The Sizewell C Project

6.3 Volume 2 Main Development Site

Chapter 2 Description of the Permanent Development

Appendix 2A Outline Drainage Strategy

Revision: 1.0

Applicable Regulation: Regulation 5(2)(a)

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Schedule 2 of the Draft Development Consent Order (Doc. Ref. 3.1), requires that no part of the development may take place until details of the surface and foul water drainage system for that part (including management and maintenance arrangements, means of pollution control, sewage treatment works and a programme of construction and implementation) have been submitted by the undertaker and approved by the local planning authority, following consultation with the Environment Agency, Natural England and the drainage authority. The surface and foul water drainage proposals must be based on sustainable drainage principles and must be in accordance with this outline drainage strategy. Any approved surface and foul water drainage system must be constructed and maintained in accordance with the approved details. All general arrangement layouts shown in this document are indicative and subject to further consideration.

Storm and surface water approach

This outline drainage strategy has been developed in such a way that it will not adversely affect the hydraulic performance of the existing environment, nor will it materially affect overland flow paths and will protect areas of Sizewell Marshes Site of Special Scientific Interest (SSSI) and other sensitive receptors.

The main drainage principle for the Sizewell C construction site is to mimic the existing environmental runoff patterns where possible. The outline drainage strategy has been developed in line with industry standards, guidance and best practice regarding the safe and sustainable management of surface water run-off.

The overarching surface water drainage philosophy will follow conventional Sustainable Drainage (SuDS) steps / hierarchy presented below, moving from each stage to the next only when the current stage is deemed not practicable within the Sizewell C Project:

- store rainwater for later use (e.g. rainwater harvesting);
- use infiltration techniques (e.g. porous surfaces, swales, trenches);
- attenuate rainwater in basins or open water features for gradual release;
- attenuate rainwater by storing in tanks for gradual release through an outlet; and
- discharge rainwater direct into watercourse or sea.

It is proposed that rainwater harvesting and reuse will form part of a holistic approach to surface water management, particularly in areas that will have a high-water demand such as the Accommodation Campus. The viability of rainwater harvesting will be assessed at detailed design stage as part of the design process. There is a variability of groundwater and strata across the Sizewell C construction sites including the main construction area (MCA), the temporary construction area (TCA), the Land East of Eastlands Industrial Estate (LEEIE) and the associated development sites, and as such each area has a flexibility to the approach taken and the approach has been adapted to suit each area.

Strategic design criteria

The surface water drainage network will be designed to retain excess storm water which results from a 1 in 100-year return period rainfall event within the site, for both construction and operation phases.

Surface water management

Main Construction Area / Main Platform

The MCA will require provision of surface water drainage as soon as construction commences. The requirements will change with development and there will be a need to ensure flexibility over time to allow for transition from current undeveloped site, through construction drainage, to the permanent drainage network.

The operational power station site will be provided with a permanent surface water drainage network. It will be designed to drain all impermeable areas which will include roofs, roads, footpaths and car parks, and will discharge through the cooling water tunnel.

Temporary Construction Area

The TCA is sub-divided into separate Water Management Zones (WMZs) where surface water would be managed in accordance with the uses within each of the WMZs, using SuDS techniques, infiltrating where possible. Detention basins within each WMZ would store excess runoff. Again, there will be a need to ensure flexibility over time to allow for transition from current undeveloped site, through construction drainage, and back to the former uses upon completion of construction.

Land East of Eastlands Industrial Estate

The overarching strategy for the surface water run-off associated with LEEIE is storage with infiltration where possible.

Storage would be used to balance runoff from the LEEIE with outfalls to watercourses at greenfield rates. Extreme storm runoff will be attenuated in an attenuation pond within the main development site to the east of the LEEIE before release to the environment through infiltration or discharged at greenfield runoff rate.

Associated Development sites

The strategy for the surface water run-off associated with the bypasses, access roads, Park and Ride and Freight Management Facilities uses the same SuDS techniques.

The strategy will drain the surface water run-off through infiltration techniques and ensure no additional rainwater runoff area is added to the site wide drainage system.

Where impervious surfacing is necessary, the outline drainage strategy is to convey run-off from these areas into either permeable paving systems (for the car park and laydown areas), infiltration trenches or into discrete soakaways located alongside the operational car parks.

Foul water management

The overarching foul water outline drainage strategy provides conventional drainage through the steps / hierarchy presented below, moving from each stage to the next only when the current stage is deemed not practicable within the Sizewell C Project:

- Transfer flows to Treatment Works.
- Introduce local foul treatment package plant.
- Specialist low flow package plant.
- Tankering to works.

Main Construction Area and Temporary Construction Area

The MCA and TCA will be served by temporary Sewage Treatment Plants. The treated effluent will be pumped to the Combined Drainage Outfall (CDO) from where it will discharge to sea.

The permanent sewage treatment plant will receive and treat all domestic foul water generated within the operational site. The treated effluent will be discharged to sea through the cooling water tunnel.

Land East of Eastlands Industrial Estate

The preferred approach is for foul water to be conveyed to Anglian Water Services Leiston Water Recycling Centre should capacity be available. If no capacity is available, foul water could potentially be treated in or close to LEEIE with an outfall connected with Leiston Drain, as infiltration of treated foul water is not a viable solution at LEEIE due to poor infiltration. If this is not possible, the next option in the hierarchy, cess pits with tankering, will be considered.

Associated development Sites

The Park and Ride sites and Freight Management Facilities are remote from the main development site. The current proposal is to introduce local package plants and to drain the effluent to ground through SuDS infiltration devices. There is no link to a local treatment plant as this would be the first option. Very low flow rates can impact on the functionality of a package treatment plant, and a low flow package treatment plant will be used if necessary. Tankering to works is an alternative option should the flow be insufficient for the low-flow package treatment plant.

1 Introduction

1.1 Purpose of outline drainage strategy

1.1.1 Schedule 2 of the **Draft Development Consent Order** (Doc. Ref. 3.1), requires that no part of the development may take place until details of the surface and foul water drainage system for that part (including management and maintenance arrangements, means of pollution control, sewage treatment works and a programme of construction and implementation) have been submitted by the undertaker and approved by the local planning authority, following consultation with the Environment Agency, Natural England and the drainage authority. The surface and foul water drainage proposals must be based on sustainable drainage principles and must be in accordance with this outline drainage strategy. Any approved surface and foul water drainage system must be constructed and maintained in accordance with the approved details.

1.1.2 This report has been prepared to set out the site wide outline drainage strategy of the Sizewell C nuclear power station for submission with the application for development consent.

1.1.3 The scope of this outline drainage strategy is to provide the principles for drainage and foul water management at the main construction are (MCA), temporary construction area (TCA), Land East of Eastlands Industrial Estate (LEEIE), and associated development sites, in respect of both the construction and operational phases.

1.1.4 This outline drainage strategy primarily focusses on surface water disposal, but also encompasses foul water management and treatment. It has been developed following conventional industry standards, guidance and best practice regarding the safe and sustainable management of surface water run-off and foul drainage. The strategy has also been developed with specific consideration of site issues which would affect the feasibility of specific solutions, such as the availability of land and the nature of the subsoil (allowing for infiltration), the availability of foul drainage facilities (allowing for wastewater disposal emanating from the Accommodation Campus and Temporary Buildings during construction) and the normal operation of the site following completion of the construction phase.

1.1.5 This strategy specifically assesses the drainage requirements of the Sizewell C Project sites.

1.1.6 Water Management Zones (WMZ) have been proposed based on:

- the construction site layouts for the MCA, TCA, LEEIE, and associated development sites;

- information from ground investigations, including groundwater levels and infiltration rates;
- watercourse connectivity; and
- refinement of the design parameters such as the design return period.

1.1.7 This report identifies WMZs and covers the MCA, the TCA, the Accommodation Campus and the LEEIE. In addition, the report considers the outline drainage strategy of associated development sites consisting of road and rail schemes, park and ride sites and a freight management facility, to ensure a consistent approach across all areas is maintained.

1.1.8 Within this strategy, there is a move from generic infiltration and detention techniques, to flexible Sustainable Drainage System (SuDS) structures and contaminant management.

1.1.9 All general arrangement layouts shown in this document are indicative and subject to further consideration.

1.2 Background

a) Proposed development

1.2.1 Sizewell C is a proposed power station located immediately to the north of the existing Sizewell B power station. The new nuclear power station would represent the Nationally Significant Infrastructure Project (NSIP) component of the proposed development.

1.2.2 The main development site is located 2km east of the town of Leiston. The main development site, as shown on **Figure 2A.1**, comprises predominantly undeveloped land with no significant development. The proposed development is within and adjacent to the Sizewell Marshes SSSI and is to the south of Minsmere to Walberswick Heaths and Marshes SSSI, Special Area of Conservation (SAC), Special Protection Area (SPA) and Ramsar site.[1] Careful consideration will therefore be given within the outline drainage strategy to mitigate any potential impact on all of the surrounding designated areas.

1.2.3 The main development site, as shown in **Figure 1.2** of **Volume 2** of the **Environmental Statement** (Book 6), comprises five components, which are described below:

[1] https://www.rspb.org.uk/reserves-and-events/reserves-a-z/minsmere/

- main platform / MCA: the area that would become the power station itself;
- Sizewell B relocated facilities and National Grid land: the area that certain Sizewell B facilities would be moved to in order to release Sizewell B land for the proposed development and the area required for the National Grid transmission network;
- offshore works area: the area where offshore cooling water infrastructure and other marine works would be located;
- TCA: the area located primarily to the north and west of the proposed Sizewell Marshes SSSI crossing, which would be used to support construction activity on the main platform; and
- Land East of Eastlands Industrial Estate (LEEIE): the area would be used to support construction on the main platform and TCA, with a new rail head being constructed.

1.2.4 Following completion of construction, the main development site will consist of permanent development as set out in **Chapter 2, Volume 2** of the **Environmental Statement** (Book 6).

1.2.5 There are additional off-site developments associated with the construction on the main development site. These includes areas of habitat creation for fen meadow at Benhall and Halesworth, marsh harrier habitat improvement area at Westleton and the off-site sports facilities in Leiston. Further information on these works is provided within **Chapters 2** and **3** of **Volume 2** of the **Environmental Statement** (Book 6). This strategy considers the requirements for drainage at the off-site sports facilities in Leiston. Habitat creation areas have not been specifically considered further within this strategy, as these works would be subject to site specific change in land and water management practices. Nevertheless, any surface water drainage required would follow the general principles set out within this strategy. And construction of these sites would require mitigation measures to manage stormwater and pollutants (e.g. suspended solids).

1.2.6 In addition, there are temporary and permanent Associated Development sites consisting of road and rail schemes, park and ride sites and freight management. The associated developments include the following:

- temporary park and ride facilities, including the northern park and ride at Darsham and southern park and ride at Wickham Market;
- temporary freight management facility at Seven Hills;

- permanent road infrastructure, including the two village bypass, Sizewell link road, a new roundabout at Yoxford and other highway improvements; and

- rail proposals, including the temporary rail extension route and permanent improvements to the existing Saxmundham to Leiston branch line.

1.2.7 **Chapter 2** of **Volumes 3** to **9** of the **Environmental Statement** (Book 6) provide further information on the associated developments.

b) Sizewell B relocated facilities works

1.2.8 A hybrid planning application for the relocation, demolition and replacement of a number of existing Sizewell B facilities (known as the Sizewell B relocated facilities works) was submitted to East Suffolk Council (ESC) in April 2019 (application ref. DC/19/1637/FUL) and planning permission for these works was granted on 13 November 2019. The Drainage Strategy and Drainage Strategy Addendum submitted with this application is provided in **Annexes 2A.1** and **2A.2** of this document.

1.2.9 As the Sizewell B relocated facilities works are critical elements to facilitate the construction of Sizewell C, the proposals for these facilities are also included in the application for development consent and have been considered to form part of the Sizewell C Project in this document.

1.2.10 The Sizewell B relocated facilities works included within the DCO are the same as consented by ESC under the Town and Country Planning Act 1990. However, since the preparation of the Sizewell B relocated facilities ES, two changes to the design proposals have been made and are included within the DCO, as these formed planning conditions to the permission granted by ESC:

- A footpath between the proposed outage car park at Pillbox Field and Coronation Wood development area has been removed from the design to prevent loss of land within the Sizewell Marshes SSSI, which would have been required for the construction of the footpath.

- An alternative junction arrangement for outage car park access and Sizewell Gap road has been developed to minimise effects on road safety.

1.2.11 Sizewell B lies to the south of Sizewell C. A number of existing Sizewell B power station ancillary buildings need to be relocated from the area of land that is nominated as a potentially suitable site for the development of the Sizewell C new nuclear power station – the Sizewell B relocated facilities.

Full details of the drainage strategy can be found in **Annexes 2A.1** and **2A.2**.

1.2.12 The Sizewell B relocated facilities have a broad range of functions including industrial, workplace, education, cultural and infrastructure; some of which need upgrading to comply with current standards and requirements.

1.2.13 The Sizewell B relocated facilities drainage strategy is consistent with that of Sizewell C and has also been developed with specific consideration of site issues which would affect the feasibility of specific solutions, such as the congestion of the below ground space on site, availability of existing drainage features, and the nature of the subsoil.

1.3 Glossary

Term / Abbreviation.	Definition
AD	Associated Development
AEP	Annual Exceedance Probability
AGP	Artificial Grass Pitch
AOD	Above Ordnance Datum
CDO	Combined Drainage Outfall
CESWI	Civil Engineering Specification for the Water Industry
CIRIA	Construction Industry Research and Information Association
CKD	Combined Kerb Drain
DMRB	Design Manual for Roads and Bridges
EDRMS	Electronic Document and Records Management System
EP	Environmental Permit
ESIDB	East Suffolk Internal Drainage Board
FEH	Flood Estimation Handbook
FRA	Flood Risk Assessment
FSR	Flood Studies Report
HAJ	Construction Sewage Treatment Plant (TBC)
HPC	Hinkley Point C
HXE	Permanent Sewage Treatment Plant
LEEIE	Land East of Eastlands Industrial Estate
LLFA	Lead Local Flood Authority
MCA	Main Construction Area
MCERT	EA Monitoring Certification Scheme

Term / Abbreviation.	Definition
MCHW	Manual of Contract Documents for Highway Works
MUGA	Multi Use Games Area
NPPF	National Planning Policy Framework
ONR	Office for Nuclear Regulation
OS	Ordnance Survey
SfA	Sewers for Adoption
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage System
SZA	Sizewell A power station
SZB	Sizewell B power station
SZC	Sizewell C power station
TCA	Temporary Construction Area
WIMES	Water Industry Mechanical and Electrical Specification
WMZs	Water Management Zones
0SEH	Permanent Local Oily Water Drain
0SEO-EP	Permanent Surface Water Drain
0SEO-EU/EV	Permanent Foul Water Drain

2 Strategy approach

2.1 Summary of strategy

2.1.1 This outline drainage strategy has been developed in such a way that it will not adversely affect the hydraulic performance of the existing environment. The approach proposed will mitigate adverse impacts on overland flow paths.

2.1.2 The main drainage principle is to mimic the existing environmental runoff patterns where possible. This outline drainage strategy has been developed in line with industry standards, guidance and best practice regarding the safe and sustainable management of surface water run-off.

2.1.3 The overarching surface water drainage philosophy provides conventional SuDS through the steps / hierarchy presented below, moving from each stage to the next only when the current stage is deemed not practicable within the Sizewell C Project:

- store rainwater for later use (e.g. rainwater harvesting);

- use infiltration techniques (e.g. porous surfaces);
- attenuate rainwater in ponds or open water features for gradual release;
- attenuate rainwater by storing in tanks for gradual release through an outlet; and
- discharge rainwater direct into watercourse or sea.

2.1.4 It is proposed that rainwater harvesting forms part of a holistic approach to integrated water management, particularly in areas that will have a high-water demand such as the accommodation campus. The viability of rainwater harvesting will be assessed at the detailed design stage as part of the design process in order to maximize the economic benefit without compromising the sustainability of ecosystems.

2.2 Aim of the outline drainage strategy

2.2.1 The principal aim of this outline drainage strategy is to set out the guiding principles for functional drainage systems which will satisfy the legislative and policy requirements of regulators and relevant organisations including the Highways Authority, Lead Local Flood Authority, the Environment Agency and the Internal Drainage Board.

2.2.2 In addition, the approach will seek to satisfy the following criteria as detailed in Construction Industry Research and Information Association (CIRIA) 753, where reasonably practicable:

- control run-off at or close to where it hits the ground;
- reduce the rate of run-off leaving any part of the site and discharging to nearby watercourses (ditches, streams, rivers, sea etc.) to greenfield rates;
- use at, or near-surface drainage features wherever practicable, slowing the rate of run-off entering into below ground drainage attenuation;
- provide stages of water treatment;
- select and combine appropriate drainage features or SuDS components to suit site constraints;

- encourage habitats for wildlife in developed areas and opportunities for biodiversity enhancement; and
- contribute to the ecology and aesthetic value of developed areas.

2.2.3 This strategy demonstrates the variety of SuDS components and design options available allow the Designer to consider local land use, land take, and future management scenarios.

2.2.4 Active design decisions can be taken to balance the interests of different stakeholders and the risks associated with each design option through consultation, and engagement.

2.3 Surface water flood risk design parameters

2.3.1 The surface water drainage networks for all proposed works will be designed to the following high level requirements, as set out in **Table 2.1.**

Table 2.1: Design parameters

Requirement	Description
Design Storm.	Proposed designs to be based on Summer/Winter storm events from 15 minutes to 1440 minute duration.
Return Period.	All return periods will have a climate change allowance applied, in accordance with the Environment Agency Guidance, to allow for anticipated changes in the peak rainfall intensity.
Level of Protection.	Any flooding under extreme storm conditions will be directed to locations that avoid damage to critical structures or buildings. To identify these routes a detailed analysis of the digital terrain model needs to be combined with flow path analysis.

a) Environment Agency requirements

2.3.2 As indicated in **Plate 2.1**, the Sizewell C site partially lies within Flood Zone 3, equating to land having a 1 in 100 or greater annual probability of river flooding; or land having a 1 in 200 or greater annual probability of sea flooding.

Plate 2.1: Environment Agency flood map (rivers and sea)

2.3.3 Where the site is within Flood Zone 3, flood resilience measures are required, and the design of the development should keep water out as much as possible. The platform drainage on the MCA has taken this into consideration. The WMZs also provide compensatory area into which exceedance events may flow in a controlled manner. Drainage features should be located outside of fluvial floodplains where possible.

b) Climate change allowance

2.3.4 In accordance with current Environment Agency guidance as shown in **Plate 2.2**, it is currently proposed that a 40% climate change allowance will be accommodated within the design of permanent works.

2.3.5 Infiltration basins within the TCA will be designed to cater for a 100 years flood event plus a 20% allowance for climate change. Flood relief basins will be designed to cater for a 100 years flood event plus a 40% allowance for climate change.

2.3.6 Car parking areas, access roads, Sizewell link road and the two village bypass will be designed in accordance with the Design Manual for Roads and Bridges (DMRB), British Standards and best practice guidance at the time of the design, including allowance for climate change.

Plate 2.2: Peak rainfall intensity allowance in small and urban catchments (Environment Agency)[2]

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

c) The Environment Agency and Office for Nuclear Regulation Joint Advice Note

2.3.7 The Environment Agency and Office for Nuclear Regulation (ONR) have published a Joint Advice Note "Principles for Flood and Coastal Erosion Risk Management". The Advice Note sets out the requirements for the protection against flooding at nuclear power stations. Note that this applies only to the main development site, not the associated development sites.

2.3.8 In addition to a "fit for purpose assessment of flood risk", the Environment Agency and ONR require a FRA to include information on the potential for flooding due to pluvial, surface water, groundwater, high tides, storm surges and tsunamis; and the probability of failure of flood risk management measures, for example, blocked drainage channels, or the breach / over-topping of flood defences, and the associated consequences.

2.3.9 The design criteria for more typical events are included in **Table 2.2** below.

Table 2.2: Surface water drainage parameters

Return Period (years).	Drainage Criteria.	Description
1	No surcharging above outfall soffits.	The highest probability event to be specifically considered to ensure that flows to the watercourse are tightly controlled for frequent events. This criterion aims to ensure the morphological conditions in the stream remain the same.
30	No surface flooding.	A useful intermediary event for which to assess on-site system performance, because of its relevance for industry standard design. Surface water will be accommodated within SuDS

2 https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C699555.8948%2C2

Return Period (years).	Drainage Criteria.	Description
		structures. However, it will be ensured that the surface water level within the structure remains 0.3m below the top of the structure.
100	Controlled flooding to sacrificial external areas.	Represents the boundary between high and medium risks of fluvial flooding defined in the NPPF. This limit recognises that it is not practicable to fully limit flows for most exceedance events. Overland flow will be managed through existing and proposed surface topography to ensure that flood flows are directed away from critical site infrastructure.
>100	Exceedance event	When the capacity of the surface water drainage network is exceeded, surface water runoff will cumulate on the surface and be removed by overland flow to lower areas.

d) National Planning Policy Framework and guidance

2.3.10 The NPPF sets out the Government's planning policies for England. The NPPF seeks to ensure that flood risk is considered at all stages of the planning and development process, to avoid inappropriate development in areas at risk of flooding, and to direct development away from areas at highest risk of flooding. Where there are no reasonably available sites in Flood Zone 1, the local planning authority can consider reasonably available sites in Flood Zone 2. Only when there are no reasonably available sites for development in Flood Zones 1 and 2 should the suitability of sites in Flood Zone 3 be considered.

2.3.11 In addition, the NPPF states that "*the development should be made safe for its lifetime without increasing flood risk elsewhere*". For a development to be considered acceptable with regards to flood risk, the Sequential Test requirements must be satisfied, along with demonstrating the development:

- within the site, the most vulnerable development is located in areas of lowest flood risk, unless there are overriding reasons to prefer a different location;
- is appropriately flood resistant and resilient;
- it incorporates sustainable drainage systems, unless there is clear evidence that this would be inappropriate;
- any residual risk can be safely managed; and

- safe access and escape routes are included where appropriate, as part of an agreed emergency plan.

e) Storm water management

2.3.12 Proposed drainage systems utilising various SuDS techniques will be designed to accommodate the predicted flows for all rainfall return periods listed above.

2.3.13 Industry standard WinDes 'Microdrainage' or similar will be used to assist the design of SuDS and any below ground pipework. Following the Flood Studies Report (FSR) method, using Sizewell, Suffolk as the location, an M5-60 and 'r' ratio of 18.2 mm and 0.4 respectively will be used to predict the various storms in which the drainage infrastructure will be subject to, including varying storm intensities and return periods.

2.3.14 During the Detailed Design Process the Hydrology for both FSR and the Flood Estimation Handbook (FEH) methods are used. FSR predominantly for detailed design and FEH13 for checking for exceedance and identifying flood channel routes.

f) Attenuation

2.3.15 Where required, a simple model will be used to assess the preliminary attenuation storage and run-off volumes required. The proposal will be designed to cater for the 100-year critical event, with an additional allowance for allow for climate change. This is in accordance with current guidance from the Environment Agency.

2.3.16 The rate of discharge to any watercourse or drain will be limited to the equivalent greenfield run-off rate for the site, as appropriate to the existing undeveloped conditions, via the provision of storage and/or flow restrictors (e.g. hydro-brakes or similar). The flow control will constrain the rate of discharge, and attenuation storage will be employed when the rate of inflow from the storm runoff is greater than the subgrade infiltration rate or greenfield runoff rate.

g) SuDS and infiltration structures

2.3.17 SuDS will be designed in accordance with CIRIA SuDS Manual (C753).

2.3.18 A factor of safety will be applied to the observed/assumed infiltration coefficient to account for any loss of efficiency over the design life of the soakaway

2.3.19 In accordance with CIRIA C753 the following factors will be used to account for possible loss of infiltration capacity through the design life of the system.

The following figures are not based on actual observations of performance loss.

2.3.20 Where an infiltration structure is proposed, a factor of safety dependent upon the consequence of failure, as indicated in **Table 2.3** will be assessed.

Table 2.3: Factor of safety for infiltration systems

Size of area to be drained.	Consequences of failure.		
	No damage or inconvenience.	Minor inconvenience (e.g. surface on car parking).	Damage to buildings or structures, or major inconvenience (e.g. flooding of roads).
< 100m2	1.5	2	10
100 – 1000 m2	1.5	3	10
> 1000 m2	1.5	5	10

2.3.21 The Factor of Safety (FoS) is applied to the infiltration rate / permeability of the ground, to mimic any potential loss of performance over time. For example, a FoS of 1.5 applied to the assumed and conservative infiltration rate of 1 x 10-5 m/s, results in the following infiltration rate being used in calculations: (1 x 10-5) / 1.5 = 6.7 x 10-6 m/s.

2.3.22 To ensure the system's readiness to deal with a rainfall event, the infiltration rate from the system should be sufficient, so that the storage becomes half-empty within 24 hours. Where practicable, soakaways will be placed to ensure that the seasonally high groundwater table is at least 1m below the base of the soakaway. Infiltration systems will also be installed a minimum of 5m away from any foundations, including other underground structures.

2.4 SuDS maintenance

2.4.1 The types of construction recommended e.g. porous car-parks, infiltration structures etc. normally have a refurbishment requirement of between 20-30 years. The lifetime of the temporary associated development sites is 9-12 years and well within this timeframe. For operations at the main development site, the likely use of these structures is fairly light with a lot of roof drainage with sediment traps and thus the refurbishment in this case is likely to be of longer increment than usual.

2.4.2 Sufficient inspection and maintenance will be undertaken during the life of the SuDS features to ensure the condition of the permeable pavements, tree pits, infiltration trenches and/or other drainage or SuDS features remain viable. An allowance for maintenance and minor refurbishment should be programmed within the detailed designed process.

2.4.3 A SuDS Maintenance Plan will be compiled and completed in accordance with the SuDS Manual C753.

2.4.4 A Maintenance Plan ensures that all those involved in the maintenance and operation of the SuDS understand the functionality and maintenance requirements to support long-term performance to the design criteria to which they are designed.

2.4.5 Maintenance ensures efficient operation and prevents failure. As SuDS structures are on or near the surface, most can be managed using landscape maintenance techniques.

2.4.6 SuDS structures such as permeable paving and modular geocellular storage should be maintained in accordance with the advice from the manufacturer. This should include routine and long-term actions that can be incorporated into a maintenance plan.

2.4.7 **Table 2.4** is taken from CIRIA and provides a breakdown of typical maintenance requirements. This should include an overview of the design concepts and a maintenance schedule for the scheme to ensure that it continues to function as intended. Further information on maintenance can be found in The SUDS manual (CIRIA publication C753).

Table 2.4: SuDS maintenance requirements

Maintenance Type.	Indicative frequency.	Typical tasks.
Routine/regular maintenance.	Monthly (for normal care of SuDS).	litter picking. grass cutting. inspection of inlets, outlets and control structures.
Occasional maintenance.	Annually (dependent on the design).	silt control and removal around components. vegetation management around components. suction sweeping of permeable paving. silt removal from catch pits, soakaways and cellular storage.
Remedial maintenance.	As required (tasks to repair problems due to damage or vandalism).	inlet/outlet repair. erosion repairs. reinstatement of edgings. reinstatement following pollution. removal of silt build up.

2.5 Contaminant management

a) Contaminant management in runoff

2.5.1 Managing the quality of surface water runoff so that receiving waters and/or groundwaters are protected is intrinsically linked to the hydraulic control of runoff. SuDS treatment and pollution removal can work alongside conveyance, attenuation and infiltration, particularly within vegetated surface-based systems.

2.5.2 Any SuDS component will be designed according to the guidance set out in the technical component chapters of the CIRIA SuDS Manual to ensure that treatment processes are effective.

b) Protecting surface water

2.5.3 The CIRIA SuDS Manual specifies that when discharging runoff from the site to surface waters, SuDS should be designed to intercept runoff (and the associated pollutants) for most rainfall events up to approximately 5 mm in depth.

2.5.4 When runoff does occur, treatment within SuDS components is essential for frequent rainfall events, for example up to a 1 in 1-year return period event, where contaminants are being mobilised and washed off impermeable surfaces, and the aggregated contribution to the total pollutant load to the receiving surface water body could be greater.

2.5.5 For rainfall events greater than the 1 in 1-year event, where larger volumes of surface water are generated it is likely that the dilution available in receiving surface waters will be increased, and environmental risks will be reduced, however the treatment train processes recommended in the CIRIA manual will still be applied to runoff.

c) Protecting groundwater

2.5.6 Groundwater pollution risk management will be considered for all runoff events for both storing runoff in the upper soil layers of SuDS components from where small amounts of water may infiltrate, and infiltrating significant volumes of runoff into the ground.

2.5.7 Advice on groundwater protection for England and Wales is provided in the Groundwater Protection Position Statements Guidance (Ref. 1.7) covering:

requirements, permissions, risk assessments and controls (previously covered in Groundwater Protection: Principles and Practice[3]).

2.5.8 The CIRIA SuDS Manual advises that the risk posed by surface water runoff to groundwater is often low because of the protection afforded by the layers of unsaturated soils that lie between the infiltration surface and the groundwater receptor.

2.5.9 The effectiveness of the protection will depend on the depth of the groundwater, the predominant flow type, and the soil characteristics.

2.5.10 A greater depth of unsaturated soil, intergranular flow, and soils with significant clay mineral and organic content have been demonstrated to offer increased potential for beneficial contaminant attenuation.

2.5.11 Where the risks to groundwater are considered to be unacceptable, upstream (lined) SuDS components can be used to reduce pollutant levels. If the risk is still considered unacceptable, infiltration should be prevented.

2.5.12 This report assesses groundwater at the main development site in greater detail.

d) Treatment

2.5.13 There are a range of water quality treatment processes that can be utilised within the design of SuDS: sedimentation, infiltration and biofiltration, separation, adsorption, biodegradation, volatilisation, precipitation, hydrolysis, oxidation, reduction and substitution, plant uptake and photolysis.

2.5.14 The effectiveness of each treatment is linked to the control of runoff both in the velocity of flow and in the retention time. Controlling velocity affects sediment deposition, filtration and other similar processes occurring at low flow velocities during regular rainfall events up to the 1 in 1-year event.

2.5.15 Contaminant removal occurs through settling, adsorption and other similar processes occurring over in the time that the runoff is in contact with the SuDS such as a swale, a bioretention system, or held within a basin/pond. It is also dependent on the qualities of any materials through which the runoff is filtered.

2.5.16 The proposed SuDS to be constructed across the Sizewell C sites are indicated inthis report. The detail for each WMZ and associated development site will be developed at the detailed design stage.

[3] https://www.gov.uk/government/publications/groundwater-protection-principles-and-practice-gp3

2.6 Foul water management

2.6.1 The outline foul drainage strategy provides conventional drainage through the steps / hierarchy presented below, moving from each stage to the next only when the current stage is deemed not practicable within the Sizewell C Project:

- Transfer flows to Treatment Works.
- Introduce package plant.
- Specialist low flow package plant.
- Tankering to works (Cess Pits).

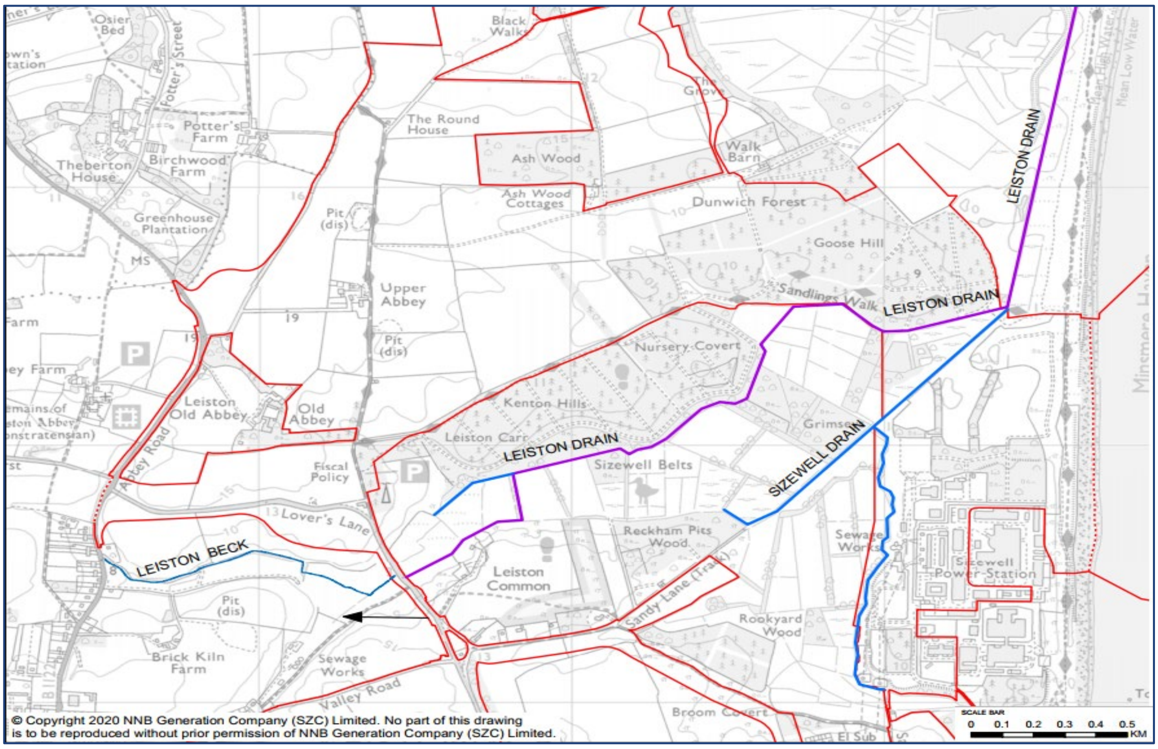
3 Main development site

3.1 Overview of current local drainage

3.1.1 With the exception of the part of the MCA which is currently occupied by ancillary Sizewell B buildings, the land within the construction site boundary is currently undeveloped and as a result has natural, greenfield drainage. Some rainfall will percolate into the ground contributing to groundwater recharge and some will discharge to natural watercourses, via surface water overland flow.

3.1.2 The surface land drainage features shown on the ordnance survey (OS) 1:25,000 scale mapping in **Plate 3.1** shows that within the site boundary is a small length of Leiston Drain which passes through the gap between the MCA and TCA, and Sizewell Drain which passes through the footprint of the MCA. The Leiston Drain (Main River) and Ordinary Watercourses are indicated in **Plate 3.1**.

Plate 3.1: Existing drainage features



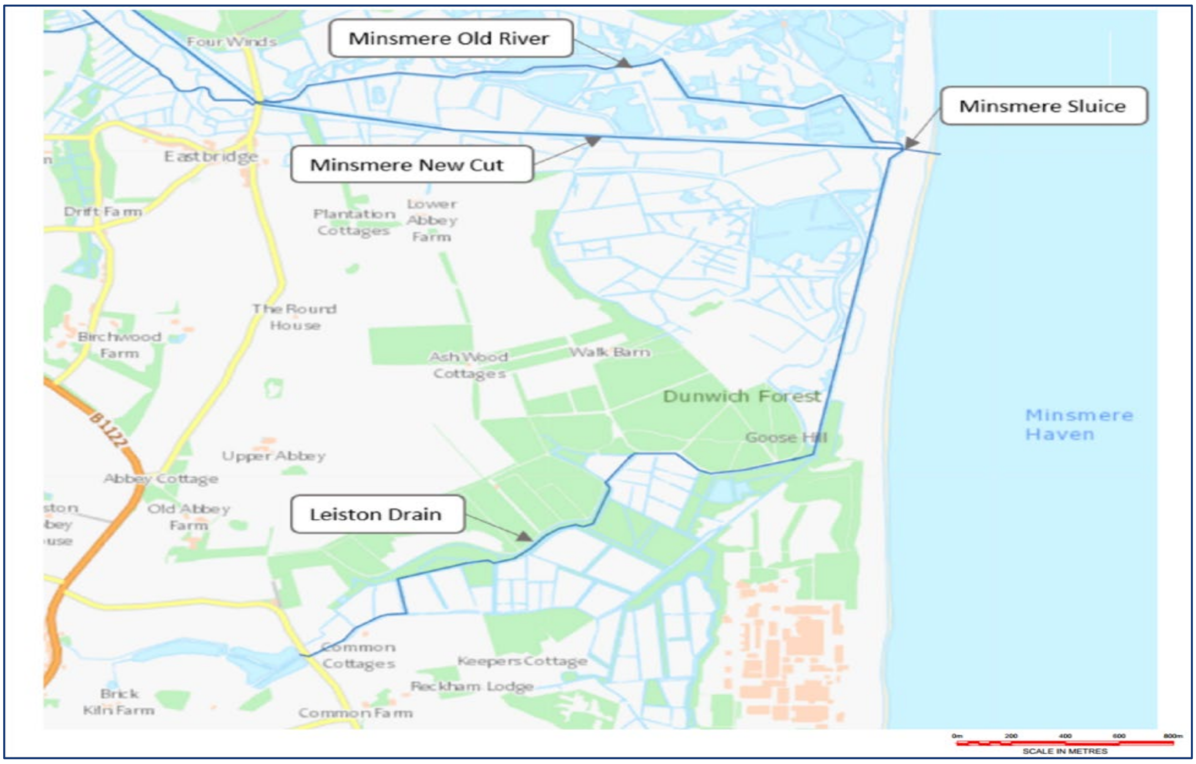
3.1.3 Indicative directions of the surface water overland flow paths, based on general topography and ground levels, are shown in **Figure 2A.2**.

3.1.4 The low-lying areas, forming Sizewell Marshes SSSI and part of the MCA footprint, are part of the floodplain for Leiston Drain and Sizewell Drain. Flood maps produced by the Environment Agency show the extent of land adjacent to watercourses that is flooded due to river flooding during a 1 in 100-year return period rainfall event or 1 in 200 (undefended) coastal flooding events. This extent is known as Flood Zone 3.

3.1.5 The Minsmere River is to the north of and outside of the site boundary. This discharges to sea via the Minsmere Sluice which controls outflow from watercourses to sea whilst preventing large scale backflow from the sea.

3.1.6 **Plate 3.2** indicates the statutory Main Rivers, showing the locations of the Minsmere Old River, the Minsmere New Cut and the Leiston Drain.

Plate 3.2: Statutory Main River map taken from Environment Agency mapping – ARC GIS Service[4]



a) Minsmere River and Minsmere Sluice

3.1.7 Minsmere River discharges to sea via the Minsmere Sluice. The sluice is divided into two chambers, each with its own gravity outlet culvert. The northern chamber receives flows from the Minsmere New Cut, while the southern chamber receives flows from Leiston Drain and Scott's Hall Drain (Ordinary Watercourse). When river levels exceed sea levels, water flows from river to sea. When sea levels exceed river levels, flow will cease, and water is stored upstream of the sluice. Some ingress of seawater into the freshwater system has been factored into the operation.

3.1.8 No part of the TCA is currently drained to Minsmere River and under normal operation of Minsmere Sluice, there should be no flow from the main development site / TCA catchments via Leiston Drain into Minsmere River. As a result, Minsmere River is not considered further as part of this strategy.

4 https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C699555.8948%2C295506.412%2C27700

3.1.9 Any overland flow towards Minsmere River would be intercepted by ditches which connect to Leiston Drain in proximity to Minsmere Sluice. The FRA indicates that the impact of the development is low. It is also noted that due to changes of topography to create the construction platforms and the use of infiltration for removal of surface water runoff, it is not intended that there will be any future direct surface water discharge from the site during construction, north to ditches or to Minsmere River.

b) Leiston Drain

3.1.10 Minsmere Sluice is the convergence point of Leiston Drain, Minsmere New Cut and Minsmere River. The source of Leiston Drain is located at the side of the B1122 (Abbey Road) adjacent to the site of Leiston Abbey. This local watercourse runs alongside the west side of the road before passing into a culvert at the entrance to Leiston.

3.1.11 Leiston Drain issues from the culvert downstream of Abbey Road and runs through the Aldhurst Farm area to the north of Leiston before passing under Lover's Lane in a culvert to discharge into the Sizewell Marshes SSSI. The Leiston Sewage Treatment Works discharges treated final effluent into Leiston Drain via a ditch, upstream of Lover's Lane. During dry weather, the treated final effluent flows form a significant proportion of base flow. The urban areas of Leiston also discharge surface water into Leiston Drain via the public surface water sewer network.

3.1.12 Downstream of Lover's Lane, Leiston Drain splits into two separate channels. The northern channel is the main channel, classified as Main River by the Environment Agency. The southern channel is classified as a ditch.

3.1.13 The area between the two channels is a flat low-lying wetland area forming Sizewell Marshes SSSI and maintained by Suffolk Wildlife Trust on behalf of SZC Co. The OS 1:25,000 scale mapping in **Plate 3.1** shows a complex series of ditches within this area. However, these ditches not only drain the area but are used to control groundwater levels required to maintain the ecology of the SSSI. At the eastern end of Sizewell Marshes SSSI the two channels re-join before passing through a narrow gap between the proposed MCA platform to the south and Goose Hill (proposed TCA platform) to the north. Leiston Drain then turns north running through a wide low flood plain, parallel to the sea defence bund outfalling to Minsmere Sluice. Under normal operation there is no direct interconnection between Minsmere River and Leiston Drain at the sluice. Leiston Drain discharges to sea via a separate outfall independently from Minsmere River. However, the Leiston Drain outfall is shared by the Scotts Hall Drain which connects from the north. This drains to the RSPB Minsmere Nature Reserve (SSSI, Special Area of Conservation, Special Protection Area and Ramsar).

3.1.14 It is intended that by implementing this outline drainage strategy, through removal of surface water runoff by a combination of limiting flow to greenfield runoff rates and infiltration to ground, and subsequent permanent detailed drainage strategy, that no adverse changes due to development will be observed at Minsmere Sluice/Scotts Hall Drain. The drainage system will include flexible design measures whereby water movement can be influenced if required.

3.1.15 Much of the TCA and the entire MCA are located within the Leiston Drain catchment. A surface water drainage system will drain the TCA and surface water will either infiltrate into the ground or discharge to Leiston Drain at greenfield runoff rates after any contaminant removal treatment has taken place. A surface water drainage network will drain the MCA but will discharge to sea via the Combined Drainage Outfall (CDO).

3.1.16 There is a separate construction site known as Land to the East of Eastlands Industrial Estate (LEEIE) at Leiston. This falls within the Leiston Drain catchment.

c) Sizewell Drain

3.1.17 Sizewell Drain is a tributary of the Leiston Drain connecting to it at the narrow gap between the proposed MCA site platform to the south and Goose Hill (proposed TCA) to the north. In **Figure 2A.3**, the MCA site is to the east of Sizewell Drain and south of Leiston Drain. This currently discharges runoff to Sizewell Drain but will not do so when construction takes place. It is classified as an East Suffolk Internal Drainage Board (ESIDB) ditch reference DRN163G0202.

3.1.18 OS 1:25,000 scale mapping in **Figure 2A.3** shows it as issuing immediately to the north of the Sizewell Gap road and then running in a defined watercourse along the western boundary with Sizewell A and Sizewell B. However, as part of a scoping investigation for the development of the FRA hydraulic model, it was found that the Sizewell Drain's source is much further north and runs through a wetland such that the channel is not fully defined. At its northern extent there is a complex series of ditches which link in with those connecting to the Leiston Drain.

3.2 Impact of development on local drainage

a) Flood Zones

3.2.1 The extent of area subject to flood risk is shown on the Environment Agency flood map, an extract of which is shown on **Plate 3.3** below[5].

Plate 3.3: Environment Agency flood map extract

3.2.2 The flood risk extent, categorised as Flood Zone 3, has been determined by Environment Agency hydraulic modelling. The area shown shaded light blue is at risk of flooding due to either a 0.5% Annual Exceedance Probability (AEP) (commonly referred to as a 1 in 200-year return period) coastal flooding event or a 1.0 % AEP (commonly referred to as a 1 in 100-year return period) fluvial (river) flooding event. For the purpose of development flood risk, it is irrelevant as to whether flooding is due to coastal or fluvial events, so the map does not distinguish source.

5 "https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C6

b) Main development site and flood risk

3.2.3 From a comparison of the extent of the construction site (shown in **Figure 2A.1**) and the currently assumed Flood Zone 3 (shown in **Plate 2.1** in this report), it is apparent that there is a potential intrusion on the Flood Zone which would imply risk of flooding and potentially a constraint to surface and stormwater management.

3.2.4 The National Planning Policy Framework (NPPF) provides that inappropriate development in areas at the greatest risk of flooding should be avoided. Where development is necessary in such areas, the development should be made safe for its lifetime without increasing flood risk elsewhere. The **Main Development Site Flood Risk Assessment** (Doc. Ref. 5.2) provides further details on flood risk.

c) LEIEE and flood risk

3.2.5 The risk of flooding to areas adjacent to the site will be mitigated by provision of surface water management measures which will attenuate runoff from the site. The **Main Development Site Flood Risk Assessment** (Doc. Ref. 5.2) provides further details on flood risk.

d) SSSI crossing

3.2.6 The main access to Sizewell C will be via a permanent road from a roundabout junction with Abbey Road (B1122). This road would run west to east through the TCA and cross Leiston Drain and its adjacent floodplain on the SSSI crossing to access the MCA. Given the importance of early access to the main platform area, the SSSI crossing would be installed early in the construction programme.

e) Sizewell Drain diversion

3.2.7 Sizewell Drain will be diverted north. At its northern extent, it would discharge to the Leiston Drain upstream of the SSSI crossing. In addition, revised water level management may be required for the drainage units and watercourses adjacent to the construction site. This would require the inclusion of water level control structures along the realigned Sizewell Drain and the revised operation of other existing structures. see **Chapter 19, Volume 2** of this **ES** for further details.

3.3 Strategic water management

a) Strategic design criteria

3.3.1 The drainage criteria are as follows:

i. Volume criteria

- Drainage facilities to provide no surface flooding from a 1 in 30-year return period rainfall event, in accordance with accepted guidelines, combining a range of techniques e.g. Infiltration systems, permeable paving and surface drainage structures to remove water from paved or semi-paved surfaces (e.g. storage areas) with no ponding for a 1 in 30-year rainfall event.

- Store or safely convey the run-off from exceedance storm events greater than 1 in 30-year return period, without putting public or property at risk.

- Reduce if possible, or at least not increase, the pre-development risk of flooding.

- Determine the impact and store on site the volume of water generated from a 1 in 100-year rainfall event to prevent escape into adjacent areas.

ii. Water quality criteria

- Remove / treat any contaminants within surface water runoff before discharge.

iii. Amenity and ecology criteria

- Provide amenity and ecological enhancement, if practicable.

iv. Sustainability criteria

- Protect the environment, minimise the use of finite natural resources and energy and provide value to those involved in its design, construction and operation.

3.3.2 A key design requirement of SuDS and drainage design for external paved areas is 'interception' – the capture and retention of the first 5mm of every rainfall event.

3.3.3 Rainfall run-off from external paved surfaces, such as car parks, laydown areas, material storage areas and roads, can contain a range of pollutants. The highest concentration of these pollutants tends to be found in run-off from the earliest part of a rain storm.

3.3.4 Intercepting the first 5mm of every rain storm has positive benefits for water quality and quantity, as such, interception will be implemented into the drainage approach wherever practicable.

3.3.5 Where necessary, appropriate oil/fuel controls, such as formal oil separators or through utilising effective SuDS principles, such as permeable paving, swales, etc., will be implemented into the surface water drainage networks. However, it is anticipated that these types of pollutant loads will be managed through physical interventions such as petrol, oil, diesel interceptors.

3.3.6 Groundwater levels, infiltration rates and ground conditions at the various proposed sites will be determined in order to propose a suitable drainage design. This drainage philosophy will make assumptions for these conditions and list them where applicable. Where practicable, the drainage system will emulate the current greenfield run-off characteristics.

3.3.7 For facilities that would be served by a direct drainage connection into the existing network, there will be no increase in flow rates or volumes compared to the existing conditions at the site. This will require formal confirmation with respect to the viability (condition and performance) of the existing drainage network. Assurance will be required that there is sufficient capacity to accommodate the anticipated surface water such that there is no increased risk of surface flooding. Affected existing pipework may need to be locally upgraded / upsized to accommodate any increased run-off volume, although no such network reinforcement is currently envisaged to satisfy this outline drainage strategy.

3.3.8 Flow controls will be incorporated where the surface water is proposed to be discharged into the existing site drainage network, to limit the discharge rate to the equivalent greenfield run-off rate up to a 1 in 1-year event.

b) Construction drainage

3.3.9 The TCA has been divided into 10 WMZ catchments for the purpose of storm water management and disposal, and nine of these zones have been aggregated into three groups:

- Group 1 - WMZ-1, 2, 3 and 6 that discharge to both surface and groundwater.
- Group 2 – WMZ-4, 5 and 10 that discharge to groundwater only.
- Group 3 – WMZ-7, 8 and 9 that discharge to surface and tidal waters (MCA).

3.3.10 WMZ-9 is the MCA Deep Excavation.

3.3.11 All areas in Groups 1 and 2 would be returned to their former use upon completion of the construction phase.

3.3.12 On completion of construction, WMZ-7, 8 and 9 form part of the permanent site and these will be served by traditional piped systems.

3.3.13 The layout of these WMZs is shown in **Figure 2A.4**.

3.3.14 Each of these WMZs has been assessed and the recommended methods of surface water management for each WMZ consider the type of use in each sub-area of the construction site as well as considering its impact on the surrounding environment.

3.3.15 As well as managing runoff volume the strategy also considers pollutant loadings and these will be dependent on what the area is being used for.

3.3.16 In addition to managing the 30-year event the strategy considers the site resilience to extreme rainfall such as 100-year event and where the runoff will end up ensuring that the surrounding Sizewell Marshes SSSI and Minsmere Nature Reserve are not adversely affected.

3.3.17 Similarly, LEEIE has been assessed and the recommended methods of Surface Water Management for the LEIEE considers the type of use in each of the areas.

3.3.18 Each of the WMZs and the additional locations are appraised individually in this outline strategy, where the drainage principles and mitigation required in the design stage both during construction and for the permanent development are detailed.

3.3.19 There is variety of SuDS techniques proposed across the main development site. This is based on infiltration testing that shows the permeability has different features as you move further inland. The strategy allows for different types of approach to cater for these variations

3.3.20 The Site Entrance Hub will follow the same guidelines as laid out in this outline drainage strategy.

3.3.21 The Water Resource Storage Area is primarily an area for site water storage for a number of different uses, e.g. dust suppression, washdown areas, etc. This does not have direct links to the outline drainage strategy methods as it is predominantly water storage. Further details for the Water Resource Storage Area can be found in **Chapter 3 Volume 2** of the **Environmental Statement**.

c) Infiltration testing

3.3.22 Infiltration testing on the main development site has been carried out as part of previous investigations in 2014 and 2017, through both trial pits and boreholes. The approximate locations and indicative infiltration rates of these locations are shown in **Figure 2A.5**.

3.4 Water Management Zone assessment

3.4.1 The MCA and TCA have been divided into 10 WMZs (catchments for the purpose of storm water management and disposal). The WMZs have been further grouped according to their required drainage strategies.

3.4.2 This section outlines the specific drainage strategies to be applied to each of the proposed WMZ groups.

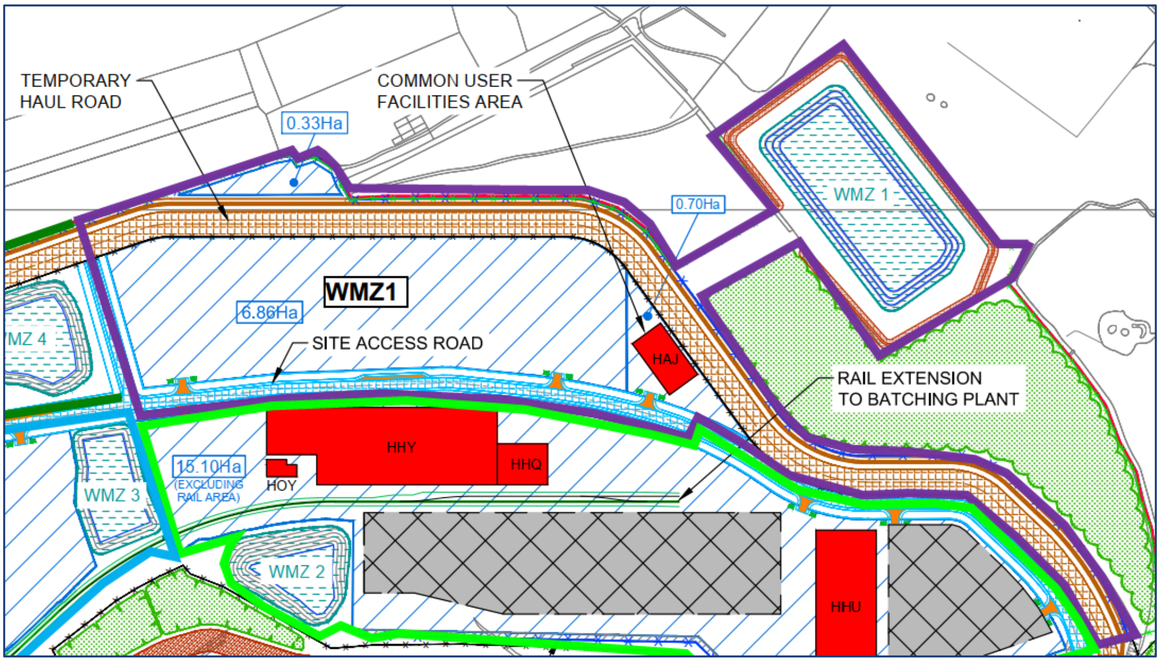
a) Water Management Zones 1, 2 ,3 and 6 (Group 1)

3.4.3 These WMZs, which discharge by both controlled greenfield rate and infiltration, are shown in **Figure 2A.4.**

i. Water Management Zone 1

3.4.4 WMZ-1, shown in **Plate 3.4**, indicatively serves the proposed temporary haul road during construction as well as part of the site access road. WMZ-1 also indicatively includes the Temporary Sewage Treatment Plant.

Plate 3.4: Water Management Zone 1 (edged in purple)



3.4.5 The proposed strategy is to drain the surface water run-off through infiltration techniques by directing the road surface run-off into suitably located gullies, which will subsequently convey the surface water into a detention basin which will allow infiltration.

3.4.6 It is proposed that surface water runoff in WMZ-1 be primarily managed via a roadside infiltration trench and/or swale. This will ensure that surface water is treated close to source.

3.4.7 Strategically located infiltration trenches within the WMZ would also be used to collect, convey and infiltrate surface water where appropriate, to avoid large volumes of overland flow.

3.4.8 The infiltration trenches will create temporary subsurface storage of stormwater runoff, thereby enhancing the natural capacity of the ground to store and drain water. Water will exfiltrate into the surrounding soils from the bottom and sides of the trench.

3.4.9 The detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity, however ecological surveys indicate that the proposed location for the basin may encroach on a wildlife habitat. A change in its size/shape to avoid the habitat may be required at detailed design stage. A reduction in capacity would be compensated in swales and infiltration trenches that serve the WMZ, if required.

3.4.10 The site access road, where constructed to highways standards using impermeable surfacing, may drain via surface water gullies to the infiltration trenches/swales alongside the road, allowing storage and infiltration.

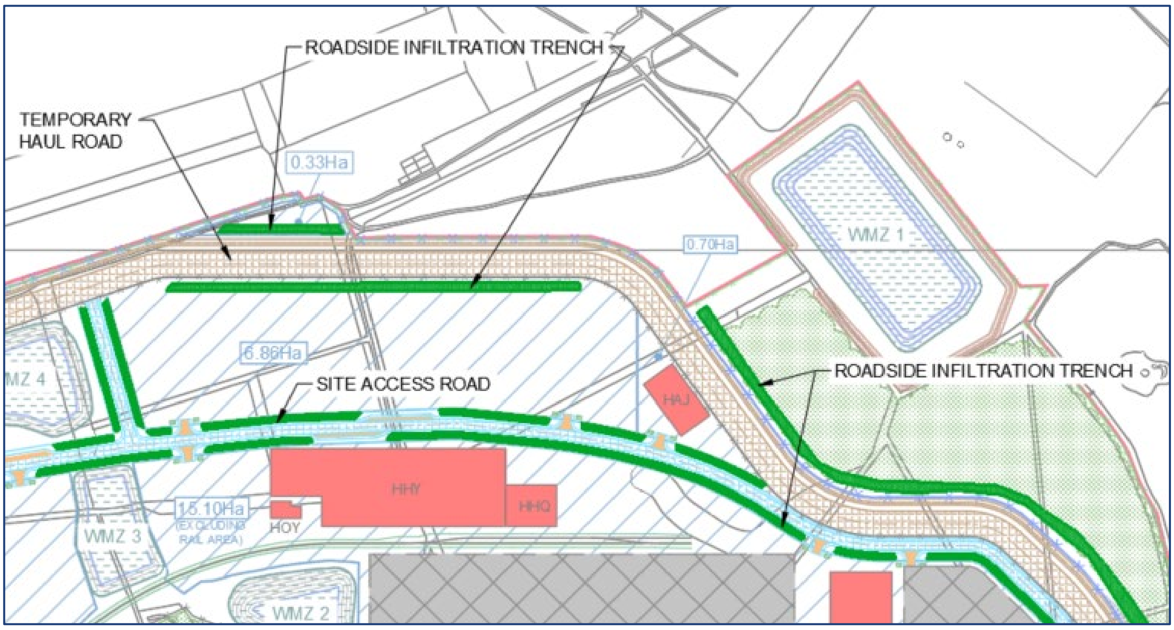
3.4.11 During construction, storm water runoff may have a high concentration of silts from fine particles contained within the soil or present on the surface of substrata. Over time this can blind the surface of the basin/pond or the faces or base of other structures such as porous surfaces or trenches. This can make them inoperable depending on the degree of silt contained in the runoff, therefore strategically positioned filters, semi-permeable barriers and settling forebays can be provided in the bigger structures. These can be cleaned out periodically thereby protecting the SuDS structures and runoff to watercourses.

3.4.12 Hydrocarbon loading from haul and access roads are common. Pollutant loads are managed within SuDS structures. Almost all the pollutant load is held within the fine particles in the runoff, removal of these fine particles may be carried out using proprietary measures should further treatment be necessary.

3.4.13 Prior to the construction of the CDO, it is proposed that the MCA drains to WMZ-1 and WMZ-2. Treated runoff may be conveyed to the attenuating features within WMZ-1 and they should therefore be sized accordingly.

3.4.14 **Plate 3.5** indicates proposed techniques in WMZ-1 and **Table 3.1** sets out the surface water hierarchy for WMZ-1.

Plate 3.5: Proposed techniques in Water Management Zone 1



3.4.15 Some examples of infiltration trenches are shown below:

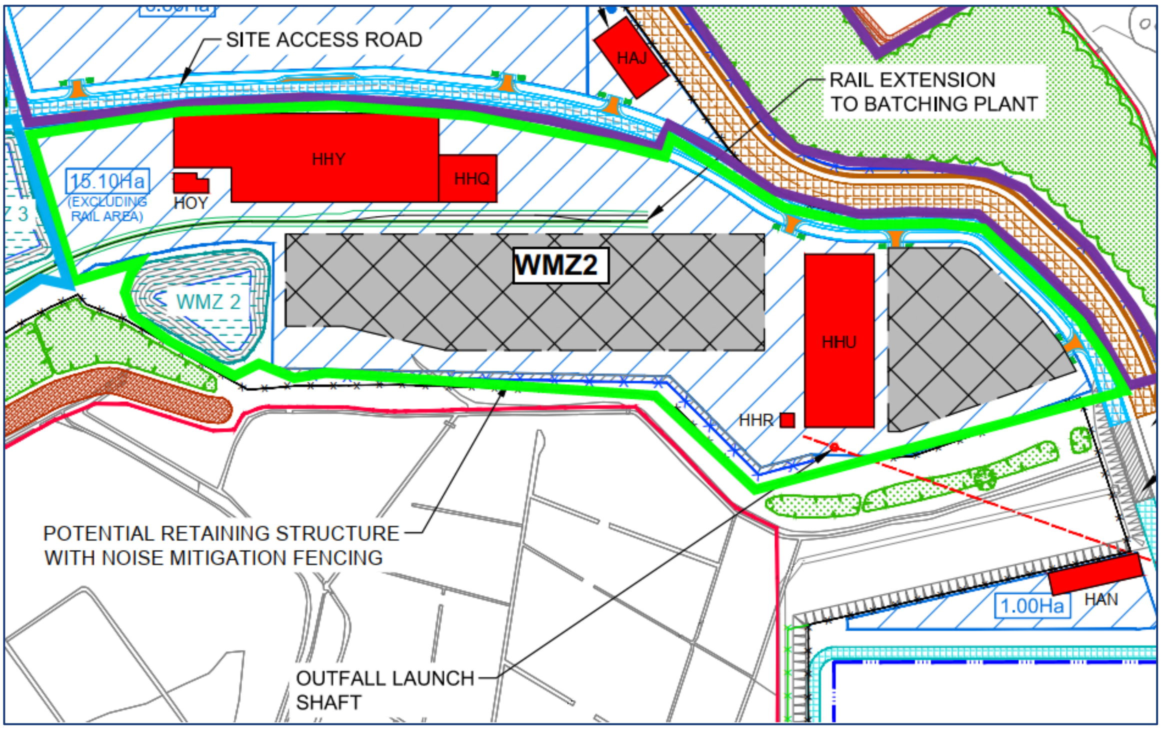
Table 3.1: Surface water drainage hierarchy WMZ-1

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Surface water will infiltrate into the ground at source where possible through permeable surfacing. Additional run-off from the access road surface will be conveyed into infiltration trenches located alongside the proposed access and/or haul roads. Where required, silt interception systems will be in place due to the close proximity of the Sizewell Marshes SSSI.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the boundary of the access road within the soft landscaping to provide support drainage for overflows. These would be used to collect, convey, infiltrate and attenuate run-off. Treated surface water that cannot infiltrate may runoff into local watercourses.
4. Attenuation (tanks).	✓	A below ground attenuation tank with a volume sufficient to attenuate run-off and discharge into the site drainage network. These however will not generally be implemented as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	The Sizewell Marshes SSSI runs close to the site boundary, therefore direct discharge into any watercourses is deemed undesirable, due to strict restrictions on the water quality of the run-off discharging into it. If soakaways are deemed unviable following detailed design calculations, the surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of hydrocarbons.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water drains in the vicinity.
7. Discharge – Combined Sewer.	X	Discounted - there are no known combined sewers in the vicinity.

ii. Water Management Zone 2

3.4.16 During construction it is proposed that WMZ-2 will serve the Raw Water Storage, the Containment Liner Prefabrication Facility, the Concrete Batching Plant and the Common User Facilities Area. During construction, and upon completion, WMZ-2 would also indicatively serve part of the Site Access Road. It is proposed that the MCA car park would also be constructed within WMZ-2. WMZ-2 is indicated on **Plate 3.6**.

Plate 3.6: Water Management Zone 2 (edged in green)



3.4.17 The proposed strategy is to drain the surface water run-off through infiltration techniques by directing the road surface run-off into gullies, which will subsequently convey the surface water into a detention basin which will allow infiltration.

3.4.18 Other impermeable surfaces within WMZ-2 are also proposed to drain to infiltration structures located within the WMZ, as appropriate.

3.4.19 The car park that is to be constructed within the TCA, and remain following the construction phase for use when the site is operational, would be constructed using permeable surfacing where possible. To allow for infiltration, storage would need to be located beneath the car parking areas.

3.4.20 The ground investigation reports indicate that infiltration rates vary across the site and infiltration is possible in the vicinity of the car park. The underground storage systems will infiltrate to the ground at a rate depending on the characteristics of the underlining soil. Further ground investigations will indicate the expected infiltration rates and therefore the volumes of storage required.

3.4.21 It is proposed that the site access road, where constructed to highways standards using impermeable surfacing, may drain via surface water gullies to infiltration trenches/swales alongside the road, allowing storage and infiltration close to source.

3.4.22 The detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity.

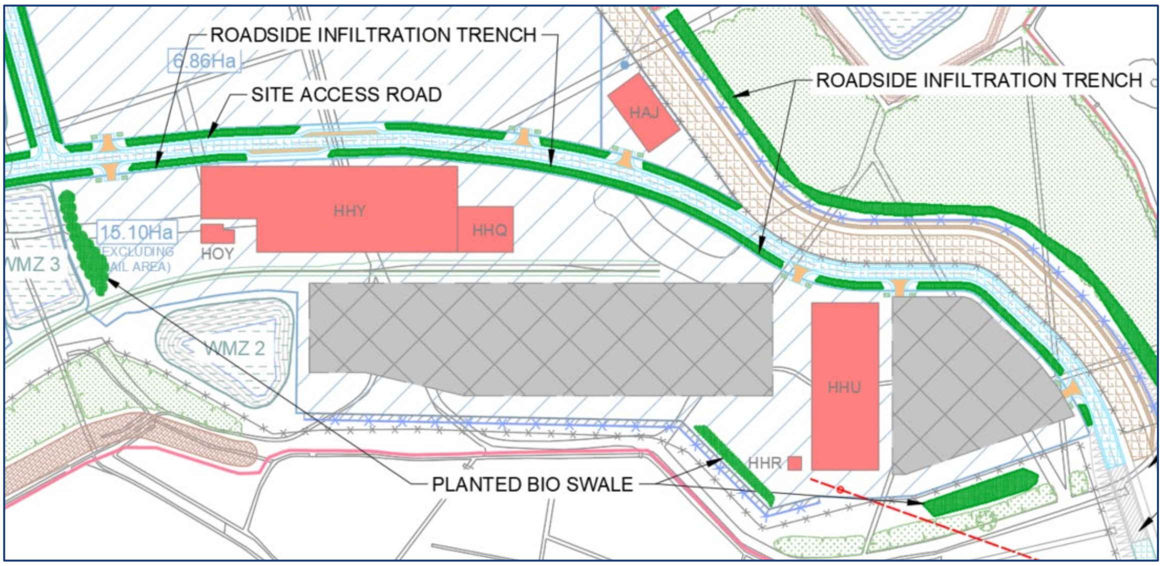
3.4.23 During construction, storm water runoff may have a high concentration of silts from fine particles contained within the soil or present on the surface of exposed substrata. Over time this can blind the surface of the basin/pond or the faces or base of other structures such as porous surfaces or trenches. This can make them inoperable depending on the degree of silt contained in the runoff.

3.4.24 The Concrete Batching Plant and the Containment Liner Prefabrication Facility will have a greater propensity for sulphate loading from concrete related activity.

3.4.25 It is recommended that any treatment is carried out as close to the potential pollution area as possible. SuDS features such as filter strips or planted/bio-swales may be used where appropriate, however where pollutant load is high, strategically positioned filters, semi-permeable barriers and settling forebays can be provided in the bigger structures which can be cleaned out periodically thereby protecting the SuDS structures or where discharge to watercourses are proposed.

3.4.26 Prior to the construction of the CDO, it is proposed that the MCA drains to WMZ-1 and WMZ-2. Treated runoff may be conveyed to the attenuating features within WMZ-2 and they should therefore be sized accordingly. Proposed techniques for WMZ-2 are indicated in **Plate 3.7** and the surface water drainage hierarchy is presented in **Table 3.2**.

Plate 3.7: Proposed techniques in Water Management Zone 2



3.4.27 Some examples of planted swales are shown below:

Plate 3.8: Examples of planted swales


Table 3.2: Surface water drainage hierarchy WMZ-2

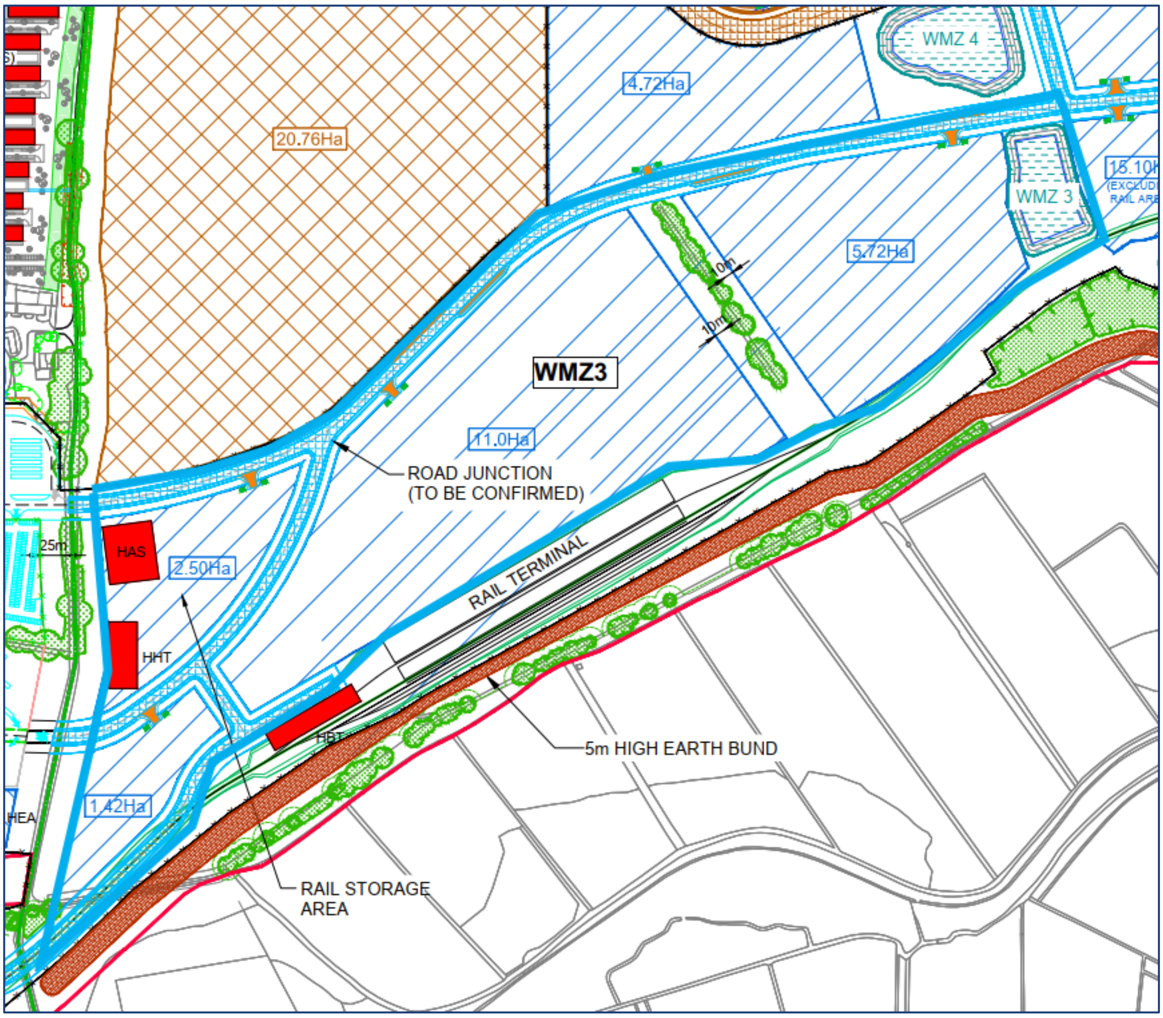
Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	✓	No permanent occupancy, however viability would be assessed as part of the design process.
2. Infiltration	✓	Surface water will infiltrate into the ground as close to the source as possible. Run-off from the access road surface will be conveyed into infiltration trenches located alongside the proposed access and/or haul roads. Where required, silt interception systems will be in place. The run-off from the Containment Liner Prefabrication Facility and the Concrete Batching Plant will be conveyed into planted or bioswales. Filtration and silt interception systems will be in place where required due to the close proximity.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the boundary of the access road within the soft landscaping to provide support drainage for overflows. These will be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation (tanks).	✓	Any below ground attenuation tank may need to be lined with an impermeable membrane to prevent groundwater ingress. Storage below car parking areas should have sufficient capacity to allow for the infiltration rates that are found at this location.
5. Discharge – watercourse.	✓	The Sizewell Marshes SSSI runs close to the site boundary, therefore direct discharge into any watercourses is deemed undesirable, due to strict restrictions on the water quality of the run-off discharging into it. Direct discharge into an open ditch or watercourse is not appropriate in this WMZ due to potential silt and contaminant load. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to

Drainage Principle.	Feasibility	Reason
		account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water drains in the vicinity.
7. Discharge – Combined drain..	X	Discounted - there are no known combined sewers in the vicinity.

iii. Water Management Zone 3

3.4.28 WMZ-3 indicatively serves the proposed Site Access Road, the Temporary Works Construction Contractor's Areas and Main Forward TCA Site Office, as well as Railhead Facilities and a Rail Storage Facility, as shown on **Plate 3.8.**

Plate 3.9: Water Management Zone 3 (edged in blue)



3.4.29 The proposed strategy is to drain the surface water run-off through infiltration techniques by directing the road surface run-off into gullies, which will subsequently convey the surface water into a detention basin which will allow infiltration.

3.4.30 Other impermeable surfaces within WMZ-3 are also proposed to drain to the detention basin. Infiltration structures may be located within the WMZ as appropriate.

3.4.31 It is proposed that the site access road, where constructed to highways standards using impermeable surfacing, may drain via surface water gullies to infiltration trenches/swales alongside the road, allowing storage and infiltration close to source.

3.4.32 The detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity.

3.4.33 During construction, storm water runoff may have a high concentration of silts from fine particles contained within the soil or present on the surface of exposed substrata. Over time this can blind the surface of the basin/pond or the faces or base of other structures such as porous surfaces or trenches. This can make them inoperable depending on the degree of silt contained in the runoff.

3.4.34 Runoff from the Temporary Works Construction Contractors Areas and Main Forward TCA Site Office, during construction may again be drained via infiltration trenches, and where site use causes greater sediment load and/or pollutant load, filer strips and planted bio swales may be preferred.

3.4.35 Again, it is recommended that any treatment is carried out as close to the potential pollution area as possible. SuDS features such as filter strips or planted/bio-swales may be used where appropriate, however where pollutant load is high, strategically positioned filters, semi-permeable barriers and settling forebays can be provided in the bigger structures which can be cleaned out periodically thereby protecting the SuDS structures or runoff to watercourses are proposed.

3.4.36 Where the pollutant loads are managed within SuDS structures and the pollutant load is held within the fine particles in the runoff, removal of these fine particles may be carried out via Siltbuster or other similar treatment as required. Proposed techniques for WMZ-3 are indicated in **Plate 3.9** and the surface water drainage hierarchy is presented in **Table 3.3**.

Plate 3.10: Proposed techniques in Water Management Zone 3

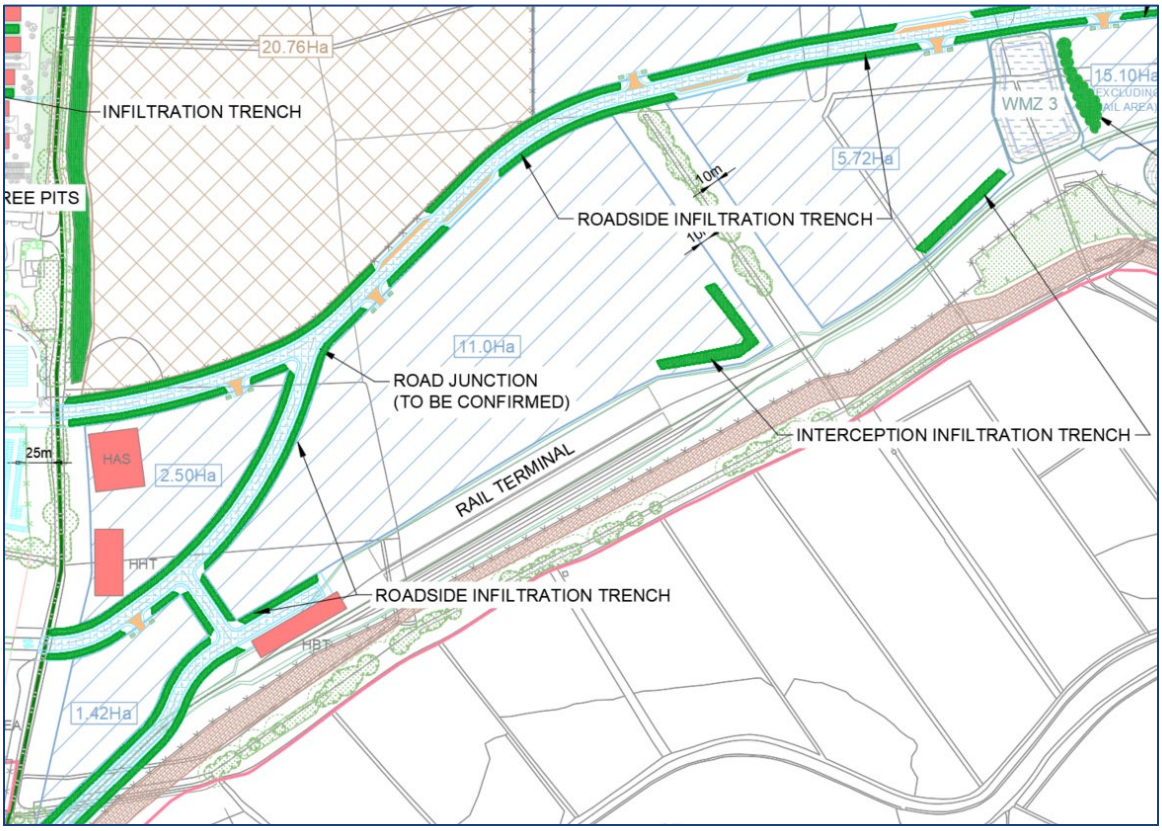


Table 3.3: Surface water drainage hierarchy WMZ-3

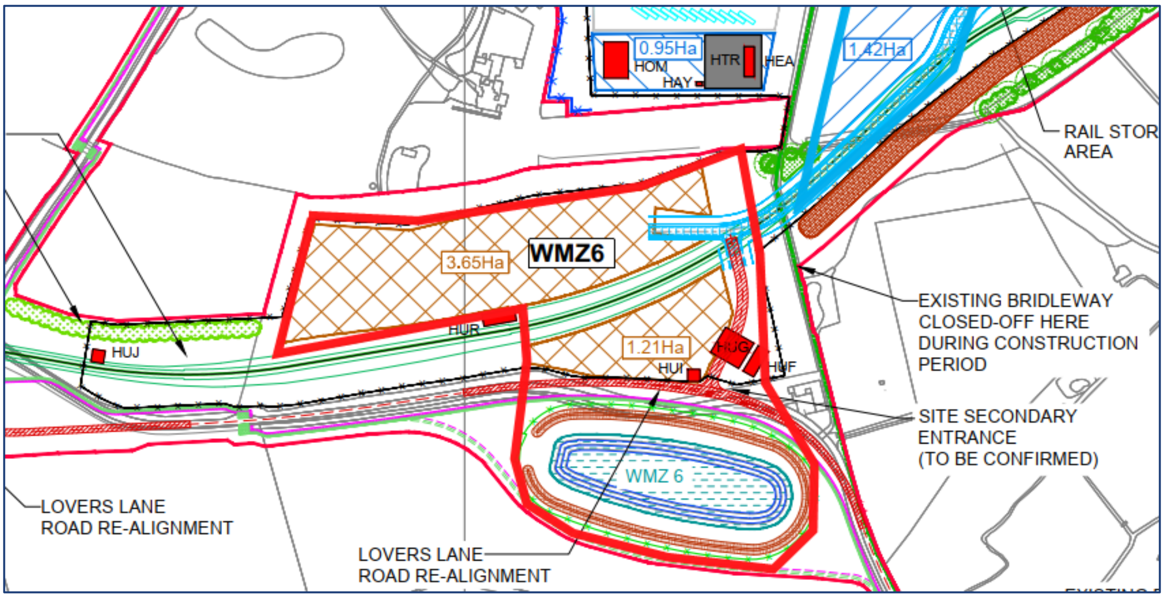
Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	✓	No permanent occupancy, however viability would be assessed as part of the design process.
2. Infiltration	✓	Surface water will infiltrate into the ground as close to the source as possible. Run-off from the access road surface will be conveyed into infiltration trenches located alongside the proposed access and/or haul roads. Where required, silt interception systems will be in place due to the close proximity of Sizewell Marshes SSSI. The run-off from the Temporary Works Construction Contractors Areas and Main Forward TCA Site Office will be conveyed into filter strips and planted or bioswales where required. Filtration and silt interception systems will be in place where required.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the eastern boundary of the access road within the soft landscaping to provide support drainage for overflows. These will be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation	✓	A below ground attenuation tank with a volume sufficient to attenuate run-off and discharge into the site drainage network.

Drainage Principle.	Feasibility	Reason
(tanks).		These however will not generally be implemented as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A SSSI runs close to the site boundary, therefore direct discharge into any watercourses is deemed undesirable, due to strict restrictions on the water quality of the run-off discharging into it. Direct discharge into an open ditch or watercourse is not appropriate in this WMZ due to potential silt and contaminant load. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water drains in the vicinity.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

iv. Water Management Zone 6

3.4.37 WMZ-6 indicatively serves the proposed Materials Storage Area, Security Cabin and Visual Inspection Cabin during construction, a shown on **Plate 3.10**.

Plate 3.11: Water Management Zone 6 (edged in red)



3.4.38 The proposed strategy is to drain the surface water run-off through infiltration techniques conveying surface water into a detention basin which will allow infiltration, as well as draining to local watercourses.

3.4.39 It was established that the access road drains to the ditch which runs parallel to Lover's Lane. This eventually connects with the Leiston Drain.

3.4.40 Impermeable surfaces within WMZ-6 are proposed to drain to the infiltration structures.

3.4.41 The Materials Storage Area would employ trench infiltration or swales to capture runoff locally and maximise the source control, allowing storage and infiltration close to source. These features may be sited strategically at the boundary of the Materials Storage Area so as not to reduce the space available. It is also possible to drain the impermeable surfaces of the Security Cabin and Visual Inspection Cabin to these same infiltration trenches.

3.4.42 The detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity.

3.4.43 Where surface water cannot be conveyed to the infiltration structures, for example, south of the detention basin where the ground level is lower, it is proposed that the highway drains to the ditch system. The detention basin may also discharge to the ditch should infiltration rates be particularly poor. Proposed techniques for WMZ-6 are indicated in **Plate 3.11** and the surface water drainage hierarchy is presented in **Table 3.4.**

Plate 3.12: Proposed techniques in Water Management Zone 6

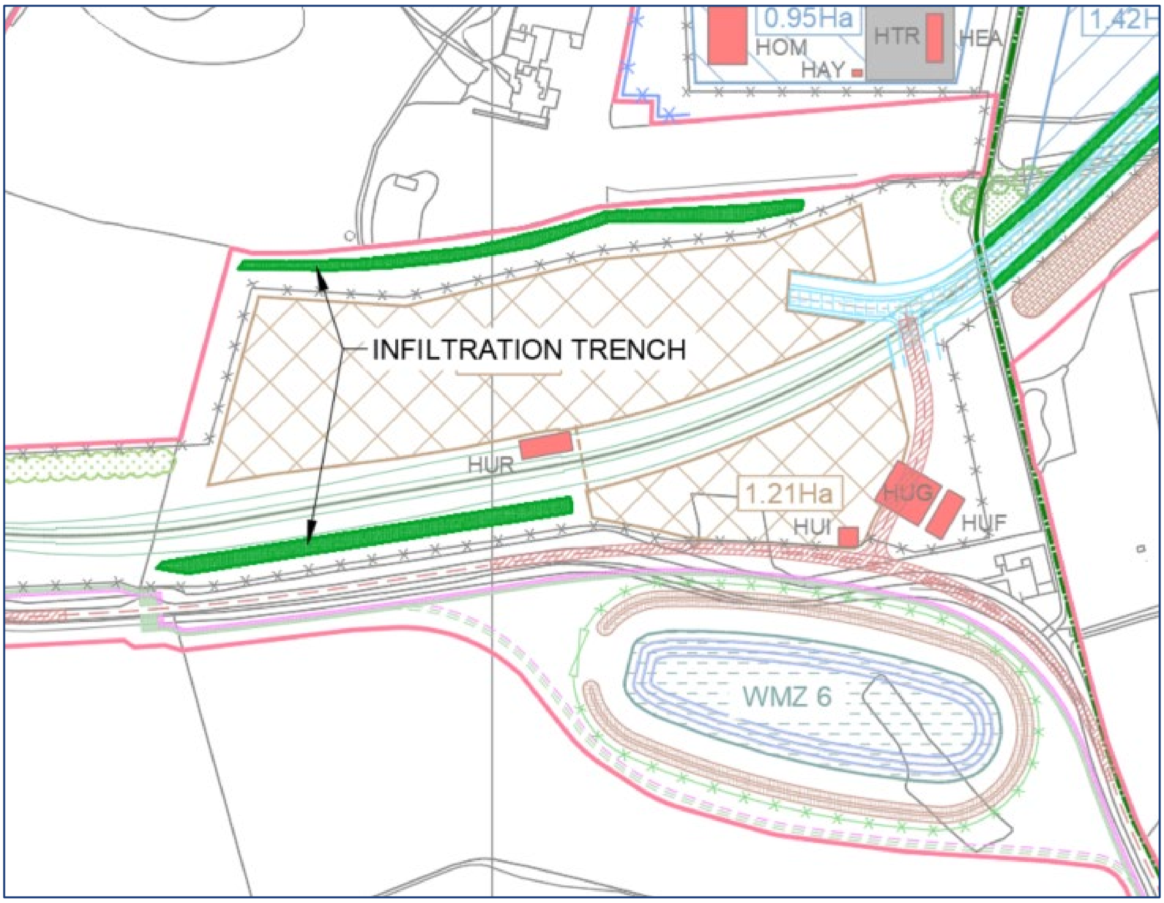


Table 3.4: Surface water drainage hierarchy WMZ-6

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Surface water will infiltrate into the ground as close to the source as possible. Run-off from the access lane and the materials storage area will be conveyed into infiltration trenches located within the WMZ. Where required, filtration and silt interception systems will be in place. Surface water run-off from high intensity events on the road surface will be conveyed via road gullies and below ground pipework to WMZ-6 located alongside the proposed access road. Oil / hydrocarbon / silt interception systems (I.e. SuDS treatment or formal oil separator) will be in place due

Drainage Principle.	Feasibility	Reason
		to the close proximity of Sizewell Marshes SSSI.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the boundary of the haul road and materials storage area within the soft landscaping to provide support drainage for overflows. These will be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation (tanks).	✓	A below ground attenuation tank with a volume required to attenuate run-off and discharge into the site drainage network. This will not be adopted if conventional infiltration provides an adequate solution.
5. Discharge – watercourse.	✓	Direct discharge into an open ditch or watercourse is not preferred due to potential silt and contaminant load, however it has been established that the road drains to the ditch which runs parallel to Lover's Lane. This eventually connects with the Leiston Drain Surface water may be discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water sewer.	X	Discounted - there are no known surface water drains in the vicinity
7. Discharge – Combined sewer.	X	Discounted - there are no known combined sewers in the vicinity.

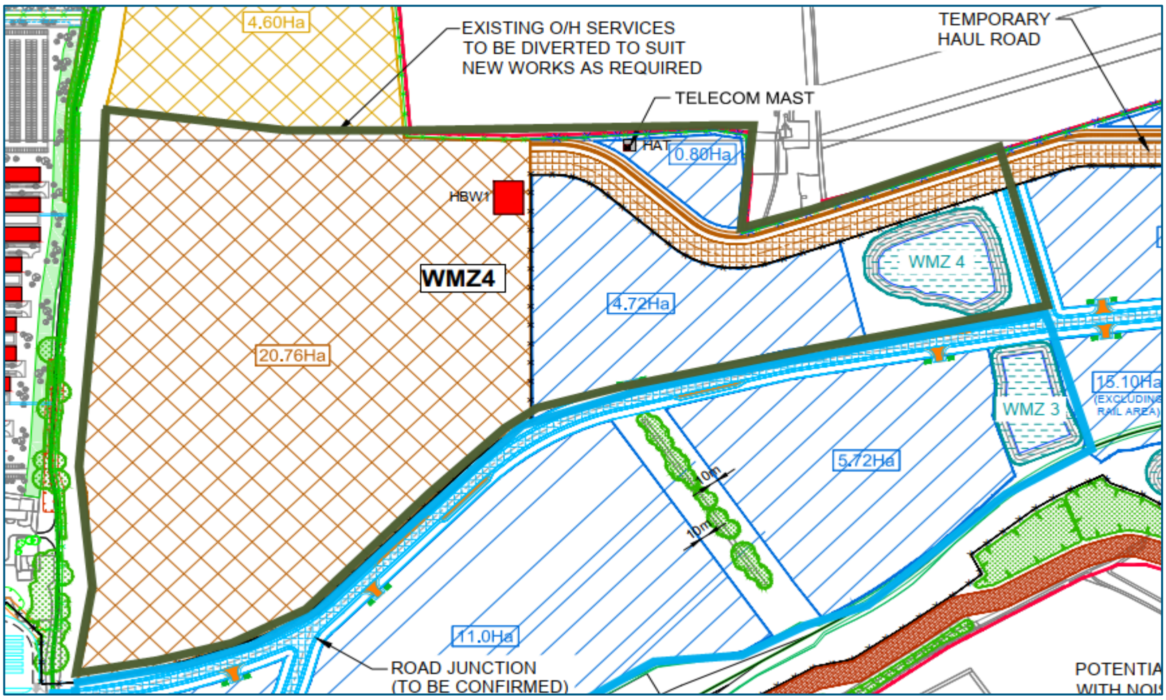
b) Water Management Zones 4 and 5 (Group 2)

3.4.44 These WMZs are intended to discharge by infiltration only.

i. Water Management Zone 4

3.4.45 WMZ-4 indicatively serves the proposed temporary Haul Road and a Materials Storage Area during construction which is indicated on **Plate 3.12**. Proposed techniques for WMZ-4 are indicated in **Plate 3.13** and the surface water drainage hierarchy is presented in **Table 3.5**.

Plate 3.13: Water Management Zone 4 (edged in green)



3.4.46 The strategy is to drain the surface water run-off through infiltration techniques.

3.4.47 Where the runoff for materials storage and are located the surface water would be managed by providing trench infiltration or swales to capture runoff locally and maximise the source control philosophy.

3.4.48 Surveys to date have indicated that infiltration is possible in this area and therefore conventional infiltration type drainage is expected to provide an adequate solution.

3.4.49 The detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity.

Plate 3.14: Proposed techniques in Water Management Zone 4

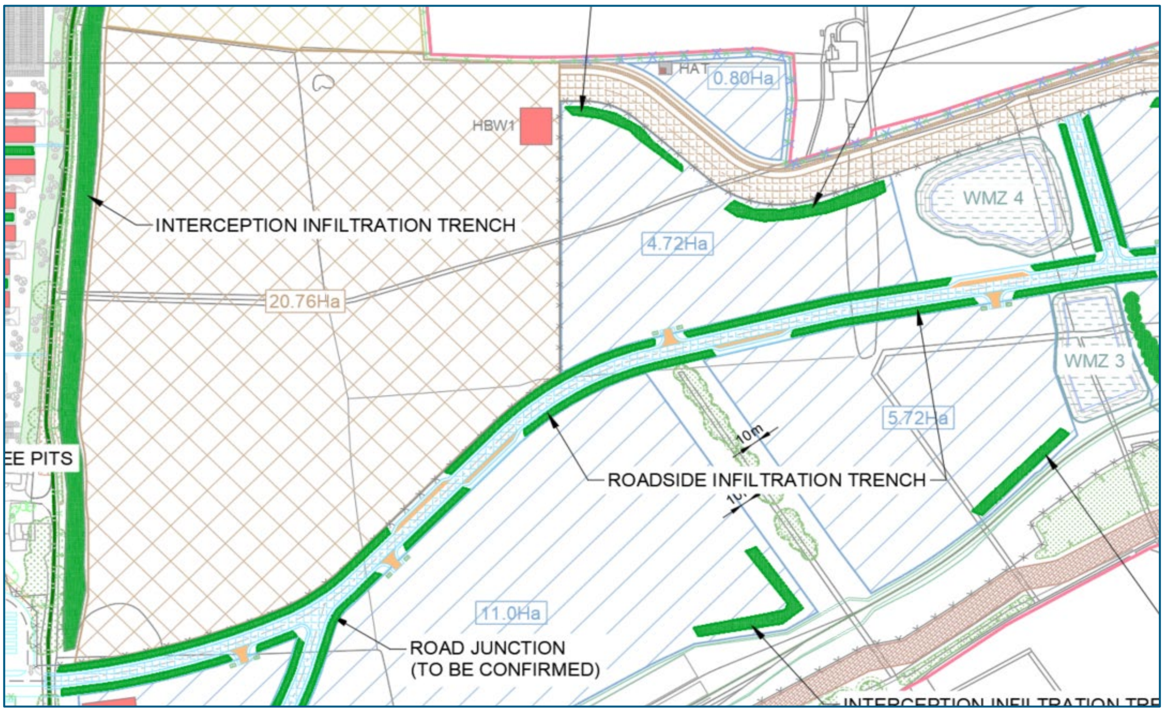


Table 3.5: Surface water drainage hierarchy WMZ-4

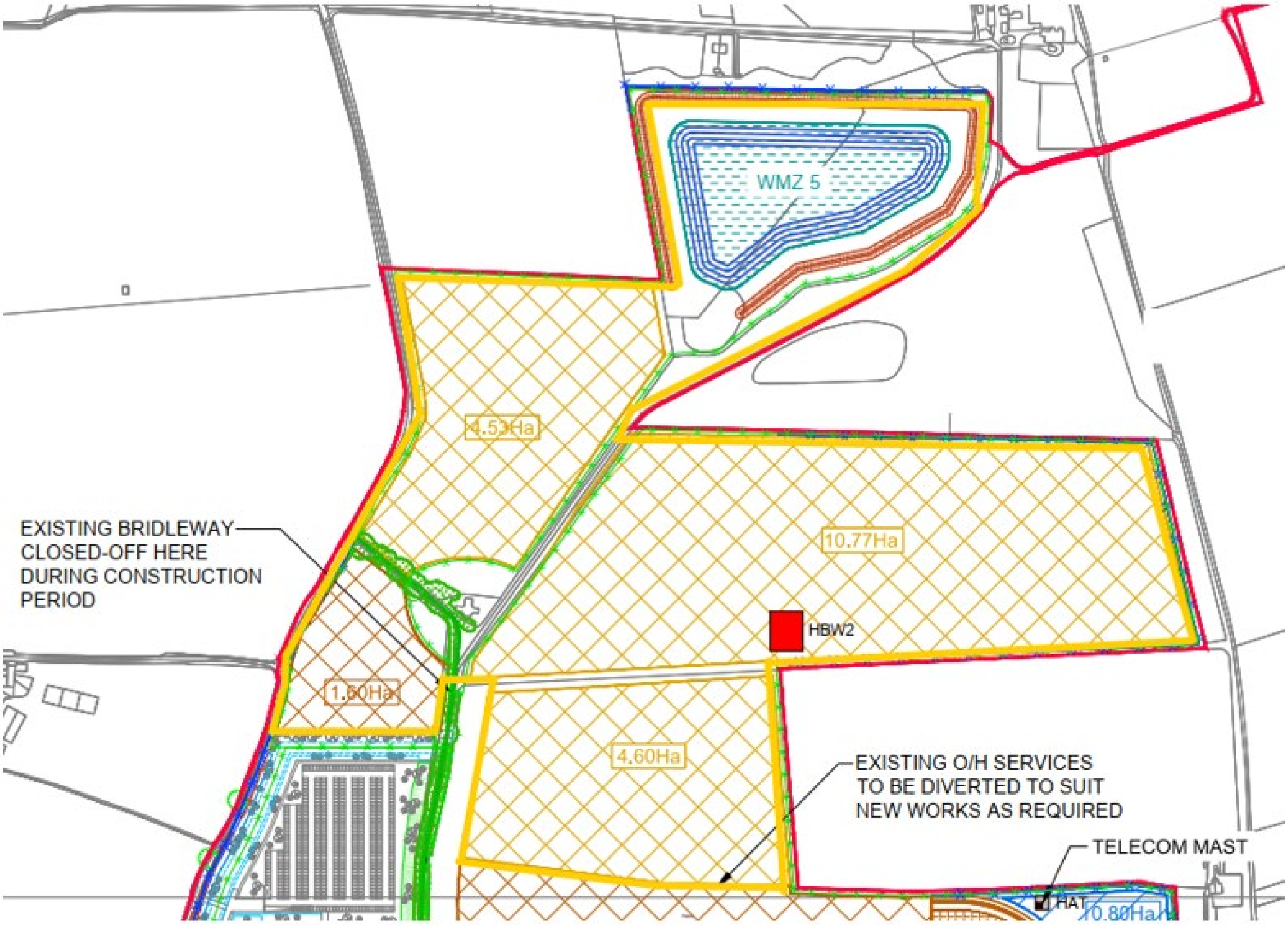
Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Surface water will infiltrate into the ground as close to the source as possible. Run-off from the access road and the materials storage area will be conveyed into roadside infiltration trenches located within the WMZ. Where required, filtration and silt interception systems will be in place.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the boundary of the access road within the soft landscaping to provide support drainage for excess flow. These can be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation (tanks).	✓	A below ground attenuation tank of sufficient volume would be required to attenuate run-off and discharge into the ground. This is not expected as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	X	Discounted - as conventional infiltration is expected to provide an adequate solution, a discharge into a watercourse is not deemed to be necessary. Direct discharge into an open ditch or watercourse is therefore not appropriate in this WMZ.
6. Discharge – Surface Water	X	Discounted - there are no known surface water drains in the vicinity

Drainage Principle.	Feasibility	Reason
sewer.		
7. Discharge – Combined sewer.	X	Discounted - there are no known combined sewers in the vicinity.

ii. Water Management Zone 5

3.4.50 WMZ-5 indicatively serves the proposed borrow pit area and the temporary Site Welfare Facilities during construction as indicated on **Plate 3.14**.

Plate 3.15: Water Management Zone 5 (edged in yellow)



3.4.51 The proposed strategy is to drain the surface water run-off through infiltration techniques.

3.4.52 Where the runoff for material storage areas are located the surface water should be managed by providing trench infiltration or swales to capture runoff locally and maximise the source control philosophy.

3.4.53 In addition to infiltration trenches and swales, the detention basin that forms part of the design would be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. Proposed techniques for WMZ-5 are indicated in **Plate 3.15** and the surface water drainage hierarchy is presented in **Table 3.6.**

Plate 3.16: Proposed techniques in Water Management Zone 5

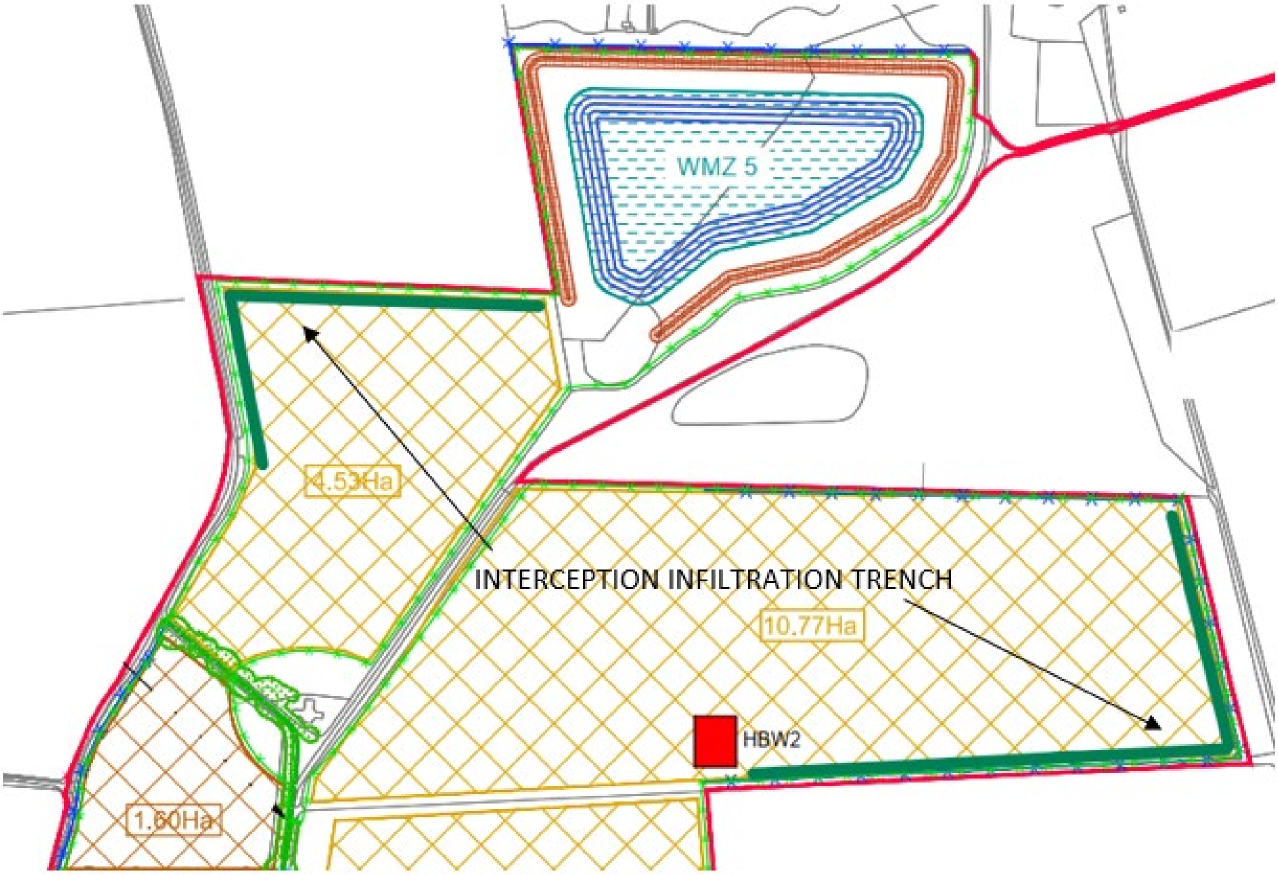


Table 3.6: Surface water drainage hierarchy WMZ-5

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	✓	No permanent occupancy however viability would be assessed as part of the design process.
2. Infiltration	✓	Surface water will infiltrate into the ground as close to the source as possible. Run-off from the borrow pit area will be intercepted and conveyed into infiltration trenches located within the WMZ. Where required, filtration and silt interception systems will be in place.
3. Attenuation (ponds, swales).	✓	Swales etc. would be incorporated along the boundary of the access road within the soft landscaping to provide support drainage for

Drainage Principle.	Feasibility	Reason
		overflows. These can be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation (tanks).	X	Not expected to be suitable in this area
5. Discharge – watercourse.	X	Discounted - as conventional infiltration is expected to provide an adequate solution, a discharge into a watercourse is not deemed to be necessary. Direct discharge into an open ditch or watercourse is therefore not appropriate in this WMZ.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water drains in the vicinity
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

c) Water Management Zones 7, 8 and 9 (Group 3)

3.4.54 The discharge from WMZs 7,8 and 9 would be directly to the sea via the Combined Drainage Outfall (CDO) during the construction phase, and discharge from the plant when it becomes operational will be via the cooling water tunnel.

3.4.55 In **Plate 3.16**, WMZ-7 is shown edged in yellow, WMZ-8 is shown edged in orange, and WMZ-9 is the platform area in the centre of these.

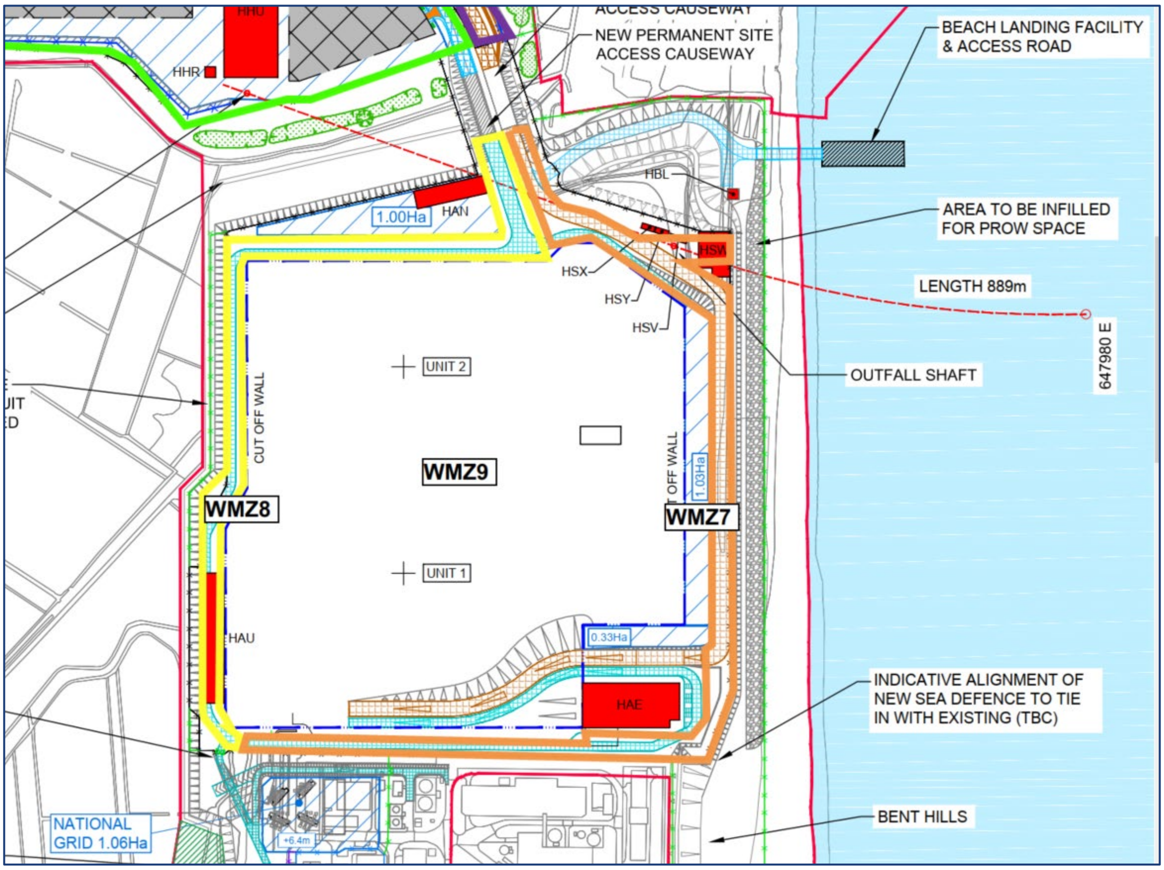
3.4.56 Prior to the CDO construction treated surface water in WMZ-7,8 and 9 that is not infiltrated would be discharged to neighbouring WMZ basins in WMZ-1 and WMZ-2 and would be sized accordingly. At times of high surface water inundation there may be a necessity to construct additional attenuation storage within the MCA as temporary measures.

3.4.57 It should be noted that during the early years of the site establishment that the WMZ detention basins and the CDO may not be in place when the site could be subject to an extreme storm or inundated locally with surface water due to incapacity downstream. During these times a permitted temporary discharge may be required to pump excess treated surface water to the foreshore.

3.4.58 The proposed large capacity of the CDO means that storage will not be required for exceedance events up to the 1 in 100-year event, where all treated surface water can be discharged to sea. Exceedance events greater than the 1 in 100-year event could be managed by discharging surface water via the CDO and also to the foreshore in a similar fashion to before completion of the CDO. All surface water from up to the 1 in 100-year event shall be treated prior to discharge, and surface water from events greater than 1 in 100-year event shall be treated where practicable.

3.4.59 WMZ-9 is the MCA Deep Excavation. As WMZ-9 is at low level, storm water draining to the lower levels will need to be pumped up to platform level and the outfall arrangements set in place for WMZ-7 and 8 where the surface water will discharge to the sea via the CDO. Parts of the area of WMZ-8 drain naturally to the marshes and this will be managed to help the existing water balance of the natural environment. Again, consideration would be given to harvesting surface water for re-use on site. Proposed techniques for WMZs 7,8 and 9 are indicated in **Plate 3.16.**

Plate 3.17: Proposed techniques in Water Management Zones 7,8 & 9



i. Combined Drainage Outfall (CDO)

3.4.60 The CDO is required in order to dispose various sources of water to sea during construction operations. The sources include:

- Treated final effluent originating from the construction phase sewage treatment plant.
- Treated surface water runoff from the deep excavation within the MCA.

- Groundwater, treated if required, from dewatering within the MCA cut-off wall.
- Treated plant cold commissioning waters.
- Treated concrete wash water.
- Treated water originating from tunnel construction.

3.4.61 On completion of cold comissioning the CDO would be discontinued. The discharge of surface water from the Platform when it becomes operational will be via the cooling water tunnel. The cooling water tunnel would also be used for the disposal of:

- Treated final effluent originating from the permanent sewage treatment plant.
- Exceedance runoff from the main platform area (WMZ-9).

3.4.62 Prior to the construction of the CDO, surface water from the MCA could be conveyed to neighbouring WMZs. Treated runoff may be conveyed to the attenuating features within WMZ-1 and WMZ-2 and they should therefore be sized accordingly.

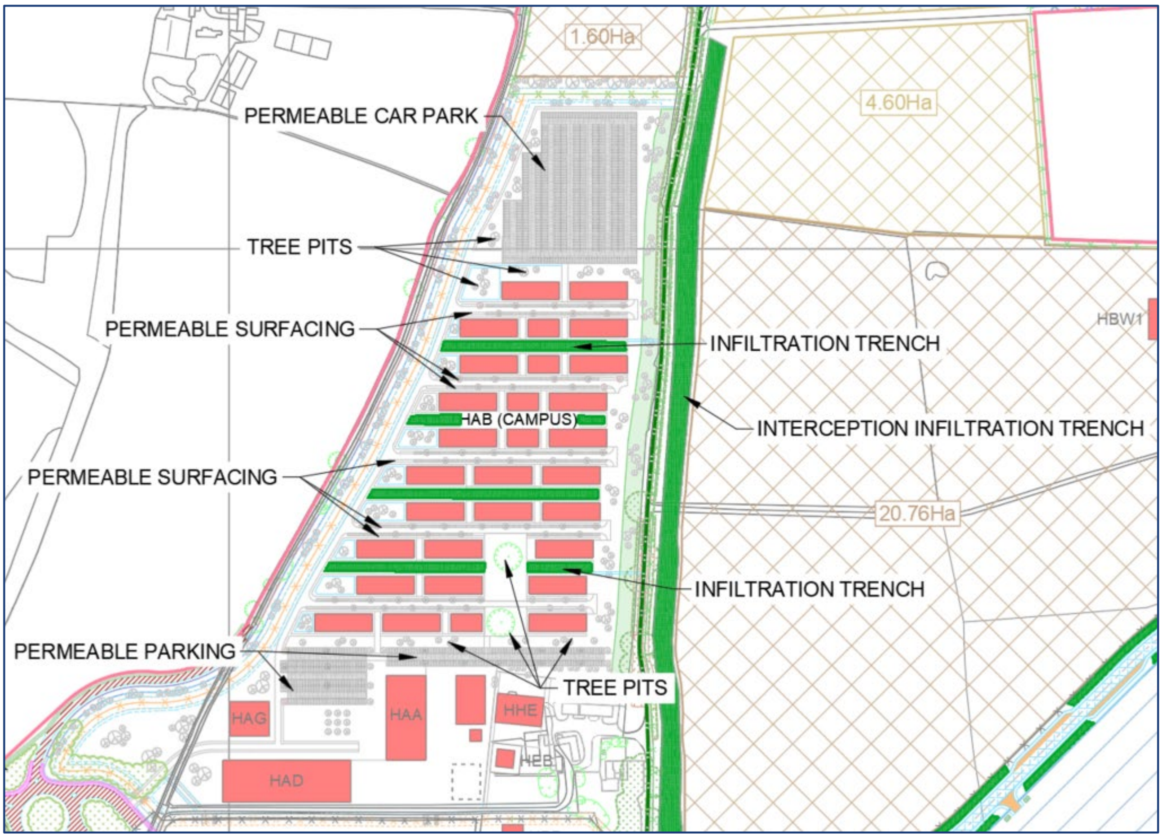
3.4.63 Although it is not intended to discharge surface water runoff from the TCA into the CDO, this would be possible if problems arose during the construction phase to reduce flood risk and allow operations to continue.

3.4.64 An access shaft would be constructed on the tunnel within the MCA. This would provide a connection point for disposal of treated surface water runoff from the MCA, groundwater, treated if required, from dewatering within the MCA cut off wall, treated plant cold waters and treated decommissioning waters, as well as treated sewage effluent. This shaft will be located within the permanent site security fence.

d) Water Management Zone 10

3.4.65 WMZ-10 will indicatively provide attenuation and infiltration for the proposed Accommodation Campus Site during construction. Proposed techniques for WMZ-10 are indicated on **Plate 3.17** and the surface water drainage hierarchy is presented in **Table 3.7**.

Plate 3.18: Proposed techniques in Water Management Zone 10



3.4.66 The Campus is an area designated for accommodation and facilities for the development at Sizewell C with an operational life of approximately 9 to 12 years. The site would be returned to its former use upon completion of construction.

3.4.67 The Campus is located in the western end of the TCA. No watercourses are available in the vicinity of the Campus to facilitate a suitable connection for surface water discharge. Therefore, it would be necessary to store rainfall runoff below ground and allow gradual infiltration.

3.4.68 The necessary storage would need to be located beneath the car park areas within the campus site

3.4.69 The underground storage systems will infiltrate to the ground and each car park area will infiltrate at different rate depending on the characteristics of the underlining soil. The ground investigation reports indicate that infiltration rates vary across the site.

3.4.70 Given the depth to groundwater is considerable, there is opportunity to utilise other methods of surface water management including rainwater harvesting and treating surface water at source through detention and infiltration.

3.4.71 The accommodation blocks should be designed in a manner that allows for the collection and re-use of roof water where possible. Rainwater harvesting systems may be integrated into the design to avoid retro-fit. The harvested rainwater can be used for toilets, washing machines and other non-potable use, giving significant reductions in water usage.

3.4.72 Rainwater harvesting will likely involve the use of below ground tanks to ensure no space is taken up and the appearance of the building is not altered. As the collected rainwater will have no light affecting it, the water will stay cool and make bacterial growth improbable, thus keeping the quality of the water high. Below ground tanking also means that the tanks are frost protected.

3.4.73 Where there are large car parking areas proposed, it is proposed that these areas use permeable surfacing. The surfacing would be robustly constructed, emulating the current drainage characteristics, whilst providing suitable treatment of any incidental oil spills.

3.4.74 Grasscrete, Tarmac Ultra Porous, Marshall's Priora or similar may be used to ensure runoff from the car parks is controlled at source.

3.4.75 In addition, the access ways between the buildings and other non-heavily tracked areas within the campus may also employ permeable surfacing to allow infiltration at source. Where reasonably practicable, the run-off conveyed from the roof of the buildings within the campus will also be incorporated within the permeable surfacing sub-base.

3.4.76 Trees will be planted throughout the campus, and it is proposed that where there is a large amount of impermeable roof area tree pits may be utilised to provide storage and infiltration into the ground as close to source as possible.

3.4.77 Shallow infiltration trenches along the perimeter of the campus and in the green space between the blocks may also provide additional storage and infiltration opportunities for exceedance events.

3.4.78 Some examples of permeable surfacing are shown below:

Plate 3.19: Examples of permeable surfacing

3.4.79 Some examples of tree pits are shown below:

Plate 3.20: Examples of tree pits

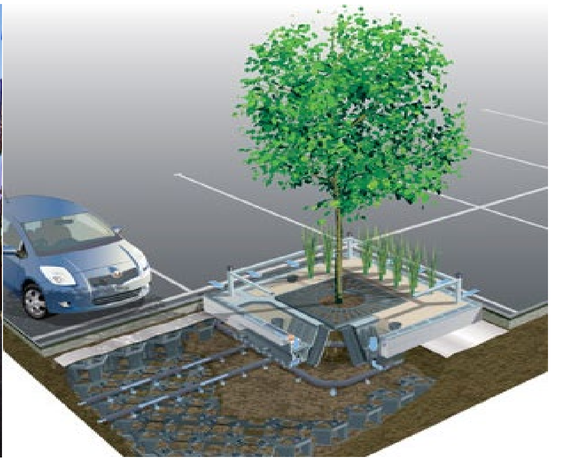


Table 3.7: Surface water drainage hierarchy WMZ-10 (Campus)

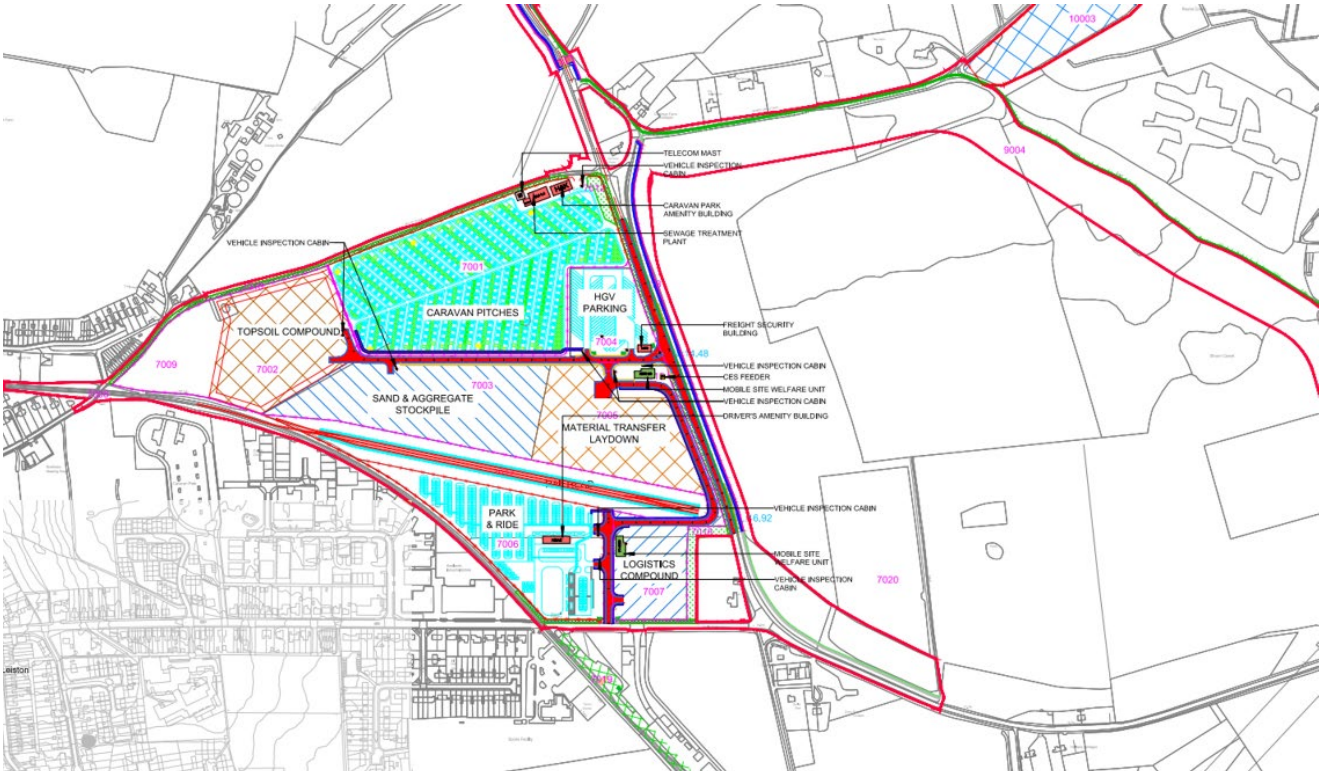
Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	✓	Occupancy of the Campus is expected for 9 to 12 years therefore deemed to be a viable mitigation measure. Due to the relatively short life expectancy of the campus it should be investigated whether this will be a cost-effective investment.
2. Infiltration	✓	Permeable paving is proposed to enable surface water to infiltrate directly into the ground. The run-off from the car park and other hard standing areas around the buildings may also utilise permeable surfacing. Additional run-off from the campus building roofs will be conveyed into shallow infiltration trenches located alongside the perimeter of the campus and in the green space between the blocks. Tree pits allow for storage and infiltration of surface water. Strategically placed tree pits will add increased infiltration capabilities.

Drainage Principle.	Feasibility	Reason
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be incorporated along the boundary of the car parking areas and within the soft landscaping, to provide support drainage for overflows. These can be used to collect, convey, infiltrate or attenuate run-off. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
4. Attenuation (tanks).	✓	A below ground attenuation tank with sufficient volume would be required to attenuate run-off and discharge into the site drainage network. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge from a parking area into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Direct discharge into an open ditch or watercourse is not appropriate in this WMZ due to potential silt and contaminant load. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	✓	If soakaways are not viable, then attenuation and discharge into the existing surface water drainage network will be progressed. An existing surface water chamber is located to the north of proposed facility.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

e) Land East of Eastlands Industrial Estate

3.4.80 LEEIE would serve a variety of uses including topsoil and aggregate storage, a park and ride facility and a caravan park as set out in **Chapter 3 Volume 2** of the **Environmental Statement**. The overarching strategy for the surface water run-off associated with the LEEIE is storage with infiltration where possible. The indicative layout of construction activity at LEEIE is shown in **Plate 3.18**.

Plate 3.21: Proposed site layout at the Land East of Eastlands Industrial Estate



3.4.81 Infiltration is unlikely to be an effective technique for this area. The philosophy proposed for the LEEIE is to convey run-off from impermeable areas into storage areas located within the LEEIE area, with outfalls to Leiston Drain at greenfield rates. However, the site boundary means that space for open SuDS attenuation features may be limited. Utilising swales at boundaries and along the roadside of the re-aligned lane may not provide enough storage for surface water generated in this area.

3.4.82 Underground geocellular storage is therefore proposed as part of the attenuation storage techniques in the LEEIE. The most appropriate locations for the geocellular storage are below the indicative caravan pitches at the north of the LEEIE, and under the indicative Park and Ride area, south of the Alternative Rail Head.

3.4.83 It is suggested that the caravan pitches be based on permeable surfacing where possible, to allow for infiltration into the storage units below ground and reduce runoff. Oil interceptors would be provided as necessary.

3.4.84 In order to accommodate the larger volumes of runoff from longer return period storms the land to the east of the LEIEE would be used. This area would store surface water in extreme events. The route to this area will indicatively be across Lover's Lane and through the services area which has natural falls. The excess volume temporarily stored in the attenuation area will be managed through a combination of natural infiltration and low flow greenfield runoff to the area in which it would have originally discharged.

3.4.85 Where the large car parking area for the park and ride facility is indicatively located, it is proposed that permeable surfacing again be utilised allow for infiltration into the storage units below ground. The surfacing would be robustly constructed, emulating the current drainage characteristics, whilst providing suitable treatment of any incidental oil spills.

3.4.86 Grasscrete, Tarmac Ultra Porous, Marshall's Priora or similar may be used to ensure runoff from the car parking area is controlled at source.

3.4.87 Surface water within the indicative earth material storage area should be managed by providing trenches or swales to capture runoff locally and maximise the source control philosophy. While earthworks such as topsoil storage will allow for infiltration, it is likely that silt will be generated from the stored topsoil. With infiltration being unlikely to be an effective technique for heavy or prolonged events, storage and conveyance, with outfall rates reduced to greenfield would likely be the most appropriate. Where runoff is conveyed to an underground attenuation feature, a treatment stage will be required to remove silt from the runoff.

3.4.88 Any pollutant runoff from laydown or storage areas will be managed using SuDS techniques or proprietary products.

3.4.89 The site would be returned to its former use upon completion of the construction phase. **Table 3.8** sets out the surface water drainage hierarchy for the LEEIE.

Table 3.8: Surface water drainage hierarchy LEEIE

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	✓	Occupancy of the Caravan pitches is expected for more than 10 years, being available in the early years before the campus is established and retained throughout construction as an option for workers. It is unclear how surface water may be collected efficiently due to the small roof area of individual caravans. This is therefore not deemed to be a viable mitigation measure.
2. Infiltration	✓	Permeable surfacing is proposed to enable surface water to infiltrate both into the ground and into additional mitigation measures. The caravan pitches would be located on permeable surfacing to allow for some infiltration, and the car parking areas in the Park and Ride facility would have permeable surfacing on top of storage structures. Permeable surfacing alone is unlikely to be an adequate measure for this area.

Drainage Principle.	Feasibility	Reason
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be incorporated into the topsoil compound to manage surface water by providing trenches or swales to capture runoff locally and maximise the source control philosophy. There is unlikely to be sufficient space to allow for storage of all surface water. Swales would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	✓	Below ground attenuation tanks with sufficient volume are required to attenuate run-off and discharge into the site drainage network. The most appropriate locations for the geocellular storage are below the caravan pitches at the north of the LEEIE, and under the Park and Ride area, south of the Alternative Rail Head.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water sewers in the vicinity.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

3.5 Groundwater at the main development site

a) Introduction

3.5.1 The construction of the main development site will increase impermeable surface area and hence reduce the amount of rainwater that infiltrates to groundwater aquifers and potentially have an effect on groundwater levels.

3.5.2 Surface water drainage will act to manage and control discharge of surface water to groundwater at an acceptable rate.

3.5.3 The mitigation measures to protect groundwater have been identified through the Environmental Impact Assessment process and have been incorporated into the design and construction planning of the proposed development.

3.5.4 The predevelopment groundwater levels within and adjacent to Sizewell C are normally in the range 0.0 – 1.0 m AOD. The maximum water level varies to an extent due to tidal interaction. Most of the Sizewell C footprint is at a level well above natural groundwater level so is not at current risk of groundwater flooding.

b) Treatment

3.5.5 As discussed in above, managing the quality of surface water runoff so that groundwater is protected, is linked to the hydraulic control of runoff where SuDS treatment and pollution removal can work alongside conveyance, attenuation and infiltration, particularly within vegetated surface-based systems.

c) Cut-off wall

3.5.6 In order to separate the wider groundwater environment from the SZC excavation footprint, a low permeability cut-off wall will be constructed around the deep excavation. The cut-off wall will extend down into the impermeable London Clay, which sits below the permeable Norwich Crag. Once complete there will be limited groundwater movement from outside of the cut-off wall into the excavation.

d) Dewatering

3.5.7 With the cut-off wall in place, groundwater can be pumped out of the area inside the wall. Construction and backfilling will then take place in dry working conditions. Groundwater pumped from within this area would be appropriately treated prior to being discharged to sea via the CDO.

e) Permanent groundwater arrangements

3.5.8 Given the nature and depth of the cut-off wall it is intended to leave it in place following construction. There will be nominal groundwater leakage into the area enclosed by the cut-off wall from outside. There will be groundwater recharge through rainwater infiltrating into the ground in the unpaved permeable areas of the site.

3.5.9 As part of the environmental impact assessment significant ground investigation has taken place with boreholes and groundwater level monitoring undertaken.

3.5.10 The results of this investigation and monitoring have been incorporated in a numerical groundwater model which replicates groundwater movement within the area of the main development site. This model will be used to establish the impact of the installation of the cut-off wall on groundwater movement and levels to demonstrate that there will be no significant adverse impact to adjacent areas.

3.6 Foul water management

a) Main development site

3.6.1 Over a 9-12-year construction period, an Accommodation Campus will provide accommodation for up to 2,400 personnel. Welfare facilities including canteens, toilets and showers will be in use throughout the construction phase. These facilities will require a foul network and sewage treatment. The workforce numbers do not exceed 10,000 therefore the site will not be required to comply with the Urban Waste Water Directive (Ref. 1.8).

3.6.2 There will be a considerable requirement for foul water treatment and disposal throughout construction. This requirement will fluctuate considerably through the course of the contract and it is therefore imperative that a flexible approach is applied.

3.6.3 The construction phase sewage treatment plants will be located close to sources of effluent and will receive and treat all domestic foul water generated during construction.

3.6.4 Lessons learned from Hinkley Point C have been taken into account where excavating and re-siting of buried rising mains posed issues during the construction phase. The siting of any pumped network at Sizewell C, particularly in the vicinity of the TCA would be carefully considered. Where the rising main is temporary, consideration can be made for alternative routes that maximise the flexibility for construction phasing.

3.6.5 Disposal to sea following treatment has been selected, as the receiving waters are less sensitive and dilution of the treated effluent is much greater than for a watercourse.

3.6.6 The construction phase sewage treatment plants will receive and treat all domestic foul water generated during construction. It will be possible to pump sewage to the treatment plant from the Campus Area, however during construction of the temporary treatment plant, interim arrangements will be required.

3.6.7 A plan of an indicative drainage network to be provided for the collection and removal of domestic foul water flows from the TCA and MCA during construction is shown in **Figure 2A. 6**.

3.6.8 Treated foul sewage effluent has to meet permitted quality limits prior to any dilution. The treated effluent will be pumped to the CDO during construction phase, from where it is disposed to sea.

3.6.9 Typical approaches during construction would usually range from packaged treatment plants to holding septic tanks or cess pits with tanker provisions, however the network approach illustrated above allows for the efficient treatment of wastewater during the construction phase, and removes a significant requirement for a number of package plants that would otherwise have been required across the TCA.

3.6.10 The permanent sewage treatment plant would receive and treat all domestic foul water generated within the power station site and Off-Site Delivery Checkpoint Building which will remain after the construction stage.

3.6.11 The construction phase Sewage Treatment Plants would be required until such time as the permanent Sewage Treatment Plant is complete.

3.6.12 In the operational phase, treated effluent from the permanent sewage treatment plant would be discharged to the cooling water tunnel outfall.

b) Land East of Eastlands Industrial Estate

3.6.13 There will be requirements for foul water disposal and treatment at the LEEIE for the temporary caravan pitches and park and ride facility. Being removed from the MCA and the TCA, a different strategy is more appropriate.

3.6.14 A package treatment plant is preferred to serve the mobile welfare units which are currently proposed to serve the caravan pitches. The feasibility of this requires further investigation.

3.6.15 The preferred approach is for foul water to be conveyed to the Anglian Water Services Leiston Water Recycling Centre should capacity be available. If no capacity is available, foul water could potentially be treated in or close to the LEEIE with an outfall connected with Leiston Drain (since infiltration of treated foul water is not a viable solution due to poor infiltration). If this is not possible, the next option in the hierarchy should be considered, which in this instance is cess pits with tankering to the TCA where foul water may be treated and disposed of via the CDO.

4 Associated development sites

4.1 Water Management Zone assessment

4.1.1 The following sections set out the outline drainage strategy for each of the associated development sites. Further reference can be made to the Associated Development Design Principles (Doc Ref. 8.3).

a) Northern park and ride

4.1.2 A site walkover was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site. The site is currently open fields and farmed agricultural land, with Darsham service station 30m to the south-east and Darsham railway station located adjacent to the southern site boundary. A pond was identified within the site, adjacent to the boundary with Moate Hall. No groundwater emergences were identified.

4.1.3 Light Detection and Ranging data show that the highest ground levels, above 32m Above Ordnance Datum (AOD), are located in the north-east corner of the site. Ground levels are lower in the south and west of the site, with the lowest ground levels slightly below 22m AOD at the south-west edge.

4.1.4 Online BGS mapping shows that the superficial geology underlying the majority of the site is the Lowestoft Formation, specifically diamicton (boulder clay). The Lowestoft Formation is formed of a sheet of chalky till, together with outwash sands and gravels, silts, and clays. A thin strip of land along the western site boundary is underlain by Head (windblown) deposits, comprising clay, silt, sand and gravel deposits. Although not shown on the online BGS mapping, Made Ground is expected to be present along the East Suffolk line which is adjacent to the south-west and north-west sections of the site.

4.1.5 Online BGS mapping shows that the bedrock geology beneath the site comprises the Crag Group. The Crag Group is made up of shallow water marine and estuarine sands, gravels, silts and clays. Beneath the Crag Group is the London Clay Formation and the Chalk Group.

4.1.6 There are no BGS borehole scans or trial pits within the inner study area. Within the outer study area, the closest borehole scan (ref. TM37SE18) is located at National Grid Reference (NGR) 639750E 270780N which is approximately 750m to the north-west of the site boundary. This borehole shows a thickness of Lowestoft Formation (diamicton) of approximately 20m, underlain by approximately 30m of Crag Group.

4.1.7 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 3, Chaper 12** of the **ES**.

4.1.8 The strategy for the surface water run-off associated with the Northern Park and Ride is storage and infiltration SuDS techniques.

4.1.9 The proposed strategy for these facilities is to drain the surface water run-off through infiltration techniques, such as heavy-duty permeable block paving, infiltration trenches and/or catchpit soakaways, with the pond and swales proposed remaining in place for exceedance events. This philosophy will ensure no additional impervious areas are added to the existing site wide drainage network.

4.1.10 Where impervious surfacing is necessary, the proposed strategy is to convey run-off from these areas into either the permeable paving systems proposed for the car park and laydown areas, infiltration trenches or into discrete soakaways located alongside the proposed operational car park.

4.1.11 The site would be returned to its former use upon completion of the construction phase. **Table 4.1** sets out the surface water drainage hierarchy for the Northern park and ride site.

Table 4.1: Surface water drainage hierarchy - Northern Park and Ride site

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
3. Infiltration	✓	Permeable surfacing is proposed to enable surface water to infiltrate both into the ground and into additional mitigation measures. The car parking areas would have permeable surfacing on top of storage structures.
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	✓	A below ground attenuation tank with sufficient volume would be required to attenuate run-off and discharge into the site drainage network. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water sewers in the vicinity.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

b) Southern park and ride

4.1.12 A site walkover was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk-study mapping and aerial photographs. The site is currently open arable fields, with an overgrown and wooded area located along the western site boundary, in the area identified on available mapping as a disused sand pit. The site is bounded to the south by the A12.

4.1.13 The site is located on the watershed between the River Deben and the River Ore. Light Detection and Ranging data shows that the highest ground levels, slightly above 29m Above Ordnance Datum (AOD), are located in the north-east corner of the site. Ground levels become progressively less through a moderate slope to the south and west of the site, with the lowest ground levels slightly below 25m AOD at the south-west edge.

4.1.14 Although not shown on the online BGS mapping, there is the potential for Made Ground to be encountered in the disused sand pit which is likely to have been infilled, and in the areas associated with the construction of the: B1078 (Main Road); B1078 slip road; and the A12 to the south and south-west of the site.

4.1.15 Online BGS mapping indicates that the superficial geology underlying the south-eastern and north-western areas of the site is the sands and gravels of the Lowestoft Formation, which is formed of a sheet of chalky till, together with outwash sands and gravels, silts and clays whereas the central portion of the site is underlain by diamicton (boulder clay) deposits of the Lowestoft Formation.

4.1.16 The bedrock geology beneath the site comprises the Crag Group. The Crag Group is made up of shallow water marine and estuarine sands, gravels, silts and clays.

4.1.17 BGS borehole logs located along the A12 indicate that sand and gravel deposits are present within the south of the site. Lithological descriptions detailed within the trial pit logs and borehole logs generally include clay, sand and gravel with occasional chalk up to approximately 6m below ground level (m bgl). The underlying material becomes denser and sandier with depth, with bedrock not proven up to a depth of 20m bgl.

4.1.18 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 4 Chaper 12** of the **ES**.

4.1.19 The strategy for the surface water run-off associated with the Southern Park and Ride is SuDS techniques.

4.1.20 The proposed strategy for these facilities is to drain the surface water run-off through infiltration techniques, such as infiltration basins, trenches and/or catch pit soakaways, with basins, swales and geocellular storage in place for exceedance events. This philosophy will ensure no additional impervious areas are added to the existing site wide drainage network.

4.1.21 Where impervious surfacing is necessary, the proposed strategy is to convey run-off from these areas into either the permeable paving systems proposed for the car park and laydown areas, infiltration trenches or into discrete soakaways located alongside the proposed operational car park.

4.1.22 The site would be returned to its former use upon completion of the construction phase. **Table 4.2** sets out the surface water drainage hierarchy for the Southern park and ride site.

Table 4.2: Surface water drainage hierarchy - Southern Park and Ride site

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
4. Infiltration	✓	Permeable surfacing is proposed to enable surface water to infiltrate both into the ground and also into additional mitigation measures. The car parking areas would have permeable surfacing on top of storage structures.
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	✓	A below ground attenuation tank with sufficient volume would be required to attenuate run-off and discharge into the site drainage network. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water sewers in the vicinity.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

c) Freight management facility

4.1.23 The proposed freight management facility is to be located at Seven Hills near Ipswich. The facility will serve as a holding area for HGVs, regulating the timing and flow of vehicles to the Sizewell C main development site.

Being some distance from the Sizewell site, the land may have very different drainage characteristics. There are large existing soakaways outside the boundary of the site. It is assumed that these relate to runoff from the A14. However, despite soakaways being present close by, the performance of the soakaways and the ground conditions are not currently known, and infiltration testing will be required to establish the viability of infiltration drainage on the site.

4.1.24 A site visit from public roads was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk study mapping and aerial photographs. Additionally, it was an opportunity to identify potential visual or olfactory contamination present at the site at the time of the visit.

4.1.25 The majority of the site comprises agricultural fields with the remainder being a section of Felixstowe Road. The site is located to the south-east of the A12 and A14 junction south-east of Ipswich and is bounded by the A14 to the north, Felixstowe Road to the south and arable land to the east and west. No hazards or evidence of contamination were observed during the site visit.

4.1.26 The site is located within the catchment of the River Orwell. Based on online mapping, the site is generally flat and sits at approximately 25m Above Ordnance Datum (AoD).

4.1.27 There is the potential for Made Ground to be encountered related to the construction of existing roads, railway, former sand and gravel pits, and farmer's tips.

4.1.28 Online BGS mapping indicates that the site is underlain by superficial deposits of the Kesgrave Catchment Subgroup which fluvial sands and gravels and lacustrine and organic silts, clays and peats of the pre-diversionary River Thames, and the pre-glacial soils developed on such deposits.

4.1.29 The bedrock geology beneath the site is comprised of the Crag Formation which is described as coarse-grained, poorly sorted abundantly shelly sands.

4.1.30 The majority of BGS borehole scans and trial pits within the outer study area are clustered along the A12 and A14. Most were drilled for the construction of the A14 in 1976. There are three BGS boreholes located on-site and five located within the inner study area. A review of the available logs has indicated that the Kesgrave Catchment Group was recorded from approximately 0.9m to 6.7m below ground level (m bgl). The Crag Formation was encountered from approximately 4.3m to 13.1m bgl.

London Clay was encountered underlying the Crag Formation, with the depth not proven.

4.1.31 Current groundwater levels at the site are not known. Contours shown on BGS hydrogeological mapping suggest that groundwater levels within the Crag Group may be 15m AoD, approximately 10m bgl at the site. These contours are based on data from 1976 and are only indicative of current levels. However, the hydrogeological regime is not considered likely to have changed substantially in the intervening years. Further ground investigation would be needed to establish current groundwater levels at the site. On-site historical borehole logs available from the BGS report water strikes within the Crag aquifer at approximately 5m bgl.

4.1.32 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 8 Chaper 12** of the **ES**.

4.1.33 The proposed strategy for these facilities is to drain the surface water run-off through infiltration techniques where possible, such as heavy-duty permeable block paving, infiltration trenches and/or catch pit soakaways, with the ponds and swales previously proposed remaining in place for exceedance events. This philosophy will ensure no additional impervious areas are added to the existing drainage network.

4.1.34 Where heavy duty block paving cannot be utilised, surface water runoff from the lorry parking area will need to drain to a bypass separator.

4.1.35 The current proposed earth bunds may be repositioned to provide additional storage ponds like other WMZs.

4.1.36 The site would be returned to its former use upon completion of the construction phase. **Table 4.3** sets out the surface water drainage hierarchy for the freight management facility.

Table 4.3: Surface water drainage hierarchy - Freight Management Facility

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
5. Infiltration	✓	Permeable surfacing is proposed to enable surface water to infiltrate both into the ground and also into additional mitigation measures. The car parking areas would have permeable surfacing on top of storage structures.
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.

Drainage Principle.	Feasibility	Reason
4. Attenuation (tanks).	✓	A below ground attenuation tank with sufficient volume would be required to attenuate run-off and discharge into the site drainage network. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - a discharge into a surface water sewer is undesirable where infiltration is expected to provide an adequate solution.
7. Discharge – Combined drain.	X	Discounted – a discharge into a combined sewer is undesirable. Infiltration is expected to provide an adequate solution

d) Sizewell link road

4.1.37 A site visit from public roads and footpaths was undertaken during March 2019 to gain further information on the site setting, to consider the context of the proposed development, and to confirm the current desk study mapping and aerial photographs. Additionally, it was an opportunity to identify potential visual or olfactory contamination present at the site at the time of the walkover.

4.1.38 The site predominantly comprises agricultural land. The site includes several local roads, existing watercourses and woods, and is also in close proximity to farms and residential properties. The East Suffolk line crosses the site in the west. The areas surrounding the site are predominantly agricultural land with isolated farms and residential properties nearby.

4.1.39 The site is located within the Minsmere Old River watershed. Light Detection and Ranging data (LiDAR) show that the highest ground levels are located in the north-west area of the site at approximately 40m Above Ordnance Datum (AOD). The topography across the site varies between approximately 10m AOD and 35m AOD. The topography is gently rolling.

4.1.40 There is the potential for Made Ground to be encountered in the areas adjacent to the railway line and the existing roads. In addition, due to the nature of the site and surrounding area, there is the potential for fly tipping as well as the potential for farmers tips, the contents of which will be unknown.

4.1.41 BGS records indicate that the site is largely underlain by superficial Diamicton deposits of the Lowestoft Formation, and sand and gravel deposits of the Lowestoft Formation, which comprise an extensive sheet of chalky till as well as outwash sands and gravels, silts and clays.

4.1.42 Head (windblown) deposits are shown on the map where the site crosses Fordley Road and Hawthorne Road. These deposits comprise clay, silt, sand and gravel. Head deposits, comprising gravel, sand and clay deposits are also present in two small areas in the north-east of the site.

4.1.43 The bedrock geology beneath the site comprises sand of the Crag Group. Crag is made up of shallow water marine and estuarine sands, gravels, silts and clays.

4.1.44 A review of online BGS mapping indicates that there are several borehole or trial pit scans within the inner study area. Boreholes within 500m of the site show, variously, near surface geology as glacial drift, boulder clay or Crag Group.

4.1.45 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 6, Chaper 12** of the **ES**.

4.1.46 The strategy for the surface water run-off associated with the Sizewell Link Road is infiltration.

4.1.47 The proposed strategy is to convey run-off from impermeable highway surfaces into swales and infiltration features located adjacent to the route of the proposed Sizewell link road.

4.1.48 These features would form part of the permanent drainage of the link road, and a management and maintenance plan shall be required to ensure that the drainage performs as intended for the life of the link road. **Table 4.4** sets out the surface water drainage hierarchy for the link road.

Table 4.4: Surface water drainage hierarchy – Sizewell link road

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
6. Infiltration	✓	Although the link road will not be constructed with permeable surfacing, surface water conveyed into swales and infiltration features would infiltrate into the ground.
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.

Drainage Principle.	Feasibility	Reason
4. Attenuation (tanks).	X	Below ground attenuation tanks will not be adopted as conventional conveyance and infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - a discharge into a surface water sewer is undesirable where infiltration is expected to provide an adequate solution
7. Discharge – Combined drain.	X	Discounted - a discharge into a combined sewer is undesirable. Infiltration is expected to provide an adequate solution.

e) Yoxford roundabout

4.1.49 A site walkover was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk study mapping and aerial photographs. Additionally, it was an opportunity to identify potential visual or olfactory contamination present at the site at the time of the walkover.

4.1.50 The site was noted to comprise the existing A12 and B1122 roads and an area of agricultural land. No hazards or evidence of contamination were observed during the site walkover.

4.1.51 The proposed Yoxford roundabout site is located in the River Yox catchment. Light detection and ranging data show that the highest ground levels are located in the south of the site, at approximately 16m Above Ordnance Datum (AOD). Ground levels drop to the west and east of the site, with the lowest ground levels at approximately 10m AOD at the south west edge.

4.1.52 Made Ground is not shown on the BGS online mapping, however the areas adjacent to the existing roads have the potential to include Made Ground. Due to the nature of the site there is the potential for fly tipping as well as the potential for farmers' tips, the constituents of which will be unknown.

4.1.53 Online BGS mapping indicates that the majority of the site is not underlain by superficial deposits. Part of the northern section of the site is underlain by the Head Formation which is made up of clay, silt, sand and gravel.

4.1.54 Off-site, alluvial deposits associated with the River Yox are present to the north, with diamicton deposits and sands and gravels deposits of the Lowestoft Formation also present within the study area.

4.1.55 The bedrock geology beneath the site comprises of the Crag Group which is made up of shallow water marine and estuarine sands, gravels, silts and clays.

4.1.56 BGS borehole scan reference TM46NW27 located at national grid reference (NGR) 640130 268680 (10m from the site) suggests that the Crag aquifer is likely to extend at least 31m below ground level (bgl). BGS scans of shallow boreholes adjacent to the northern extent of the site indicate made ground is present to 0.5 – 1m bgl. This is underlain by varying thicknesses and sequences of clay, sand and silt. Bedrock was not encountered in any of these nearby boreholes.

4.1.57 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 7 Chaper 12** of the **ES**.

4.1.58 The strategy for the surface water run-off associated with Yoxford Roundabout is infiltration.

4.1.59 The proposed strategy is to convey run-off from impermeable highway surfaces into swales and infiltration features located adjacent to the proposed roundabout.

4.1.60 These features would form part of the permanent drainage of the roundabout, and a management and maintenance plan would be required to ensure that the drainage performs as intended for the life of the roundabout. **Table 4.5** sets out the surface water drainage hierarchy for the Yoxford roundabout works.

Table 4.5: Surface water drainage hierarchy – Yoxford Roundabout

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
7. Infiltration	✓	Although the roundabout will not be constructed with permeable surfacing, surface water conveyed into the detention basin, swales and infiltration features would infiltrate into the ground.
3. Attenuation (ponds, swales).	✓	A detention basin, swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	X	Below ground attenuation tanks will not be adopted as conventional conveyance and infiltration is expected to provide

Drainage Principle.	Feasibility	Reason
		an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - a discharge into a surface water sewer is undesirable where infiltration is expected to provide an adequate solution
7. Discharge – Combined drain.	X	Discounted - a discharge into a combined sewer is undesirable. Infiltration is expected to provide an adequate solution.

f) Two village bypass

4.1.61 Site walkovers of the River Alde floodplain, and from public roads and tracks, were undertaken in March 2019 and May 2019 to gain further information on the site setting, to consider the context of the proposed development, and to confirm the current desk study mapping and aerial photographs. Additionally, these walkovers provided opportunities to identify potential visual or olfactory contamination present at the site at the time of the walkover. Alongside the second walkover survey, the river corridor survey methodology was used to characterise the River Alde and the floodplain drainage network. Details of the dominant riparian vegetation and physical structures of the watercourses were recorded in the form of a map using a set of standard symbols and abbreviations.

4.1.62 The site comprises agricultural land with associated access tracks and local roads. The western and eastern site boundaries are formed by the existing A12. The site's northern and southern boundaries are formed by agricultural land.

4.1.63 The site is located on the floodplain of the River Alde before rising onto the watershed between the Rivers Alde and Fromus. Light Detection and Ranging data show that the highest ground levels, slightly above 26m Above Ordnance Datum (AoD), are located in the central section (Pond Wood to north of Farnham Hall) of the site. The lowest ground levels, slightly below 4m AoD are located in the western end (River Alde floodplain) of the western section (A12/Tinker Brook to Pond Wood) of the site.

4.1.64 There is potential for Made Ground to be encountered in the areas associated with the construction of the A12 and other minor roads. In addition, there is potential for fly tipping in the area, as well as farmers tips, the contents of which will be unknown.

4.1.65 Available BGS records indicate that the superficial geology underlying the site comprises Lowestoft Formation (diamicton) described as poorly-sorted matrix-supported deposits in the western and eastern sections of the site, in the vicinity of the junctions with the A12. The River Alde and the associated network of drains that intersect the site are underlain by alluvium. Superficial deposits are recorded absent in some areas in the east of the site.

4.1.66 The bedrock geology beneath the site comprises of three different bedrock strata. The Chillesford Church Sand Member underlies the majority of the site. This is described as shallow-water marine and estuarine sands, gravels, silts and clay. The Red Crag Formation outcrops in the west of the site, underlying the River Alde and comprises sands. The Crag Group underlies the north-east of the site and is described as shallow water marine and estuarine sands, gravel, silts and clays.

4.1.67 BGS borehole scans and trials pits within 1km of the site boundary are limited in number and located sporadically. Borehole reference TM36SE84 is located to the north of the site at national grid reference (NGR) 636390 260750 and shows that sand and gravel of either the Lowestoft Formation or Crag Group extends at least 30m below ground level (mbgl). Borehole records TM35NE53 and TM35NE32 are located within the western part of the site at NGR 636230 259910 and 635430 259740, respectively. These describe shallow deposits and also indicate that the shallow geology of the site comprises predominately poorly sorted sands interbedded with gravel, clays and silts.

4.1.68 The site does not lie within or adjacent to a groundwater Source Protection Zone (SPZ). A Total Catchment Zone (Zone 3) of a groundwater SPZ is located approximately 720m north of the western boundary of the proposed development.

4.1.69 Current groundwater levels at the site are unknown. Contours shown on BGS hydrogeological mapping suggest that groundwater levels within the Crag Group are around 5m AoD (approximately 0-15 mbgl across the site). These contours are based on data from 1976, and are only indicative of current levels, however the hydrogeological regime is considered unlikely to have changed significantly in the intervening years. Further GI would establish current groundwater levels at the site.

4.1.70 The site is located within the River Alde and the River Fromus catchments. The western end of the site crosses the River Alde and floodplain. The study area includes a network of drains on the River Alde floodplain. There are also 25 ponds within the inner study area. Several ponds are located on the northern side of the A12 and are considered hydrologically isolated from the site.

4.1.71 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 5 Chaper 12** of the **ES**.

4.1.72 The strategy for the surface water run-off associated with Two Village Bypass is infiltration.

4.1.73 The proposed strategy is to convey run-off from impermeable highway surfaces into swales and infiltration features located adjacent to the proposed bypass.

4.1.74 These features would form part of the permanent drainage of the bypass, and a management and maintenance plan would be required to ensure that the drainage performs as intended for the life of the bypass. **Table 4.6** sets out the surface water drainage hierarchy for the Two Village Bypass.

Table 4.6: Surface water drainage hierarchy – Two Village Bypass

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
8. Infiltration	✓	Although the bypass will not be constructed with permeable surfacing, surface water conveyed into swales and infiltration features would infiltrate into the ground.
3. Attenuation (ponds, swales).	✓	Swales, or similar features, would be used to collect, convey, infiltrate or attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	X	Below ground attenuation tanks will not be adopted as conventional conveyance and infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is deemed undesirable due to strict restrictions on the water quality of the run-off discharging into it. Surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	X	Discounted - there are no known surface water sewers in the vicinity.
7. Discharge – Combined drain.	X	Discounted - there are no known combined sewers in the vicinity.

g) Rail proposals

4.1.75 The construction of Sizewell C Project would require the delivery of substantial amounts of construction materials by rail.

4.1.76 A temporary rail route would be constructed from Saxmundham Road to the main development site (rail extension route) and improvements to the Saxmundham to Leiston branch line (branch line), including upgrades to various level crossings will be made.

4.1.77 A site visit from public roads was undertaken during March 2019 to gain further information on the site setting and study area, to consider the context of the site, and to support the desk study mapping and aerial photographs.

4.1.78 The site comprises agricultural fields, with the existing Saxmundham to Leiston branch line present within the south-western edge of the site. Buckleswood Road is also present in the south of the site, crossing the proposed rail extension route from north-west to south-east.

4.1.79 Light Detection and Ranging data for the site shows that the highest ground levels, slightly above 23m Above Ordnance Datum (AOD), are located in the southern extent of the site. Ground levels become progressively lower to the north of the site, with the lowest ground levels slightly below 7m AOD at the north-east edge.

4.1.80 There is the potential for Made Ground to be present associated with the existing railway line, roads crossing the site, small scale structures and the old sand pits located in the vicinity of the site.

4.1.81 Online BGS mapping indicates that the superficial geology underlying the majority of the site is the diamicton (boulder clay) deposits of the Lowestoft Formation. The north-eastern area of the site is underlain by the sands and gravels of the Lowestoft Formation, which is formed of a sheet of chalky till, together with outwash sands and gravels, silts and clays.

4.1.82 The bedrock geology beneath the site comprises Crag Group. The Crag Group is made up of shallow water marine and estuarine sands, gravels, silts and clays.

4.1.83 A ground investigation encompassing a section of the rail extension route was undertaken in 2014. Eight exploratory holes were drilled in the vicinity of the site. The ground investigations report states that ground conditions encountered are consistent with those indicated by published geological records, with the boreholes within the site confirming the presence of the Crag bedrock, overlain by superficial deposits of the Lowestoft Formation (diamicton).

4.1.84 The boundary between the Crag Group and the Lowestoft Formation (diamicton) was found to be indistinct in places. The thickness of superficial deposits was generally found to increase with distance from the coast, with a maximum thickness of 7.3m of Lowestoft Formation (diamicton).

4.1.85 The Environment Agency classifies the sand and gravel of the Lowestoft Formation as a Secondary A Aquifer and the Lowestoft Formation (diamicton) as a Secondary Aquifer (undifferentiated). The Environment Agency classifies the Crag Group bedrock underlying the site as a Principal Aquifer.

4.1.86 The eastern and northern section of the site does not lie within a groundwater Source Protection Zone (SPZ). The south-western section of the site lies within the Outer Zone (Zone 2), or Total Catchment (Zone 3) of an SPZ. The inner protection zone (Zone 1) is approximately 1km south of the site.

4.1.87 As part of the ground investigation undertaken within the site, groundwater levels were monitored. These showed groundwater levels ranging from 2.75 to 17.60m below ground level (bgl).

4.1.88 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 9 Chaper 12** of the **ES**.

4.1.89 The strategy for the surface water run-off associated with the rail improvements is infiltration.

4.1.90 Rail track drainage systems would comply with the Network Rail - NR/L3/CIV/005/1 Railway Drainage Systems Manual. This Network Rail standard includes mandatory requirements for track drainage design.

4.1.91 Where collector drains and carrier drains are used to convey surface water away from the rail, the surface water would be treated in swales and infiltration trenches adjacent to the track. **Table 4.7** sets out the surface water drainage hierarchy for the rail improvements.

Table 4.7: Surface water drainage hierarchy – Rail Improvements

Drainage Principle.	Feasibility	Reason
1. Rainwater Harvesting.	X	No permanent occupancy therefore deemed to be not viable.
9. Infiltration	✓	Although the railway will be constructed with permeable surfacing, surface water will be collected and conveyed into swales and infiltration trenches and would infiltrate into the ground.
3. Attenuation	✓	Swales, or similar features, would be used to infiltrate or

Drainage Principle.	Feasibility	Reason
(ponds, swales).		attenuate run-off, and provide a treatment stage.
4. Attenuation (tanks).	✓	Below ground attenuation tanks with sufficient volume would be required to attenuate run-off will not be adopted as conventional conveyance and infiltration is expected to provide an adequate solution.
5. Discharge – watercourse.	✓	A direct discharge into a watercourse is possible despite strict restrictions on the water quality of the run-off discharging into it as there will be no pollutant or contaminant load, however flow rates from positive drainage . Surface water may also be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of silt and contaminant load.
6. Discharge – Surface Water drain.	**X**	Discounted - there are no known surface water sewers in the vicinity.
7. Discharge – Combined drain.	**X**	Discounted - there are no known combined sewers in the vicinity.

4.2 Foul water management

a) Northern park and ride

4.2.1 The Northern Park and Ride is remote from the MCA and TCA. Due to the remoteness, connection to the TCA's foul system is not an option. The site will have low use and foul disposal demands associated with the Driver's Amenity building. Whilst there is an Anglian Water Services public foul water asset in the vicinity, there appears to be insufficient head differential to drain by gravity, and a pumped solution is not considered feasible.

4.2.2 The preferred approach is to introduce a package plant and to drain the effluent to ground through SuDS infiltration devices. Low flow rates are likely to impact on the functionality of a package treatment plant, and a low flow package treatment plant would be specified. Tankering to works from a cess pit is an alternative option should ground conditions be unfavourable or the flow be insufficient for the low-flow package treatment plant.

4.2.3 Infiltration testing is being carried out to confirm the acceptability of the solution. The specific arrangements require further investigation, and details are to be refined at design stage.

b) Southern park and ride

4.2.4 The Southern Park and Ride is remote form the MCA and TCA. Due to the remoteness, connection to the TCA's foul system is not an option. The site will have low use and foul disposal demands associated with the Amenity and Welfare building.

4.2.5 The preferred approach is to introduce a package plant and to drain the effluent to ground through SuDS infiltration devices. Low flow rates are likely to impact on the functionality of a package treatment plant, and a low flow package treatment plant would be specified. Tankering to works from a cess pit is an alternative option should ground conditions be unfavourable or the flow be insufficient for the low-flow package treatment plant.

4.2.6 Infiltration testing is being carried out to confirm the acceptability of the solution. The specific arrangements require further investigation, and details are to be refined at design stage.

c) Freight management facility

4.2.7 The freight management facility is also remote form the MCA and TCA. The site will have low use and foul disposal demands associated with the Amenity and Welfare building.

4.2.8 Due to the remoteness, connection to the TCA's foul system is not an option.

4.2.9 The current proposal is to introduce a package plant and to drain the effluent to ground through SuDS infiltration devices. Low flow rates are likely to impact on the functionality of a package treatment plant, and a low flow package treatment plant would be specified. Tankering to works is an alternative option should the flow be insufficient for the low-flow package treatment plant.

4.2.10 A packaged treatment plant is preferred. Again, the current proposal is to introduce a package plant and to drain the effluent to ground through infiltration devices. Due to the remoteness of the site from the rest of the TCA, connection to the TCA foul system is not a preferred option.

4.2.11 Testing is being carried out to confirm the acceptability of the solution. The specific arrangements require further investigation, and details are to be refined at design stage.

5 Other sites

5.1 Water management assessment

a) Leiston off-site sports facilities

5.1.1 Off-site sports facilities for use by the general public and the construction workforce are to be located in Leiston and retained for use after construction. A full-sized artificial grass pitch (AGP) and multi-use games areas (MUGA) are proposed on land between Leiston Leisure Centre and Alde Valley Academy.

5.1.2 The base for an AGP and MUGA is typically a porous engineered construction consisting of two courses of open-textured bituminous macadam laid above a graded stone sub-base, which would allow the AGP and MUGA to be free-draining. Where infiltration is poor, a sub-surface drainage system may be required. The design of subsurface drainage would follow Sport England's Artificial Surfaces for Outdoor Sport Design Guidance Note[6] and employ SuDS techniques to attenuate and limit flow from the site to greenfield runoff rates.

5.1.3 Details are to be refined at design stage.

6 https://sportengland-production-files.s3.eu-west-2.amazonaws.com/s3fs-public/artificial-surfaces-for-outdoor-sports-2013.pdf?t.3rEH_hWpkMZ.am24nSILAAFDgQ4Lpz

References

1.1 Minsmere to Walberswick Heaths and Marshes

https://www.rspb.org.uk/reserves-and-events/reserves-a-z/minsmere/

1.2 Statutory Main River map taken from Environment Agency Mapping – ARC GIS Service

https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C699555.8948%2C295506.412%2C27700

1.3 Environment Agency Flood Map

https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C6

1.4 Peak Rainfall Intensity Allowance in small and urban catchments (Environment Agency)

https://www.arcgis.com/apps/webappviewer/index.html?id=17cd53dfc524433980cc333726a56386&extent=588430.6725%2C236967.2324%2C699555.8948%2C2

1.5 Groundwater protection principles

https://www.gov.uk/government/publications/groundwater-protection-principles-and-practice-gp3

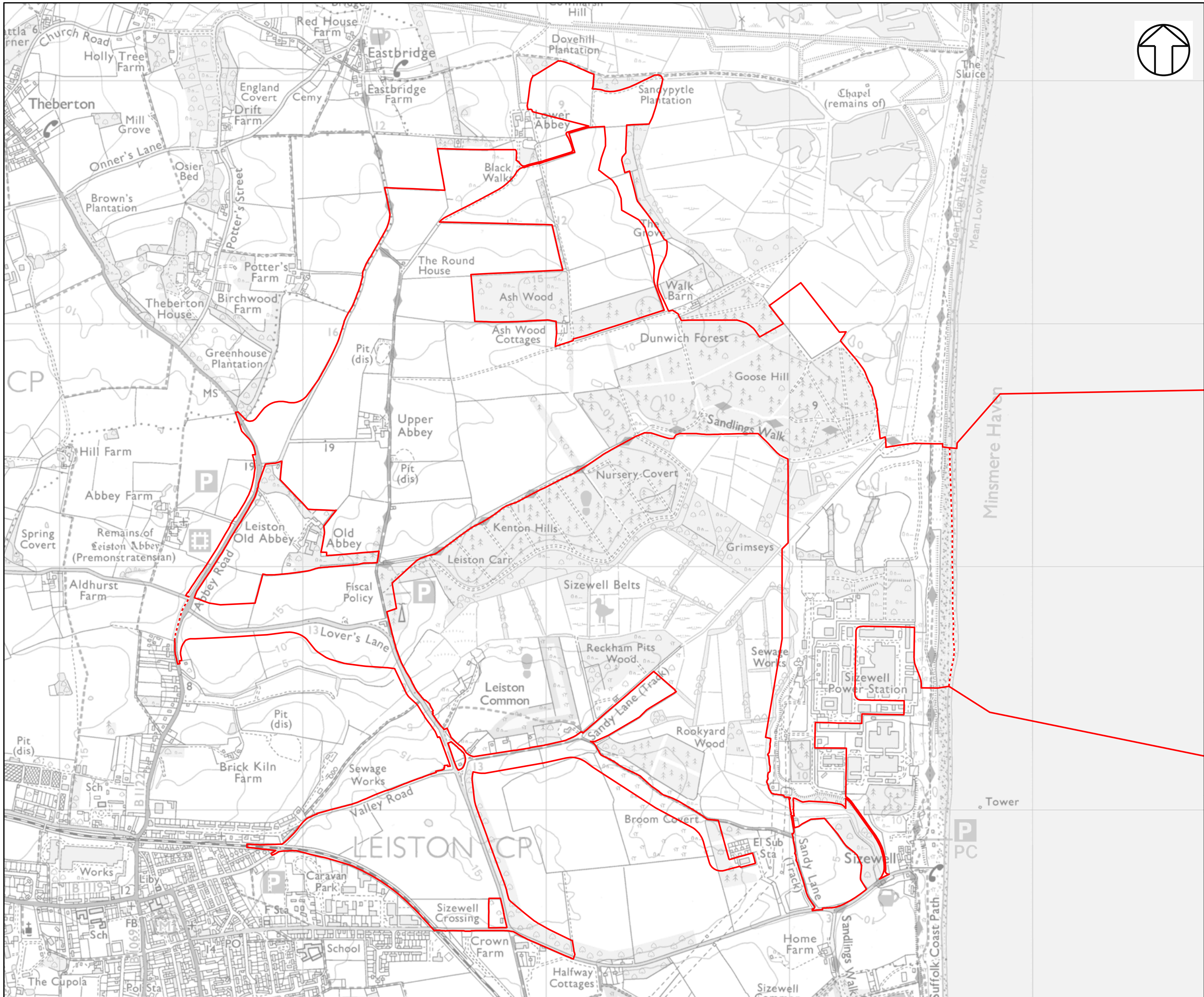
1.6 National Planning Policy Framework

https://www.gov.uk/guidance/flood-risk-and-coastal-change

1.7 Environment Agency's approach to Groundwater Protection (2018)

1.8 Council Directive 91/271/EEC

VOLUME 2, CHAPTER 2, APPENDIX 2A OUTLINE DRAINAGE STRATEGY, FIGURES 2A.1 - 2A.6



NOTES

KEY

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- DEMARCATION LINE

NOT PROTECTIVELY MARKED

DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
OUTLINE DRAINAGE STRATEGY

DRAWING TITLE:
LOCATION PLAN AND SITE BOUNDARY

DRAWING NO:
FIGURE 2A.1

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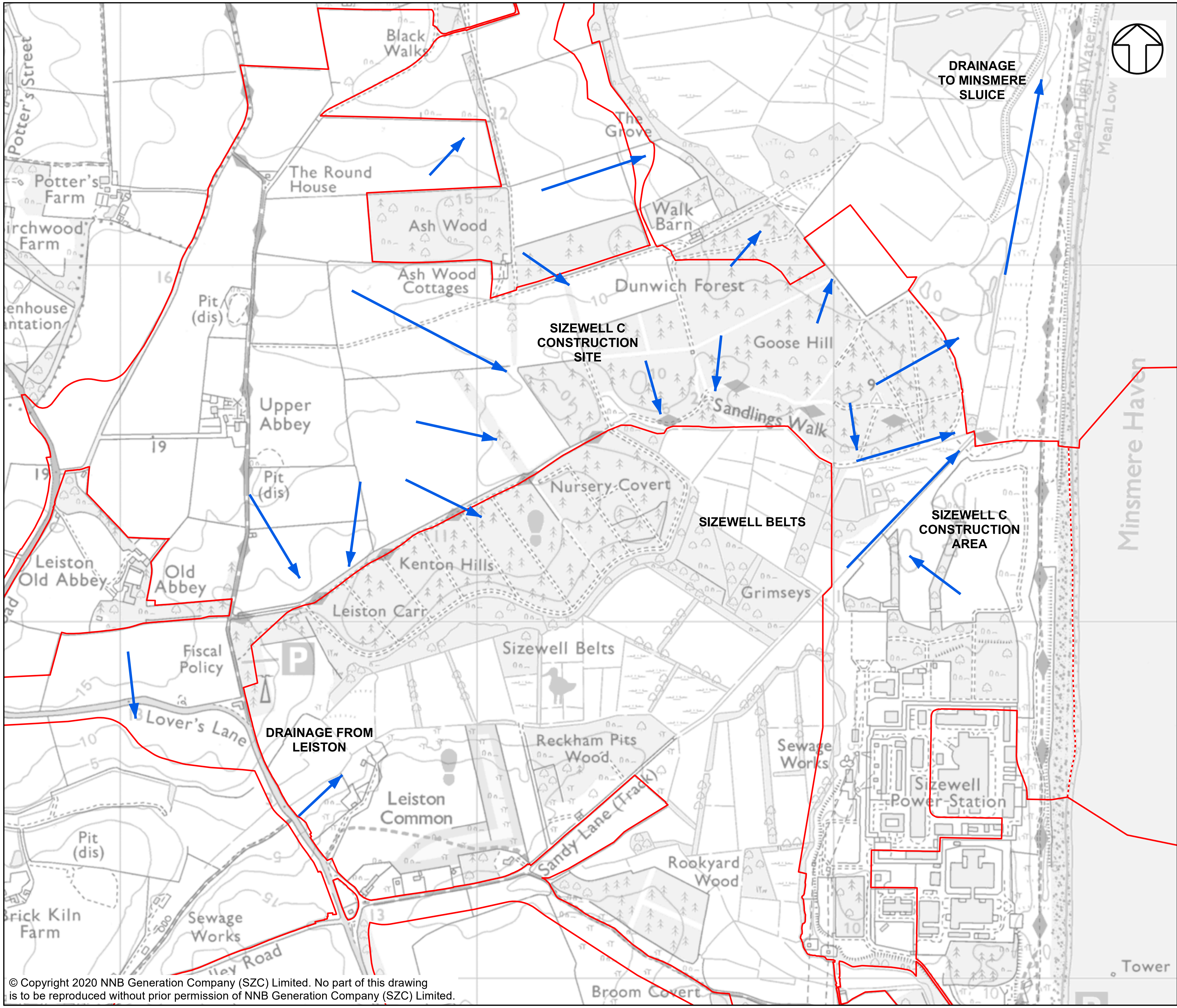

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- DEMARCATION LINE
- INDICITIVE WATER PATHWAYS

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SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
OUTLINE DRAINAGE STRATEGY

DRAWING TITLE:
TOPOGRAPHY AND SURFACE WATER OVER LAND FLOW PATHS

DRAWING NO:
FIGURE 2A.2

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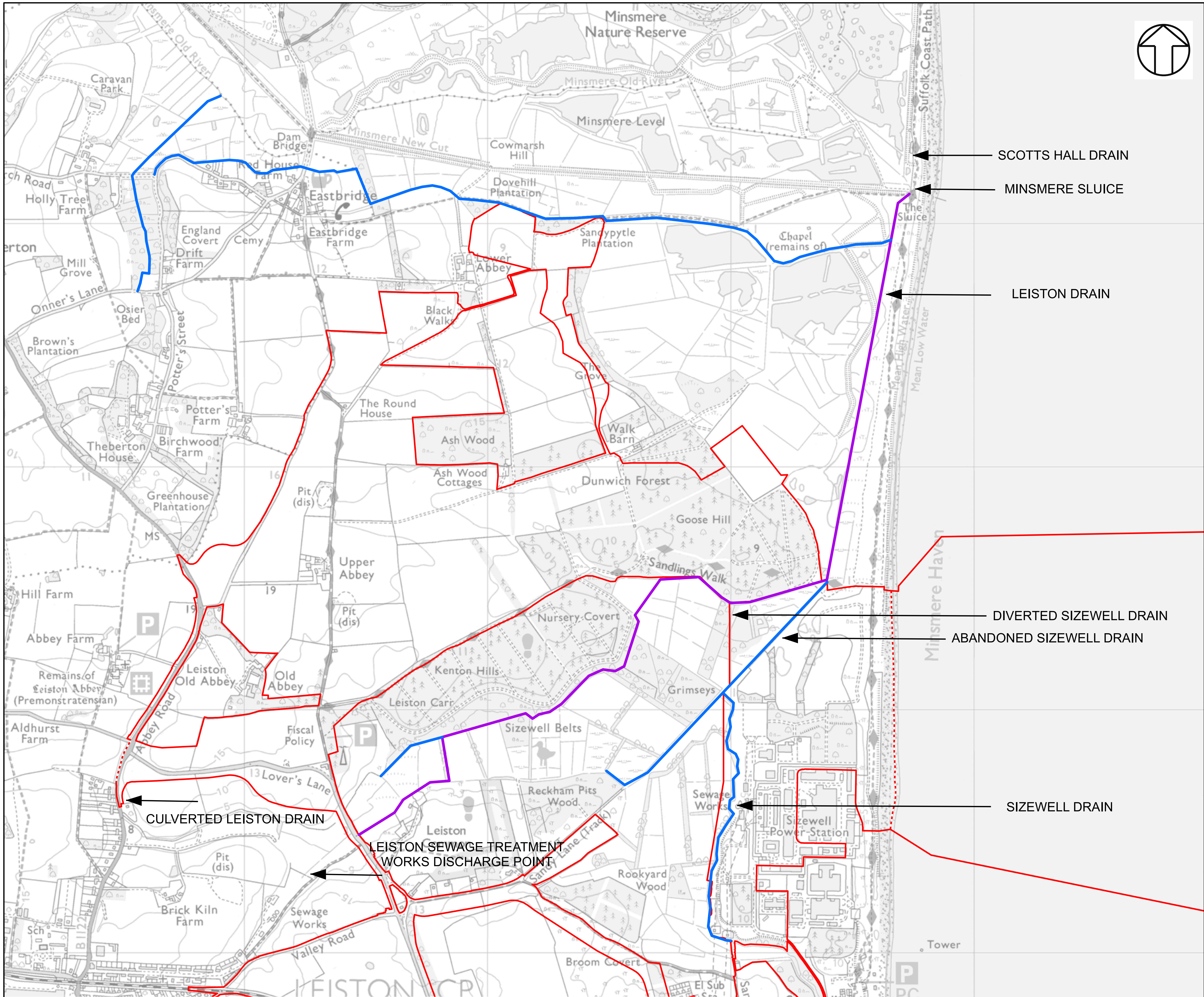

NOTES

KEY

- WATERCOURSE
- WATERCOURSE - PRIMARY DRAINAGE ROUTE
- SIZEWELL C MAIN DEVELOPMENT SITE
- DEMARCATION LINE

NOT PROTECTIVELY MARKED

SZC
EDF ENERGY
CGN

DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
OUTLINE DRAINAGE STRATEGY

DRAWING TITLE:
LOCAL WATERCOURSES

DRAWING NO:
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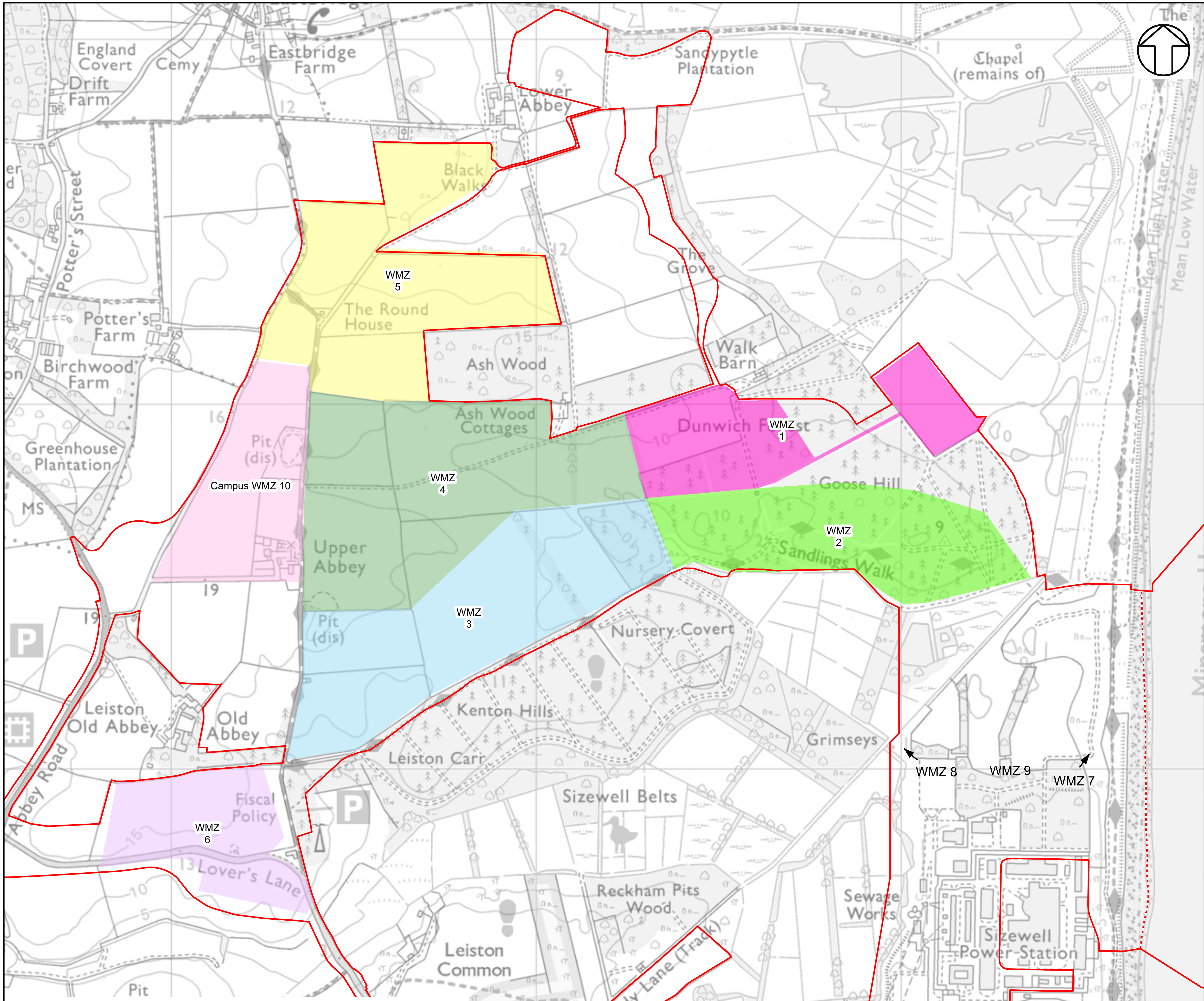

NOTES

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- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
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- CAMPUS WMZ 10
- WMZ 1
- WMZ 2
- WMZ 3
- WMZ 4
- WMZ 5
- WMZ 6

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DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
OUTLINE DRAINAGE STRATEGY

DRAWING TITLE:
LAYOUT OF WATER MANAGEMENT ZONES

DRAWING NO:
FIGURE 2A.4

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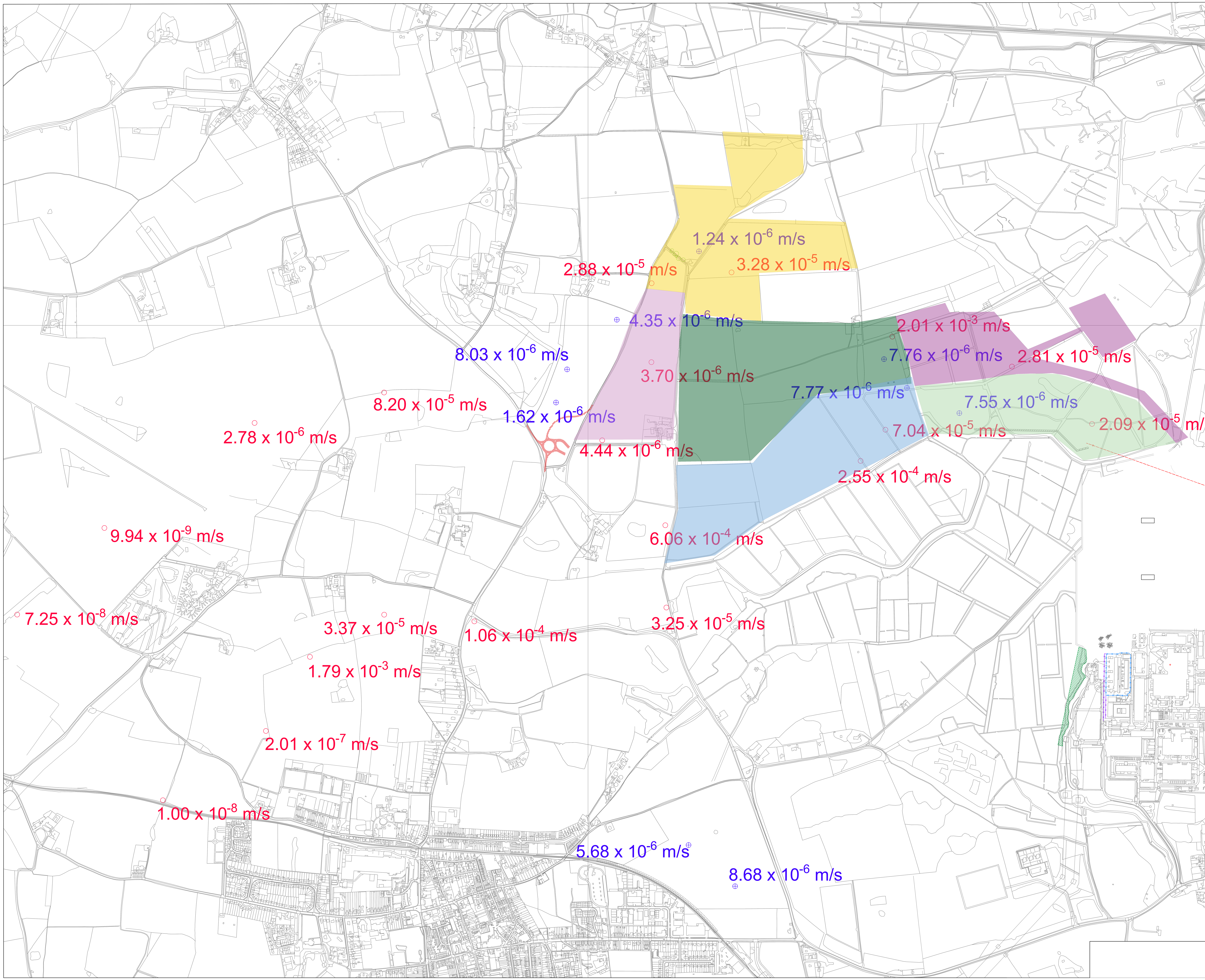

NOTES

KEY

INFILTRATION TESTS (STRUCTURAL SOILS - 2017)

INFILTRATION TESTS (STRUCTURAL SOILS - 2014)

WMZ 1

WMZ 2

WMZ 3

WMZ 4

WMZ 5

CAMPUS WMZ 10

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SZC
EDF ENERGY
CGN

DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
DRAINAGE STRATEGY

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LAYOUT OF INFILTRATION TESTS

DRAWING NO:
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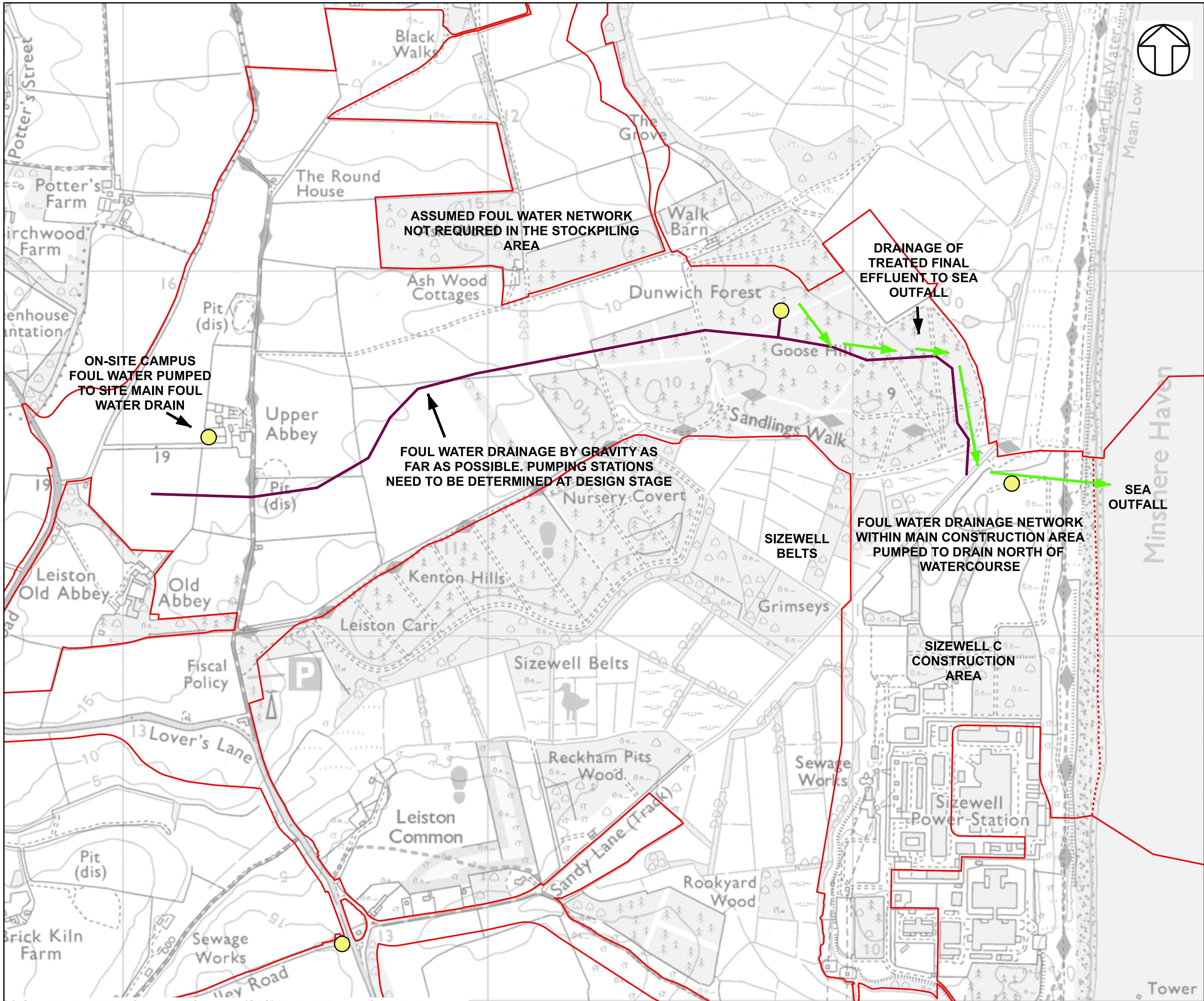

NOTES

KEY

- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
- DEMARCATION LINE
- TEMPORARY TREATMENT PLANTS
- TREATED FINAL EFFLUENT
- PROPOSED FOUL NETWORK

NOT PROTECTIVELY MARKED

EDF ENERGY SZC CGN

DOCUMENT:
SIZEWELL C
ENVIRONMENTAL STATEMENT
VOLUME 2
APPENDIX 2A
DRAINAGE STRATEGY

DRAWING TITLE:
INDICATIVE FOUL DRAINAGE LAYOUT

DRAWING NO:
FIGURE 2A.6

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VOLUME 2, CHAPTER 2, ANNEX 2A.1 SIZEWELL B RELOCATED FACILITIES DRAINAGE STRATEGY

VOLUME II:
TECHNICAL APPENDICES

3.2 Drainage Strategy

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CONTENTS

TABLES

FIGURES

1. INTRODUCTION

1.1.1 A number of existing Sizewell B Power Station facilities need to be relocated from the area of land that is nominated as a potentially suitable site for the development of the Sizewell C new nuclear power station – the Sizewell B Relocated Facilities (referred to as the 'Proposed Development'). The facilities have a broad range of functions including industrial, workplace, education, cultural and infrastructure; some of which need upgrading to comply with current standards and requirements.

1.1.2 The Planning Application consists of outline and full elements:

- In outline, comprising a Visitor Centre (maximum 2,000sq.m GEA) and a maximum of 9,500sq.m (GEA) of floorspace to provide administration, storage, welfare and canteen facilities with all matters reserved apart from access.
- In full, for the demolition of the existing Outage Store, Laydown Area, Operations Training Centre, Technical Training Facility, Visitor Centre, and Rosery Cottage garage; removal of technical training and pool car park (63 spaces), Coronation Wood car park (21 spaces), Visitor Centre car park (16 spaces) and northern outage car park (576 spaces); meantime use of the Technical Training Centre as an interim Visitor Centre followed by its demolition; and erection of new (all floorspace in GEA) Outage Store (2,778sq.m), Laydown Area (11,990sq.m) including New Western Access Road, Yardman's Office (23sq.m), Training Centre (4,032sq.m), Rosery Cottage garage (30sq.m), Replacement Car Park (2,363sq.m) providing 112 spaces, and Outage Car Park (15,525sq.m) providing (576 spaces) including new access road (and alternative access to bridleway), footpath and amended junction at Sizewell Gap; and associated landscaping earthworks/recontouring, tree felling and boundary treatment.

1.1.3 As noted above, the Proposed Development includes the relocation of the Outage Store, which is associated with the shutdown period when the Sizewell B Power Station is refuelled. A planned outage occurs approximately every 18 months where the reactor components are taken apart and the fuel is replaced. During this period the station components that cannot be accessed during normal operating conditions are inspected or replaced and tested. The plant is then reassembled and tested to ensure it meets the relevant safety and functional requirements.

1.1.4 The following sections outline the Surface Water (SW) Drainage Strategy, as part of the Sizewell B Relocated Facilities Project.

1.1.5 Note: all reference to drainage in this document relates to surface or storm water drainage. Foul Water drainage has been addressed separately to this report.

1.1.6 The drainage strategy contained herein applies to the following facilities:

- Proposed Car Park
- Pillbox Field Outage Car Park (including pedestrian access)
- Laydown
- Western Access Road

- Proposed Outage Store
- Proposed Training Centre
- Outline Development Zone facilities
- Pumping Station Removal
- Proposed Visitor Centre

1.1.7 Where stated within this document, reference to ‘Station’ refers to the main Sizewell B Power Station site and includes the main area within the Sizewell B perimeter, i.e. excludes areas outside of the perimeter, such as the car parks, external site access roads, training centre, visitor centre and Coronation Wood etc.

2. OVERARCHING SURFACE WATER DRAINAGE STRATEGY

2.1.1 This section outlines the site wide drainage strategy, applicable to all Relocated Facilities inside and outside of the Sizewell B Power Station. Details regarding facility specific drainage strategies can be found in Sections 6 and 7. Details of the concept designs arising from the application of this strategy have been presented separate to this document.

2.2 Summary of Strategy and Approach

2.2.1 The surface water drainage strategy has been developed in such a way that it will not adversely affect the hydraulic performance of the existing site surface water drainage networks, nor will it materially affect overland flow paths within the Sizewell B Station Perimeter. The drainage aspects of the Sizewell B Power Station Nuclear Safety Case (the justification to the regulator that the site can be designed, constructed and operated safely) do not place claims on the piped networks, but instead rely on overland flow to deal with exceptional events. The adoption of this strategy will not adversely affect the station's Nuclear Safety Case, and the strategy therefore does not specifically make further reference to specific 'nuclear' requirements.

2.2.2 Due to the location of the relocated facilities, as illustrated in **Figure 3-2** and **Figure 3-3**, and where deemed necessary, surface water drainage associated with the proposed facilities will connect to the southern branch of the surface water drainage network (shown in blue in **Figure 3-1**), and therefore will not adversely alter or increase surface water run-off draining into the northern branch of the surface water drainage network (Red in **Figure 3-1**).

2.2.3 The drainage strategy for the Relocated Facilities is summarised as:

- Assets outside the Station – drainage by infiltration, independent of existing site (i.e. inside the Station) piped networks.
- Assets inside the Station – drainage direct to existing site piped networks, with exceedance flows addressed through overland flow.

2.2.4 The drainage strategy has been developed following conventional industry standards, guidance and best practice regarding the safe and sustainable management of surface water run-off. The strategy has also been developed with specific consideration of site issues which would affect the feasibility of specific solutions, such as the congestion of the below ground space on site within the station, availability of existing drainage features, and the nature of the subsoil.

2.2.5 The overarching surface water drainage philosophy for the site wide facilities follows the conventional Sustainable Drainage (SuDS) steps / hierarchy presented below, moving from each stage to the next only when the current stage is deemed not practicable within the project:

- 1: Store rainwater for later use (e.g. rainwater harvesting);
- 2: Use infiltration techniques (e.g. porous surfaces);

- 3: Attenuate rainwater in ponds or open water features for gradual release;
- 4: Attenuate rainwater by storing in tanks for gradual release through an outlet;
- 5: Discharge rainwater direct into watercourse;
- 6: Discharge rainwater to a surface water sewer / drain;
- 7: Discharge rainwater to a combined sewer.

2.2.6 Rainwater harvesting is considered not to form a part of the drainage strategy, as these features do not provide any attenuation storage. For design purposes they are considered as being full from a previous rainfall event when the next occurs. The possible implementation of rainwater harvesting for each proposed facility will be addressed in the subsequent design stages.

2.2.7 Green roofs have not been considered as forming part of the drainage strategy for the site due to the limited benefits that they offer when assessing attenuation and controlling run-off rates for storms greater than the 1 in 1 year rainfall event. Their possible implementation and use for the proposed facilities will be addressed in the subsequent design stages.

2.2.8 The drainage design will be coordinated accounting for site constraints, including the location of the existing and proposed underground utilities, alongside accommodating constructability and maintainability limitations.

2.3 Aims of Drainage Strategy

2.3.1 The principal aim of the drainage strategy is to provide functional drainage systems which will satisfy the surcharge and flooding criteria expressed in Section 4 of this report.

2.3.2 In addition to the key requirement of providing functional drainage, the design will aim to satisfy the following criteria where reasonably practicable:

- Control run-off at or close to where it hits the ground;
- Reduce the rate of run-off leaving the site and discharging to nearby watercourses (rivers, sea etc.);
- Use at, or near-surface drainage features wherever practicable, slowing the rate of run-off entering into below ground drainage networks.
- Provide stages of water treatment;
- Pick and combine appropriate drainage features or SuDS components to suit site constraints;
- Provide habitats for wildlife in developed areas and opportunities for biodiversity enhancement;
- Contribute to the enhanced amenity and aesthetic value of developed areas.

2.3.3 The variety of SuDS components and design options available will allow the design to consider local land use, land take, future management scenarios, and the needs of the user.

2.3.4 Active decisions will be made that balance the wishes of different stakeholders and the risks associated with each design option.

2.4 Strategic Design Criteria

2.4.1 The drainage design will consider the following criteria:

a) Hydraulic Criteria

- Store or safely convey the run-off from exceedance storm events, without putting public or property at risk;
- Reduce if possible, or at least not increase, the pre-development risk of flooding associated with the receiving watercourse; the design will qualitatively address external flooding (Pluvial and Fluvial) to ensure that there are no detrimental effects to the existing arrangement.
- Prevent downstream stream bank and channel erosion.
- Drainage facilities to provide no surface flooding from piped networks due to a 1 in 30 year return period rainfall event, in accordance with **Table 4-1**.
- Combine permeable paving and surface drainage structures to remove water from paved surfaces with no ponding for a 1 in 30 year rainfall event.
- Construction drainage will not be covered as part of this drainage strategy.

b) Water Quality Criteria

- Reduce urban run-off pollutants and improve SW quality before discharge, either by infiltration to ground or overland flow to watercourse.

c) Amenity and Ecology Criteria

- Provide amenity and ecological benefits, wherever practicable.

d) Sustainability Criteria

- Aim to protect the environment, minimise the use of finite natural resources and energy and provide reasonable value to those involved in its design, construction and operation.

2.4.2 A key design requirement of SuDS and drainage design for external paved areas is 'Interception' – the capture and retention of the first 5 mm of every rainfall event.

2.4.3 Rainfall run-off from external paved surfaces, such as car parks and roads, can contain a range of pollutants. The highest concentration of these pollutants tends to be found in run-off from the earliest part of a rain storm.

2.4.4 Intercepting 5mm of every rain storm has positive implications for water quality and quantity, as such, interception will be implemented into the design wherever practicable (at this stage this is considered feasible for the Coronation Wood and Pillbox Field areas, but not for the Outage Store or Outline Development Zone). Providing interception storage will also contribute to the BREEAM score for each facility.

2.4.5 Appropriate oil/fuel controls, such as formal oil separators or through utilising effective SuDS principles, such as permeable paving, swales etc., will be implemented into the surface water drainage networks where this is a risk of oil contaminating the surface water drainage and in accordance with guidance set out in Pollution Prevention Guidance Note 3 and The SuDS Manual (CIRIA C753).

2.4.6 Ground water levels, infiltration rates and ground conditions at the various proposed sites will be determined in order to propose a suitable drainage design. This strategy has made assumptions for these conditions and listed them where applicable. Where practicable, the drainage design philosophy will strive to either emulate the equivalent existing greenfield characteristics, or for brownfield areas, will look to emulate greenfield characteristics i.e. to improve the existing situation and provide betterment in drainage and flood characteristics, so that the existing drainage network is not subject to additional loading.

2.4.7 For facilities developed within the Sizewell B Power Station Security Perimeter (Outline Development Zone and Outage Store), the proposed facilities are not expected to increase the surface water run-off volumes and rates above the values that have previously discharged into the site drainage network (this is due to the pre- and post- development surface both being impermeable). Therefore it is anticipated the existing drainage network will not require global alteration to increase capacity and there will be no increased risk of surface flooding.

2.4.8 For facilities served by a direct drainage connection into the existing network, there would be no net increase in flow rates or volumes compared to the previous existing conditions at the site. This will require formal confirmation with respect to the viability (condition and performance) of the existing drainage network. Assurance will be required that there is sufficient capacity to accommodate the anticipated surface water such that there is no increased risk of surface flooding and that the safety case is not adversely affected. Where this is not possible, the affected existing pipework may need to be locally upgraded / upsized to accommodate any increased run-off volume, although no such network reinforcement is currently envisaged to satisfy this drainage strategy.

2.4.9 Flow controls may be incorporated where the surface water is proposed to be discharged into the existing site drainage network, to limit the discharge rate to the equivalent brownfield / greenfield run-off rate.

3. EXISTING SURFACE WATER DRAINAGE

3.1.1 The existing surface water drainage network is illustrated in **Figure 3-1**, and comprises northern and southern branches. Both branches drain to the main site surface water outfall to sea at the north east of the Sizewell B site as annotated. The northern branch comprises a pumping station to discharge surface water arising from facilities outside the Sizewell B Station Perimeter at a lower level (including the existing outage car park and southern portion of the western operational car park) to the surface water network within the Sizewell B site. The southern branch is entirely a gravity sewer network.

3.1 Southern (Gravity) Branch

3.1.1 Through working knowledge of the existing site conditions and the recent construction of the Dry Fuel Store, an impermeable surface previously draining to the site networks was replaced with a new building draining to soakaways. The amount of impermeable area draining into the existing site surface water drainage network was therefore reduced by approximately 0.820 ha through the incorporation of soakaway systems, with 0.715 ha being removed from the existing southern drainage branch. This area is considered as available to the Relocated Facilities project as a part of the add / omit balance to achieve no net increase in impermeable area connected to the site network.

3.1.2 In addition to the assumption of balancing impermeable drainage areas, the following also require addressing before the drainage assumption can be fully qualified at Detailed Design Stage:

- Identify any additional areas that may already be contributing to the southern branch of the existing drainage network;
- Survey the current condition of the existing drainage network;
- Determine any spare capacity of the existing network, whether it is capable of supporting any additional loading;
- Assess any potential localised ‘overloading’ of the existing surface water drainage network and therefore increased risk of flooding.

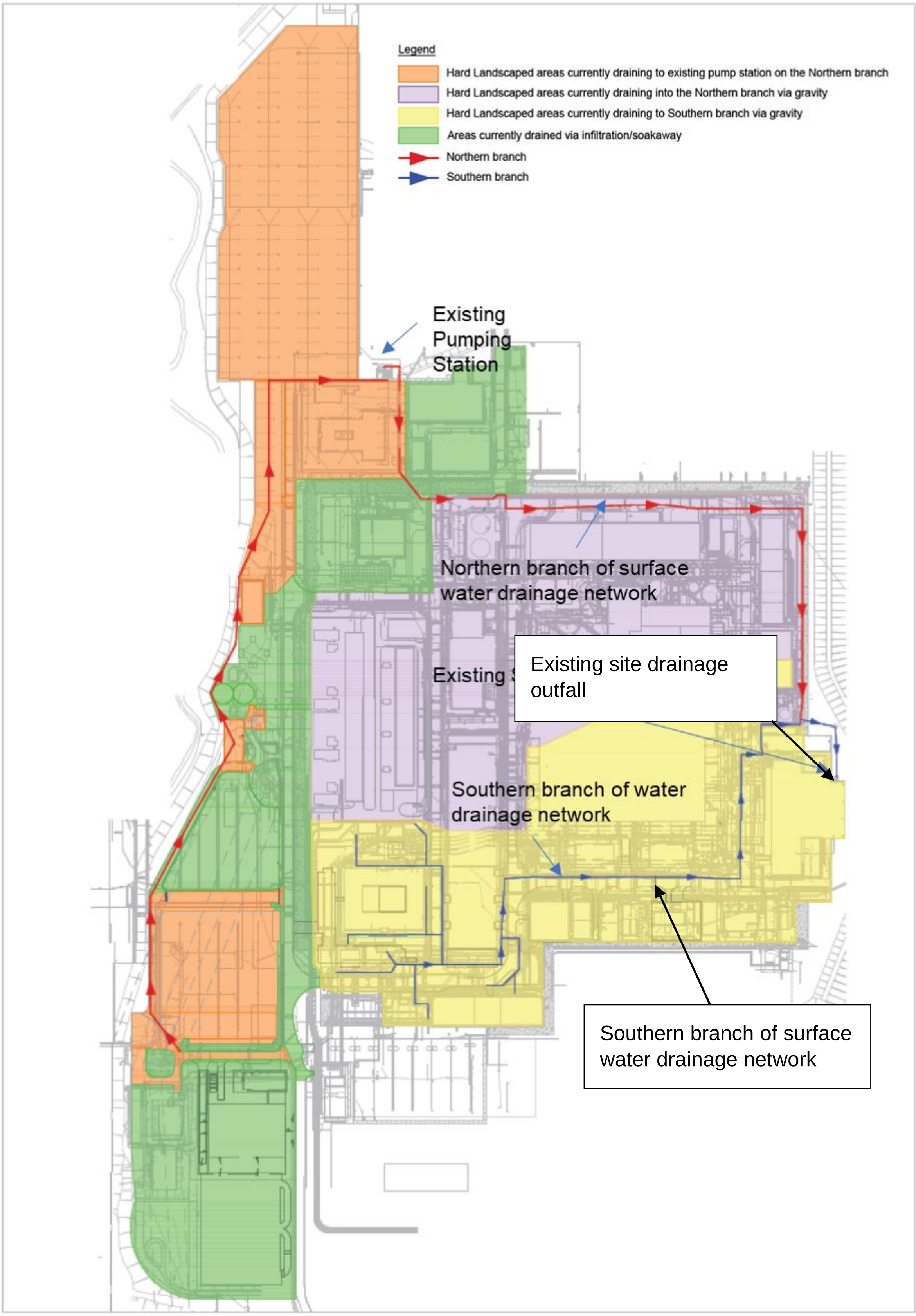


Figure 3-1: Existing Surface Water Drainage Network

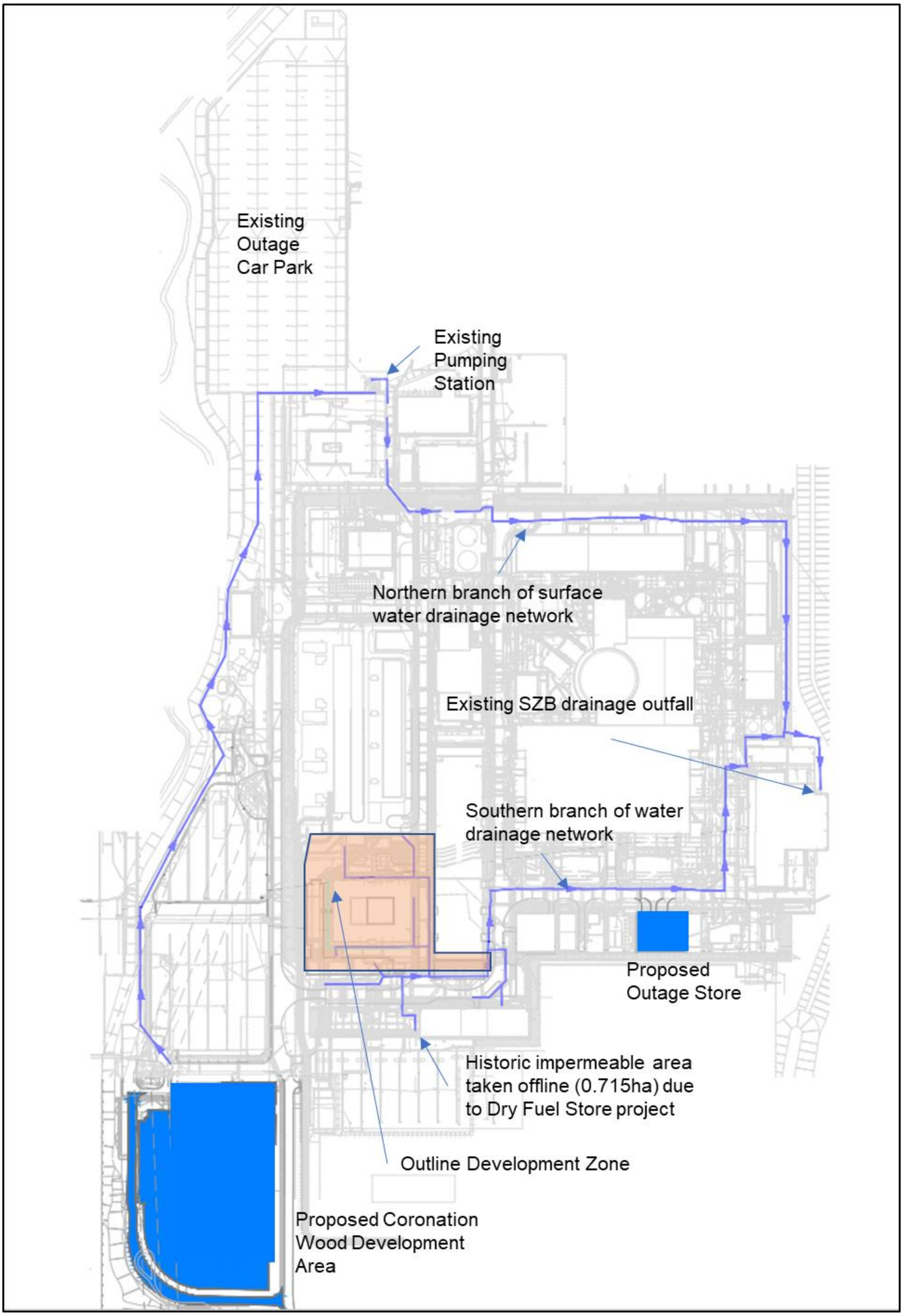


Figure 3-2: Proposed Facilities (excl. Pillbox Field Outage Car Park)

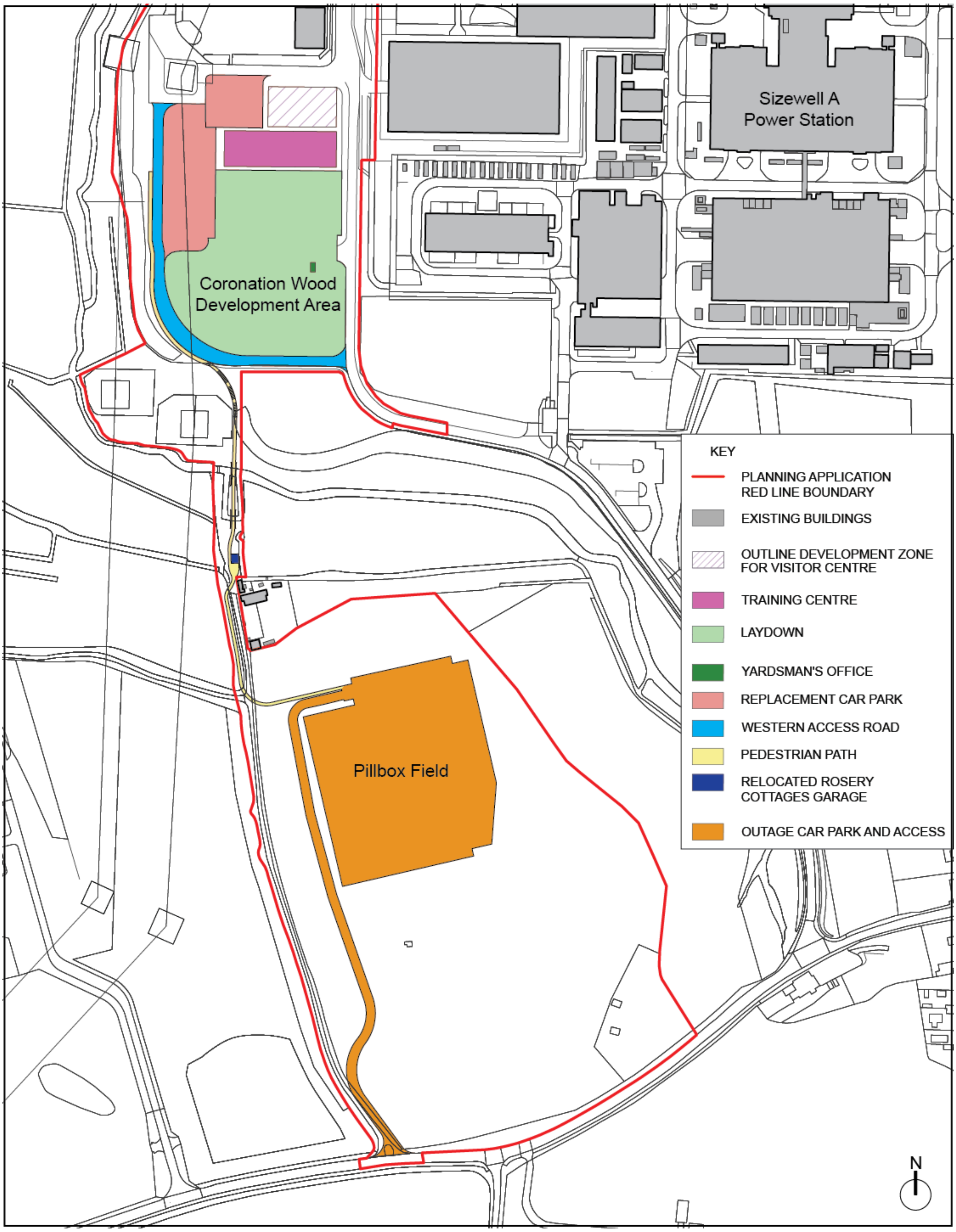


Figure 3-3: Proposed Location of the Pillbox Field Outage Car Park Facility

3.2 Northern (Pumped) Branch and Existing Pumping Station

3.2.1 The Northern branch, illustrated in red in **Figure 3-1** drains areas within the Sizewell B Power Station Perimeter and hardstanding areas outside of the Perimeter, to the west.

3.2.2 Areas shown in amber in **Figure 3-1** are drained via gravity to the existing pumping station and oil separators located to the north of the site. The run-off is pumped up onto the Sizewell B Power Station platform and then conveyed via gravity to the existing surface water outfall to sea.

3.2.3 The area shown in purple in **Figure 3-1** drains via gravity to the northern branch and in turn to the outfall.

3.2.4 Areas shown in green are drained by infiltration, either through designed soakaways or as soft landscaped areas, and do not drain to the existing site drainage network.

3.2.5 Proposals for managing the removal of the pumping station are outlined in Section 8.

4. DESIGN PARAMETERS

4.1.1 Unless noted otherwise the surface water drainage networks for all proposed and relocated facilities will be designed to the following requirements (based on Summer/Winter storm events from 15 minutes to 1440 minute duration).

4.1.2 All return periods will have a climate change allowance applied, in accordance with the Environment Agency Guidance issued February 2016, to allow for anticipated changes in the peak rainfall intensity.

4.1.3 As indicated in **Figure 4-1**, the Sizewell B Power Station site and Pillbox Field Outage Car Park lie outside Flood Zones 2 and 3, and therefore can be considered to exist within Flood Zone 1, equating to land having a less than 1 in 1,000 annual probability of river or sea flooding.

4.1.4 The footpath from the Outage Car Park will cross flood zone 3, however, it will be constructed at ground level. Occasional flooding of the path is considered acceptable due to the infrequency of flood events coexisting with outages and consequent use of the path. Crossings of permanent watercourses will use timber bridges as to not obstruct flood water. A small section of the access road to the Outage Car Park will be situated in flood zone 2, this means the road will be usable without risk of flooding for up to a 1 in 100 year rainfall event. This is deemed suitable due to the combination of low frequency flooding events and use expected for the Outage Car Park.

4.1.5 Any surface flooding under extreme storm conditions will be directed to locations that avoid damage to critical areas, services, structures or buildings. To identify any flood routes a detailed analysis of the digital terrain model needs to be combined with flow path analysis. This is not a requirement at drainage strategy or concept design stage, but it is something we recommend is carried out at the earliest opportunity as the design progresses to identify the location of any sacrificial flood areas.

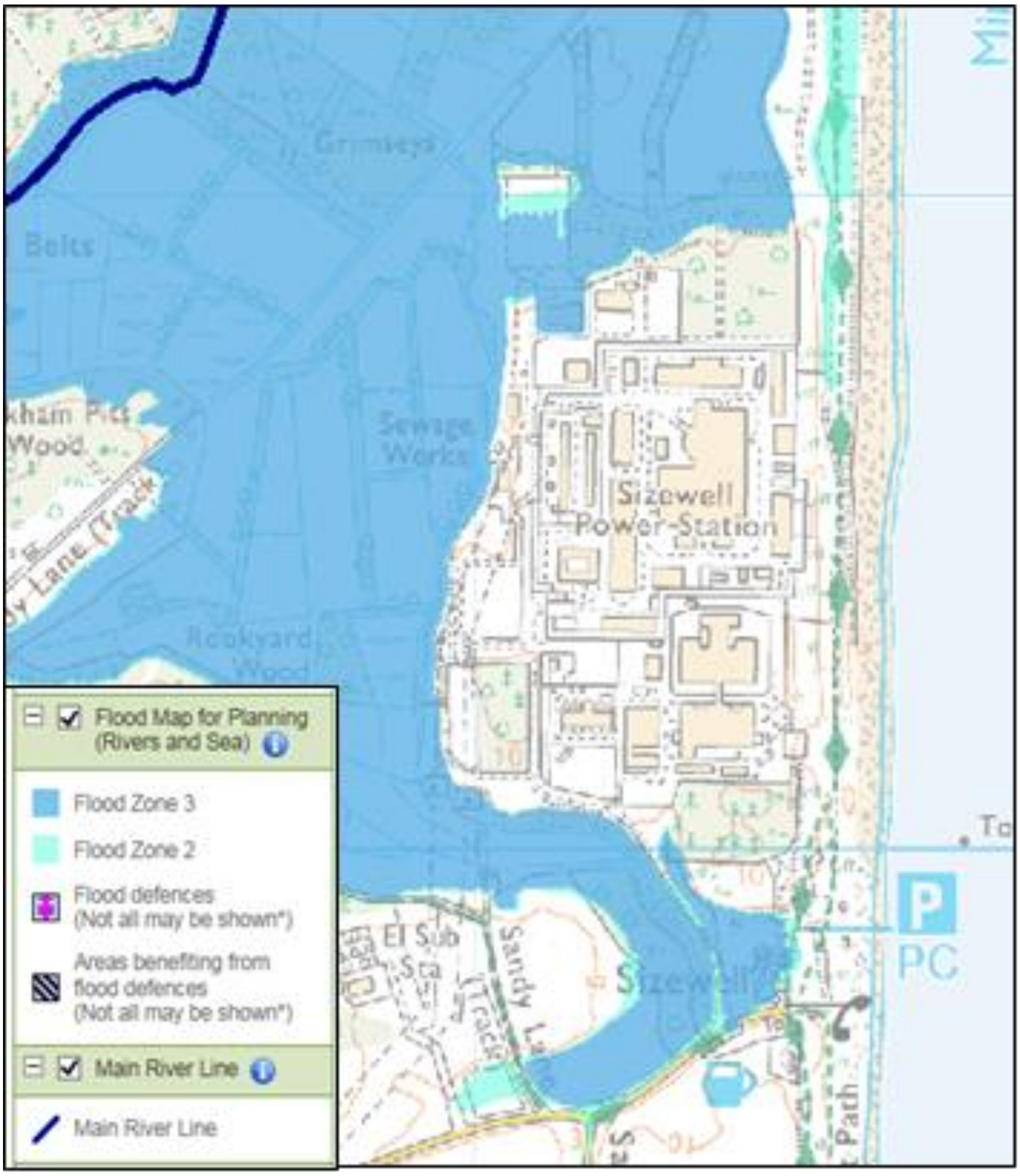


Figure 4-1: Flood Map (Rivers and Sea) [Environment Agency]

4.1.6 In accordance with Environment Agency guidance it is recommended a 10% climate change allowance is accommodated for within the design. This is based on a low flood risk vulnerability classification and total potential change anticipated for the '2050s'.

4.1.7 The climate change recommendations within this Drainage Strategy have not yet changed from those issued by Government at the time the original Drainage Strategy was produced. Climate change guidance is currently under review (UKCP 2018). Careful consideration should be made for any changes to climate change recommendations that could occur prior to the detailed design stage.

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

Figure 4-2: Peak Rainfall Intensity Allowance in small and urban catchments (use 1961 to 1990 baseline) [Environment Agency]

Table 4-1: Surface Water Design Parameters

Return Period (Years)	Drainage Criteria	Description
1	No surcharging above pipe soffits.	The highest probability event to be specifically considered to ensure that flows to the watercourse are tightly controlled for frequent events. This criterion aims to ensure the morphological conditions in the stream remain the same.
30	No surface flooding.	A useful intermediary event for which to assess on-site system performance, because of its relevance for adoptable pipework design (e.g. Sewers for Adoption requirements). Upon any pipes becoming surcharged, surface water will be accommodated within chambers. However it will be ensured that the surface water level within the chambers remains 0.3m below the top of the chamber.
100	Controlled flooding to sacrificial external areas.	Represents the boundary between high and medium risks of fluvial flooding defined in the NPPF. This limit recognises that it is not practicable to fully limit flows for most exceedance events. Overland flow will be managed through existing and proposed surface topography to ensure that flood flows are directed away from critical site infrastructure.
200	Exceedance event (if required).	A useful event to assess/predict where surface water would flow in an exceedance event.

4.1.8 Proposed drainage networks will be designed to accommodate the predicted flows for all rainfall return periods listed above. Further, to ensure self-cleansing of pipes during smaller storms, the minimum pipe velocities will be 1 m/s at full pipe flow.

4.1.9 WinDes 'Microdrainage' 2015 will be used to assist the design of the below ground pipework. Following the Flood Studies Report (FSR) method, using Sizewell, Suffolk as the location, an M5-60 and 'r' ratio of 18.2 mm and 0.4 respectively will be used to predict the various storms in which the drainage infrastructure will be subject to, including varying storm intensities and return periods.

4.1.10 It is also recommended that the Flood Estimation Handbook 13 (FEH13) method is utilised when determining the design hydrology. Since the inception of this Drainage Strategy in 2016 FEH13 hydrology has been introduced more widely into drainage design. The impact of FEH13 in this part of the country is known to create larger storms at longer return periods. The longer return periods (and particularly for checking exceedance events) utilising the FEH13 methods produce higher values in this part of the country. It is therefore recommended that during the detailed design stage the hydrology for both methods are used. FSR predominantly for detailed design and FEH13 for checking for exceedance and identifying flood channel routes.

4.1.11 The long-term use and end-state scenarios of this site indicate a design life of 50-60 years. The types of construction recommended e.g. porous car-parks, infiltration structures etc. normally have a refurbishment requirement of between 20-30 years. As the likely use of these structures is “fairly light” with a lot of roof drainage with sediment traps the refurbishment in this case is likely to be of longer increment than usual. It would therefore seem appropriate that a maintenance and refurbishment requirement is built into the design life profile.

a) Attenuation

4.1.12 As outlined in Section 2, attenuation tanks will not be adopted for facilities within the Sizewell B Station Perimeter, as the run-off will be conveyed directly to the site drainage network and thence to the marine outfall.

4.1.13 Where required, and for facilities outside of the Sizewell B Power Station, a simple model will be used to assess the preliminary attenuation storage and run-off volumes required. The proposal will be designed to cater for the 100 year critical event, with an additional allowance of 25% to allow for this approximation. This is in accordance with CIRIA C753 the SuDS Manual.

4.1.14 The rate of discharge of the urban run-off will be limited, where practicable, to the equivalent Greenfield or Brownfield run-off rate for the site, as appropriate to the current/existing site conditions, via the provision of attenuation storage and/or flow restrictors (such as below ground tanks and hydro-brakes). For Brownfield sites the existing surface water run-off rate will be determined and reduced as far as reasonably practicable to the Greenfield run-off rate. The flow control will constrain the rate of discharge, the attenuation storage will be employed when the rate of inflow from the upstream drainage system is greater than the subgrade infiltration rate or allowable rate of discharge to the downstream drainage network. The attenuation storage will empty once the event has passed.

b) Soakaways

4.1.15 Soakaways will only be adopted for facilities outside of the Sizewell B Station Perimeter and will be designed in accordance with CIRIA SuDS Manual (C753).

4.1.16 A factor of safety will be applied to the observed/assumed infiltration coefficient to reflect the possible reduction to the rate of infiltration over time and to account for any loss of efficiency over the design life of the soakaway, particularly if effective pre-treatment is not included within the design and / or system maintenance is poor.

4.1.17 In accordance with CIRIA C753 the following factors will be used to account for possible loss of infiltration capacity through the design life of the system. The following figures are not based on actual observations of performance loss.

Table 4-2: Factor of Safety for Infiltration Systems

Size of Area to be Drained	No damage or inconvenience	Minor inconvenience (e.g. surface on car parking)	Damage to buildings or structures, or major inconvenience (e.g. flooding of roads)
< 100m2	1.5	2	10
100 – 1000 m2	1.5	3	10
> 1000 m2	1.5	5	10

4.1.18 As outlined in Section 2, soakaways will only be considered for facilities outside of the Sizewell B Station Perimeter. Where a soakaway structure is proposed, a factor of safety dependent upon the consequence of failure, as indicated in **Table 4-2**, will be assessed.

4.1.19 The FoS is applied to the infiltration rate / permeability of the ground, to mimic any potential loss of performance over time. For example, a FoS of 1.5 applied to the assumed and conservative infiltration rate of 1 x 10-5 m/s, results in the following infiltration rate being used in calculations: (1 x 10-5) / 1.5 = 6.7 x 10-6 m/s.

4.1.20 To ensure the system's readiness to deal with a rainfall event, the infiltration rate from the system should be sufficient, so that the storage becomes half-empty within 24 hours. Where practicable, soakaways will be placed to ensure that the seasonally high groundwater table is at least 1m below the base of the soakaway. Infiltration systems will also be installed a minimum of 5m away from any foundations, including basements.

4.1.21 When designing permeable paving systems a global FoS of 10 will be applied to the assumed infiltration rate in accordance with CIRIA C753 The SuDS manual and industry best practice.

4.1.22 The boreholes carried out during a soil investigation in 2016 did not encounter ground water at shallow depths. Therefore, despite the fact that groundwater has a tendency to vary when in close proximity to the sea, the expected groundwater level is sufficiently deep that it would appear not to present any impediment to infiltration techniques.

4.2 Overarching Assumptions

- A conservative infiltration rate of 1 x 10^{-5} m/s has been assumed in determining soakaway volumes. This has been based on values from working knowledge of the Sizewell B Power Station. The infiltration rate requires qualification prior to progression of the design through facility specific on-site infiltration testing.
- The groundwater level has been assumed to be at +1.0m AOD based on existing site knowledge. It is recommended that checks are also made against the

proposed Sizewell C Power Station geotechnical data and the groundwater model. The widespread use of soakaways and infiltration techniques can only be effective if there is clearance from groundwater level below which it is assumed that strata is saturated.

- Through recent site knowledge from construction of the Dry Store, it has been assumed that the contamination levels on site are such that surface water is allowed to infiltrate into the surrounding ground.
- It has been assumed that surface water run-off from relocated facilities within the Sizewell B Station Perimeter can be discharged into the existing site wide drainage network, provided that the total additional run-off is less than the amount previously removed from the southern branch as a result of the Dry Store Project (approximately 0.715ha). Connections will also be made at appropriate locations, i.e. downstream of any previous run-off removal. Further information associated with the assumption has been listed in Section 3.1.

5. CONSIDERATION OF SIZEWELL B RELOCATED FACILITIES END STATES

5.1.1 The Planning Application seeks consent to a scheme which comprises the relocation of existing facilities and functions. Where an existing facility is to be relocated, then the scheme includes for the demolition or removal of the existing facility which is rendered redundant by the scheme. The space occupied by the redundant asset will be landscaped to reflect the surroundings as part of the scheme.

5.1.2 The phasing of the development, and timescales for removal of assets which are rendered redundant by the development, has not been fully determined. Where a facility is to be removed under this scheme, then it will be returned to the end-state within 5 years of the transfer of function to the new asset which replaces it.

5.1.3 In the event that Sizewell C Power Station is not developed, or that individual new Sizewell B Relocated Facilities are not developed, then existing facilities whose re-provision or relocation has not commenced will remain as existing. The following paragraphs provide further clarity on the proposals for individual assets or asset groups in the event that a decision is taken not to progress the development of Sizewell C prior to the completion of work on the asset or asset group:

- Outage Car Parking

  Work on the Pillbox Field site would be ceased. Areas disturbed by aborted work would be reinstated to soft landscape.

- Visitor Centre

  The Sizewell B Visitor Centre would remain in its temporary location within the Technical Training Building. The area allocated for a new Visitor Centre within Coronation Wood would be utilised for parking and allocated as a ‘future development site’ for a new Sizewell B Visitor Centre when funding is available. A new design would be required for this and submitted to the planning authority.

- Northern Compound

  If a decision not to progress Sizewell C were taken prior to tree removal at Coronation Wood, the development of this area to form car parking and laydown under this Planning Application would be aborted. If such a decision were taken after tree removal had begun, EDF Energy (NGL) would continue to develop the site for Laydown use and restore the existing Northern Compound to landscape.

6. FACILITIES WITHIN THE SIZEWELL B STATION PERIMETER

6.1.1 Due to the congested nature of below ground utilities within the Sizewell B Station Perimeter and in accordance with a requirement from Sizewell Station, refer to Section 1, the implementation of large SuDS features, in particular soakaway systems, has been deemed impracticable. Where this decision has been made, due justification in accordance with the surface water drainage hierarchy outlined in Section 2 has been given.

6.1 Proposed Outage Store (SOS)

6.1.1 The proposed drainage strategy for this facility is to collect run-off at roof level and convey the water directly into the existing site wide drainage network, as shown in **Figure 6-1**. The routes for below-ground drainage pipes shown below are indicative only and are subject to change during detailed design.

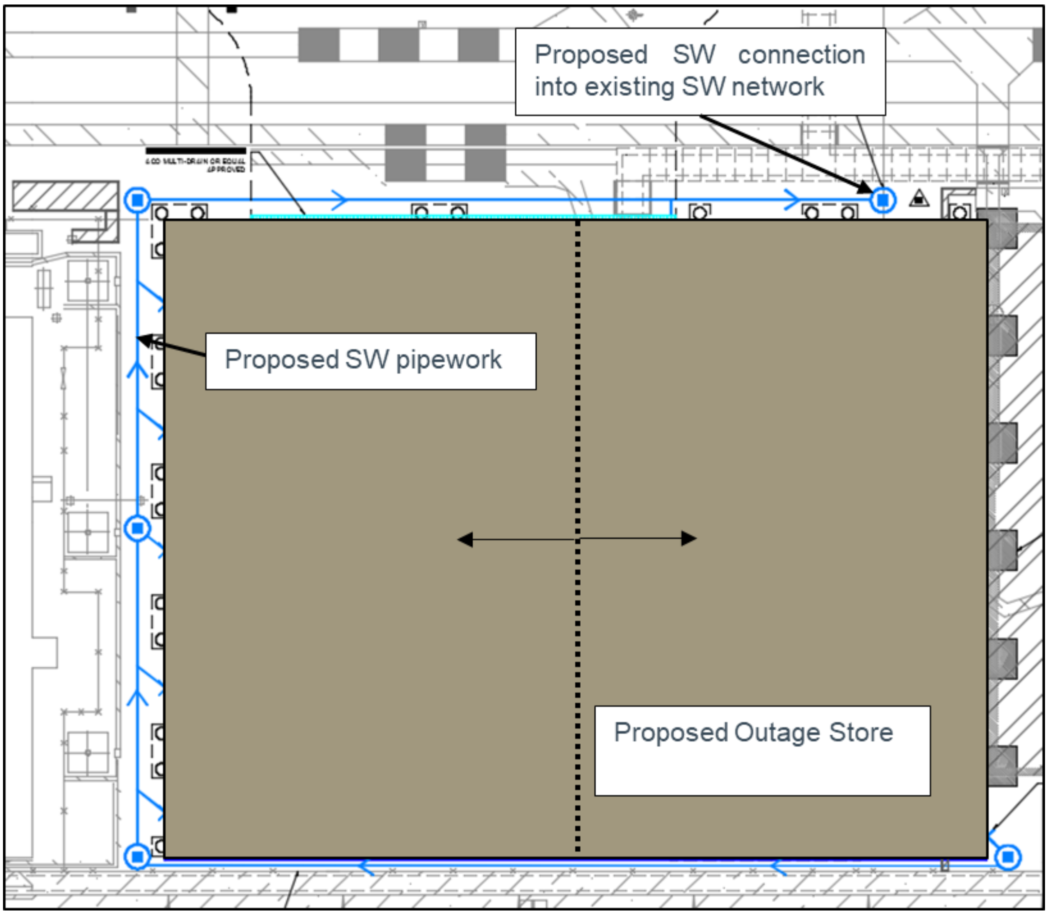


Figure 6-1: Proposed Outage Store Drainage Schematic

a) Surface Water Drainage Hierarchy

Table 6-1: Proposed Outage Store Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	Due the low occupancy of this building, in addition to the congested nature of utilities at and around the proposed building, rainwater harvesting has been deemed impracticable.
2. Infiltration	X	Due to the volume of below ground utilities infiltration is deemed impracticable. The development will not increase the amount of impermeable surfacing and therefore infiltration is not necessary.
3. Attenuation (ponds, swales)	X	Due to the lack of space at and around this facility green attenuation features will not be considered.
4. Attenuation (tanks)	X	As point 2. Due to the volume of below ground utilities and no alteration to the permeable-impermeable land balance, attenuation is deemed impracticable.
5. Discharge – watercourse	X	Discounted - no nearby watercourses.
6. Discharge – SW drain	✓	Surface water currently drains into the site wide surface water network via below ground pipework. The proposed facility does not alter the pre and post development drainage characteristics and so conveyance of SW run-off is proposed via below ground pipework connecting into the existing site wide drainage network (Refer to **Figure 6-1**).
7. Discharge – Combined drain	X	Discounted - there are no known combined drains in the vicinity.

b) Surface Water Drainage Design

6.1.2 The Proposed Outage Store involves the development of a new facility in the location of an existing building. The proposed facility will be located on impermeable land. The development will not result in an increase in impermeable surfacing, and therefore will not alter the balance between permeable and impermeable land.

6.1.3 The surface water will be drained from the roof via downpipes. Several downpipes are proposed along the western edge of the facility due to availability of below ground space for pipework. Runoff associated with the eastern portion of the roof will be collected via traditional guttering and conveyed to the north east of the facility via above ground pipework, due to the close proximity of the neighbouring existing building and a lack of available below ground space for pipework.

6.1.4 Channel drains may need to be incorporated in order to drain the surface water away from the facilities foundations. Trapped outfalls and catchpits will be proposed to reduce any floating debris or silt.

6.1.5 Due to the congested nature of below ground utilities at the proposed location of the Proposed Outage Store and in accordance with a requirement from the Sizewell B Power Station, refer to Section 1, it is deemed impracticable to incorporate Sustainable Drainage Systems (SuDS) features such as swales and ponds.

6.1.6 The drainage design will require the surface water to be transported via below ground pipework to the existing sewer network, through a connection with a nearby surface water manhole/chamber.

c) Assumptions

- The development of the Proposed Outage Store facility does not alter the balance between permeable and impermeable land, and therefore does not impose additional surface water loading on the existing site drainage system. Therefore, the existing surface water network in the vicinity of the Proposed Outage Store is adequately sized for the development. This could be validated via assessment of the existing drainage network.

d) Constraints

- Underground utilities within the vicinity of the Proposed Outage Store are congested, therefore consideration will be made when locating below ground surface water drainage infrastructure.

6.2 Outline Development Zone

6.2.1 Offices, Canteen and Welfare Facilities within the station form part of the Outline Development Zone. This zone is illustrated in **Figure 6-2**.

6.2.2 Facilities within the Outline Development Zone are being submitted for Outline Planning approval, and include a minimum level of detail on:

- what the buildings will be used for
- minimum and maximum building sizes
- where entrances to the site will be.

6.2.3 Facilities within the Outline Development Zone will follow the overarching drainage principles and strategy defined in Section 2.

6.2.4 These principles being “drainage direct to existing site piped networks, with exceedance flows addressed through overland flow.”

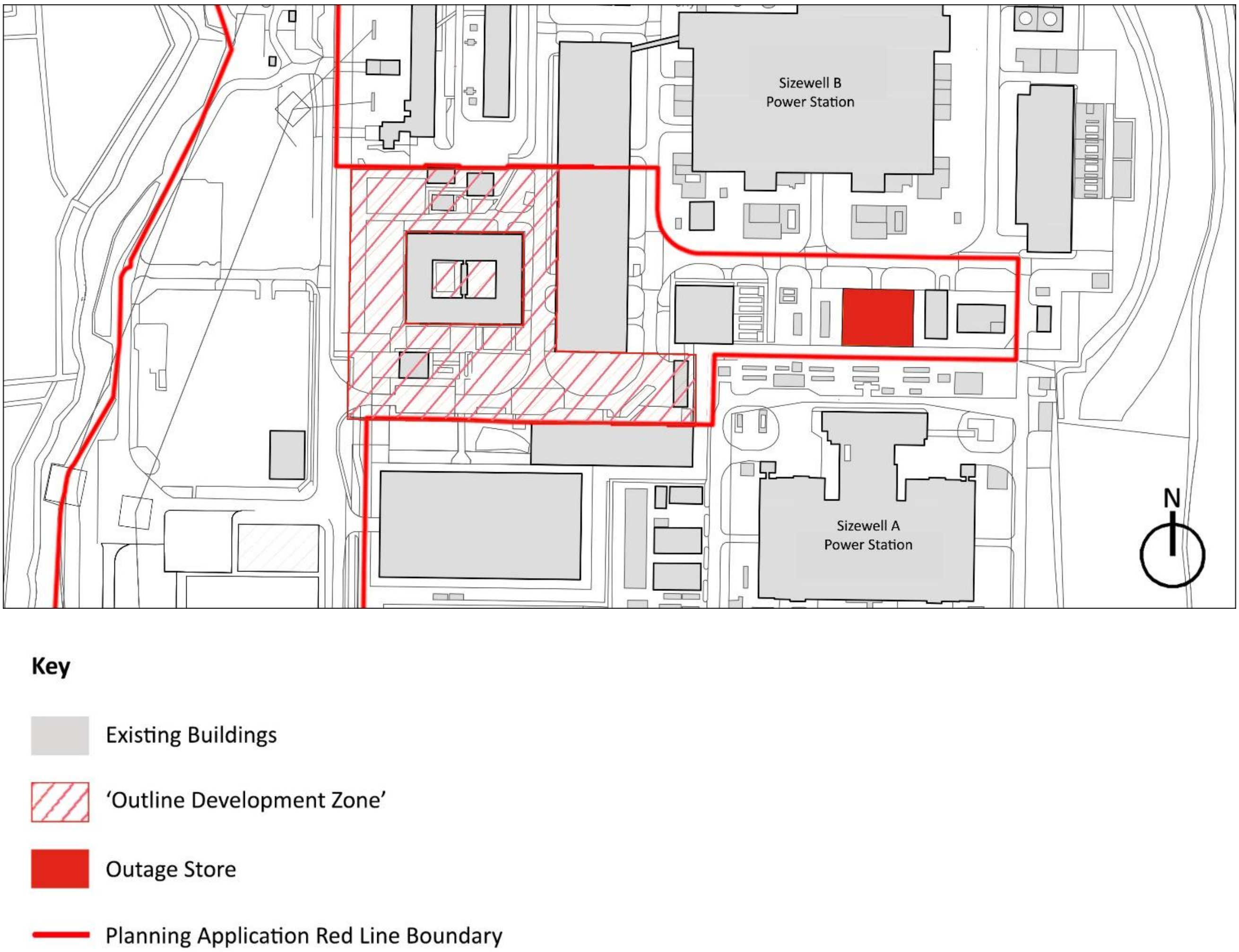


Figure 6-2: Development Areas within the Sizewell B Power Station Security Perimeter

7. FACILITIES OUTSIDE THE SIZEWELL B STATION SECURITY PERIMETER

7.1.1 This Section outlines the specific drainage strategies to be applied to proposed facilities outside of the main Sizewell B Power Station site perimeter.

7.1.2 In general there is greater scope to implement sustainable drainage (SuDS) features, such as swales and soakaways. Discharge of direct run-off to the Sizewell Drain watercourses, other than in exceedance rainfall events, will be avoided. A reasoned justification has been given where the drainage strategy differs from this stance.

7.1 Area Immediately West of Sizewell B Power Station

7.1.1 The existing western operational car park will be supplemented by additional car park spaces located at the site of the current SZA reservoirs, as illustrated in **Figure 3-3**.

7.1.2 A relocated Outage Car Park will be provided at Pillbox Field, as also illustrated in **Figure 3-3**.

7.1.3 The sites for the proposed car parking facilities both currently comprise permeable surfaces and so any development at these sites has the potential to alter the existing drainage characteristics.

7.1.4 The following sections outline the drainage strategy to be adopted for these two sites to ensure the change in drainage characteristics is managed effectively.

a) Proposed Replacement Car Park and Laydown

7.1.5 An at-grade car parking facility and laydown area are proposed to be located at a site which currently contains the redundant Sizewell A reservoir tanks (2no.), soft landscaping and Coronation Wood.

7.1.6 The proposed drainage strategy for these facilities is to drain the surface water run-off through infiltration techniques, such as heavy duty permeable block paving and/or catchpit soakaways. This philosophy will ensure no additional impervious areas are added to the existing side wide drainage network.

7.1.7 Prior to construction of the proposed facility, the Sizewell A reservoir tanks, soft landscaping and woodland will be suitably demolished/removed and earthworks will be performed to attain an adequate foundation layer.

7.1.8 Where a below ground soakaway is required, the most appropriate location would be within the vicinity of the existing Sizewell A reservoir tanks, due to the extent of earthworks that will be undertaken. In addition, this area would likely only be subject to typical car park loading instead of heavy, localised laydown loads. This is not proposed at this stage

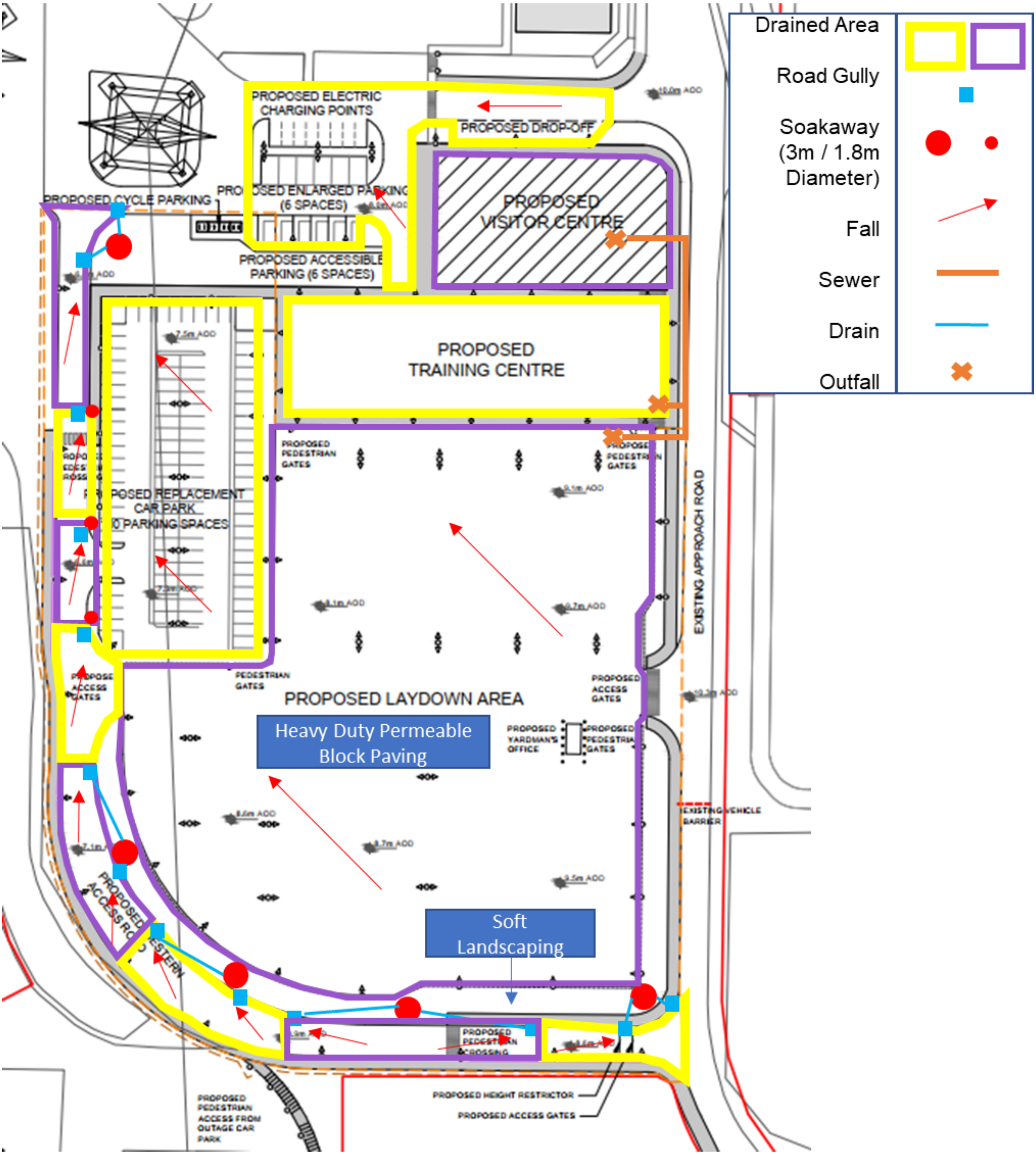


Figure 7-1: Car Park and Laydown Area Proposed Drainage Strategy Schematic

i. Surface Water Drainage Hierarchy

Table 7-1: Proposed Car Park and Laydown Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Permeable paving is proposed to enable surface water to infiltrate directly into the ground. The run-off from the car park and laydown area could be conveyed via channel drainage and below ground pipework to soakaway chambers located adjacent to the proposed car park. Oil / hydrocarbon / silt interception systems (I.e. permeable paving or formal oil separator) will be in place due to the close proximity of a SSSI.
3. Attenuation (ponds, swales)	✓ (see detail)	Swales, or similar features, could be incorporated along the western boundary of the car park and laydown area within the soft landscaping (as shown in **Figure 7-1**), to provide support drainage for overflows. These can be used to collect, convey, infiltrate or attenuate run-off. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
4. Attenuation (tanks)	✓ (see detail)	Whilst a below ground attenuation tank with a volume of approximately 1600m^3 would be required to attenuate run-off and discharge into the site drainage network at 1 l/s. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse	X	A SSSI runs close to the western site boundary, therefore direct discharge into any watercourses is deemed un-desirable, due to strict restrictions on the water quality of the run-off discharging into it. If soakaways are deemed unviable following detailed calculations, the surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of hydrocarbons. This is not a desired solution.
6. Discharge – SW drain	X (see detail)	If soakaways are not viable, then attenuation and discharge into the existing SW drainage network will be progressed. An existing SW chamber is located to the north of proposed facility.
7. Discharge – Combined drain	X	Discounted - there are no known combined drains in the vicinity.

ii. Surface Water Drainage Design

7.1.9 The at-grade Proposed Car Park and laydown area are proposed to be situated at the current location of the Sizewell A reservoir tanks and Coronation Wood, in close proximity to a SSSI along the western boundary.

7.1.10 The proposed location of the car park and laydown area currently consists of permeable soft landscaped surfacing, together with derelict underground concrete structures and pipework at the proposed site of the north-west portion of the car park.

7.1.11 The underground infrastructure, soft landscaping and woodland will be demolished/cleared/removed and suitable measures will be employed to provide a suitable foundation layer on which the surface car park and laydown area will be situated.

7.1.12 Infiltration techniques will be employed, such that the development will not alter the amount of impermeable area contributing to the site surface water drainage network.

7.1.13 The laydown area will provide storage of predominantly dry goods, such as scaffolding components.

7.1.14 A permeable paving solution, using heavy duty concrete blocks will be employed for the car park and laydown surface, enabling the surface water to directly infiltrate into the underlying ground emulating the current drainage characteristics, whilst providing suitable treatment of any incidental oil spills.

7.1.15 There will be a small Yardsman's office located within the laydown area. Run-off from the roof of the yard office will be incorporated within the permeable pavement sub-base.

7.1.16 Where reasonably practicable the run-off conveyed from the roof of the Proposed Training Centre and Proposed Visitor Centre will also be incorporated within the permeable pavement sub-base.

7.1.17 A typical arrangement for discharging run-off into the permeable paving sub-base is illustrated in **Figure 7-2**. This image should be read as indicative of the typical features of such a system, and is not to scale nor tailored to reflect building-specific features such as internal downpipes.

7.1.18 It is recommended that additional trial pit and infiltration testing is carried out at the sites where infiltration structures are proposed. This is something that should be carried out before the detailed design of drainage commences.

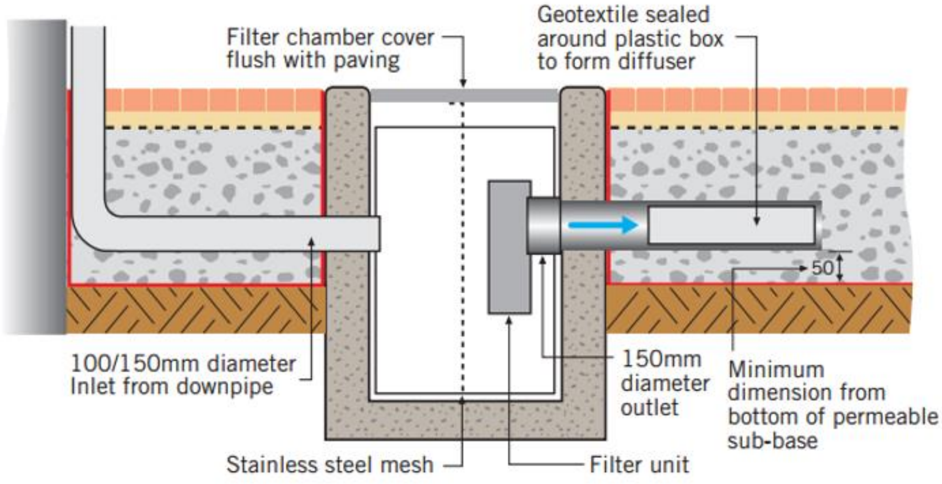


Figure 7-2:Discharge into Permeable Paving Sub Base

7.1.19 The discharge chambers will be located a minimum distance of 5m away from the Proposed Training Centre foundations. The 5m exclusion zone surrounding the Proposed Training Centre facility is illustrated in **Figure 7-3**.

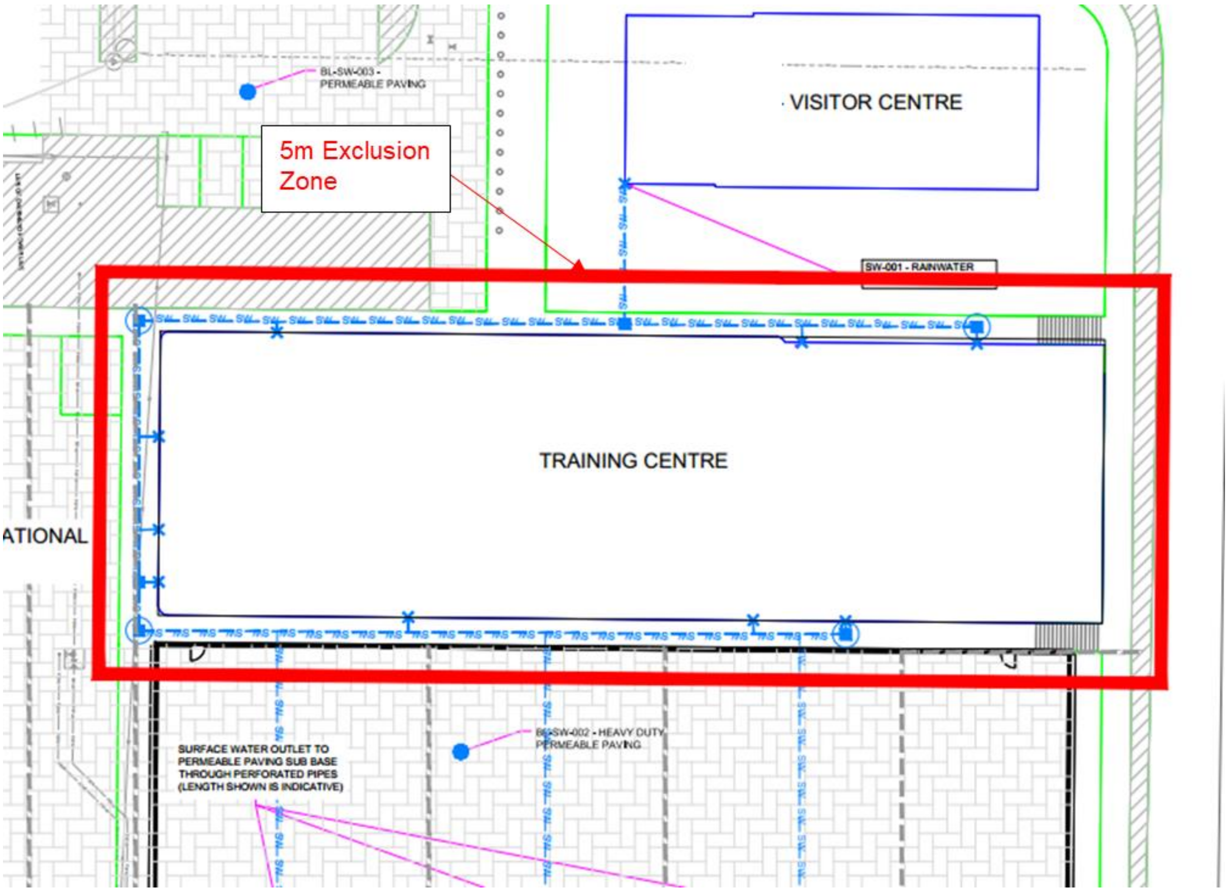


Figure 7-3:Infiltration Systems 5m Exclusion Zone

7.1.20 The interception storage required to capture the first 5mm of every storm is approximately 65m3. This can be adequately intercepted and captured within the permeable paving and soakaways.

iii. Assumptions

- It is assumed that sufficient inspection and maintenance will be undertaken during the life of the car park and laydown facilities to ensure the condition of the permeable pavements and/or other drainage or SuDS features remain at an adequate level. An allowance for maintenance and minor refurbishment should be programmed within the detailed design stage.

iv. Constraints

- A SSSI runs adjacent to the western perimeter of the main site and therefore direct and uncontrollable discharge of surface water into the nearby watercourses prior to adequate water quality controls has been deemed un-desirable.
- If surface water is proposed to infiltrate adjacent to existing watercourses, it will be ensured that the discharging surface water quality will be at least to the same levels as the existing receiving infiltrating water by incorporating suitable water quality control measures, such as swales, permeable paving, filter drains etc.
- The SZA reservoirs currently consist of redundant underground concrete structures. It is perceived that this infrastructure will be removed or reduced to the extent whereby infiltration techniques can be employed whilst ensuring a pollutant pathway into the SSSI is not created.

b) Western Access Road

7.1.21 The proposed drainage strategy for the Western Access Road is to drain the surface water run-off through infiltration techniques. This will be achieved by directing the road surface run-off into suitably located gullies, which will subsequently convey the surface water into soakaway chambers as illustrated in **Figure 7-1**. This will ensure no additional impervious areas are added to the existing side wide drainage network.

i. Surface Water Drainage Hierarchy

Table 7-2: Western Access Road Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Surface water will infiltrate into the ground via below ground soakaways. The run-off from the access road surface will be conveyed via road gullies and below ground pipework to soakaway chambers located alongside the proposed access road. Oil / hydrocarbon / silt interception systems (I.e. SuDS treatment or formal oil separator) will be in place due to the close proximity of a SSSI.
3. Attenuation (ponds, swales)	✓ (see detail)	Swales etc. could be incorporated along the eastern boundary of the access road within the soft landscaping (as shown in **Figure 7-1**) to provide support drainage for overflows. These can be used to collect, convey, infiltrate or

Drainage Principle	Feasibility	Reason
		attenuate run-off. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
4. Attenuation (tanks)	✓ (see detail)	A below ground attenuation tank with a volume of approximately 170m^3 would be required to attenuate run-off and discharge into the site drainage network at 1 l/s. These however will not be adopted as conventional infiltration is expected to provide an adequate solution.
5. Discharge – watercourse	X	A SSSI runs close to the western site boundary, therefore direct discharge into any watercourses is deemed un-desirable, due to strict restrictions on the water quality of the run-off discharging into it. If soakaways are deemed unviable following detailed calculations, the surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of hydrocarbons. This is not a desired solution.
6. Discharge – SW drain	X (see detail)	If soakaways are not viable, then attenuation and discharge into the existing SW drainage network will be progressed. An existing SW chamber is located to the north of proposed western access road
7. Discharge – Combined drain	X	Discounted - there are no known combined drains in the vicinity.

ii. Surface Water Drainage Design

7.1.22 The proposed location of the Western Access Road currently consists of permeable soft landscaped surfacing, in close proximity to a SSSI along the western boundary.

7.1.23 Infiltration techniques will be employed, such that the new development will not alter the amount of impermeable area contributing to the site surface water drainage network or nearby watercourses. It is recommended that additional trial pit and infiltration testing is carried out at the sites where infiltration structures will be sited. This is something that should be carried out before detailed design of drainage commences.

7.1.24 It is anticipated that the proposed access road will be subject to substantial traffic loading (weight and frequency). Therefore, an impermeable paving solution, such as asphaltic surfacing, will be employed for the western access road surface.

7.1.25 The surface water associated with the impermeable road surface will be directed to strategically located road gullies, through the adoption of appropriate surface gradients. The surface water run-off will then be conveyed via below ground pipework into soakaway chambers located along the proposed road, therefore enabling the surface water to infiltrate into the underlying ground, emulating the current drainage characteristics.

7.1.26 The interception storage required to capture the first 5mm of every storm is approximately 10m^3. This can be adequately intercepted and captured within the soakaway chambers.

iii. Assumptions

- It is assumed that sufficient inspection and maintenance will be undertaken during the life of the western access road to ensure the condition of the soakaways and/or other drainage or SuDS features remain at an adequate level. An allowance for maintenance and minor refurbishment should be programmed within the detailed design stage.

iv. Constraints

- A SSSI runs adjacent to the western perimeter of the main site and therefore direct and uncontrollable discharge of surface water into the nearby watercourses prior to adequate water quality controls must be avoided.
- If surface water is proposed to infiltrate adjacent to existing watercourses, it will be ensured that the discharging surface water quality will be at least to the same levels as the existing receiving infiltrating water by incorporating suitable water quality control measures, such as soakaways, swales, filter drains etc.

c) Proposed Training Centre

7.1.27 The proposed drainage strategy for Proposed Training Centre is to convey run-off from roofed and surrounding impermeable areas into either soakaway chambers or into the permeable paving proposed for the car park and laydown area, as illustrated in **Figure 7-1**.

7.1.28 The overarching strategy for the surface water run-off associated with the Training Centre is infiltration.

7.1.29 The exact size, location and coordination with below ground utilities will be undertaken at the next stage of the design.

i. Surface Water Drainage Hierarchy

Table 7-3: New Training Centre Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	The Facility's roof structure, size and occupancy suit the use and implementation of rainwater harvesting. However, due to a lack of space at and around this plot rainwater harvesting is not proposed at this stage of design.
2. Infiltration	✓	Run-off will be disposed of by infiltration, either through the use of permeable paving or by using discrete soakaway chambers. Adequate oil/hydrocarbon/silt treatment will occur prior to infiltration due the close proximity of a SSSI.
3. Attenuation (ponds, swales)	X	Where practicable green attenuation features, such as swales and ditches, are proposed to collect, convey and

Drainage Principle	Feasibility	Reason
		infiltrate run-off. Due to the lack of space at and around this facility green attenuation features will not be considered.
4. Attenuation (tanks)	X	A below ground attenuation tank volume of 140 m^3 would be required to attenuate run-off and discharge at 1 l/s. Not proposed at this stage.
5. Discharge – watercourse	X	A SSSI runs along the western site boundary, therefore direct discharge into any watercourses is deemed un-desirable, due to strict restrictions on the water quality of the run-off discharging into it. If soakaways are deemed unviable following detailed calculations, the surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of hydrocarbons.
6. Discharge – SW drain	X	Connection into the existing SW drainage network will be a last resort.
7. Discharge – Combined drain	X	Not proposed at this stage.

ii. Surface Water Drainage Design

7.1.30 The proposed site of the Proposed Training Centre currently consists of a soft landscaping and trees and therefore, following their removal and the construction of the Proposed Training Centre, will alter the balance between permeable and impermeable land.

7.1.31 The proposed drainage system will emulate the current Greenfield run-off characteristics, such that the existing drainage network is not subjected to additional loading.

7.1.32 The surface water will be drained from the Proposed Training Centre roof via rainwater downpipes. Channel drains and/or filter drains will be used to drain any surface water away from the facilities foundations.

7.1.33 The surface water run-off will then be conveyed via new below ground pipework into the Proposed Car Park and Laydown Area permeable paving or into soakaway chambers.

7.1.34 Permeable paving is proposed around the vicinity of the Proposed Training Centre to emulate pre-development drainage characteristics. This permeable paving will also provide the required interception storage.

7.1.35 It is recommended that additional trial pit and infiltration testing is carried out at the sites where infiltration structures will be sited. This is something that should be carried out before detailed design of drainage commences.

iii. Assumptions

- Sufficient inspection and maintenance will be undertaken during the life of the Proposed Training Centre to ensure the condition of the permeable pavements and/or other drainage or SuDS features remain at an adequate level. An allowance for maintenance and minor refurbishment should be programmed within the detailed design stage.

iv. Constraints

- An SSSI runs adjacent to the western perimeter of the main site and therefore direct and uncontrollable discharge of surface water into the nearby watercourses prior to adequate water quality controls has been deemed un-desirable.
- If surface water is proposed to infiltrate adjacent to existing watercourses, it will be ensured that the discharging surface water quality will be at least to the same levels as the existing receiving infiltrating water by incorporating water quality controls, such as filtration through permeable paving.

d) Proposed Visitor Centre (Outline Planning)

7.1.36 The Proposed Visitor Centre, part of the Outline Planning Application, will follow the same drainage strategy as the Proposed Training Centre. The overarching strategy for the surface water run-off associated with the Proposed Visitor Centre is infiltration.

7.1.37 The proposed drainage strategy is to convey run-off from roofed and surrounding impermeable areas into either the permeable paving proposed for the car park and laydown area or into a discrete soakaway chambers located alongside the Proposed Car Park as illustrated in **Figure 7-1**.

7.2 Temporary Visitor Centre

7.2.1 A temporary visitor centre is proposed to the north of the site. This facility comprises a refurbishment of the existing visitor centre.

7.2.2 As a result, the drainage characteristics at this location will not be altered. The drainage strategy for the Temporary Visitor Centre is to follow the current drainage principles.

7.3 Pillbox Field

7.3.1 Currently Pillbox Field drains by infiltration and by overland flow to the Sizewell Drains (ditches), located to the north and east of the field, as illustrated in **Figure 7-4**.

7.3.2 As a result, any proposed development at Pillbox Field may alter the drainage characteristics of the field. The proposed design will maintain the infiltration drainage characteristics of the field but may change the overland flow paths for extreme rainfall events as a result of a relatively wide and flat car park surface altering the field profile.

Figure 7-4:Pillbox Field Existing Drainage Plan

b) Outage Car Park (OUC)

7.3.3 The drainage strategy for the proposed Outage Car Park at Pill Box Field is to drain the surface water using infiltration techniques, such as porous surfacing as illustrated in **Figure 7-5**.

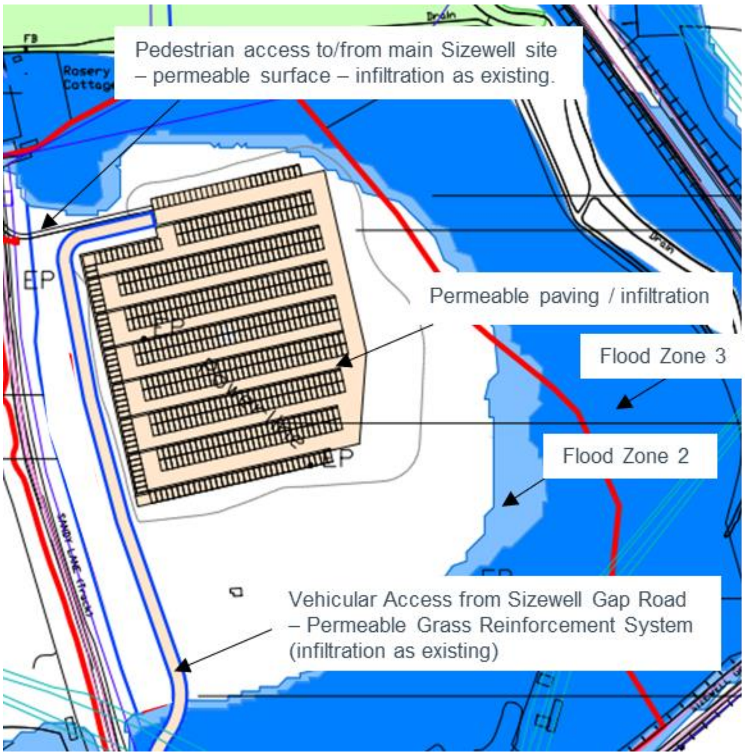


Figure 7-5:Pillbox Field Outage Car Park Surface Water Drainage Strategy Schematic

i. Surface Water Drainage Hierarchy

Table 7-4: Pillbox Field Car Park Surface Water Drainage Hierarchy

Design Principle	Feasibility	Reason
1. Rainwater Harvesting	X	No permanent occupancy therefore deemed to be not viable.
2. Infiltration	✓	Permeable paving is proposed to enable surface water to infiltrate directly into the ground, or via a below ground soakaway. The run-off from the car park surface could be conveyed via channel drainage and below ground pipework to a soakaway located below the proposed car park. The predicted soakaway storage volume is approximately 1215m^3, based on the assumed infiltration rate (Section 4.2). Oil / hydrocarbon / silt interception systems (I.e. permeable paving or formal oil separator) will be required.
3. Attenuation (ponds, swales)	X (see detail)	Swales etc. could be incorporated along the boundary of the car park to provide support drainage for overflows. These can be used to collect, convey, infiltrate or attenuate run-off.
4. Attenuation (tanks)	X (see detail)	A below ground attenuation tank with a volume of approximately 1750m^3 would be required to attenuate run-off and discharge into the nearest drainage network at 1 l/s. Due to the complexities of connecting an outflow into an existing SW network (there are no nearby SW networks) this option will not be proposed at this stage.
5. Discharge – watercourse	X	A SSSI runs close to the northern and eastern site boundary, therefore discharge into any watercourses is deemed un-desirable, due to strict restrictions on the water quality of the run-off discharging into it. If soakaways are deemed unviable following detailed calculations, the surface water may be indirectly discharged into the surrounding watercourses following appropriate measures to account for the volume of surface water and the presence of hydrocarbons. This is not a desired solution.
6. Discharge – SW drain	X	Due to the complexities of connecting an outflow into an existing SW network (there are no nearby SW networks) this option will not be proposed at this stage.
7. Discharge – Combined drain	X	Discounted - there are no known combined drains in the vicinity.

ii. Surface Water Drainage Design

7.3.4 The Outage Car Park proposed to be located within Pillbox Field involves the development of an at-grade car park with an associated access road.

7.3.5 Due to the remoteness of the location, the surface water drainage is proposed to be managed on-site without connecting to existing drainage networks or watercourses.

7.3.6 Greenfield run-off characteristics will be replicated.

7.3.7 Permeable surfacing, is proposed, enabling the surface water to directly infiltrate into the underlying ground, whilst providing suitable treatment of any incidental oil spills when in use as an Outage Car Park.

7.3.8 The pedestrian access path and the majority of the vehicular access road serving Outage Car Park, is proposed to comprise a permeable surface, employing infiltration techniques to drain the surface water drainage and mimicking pre-development drainage characteristics.

7.3.9 The existing junction at Sandy Lane / Sizewell Gap will be re-surfaced using traditional asphaltic surfacing. The proposed topography will direct surface water runoff away from the main highway and into local infiltration ditches, thus maintaining pre-development drainage characteristics.

7.3.10 The interception storage required to capture the first 5mm of every storm is approximately 70 m^3. This can be adequately intercepted and captured within the permeable paving.

7.3.11 It is recommended that additional trial pit and infiltration testing is carried out at the sites where infiltration structures will be sited. This is something that should be carried out before detailed design of drainage commences.

iii. Assumptions

- It is assumed that sufficient inspection and maintenance will be undertaken during the life of the car park facility to ensure the condition of the permeable pavements and/or other drainage or SuDS features remain at an adequate level. An allowance for maintenance and minor refurbishment should be programmed within the detailed design stage.

iv. Constraints

- There is a SSSI to the north and west of the proposed Outage Car Park, and the proposed pedestrian footpath's alignment takes it into the SSSI near Rosery Cottages. Direct and uncontrollable discharge of surface water from the Outage Car Park into the SSSI and nearby watercourses prior to adequate water quality controls must be avoided.
- If surface water is proposed to infiltrate adjacent to existing watercourses, it will be ensured that the discharging surface water quality will be at least to the same levels as the existing receiving infiltrating water by incorporating suitable water quality control measures, such as swales, permeable paving, filter drains etc.

8. DECOMMISSIONING OF PUMPING STATION

8.1.1 As part of the wider masterplan for the Sizewell site, a number of existing facilities, located to the north of the red boundary line shown in **Figure 8-1** will eventually be replaced by Sizewell C Power Station facilities. This will include the decommissioning of the existing pumping station which forms part of the northern branch of the existing surface water drainage network, resulting in a discontinuity in the surface water drainage network.

8.1.2 Areas shown in green on **Figure 8-1** would be unaffected by the removal of the pumping station, as they currently drain by infiltration and do not contribute to the pump station flow. During an exceedance event, the run-off from these areas will flow away from the main site areas and towards the drainage ditches to the west of the main site boundary. No change is therefore proposed in respect of the green areas.

8.1.3 The areas shown in amber **Figure 8-1** currently drain by gravity to the pumping station, which then pumps flow towards the outfall. Flows from these areas must be addressed prior to decommissioning the pumping station.

8.1.4 As part of the Sizewell C Power Station development, Areas 4, 5, 6 and 7, as shown in **Figure 8-1**, are expected to be developed from their current state, or returned to soft landscaping. These areas are therefore excluded from long-term consideration in the pumping station decommissioning. Until these areas are transformed to soft, permeable, surfaces, or altered within the Sizewell C development, they will continue to drain via the pumping station. Pumping facilities, using either the existing pumping station or a temporary replacement, will be required to cover the period until these areas are transformed.

8.1.5 The remaining areas 1, 2 and 3 will require alternative long-term drainage solutions.

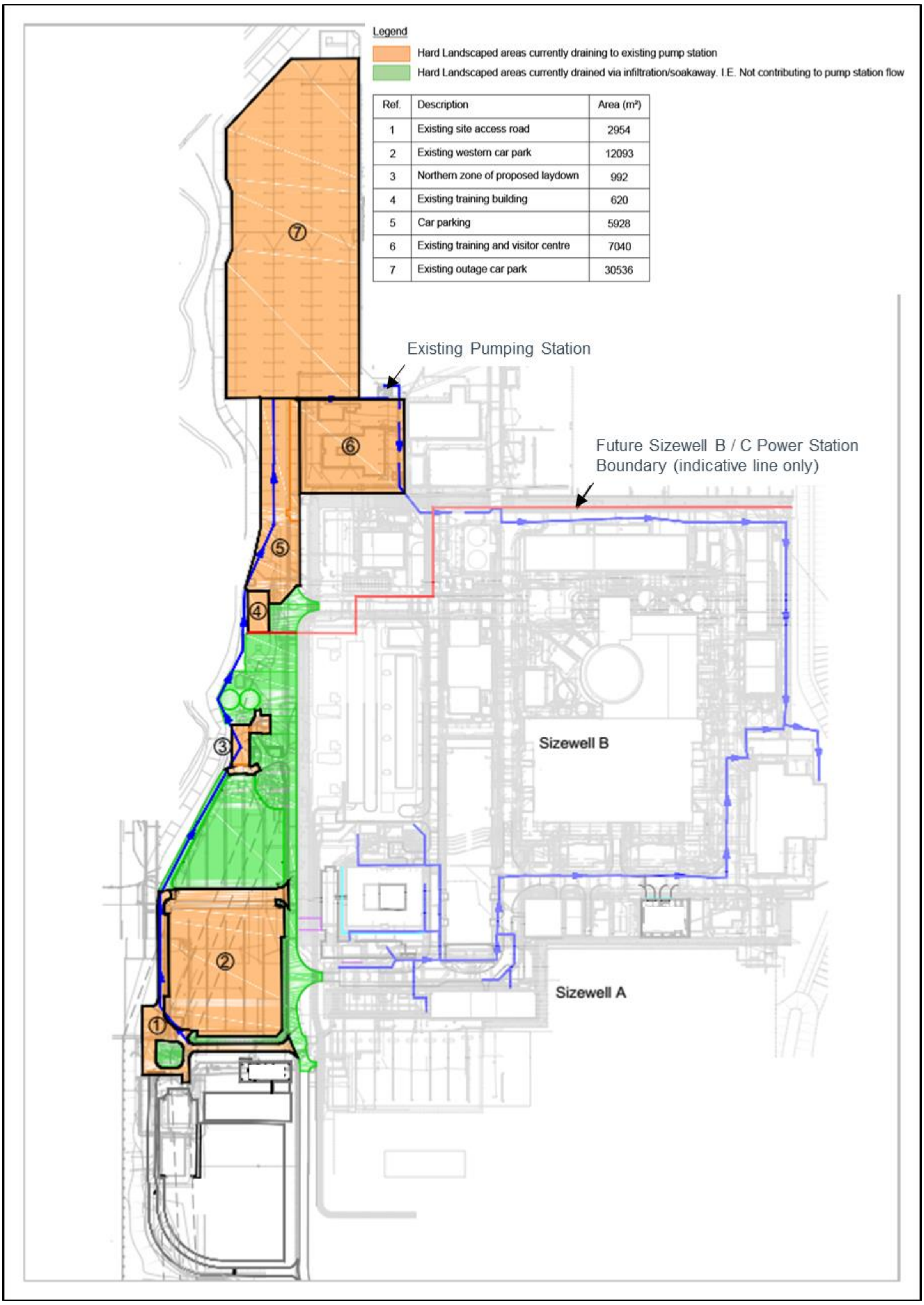


Figure 8-1:Existing Pumping Station (Affected Areas)

a) Pumping Station Removal

8.1.6 This section considers options for the removal of the existing pumping station to the north of the Sizewell B Power Station site, considering the surface water drainage associated with areas 1, 2 and 3 highlighted in **Figure 8-1**. At this stage, no single option will be recommended. Further assessment should be made in the subsequent project phases and subject to detailed design.

i. Retaining pumped solutions

8.1.7 One option could be relocating or constructing a new pumping station within the existing site boundary and maintaining the existing method/philosophy of draining this part of site. This would maintain the process of pumping of surface water, imposing continuing energy and maintenance costs. It would however also result in the continued pumping of off-site water across the Station site, introducing off-site hazards onto the Station area.

8.1.8 This is also reiterated by the complexities surrounding the relocation of the pumping station or construction of a new one, as it would need to be coordinated with the existing infrastructure and not impede current or future site operations, alongside not interrupting any future development plans.

ii. Gravity drainage to outfall

8.1.9 Topography does not permit gravity drainage to the existing outfall. If feasible hydraulically, such a solution would also retain the issues associated with water being brought from outside the Station across the Station platform.

8.1.10 The creation of a new piped outfall to an alternative location is not considered feasible. The most hydraulically suitable discharge point would be into the adjacent SSSI, which is not considered ideal. It is however an option that should be included for further development.

iii. Infiltration

8.1.11 The drainage of areas 1, 2 and 3 may be achieved using through infiltration, either through discrete soakaways or using a permeable pavement solution.

8.1.12 A large underground cellular soakaway installed beneath the surface of the existing western car park has been considered as a feasible solution, although not ideal. Such an installation would require the demolition of current underground infrastructure such as concrete foundations present beneath the existing car park, as well as potential conflicts with underground utilities and with the Dry Store located in the south-eastern portion of the car park and its associated heavy load route.

8.1.13 Another option is for the asphaltic surfacing of the existing western car park (Area 2) be re-constructed as a permeable surface, such as permeable concrete block paving or porous asphalt. This would provide direct infiltration for rainwater falling on Area 2.

8.1.14 Area 1 would be drained into the sub-base of the new permeable pavement of Area 2. This would be achieved by diverting the existing carrier drain which conveys the surface water associated with Area 1 to deliver flows to the sub-base of permeable paving in Area 2, and connecting to a network of perforated pipes within the sub-base of Area 2 that would distribute the run-off into the permeable paving sub-base. This would not require modification of the surfacing or drainage collection within Area 1.

8.1.15 Surface water run-off from Area 3 might also be discharged into the sub-base of Area 2 in the same manner. However, due to the falls and distance along which the carrier drain need to be re-laid, it would enter Area 2 at a low level and require significant volumes of additional sub-base beneath Area 2 to provide effective drainage. It is therefore recommended that Area 3 is resurfaced with permeable paving, and drained by direct infiltration within its own footprint. This solution is illustrated in **Figure 8-2**.

8.1.16 It is recommended that additional trial pit and infiltration testing is carried out at the sites where infiltration structures will be sited. This is something that should be carried out before detailed design of drainage commences.

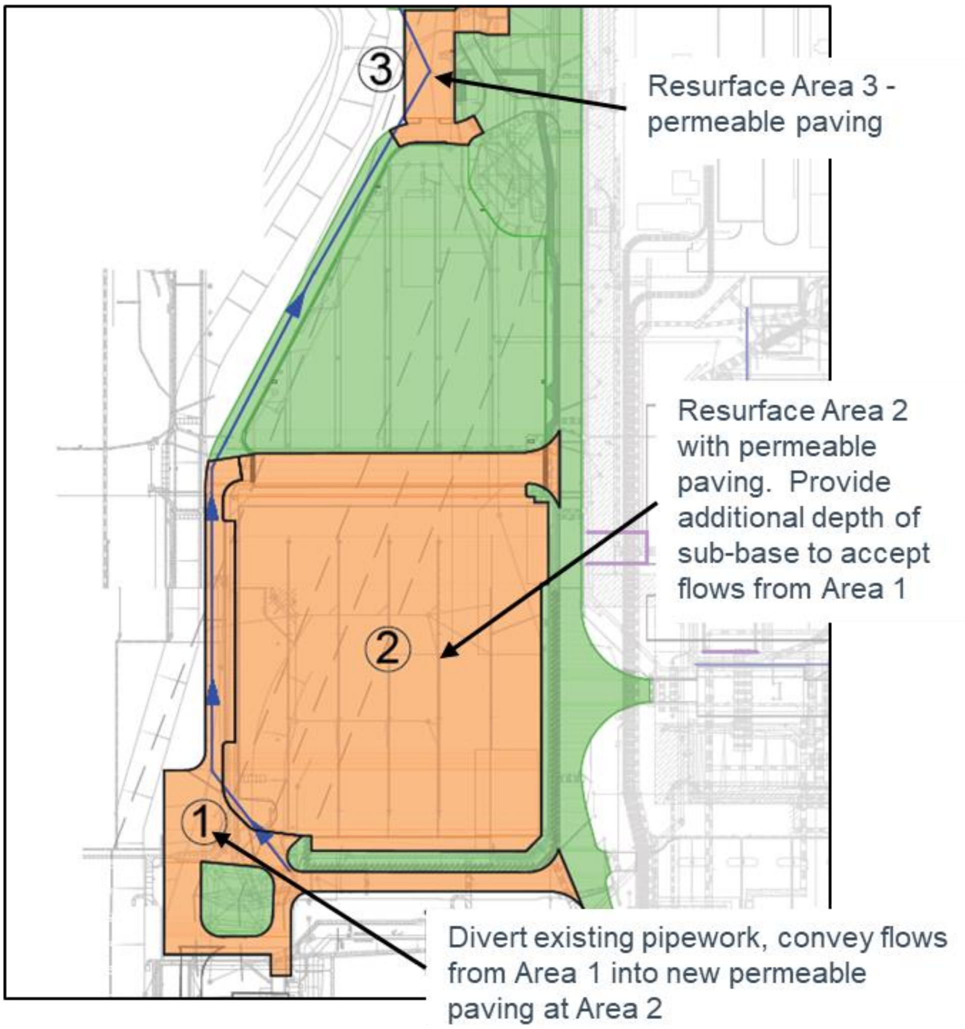


Figure 8-2:Infiltration Options for Areas 1, 2, 3

8.1.17 Preliminary sizing of required permeable surfacing required to infiltrate Areas 1 and 2 indicates a proposed pavement construction as follows (assuming a level surface):

Table 8-1: Proposed Pavement Construction for Areas 1, 2, 3

Layers	Permeable Block Paving	Porous Asphalt
Surfacing	80mm concrete pavers	180mm or (80mm with HBCGA below) Porous Asphalt
	50mm laying course	(125mm Hydraulically Bound Coarse Graded Aggregate)
Pollutant control	Upper geotextile	
Sub-base	200mm hydraulically bound course graded aggregate + 250mm coarse graded aggregate	
Pollutant control	Lower geotextile	

8.1.18 Note, if the surface gradient were 1:60, the sub-base layer would increase to approximately 700mm to ensure adequate storage is provided. It is recommended that concrete baffles are installed, as demonstrated in **Figure 8-3**, in order to provide sufficient storage without greatly increasing the sub-base depth, as this may be constrained by the water table.

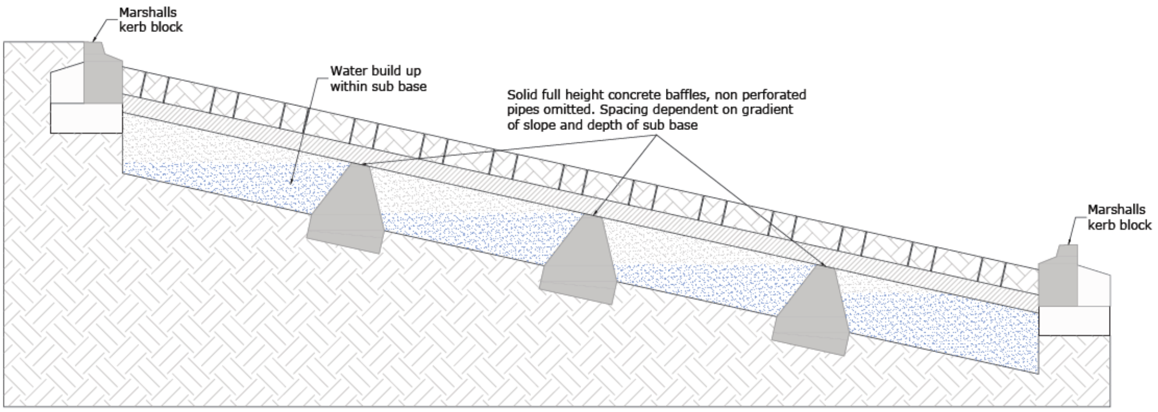


Figure 8-3: Permeable Paving Concrete Baffles [Marshalls- Permeable Paving Design Guide]

8.1.19 A permeable paving solution may accept run-off from adjacent impermeable areas, subject to a limitation that the impermeable area drained does not exceed twice the permeable area. Therefore it is recommended that the car park is resurfaced so that the car park spaces comprise permeable paving, whilst the aisles between the spaces may be formed using permeable or impermeable surfacing, such as asphalt without adversely affecting the drainage solution.

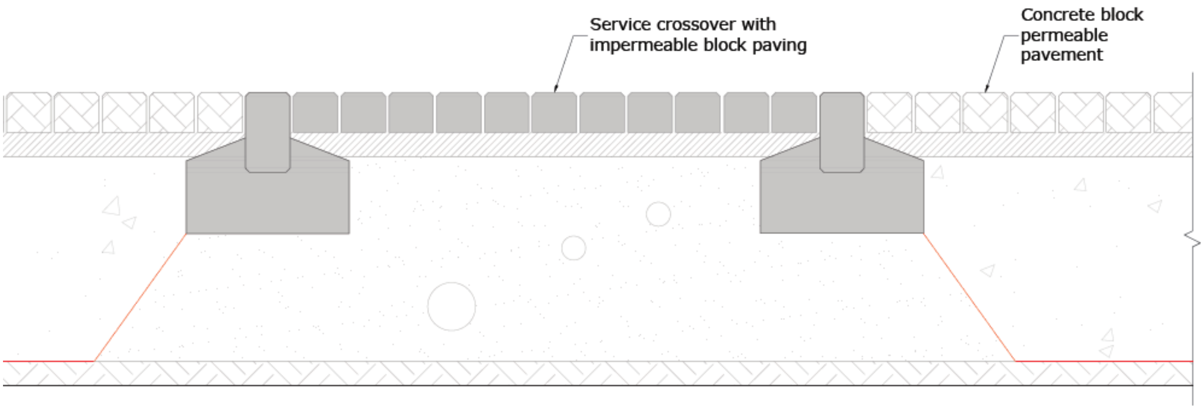


Figure 8-4: Impermeable and Permeable Paving

8.1.20 A permeable sub-base replacement system comprising lattice plastic, cellular units could be incorporated beneath the permeable pavement structure to provide additional storage as indicated in **Figure 8-5**, as they possess a greater water storage capacity than conventional granular systems (30-40% of the depth).

8.1.21 In accordance with the SuDS manual, the permeable pavement structure provides sufficient hydrocarbon treatment through the adoption of the following processes within the pervious pavement:

- Biodegradation of organic pollutants within the pavement construction
- Adsorption of pollutants to the surfaces of the sub-base material. Dependent upon factors such as aggregate structure, texture and moisture content.
- Retention and settlement of solids.

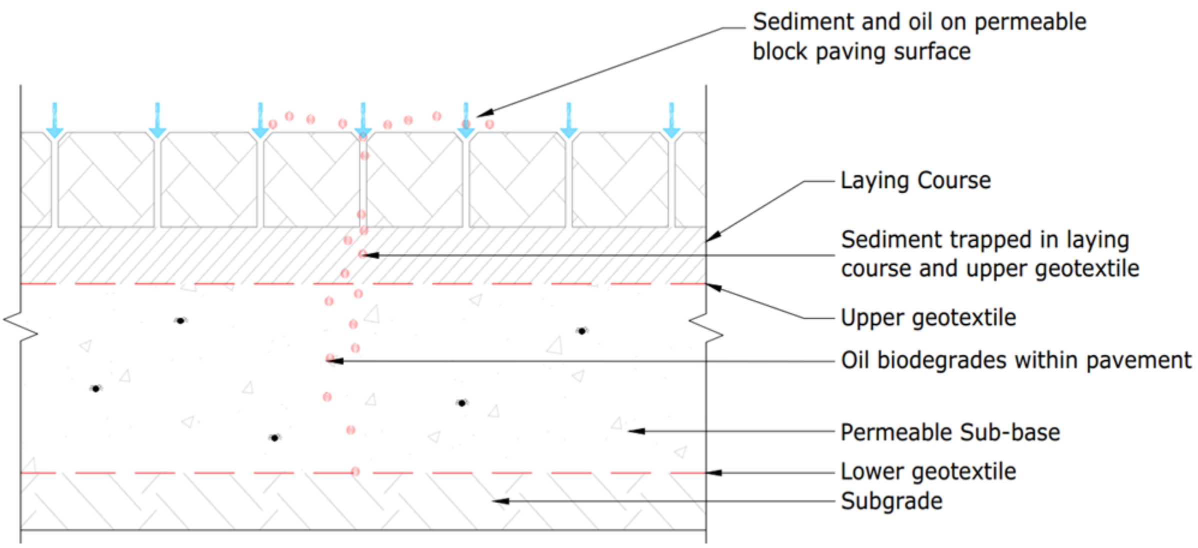
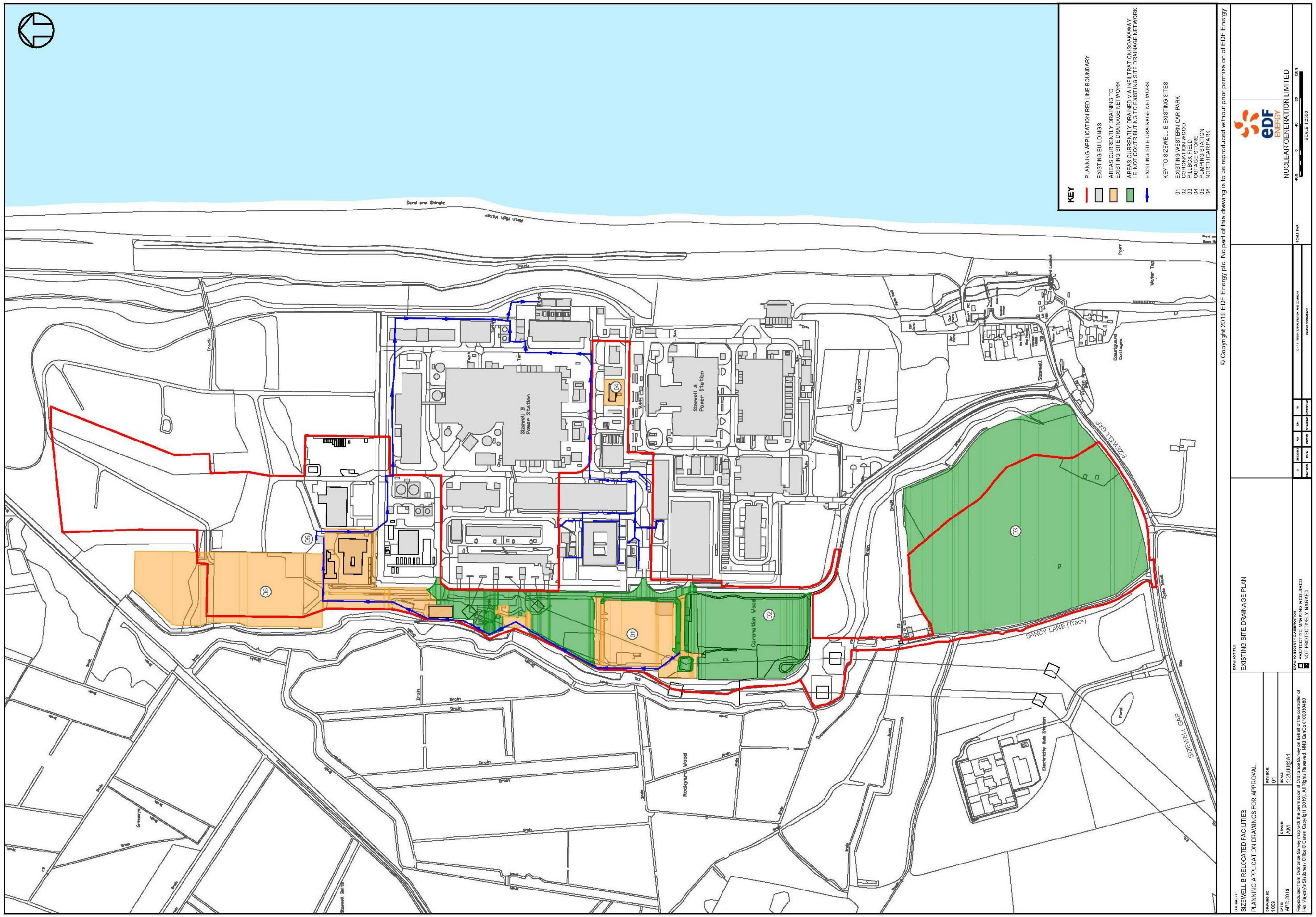


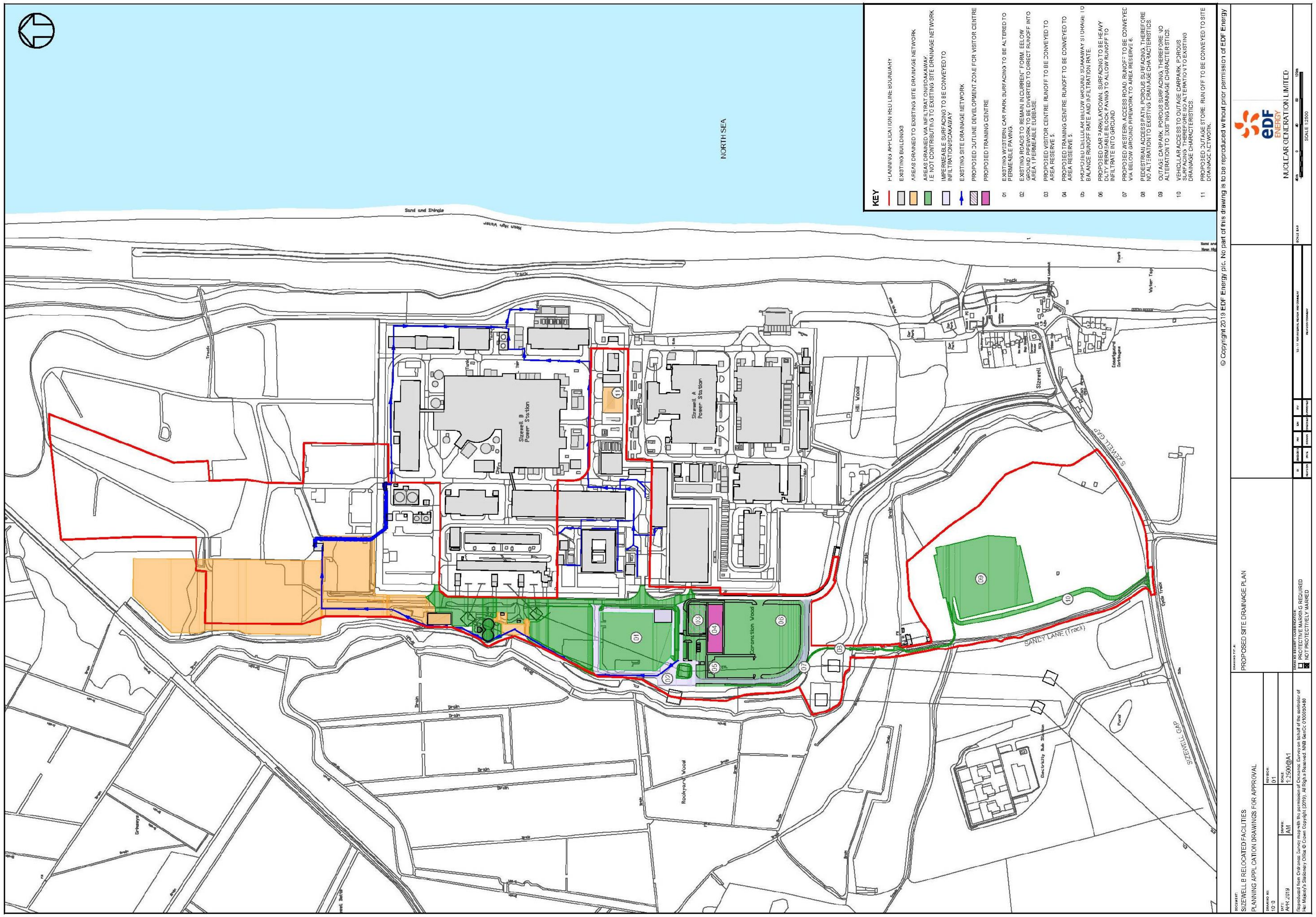
Figure 8-5: Permeable Sub-base Replacement System located beneath permeable paving structure [Interpave – Permeable Pavements]

APPENDIX 1A SURFACE WATER DRAINAGE PLANS

Existing Site Drainage Plan



Proposed Site Drainage Plan



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VOLUME 2, CHAPTER 2, ANNEX 2A.2 SIZEWELL B RELOCATED FACILITIES DRAINAGE STRATEGY ADDENDUM

Sizewell B Relocated Facilities

Drainage Strategy Addendum

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CONTENTS

TABLES

1. INTRODUCTION

1.1.1 Further to the submission of the Surface Water Drainage Strategy (Environmental Assessment, Appendix 3.2) of the SZB Relocated Facilities planning application, this document is an addendum to this strategy. This document responds to comments forwarded to us from East Suffolk Council, by Suffolk County Council, Flood and Water Officer on the 16th May 2019 and 4th July 2019.

2. COMMENT RESPONSES

Table 2-1: Responses to Comments ESC SW Drainage Strategy Objection Comments

	ESC Comment	Response
1.	Infiltration testing and boreholes at the location of infiltration components to determine the depth of any made ground, ground water levels and infiltration rates. I note the groundwater depths stated in 13.4.14, however given the variance between 1.0m and 1.46m clarification should be sought	• Nearby SI and general knowledge of the site has been used to inform approach for made ground, ground water levels and infiltration as part of the concept design (to which the SW Drainage Water strategy is based) • On the basis of nearby SI, an infiltration rate of approximately $1x10^{-5}$ m/s has been conservatively assumed in the drainage water design. NGL will conduct infiltration testing specific to the sites and proposed ground levels in Coronation Wood and Pillbox Field to correspond to the proposed layouts. These tests will aim to confirm adequacy of the infiltration rates used in the design, and will inform the drainage modifications in future design stages. • The GWL variance on site is due to the coastal siting – the SW Drainage Strategy has used a conservative value
2.	Establish peak seasonal groundwater levels. I note that 1m clearance is proposed, which is compliant with CIRIA SuDS Manual, however I expect the EA would require you to comply with their criteria of 1.2m at this location	The concept design was based on an industry standard (the SuDS manual). There was no requirement to use EA levels in the design, and this would not have been expected based on standard engineering practice. Also refer to response to comment 22.
3.	Location of infiltration components – infiltration in fill is not permitted, this may cause issues at the location of the car park and laydown areas where the SZA reservoir tanks will be removed, dependant on their depth	Any backfill would be good quality, granular fill suitable for infiltration (comparable to soakaway chamber surrounds)
4.	Depth of infiltration components	This has been considered and documented in the design, and details on the calculations have been provided direct to SCC.
5.	Volume of infiltration components	This has been considered and documented in the design, and details on the calculations have been provided direct to SCC.

	ESC Comment	Response
6.	Source Control calculations	This has been considered and documented in the design, and details on the calculations have been provided direct to SCC.
7.	Network calculations and assessment of outputs for the critical event	This has been considered and documented in the design, and details on the calculations have been provided direct to SCC.
8.	Clarification on Climate Change figure used. Surface Water Drainage Strategy makes reference to 10%, this should be 40% based on the 50 – 60 year design life of the site	* Please refer to response at the end of this table
9.	Clarification on pollution mitigation for surface water from the western access road	The risk of spillages along the Western Access Road have been deemed to be low (based on the DMRB risk process and the SuDS manual hazard indices) therefore the design provides for gulley pots into soakaways, which matches the approach to nearby on-site roads. For the interception storage approach, as per paragraph 7.1.26 of the SW Drainage Strategy, interception storage required to capture the first 5mm of every storm is approximately $10m^3$ is adequately provided for by the soakaway chambers. As Table 7.2 indicates, pollution control is required for oil/hydrocarbons, which would be provided for via proprietary systems (note that this level of detail is not shown within the strategy document).
10.	Explain how interception is provided by the drainage of the western access road	Interception is provided by the soakaway chambers. For the interception storage approach, as per paragraph 7.1.26, interception storage required to capture the first 5mm of every storm is approximately $10m^3$ is adequately provided for by the soakaway chambers.
11.	Explanation of why 1:100 is not listed under hydraulic criteria	This is not listed under the hydraulic criteria as pipes have not been specifically sized for 1:100, however as per Table 4-1, 1:100 has been considered for SW design parameters (controlled flooding to sacrificial areas)
12.	Assessment of flooded volumes during 1:100 + CC storm, if applicable	This has been considered and documented in the design, however is not practicable to summarise in this response format. See further information in response to comment 23.
13.	An assessment of exceedance routes based on proposed levels	A preliminary assessment has been made on exceedance routes, and exceedance flows are retained within the site boundaries flowing into internal storage areas. It is proposed that a detailed assessment will be undertaken in subsequent design phases.
14.	Assessment of half drain times	This has been considered and documented in the

	ESC Comment	Response
		design, however is not practicable to summarise in this response format. Details will be provided with the calculation pack to follow.
15.	Reference is made to enhancement in biodiversity and the provision of habitats. The potential use of swales is also included. None of these have been provided. The drainage strategy should either be altered to include biodiversity improvements or this should be removed as a design principle	This principle was applied at the start of the design process, however was not implementable (justification has been given as to why green SuDS could not be used). As such we consider it appropriate for inclusion.
16.	Clarification of how soakaway chambers are expected to provide interception?	Interception provided by the soakaway chambers. For the interception storage approach, as per paragraph 7.1.26, interception storage required to capture the first 5mm of every storm is approximately $10m^3$ is adequately provided for by the soakaway chambers.
17.	Details of a maintenance strategy for the lifetime of the development, including asset owners	The site operator, NGL, will own and maintain the SW drainage features of the proposed scheme in accordance with their site-wide maintenance processes and plans. The maintenance strategy will be aligned to the principles of the SuDS manual.
18.	The indicative construction and demolition programme suggest that drainage will be constructed after impermeable surfaces have been built. This would result in a short term increase in flood risk and is not best practice. This should be clarified	The Contractor will work with NGL to ensure that suitable risk mitigation measures are planned and implemented with regards to temporary drainage and any potential accidental pollutant spills during construction.
19.	Given the construction plant/equipment proposed there is a risk that infiltration surfaces will be compacted during construction. There should be an assessment of this risk and an identification of suitable remediation prior to construction in the event of compaction	The Contractor is responsible for completing construction works in line with design specifications, and as such, will be responsible for demonstrating sufficient infiltration characteristics and addressing any non-compliant areas.
20.	Reference is made in the Drainage Strategy to decommissioning of the pumping station. As far as I'm aware, this isn't part of this application and I presume is for information only. Could this please be clarified?	Decommissioning of the pumping station is out of scope of the Relocated Facilities Planning Application, however has been included for information.
21.	Evidence must be provided to justify the design infiltration rate used.	On the basis of nearby SI (documents submitted direct to SCC), an infiltration rate of approximately $1x10^{-5}$ m/s has been conservatively assumed in the surface water drainage design. Site-specific

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		soakaway tests have also been specified which will be undertaken in advance of the detailed design phase of the works and will inform the design going forward.
22.	In regards to groundwater clearance, my advice to the LPA will be to seek clarification on this matter from the Environment Agency. If they specify 1.2m clearance must be maintained between the base of infiltration and seasonal peak groundwater levels (GWL), as per their published guidance, then this is the standard that I would expect to be applied. I appreciate GWL information may have been obtained from previous testing. However, all existing data available to EDF must be utilised, this includes using the groundwater model being developed as part of SZC proposals to determine peak groundwater levels and clearance from these.	The Environment Agency has not provided comment on this aspect, however, should this be stipulated at a later date, it is considered feasible to amend the geometry of the drainage features to accommodate an increased clearance level. The next phase of the design will make use of up-to-date groundwater information, where relevant, from available sources e.g. the SZC groundwater model.
23.	The access road drainage is identified to have flooding in the 1:100+CC event. This has been assessed as minor as per CIWEM WaPUG User Note No 29. This is a simplistic view and the guidance document clearly states that overland flow routes must be assessed. It must be demonstrated that any flooding will remain on site for the critical event and there will be no increase in flood risk offsite.	The scheme developed in support the planning application has used sound design principles and engineering best practice for the proposed Western Access Road which means that surface water flooding would be directed away from the scheme boundary on the western side of Coronation Wood (i.e. away from the SSSI) flowing instead towards the infiltration storage of the car park and laydown areas. A qualitative assessment of the 3d surface model has been made at this stage. A quantitative assessment of this design aspect is planned to be undertaken in the next design phase.

2.1.1 * Comment 8 Response: Figure 4-2 in the Sizewell B Relocated Facilities Surface Water Drainage Strategy correctly references the table from https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances for the peak rainfall intensity allowance due to climate change with a design life of the 2050s, insert below. This table has two categories of risk ‘Upper end’ or ‘Central’. Typically, the local authority stipulates the use of ‘Upper end’ or ‘Central’ in their local plans.

Table 2 peak rainfall intensity allowance in small and urban catchments (use 1961 to 1990 baseline)

Applies across all of England	Total potential change anticipated for the '2020s' (2015 to 2039)	Total potential change anticipated for the '2050s' (2040 to 2069)	Total potential change anticipated for the '2080s' (2070 to 2115)
Upper end	10%	20%	40%
Central	5%	10%	20%

2.1.2 In the Suffolk Local Flood Risk Management Strategy – Suffolk Surface Water Drainage (SuDS) Guidance, Standards and Information, it states to *'Design at 20% and then sensitivity check at 40% to see wider flood risk'* for climate change factors. In Concept Design, this was interpreted as design for the 'Central' allowance value and sensitivity check for the 'Upper end' allowance, since the allowance values should be in the same design life column. The time period relating to the guidance note's 20%/40% allowance relates to the 2080s column (i.e. a time period from 2070 to 2115). However, the assets related to the Relocated Facilities Planning Application will be required for Sizewell B operational activities through the current site licence operating timeframe to 2035, with a potential 20 year extension to 2055. On this basis, the climate change allowance timeframe chosen for the concept design was the 2050s (2040 to 2069) column i.e. to the end of future station operation, with the approach from the Suffolk guidance document applied i.e. 'Central' 10% value used in the design, with a sensitivity check on 'Upper End' 20%. Therefore, the use of the 10% allowance in the design is considered to be correct.

2.1.3 As can be seen in the informal release of the drainage calculations direct to Suffolk County Council, the 20% sensitivity check on the permeable paving is more than adequately accommodated in the paving design, as the design makeup is dictated by structural requirements. A sensitivity check on the soakaway elements of the scheme was not undertaken, however the infiltration rate used in the design is considered conservative and will be confirmed prior to the commencement of detailed design. In the event that improvement in the measured infiltration rate is not observed, and a re-design results in resized soakaway chambers, there are no significant spatial constraints on the proposed site to prohibit the accommodation of this.