
**THREE OAKS RENEWABLE
ENERGY PARK
EXTENSION**

**Environmental
Statement Appendix 8.6: Surface Water
Drainage Strategy**

MAY 2026



Surface Water Drainage Strategy

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Contents

1.	Introduction	5
1.1	Overview	5
1.2	Purpose and Scope	5
1.3	Development Proposals	6
1.4	Site Access	7
2.	Understanding the Existing Drainage Regime	9
2.1	Site Description	9
2.2	Greenfield Runoff	9
2.3	Geology	10
2.4	Existing Flood Risk	10
2.5	Groundwater Protection Zones	13
3.	Proposed Drainage Strategy.....	15
3.1	Design Criteria and LLFA Requirements	15
3.2	Following the Drainage Hierarchy	15
3.3	Land Drainage	16
3.4	Culverts	17
3.5	Public Highway, Access Tracks and Hardstanding Areas	17
3.6	Hydraulic Calculations	20
3.7	Water Quality	20
3.8	Biodiversity	21
3.9	Operation and Maintenance	21
4.	Conclusions	24

Table 2.1	Greenfield Runoff	10
Table 3.1	Factors of safety for use in the hydraulic design of infiltration systems	16
Table 3.2	Infiltration Basin Details	19
Table 3.3	Simple Index Approach	20
Table 3.4	Groundwater Risk Assessment – Infiltration within SPZ 2 and SPZ 3	21
Table 3.5	Filter Strips – Operation & Maintenance Schedule	22
Table 3.6	Swales – Operation & Maintenance Schedule	22
Table 3.7	Infiltration Basins – Operation & Maintenance Schedule	23

Figure 1.2	Indicative Site Layout	7
Figure 1.3	Existing Access Junction with A614	8
Figure 2.1	Typical Road Condition	9
Figure 2.2	Fluvial Flood Map	11
Figure 2.3	Pluvial Flood Map (1 in 100 year)	12
Figure 2.4	Pluvial Flood Map (1 in 1,000 year)	12
Figure 2.5	Source Protection Zones	13
Figure 3.1	Estimated Storage Volume	18

Appendix A	Greenfield Runoff Calculations
Appendix B	Drawings
Appendix C	Hydraulic Calculations
Appendix D	Water Quality Assessment

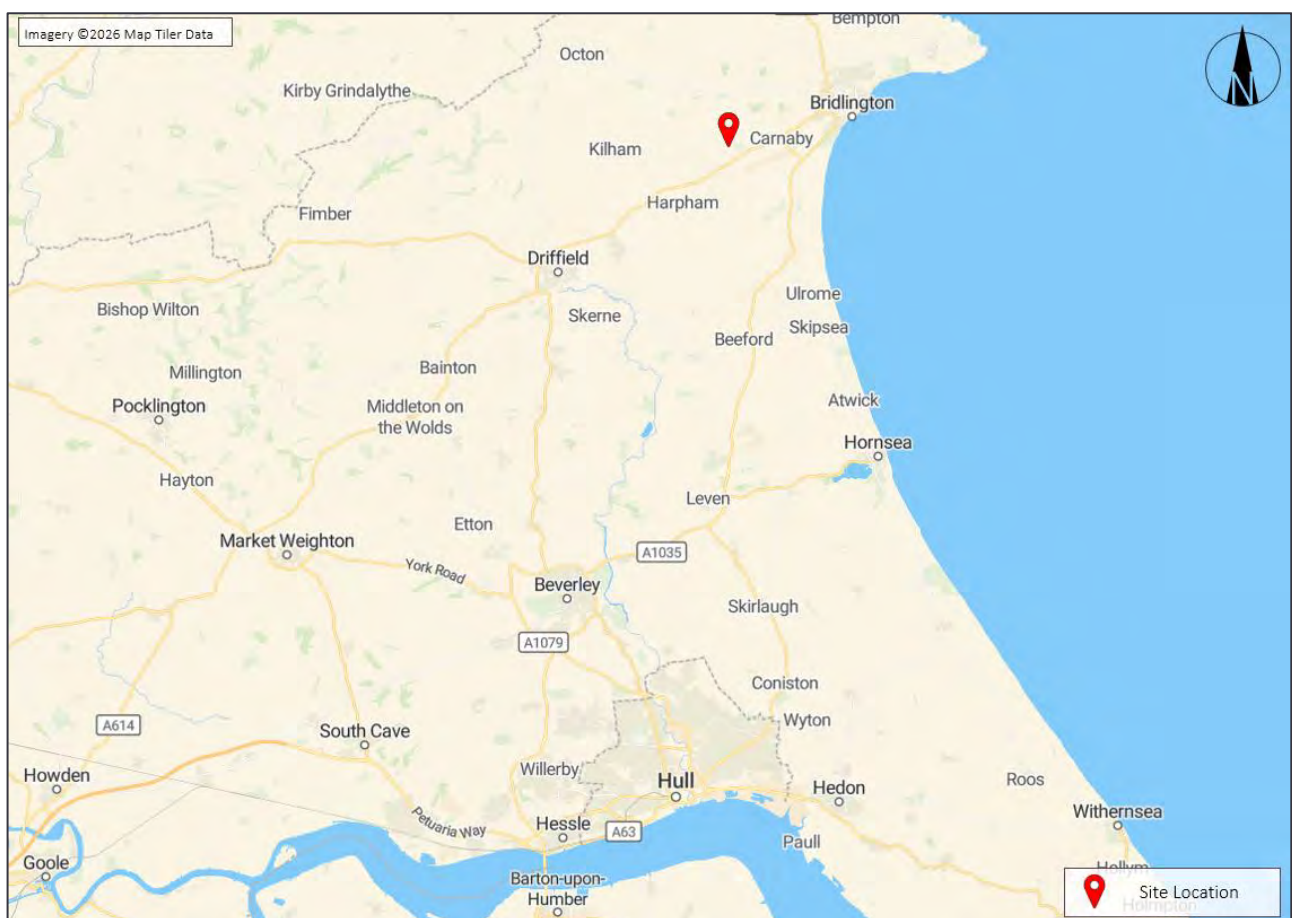
1. Introduction

1.1 Overview

The site falls within the jurisdiction of East Riding of Yorkshire Council in the northeast of England, situated to the west of Bridlington. The surrounding area consists of agricultural fields with gently rolling terrain, interspersed with hedgerows, trees, and occasional farm buildings. The site is accessed from an existing unclassified public highway, which forms a priority junction with the A614.

Figure 1.1 illustrates the site's location within the strategic context.

Figure 1.1 Site Location Within Strategic Context



1.2 Purpose and Scope

The purpose of this report is to set out the surface water drainage design requirements and explain how these have been met with the proposed surface water drainage strategy. The strategy includes for two focus points which are to:

- 1) Manage surface water runoff from the proposed site infrastructure and mitigate flood risk from external sources; and

- 2) Mitigate the existing highway flood risk where runoff from the unmetalled road creates ponding at the junction with A614.

1.3 Development Proposals

The component parts of the Proposed Development (with an export capacity of 25.2 MW) are as follows:

- Wind turbines;
- Wind turbine foundations;
- Crane hardstandings;
- Met mast;
- Site access and maintenance tracks;
- Transformers;
- Cabling;
- Temporary construction compound;
- Mitigation and Enhancement; and
- The substation and access tracks from the adjacent consented (yet to be built) Three Oaks Renewable Energy Park.

An indicative site layout is shown in Figure 1.2.

Figure 1.2 Indicative Site Layout



1.4 Site Access

A new site access and haulage road will be constructed as part of the Proposed Development, following and upgrading the existing unclassified public highway that connects to the A614. The proposed access has been specifically designed to facilitate construction traffic and Abnormal Indivisible Loads (AIL), including the provision of a widened junction arrangement at the A614 to safely accommodate turning movements associated with the largest anticipated vehicles.

The existing access junction between the unclassified public highway and the A614 is shown in Figure 1.3.

Figure 1.3 Existing Access Junction with A614



The design of the new access has been developed in direct response to consultation with the Local Highway Authority (LHA). In particular, the access has been designed to provide a minimum carriageway width of c.4.0m and will be constructed to an adopted standard. The access geometry has been designed to ensure that the largest vehicles and abnormal loads can complete turning movements in a single manoeuvre.

2. Understanding the Existing Drainage Regime

2.1 Site Description

The site is located on raised land which has a natural gradient falling in a southerly direction. The existing land is currently used for agricultural purposes and incorporates a series of land drainage ditches to collect overland runoff and direct flows transversely across the site.

The existing unmetalled road passes through the site and is bounded by a grass verge and hedgerow on both sides. Wheel ruts have been created in the running surface, which creates localised ponding.

Figure 2.1 Typical Road Condition



2.2 Greenfield Runoff

Outside of the adopted highway, the site is currently 100% greenfield.

To understand the existing greenfield runoff rate across the site, calculations have been undertaken using the UKSUDS Greenfield Runoff tool¹. FEH-22 catchment descriptors have been obtained from Flood Estimation Handbook Web Service, which have been used in the calculations to find a rate per hectare of contributing area, which could be used in the designs across the site. The results are summarised in Table 2.1 and a copy of the calculations can be found in Appendix A.

Table 2.1 Greenfield Runoff

Return Period	Runoff Rate (l/s/ha)
1 in 1 year	0.4 l/s/ha
1 in 30 year	0.8 l/s/ha
1 in 100 year	1.0 l/s/ha

2.3 Geology

The site lies on the gently dipping slope of the Yorkshire Wolds underlain by Flamborough Chalk Formation bedrock of Late Cretaceous age. This chalk is variably overlain by Devensian glacial till, comprising an unsorted diamicton of clay, silt, sand and gravel. The chalk bedrock exhibits moderate to high permeability via fractures and solution features, forming part of the regional aquifer system. Subsurface conditions should be confirmed by site-specific investigation due to lateral variation in till thickness and drift composition but for the purpose of the outline design an infiltration rate of 6.7×10^{-5} m/s (0.2412 m/hr) has been used to represent the existing ground conditions.

2.4 Existing Flood Risk

The LHA has identified an existing flooding issue at the junction with the A614. This is likely to be due to the runoff from the unclassified public highway that cannot drain naturally into the grass verges, the longitudinal gradient falling towards the junction and not having a drainage system to discharge into.

The highway consultation response highlights how this issue could be exacerbated by upgrading the road to a non-permeable surface.

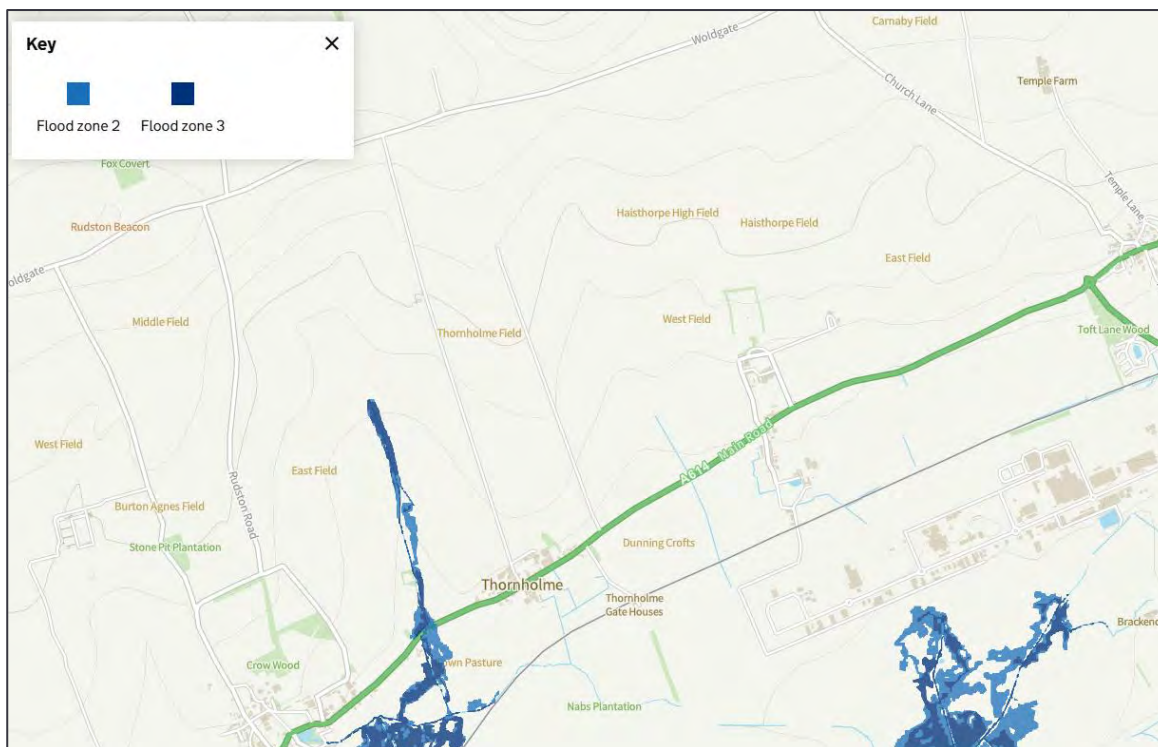
“Water drainage and pooling, the gradient of the unmetalled highway suggest that any non-permeable surface treatment supporting HGV access may lead to a stream of water/mud affecting safe use of the A614. It is contrary to section 163 of the Highways Act 1980 for surface water from private development to drain onto the highway or discharge into the highway drainage system. The development shall therefore be so designed and constructed that surface water from the development shall not be permitted to drain onto the highway or into the highway drainage system.”

Fluvial flood maps have been obtained from the government ‘Flood Map for Planning’ data source² in February 2026 to confirm that the site is within Flood Zone 1 and is therefore not at risk of flooding from rivers, lakes or the sea. These are summarised in the following figures.

¹ <https://www.uksuds.com/tools/members/greenfield-runoff-rate-estimation-members>

² <https://flood-map-for-planning.service.gov.uk/map?cz=511205.7,464245.8,15>

Figure 2.2 Fluvial Flood Map



Pluvial flood maps have been obtained from the government 'Flood Map for Planning' data source² in February 2026 to understand the extent of flooding from surface water for the 1 in 100 year and 1 in 1,000 year storm events. The 1 in 1,000 year event has been included as it represents the standard upper-bound extreme event for surface water flood risk as referenced in the National Planning Policy Framework (NPPF) Planning Practice Guidance (Flood Risk and Coastal Change), and is necessary to demonstrate that the proposed development will remain safe and that flood risk can be appropriately managed across the full range of surface water flood probabilities. The results of this are summarised in Figure 2.3 and Figure 2.4.

Figure 2.3 Pluvial Flood Map (1 in 100 year)

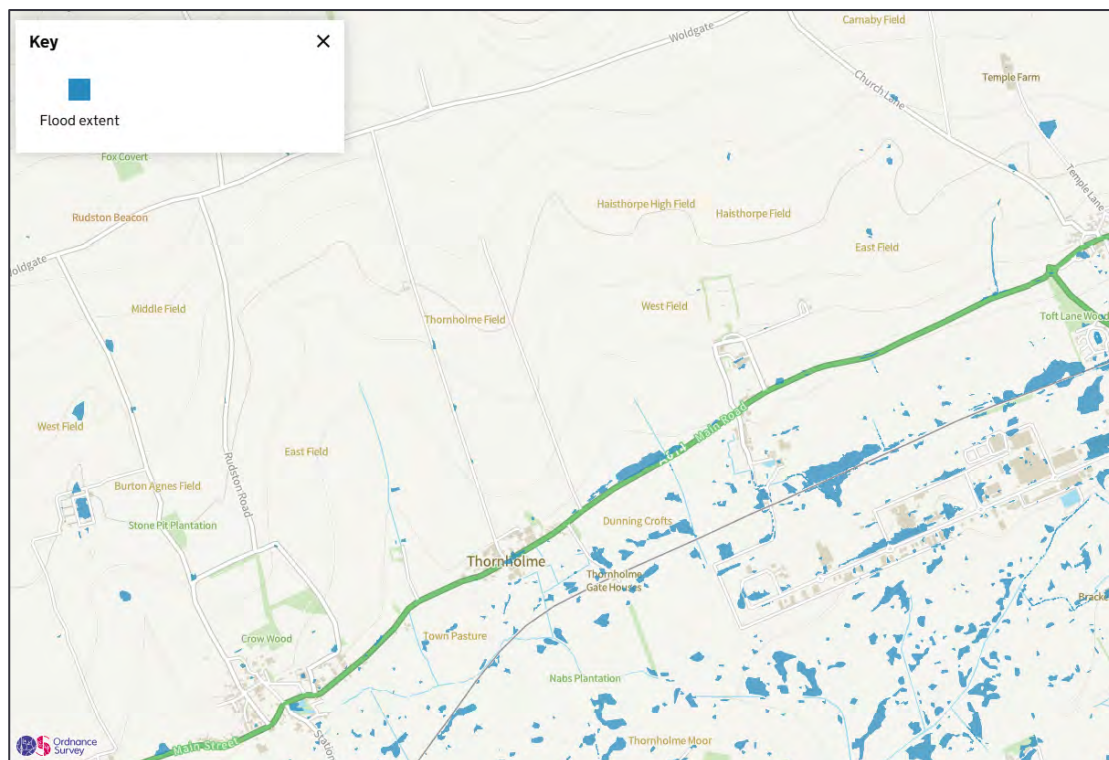
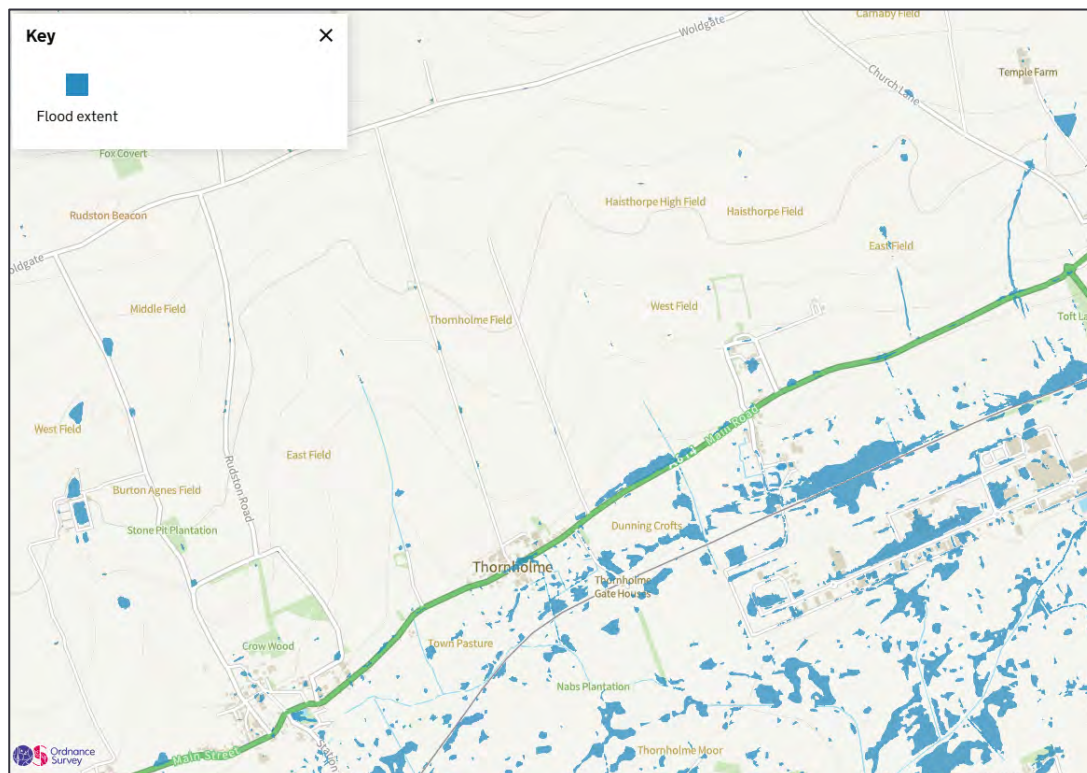


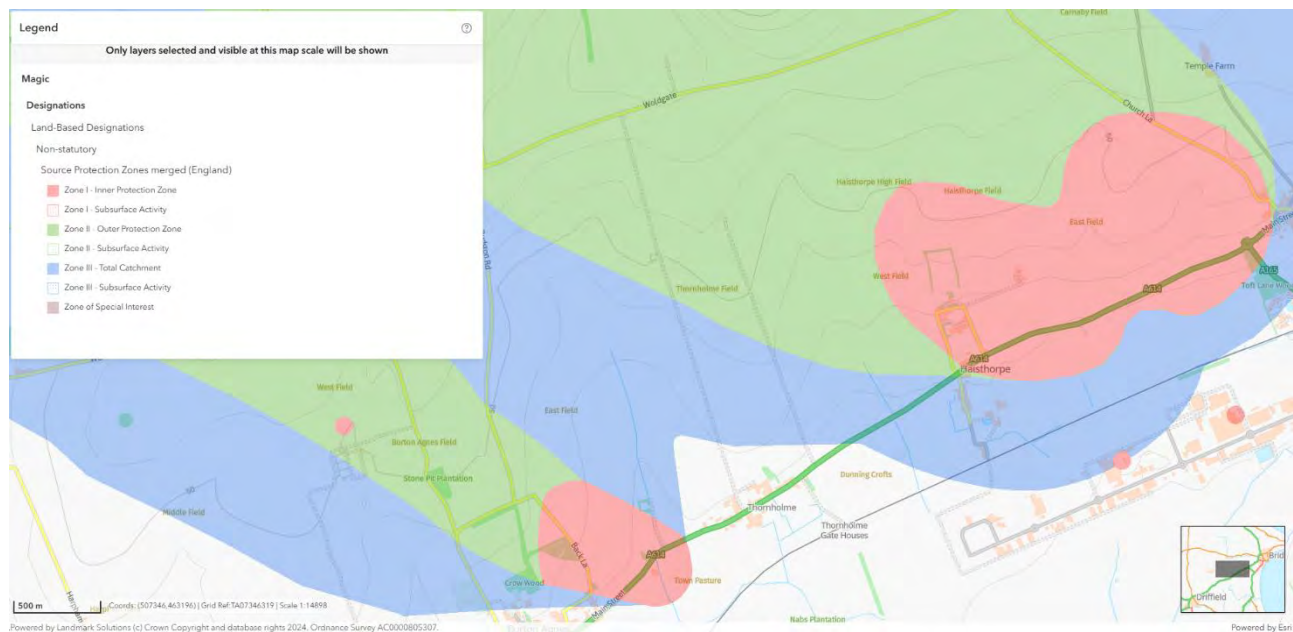
Figure 2.4 Pluvial Flood Map (1 in 1,000 year)



2.5 Groundwater Protection Zones

As illustrated in Figure 2.5 the site lies partially within Source Protection Zone (SPZ) 2 and SPZ 3, which is associated with public water supply abstraction. This section sets out the justification for the use of infiltration within these zones and demonstrates that the proposed drainage strategy presents no unacceptable risk to groundwater quality or quantity, in accordance with current groundwater protection policy.

Figure 2.5 Source Protection Zones



The Proposed Development would generate runoff primarily from:

- Site access tracks
- Turbine hardstanding
- A section of public highway being upgraded to accommodate the construction traffic

The proposed development does not include:

- Industrial processes
- Vehicle maintenance areas

Traffic levels during the operational phase are low and intermittent, resulting in pollution levels in the runoff that are comparable to rural road runoff and is therefore considered a low to moderate pollution risk.

Higher-risk construction-phase activities such as refueling of construction plant or the storage of chemicals will be managed separately through a Construction Environmental Management Plan (CEMP) and do not rely on infiltration for pollution control. This is expected to be a condition of the planning application. An outline CEMP is submitted as part of the application in Appendix 2.1 – Volume 4.

To protect groundwater quality within SPZ 2 and SPZ 3, the following measures are proposed to be incorporated:

- A minimum unsaturated zone thickness between the base of infiltration features and the groundwater table, where feasible
- Infiltration restricted to treated runoff only
- No direct infiltration of runoff from refuelling, concrete washout, or high-risk areas
- Emergency spill response procedures incorporated into the site management plan
- Regular inspection and maintenance of the proposed SuDS features to ensure ongoing performance, as outlined in Section 3.9.

These measures ensure that potential pollutants are retained, degraded, or immobilised within the soil profile prior to reaching groundwater.

Within SPZ 2, infiltration is considered appropriate on the basis that there is limited to low risk treated runoff, which is achieved via shallow naturally vegetated systems. The absence of deep infiltration systems, combined with multiple treatment stages and strict operational controls, ensures compliance with groundwater protection objectives.

Within SPZ 3, infiltration is considered appropriate given the lower sensitivity of the zone, subject to standard SuDS treatment and maintenance. The proposed design exceeds minimum requirements by incorporating the same treatment and management principles applied within SPZ 2.

3. Proposed Drainage Strategy

3.1 Design Criteria and LLFA Requirements

In accordance with the National Standards for Sustainable Drainage Systems (SuDS) and SuDS Combined Planning Note and Standing Advice - East Riding of Yorkshire Council (Sept 2016), the surface water drainage systems shall be designed, constructed, maintained and operated following a natural approach to managing water. This should mimic natural drainage, manage surface runoff at or close to the surface and as close to its source as practicable. This approach should also control the flow of runoff and provide a range of additional benefits.

The most effective surface water drainage systems use a series of different drainage features, operating as close to the source of runoff as practicable. These should work as a SuDS management train to control flow rates and reduce volumes of runoff, providing water quality benefits and opportunities to encourage biodiversity and amenity.

This is referred to as the 'SuDS Approach' throughout the standards and is defined as:

- mimicking natural drainage systems and delivering surface water management that recognises the value of rainfall and runoff as a resource
- managing surface water flooding and the rates and volumes of runoff from developments now and in the future
- contributing to cleansing diffuse particulate and chemical substances that may be found in surface water runoff
- using drainage features in combination as a management train, which integrates these throughout the development and its landscape to help create healthy and resilient spaces for people and habitats for wildlife
- managing runoff close to its source, prioritising features that lie on the surface and incorporate vegetation
- meeting the requirements for delivering multiple benefit SuDS over the lifetime of the development by planning for a changing climate and ensuring long-term maintenance
- being sustainable, considering both construction and long-term maintenance and the additional environmental and social benefits afforded by the system

3.2 Following the Drainage Hierarchy

The key principle of the surface water drainage strategy is to utilise sustainable drainage systems (SuDS) in accordance with the National Standards for Sustainable Drainage Systems. This ensures that the discharge hierarchy is followed, where the aim should be to discharge surface water run-off as high up the drainage hierarchy, as reasonably practicable, which is summarised as follows:

- priority 1: collected for non-potable use
- priority 2: infiltrated to ground
- priority 3: discharged to an above ground surface water body

- priority 4: discharged to a surface water sewer, or another piped surface water drainage system
- priority 5: discharged to a combined sewer.

Infiltration

In accordance with the drainage hierarchy, the proposed surface water drainage strategy is to infiltrate all runoff from the public highway, access tracks and hardstanding areas. Although some infiltration will occur in ditches and swales, the majority of runoff will be conveyed towards infiltration basins and allowed to fully infiltrate. Overflow/spillways can be included in the detailed design to allow a form of resilience.

Geotechnical investigations shall be undertaken at the detailed design stage following planning approval, to ensure that the ground conditions are suitable for infiltrating surface water runoff in accordance with industry recognised guidance and infiltration testing methods.

A conservative infiltration rate of 6.7×10^{-5} m/s (0.2412 m/hr) has been adopted for the sandy and gravelly soils overlying chalk, consistent with typical values in CIRIA C753, to ensure preliminary SuDS designs are appropriately sized. Detailed site testing will confirm the final rates, which are anticipated to be greater than this, which will provide opportunities to reduce the attenuation volumes and enable the reshaping of basins to blend into the existing landscape more naturally.

The infiltration features have been designed so that rainfall events up to the 3.3% AEP event shall half empty their runoff volume within a maximum of 24 hours.

To account for uncertainties with soil infiltration rates, their possible reduction in performance over time, and the consequence of inadequate performance when using the RP 156 (CIRIA) method, a factor of safety has been used when sizing the infiltration feature or assessing its performance in accordance with Table 3.1.

Table 3.1 Factors of safety for use in the hydraulic design of infiltration systems

Size of area to be drained	No damage or inconvenience from flooding	Minor inconvenience from flooding	Damage to buildings or structures, or major inconvenience (for example, flooding of roads)
Less than 100m ²	1.5	2	10
100m ² to 1000m ²	1.5	3	10
More than 1000m ²	1.5	5	10

In all cases across the scheme, the catchments are between 100m² and over 1,000m², with the consideration that no damage or inconvenience from flooding would occur if the system performance reduced over time, based on the remote location from neighbouring properties and infrequent operational use.

3.3 Land Drainage

To ensure the proposed access tracks and hardstanding areas are not flooded with overland flows falling towards the scheme, a series of land drainage cut-off ditches have been provided on the upstream side of the features. Existing site levels generally allow this runoff to be directed away from the scheme and towards natural flow paths across the site. Where site levels do not allow for this, a culvert has been proposed at the low point to pass flows underneath the access track and track drainage channel, so that the natural flows can continue as they would in the existing situation.

In most cases, an allowance for a flow spreader has been provided which will reduce the intensity of the flows and allow the flows to naturally infiltrate into the ground using a series of perforated pipes in gravel trenches. The details of this will be confirmed during the detailed design.

3.4 Culverts

Where conveyance routes cannot be provided to avoid overland drainage from entering onto the site tracks and hardstanding areas, it will be necessary to provide culverts that pass under the access tracks. The culverts are expected to remain small in diameter, between 300-450mm and will either discharge into a track drainage channel or via a flow spreader into the natural flow path, depending on the anticipated flow rates. The culverts have been positioned to avoid large areas of earthwork cuttings, so that a normal circular or box culvert can be provided without the need for drop inlet culverts or siphons. Due to the rural nature of the site, it is assumed that pre-cast concrete headwalls will not be required and instead a more natural solution will be provided such as seeded sandbags or rock/stone headwalls. Agreements with the Highway Authority would be required to confirm their preferred solution and maintenance requirements associated with these culverts.

Where the proposed highway drainage channels pass through existing field access points, an allowance for a culvert has been provided to ensure that land owners can gain unrestricted access.

3.5 Public Highway, Access Tracks and Hardstanding Areas

As the public highway will be upgraded and levels realigned to accommodate the construction and delivery traffic, there is an opportunity to enhance the drainage systems associated with this. Due to the rural nature of this road, a natural solution has been proposed which includes for a swale system positioned on the low side of the proposed crossfall. As the existing verge widths vary along the route, the proposed swales have been positioned to account for the space available between the edge of new carriageway and existing hedgerows. This has resulted in the swale being positioned on the western verge throughout the northern section and this swapping over to the eastern verge further south. This approach also means that the infiltration basins are on the same side, to reduce the number of culverts required to pass under the road.

In order to drain the access tracks and hardstanding areas a series of swales will be provided on the downstream side of the infrastructure, which will convey flows towards a SuDS storage feature. As the site is likely to allow for infiltration, it is expected that a significant volume will naturally infiltrate in the swales but during more severe storms, the flows will be directed towards infiltration basins.

All infiltration basins have been designed to accommodate the 1 in 100 year plus 40% climate change events, which only allow for infiltration through the base area. There is an opportunity at the detailed design stage to enhance the mitigation measures already incorporated into the drainage system by including a layer of gravel and geotextile in the base area to further mitigate the risk of polluted runoff entering the natural ground. The side slopes, base area and earthworks will be left to naturally vegetate to create a bio-diverse environment that blends into the natural landscape to reduce the visual impact of the surface water drainage scheme.

To provide water quality enhancements, a management treatment train consisting of filter strips, swales/channels and detention (infiltration) basins will manage the runoff from all impermeable areas across the site. Each of the SuDS features are described in further detail.

Filter Strips

A 0.5m wide filter strip has been provided in between the edge of the access road and top of swale. This allows sheet runoff to pass over this area before entering the swale/open channels alongside the tracks. The filter strip will catch some of the possible pollutants before flows enter the conveyance systems.

Swales

Where the longitudinal gradient of a swale is less than 1:100 and has at least 500mm of suitable base material, swales are suitable for interception for impermeable surface areas up to 5 times the base of the vegetated surface area receiving the runoff, whether lined or unlined.

Any swale which is unlined and has a longitudinal fall which is less than 1:100 and an infiltration capability greater than 1×10^{-6} m/s shall be assumed to comply with interception for a contributing area up to 25 times the base area of the swale.

Interception shall not be deemed to have been provided for impermeable areas draining to an unlined swale within 5m from the swale outlet, unless the swale is flat and has a slightly raised outlet to create a temporary storage zone to encourage infiltration before runoff takes place.

As the existing contours across the site vary, not all swales have a longitudinal gradient less than 1:100 and therefore the purpose of the swale in these areas is for conveyance only.

Infiltration Basins

Areas of the scheme drained to detention basins with a flat unlined base where infiltration rates are greater than 1×10^{-6} m/s shall be assumed to comply where the drained impermeable surface area is up to 25 times the base area of the basin. In addition, a high level storage calculation undertaken using the design infiltration rate of 6.7×10^{-5} m/s (0.2412 m/hr) shows that approximately 600m³ of storage is needed per hectare of contributing area, as illustrated in Figure 3.1.

Figure 3.1 Estimated Storage Volume

Storage Estimate

Return Period (years)	100	OK
Climate Change (%)	40	Cancel
Impermeable Area (ha)	1.000	Update
Peak Discharge (l/s)	0.001	
Infiltration Coefficient (m/hr) (leave blank if no infiltration)	0.24120	Calc
Required Storage (m³)	Calc	
from	1093	
to	1093	
With infiltration (m³)		
from	1	
to	597	

The infiltration basins have been designed to be 1m deep with 1 in 4 side slopes to allow for naturalised vegetation. A freeboard of 300mm has been allowed for to provide additional resilience to the design. Key

details are summarised in Table 3.2 and are illustrated on drawings 211213-TTC-XX-XX-CD-H-0001 and 211213-TTC-XX-XX-CD-H-0002, contained in Appendix B.

Table 3.2 Infiltration Basin Details

Basin Reference	Contributing Catchment Source	Contributing Catchment Area (m ²)	Estimated Volume Required (m ³)	Volume Provided (m ³)	Land Take (m ²)	Comments
Basin 1	Private Infrastructure	4,162	250	440	1,885	Basin volume sufficient to accommodate design event.
Basin 2	Private Infrastructure	4,660	280	470	1,590	Basin volume sufficient to accommodate design event.
Basin 3	Private Infrastructure	6,000	360	570	1,440	Basin volume sufficient to accommodate design event.
Basin 4	Private Infrastructure	6,723	403	715	1,320	Basin volume sufficient to accommodate design event.
Basin 5	Private Infrastructure	8,540	512	540	1,370	Basin volume sufficient to accommodate design event.
Basin 6	Public Highway	2,565	154	290	825	Basin volume sufficient to accommodate design event.
Basin 7	Private Infrastructure	4,107	246	450	1,145	Basin volume sufficient to accommodate design event.
Basin 8	Public Highway	2,450	147	250	810	Basin volume sufficient to accommodate design event.
Basin 9	Public Highway	2,456	147	200	620	Basin volume sufficient to accommodate design event.

3.6 Hydraulic Calculations

Initial design calculations have been undertaken using design tools sourced from the UKSUDS website to estimate the base area required for the basins. FEH-22 point and catchment descriptors have been obtained from the FEH data source and used in the calculations.

Hydraulic modelling has also been undertaken using Causeway Flow (v17) software to understand the performance of the system and to ensure the proposed drainage system can accommodate the runoff generated from the site. A typical solution based on 1 hectare of contributing area has been modelled and simulated to ensure that the basins have been sized correctly, on a pro-rata basis. The model created includes for an inlet into the infiltration basin, the infiltration basin and a 'dummy pipe' to identify if there is any overflow. The results of this confirm that the estimated volume of 600m³ per hectare of contributing area is sufficient to ensure that the basins will not flood for all storms up to the 1 in 100 year plus 40% climate change events.

The results of the modelling are contained in Appendix C.

3.7 Water Quality

Impermeable surfaces collect pollutants from a wide variety of sources including cleaning activities, wear from car tyres, vehicle oil and exhaust leaks and general atmospheric deposition. The implementation of SuDS in development drainage provides a significant benefit in removal of pollutant from development run-off. No infiltration is proposed from refuelling, chemical storage, or concrete washout areas.

The SuDS Manual C753 describes a 'Simple Index Approach' for assessing the pollution risk of surface run-off to the receiving environment using indices for likely pollution levels for different land uses and SuDS performance capabilities. Using the management treatment train proposed, this has been assessed using the 'Simple Index Approach' tool from the UKSUDS website, as summarised in Table 3.3.

Table 3.3 Simple Index Approach

Assessment	Total Suspended Solids	Metals	Hydrocarbons
'Other industrial site area'	0.8	0.8	0.9
Aggregated Surface Water Pollution Mitigation Index Filter strip → Swale → Detention basin	0.9	0.95	>0.95
Sufficiency of Pollution Mitigation Indices	Sufficient	Sufficient	Sufficient

The full results of this assessment are contained in Appendix D.

When considering the groundwater risk, an assessment has been undertaken to consider the risk from each drainage catchment. The results of this are summarised in Table 3.4.

Table 3.4 Groundwater Risk Assessment – Infiltration within SPZ 2 and SPZ 3

Drainage Catchment	SPZ	Potential Pollution Sources	Inherent Risk (Pre-Mitigation)	Mitigation Measures / Treatment	Residual Risk
Site access tracks (lightly trafficked)	SPZ 2	Suspended solids, trace hydrocarbons, metals	Medium	Vegetated swales providing sedimentation and biofiltration; shallow infiltration basin with grass cover; infiltration via unsaturated zone; routine inspection and maintenance	Low
Turbine hardstanding (operational phase)	SPZ 2	Trace hydrocarbons from maintenance vehicles; suspended solids	Medium	Two-stage SuDS treatment (swale + infiltration basin); no refuelling or vehicle maintenance on hardstanding; spill response procedures in place	Low
Public highway runoff (where applicable)	SPZ 2	Hydrocarbons, metals, sediments	Medium–High	Pre-treatment via vegetated swales; extended flow path; infiltration only following treatment; emergency spill controls; no direct soakaways	Low
Site access tracks	SPZ 3	Suspended solids, hydrocarbons	Medium	Vegetated swales and infiltration basins; shallow infiltration; standard SuDS maintenance regime	Low
Turbine hardstanding	SPZ 3	Trace hydrocarbons; sediments	Medium	Swales and infiltration basins; low traffic frequency; operational controls	Low
Construction phase runoff (all areas)	SPZ 2 & 3	Sediment, cementitious materials, fuels, oils	High	Construction Environmental Management Plan; temporary drainage and sediment controls; no infiltration of concrete washout; bunded refuelling areas; spill kits and trained staff	Low

Risk Classification

High - Likely to pose an unacceptable risk to groundwater without mitigation

Medium - Potential to affect groundwater quality; mitigation required

Low - Unlikely to affect groundwater quality following mitigation

3.8 Biodiversity

A ‘SuDS approach’ shall be adopted to ensure the surface water drainage system maximises biodiversity benefits throughout the development lifecycle.

The surface water drainage system shall add biodiversity value by:

- creating diverse, self-sustaining, resilient local ecosystems which contribute to net gains in biodiversity
- supporting and promoting natural local habitat and species, for example, through local nature recovery strategies (LNRS)
- contributing to the delivery of local biodiversity strategies
- contributing to habitat connectivity

Reference is to be made to the environmental assessment for further details on biodiversity net gain achieved across the site.

3.9 Operation and Maintenance

Regular inspection and maintenance is important for the effective operation of SuDS systems. A summary of operation and maintenance requirements, taken from guidance in The SuDS Manual, is outlined in the

following tables. These schedules reflect recognised industry practice, in which routine and bi-annual activities can be tailored to site-specific conditions, including the remote nature of the site and its low third-party flood-risk context. This ensures that each SuDS element continues to function as intended without imposing unnecessary maintenance burdens, consistent with guidance that allows frequencies to be adjusted to suit risk and local circumstances. It is currently assumed that Ridge Clean Energy Ltd will be responsible for maintenance activities throughout the construction and operational period of the renewable energy site. Following completion of this period, it is expected that the Highway Authority will adopt the drainage systems associated with the public highway.

Table 3.5 Filter Strips – Operation & Maintenance Schedule

Maintenance Activity	Frequency During Construction	Frequency During Operation	Performance Standard / Requirement	Responsibility / Notes
Visual inspection for erosion, rilling, ponding or compaction	Monthly and after heavy rainfall	Bi-annually	No rills or channels forming; no standing water lasting >24 hours	Pay particular attention to upstream edges
Removal of litter and debris	Monthly	Bi-annually	Filter strip free of debris; sheet flow maintained	Increase frequency during construction if debris accumulates
Grass cutting / vegetation management	4–6 times per year during growing season	2–4 times per year during growing season	Vegetation height maintained at 75–150 mm	Remove cuttings from filter strip
Removal of accumulated sediment	Quarterly or as required	Annually or as required	Sediment build-up not exceeding 25 mm	Increase frequency if high sediment loads observed
Inspection of inlets and edges	Monthly	Bi-annually	No erosion, undercutting or damage	Repair erosion promptly to prevent failure

Table 3.6 Swales – Operation & Maintenance Schedule

Maintenance Activity	Frequency During Construction	Frequency During Operation	Performance Standard / Requirement	Responsibility / Notes
Visual inspection of swale bed and side slopes	Monthly and after significant rainfall	Bi-annually	No erosion, scouring or channelisation	Inspect after storm events
Removal of litter and debris	Monthly	Bi-annually	Swale cross-section unobstructed	Focus on inlets and low points
Sediment removal	Quarterly or as required	Annually or as required	Sediment depth not exceeding 25 mm	Prevent reduction in storage and conveyance
Vegetation management (mowing)	4–6 times per year during growing season	2–4 times per year during growing season	Even grass cover maintained; no bare patches	Remove cuttings to prevent clogging
Inspection of inlets and outlets	Monthly	Bi-annually	Free flow; no undermining or blockage	Stabilise with stone where required

Table 3.7 Infiltration Basins – Operation & Maintenance Schedule

Maintenance Activity	Frequency During Construction	Frequency During Operation	Performance Standard / Requirement	Responsibility / Notes
Visual inspection of basin, embankments and side slopes	Monthly	Bi-annually	No erosion, slumping or instability	Repair defects immediately
Inspection of inlets and flow distribution	Monthly	Bi-annually	Even flow distribution; no blockages	Clear debris and sediment as needed
Removal of sediment from basin floor or forebay	Quarterly or as required	Annually or as required	Sediment accumulation not exceeding 10–15 mm	Increase frequency if infiltration performance reduces
Vegetation management	4–6 times per year during growing season	2–4 times per year during growing season	Healthy vegetation cover; no bare areas	Avoid compaction by machinery
Infiltration performance monitoring	Annually or as required	Annually or as required	Basin drains within 24–48 hours	Investigate if standing water persists

4. Conclusions

This report has been set out to summarise the surface water drainage design requirements and explain how these have been met with the proposed surface water drainage strategy. The strategy includes for two focus points which are to:

- 1) Manage surface water runoff from the proposed site infrastructure and mitigate flood risk from external sources; and
- 2) Mitigate the existing highway flood risk where runoff from the unmetalled road creates ponding at the junction with A614.

The surface water drainage strategy for the site is in accordance with the National Standards for Sustainable Drainage Systems (SuDS) and SuDS Combined Planning Note and Standing Advice - East Riding of Yorkshire Council (Sept 2016). In accordance with the drainage hierarchy, the proposed surface water drainage strategy is to infiltrate all runoff from the public highway, access tracks and hardstanding areas. Although some infiltration will occur in ditches and swales, the majority of runoff will be conveyed towards infiltration basins and allowed to fully infiltrate.

To mitigate the existing flood risk issue with the ponding at the junction with the A614, a series of infiltration basins have been proposed alongside the public highway. As part of the improvement works to the existing road, the vertical alignment will be raised to allow runoff to enter a new swale system within the highway verge. These will convey flows towards the infiltration basins and ensure all runoff is managed to avoid any ponding at the junction.

Appendix A

Greenfield Runoff Calculations

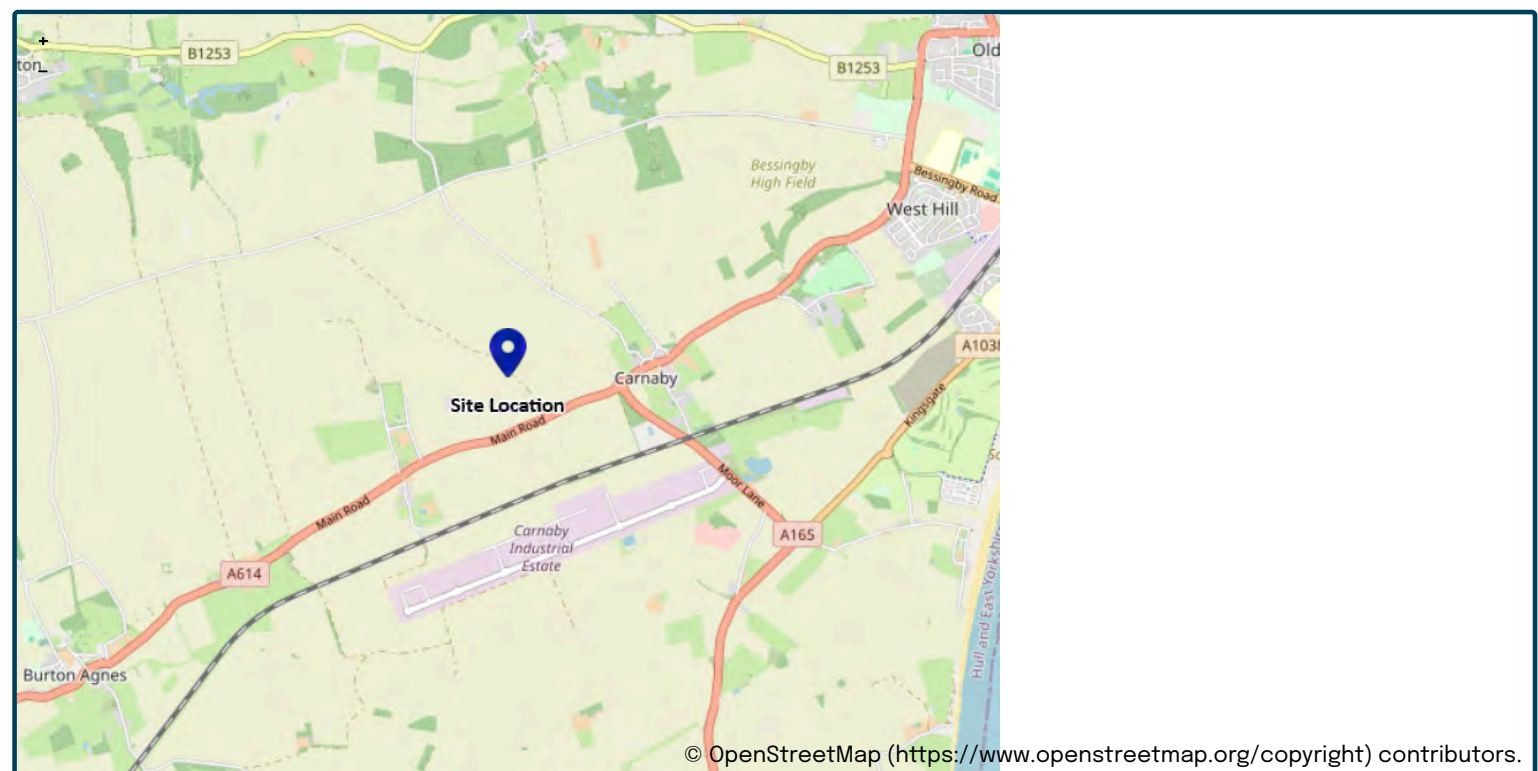
This is an estimation of the greenfield runoff rates that are used to meet normal best practice criteria in line with Environment Agency guidance “Rainfall runoff management for developments”, SC030219 (2013), the SuDS Manual C753 (CIRIA, 2015) and the non-statutory standards for SuDS (Defra, 2015). 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	06/02/2026
Calculated by	P Clay
Reference	Three Oaks
Model version	2.2.2

Location

Site name	Three Oaks
Site location	East Riding



Site easting (British National Grid)	513521
Site northing (British National Grid)	465180

Site details

Total site area (ha)	1	ha
----------------------	--------------------------------	----

Greenfield runoff

Method

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

FEH statistical (2025)

	<u>My value</u>	<u>Map value</u>
SAAR9120 (mm)	729 mm	
BFIHOST19scaled	0.898	
QMed-QBar conversion	1.064	1.064
QMed (l/s)	0.4 l/s	
QBar (FEH statistical 2025) (l/s)	0.5 l/s	

Growth curve factors

	<u>My value</u>	<u>Map value</u>
Hydrological region	3	3
1 year growth factor	0.86	
2 year growth factor	0.94	
10 year growth factor	1.45	
30 year growth factor	1.75	
100 year growth factor	2.08	
200 year growth factor	2.37	

Results

Method	FEH statistical (2025)
Flow rate 1 year (l/s)	0.4 l/s
Flow rate 2 year (l/s)	0.4 l/s
Flow rate 10 years (l/s)	0.7 l/s
Flow rate 30 years (l/s)	0.8 l/s
Flow rate 100 years (l/s)	1.0 l/s
Flow rate 200 years (l/s)	1.1 l/s

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

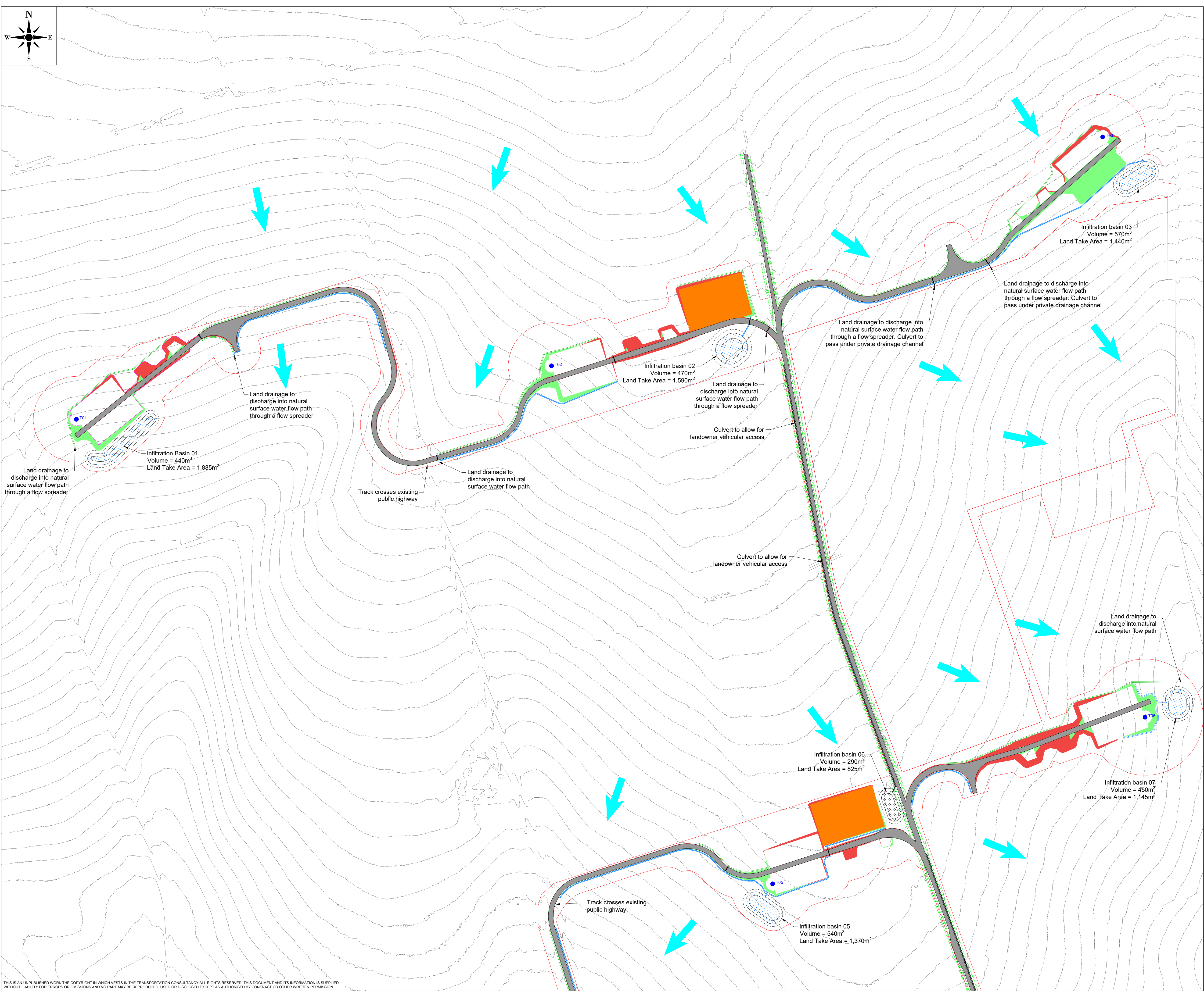
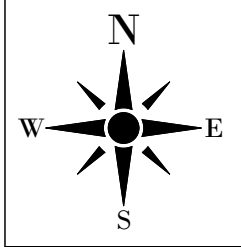
Disclaimer

This report was produced using the Greenfield runoff rate estimation tool (2.2.2) 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 B

Drawings



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Notes

1. Topographic data taken from combination of freely available Lidar data and topographic drawing 'RCE1000-001 to 008' provided by latitude surveys dated 23/10/2025.
2. Design should be considered as provisional outline. Details to be refined at detailed design stage following planning consent.
3. Turbine and spur tracks locations taken from GONDOLIN Land & Water drawing GSL-001 Rev 05
4. This drawing is to be read in conjunction with the 'TTC' Surface Water Drainage Strategy '211213-06.

General Legend

- Planning Boundary
- Highway Drainage Channel
- Highway Infiltration Basin
- Private Drainage Channel
- Private Infiltration Basin
- Land Drainage Ditch
- Concrete Culvert
- Overland Flow Direction

DO NOT SCALE

P01	Issued for Planning	PC	JM	06/02/26
REV	DESCRIPTION	DRN	CHK	DATE



The Transportation Consultancy,
27 Park Street,
Leamington Spa,
CV32 4QN
Email: Info@ttc-transportplanning.com

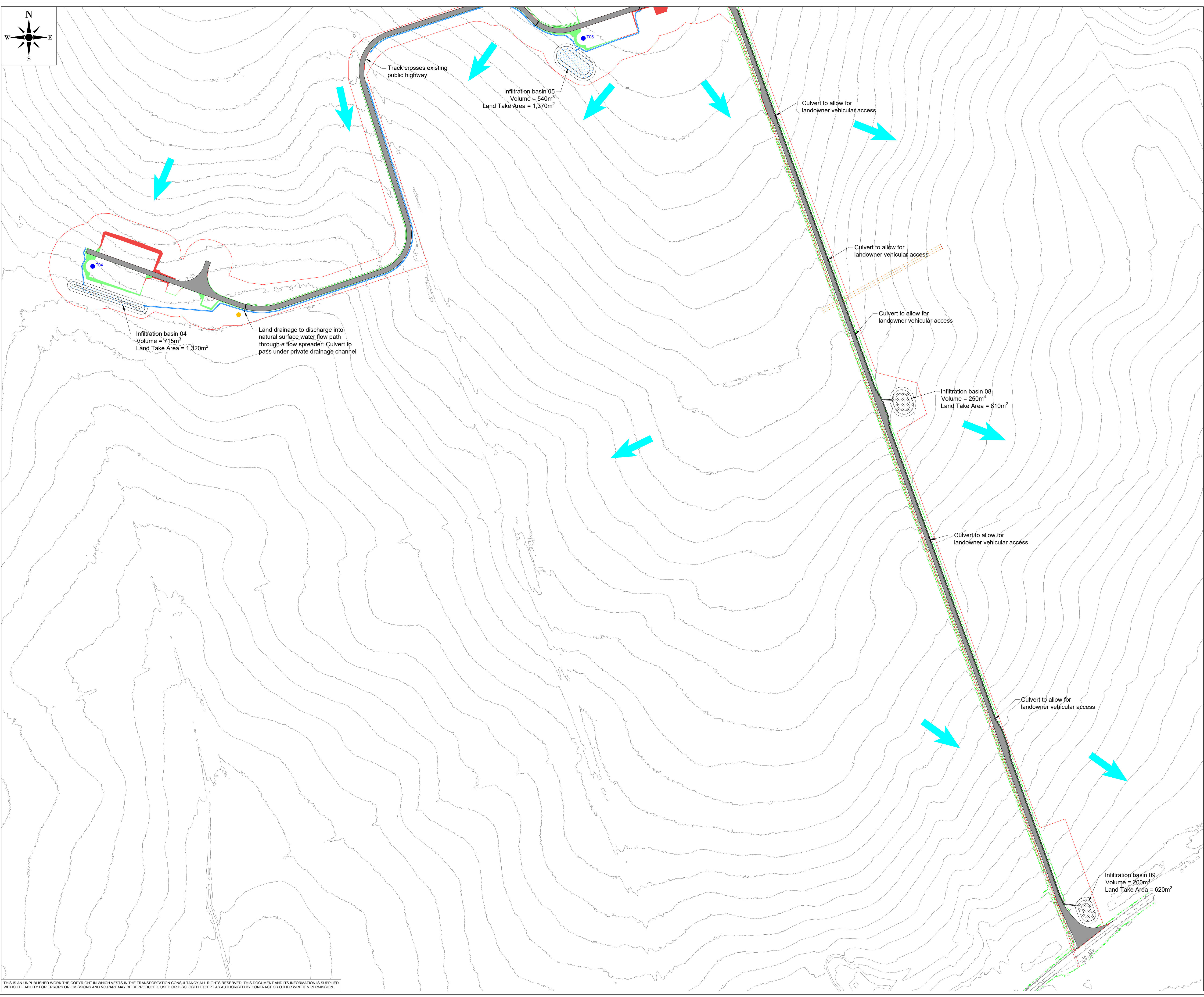
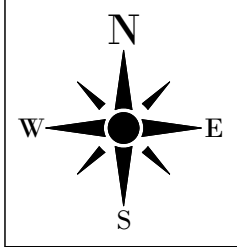
VALUE EXCEED TRUST EXCELLENCE CLARITY

PROJECT Three Oaks Renewable Energy Park Extension

CLIENT Ridge Clean Energy Ltd

SCHEME TITLE General Site Layout
Surface Water Drainage Strategy
Sheet 1

DATE: 06/02/26	SCALE: 1:2000	DRN: PC	CHKD: PC	APP: JM
DRAWING N°:		Status	Rev.	
211213-TTC-XX-XX-CD-H-0001		S3	P01	



Notes

1. Topographic data taken from combination of freely available Lidar data and topographic drawing 'RCE1000-001 to 008' provided by latitude surveys dated 23/10/2025.
2. Design should be considered as provisional outline. Details to be refined at detailed design stage following planning consent.
3. Turbine and spur tracks locations taken from GONDOLIN Land & Water drawing GSL-001 Rev 05
4. This drawing is to be read in conjunction with the 'TTC' Surface Water Drainage Strategy '211213-06.

General Legend

- Planning Boundary
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- Land Drainage Ditch
- Concrete Culvert
- Overland Flow Direction

DO NOT SCALE

P01	Issued for Planning	PC	JM	06/02/26
REV	DESCRIPTION	DRN	CHK	DATE



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Leamington Spa,
CV32 4QN
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PROJECT Three Oaks Renewable Energy Park Extension

CLIENT Ridge Clean Energy Ltd

SCHEME TITLE General Site Layout
Surface Water Drainage Strategy
Sheet 2

DATE: 06/02/26	SCALE: 1:2000	DRN: PC	CHKD: PC	APP: JM
DRAWING N°:	211213-TTC-XX-XX-CD-H-0002	Status	Rev.	
		S3	P01	

Appendix C

Hydraulic Calculations

This is an estimation of the infiltration volumes and drain-down time to half empty the infiltration system in line with the on CIRIA infiltration drainage R156 guidance (1996) and CIRIA SuDS manual (C753, 2015). This information may be used as the basis for designing an infiltration system for the drainage of surface water runoff from sites.

Project details

Date	06/02/2026
Calculated by	P Clay
Reference	Three Oaks
Model version	2.2.2

Site details

Site name	Three Oaks
Site location	East Riding

Infiltration system

Infiltration system	Planar infiltration
Type	Infiltration from base only

Geometry, porosity and infiltration

Infiltration coefficient (m/s)	0.0000167	m/s
Porosity of fill material	50% - e.g. High-porosity uniform gravel	
Soakaway height (m)	1	m

Area to be drained

Total area (m ²)	100	m ²
Factor of safety	1.5	

Rainfall

Rainfall input type	FEH22 CSV file
	FEH_1km_Rainfall_120min.csv
Return period (years)	100
Climate change allowance factor	140%

Results

Minimum base area (m²)	10.0	m²
Time for half-emptying (hours)	6.2	hours
Critical duration (hours)	4.0	hours

Please note storage volume estimation are subject to uncertainty. Infiltration system height and base area are reported to the nearest 1m or 1m² value when the height or base area are greater than 10m or 10m²; and reported to the nearest to 0.1m or 0.1m² value when the height or base area are less than 10m or 10m².

Disclaimer

This report was produced using the infiltration volume design tool (2.2.2) developed by HR Wallingford and available at [uksuds.com](https://www.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) (<https://www.uksuds.com/terms-conditions>). The outputs from this tool have been used to estimate infiltration volumes and drain-down times. 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.

HR Wallingford are not responsible for any rainfall data shared that is subject to licensing terms imposed by UK Centre for Ecology & Hydrology's Flood Estimation Handbook web service (<https://fehweb.ceh.ac.uk/Home/Terms> (<https://fehweb.ceh.ac.uk/Home/Terms>)).

Design Settings

Rainfall Methodology	FEH-99	Time of Entry (mins)	5.00
Return Period (years)	100	Maximum Time of Concentration (mins)	30.00
Additional Flow (%)	0	Maximum Rainfall (mm/hr)	50.0
C (1km)	-0.025	Minimum Velocity (m/s)	1.00
D1 (1km)	0.375	Connection Type	Level Soffits
D2 (1km)	0.291	Minimum Backdrop Height (m)	0.200
D3 (1km)	0.283	Preferred Cover Depth (m)	1.200
E (1km)	0.301	Include Intermediate Ground	✓
F (1km)	2.379	Enforce best practice design rules	x
CV	1.000		

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Node Type	Easting (m)	Northing (m)	Depth (m)	Invert Level (m)	Notes
✓ J1	0.000	5.00	100.000	Junction	1.200	86.706	0.250	99.750	
✓ J2	1.000	5.00	99.880	Junction	8.312	73.836	1.080	98.800	
✓ J3		5.00	99.800	Junction	17.118	58.086	0.100	99.700	Auto-design is off
✓ J4			99.800	Junction	19.746	53.402	0.200	99.600	

Links (Results)

Name	US Node	DS Node	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Minimum Depth (m)	Maximum Depth (m)
1.000	J1	J2	0.826	154.8	0.0	0.000	-0.020	-0.020	0.000
2.000	J3	J4	1.092	8.6	0.0	0.000	0.100	0.000	0.100

SuDS Carriers

Link	US Node	DS Node	Link Type	Base Inf Coef (m/hr)	Sides Inf Coef (m/hr)	Safety Factor
1.000	J1	J2	Swale	0.24120	0.00000	1.5

Simulation Settings

Rainfall Methodology	FEH-99	E (1km)	0.301	Drain Down Time (mins)	240
Rainfall Events	Singular	F (1km)	2.379	Additional Storage (m³/ha)	20.0
C (1km)	-0.025	Summer CV	1.000	Starting Level (m)	
D1 (1km)	0.375	Winter CV	1.000	Check Discharge Rate(s)	x
D2 (1km)	0.291	Analysis Speed	Normal	Check Discharge Volume	x
D3 (1km)	0.283	Skip Steady State	x		

Storm Durations

15 | 30 | 60 | 120 | 240 | 360 | 720 | 1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
2	0	0	0
30	0	0	0
100	40	0	0

Node J3 Infiltration Basin Storage Structure

Base Inf Coefficient (m/hr)	0.24120	Invert Level (m)	98.800
Side Inf Coefficient (m/hr)	0.00000	Time to half empty (mins)	152
Safety Factor	1.5	Analyse flow through structure	x
Porosity	1.00		

Inlets
J2

Depth (m)	Area (m ²)	Inf Area (m ²)	Depth (m)	Area (m ²)	Inf Area (m ²)
0.000	642.8	600.0	1.000	1255.2	1221.8

Results for 2 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J1	1	99.750	0.000	0.0	0.0000	0.0000	OK
60 minute summer	J2	42	98.907	0.107	113.7	0.0000	0.0000	OK
60 minute summer	J3	44	98.896	-0.804	67.9	70.3775	0.0000	OK
15 minute summer	J4	1	99.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J1	1.000	J2	0.0	0.000	0.000	0.0002	
60 minute summer	J2	Infiltration (1.000)		0.0				
60 minute summer	J3	2.000	J4	0.0	0.000	0.000	0.0000	0.0
60 minute summer	J3	Infiltration		26.8				

Results for 30 year Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J1	1	99.750	0.000	0.0	0.0000	0.0000	OK
120 minute summer	J2	92	99.103	0.303	183.7	0.0000	0.0000	OK
120 minute summer	J3	94	99.091	-0.609	101.7	223.6115	0.0000	OK
15 minute summer	J4	1	99.600	0.000	0.0	0.0000	0.0000	OK
Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J1	1.000	J2	0.0	0.000	0.000	0.0002	
120 minute summer	J2	Infiltration (1.000)		0.0				
120 minute summer	J3	2.000	J4	0.0	0.000	0.000	0.0000	0.0
120 minute summer	J3	Infiltration		26.8				

Results for 100 year +40% CC Critical Storm Duration. Lowest mass balance: 100.00%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
15 minute summer	J1	1	99.750	0.000	0.0	0.0000	0.0000	OK
120 minute winter	J2	118	99.452	0.652	250.0	0.0000	0.0000	OK
120 minute winter	J3	120	99.437	-0.263	134.0	553.1581	0.0000	OK
15 minute summer	J4	1	99.600	0.000	0.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
15 minute summer	J1	1.000	J2	0.0	0.000	0.000	0.0002	
120 minute winter	J2	Infiltration (1.000)		0.0				
120 minute winter	J3	2.000	J4	0.0	0.000	0.000	0.0000	0.0
120 minute winter	J3	Infiltration		26.8				



Appendix D

Water Quality Assessment

SIMPLE INDEX APPROACH: TOOL



HRW shall not be liable for any direct or indirect damage claim, loss, cost, expense or liability howsoever arising out of the use or impossibility to use the tool, even when HRW has been informed of the possibility of the same. The user hereby indemnifies HRW from and against any damage claim, loss, expense or liability resulting from any action taken against HRW that is related in any way to the use of the tool or any reliance made in respect of the output of such use by any person whatsoever. HRW does not guarantee that the tool's functions meet the requirements of any person, nor that the tool is free from errors.

- The steps set out in the tool should be applied for each inflow or 'runoff area' (ie each impermeable surface area separately discharging to a SuDS component).
- The supporting 'Design Conditions' stated by the tool must be fully considered and implemented in all cases.
- Relevant design examples are included in the SuDS Manual Appendix C.
- Each of the steps below are part of the process set out in the flowchart on Sheet 3.

5. Sheet 4 summarises the selections made below and indicates the acceptability of the proposed SuDS components.

	RELEVANT INPUTS NEED TO BE SELECTED FROM THESE LISTS, FOR EACH STEP
	USER ENTRY CELLS ARE ONLY REQUIRED WHERE INDICATED BY THE TOOL

STEP 1: Determine the Pollution Hazard Index for the runoff area discharging to the proposed SuDS scheme

This step requires the user to select the appropriate land use type for the area from which the runoff is occurring

If the land use varies across the 'runoff area', either:

- use the land use type with the highest Pollution Hazard Index;
- apply the approach for each of the land use types to determine whether the proposed SuDS design is sufficient for all. If it is not, consider collecting more hazardous runoff separately and providing additional treatment.

If the generic land use types suggested are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in the row below the drop-down lists.

Runoff Area Land Use Description	Pollution Hazard	Pollution Hazard Indices			DESIGN CONDITIONS	
		Total Suspended	Metals	Hydrocarbons	1	2
Select land use type from the drop-down list (or 'Other' where applicable):					These indices should only be used if considered appropriate by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk Sites. In England and Wales, the environmental regulator should be consulted prior to design (the pre-assessment advice) to determine the most appropriate design approach and requirements for risk assessment.
If the generic land use types in the drop-down list above are not applicable, select 'Other' and enter a description of the land use of the runoff area and agreed user defined indices in this row:	Other industrial site area	High	0.8	0.8	0.9	
Landuse Pollution Hazard Index		High	0.8	0.8	0.9	

STEP 2A: Determine the Pollution Mitigation Index for the proposed SuDS components

This step requires the user to select the proposed SuDS components that will be used to treat runoff - before it is discharged to a receiving surface waterbody or downstream infiltration component

If the runoff is discharged directly to an infiltration component, without upstream treatment, select 'None' for each of the 3 SuDS components and move to Step 2B

This step should be applied to evaluate the water quality protection provided by proposed SuDS components for discharges to receiving surface waters or downstream infiltration components (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

If you have fewer than 3 components, select 'None' for the components that are not required.

If the proposed component is bespoke and/or a proprietary treatment product and not generically described by the suggested components, then 'Proprietary treatment system' or 'User defined indices' should be selected and a description of the component and agreed user defined indices should be entered in the rows below the drop-down lists.

SuDS Component Description	Total Suspended	Pollution Mitigation Indices			DESIGN CONDITIONS		
		Metals	Hydrocarbons		1	2	3
Select SuDS Component 1 (i.e. the upstream SuDS component) from the drop-down list:					SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B.		
Filter strip	0.4	0.4	0.5				
Select SuDS Component 2 (i.e. the second SuDS component in a series) from the drop-down list:							
Grass	0.5	0.6	0.6		SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B.		
Select SuDS Component 3 (i.e. the third SuDS component in a series) from the drop-down list:							
Detention basin	0.5	0.5	0.6				
If the proposed SuDS components are bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary treatment system' or 'User defined indices' and enter component descriptions and agreed user defined indices in these rows:					Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at >0.95. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).		
Aggregated Surface Water Pollution Mitigation Index		0.9	0.95	>0.95			

Is the runoff now discharged to an infiltration component?

Yes ? [Go to Step 2B](#)
No ? [Go to Step 2C](#)

STEP 2B: Determine the Pollution Mitigation Index for the proposed Groundwater Protection

This step requires the user to select the type of groundwater protection that is either part of the SuDS component or that lies between the component and the groundwater

This step should be applied where a SuDS component is specifically designed to infiltrate runoff (note: in England and Wales this will include components that allow any amount of infiltration, however small, even where infiltration is not specifically accounted for in the design).

'Groundwater protection' describes the proposed depth of soil or other material through which runoff will flow between the runoff surface and the underlying groundwater.

Where the discharge is to surface waters and risks to groundwater need not be considered, select 'None'.

If the proposed groundwater protection is bespoke and/or a proprietary product and not generically described by the suggested measures, then a description of the protection and agreed user defined indices should be entered in the row below the drop-down list.

Select type of groundwater protection from the drop-down list:	Total Suspended Solids	Pollution Mitigation Indices			DESIGN CONDITIONS			
		Metals	Hydrocarbons		1	2	3	4
300 mm minimum depth of soils with good contamination attenuation potential	0.4	0.3	0.3		All designs must include a minimum of 3 m unsaturated depth of soil/soil or lighter material between the infiltration surface and the maximum fully groundwater level. The underlying soils must provide good contaminant attenuation potential (eg as recommended in either CIRIA (a) and (b) / Scott (a), or designed specifically to retain sediment in a separate lined zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events.			
If the proposed groundwater protection is bespoke/proprietary and/or the generic indices above are not considered appropriate, select 'Proprietary product' or 'User defined indices' and enter a description of the protection and agreed user defined indices in this row:								
Groundwater Protection Pollution Mitigation Index		0.4	0.3	0.3				

STEP 2C: Determine the Combined Pollution Mitigation Indices for the Runoff Area

This is an automatic step which combines the proposed SuDS Pollution Mitigation Indices with any Groundwater Protection Pollution Mitigation Indices

Combined Pollution Mitigation Indices for the Runoff Area	Combined Pollution Mitigation Indices			Note: If the total aggregated mitigation index is > 1 (which is not a realistic outcome), then the outcome is fixed at >0.95. In this scenario, the proposed components are likely to have a very high mitigation potential for reducing pollutant levels in the runoff and should be sufficient for any proposed land use (note: where risk assessment is required, this outcome would need more detailed verification).
	Total Suspended Solids	Metals	Hydrocarbons	
	>0.95	>0.95	>0.95	

STEP 2D: Determine Sufficiency of Pollution Mitigation Indices for Selected SuDS Components

This is an automatic step which compares the Combined Pollution Mitigation Indices with the Land Use Hazard Indices, to determine whether the proposed components are sufficient to manage each pollutant category type

When the combined mitigation index exceeds the land use pollution hazard index, then the proposed components are considered sufficient in providing pollution risk mitigation.

In England and Wales, where the discharge is to protected surface waters or groundwater, an additional treatment component (in over and above that required for standard discharges), or other equivalent protection, is required that provides environmental protection in the event of an unexpected pollution event or poor system performance. Protected surface waters are those designated for drinking water abstraction. In England and Wales, protected groundwater resources are defined as Source Protection Zones 1. In Northern Ireland, a more precautionary approach may be required and this should be checked with the environmental regulator on a site-by-site basis.

DESIGN CONDITIONS

Sufficiency of Pollution Mitigation Indices

Total Suspended Solids

Metals

Hydrocarbons

Sufficient

Sufficient

Sufficient

1

Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England.

SUMMARY TABLE		DESIGN CONDITIONS			
		1	2	3	4
Land Use Type	Other industrial site area	These indices should only be used if considered appropriate by the required risk assessment and where approved by the regulator. If they are not considered appropriate, the risk assessment should use alternative measures of pollution hazard for the site.	In Scotland and Northern Ireland, the environmental regulator should be consulted as part of the licensing process required for High Risk sites. In England and Wales, the environmental regulator should be consulted prior to design (for pre-permitting advice) to determine the most appropriate design approach and requirements for risk assessment.		
Pollution Hazard Level	High				
Pollution Hazard Indices					
TSS	0.8				
Metals	0.8				
Hydrocarbons	0.9				
SuDS components proposed		SuDS components can only be assumed to deliver these indices if they follow design guidance with respect to hydraulics and treatment set out in the relevant technical component chapters of the SuDS Manual. See also checklists in Appendix B			
Component 1	Filter strip				
Component 2	Swale				
Component 3	Detention basin				
SuDS Pollution Mitigation Indices					
TSS	0.9				
Metals	0.95				
Hydrocarbons	>0.95				
Groundwater protection type	300 mm minimum depth of soils with good contamination attenuation potential	All designs must include a minimum of 1 m unsaturated depth of subsoil or aquifer material between the infiltration surface and the maximum likely groundwater level. Infiltration components should always be preceded by upstream component(s) that trap(s) silt, or designed specifically to retain sediment in a separate lined zone, easily accessible for maintenance, such that the sediment will not be re-suspended in subsequent events	The underlying soils must provide good contaminant attenuation potential (eg as recommended in Sniffer 2008 (a) and (b) / Scott Wilson (2010) or other appropriate guidance). Alternative depth and soil combinations must provide equivalent protection to the underlying groundwater		
Groundwater protection					
Pollution Mitigation Indices					
TSS	0.4				
Metals	0.3				
Hydrocarbons	0.3				
Combined Pollution Mitigation Indices		Reference to local planning documents should also be made to identify any additional protection required for sites due to habitat conservation (see Chapter 7 The SuDS design process). The implications of developments on or within close proximity to an area with an environmental designation, such as a Site of Special Scientific Interest (SSSI), should be considered via consultation with relevant conservation bodies such as Natural England			
TSS	>0.95				
Metals	>0.95				
Hydrocarbons	>0.95				
Acceptability of Pollution Mitigation					
TSS	Sufficient				
Metals	Sufficient				
Hydrocarbons	Sufficient				