OUTLINE DRAINAGE STRATEGY

NINFIELD GREENER GRID PARK

JULY 2021

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TABLE OF CONTENTS

1 INTRODUCTION

1.1 Background

Statkraft UK LTD ('the Applicant') is proposing the installation of a Greener Grid Park ('the Development') on greenfield land immediately to the south west of Ninfield substation, approximately 1.5 kilometres (km) to the south east of Ninfield ('the Site') at approximate Nation Grid Reference: E 572217, N 111785.

The Site Layout, including all proposed infrastructure, is shown in Appendix A and further detail is included in the Planning Design and Access Statement and suite of Planning Drawings which are submitted as part of the planning application.

Arcus Consultancy Services Ltd ('Arcus') has been commissioned by the Applicant to undertake an Outline Drainage Strategy ('ODS') in relation to the Development.

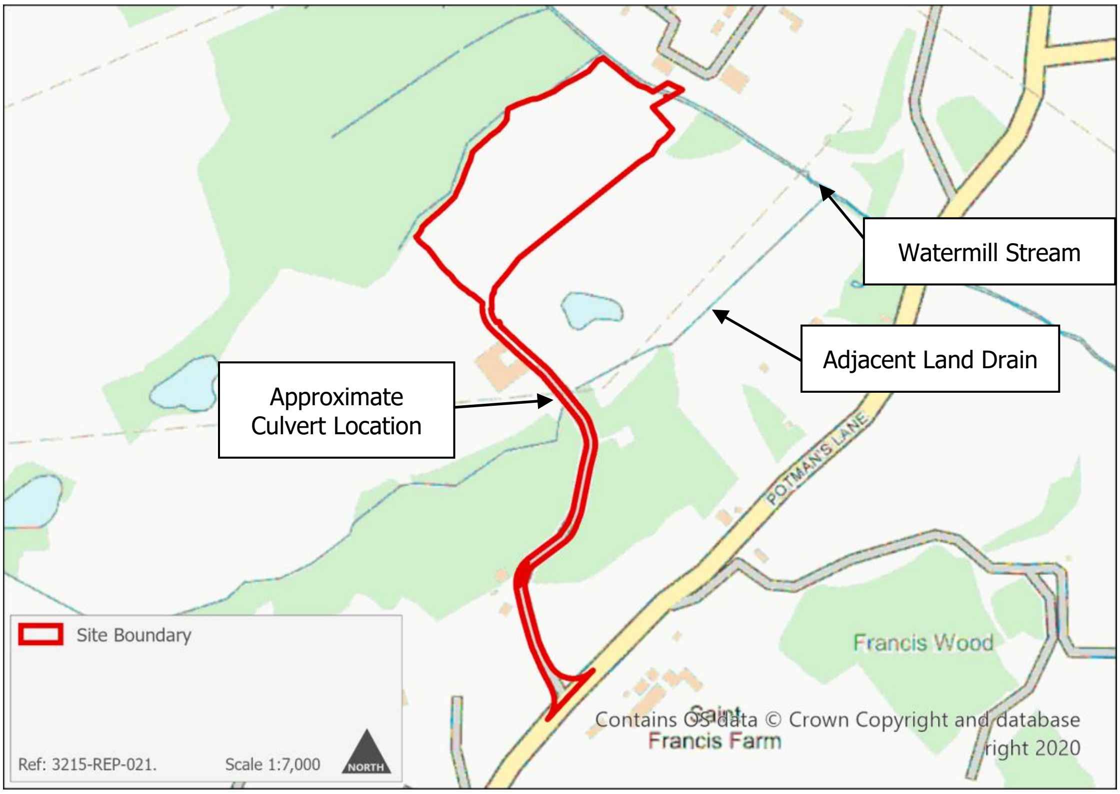
An Outline Drainage Layout is shown in Appendix B of this report.

1.2 Site Characteristics

The Site is located to the west of Potman's Lane, Ninfield as shown in Plate 1. The Site area measures approximately 2.58 hectares (ha). The Site is undeveloped and currently comprises pastoral agricultural land and is bounded by agricultural land to the east and west, agricultural land and infrastructure to the south and Watermill Stream and the Ninfield 400kV Substation to the north, as shown in Plate 1.

The area which will comprise of the proposed Development infrastructure ('the Development Area') measures approximately 1.7 ha in area and is located in the north of the Site and excludes the existing access track from the south.

Plate 1: Site Location and Surrounding Hydrological Network



Watermill Stream runs along the north of the Site in an easterly direction before reaching its tributary with Combe Haven approximately 4.4 km south east of the Site, with the watercourse draining the surrounding Ninfield and Catsfield catchment.

An open drain is located approximately 130 metres (m) east of the Site which serves the surrounding agricultural land, Kiln Wood and Staplehurst Wood to the south of the Site. The source of the land drain is a pond within Staplehurst Wood approximately 1 km south of the Site, flowing in a northerly direction towards Watermill Stream. The land drain is shown to be culverted beneath the existing access route to the Site.

A topographical survey of the site has been conducted by Ratcliffe Land and Engineering Surveys Ltd in February 2021 and is available in Appendix C. The topographical survey indicates elevations falls west to east from the Site towards Watermill Stream, with elevations ranging from approximately 17 to 31 m Above Ordnance Datum (m AOD).

The Site is currently freely draining in accordance with Site topography with no formal drainage network. In order to demonstrate the Site's existing drainage flow route a 2D hydraulic model has been designed in Flood Modeller software, with flow routing outputs to 1 m resolution shown in Appendix D.

1.3 Geology and Soils

The British Geological Survey (BGS) Borehole Scans[1] show a borehole scan approximately 80 m east of the Site. This record indicates that grounds near the Site comprise clay and hard marl and shale stratum to depths of 15 m below ground level (bgl). Water was encountered at depths of approximately 1.8 m, but no groundwater rest level was recorded as being present to depths of 15 m bgl.

A BGS Borehole log[2] approximately 75 m north of the Site indicates grounds at the scan comprise clay-based marl stratum to depths of 9.6 m. Groundwater was encountered at depths of 2.7 m.

A BGS Borehole log[3] approximately 75 m north of the Site indicates grounds at the scan comprise clay-based marl and shale stratum to depths of 9.6 m. Groundwater was encountered at depths of 2.4 m, assessed as the highest rest level of groundwater within the vicinity of the Site.

National Soil Resource Institute (NSRI) maps indicate the soils overlying the Development are defined as slowly permeable seasonally wet acid loamy and clay-based soils with impeded drainage[4].

1.4 Proposed Development Infrastructure

The Development Area measures approximately 1.7 ha, with the existing Site access from Astwood Lane not incorporated into the Development area. The Development Area comprises land where the BESS infrastructure is to be located and the extension to the proposed existing access route.

A total impermeable area of 0.17 ha has been calculated via the Site Layout, as detailed further in Table 1.

The proposed access tracks will comprise of permeable materials (e.g., Type 2 aggregate) and will be free draining and are therefore excluded from the total impermeable areas.

The proposed battery units, inverters, communications house and welfare facility shown in Appendix A will be raised from the ground via plinths, meaning the available area for

[1] British Geological Survey, Borehole Scans. Node: 691292. [Online]. Available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/691292/images/12564298.html
[2] British Geological Survey, Borehole Scans. BGS ID: 691288 [Online]. Available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/691288/images/12564294.html
[3] British Geological Survey, Borehole Scans. BGS ID: 391291. [Online]. Available at: http://scans.bgs.ac.uk/sobi_scans/boreholes/691291/images/12564297.html
[4] National Soil Resource Institute Map [online] Available at: https://www.landis.org.uk/soilscapes/.

infiltration will remain as per the baseline. As such the Development will not result in any significant increase in impermeable areas.

Table 1: Proposed Impermeable Areas

Hardstanding Infrastructure	**Area of Hardstanding (m^2)**
HV Compound	366
Transformers	210
Switch House	80
Cooler Unit	92
Emergency Back Up Generator	22
E House and EMS Building	799
13 kV Reactor	112
Switchgear Container	30
Total Hardstanding (m^2):	**1711 m^2**
Total Hardstanding (ha):	**0.17**

1.5 Stakeholder Consultations

In accordance with Table 3A.1 and 3F.1 of the ESCC SuDS Guidance[5] consultations have been held with the appropriate stakeholders, as detailed in Table 2.

Such consultations indicate that the relevant consultees agree in principle with the proposed approach to the Outline Drainage Strategy.

Table 2: Conducted Consultations

Consultee	**Consultation Format**	**Consultations Summary**	**Location**
East Sussex County Council (LLFA)	Email	Arcus contacted ESCC in July 2020 to confirm that drainage via infiltration is unfeasible at the Site due to underlying ground conditions, and as such BRE 365 testing is not be required. ESCC confirmed that BGS borehole records can be utilised to demonstrate the unsuitable grounds for infiltration drainage.	Appendix E
Rother District Council	Email	The RDC Planning Application Requirements[6] indicate that the LLFA should be contacted to discuss SuDS, as per above.	Appendix E
Pevensey and Cuckmere IDB	Email	Arcus contacted Pevensey and Cuckmere IDB ('the IDB') in November 2020, with the proposed surface water flows discharging into Watermill Stream, which is upstream of the IDB operational boundary. The IDB indicated that runoff rate should be set 'as low as possible', with the Qbar rate utilised for all events with an occurrence of less than the 1:2.33-year return period and the greenfield rate for the 1:1-year return period. Such consultation also indicated that the Development could be subject to a surface	Appendix F

[5] East Sussex County Council, Guide to SuDS in East Sussex (2015). [Online]. Available at: https://www.eastsussex.gov.uk/media/1995/guide-to-sustainable-drainage-systems-in-east-sussex2.pdf

[6] Rother District Council, National and Local List of Planning Application Requirements (2013). [Online]. Available at: https://www.rother.gov.uk/wp-content/uploads/2020/01/Post_NPPF_Planning_Validation_Document___DaSA_update_November18.pdf

		water development contribution as the Site will indirectly input flows into the IDB catchment. As such the IDB Ordinary Watercourse Consent will be sought with the appropriate surface water development contribution being provided. Such consultation indicated that all forms of flood risk are to be assessed in order to prevent uncontrolled discharge from the Development and as such groundwater monitoring may be required. The site-specific Flood Risk Assessment details how due to the underlying geology comprising clays to significant depths, groundwater fluctuations are unlikely and as such is the groundwater will not lead to increased runoff. The SuDS design should be informed by groundwater monitoring to take place between Autumn and Spring.	
Environment Agency	Email	Arcus contacted the EA as part of the Product 4 data request process in January 2021. Such consultation indicated that as the proposed outfall will be outside of the 'Main River' categorisation outfall consent will be sought from the LLFA, as detailed above.	Appendix G

2 DRAINAGE DESIGN PARAMETERS

2.1 Greenfield Run-off Rates

Calculations were derived using the Interim Code of Practice for Sustainable Drainage Systems ('ICP SuDS') Mean Annual Flood method using Micro Drainage software and are shown in Appendix H of this Report.

The Development lies within Hydrological Region 7 of the UK.

The application of this approach leads to mean peak greenfield flow rates from the Development Area for the 1-year, 30-year and 100-year return periods as well as Q_{BAR}, as shown in Table 3.

Table 3: Development Area Estimated Greenfield Run-off Flow Rates (Q) (taken from Micro Drainage)

Return Period	Q (l/s)
Q_{BAR}	8.1
1	6.9
30	18.3
100	25.8
1000	41.8

2.2 Hierarchical Drainage Options

In accordance with the SuDS Manual, the information within Table 4 outlines the most appropriate option to dispose of surface water from the Development along with the rationale.

Table 4: Disposal of Surface Water based on the SuDS Hierarchy

Disposal Route	Feasibility	Reason
Re-use onsite	×	Site will be unmanned with infrequent maintenance visits, therefore no demand for water re-use.
Infiltrate to ground	×	As discussed in Section 1.3 the onsite geology comprises of clay-based marl stratum to depths of 15 m, overlain with slowly permeable seasonally wet acid loamy and clay-based soils. Acknowledging the limited permeability of the onsite geology, the Site would have limited capacity to infiltrate. In order to confirm the suitability of infiltration at the Site, Pevensey and Cuckmere IDB and the LLFA have been consulted, who have confirmed that drainage by the means of infiltration is not feasible at the Site, as shown in Table 2. Therefore, drainage via infiltration is unfeasible and it is proposed that the additional runoff will be addressed through *discharge to a natural watercourse* as per the aforementioned drainage hierarchy.
Discharge to watercourse	✓	As discussed in Section 1.2 the onsite topography falls towards Watermill Stream and as such any proposed drainage network could utilise the natural topography of the Site.
Discharge to surface water sewer	×	The Watermill Stream is an appropriate outlet for surface water flows.
Discharge to combined sewer	×	The Watermill Stream is considered an appropriate outlet for surface water flows.

Acknowledging the lack of available surface water discharge options, the proposed SuDS network will attenuate and discharge surface water runoff *to a natural watercourse* as per the above drainage hierarchy.

The proposed surface water drainage network will be designed to attenuate and discharge flows without overtopping in up to a 1:100-year (+40% climate change allowance) event.

Further details of the proposed drainage scheme are detailed in Section 3 of this report.

2.3 Proposed Discharge Rates

As the access track is already located at the Site, the Development Area is the element of the Development which will be served by the proposed SuDS network. Therefore, the following SuDS design is based upon greenfield runoff calculations for the 1.7 ha Development Area.

As detailed in Section 2.2 the calculated greenfield runoff rate (Q_{BAR}) for the Development Area Site is 8.1 l/s.

Following consultation with the IDB, as detailed in Table 2, the Qbar rate will be utilised for events above the 1:2.33-year return period and the 1:1-year greenfield rate for the 1:1-year and 1:2-year return periods.

As such the proposed SuDS network will discharge at 8.1 l/s without overtopping in up to the 1:100-year (+40%) event, with a rate of 6.9 l/s during the 1:1-year and 1:2-year (+40%) events without overtopping.

2.4 Proposed Drainage Network

Acknowledging the unfeasibility of reuse of water onsite and infiltration, it is proposed that the onsite drainage network will discharge into Watermill Stream to the north of the Site. Surface water flows will be attenuated and discharged to the watercourse at the greenfield runoff rate.

As discussed in Section 2.2 the onsite topography falls south west to north east towards Watermill Stream and as such any proposed drainage network could utilise the natural topography of the Site to limit the requirement for pumping of surface water.

The outline surface water drainage schematic is shown in Appendix B.

3 OUTLINE DRAINAGE STRATEGY

3.1 SuDS Measures

The measures outlined in the following Sections will be implemented by the Developer's Contractor to ensure that greenfield runoff rates are maintained during the construction and operational phases of the Development. Should the measures or locations differ to what is outlined within this DIA, then the final detailed drainage design will be provided by the Contractor prior to construction.

The Developer's Contractor will adhere to the following guidance:

- DEFRA: Sustainable Drainage Systems: non-statutory technical standards for sustainable drainage systems[7];
- The Construction Industry Research and Information Association (CIRIA), Environmental Good Practice on Site (C741)[8];
- CIRIA, The SuDS Manual (C753)[9]; and
- CIRIA, Control of Water Pollution from Linear Construction Sites (C649)[10]

3.2 Required Storage Volumes

Acknowledging Table 3.F.1 Outline Design Checklist of the ESCC SuDS Guidance the proposed drainage network will make allowances for climate change relative to Table 2 from DEFRA guidance on climate change[11] which has been recreated in Table 5 below.

Table 5: Climate Change Allowance

	Design Life 2015 - 2039	Design Life 2040-2069	Design Life 2070-2115
Upper End Projection	10%	20%	40%
Central Projection	5%	10%	20%

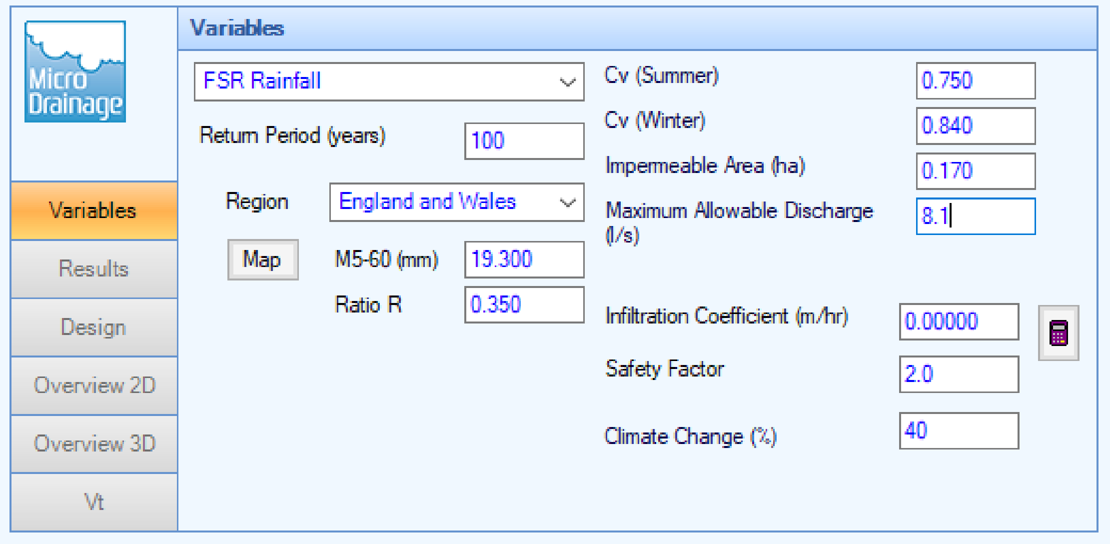
[7] DEFRA, Sustainable Drainage Systems: non-statutory technical standards for sustainable drainage systems (2015). [Online]. Available at: https://www.gov.uk/government/publications/sustainable-drainage-systems-non-statutory-technical-standards
[8] CIRIA, Environmental Good Practice on Site (C741) (2015). [Online]. Available at: https://www.ciria.org/Training/Training_courses/Environmental_good_practice_on_site.aspx
[9] CIRIA, The SuDS Manual (C753) (2015). [Online]. Available at: https://www.susdrain.org/resources/SuDS_Manual.html
[10] CIRIA, Control of Water Pollution from Linear Construction Sites (C649) (2006). [Online]. Available at: https://www.ciria.org/ItemDetail?iProductCode=C649&Category=BOOK&WebsiteKey=3f18c87a-d62b-4eca-8ef4-9b09309c1c91
[11] DEFRA, Climate Change Allowances (2020). [Online]. Available at: https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Acknowledging the sensitive nature of the Site the Upper End Projection should be applied. The assumed design life is to exceed 50 years (from 2024) and as such a climate change allowance of 40% will be incorporated into drainage calculations ('+40% CC').

In order to prevent an increase in surface water runoff the proposed drainage network will limit flows to the greenfield runoff rate of 8.1 l/s as detailed in Section 2.3 in up to the 1:100-year (+40%) event and 6.9 l/s during the 1:1-year and 1:2-year (+40%) events.

The overall storage required is shown in Plate 2 and 3 for the 1:100-year (+40%) and 1:1 (+40%) event respectively, as calculated in the Source Control module of Micro Drainage.

Plate 2: 1:100-Year (+40%) Surface Water Storage Estimate (Taken from Micro Drainage)



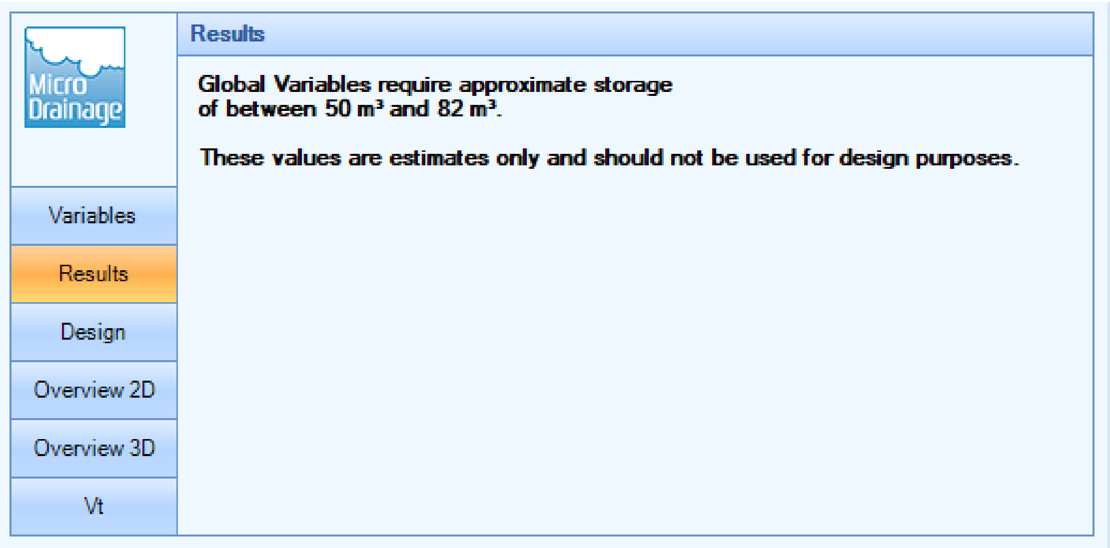
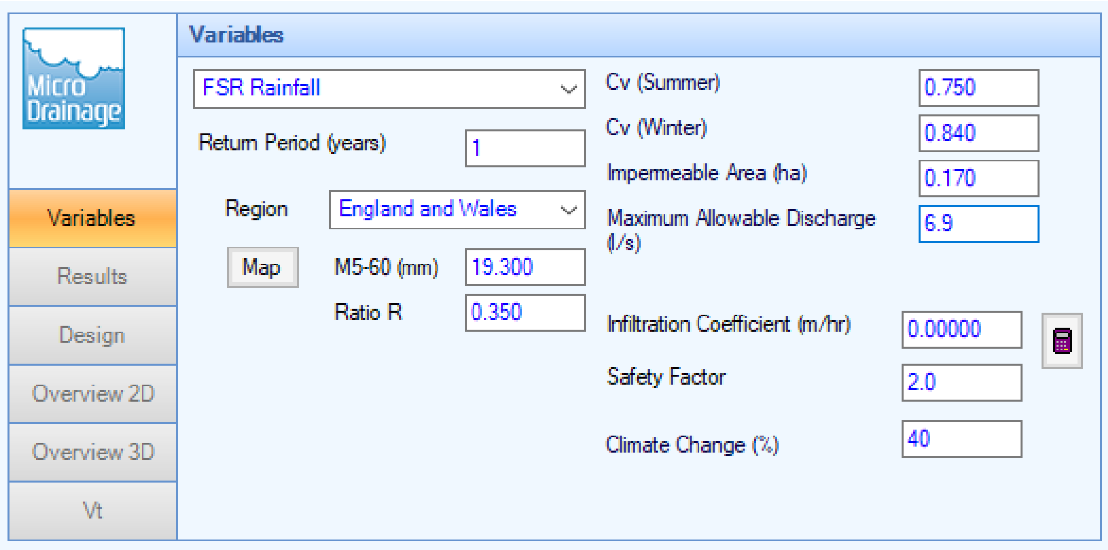
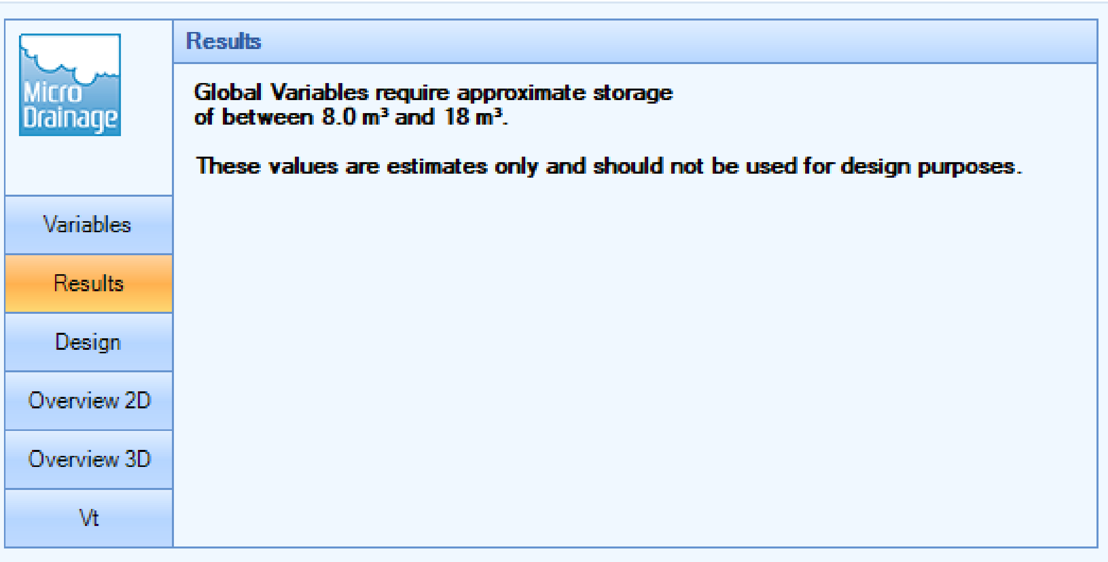


Plate 3: 1:1-Year (+40%) Surface Water Storage Estimate (Taken from Micro Drainage)





3.3 Outline Surface Water Drainage Design

In order to restrict surface water flows to the Q_{BAR} and greenfield values a pond will be implemented to the north of the Site, as shown in Appendix C. This pond will attenuate surface water before discharging into the Watermill Stream through an outfall pipe at the greenfield runoff rate.

In order to restrict discharge to greenfield rates, a Hydro-Brake (or other flow restricting device) should be placed on the manhole upstream of the outfall of the pipe.

As per Section 1.3 BGS Borehole logs indicate surrounding grounds comprise clay-based marl and shale stratum, with the highest surrounding groundwater rest level of 2.4m bgl. As such no attenuation feature shall be at depths of less than 1 m above the existing groundwater level i.e., 1.4 m bgl.

The design parameters for the proposed attenuation pond are as follows:

- Total area[12]: 111.5 m^2;
- Base area: 12 m^2;

[12] Defined in SuDS calculations (Appendix I) as 111.4 m^2 but rounded up to 111.5 m^2 for design purposes.

- Depth: 1 m; and
- Slope: 1 in 4.

As detailed in Section 2.3 the proposed SuDS pond will be designed to attenuate surface water to the 1:100-year (+40%) event to the Q_{BAR} rate, with flows limited to the 1:1-year greenfield event during the 1:1 and 1:2 year events.

The proposed attenuation basin is shown to attenuate water levels with no flooded volume during the critical storm duration in up to and including the 1:100-year (+40% CC) event, as shown in Plates 4 to 8.

Outline design parameters have been validated for a number of storm durations for the 1:1-year, 1:2-year, 1:30 year, 1:100-year and 1:1,000-year (+40%) return periods and can be found in Appendix I.

Plate 4: 1:1,000-year (+ 40%) Critical Storm Event (Taken from Micro Drainage)

Storm Event	Rain (mm/hr)	Time to Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Flooded Volume (m³)	Max Control (l/s)	Discharge Volume (m³)	Σ Max Outflow (l/s)	Maximum Volume (m³)	Status
120 min Winter	57.084	114	1.474	1.474	52.8	9.7	163.0	9.7	106.2	FLOOD

Plate 5: 1:100-year (+ 40%) Critical Storm Event (Taken from Micro Drainage)

Storm Event	Rain (mm/hr)	Time to Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Flooded Volume (m³)	Max Control (l/s)	Discharge Volume (m³)	Σ Max Outflow (l/s)	Maximum Volume (m³)	Status
60 min Winter	54.663	60	0.994	0.994	0.0	8.1	78.1	8.1	52.6	Flood Risk

Plate 6: 1:30-year (+ 40%) Critical Storm Event (Taken from Micro Drainage)

Storm Event	Rain (mm/hr)	Time to Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Flooded Volume (m³)	Max Control (l/s)	Discharge Volume (m³)	Σ Max Outflow (l/s)	Maximum Volume (m³)	Status
60 min Winter	41.595	58	0.826	0.826	0.0	8.1	59.4	8.1	36.1	Flood Risk

Plate 7: 1:2-year (+ 40%) Critical Storm Event (Taken from Micro Drainage)

Storm Event	Rain (mm/hr)	Time to Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Flooded Volume (m³)	Max Control (l/s)	Discharge Volume (m³)	Σ Max Outflow (l/s)	Maximum Volume (m³)	Status
30 min Winter	34.229	32	0.504	0.504	0.0	6.9	24.4	6.9	14.4	O K

Plate 8: 1:1-year (+ 40%) Critical Storm Event (Taken from Micro Drainage)

Storm Event	Rain (mm/hr)	Time to Vol Peak (mins)	Max Water Level (m)	Max Depth (m)	Flooded Volume (m³)	Max Control (l/s)	Discharge Volume (m³)	Σ Max Outflow (l/s)	Maximum Volume (m³)	Status
30 min Winter	26.556	30	0.397	0.397	0.0	6.9	19.0	6.9	9.7	O K

The proposed SuDS Pond is shown to attenuate and discharge surface water to the greenfield runoff rate without flooding in up to and including the 1:100 (+40%) event.

3.4 Excess Flow Event

In accordance with *Table 3F.1* of the ESCC SuDS Guidance the 1:1,000-year event has been included in order to demonstrate how flows in excess of the design event will be managed safely.

As shown in Plate 4 during the 1:1,000-year event the proposed SuDS pond will overtop, with maximum depths of 0.47 m when considering the depth of the pond. During such an event outflow from the SuDS network serving the Development is limited to 9.7 l/s. As shown in Appendix H, during such an event the greenfield runoff rate is calculated at 41.8 l/s. As such the SuDS network will provide additional storage capacity to the surrounding catchment, whilst providing an approximate 76.8% reduction in runoff during the 1:1,000-year (+40%) event.

Due to the proximity of the SuDS pond to the surrounding watercourse overtopping waters will flow towards Watermill Stream in line with surrounding topography of the catchment, with no flows inundating the Development or surrounding areas. In order to demonstrate the overland flows during the 1:1,000-year event a 2D hydraulic model has been designed in Flood Modeller utilising a rainfall profile design with the Flood Studies Report (FSR) method in Micro Drainage, as shown in Appendix J.

The output of the hydraulic model show that general overland flows follow general site topography, with flows ultimately leading towards Watermill Stream, as shown in Appendix D. During such an event flows emanating from the SuDS pond will therefore not inundate the Development or surrounding areas and will disperse into the Watermill Stream at a redcued rate relative to the baseline scenario.

3.5 East Sussex County Council Benefits of SuDS

Appendix K details how the proposed SuDS network satisfies the role of SuDS in providing benefit detailed within Table 1.1 of the ESCC SuDS Guidance, also defined within the ESCC Water, People and Places ('WPP')[13].

3.6 East Sussex Outline SuDS Design Checklist

Appendix L details how the proposed SuDS network satisfies the requirements detailed within *Table 3F.1* of the ESCC SuDS Guidance.

3.7 Construction Phase

The nature of hydrological incidents that could result from construction activities shall be mitigated through the implementation of construction phase SuDS and the application of industry good practice as per CIRIA Guidance (C741)[14].

To prevent any sediment, increase in associated runoff during the construction phase SuDS measures such as the use of swales and interception bunds will effectively prevent sediment entering surrounding watercourses.

The implementation of such construction phase SuDS is to be confirmed with the Environment Agency and East Sussex County Council prior to the construction phase.

3.8 Operation and Management Plan

It will be the responsibility of the Development operator to maintain effective drainage measures and rectify drainage measures that are not functioning adequately. A nominated person will also have responsibility for reporting on the functionality of drainage measures.

Where impermeable areas remain through the lifetime of the Development, the SuDS measures serving these areas will be checked on a regular basis. Should drainage measures require dredging or unblocking, this will be undertaken as soon as practicable by a local contractor engaged by the management company.

A maintenance schedule will be undertaken by the appointed management company, as outlined in Appendix M.

3.9 Timescales

Drainage measures outlined within this report should be implemented as soon as practical by the Developer's Contractor but in any event before the construction of any impermeable surfaces which are proposed to drain into the approved drainage system.

[13] LLFAs of South East England and AECOM, Water People Places. [Online]. Available at: https://www.eastsussex.gov.uk/media/1997/se7-suds-masterplanning_low_res_reduced.pdf

[14] The Construction Industry Research and Information Association (CIRIA), (2015), Environmental Good Practice on Site Guide (C741), CIRIA: London.

Measures such as drainage pipes should be installed at the same time as the excavations, or as soon as practicable thereafter.

3.10 Foul Water Drainage

During construction of the Development foul water will be disposed of via 'Port-a-loo' type facilities and disposed of via a licenced waste carrier.

During the operational phase the Development is to be primarily unmanned, with ad-hoc maintenance checks being the only time in which the Site will accommodate staff. As such there will be no foul water discharge from the Site and no foul water drainage discharge systems are deemed necessary.

3.11 Consents

As Watermill Stream is a designated Main River[15], a Flood Risk Activity Permit will be required from the EA to discharge to this location, which will be sought following the submission of the planning application.

Although the Site is outside the operational boundary of the IDB, surface water runoff shall discharge into the IDB's catchments. As such the proposed discharge rates detailed within this report have been implemented following consultations with the IDB. This agreement could also incorporate a contribution towards a Surface Water Development Contribution prior to construction if required.

3.12 Upcoming Phase of Design

As detailed in Table 2 Pevensey and Cuckmere Water Level Management Board required SuDS design to be informed by groundwater monitoring to be conducted during Autumn to Spring as a minimum.

Section 1.3 of this report outlines the nature of the surrounding geology, which generally comprises clay-based stratum to significant depths with a minimum groundwater rest level of 2.4 m bgl. Given the shallow design depth of the SuDS feature relative to the potential groundwater rest level at the Site, the proposed SuDS network shall not impede upon the groundwater table within the vicinity.

Should such groundwater monitoring still be required it is deemed appropriate for such works to be requested and detailed via an appropriately worded planning condition.

4 CUMULATIVE IMPACTS

A battery storage facility located approximately 500 m east of the Site received planning approval from RDC in April 2021[16]. Given the close proximity of the approved Development the potential cumulative impacts in relation to surface water runoff should be considered to ensure the combination of both Developments will not result in any significant increase in runoff within the surrounding catchment.

The nearby approved Development shall utilise permeable gravel storage with attenuated discharge to the Watermill Stream at the greenfield rate. Acknowledging the implementation of a SuDS network at both developments which will attenuate surface water and discharge at the greenfield rate, there will be no significant increase in surface water runoff whilst both developments are operational.

The proposed SuDS network at both developments will provide additional storage capacity within the catchment and potential reduction in runoff during extreme rainfall events.

[15] Environment Agency, Main Rivers Map. [Online]. Available at: https://environment.maps.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386
[16] Rother District Council Planning Reference Number RR/2020/1817/P P.

5 CONCLUSION

The proposed SuDS network detailed in this report comprises a SuDS Pond which will discharge surface water flows emanating from the Development to Watermill Stream via a flow control device.

This report demonstrates that the proposed SuDS network will restrict discharge rates to the greenfield runoff rate and attenuate without surcharge during a 1:100 (+40% CC) year pluvial event, as demonstrated by outputs from Micro Drainage.

Following implementation of the proposed mitigation measures, the introduction of hard-standing associated with the Development will not lead to an increase in discharge rates from the Site above greenfield levels for the 1:100-year (+40% CC) return period.

The proposed SuDS network will provide additional storage capacity within the catchment and potential for a reduction in runoff during extreme rainfall events (i.e., 1:1,000-year +40%).

For lower return periods, the implemented mitigation measures will act to reduce any effects of run-off from the site in the wider catchment relative to the greenfield levels and therefore provide a beneficial effect.

As Watermill Stream is a designated Main River, a Flood Risk Activity Permit will be required from the EA, which will be sought following the submission of the planning application.

The Applicant shall contribute towards a Surface Water Development Contribution prior to construction if required, as per IDB consultations.

The requirements for SuDS detailed within ESCC SuDS Guidance are discussed within Appendix K and L of this report.

APPENDIX A – SITE LAYOUT PLAN

APPENDIX B – OUTLINE SURFACE WATER DRAINAGE LAYOUT

APPENDIX C – TOPOGRAPHIC SURVEY

APPENDIX D –1 IN 1,000-YEAR SURFACE WATER FLOW PATHS

APPENDIX E –EAST SUSSEX COUNTY COUNCIL CONSULTATIONS

APPENDIX F –PEVENSEY AND CUCKMERE WATER LEVEL MANAGEMENT BOARD CONSULTATIONS

APPENDIX G –ENVIRONMENT AGENCY CONSULTATIONS

APPENDIX H –ICPSUDS RURAL RUNOFF CALCULATIONS

APPENDIX I – MICRODRAINAGE SUDS DESIGN OUTPUT

APPENDIX J – FLOOD STUDES REPORT RAINFALL PROFILE

APPENDIX K – EAST SUSSEX COUNTY COUNCIL GUIDE TO SUDS IN EAST SUSSEX TABLE 1.1

Table 1.1: ESCC Benefits of SuDS

Benefit	**Benefit Description**	**Satisfaction Discussion**
Attenuation	Storing and slowly releasing surface water runoff is one of the primary benefits that SuDS offer. The storage may be in plants, soil or constructed spaces and release may be through infiltration, plant up-take or controlled discharge.	As discussed in Section 3 of this report the Site will be served by an attenuation pond to the south, which will discharge into Watermill Stream via a flow control mechanism to limit flow to greenfield runoff rates.
Water Treatment	Pollution typically found in runoff can be harmful to watercourses, groundwater and coastal waters. The soils, gravels, and vegetation present in many forms of SuDS act as filters, removing pollutants, and returning cleansed water to the natural environment.	The Development will not be a manned facility, with only occasional maintenance visits and, as such will not, be heavily trafficked. As such there will be no significant discharge of contaminants emanating from the Development. The Pollution Train tool within Micro Drainage software has been used to detail the potential treatment attributes of the proposed SuDS pond, with outputs shown in Appendix O. This indicates that the proposed SuDS pond has pollution removal capacity of 30 to 90 % for associated pollutants.
Infiltration	SuDS can be used to first cleanse rainwater runoff and then to promote infiltration into the ground to replenish groundwater, in so doing capturing water which would otherwise have been prevented from soaking into the ground by impermeable development.	As discussed in Section 1.3 the onsite geology comprises of clay-based marl stratum to depths of 15 m, overlain with slowly permeable seasonally wet acid loamy and clay-based soils. Acknowledging the limited permeability of the onsite geology the Site would have limited capacity to infiltrate; this methodology has been provided to the associated stakeholders, whom agree.
Water Reuse	Many SuDS features can be used locally to capture, treat and manage water for re-supply of cleansed water to buildings or landscapes. Rainwater harvesting can be installed at a range of scales and re-using rainwater, for non-drinking (non-potable) purposes such as watering land and toilet flushing, will help reduce potable water demand.	Site will be unmanned with infrequent maintenance visits, therefore no demand for water re-use.
Biodiversity and Habitats	SuDS can be designed to include a range of natural processes for managing and filtering surface water runoff. The inclusion of plants, trees, and other vegetation will often help to slow and store water while providing filtration. These features can also be designed to support local biodiversity aims. For	The proposed SuDS pond shall provide an additional natural habitat for native wildlife and fauna. The associated Landscape Mitigation Plan for the Development details the relevant native species which

	instance, SuDS treatment trains can be used to develop ecological corridors as well.	may be implemented at the Site.
Amenity	SuDS that integrate greenery or water features can improve the visual character of a development and in doing so they can also increase a property's value. Access to green space, views of a high quality public realm and street trees have all been shown to increase the resale value of properties.	The Site shall be unmanned within a catchment which is predominantly agricultural and industrial land. The proposed pond shall provide an attenuation feature which can be incorporated into the surrounding natural environment and provide additional aesthetic benefit.
Education	SuDS present an opportunity to educate and engage communities in water management and to stimulate a greater appreciation and respect for urban (city or town) water. If schools and colleges incorporate SuDS on their premises they can be viewed as a valuable learning opportunity for children and students.	The proposed SuDS can be utilised as an educational facility should the Applicant deem this appropriate and safe to do so.
Open Space	Designing green and public space with SuDS that work well when both wet and dry can provide a valuable community recreational space as well as important environmental infrastructure. SuDS can also contribute to development targets for open space where they are designed to be multi-functional.	The SuDS network shall be located within a private energy management facility which shall be unmanned. Due to the unmanned and high voltage nature of the Development the Site cannot not be used as green or public space. The current Site is privately owned agricultural land and therefore the Site does not currently provide public green space.

APPENDIX L – EAST SUSSEX COUNTY COUNCIL GUIDE TO SUDS IN EAST SUSSEX TABLE 3F.1

Table 3F.1: ESCC Outline SuDS Design Checklist

Item	Description	Evidence
Existing Drainage	Details of existing drainage arrangements on site, including catchment areas, contours (or site levels) and any drainage systems to which the site drains.	As shown in Appendix B and Section 3.4 the Site currently drains in accordance with Site topography towards Watermill Stream.
Drainage Layout Plan	A site plan showing the location of SuDS features, conveyance paths, discharge points, storage and treatment areas.	Refer to Appendix C.
SuDS / Drainage Strategy	Evidence demonstrating compliance with Planning Practice Guide on SuDS and the non-statutory technical standards such as runoff destination hierarchy, maintenance and management of runoff on the surface wherever possible.	This report demonstrates compliance with Planning Practice Guide on SuDS and the non-statutory technical standards.
Site Investigations	Site investigations such as topographic survey and ground investigations, including groundwater monitoring. Infiltration (soakage) tests at the location of each proposed infiltration SuDS feature. Soakage tests should be in accordance with BRE365.	As agreed with the associated stakeholders, the underlying grounds shall prevent infiltration drainage and as such infiltration testing has not been conducted. A topographic survey of the Site has been conducted and is shown in Appendix P.
SuDS Benefits	Demonstrate how the SuDS benefits described in Section 1 of this report and 'Water. People. Places' have been incorporated into the design, to create multi-functional SuDS features, including how biodiversity can be compensated and/or enhanced.	Refer to Appendix L.
Discharge and Volumes	Calculations showing the pre-development runoff rates and volumes, and post-development runoff rates together with the size drainage structures.	Refer to Section 3.3 and Appendix H and I. and I.
Climate Change and Urban Creep	Demonstrate consideration of likely impacts of climate change and likely changes in impermeable area within the development over its lifetime[17].	Due to the nature of the Development, there will be no increase in impermeable areas over the development lifecycle. As such the possibility of urban creep does not apply. Climate change allowances have been incorporated into the SuDS design as shown in Section 3.2 and Table 3.
Landscape	Demonstrate how SuDS have been designed to integrate with the beautiful landscape of East Sussex and to link with green infrastructure.	The proposed SuDS pond has been designed in accordance with the SuDS Manual in order to maximise the aesthetic benefit of the network. The Site-specific Landscape Mitigation Plan shall include details of native species which shall be implemented

[17] BS 8582:2013 recommends a 10% increase in impermeable area to take into account urban creep.

		alongside the SuDS to provide a natural embedment into the surrounding area.
Conveyance Routes	Show how runoff would be conveyed between different SuDS features safely.	As discussed in Section 3.7 industry standard good practice shall be applied during the construction of the network in order to ensure flows are safely conveyed. As discussed in Section 3.8 a long-term maintenance plan has been designed for the SuDS pond and network in order to ensure the network operates effectively and safely.
Excess Flows	Show how flows in excess of the design event will be managed safely, including the relevant calculations.	Refer to Section 3.4.
Stakeholder Consultations	Records of correspondence with the relevant stakeholders and regulatory authorities to demonstrate approval has been agreed in principle.	Refer to Table 2.
Offsite Impacts	An assessment of offsite impacts, demonstrating how they have been managed.	As discussed in Section 3.4 during the 1:1,000-year event flows shall not flow from the SuDS pond to the surrounding land.
Drainage Design Code (for multi-phased developments only)	Details of how the principles of the drainage strategy for the whole site will be retained for each phase or plot.	N/A

APPENDIX M – LONG-TERM MAINTENANCE SCHEDULE FOR THE ATTENUATION POND[18]

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

[18] Based on Table 21.3 - Operation and maintenance requirements for attenuation storage tanks of the SuDS Manual

APPENDIX N – MICRO DRAINAGE POLLUTION TRAIN OUTPUT