Switch Rooms is 1,125 m<sup>2</sup>. The calculated cumulative greenfield runoff rates are 0.22 l/s for the 1 in 2 year event, 0.55 l/s for the 1 in 30 year event and 0.66 l/s for the 1 in 100 year event. The ~~proposed cumulative discharge rate~~ indicative local storage volume is 0.1 l/s, with approximately 3.1 m<sup>3</sup> per unit, giving a cumulative ~~indicative local~~ storage requirement of approximately 46.5 m<sup>3</sup> across the fifteen units.
- 3.6.7 Given the small contributing area, low calculated discharge rates 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 or filter drain 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.
- 3.6.8 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.

- 3.6.9 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. 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 Appendix E.

**Table 4: 132kV Substation Compound\***

|                                                         |                     |
|---------------------------------------------------------|---------------------|
| <b>Contributing Area</b>                                | 9,000               |
| <b>Flow Rate</b>                                        | 2.3                 |
| <b>Flow Control</b>                                     | HydroBrake          |
| <b>Flow Control Design Head</b>                         | 1.0m                |
| <b>Estimated Required Volume (1 in 100 year +45%CC)</b> | 338.6m <sup>3</sup> |

**Table 5: 132kV substation Access Track\***

|                                                         |                     |
|---------------------------------------------------------|---------------------|
| <b>Contributing Area</b>                                | 3,558               |
| <b>Flow Rate</b>                                        | 1.0                 |
| <b>Flow Control</b>                                     | HydroBrake          |
| <b>Flow Control Design Head</b>                         | 1.0m                |
| <b>Estimated Required Volume (1 in 100 year +45%CC)</b> | 415.0m <sup>3</sup> |

**Table 6: Conversion Units / 33kV Sub Distribution Switch Room\***

|                                                         |                                                                                |
|---------------------------------------------------------|--------------------------------------------------------------------------------|
| <b>Number of Units</b>                                  | 15                                                                             |
| <b>Contributing Area</b>                                | 75 m <sup>2</sup> per unit (1,125 m <sup>2</sup> cumulative)                   |
| <b>Flow Rate</b>                                        | 0.31 l/s per unit                                                              |
| <b>Flow Control</b>                                     | HydroBrake                                                                     |
| <b>Flow Control Design Head</b>                         | 1.0m                                                                           |
| <b>Estimated Required Volume (1 in 100 year +45%CC)</b> | 3.1m <sup>3</sup> 3.1 m <sup>3</sup> per unit (46.5 m <sup>3</sup> cumulative) |

### **Everyday Rainfall**

- 3.6.10 In addition to managing extreme rainfall events, measures should be implemented to ensure runoff

generate 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 Compound\***

|                                  |                     |
|----------------------------------|---------------------|
| <b>Contributing Area</b>         | 9,000m <sup>2</sup> |
| <b>Rainfall Depth</b>            | 0.005m              |
| <b>Runoff Volume</b>             | 45m <sup>3</sup>    |
| <b>Required Additional Depth</b> | 0.045m              |

**Table 8: 132kV Substation Access Track\***

|                                  |                     |
|----------------------------------|---------------------|
| <b>Contributing Area</b>         | 3,558m <sup>2</sup> |
| <b>Rainfall Depth</b>            | 0.005m              |
| <b>Runoff Volume</b>             | 17.8m <sup>3</sup>  |
| <b>Required Additional Depth</b> | 0.03m               |

**Table 9: Conversion Units / 33kV Sub Distribution Switch Room\***

|                                  |                                                             |
|----------------------------------|-------------------------------------------------------------|
| <b>Number of Units</b>           | 15                                                          |
| <b>Contributing Area</b>         | 75m <sup>2</sup> per unit (1,125 m <sup>2</sup> cumulative) |
| <b>Rainfall Depth</b>            | 0.005m                                                      |
| <b>Runoff Volume</b>             | 0.4m <sup>3</sup> per unit (5.6 m <sup>3</sup> cumulative)  |
| <b>Required Additional Depth</b> | 0.4m                                                        |

*\*The calculations above assume that the additional storage depths presented for the 132kV Substation Compound and 132kV Substation Access Track assume that 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. Everyday rainfall associated with the Conversion Units / 33kV Sub-distribution Switch Rooms will be managed locally through the source-control SuDS arrangements described above.*

3.6.11 As shown in the tables above, the everyday rainfall volumes are limited and can be accommodated within the preferred 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 approach arrangement.

### 3.7 Preferred Drainage Scheme

- 3.7.1 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-051055]** 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 C1 and within the assessed design envelope.
- 3.7.2 Greenfield runoff rates have been calculated for the assessed hardstanding surfaces areas 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 C1, 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 areas 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.
- 3.7.3 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.
- 3.7.4 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.
- 3.7.5 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]**.

### 3.8 Event Exceedance

3.8.1 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 C1.

3.8.2 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.

### 3.9 Surface Water Treatment

3.9.1 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 |
|---------------------------------------------------------------------------------------------------------------|------------------------|------------------------------|--------|--------------|
| <b>Other Roofs (typically commercial/industrial roofs)</b>                                                    | Low                    | 0.5                          | 0.2**  | 0.4          |
| <b>Commercial Yard and Delivery Areas, Non-residential Car Parking and all roads except Low Traffic Roads</b> | 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

3.9.2 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**

| Type of SuDS               | Mitigation Indices           |        |              |
|----------------------------|------------------------------|--------|--------------|
|                            | Total Suspended Solids (TSS) | Metals | Hydrocarbons |
| <b>Permeable Surfacing</b> | 0.7                          | 0.6    | 0.7          |
| <b>Swale</b>               | 0.5                          | 0.6    | 0.6          |
| <b>Detention basin</b>     | 0.5                          | 0.5    | 0.6          |

|             |     |     |     |
|-------------|-----|-----|-----|
| <b>Pond</b> | 0.7 | 0.7 | 0.5 |
|-------------|-----|-----|-----|

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

- 3.9.3 It is concluded that a suitable combination of SuDS components, such as through the proposed surface water drainage system or any uncontrolled discharge to ground, 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.

### 3.10 Firewater Consideration

- 3.10.1 The firewater containment and pollution control principles apply to the 132kV Substation drainage at Lime Down C1. 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 [REP3-120]**.
- 3.10.2 The principal potential pathway for contaminated firewater or polluted runoff from the 132kV Substation Area would be through the proposed surface water drainage system. 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.
- 3.10.3 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.
- 3.10.4 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. This does not alter the outline drainage assessment, which demonstrates that normal operational surface water runoff can be managed without increasing flood risk.

### 3.11 Maintenance

- 3.11.1 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.
- 3.11.2 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]**.
- 3.11.3 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.

## 4. Conclusions and Recommendations

### 4.1 Conclusions

4.1.1 Lime Down C1 is for a ground mounted Solar PV Panels and associated development and access roads.

#### **Flood Risk**

4.1.2 Lime Down C1 is predominantly located within Flood Zone 1 (an area with less than 0.1% annual probability of flooding from rivers or the sea), with the exception of the north-easternmost part of Field C22, which lies within Flood Zones 2 and 3.

4.1.3 The majority of Lime Down C1 is at Very Low risk of surface water flooding. Localised areas of Low to High risk (0.1% to greater than 3.3% annual probability) are present in Fields C6–C7, along the northern boundaries of Fields C19 and C21, and in Fields C32–C36. These areas are associated with existing land drainage ditches / ordinary watercourses, with predicted depths largely remaining below 300mm.

4.1.4 The risk of flooding from all sources has been assessed and is considered to be **Negligible to Low**. As such, no strategic site-wide mitigation is required; however, infrastructure in areas of elevated flood risk will be designed with embedded flood resilience measures.

4.1.5 The Solar PV Panels will be mounted on raised frames above existing ground levels, allowing floodwater to flow freely underneath. This avoids obstruction of overland flow routes and prevents any loss of floodplain volume.

4.1.6 The proposed substation in Field C33 will be located sequentially within the field to avoid mapped surface water flow paths and will be raised above predicted flood levels. Further detail on substation design considerations is provided in Section 2.4.

#### **Drainage Strategy**

4.1.7 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.

4.1.8 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 located in the southern extent of Lime Down C1, 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 preferred SuDS features ~~by providing the required additional storage depth.~~

4.1.9 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.

- 4.1.10 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.

## **4.2 Recommendations**

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

## **Annexes**

## **Annex A- Water Body Catchment Classifications Summaries**

### Luckington Brook Water Body 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               | 2027 - Low Confidence | Disproportionately expensive; Disproportionate burdens |
| Biological Quality Elements            | Good                | Good          | Good                | Good               | 2027 - Low Confidence | Disproportionately expensive; Disproportionate burdens |
| Invertebrates                          | High                | High          | High                | Good               | 2015                  |                                                        |
| Macrophytes and Phytobenthos Combined  | Good                | Good          | Good                | Good               | 2027 - Low Confidence | Disproportionately expensive; Disproportionate burdens |
| Macrophytes sub element                | Good                | Good          | Good                |                    |                       |                                                        |
| Physio-Chemical Quality Elements       | Good                | Good          | Good                | Good               | 2027 - Low Confidence | Disproportionately expensive; Disproportionate burdens |
| Ammonia (Phys-Chem)                    | High                | High          | High                | Good               | 2015                  |                                                        |
| Dissolved Oxygen                       | Moderate            | Good          | Good                | Good               | 2015                  |                                                        |
| Phosphate                              | Moderate            | 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                  |                                                        |
| 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      | Good                | 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)      | Fail                | Fail          | 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)                | N/A                 | N/A           | 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 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  |                                                   |
| Manganese                              | 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                        |

### 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                   |                                                        |
| Manganese                              | 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                | 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                             |

## **Annex B – Manning’s Open Channel Flow Mapping**

317212 Lime Down Solar C1

## 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<sup>1/3</sup> for the channel and 0.04s/m<sup>1/3</sup> 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.

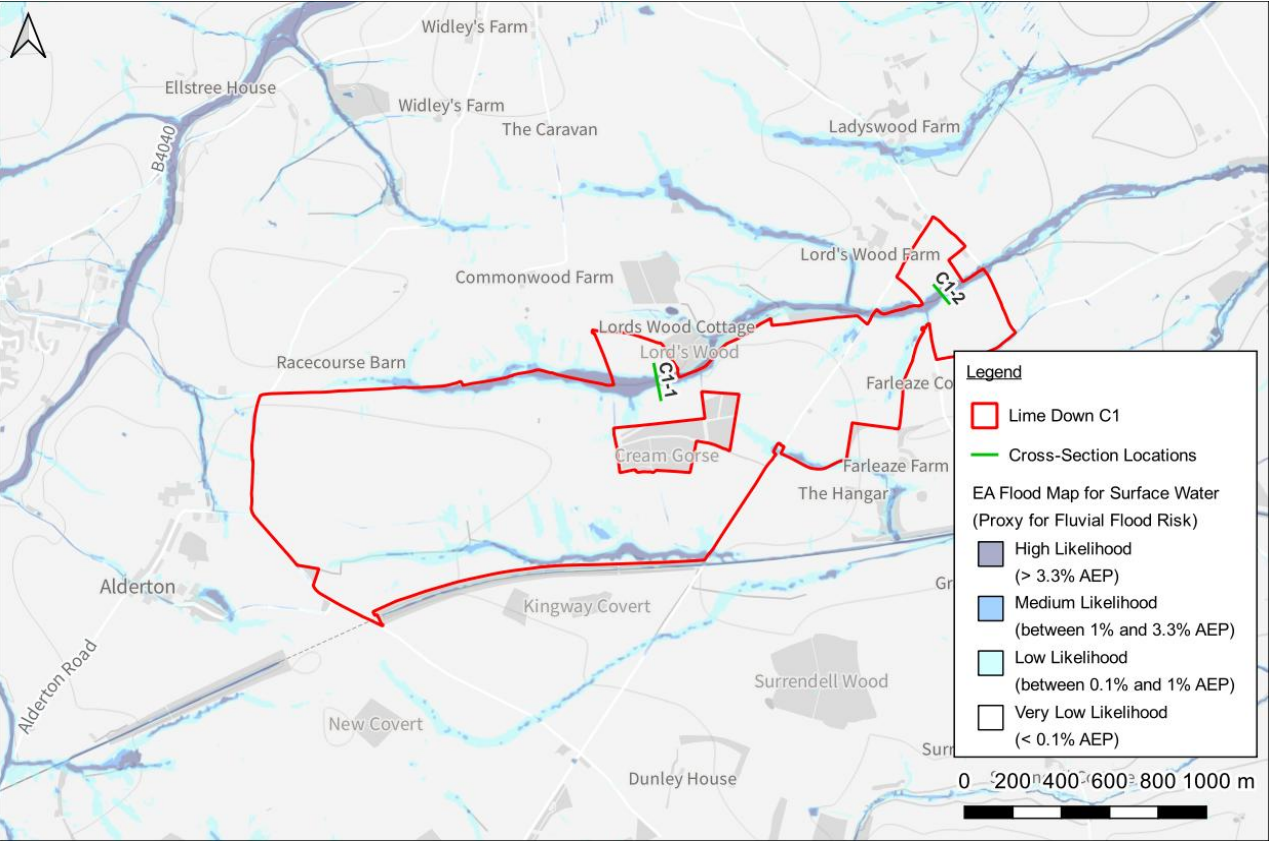
In the absence of detailed flood extent data covering the site, the extents of the EA surface water flood map (0.1% AEP event, present day) have been compared to underlying LiDAR data to provide an estimate of water levels. The surface water flood map has been used as a proxy for fluvial flooding given 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



Contains OS data © Crown copyright and database right 2024 | © Environment Agency copyright and/or database right 2015. All rights reserved. | Some features of this information are based on digital spatial data licensed from the Centre for Ecology & Hydrology © NERC (CEH). Defra, Met Office and DARD Rivers Agency © Crown copyright. | © Cranfield University. © James Hutton Institute. Contains OS data © Crown copyright and database right 2015. Land & Property Services © Crown copyright and database right.

### Calculated Flows and Levels

| Cross-Section | Level Description             | Estimated Flood Level<br>(m AOD) | Estimated Equivalent Flow<br>(m³/s) | Flow +71% CC Uplift<br>(m³/s) | Equivalent Flood Level<br>(m AOD) |
|---------------|-------------------------------|----------------------------------|-------------------------------------|-------------------------------|-----------------------------------|
| C1-1          | 0.1% AEP EA FMFSW water level | 110.90                           | 40.7                                | 69.6                          | 111.17<br>(+271mm)                |
| C1-2          | 0.1% AEP EA FMFSW water level | 103.60                           | 154.2                               | 263.7                         | 103.94<br>(+336mm)                |

### Tabulated Cross-Section Properties // C1-1

(Calculated by Flood Modeller)

| Node | Flow (m³/s) | Stage (m AOD) | Depth (m) | Velocity (m/s) | Froude no. | Area (m²) | Conveyance (m³/s) | Width (m) | W Perim. (m) | Slope  |
|------|-------------|---------------|-----------|----------------|------------|-----------|-------------------|-----------|--------------|--------|
| C1-1 | 0.000       | 109.501       | 0.000     | 0.000          | 0.000      | 0.000     | 0.000             | 0.000     | 0.000        | 0.0024 |
| C1-1 | 0.001       | 109.544       | 0.043     | 0.093          | 0.205      | 0.012     | 0.023             | 0.583     | 0.597        | 0.0024 |
| C1-1 | 0.007       | 109.586       | 0.085     | 0.148          | 0.230      | 0.050     | 0.149             | 1.167     | 1.194        | 0.0024 |
| C1-1 | 0.024       | 109.634       | 0.133     | 0.212          | 0.250      | 0.116     | 0.495             | 1.588     | 1.632        | 0.0024 |
| C1-1 | 0.053       | 109.682       | 0.181     | 0.262          | 0.264      | 0.202     | 1.071             | 2.010     | 2.070        | 0.0024 |
| C1-1 | 0.094       | 109.730       | 0.229     | 0.306          | 0.274      | 0.309     | 1.909             | 2.432     | 2.509        | 0.0024 |
| C1-1 | 0.156       | 109.782       | 0.281     | 0.350          | 0.283      | 0.446     | 3.163             | 2.860     | 2.955        | 0.0024 |
| C1-1 | 0.237       | 109.834       | 0.333     | 0.391          | 0.291      | 0.606     | 4.798             | 3.288     | 3.402        | 0.0024 |
| C1-1 | 0.338       | 109.886       | 0.385     | 0.429          | 0.298      | 0.788     | 6.847             | 3.717     | 3.849        | 0.0024 |
| C1-1 | 0.461       | 109.941       | 0.440     | 0.458          | 0.303      | 1.007     | 9.325             | 4.320     | 4.470        | 0.0024 |
| C1-1 | 0.613       | 109.995       | 0.494     | 0.487          | 0.307      | 1.259     | 12.402            | 4.923     | 5.091        | 0.0024 |
| C1-1 | 0.780       | 110.042       | 0.541     | 0.519          | 0.312      | 1.503     | 15.770            | 5.343     | 5.527        | 0.0024 |
| C1-1 | 0.970       | 110.090       | 0.589     | 0.549          | 0.317      | 1.767     | 19.628            | 5.762     | 5.963        | 0.0024 |
| C1-1 | 0.996       | 110.096       | 0.595     | 0.553          | 0.331      | 1.803     | 20.153            | 6.355     | 6.559        | 0.0024 |
| C1-1 | 1.032       | 110.104       | 0.603     | 0.554          | 0.374      | 1.862     | 20.877            | 8.320     | 8.526        | 0.0024 |
| C1-1 | 1.090       | 110.116       | 0.615     | 0.555          | 0.376      | 1.965     | 22.052            | 8.851     | 9.062        | 0.0024 |
| C1-1 | 1.184       | 110.133       | 0.632     | 0.557          | 0.387      | 2.126     | 23.957            | 10.073    | 10.287       | 0.0024 |
| C1-1 | 1.214       | 110.138       | 0.637     | 0.558          | 0.394      | 2.177     | 24.555            | 10.679    | 10.893       | 0.0024 |
| C1-1 | 1.214       | 110.138       | 0.637     | 0.558          | 0.394      | 2.177     | 24.555            | 10.679    | 10.893       | 0.0024 |
| C1-1 | 1.293       | 110.149       | 0.648     | 0.559          | 0.437      | 2.313     | 26.159            | 13.878    | 14.094       | 0.0024 |
| C1-1 | 1.308       | 110.151       | 0.650     | 0.559          | 0.441      | 2.341     | 26.467            | 14.311    | 14.527       | 0.0024 |
| C1-1 | 1.308       | 110.151       | 0.650     | 0.559          | 0.441      | 2.341     | 26.467            | 14.311    | 14.527       | 0.0024 |
| C1-1 | 1.339       | 110.155       | 0.654     | 0.558          | 0.446      | 2.399     | 27.079            | 15.064    | 15.282       | 0.0024 |
| C1-1 | 1.380       | 110.160       | 0.659     | 0.557          | 0.462      | 2.479     | 27.908            | 16.731    | 16.949       | 0.0024 |
| C1-1 | 1.414       | 110.164       | 0.663     | 0.555          | 0.462      | 2.547     | 28.606            | 17.305    | 17.523       | 0.0024 |
| C1-1 | 1.555       | 110.179       | 0.678     | 0.550          | 0.465      | 2.825     | 31.450            | 19.815    | 20.035       | 0.0024 |
| C1-1 | 1.586       | 110.182       | 0.681     | 0.550          | 0.465      | 2.885     | 32.076            | 20.256    | 20.477       | 0.0024 |
| C1-1 | 1.743       | 110.196       | 0.695     | 0.549          | 0.453      | 3.176     | 35.249            | 21.191    | 21.414       | 0.0024 |
| C1-1 | 1.787       | 110.200       | 0.699     | 0.548          | 0.458      | 3.263     | 36.141            | 22.418    | 22.641       | 0.0024 |
| C1-1 | 1.824       | 110.203       | 0.702     | 0.548          | 0.456      | 3.331     | 36.890            | 22.680    | 22.903       | 0.0024 |
| C1-1 | 2.061       | 110.221       | 0.720     | 0.549          | 0.448      | 3.755     | 41.691            | 24.522    | 24.747       | 0.0024 |
| C1-1 | 2.147       | 110.227       | 0.726     | 0.549          | 0.462      | 3.910     | 43.429            | 27.184    | 27.410       | 0.0024 |
| C1-1 | 2.147       | 110.227       | 0.726     | 0.549          | 0.462      | 3.910     | 43.429            | 27.184    | 27.410       | 0.0024 |
| C1-1 | 2.148       | 110.228       | 0.727     | 0.546          | 0.460      | 3.938     | 43.452            | 27.442    | 27.667       | 0.0024 |
| C1-1 | 2.221       | 110.233       | 0.732     | 0.545          | 0.461      | 4.078     | 44.918            | 28.709    | 28.935       | 0.0024 |

| Node | Flow (m³/s) | Stage (m AOD) | Depth (m) | Velocity (m/s) | Froude no. | Area (m²) | Conveyance (m³/s) | Width (m) | W Perim. (m) | Slope  |
|------|-------------|---------------|-----------|----------------|------------|-----------|-------------------|-----------|--------------|--------|
| C1-1 | 2.370       | 110.242       | 0.741     | 0.546          | 0.452      | 4.338     | 47.949            | 29.143    | 29.370       | 0.0024 |
| C1-1 | 2.689       | 110.260       | 0.759     | 0.552          | 0.440      | 4.874     | 54.401            | 30.335    | 30.562       | 0.0024 |
| C1-1 | 2.922       | 110.272       | 0.771     | 0.557          | 0.433      | 5.242     | 59.111            | 31.086    | 31.314       | 0.0024 |
| C1-1 | 3.130       | 110.283       | 0.782     | 0.560          | 0.430      | 5.592     | 63.317            | 32.424    | 32.652       | 0.0024 |
| C1-1 | 3.411       | 110.296       | 0.795     | 0.567          | 0.427      | 6.020     | 68.990            | 33.534    | 33.762       | 0.0024 |
| C1-1 | 3.524       | 110.301       | 0.800     | 0.569          | 0.426      | 6.189     | 71.274            | 33.974    | 34.202       | 0.0024 |
| C1-1 | 4.237       | 110.329       | 0.828     | 0.592          | 0.421      | 7.162     | 85.711            | 35.511    | 35.740       | 0.0024 |
| C1-1 | 4.657       | 110.344       | 0.843     | 0.605          | 0.419      | 7.700     | 94.209            | 36.263    | 36.493       | 0.0024 |
| C1-1 | 5.381       | 110.368       | 0.867     | 0.627          | 0.418      | 8.585     | 108.845           | 37.453    | 37.683       | 0.0024 |
| C1-1 | 6.038       | 110.388       | 0.887     | 0.646          | 0.418      | 9.343     | 122.135           | 38.329    | 38.560       | 0.0024 |
| C1-1 | 7.008       | 110.416       | 0.915     | 0.671          | 0.419      | 10.438    | 141.757           | 39.927    | 40.159       | 0.0024 |
| C1-1 | 7.077       | 110.418       | 0.917     | 0.673          | 0.419      | 10.518    | 143.146           | 40.096    | 40.329       | 0.0024 |
| C1-1 | 7.366       | 110.427       | 0.926     | 0.677          | 0.420      | 10.884    | 148.992           | 41.216    | 41.448       | 0.0024 |
| C1-1 | 7.531       | 110.432       | 0.931     | 0.679          | 0.427      | 11.095    | 152.337           | 42.967    | 43.200       | 0.0024 |
| C1-1 | 7.568       | 110.435       | 0.934     | 0.674          | 0.422      | 11.224    | 153.078           | 43.210    | 43.443       | 0.0024 |
| C1-1 | 9.329       | 110.476       | 0.975     | 0.716          | 0.425      | 13.032    | 188.699           | 44.981    | 45.216       | 0.0024 |
| C1-1 | 9.555       | 110.481       | 0.980     | 0.721          | 0.425      | 13.257    | 193.272           | 45.228    | 45.463       | 0.0024 |
| C1-1 | 11.130      | 110.514       | 1.013     | 0.753          | 0.428      | 14.775    | 225.135           | 46.756    | 46.992       | 0.0024 |
| C1-1 | 12.156      | 110.534       | 1.033     | 0.773          | 0.430      | 15.718    | 245.897           | 47.597    | 47.835       | 0.0024 |
| C1-1 | 13.509      | 110.559       | 1.058     | 0.798          | 0.432      | 16.921    | 273.262           | 48.632    | 48.871       | 0.0024 |
| C1-1 | 15.235      | 110.589       | 1.088     | 0.828          | 0.435      | 18.398    | 308.165           | 49.845    | 50.085       | 0.0024 |
| C1-1 | 16.259      | 110.606       | 1.105     | 0.845          | 0.437      | 19.252    | 328.880           | 50.545    | 50.786       | 0.0024 |
| C1-1 | 18.534      | 110.642       | 1.141     | 0.878          | 0.441      | 21.099    | 374.897           | 52.080    | 52.322       | 0.0024 |
| C1-1 | 19.028      | 110.650       | 1.149     | 0.884          | 0.441      | 21.518    | 384.900           | 52.582    | 52.825       | 0.0024 |
| C1-1 | 20.178      | 110.668       | 1.167     | 0.898          | 0.443      | 22.474    | 408.152           | 53.668    | 53.911       | 0.0024 |
| C1-1 | 22.383      | 110.699       | 1.198     | 0.927          | 0.446      | 24.157    | 452.750           | 54.939    | 55.184       | 0.0024 |
| C1-1 | 23.865      | 110.719       | 1.218     | 0.945          | 0.448      | 25.265    | 482.745           | 55.777    | 56.023       | 0.0024 |
| C1-1 | 25.965      | 110.746       | 1.245     | 0.969          | 0.451      | 26.785    | 525.215           | 56.835    | 57.082       | 0.0024 |
| C1-1 | 28.593      | 110.778       | 1.277     | 0.999          | 0.454      | 28.622    | 578.365           | 57.997    | 58.247       | 0.0024 |
| C1-1 | 30.498      | 110.800       | 1.299     | 1.020          | 0.456      | 29.906    | 616.914           | 58.716    | 58.966       | 0.0024 |
| C1-1 | 35.358      | 110.853       | 1.352     | 1.069          | 0.461      | 33.062    | 715.207           | 60.376    | 60.630       | 0.0024 |
| C1-1 | 35.827      | 110.858       | 1.357     | 1.074          | 0.462      | 33.364    | 724.704           | 60.554    | 60.808       | 0.0024 |
| C1-1 | 38.251      | 110.885       | 1.384     | 1.092          | 0.464      | 35.020    | 773.736           | 62.064    | 62.320       | 0.0024 |
| C1-1 | 40.695      | 110.910       | 1.409     | 1.112          | 0.466      | 36.585    | 823.181           | 63.110    | 63.367       | 0.0024 |
| C1-1 | 42.504      | 110.928       | 1.427     | 1.127          | 0.468      | 37.727    | 859.760           | 63.868    | 64.126       | 0.0024 |
| C1-1 | 46.573      | 110.966       | 1.465     | 1.159          | 0.471      | 40.179    | 942.071           | 65.145    | 65.405       | 0.0024 |
| C1-1 | 49.851      | 110.995       | 1.494     | 1.185          | 0.474      | 42.080    | 1008.378          | 66.020    | 66.282       | 0.0024 |
| C1-1 | 54.550      | 111.035       | 1.534     | 1.219          | 0.477      | 44.746    | 1103.428          | 67.235    | 67.500       | 0.0024 |
| C1-1 | 57.610      | 111.061       | 1.560     | 1.239          | 0.479      | 46.506    | 1165.329          | 68.231    | 68.497       | 0.0024 |
| C1-1 | 59.765      | 111.080       | 1.579     | 1.250          | 0.480      | 47.813    | 1208.909          | 69.273    | 69.539       | 0.0024 |
| C1-1 | 61.352      | 111.093       | 1.592     | 1.259          | 0.481      | 48.717    | 1241.013          | 69.835    | 70.103       | 0.0024 |
| C1-1 | 66.935      | 111.136       | 1.635     | 1.293          | 0.485      | 51.752    | 1353.954          | 71.343    | 71.613       | 0.0024 |
| C1-1 | 71.739      | 111.171       | 1.670     | 1.322          | 0.488      | 54.268    | 1451.132          | 72.427    | 72.699       | 0.0024 |
| C1-1 | 73.926      | 111.188       | 1.687     | 1.332          | 0.489      | 55.507    | 1495.358          | 73.275    | 73.548       | 0.0024 |
| C1-1 | 76.117      | 111.205       | 1.704     | 1.341          | 0.490      | 56.760    | 1539.676          | 74.192    | 74.466       | 0.0024 |
| C1-1 | 79.822      | 111.231       | 1.730     | 1.360          | 0.491      | 58.702    | 1614.620          | 75.193    | 75.468       | 0.0024 |
| C1-1 | 86.449      | 111.275       | 1.774     | 1.393          | 0.494      | 62.043    | 1748.675          | 76.642    | 76.920       | 0.0024 |
| C1-1 | 88.310      | 111.287       | 1.786     | 1.403          | 0.495      | 62.965    | 1786.311          | 77.031    | 77.309       | 0.0024 |
| C1-1 | 94.481      | 111.327       | 1.826     | 1.430          | 0.498      | 66.078    | 1911.148          | 78.617    | 78.898       | 0.0024 |
| C1-1 | 97.884      | 111.348       | 1.847     | 1.445          | 0.499      | 67.736    | 1979.984          | 79.342    | 79.625       | 0.0024 |
| C1-1 | 102.603     | 111.377       | 1.876     | 1.465          | 0.501      | 70.053    | 2075.439          | 80.450    | 80.733       | 0.0024 |
| C1-1 | 107.677     | 111.406       | 1.905     | 1.487          | 0.503      | 72.397    | 2178.076          | 81.220    | 81.506       | 0.0024 |
| C1-1 | 119.201     | 111.469       | 1.968     | 1.537          | 0.507      | 77.564    | 2411.176          | 82.806    | 83.098       | 0.0024 |
| C1-1 | 123.319     | 111.492       | 1.991     | 1.552          | 0.508      | 79.478    | 2494.472          | 83.631    | 83.924       | 0.0024 |
| C1-1 | 125.774     | 111.507       | 2.006     | 1.558          | 0.509      | 80.739    | 2544.144          | 84.501    | 84.795       | 0.0024 |
| C1-1 | 128.890     | 111.525       | 2.024     | 1.567          | 0.510      | 82.269    | 2607.167          | 85.422    | 85.716       | 0.0024 |
| C1-1 | 134.925     | 111.558       | 2.057     | 1.585          | 0.511      | 85.111    | 2729.239          | 86.890    | 87.186       | 0.0024 |
| C1-1 | 136.594     | 111.567       | 2.066     | 1.590          | 0.512      | 85.896    | 2762.999          | 87.298    | 87.595       | 0.0024 |
| C1-1 | 140.728     | 111.591       | 2.090     | 1.599          | 0.513      | 88.009    | 2846.624          | 88.825    | 89.123       | 0.0024 |
| C1-1 | 143.831     | 111.607       | 2.106     | 1.608          | 0.514      | 89.436    | 2909.384          | 89.517    | 89.815       | 0.0024 |
| C1-1 | 149.863     | 111.637       | 2.136     | 1.626          | 0.515      | 92.139    | 3031.410          | 90.715    | 91.015       | 0.0024 |
| C1-1 | 155.612     | 111.665       | 2.164     | 1.643          | 0.517      | 94.695    | 3147.699          | 91.847    | 92.148       | 0.0024 |
| C1-1 | 159.170     | 111.682       | 2.181     | 1.654          | 0.518      | 96.262    | 3219.666          | 92.529    | 92.831       | 0.0024 |
| C1-1 | 168.487     | 111.724       | 2.223     | 1.682          | 0.520      | 100.177   | 3408.125          | 93.874    | 94.179       | 0.0024 |
| C1-1 | 174.939     | 111.752       | 2.251     | 1.701          | 0.521      | 102.817   | 3538.633          | 94.700    | 95.006       | 0.0024 |
| C1-1 | 179.624     | 111.775       | 2.274     | 1.711          | 0.522      | 105.011   | 3633.396          | 96.066    | 96.373       | 0.0024 |
| C1-1 | 183.778     | 111.793       | 2.292     | 1.722          | 0.523      | 106.746   | 3717.430          | 96.734    | 97.043       | 0.0024 |
| C1-1 | 190.224     | 111.821       | 2.320     | 1.738          | 0.525      | 109.470   | 3847.813          | 97.870    | 98.180       | 0.0024 |
| C1-1 | 196.661     | 111.849       | 2.348     | 1.752          | 0.526      | 112.228   | 3978.021          | 99.138    | 99.449       | 0.0024 |
| C1-1 | 198.994     | 111.859       | 2.358     | 1.758          | 0.526      | 113.222   | 4025.209          | 99.591    | 99.903       | 0.0024 |
| C1-1 | 209.913     | 111.904       | 2.403     | 1.783          | 0.528      | 117.745   | 4246.081          | 101.440   | 101.754      | 0.0024 |
| C1-1 | 210.163     | 111.905       | 2.404     | 1.783          | 0.528      | 117.846   | 4251.146          | 101.477   | 101.791      | 0.0024 |
| C1-1 | 221.055     | 111.949       | 2.448     | 1.807          | 0.530      | 122.353   | 4471.464          | 103.352   | 103.668      | 0.0024 |
| C1-1 | 223.123     | 111.957       | 2.456     | 1.811          | 0.531      | 123.181   | 4513.296          | 103.659   | 103.975      | 0.0024 |
| C1-1 | 234.193     | 112.000       | 2.499     | 1.834          | 0.532      | 127.678   | 4737.207          | 105.500   | 105.819      | 0.0024 |
| C1-1 | 234.891     | 112.003       | 2.502     | 1.835          | 0.532      | 127.994   | 4751.342          | 105.697   | 106.015      | 0.0024 |
| C1-1 | 239.097     | 112.022       | 2.521     | 1.839          | 0.533      | 130.017   | 4836.415          | 107.123   | 107.442      | 0.0024 |
| C1-1 | 243.277     | 112.039       | 2.538     | 1.845          | 0.533      | 131.846   | 4920.975          | 108.119   | 108.439      | 0.0024 |
| C1-1 | 247.797     | 112.056       | 2.555     | 1.854          | 0.534      | 133.691   | 5012.397          | 108.932   | 109.253      | 0.0024 |
| C1-1 | 259.250     | 112.097       | 2.596     | 1.876          | 0.536      | 138.192   | 5244.063          | 110.633   | 110.956      | 0.0024 |
| C1-1 | 259.808     | 112.099       | 2.598     | 1.877          | 0.536      | 138.413   | 5255.359          | 110.721   | 111.044      | 0.0024 |
| C1-1 | 268.193     | 112.130       | 2.629     | 1.890          | 0.537      | 141.871   | 5424.960          | 112.369   | 112.693      | 0.0024 |
| C1-1 | 273.345     | 112.148       | 2.647     | 1.900          | 0.538      | 143.901   | 5529.175          | 113.181   | 113.505      | 0.0024 |
| C1-1 | 279.893     | 112.171       | 2.670     | 1.910          | 0.539      | 146.517   | 5661.635          | 114.291   | 114.616      | 0.0024 |
| C1-1 | 285.460     | 112.192       | 2.691     | 1.917          | 0.539      | 148.932   | 5774.233          | 115.677   | 116.003      | 0.0024 |
| C1-1 | 286.307     | 112.195       | 2.694     | 1.918          | 0.539      | 149.279   | 5791.369          | 115.849   | 116.175      | 0.0024 |
| C1-1 | 307.500     | 112.260       | 2.759     | 1.960          | 0.542      | 156.874   | 6220.063          | 117.826   | 118.156      | 0.0024 |
| C1-1 | 308.211     | 112.262       | 2.761     | 1.962          | 0.543      | 157.110   | 6234.436          | 118.265   | 118.596      | 0.0024 |
| C1-1 | 308.962     | 112.265       | 2.764     | 1.962          | 0.545      | 157.465   | 6249.629          | 119.100   | 119.430      | 0.0024 |
| C1-1 | 311.750     | 112.276       | 2.775     | 1.963          | 0.546      | 158.783   | 6306.026          | 120.375   | 120.706      | 0.0024 |
| C1-1 | 316.283     | 112.289       | 2.788     | 1.972          | 0.548      | 160.353   | 6397.715          | 121.214   | 121.545      | 0.0024 |
| C1-1 | 321.203     | 112.303       | 2.802     | 1.982          | 0.550      | 162.059   | 6497.251          | 122.543   | 122.875      | 0.0024 |
| C1-1 | 328.307     | 112.323       | 2.822     | 1.996          | 0.552      | 164.521   | 6640.943          | 123.662   | 123.995      | 0.0024 |
| C1-1 | 331.050     | 112.333       | 2.832     | 1.997          | 0.553      | 165.763   | 6696.417          | 124.687   | 125.020      | 0.0024 |
| C1-1 | 332.434     | 112.338       | 2.837     | 1.998          | 0.553      | 166.388   | 6724.427          | 125.193   | 125.526      | 0.0024 |

| Node | Flow (m³/s) | Stage (m AOD) | Depth (m) | Velocity (m/s) | Froude no. | Area (m²) | Conveyance (m³/s) | Width (m) | W Perim. (m) | Slope  |
|------|-------------|---------------|-----------|----------------|------------|-----------|-------------------|-----------|--------------|--------|
| C1-1 | 342.333     | 112.364       | 2.863     | 2.018          | 0.556      | 169.658   | 6924.664          | 126.395   | 126.729      | 0.0024 |
| C1-1 | 347.718     | 112.378       | 2.877     | 2.028          | 0.559      | 171.436   | 7033.582          | 127.604   | 127.939      | 0.0024 |
| C1-1 | 362.573     | 112.416       | 2.915     | 2.056          | 0.562      | 176.313   | 7334.060          | 129.077   | 129.414      | 0.0024 |
| C1-1 | 363.348     | 112.418       | 2.917     | 2.058          | 0.562      | 176.572   | 7349.734          | 129.162   | 129.499      | 0.0024 |
| C1-1 | 374.288     | 112.446       | 2.945     | 2.077          | 0.565      | 180.209   | 7571.032          | 130.665   | 131.004      | 0.0024 |
| C1-1 | 386.217     | 112.476       | 2.975     | 2.097          | 0.566      | 184.145   | 7812.326          | 131.758   | 132.098      | 0.0024 |
| C1-1 | 395.665     | 112.499       | 2.998     | 2.114          | 0.568      | 187.185   | 8003.438          | 132.512   | 132.854      | 0.0024 |
| C1-1 | 402.275     | 112.515       | 3.014     | 2.125          | 0.570      | 189.315   | 8137.156          | 133.753   | 134.095      | 0.0024 |
| C1-1 | 417.423     | 112.551       | 3.050     | 2.150          | 0.573      | 194.157   | 8443.559          | 135.264   | 135.608      | 0.0024 |
| C1-1 | 417.848     | 112.552       | 3.051     | 2.151          | 0.573      | 194.293   | 8452.151          | 135.307   | 135.651      | 0.0024 |
| C1-1 | 431.409     | 112.585       | 3.084     | 2.170          | 0.575      | 198.786   | 8726.469          | 137.022   | 137.367      | 0.0024 |
| C1-1 | 437.242     | 112.599       | 3.098     | 2.178          | 0.576      | 200.709   | 8844.462          | 137.715   | 138.061      | 0.0024 |
| C1-1 | 447.229     | 112.622       | 3.121     | 2.194          | 0.578      | 203.888   | 9046.479          | 138.715   | 139.062      | 0.0024 |
| C1-1 | 463.547     | 112.659       | 3.158     | 2.217          | 0.580      | 209.050   | 9376.548          | 140.323   | 140.672      | 0.0024 |
| C1-1 | 465.772     | 112.664       | 3.163     | 2.221          | 0.580      | 209.753   | 9421.559          | 140.616   | 140.965      | 0.0024 |
| C1-1 | 473.689     | 112.683       | 3.182     | 2.230          | 0.582      | 212.437   | 9581.706          | 141.982   | 142.332      | 0.0024 |
| C1-1 | 480.432     | 112.699       | 3.198     | 2.238          | 0.583      | 214.717   | 9718.102          | 143.106   | 143.456      | 0.0024 |
| C1-1 | 484.496     | 112.708       | 3.207     | 2.243          | 0.584      | 216.008   | 9800.311          | 143.634   | 143.985      | 0.0024 |
| C1-1 | 504.253     | 112.751       | 3.250     | 2.269          | 0.586      | 222.223   | 10199.943         | 145.419   | 145.772      | 0.0024 |
| C1-1 | 507.042     | 112.757       | 3.256     | 2.273          | 0.586      | 223.097   | 10256.360         | 145.706   | 146.059      | 0.0024 |
| C1-1 | 520.273     | 112.785       | 3.284     | 2.290          | 0.588      | 227.194   | 10524.002         | 146.998   | 147.353      | 0.0024 |
| C1-1 | 537.569     | 112.821       | 3.320     | 2.312          | 0.590      | 232.515   | 10873.850         | 148.600   | 148.956      | 0.0024 |
| C1-1 | 537.569     | 112.821       | 3.320     | 2.312          | 0.590      | 232.515   | 10873.850         | 148.600   | 148.956      | 0.0024 |
| C1-1 | 551.256     | 112.847       | 3.346     | 2.332          | 0.592      | 236.392   | 11150.710         | 149.625   | 149.981      | 0.0024 |

Tabulated Cross-Section Properties // C1-2

(Calculated by Flood Modeller)

| Node | Flow (m³/s) | Stage (m AOD) | Depth (m) | Velocity (m/s) | Froude no. | Area (m²) | Conveyance (m³/s) | Width (m) | W Perim. (m) | Slope  |
|------|-------------|---------------|-----------|----------------|------------|-----------|-------------------|-----------|--------------|--------|
| C1-2 | 0.000       | 102.303       | 0.000     | 0.000          | 0.000      | 0.000     | 0.000             | 0.000     | 0.000        | 0.0126 |
| C1-2 | 0.000       | 102.310       | 0.007     | 0.065          | 0.349      | 0.005     | 0.003             | 1.342     | 1.343        | 0.0126 |
| C1-2 | 0.012       | 102.337       | 0.034     | 0.245          | 0.486      | 0.049     | 0.107             | 1.896     | 1.901        | 0.0126 |
| C1-2 | 0.038       | 102.365       | 0.062     | 0.350          | 0.532      | 0.108     | 0.338             | 2.450     | 2.459        | 0.0126 |
| C1-2 | 0.079       | 102.392       | 0.089     | 0.433          | 0.560      | 0.183     | 0.706             | 3.005     | 3.017        | 0.0126 |
| C1-2 | 0.166       | 102.428       | 0.125     | 0.557          | 0.596      | 0.298     | 1.477             | 3.348     | 3.368        | 0.0126 |
| C1-2 | 0.281       | 102.464       | 0.161     | 0.661          | 0.622      | 0.425     | 2.503             | 3.691     | 3.719        | 0.0126 |
| C1-2 | 0.425       | 102.501       | 0.198     | 0.752          | 0.642      | 0.565     | 3.785             | 4.035     | 4.070        | 0.0126 |
| C1-2 | 0.598       | 102.537       | 0.234     | 0.834          | 0.658      | 0.717     | 5.330             | 4.378     | 4.421        | 0.0126 |
| C1-2 | 0.802       | 102.573       | 0.270     | 0.910          | 0.673      | 0.881     | 7.147             | 4.721     | 4.772        | 0.0126 |
| C1-2 | 1.038       | 102.609       | 0.306     | 0.981          | 0.685      | 1.058     | 9.247             | 5.065     | 5.123        | 0.0126 |
| C1-2 | 1.155       | 102.624       | 0.321     | 1.012          | 0.739      | 1.141     | 10.291            | 5.962     | 6.022        | 0.0126 |
| C1-2 | 1.188       | 102.628       | 0.325     | 1.018          | 0.781      | 1.167     | 10.582            | 6.738     | 6.798        | 0.0126 |
| C1-2 | 1.230       | 102.633       | 0.330     | 1.022          | 0.860      | 1.204     | 10.961            | 8.382     | 8.443        | 0.0126 |
| C1-2 | 1.304       | 102.641       | 0.338     | 1.017          | 0.948      | 1.281     | 11.616            | 10.910    | 10.972       | 0.0126 |
| C1-2 | 1.304       | 102.641       | 0.338     | 1.017          | 0.948      | 1.281     | 11.616            | 10.910    | 10.972       | 0.0126 |
| C1-2 | 1.333       | 102.644       | 0.341     | 1.012          | 1.008      | 1.317     | 11.878            | 12.807    | 12.870       | 0.0126 |
| C1-2 | 1.368       | 102.647       | 0.344     | 1.008          | 1.011      | 1.356     | 12.185            | 13.378    | 13.441       | 0.0126 |
| C1-2 | 1.507       | 102.658       | 0.355     | 0.993          | 1.024      | 1.517     | 13.424            | 15.802    | 15.866       | 0.0126 |
| C1-2 | 1.549       | 102.661       | 0.358     | 0.988          | 1.075      | 1.568     | 13.798            | 18.215    | 18.278       | 0.0126 |
| C1-2 | 1.563       | 102.662       | 0.359     | 0.985          | 1.089      | 1.587     | 13.927            | 19.018    | 19.082       | 0.0126 |
| C1-2 | 1.593       | 102.664       | 0.361     | 0.980          | 1.111      | 1.626     | 14.195            | 20.509    | 20.572       | 0.0126 |
| C1-2 | 1.593       | 102.664       | 0.361     | 0.980          | 1.111      | 1.626     | 14.195            | 20.509    | 20.572       | 0.0126 |
| C1-2 | 1.636       | 102.667       | 0.364     | 0.969          | 1.095      | 1.689     | 14.578            | 21.163    | 21.227       | 0.0126 |
| C1-2 | 2.482       | 102.706       | 0.403     | 0.976          | 0.930      | 2.543     | 22.116            | 22.674    | 22.741       | 0.0126 |
| C1-2 | 3.308       | 102.734       | 0.431     | 1.033          | 0.895      | 3.202     | 29.469            | 23.584    | 23.653       | 0.0126 |
| C1-2 | 4.289       | 102.763       | 0.460     | 1.103          | 0.884      | 3.888     | 38.210            | 24.494    | 24.565       | 0.0126 |
| C1-2 | 5.067       | 102.783       | 0.480     | 1.156          | 0.884      | 4.384     | 45.137            | 25.132    | 25.205       | 0.0126 |
| C1-2 | 6.281       | 102.811       | 0.508     | 1.226          | 0.912      | 5.125     | 55.958            | 27.810    | 27.885       | 0.0126 |
| C1-2 | 6.507       | 102.817       | 0.514     | 1.229          | 0.919      | 5.296     | 57.969            | 29.046    | 29.122       | 0.0126 |
| C1-2 | 6.547       | 102.818       | 0.515     | 1.229          | 0.921      | 5.325     | 58.322            | 29.321    | 29.398       | 0.0126 |
| C1-2 | 6.628       | 102.820       | 0.517     | 1.231          | 0.931      | 5.384     | 59.043            | 30.188    | 30.265       | 0.0126 |
| C1-2 | 6.539       | 102.821       | 0.518     | 1.207          | 0.936      | 5.415     | 58.253            | 31.911    | 31.987       | 0.0126 |
| C1-2 | 6.539       | 102.821       | 0.518     | 1.207          | 0.936      | 5.415     | 58.253            | 31.911    | 31.987       | 0.0126 |
| C1-2 | 6.567       | 102.822       | 0.519     | 1.205          | 0.958      | 5.448     | 58.504            | 33.744    | 33.821       | 0.0126 |
| C1-2 | 6.692       | 102.828       | 0.525     | 1.183          | 0.955      | 5.658     | 59.615            | 36.161    | 36.238       | 0.0126 |
| C1-2 | 6.737       | 102.830       | 0.527     | 1.176          | 0.949      | 5.731     | 60.018            | 36.646    | 36.723       | 0.0126 |
| C1-2 | 7.722       | 102.847       | 0.544     | 1.212          | 0.953      | 6.371     | 68.794            | 38.674    | 38.753       | 0.0126 |
| C1-2 | 8.994       | 102.867       | 0.564     | 1.256          | 0.954      | 7.164     | 80.124            | 40.597    | 40.677       | 0.0126 |
| C1-2 | 10.422      | 102.888       | 0.585     | 1.299          | 0.943      | 8.026     | 92.846            | 41.502    | 41.583       | 0.0126 |
| C1-2 | 12.212      | 102.911       | 0.608     | 1.358          | 0.942      | 8.991     | 108.793           | 42.431    | 42.513       | 0.0126 |
| C1-2 | 14.004      | 102.933       | 0.630     | 1.408          | 0.948      | 9.944     | 124.754           | 44.180    | 44.263       | 0.0126 |
| C1-2 | 15.913      | 102.954       | 0.651     | 1.462          | 0.950      | 10.881    | 141.763           | 45.090    | 45.174       | 0.0126 |
| C1-2 | 16.416      | 102.962       | 0.659     | 1.459          | 0.948      | 11.248    | 146.243           | 46.588    | 46.672       | 0.0126 |
| C1-2 | 19.201      | 102.989       | 0.686     | 1.534          | 0.955      | 12.519    | 171.058           | 47.567    | 47.653       | 0.0126 |
| C1-2 | 21.786      | 103.012       | 0.709     | 1.596          | 0.961      | 13.648    | 194.085           | 48.525    | 48.612       | 0.0126 |
| C1-2 | 24.534      | 103.036       | 0.733     | 1.658          | 0.968      | 14.800    | 218.563           | 49.484    | 49.572       | 0.0126 |
| C1-2 | 27.988      | 103.064       | 0.761     | 1.727          | 0.976      | 16.203    | 249.337           | 50.786    | 50.876       | 0.0126 |
| C1-2 | 29.314      | 103.075       | 0.772     | 1.748          | 0.979      | 16.766    | 261.151           | 51.546    | 51.636       | 0.0126 |
| C1-2 | 32.726      | 103.101       | 0.798     | 1.806          | 0.984      | 18.122    | 291.543           | 52.764    | 52.856       | 0.0126 |
| C1-2 | 35.824      | 103.123       | 0.820     | 1.857          | 0.989      | 19.293    | 319.141           | 53.671    | 53.764       | 0.0126 |
| C1-2 | 39.065      | 103.145       | 0.842     | 1.907          | 0.994      | 20.483    | 348.020           | 54.578    | 54.672       | 0.0126 |
| C1-2 | 42.648      | 103.167       | 0.864     | 1.964          | 1.000      | 21.719    | 379.938           | 55.256    | 55.352       | 0.0126 |
| C1-2 | 46.381      | 103.190       | 0.887     | 2.019          | 1.006      | 22.970    | 413.195           | 55.934    | 56.031       | 0.0126 |
| C1-2 | 50.355      | 103.215       | 0.912     | 2.065          | 1.013      | 24.389    | 448.601           | 57.573    | 57.672       | 0.0126 |
| C1-2 | 50.847      | 103.218       | 0.915     | 2.070          | 1.014      | 24.562    | 452.980           | 57.770    | 57.869       | 0.0126 |
| C1-2 | 56.906      | 103.252       | 0.949     | 2.146          | 1.022      | 26.518    | 506.961           | 59.017    | 59.118       | 0.0126 |
| C1-2 | 63.302      | 103.285       | 0.982     | 2.220          | 1.030      | 28.516    | 563.940           | 60.264    | 60.366       | 0.0126 |
| C1-2 | 64.086      | 103.289       | 0.986     | 2.228          | 1.031      | 28.758    | 570.926           | 60.415    | 60.517       | 0.0126 |
| C1-2 | 69.321      | 103.316       | 1.013     | 2.282          | 1.038      | 30.374    | 617.559           | 61.583    | 61.686       | 0.0126 |
| C1-2 | 74.769      | 103.342       | 1.039     | 2.335          | 1.044      | 32.022    | 666.094           | 62.750    | 62.855       | 0.0126 |
| C1-2 | 77.099      | 103.353       | 1.050     | 2.357          | 1.046      | 32.714    | 686.852           | 63.224    | 63.329       | 0.0126 |
| C1-2 | 81.975      | 103.375       | 1.072     | 2.403          | 1.051      | 34.114    | 730.290           | 64.052    | 64.159       | 0.0126 |
| C1-2 | 87.001      | 103.397       | 1.094     | 2.448          | 1.056      | 35.533    | 775.064           | 64.880    | 64.988       | 0.0126 |
| C1-2 | 92.751      | 103.422       | 1.118     | 2.498          | 1.062      | 37.134    | 826.288           | 65.837    | 65.946       | 0.0126 |

| Node | Flow (m <sup>3</sup> /s) | Stage (m AOD) | Depth (m) | Velocity (m/s) | Froude no. | Area (m <sup>2</sup> ) | Conveyance (m <sup>3</sup> /s) | Width (m) | W Perim. (m) | Slope  |
|------|--------------------------|---------------|-----------|----------------|------------|------------------------|--------------------------------|-----------|--------------|--------|
| C1-2 | 98.689                   | 103.446       | 1.143     | 2.546          | 1.067      | 38.759                 | 879.191                        | 66.793    | 66.903       | 0.0126 |
| C1-2 | 99.182                   | 103.448       | 1.145     | 2.550          | 1.078      | 38.893                 | 883.582                        | 68.213    | 68.324       | 0.0126 |
| C1-2 | 99.443                   | 103.449       | 1.146     | 2.552          | 1.079      | 38.962                 | 885.909                        | 68.254    | 68.365       | 0.0126 |
| C1-2 | 107.054                  | 103.477       | 1.174     | 2.620          | 1.087      | 40.861                 | 953.712                        | 69.058    | 69.171       | 0.0126 |
| C1-2 | 114.929                  | 103.504       | 1.201     | 2.686          | 1.096      | 42.783                 | 1023.869                       | 69.862    | 69.977       | 0.0126 |
| C1-2 | 123.062                  | 103.532       | 1.229     | 2.751          | 1.104      | 44.727                 | 1096.325                       | 70.666    | 70.783       | 0.0126 |
| C1-2 | 126.669                  | 103.544       | 1.241     | 2.779          | 1.108      | 45.577                 | 1128.461                       | 71.086    | 71.203       | 0.0126 |
| C1-2 | 134.415                  | 103.569       | 1.266     | 2.838          | 1.116      | 47.365                 | 1197.467                       | 71.883    | 72.002       | 0.0126 |

## **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](https://www.gov.uk/government/publications/pre-planning-application-enquiry-form-preliminary-opinion) 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](https://www.gov.uk/browse/environment-countryside/flooding-extreme-weather) 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

**From:** [REDACTED]

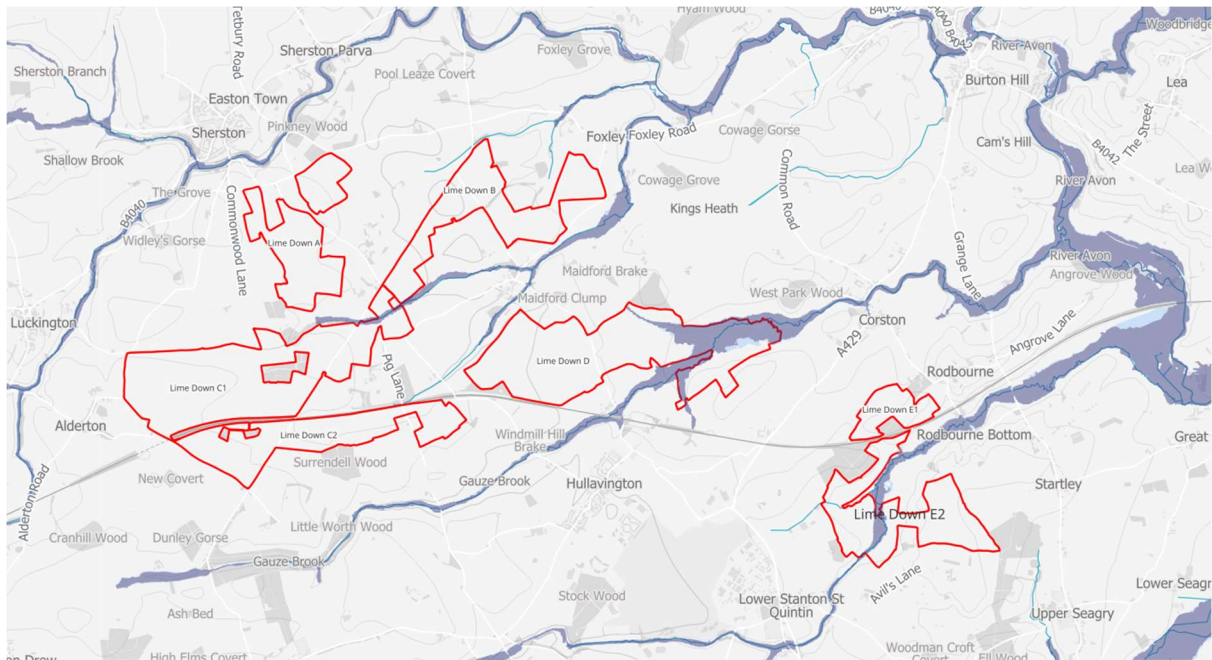
**Sent:** 15 October 2024 14:01

**To:** Enquiries, Unit <[enquiries@environment-agency.gov.uk](mailto: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 following information 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 Signature]

Consultant | Water Environment Team

Mobile: [Redacted]

[Redacted]



**IOSH & IEMA Training Course Provider**

---

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

Mabbett & Associates Ltd, Registered Office: 13 Henderson Road, Inverness, IV1 1SN.  
Registered in Scotland No. SC 163378.

This e-mail is from Mabbett & Associates Ltd. It may contain private and confidential information. If you have received this message in error, please delete it and contact us on 0141 227 2300. Emails are not secure and may contain viruses. Mabbett & Associates Ltd may monitor email traffic data. Any views or other information in this message which do not relate to our business are not authorised by us. This message does not form part of any contract unless so stated. Please refer to our Privacy Policy <https://www.mabbett.eu/privacy-policy/>

© 2024, Mabbett & Associates Ltd.

Please consider the environment before printing this e-mail

Our ref: 381197-WX  
Date: 4<sup>th</sup> November 2024

Dear [REDACTED]

Thank you for your enquiry which was received on 15<sup>th</sup> 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<br><b>Lime Down</b><br>NGR: ST9009082825                                                                                                               |
| Licence              | <a href="#">Open Government Licence</a>                                                                                                                                                   |
| Information Warnings | <i>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.</i> |
| Attribution          | Contains Environment Agency information © Environment Agency and/or database rights.<br><br>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 [REDACTED]

### **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](mailto: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](mailto:wessexenquiries@environment-agency.gov.uk)  
[www.environment-agency.gov.uk](http://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](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](mailto: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

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

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



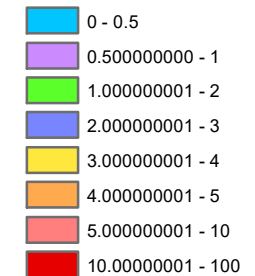
Scale 1:50,000



### Legend

#### 100yr JFLOW Depth

##### Metres



### Information Warning

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

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



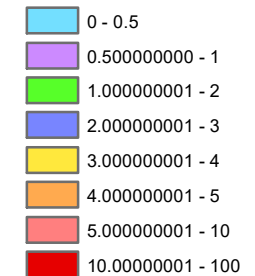
Scale 1:50,000



### Legend

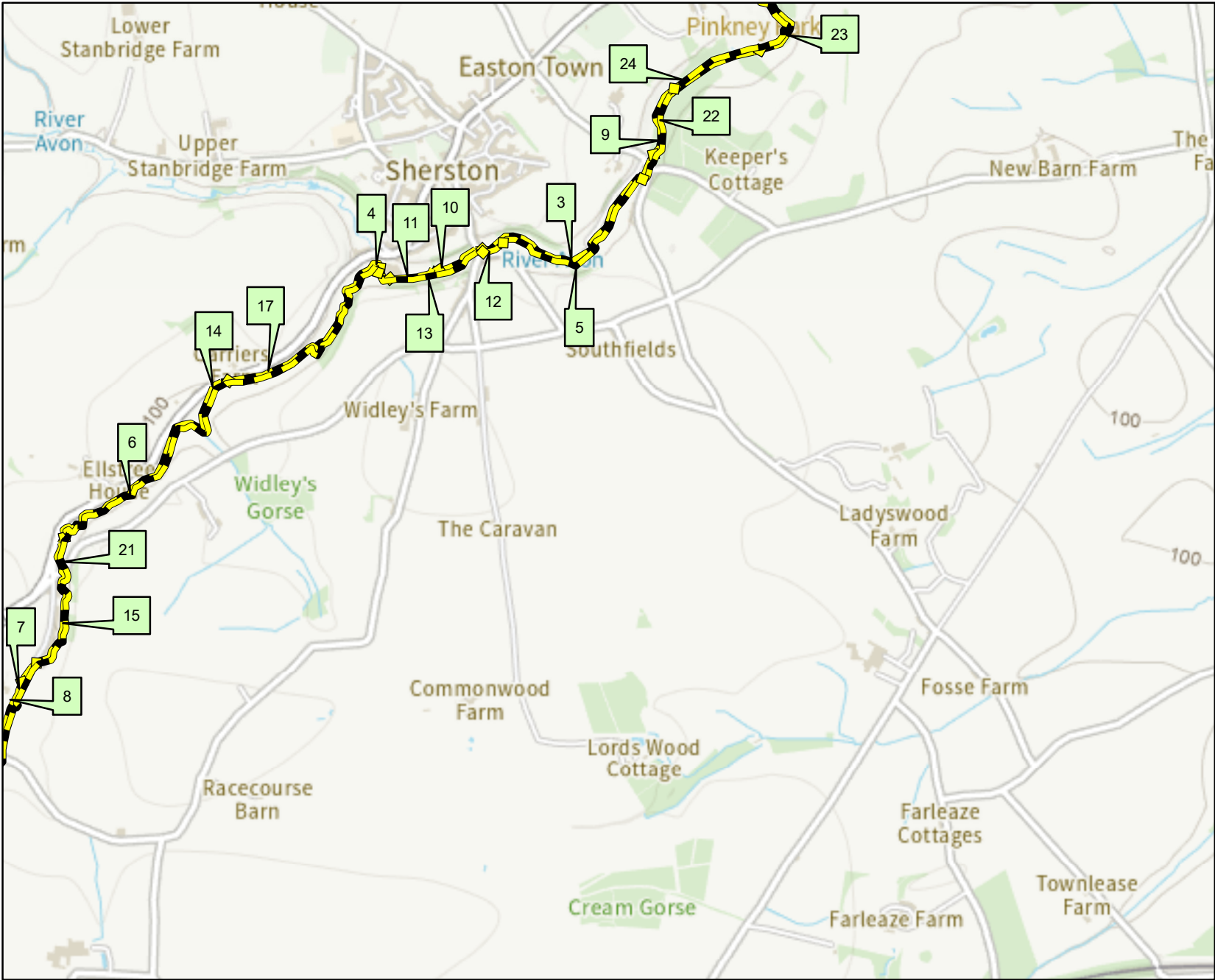
#### 1000yr JFLOW Depth

##### Metres



### Information Warning

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



Scale: 1:20,000



**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.

Product 4 - AIMS Information381197-WXDate: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

## **Appendix D – Greenfield Runoff Calculations**

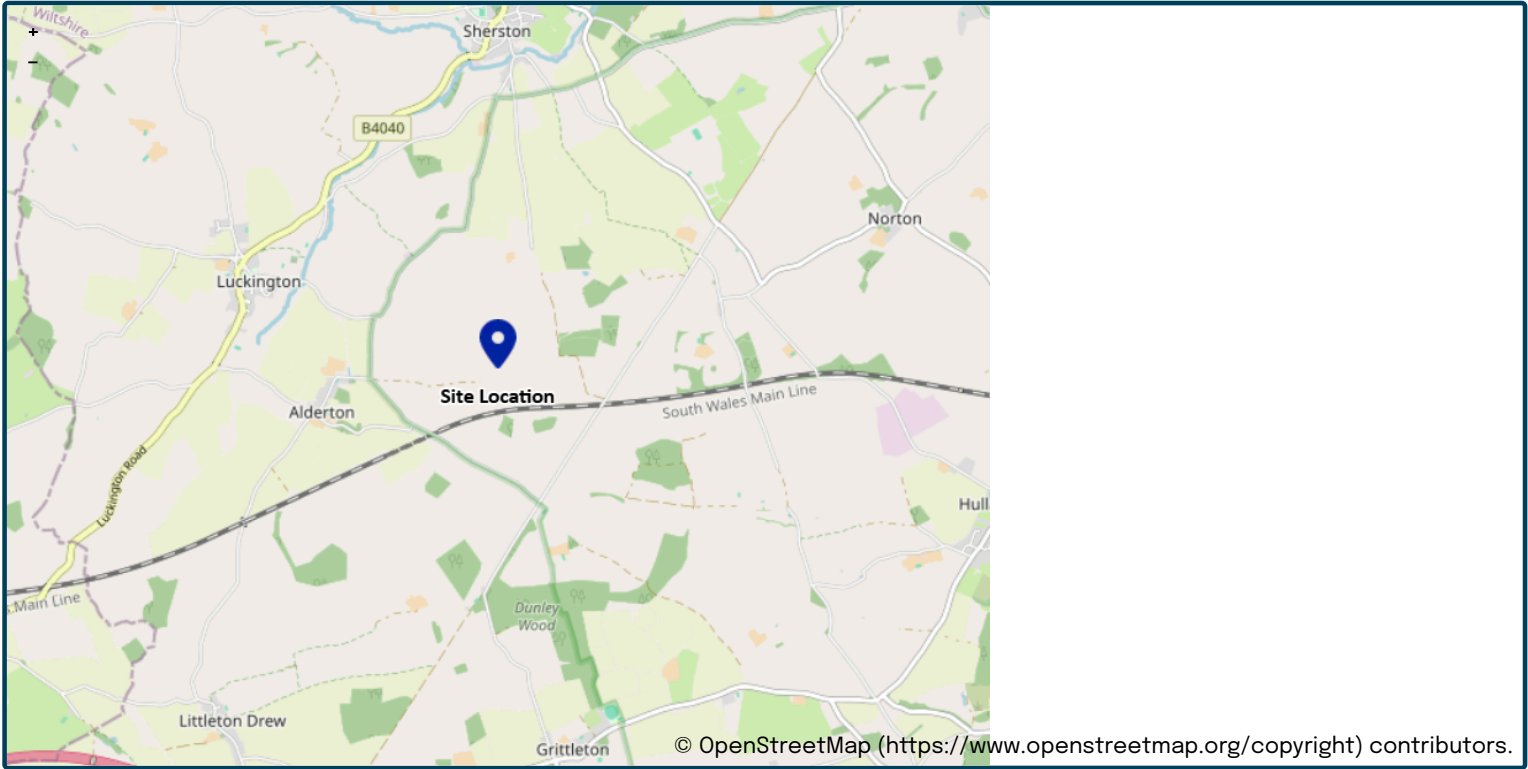
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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          | <input type="text" value="23/06/2026"/> |
| Calculated by | <input type="text" value="GH"/>         |
| Reference     | <input type="text" value="317212"/>     |
| Model version | <input type="text" value="2.2.3"/>      |

## Location

|               |                                           |
|---------------|-------------------------------------------|
| Site name     | <input type="text" value="Lime Down C1"/> |
| Site location | <input type="text"/>                      |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Site easting (British National Grid)  | <input type="text" value="385375"/> |
| Site northing (British National Grid) | <input type="text" value="182974"/> |

## Site details

|                      |                                   |    |
|----------------------|-----------------------------------|----|
| Total site area (ha) | <input type="text" value="0.12"/> | ha |
|----------------------|-----------------------------------|----|

# Greenfield runoff

## Method

|        |                                   |
|--------|-----------------------------------|
| Method | <div>FEH statistical (2025)</div> |
|--------|-----------------------------------|

## FEH statistical (2025)

|                                   | <u>My value</u>               | <u>Map value</u> |
|-----------------------------------|-------------------------------|------------------|
| SAAR9120 (mm)                     | <div>889</div> <div>mm</div>  |                  |
| BFIHOST19scaled                   | <div>0.554</div>              |                  |
| QMed-QBar conversion              | <div>1.075</div>              | <div>1.075</div> |
| QMed (l/s)                        | <div>0.5</div> <div>l/s</div> |                  |
| QBar (FEH statistical 2025) (l/s) | <div>0.5</div> <div>l/s</div> |                  |

## Growth curve factors

|                        | <u>My value</u> | <u>Map value</u> |
|------------------------|-----------------|------------------|
| Hydrological region    | <div>8</div>    | <div>8</div>     |
| 1 year growth factor   | <div>0.78</div> |                  |
| 2 year growth factor   | <div>0.93</div> |                  |
| 10 year growth factor  | <div>1.49</div> |                  |
| 30 year growth factor  | <div>1.95</div> |                  |
| 100 year growth factor | <div>2.43</div> |                  |
| 200 year growth factor | <div>2.78</div> |                  |

## Results

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

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

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

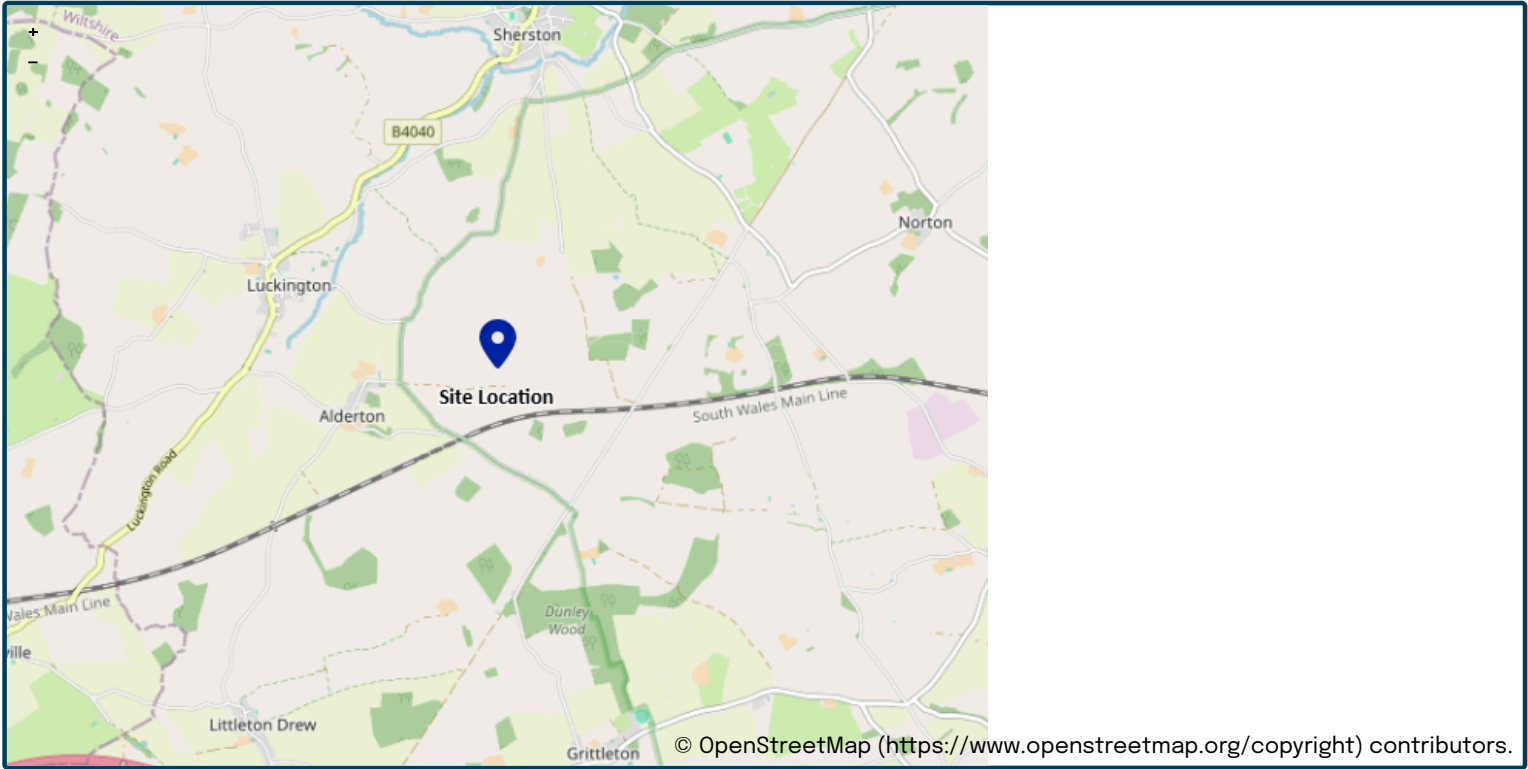
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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          | <div>08/07/2026</div> |
| Calculated by | <div>GH</div>         |
| Reference     | <div>317212</div>     |
| Model version | <div>2.2.3</div>      |

## Location

|               |                         |
|---------------|-------------------------|
| Site name     | <div>Lime Down C1</div> |
| Site location | <div></div>             |



|                                       |                   |
|---------------------------------------|-------------------|
| Site easting (British National Grid)  | <div>385124</div> |
| Site northing (British National Grid) | <div>183008</div> |

## Site details

|                      |                                 |
|----------------------|---------------------------------|
| Total site area (ha) | <div>0.3558</div> <div>ha</div> |
|----------------------|---------------------------------|

# Greenfield runoff

## Method

|        |                        |
|--------|------------------------|
| Method | FEH statistical (2025) |
|--------|------------------------|

## FEH statistical (2025)

|                                   | <u>My value</u>                    | <u>Map value</u>                   |
|-----------------------------------|------------------------------------|------------------------------------|
| SAAR9120 (mm)                     | <input type="text" value="889"/>   | <input type="text" value="mm"/>    |
| BFIHOST19scaled                   | <input type="text" value="0.554"/> | <input type="text"/>               |
| QMed-QBar conversion              | <input type="text" value="1.075"/> | <input type="text" value="1.075"/> |
| QMed (l/s)                        | <input type="text" value="1.3"/>   | <input type="text" value="l/s"/>   |
| QBar (FEH statistical 2025) (l/s) | <input type="text" value="1.4"/>   | <input type="text" value="l/s"/>   |

## Growth curve factors

|                        | <u>My value</u>                   | <u>Map value</u>               |
|------------------------|-----------------------------------|--------------------------------|
| Hydrological region    | <input type="text" value="8"/>    | <input type="text" value="8"/> |
| 1 year growth factor   | <input type="text" value="0.78"/> | <input type="text"/>           |
| 2 year growth factor   | <input type="text" value="0.93"/> | <input type="text"/>           |
| 10 year growth factor  | <input type="text" value="1.49"/> | <input type="text"/>           |
| 30 year growth factor  | <input type="text" value="1.95"/> | <input type="text"/>           |
| 100 year growth factor | <input type="text" value="2.43"/> | <input type="text"/>           |
| 200 year growth factor | <input type="text" value="2.78"/> | <input type="text"/>           |

## Results

|                           |                                  |
|---------------------------|----------------------------------|
| Method                    | FEH statistical (2025)           |
| Flow rate 1 year (l/s)    | <input type="text" value="1.1"/> |
| Flow rate 2 year (l/s)    | <input type="text" value="1.3"/> |
| Flow rate 10 years (l/s)  | <input type="text" value="2.2"/> |
| Flow rate 30 years (l/s)  | <input type="text" value="2.8"/> |
| Flow rate 100 years (l/s) | <input type="text" value="3.5"/> |
| Flow rate 200 years (l/s) | <input type="text" value="4.0"/> |

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

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

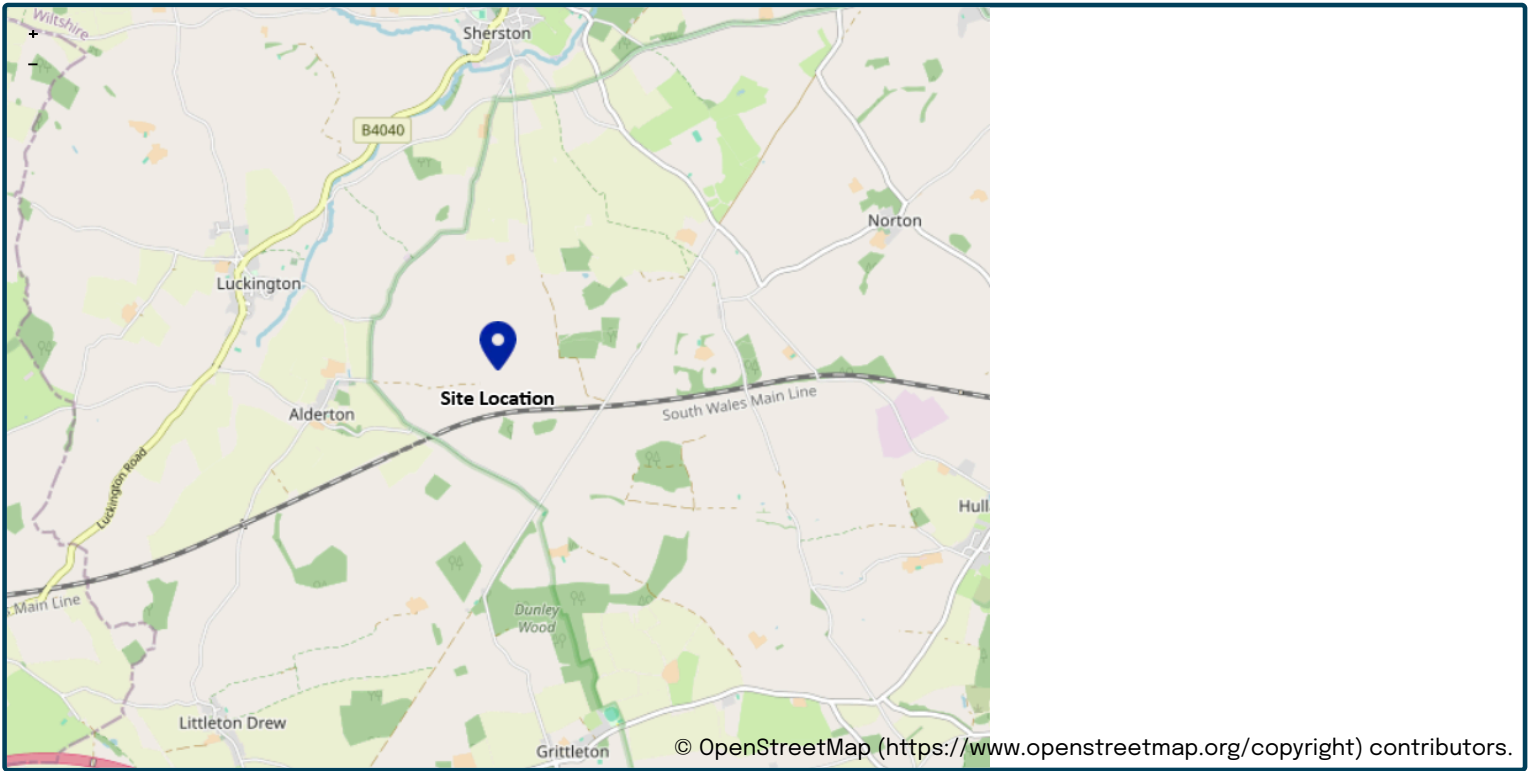
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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          | <input type="text" value="23/06/2026"/> |
| Calculated by | <input type="text" value="GH"/>         |
| Reference     | <input type="text" value="317212"/>     |
| Model version | <input type="text" value="2.2.3"/>      |

## Location

|               |                                           |
|---------------|-------------------------------------------|
| Site name     | <input type="text" value="Lime Down C1"/> |
| Site location | <input type="text"/>                      |



|                                       |                                     |
|---------------------------------------|-------------------------------------|
| Site easting (British National Grid)  | <input type="text" value="385375"/> |
| Site northing (British National Grid) | <input type="text" value="182974"/> |

## Site details

|                      |                                  |    |
|----------------------|----------------------------------|----|
| Total site area (ha) | <input type="text" value="0.9"/> | ha |
|----------------------|----------------------------------|----|

# Greenfield runoff

## Method

|        |                                   |
|--------|-----------------------------------|
| Method | <div>FEH statistical (2025)</div> |
|--------|-----------------------------------|

## FEH statistical (2025)

|                                   | <u>My value</u>               | <u>Map value</u> |
|-----------------------------------|-------------------------------|------------------|
| SAAR9120 (mm)                     | <div>889</div> <div>mm</div>  |                  |
| BFIHOST19scaled                   | <div>0.554</div>              |                  |
| QMed-QBar conversion              | <div>1.075</div>              | <div>1.075</div> |
| QMed (l/s)                        | <div>3.4</div> <div>l/s</div> |                  |
| QBar (FEH statistical 2025) (l/s) | <div>3.7</div> <div>l/s</div> |                  |

## Growth curve factors

|                        | <u>My value</u> | <u>Map value</u> |
|------------------------|-----------------|------------------|
| Hydrological region    | <div>8</div>    | <div>8</div>     |
| 1 year growth factor   | <div>0.78</div> |                  |
| 2 year growth factor   | <div>0.93</div> |                  |
| 10 year growth factor  | <div>1.49</div> |                  |
| 30 year growth factor  | <div>1.95</div> |                  |
| 100 year growth factor | <div>2.43</div> |                  |
| 200 year growth factor | <div>2.78</div> |                  |

## Results

|                           |                                   |
|---------------------------|-----------------------------------|
| Method                    | <div>FEH statistical (2025)</div> |
| Flow rate 1 year (l/s)    | <div>2.9</div> <div>l/s</div>     |
| Flow rate 2 year (l/s)    | <div>3.4</div> <div>l/s</div>     |
| Flow rate 10 years (l/s)  | <div>5.5</div> <div>l/s</div>     |
| Flow rate 30 years (l/s)  | <div>7.1</div> <div>l/s</div>     |
| Flow rate 100 years (l/s) | <div>8.9</div> <div>l/s</div>     |
| Flow rate 200 years (l/s) | <div>10.2</div> <div>l/s</div>    |

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

This report was produced using the Greenfield runoff rate estimation tool (2.2.3) developed by HR Wallingford and available at uksuds.com (<https://www.uksuds.com/>). The use of this tool is subject to the UK SuDS terms and conditions and licence agreement, which can both be found at uksuds.com/terms-conditions (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate Greenfield runoff rates. The use of these results is the responsibility of the users of this tool. No liability will be accepted by HR Wallingford, the Environment Agency, Centre for Ecology and Hydrology, Wallingford Hydrosolutions or any other organisation for the use of these data in the design or operational characteristics of any drainage scheme.

## **Appendix E – Causeway Flow 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 | 0.356     | 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     | 475.0     | 475.0         | 0.750     | 664.7     | 675.0         |

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

| Node Event         | US<br>Node | Peak<br>(mins) | Level<br>(m) | Depth<br>(m) | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status |
|--------------------|------------|----------------|--------------|--------------|-----------------|------------------|---------------|--------|
| 1440 minute winter | Storage    | 1410           | 99.981       | 0.731        | 14.0            | 415.0386         | 0.0000        | OK     |

| Link Event<br>(Upstream Depth) | US<br>Node | Link         | Outflow<br>(l/s) | Discharge<br>Vol (m³) |
|--------------------------------|------------|--------------|------------------|-----------------------|
| 1440 minute winter             | Storage    | Hydro-Brake® | 1.0              | 150.6                 |

### 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<br>(ha) | T of E<br>(mins) | Cover<br>Level<br>(m) | Diameter<br>(mm) | Easting<br>(m) | Northing<br>(m) | Depth<br>(m) | Invert<br>Level<br>(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<br>(years) | Climate Change<br>(CC %) | Additional Area<br>(A %) | Additional Flow<br>(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-0031-4000-0750-4000    |
| Design Depth (m)         | 0.750  | Min Outlet Diameter (m) | 0.075                          |
| Design Flow (l/s)        | 0.4    | 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) | 76     |

| Depth<br>(m) | Area<br>(m²) | Inf Area<br>(m²) | Depth<br>(m) | Area<br>(m²) | Inf Area<br>(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<br>Node | Peak<br>(mins) | Level<br>(m)     | Depth<br>(m)          | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status |
|--------------------------------|------------|----------------|------------------|-----------------------|-----------------|------------------|---------------|--------|
| 60 minute winter               | Storage    | 60             | 99.663           | 0.413                 | 2.8             | 3.1348           | 0.0000        | OK     |
| Link Event<br>(Upstream Depth) | US<br>Node | Link           | Outflow<br>(l/s) | Discharge<br>Vol (m³) |                 |                  |               |        |
| 60 minute winter               | Storage    | Hydro-Brake®   | 0.3              | 4.1                   |                 |                  |               |        |

### 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 | 0.900     | 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-0072-2300-1000-2300    |
| Design Depth (m)         | 1.000  | Min Outlet Diameter (m) | 0.100                          |
| Design Flow (l/s)        | 2.3    | Min Node Diameter (mm)  | 1200                           |

### Node Storage Depth/Area Storage Structure

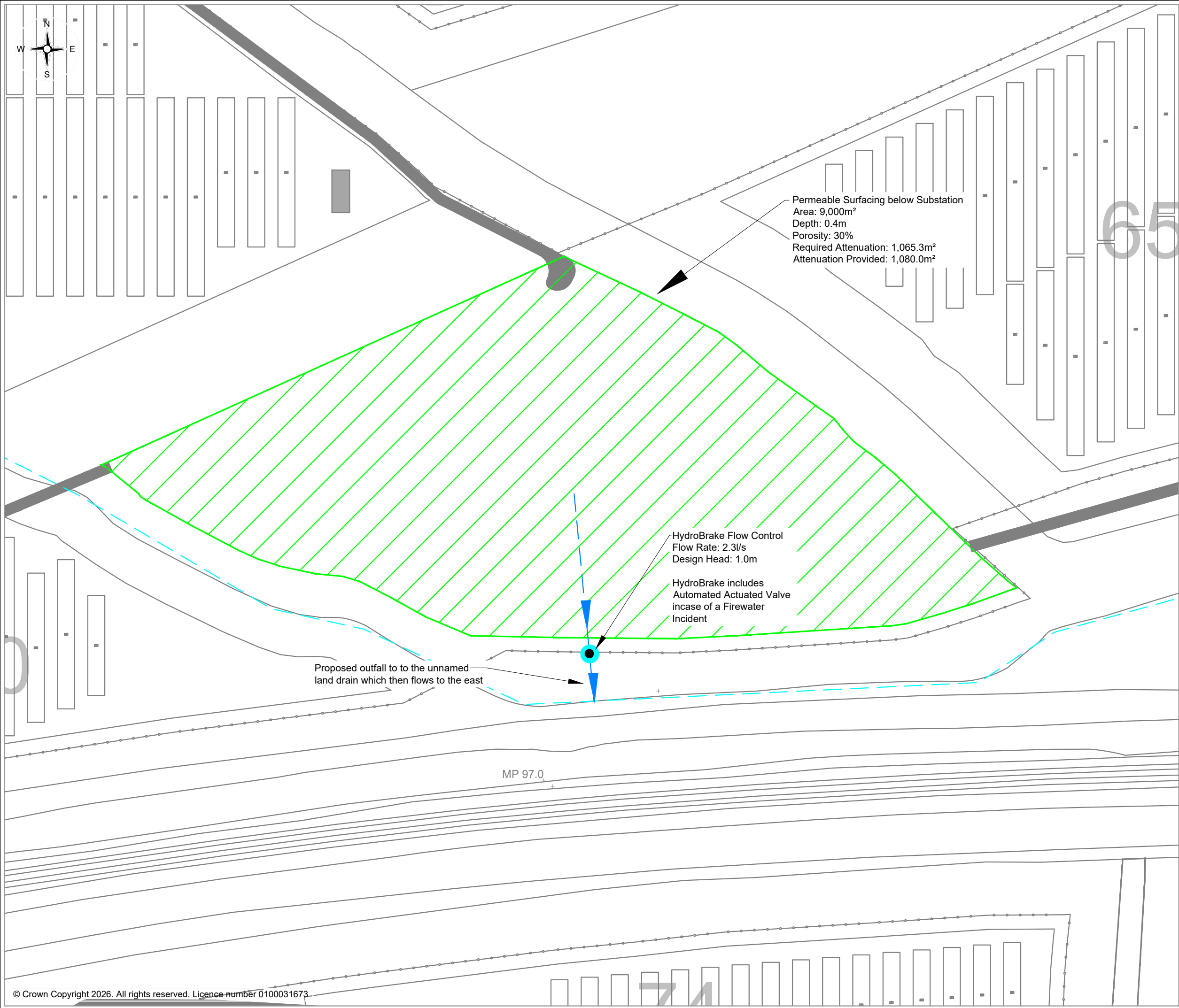
|                             |         |               |      |                           |        |
|-----------------------------|---------|---------------|------|---------------------------|--------|
| Base Inf Coefficient (m/hr) | 0.00000 | Safety Factor | 2.0  | Invert Level (m)          | 99.000 |
| 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     | 1000.0    | 1000.0        | 1.000     | 1364.6    | 1384.3        |

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

| Node Event                     | US<br>Node | Peak<br>(mins) | Level<br>(m)     | Depth<br>(m)          | Inflow<br>(l/s) | Node<br>Vol (m³) | Flood<br>(m³) | Status |
|--------------------------------|------------|----------------|------------------|-----------------------|-----------------|------------------|---------------|--------|
| 1440 minute winter             | Storage    | 1440           | 99.913           | 0.913                 | 35.5            | 1065.3280        | 0.0000        | OK     |
| Link Event<br>(Upstream Depth) | US<br>Node | Link           | Outflow<br>(l/s) | Discharge<br>Vol (m³) |                 |                  |               |        |
| 1440 minute winter             | Storage    | Hydro-Brake®   | 2.3              | 338.6                 |                 |                  |               |        |

## **Annex F – SuDS Maintenance Schedule Outline** **Drainage Sketch**



Legend:

- 132kV Substation
- Proposed Surface Water Flow Route
- Proposed HydroBrake with inclusion of Automated Valve
- Existing Unnamed Land Drain

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 Ltd**  
13 Henderson Road,  
Inverness,  
IV1 1SN  
info@arthian.com  
+44 (0) 141 227 2300  
https://www.arthian.com

Client: **Island Green Power**

Site: **Lime Down**

Drawing Title: **Lime Down C1 Drainage Sketch**

|                      |                  |                                 |
|----------------------|------------------|---------------------------------|
| Date:<br>05 Aug 2026 | Scale:<br>1:1000 | Paper Size:<br>A3 (297 x 420mm) |
|----------------------|------------------|---------------------------------|

|                 |                   |                     |                      |
|-----------------|-------------------|---------------------|----------------------|
| Drawn By:<br>GH | Checked By:<br>JR | Status:<br>Final v1 | Final Revision:<br>- |
|-----------------|-------------------|---------------------|----------------------|

|                                         |                                              |
|-----------------------------------------|----------------------------------------------|
| CAD Ref:<br>317212 11.4_Drainage_Layout | Drawing No: / Client Ref:<br><b>Figure 1</b> |
|-----------------------------------------|----------------------------------------------|

## **Annex FG – SuDs Maintenance Schedule**

# Bioretention Systems Maintenance Schedule

| Maintenance Schedule          | Required Action                                                                                                                                                                                         | Typical Frequency                                                |
|-------------------------------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------|
| <b>Regular inspections</b>    | 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                                                        |
| <b>Regular maintenance</b>    | 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                                          |
| <b>Occasional maintenance</b> | 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                                                      |
| <b>Remedial actions</b>       | 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                                                                                                     |
|-----------------------------|------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------------------------------------------------------------------|
| <b>Regular Maintenance</b>  | 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)                                                                                   |
| <b>Occasion Maintenance</b> | 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) |
| <b>Remedial Actions</b>     | 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           |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------|
| <b>Regular Maintenance</b>    | 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 |
| <b>Occasional Maintenance</b> | 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                                    |
|----------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------|
| <b>Regular Inspections</b> | 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                     |
| <b>Regular Maintenance</b> | 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                           |
| <b>Remedial Actions</b>    | 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                                      |
|-------------------------------|----------------------------------------------------------------------------------------------------------------|--------------------------------------------------------|
| <b>Regular Maintenance</b>    | 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                     |
| <b>Occasional Maintenance</b> | 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                                            |
| <b>Remedial Actions</b>       | 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                                            |
| <b>Monitoring</b>             | Inspect inlets, outlets and overflows for blockages, and clear if required                                     | <b>Monthly</b>                                         |
|                               | Inspect banksides, structures, pipework etc for evidence of physical damage                                    | <b>Monthly</b>                                         |
|                               | Inspect inlets and pre-treatment systems for silt accumulation; establish appropriate silt removal frequencies | <b>Half yearly</b>                                     |
|                               | 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                                                                                                                                                                                                                                                                                                            |
|-------------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Regular Maintenance</b>    | 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 |
| <b>Occasional Maintenance</b> | Stabilise and mow contributing and adjacent areas                                                                                                                                    | As required                                                                                                                                                                                                                                                                                                                  |
|                               | Removal of weeds or management using glyphosate applied directly into the weeds by an applicator rather than spraying                                                                | As required - once per year on less frequently used pavements                                                                                                                                                                                                                                                                |
| <b>Remedial Actions</b>       | 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)                                                                                                                                                                                                                     |
| <b>Monitoring</b>             | 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    | <b>Inlets, outlets and surface control structures –</b><br>Inspect surface structures, removing obstructions and silts as necessary. Check there is no physical damage.<br><br>Strim Vegetation 1 m min. surround to structures and keep hard aprons free from silt and debris. | Monthly           |
|                        | <b>Inspect chambers and below-ground control chambers –</b><br><br>Remove cover and inspect, ensuring that water is flowing freely and that the exit route for water is unobstructed. Remove debris and silt.<br><br>Undertake inspection after leaf fall in autumn.            | Monthly           |
| Occasional Maintenance | Check topsoil levels are 20mm above edges of baskets and chambers to avoid mower 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 to a 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                   |
|----------------------------|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------|
| <b>Regular maintenance</b> | 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            |
| <b>Remedial actions</b>    | Repair/rehabilitate inlets, outlet, overflows and vents                                                                                                                                                | As required                         |
| <b>Monitoring</b>          | 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                                                                   |
|-------------------------------|----------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------|
| <b>Regular Maintenance</b>    | 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                                                                         |
| <b>Occasional Maintenance</b> | 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 |
| <b>Remedial Actions</b>       | 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

---

<sup>i</sup> <https://www.google.co.uk/maps>

<sup>ii</sup> <https://www.bgs.ac.uk/map-viewers/geoindex-onshore/>

<sup>iii</sup> <https://flood-map-for-planning.service.gov.uk/>

<sup>iv</sup> <https://check-long-term-flood-risk.service.gov.uk/postcode>

<sup>v</sup> <https://environment.data.gov.uk/hydrology/climate-change-allowances/river-flow>