The Sizewell C Project

6.3/ 10.14 Volume 2 Main Development Site Chapter 2 Description of the Permanent Development Appendix 2A of the Environmental Statement: Drainage Strategy - Clean Version - Part 1 of 3

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Planning Act 2008
Infrastructure Planning (Applications: Prescribed Forms and Procedure) Regulations 2009

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Level 1 control documents will either be certified under the DCO at grant or annexed to the Deed of Obligation (DoO). All are secured and legally enforceable. Some Level 1 documents are compliance documents and must be complied with when certain activities are carried out. Other Level 1 documents are strategies or draft plans which set the boundaries for a subsequent Level 2 document which is required to be approved by a body or governance group. The obligations in the DCO and DoO set out the status of each Level 1 document.

This strategy is a Level 1 document. Requirement 5 of the **draft Development Consent Order** (**dDCO**) (Doc. Ref. 3.1(J)) requires that no part of the authorised development may be commenced until a Drainage Strategy Update has, after consultation with the Lead Local Flood Authority, been submitted to and approved by East Suffolk Council. The drainage strategy update must be in general accordance with this strategy.

Further, no part of the development (with limited exceptions) may be commenced 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 to and approved by East Suffolk Council, following consultation with the Environment Agency, the relevant Statutory Nature Conservation Body, the East Suffolk Internal Drainage Board, the Lead Local Flood Authority, the sewerage undertaker and the drainage authority. The purpose of this document is to inform the detailed design proposals for surface and foul water drainage. As such, the surface and foul water drainage proposals must be based on sustainable drainage principles and must be in accordance with the Drainage Strategy Update. Once approved, the details of the approved management and maintenance arrangements and means of pollution control must be provided to Suffolk County Council and no part of the authorised development may be commenced until Suffolk County Council have endorsed the approval of the details for that part. Any approved surface and foul water drainage system must be constructed and maintained in accordance with the approved details.

Requirements 13A and 22 of the **dDCO** require that no part of the road developments may be commenced until details of the surface and foul water drainage system for that part have been submitted to and approved by Suffolk County Council. The surface and foul water drainage proposals must be based on sustainable drainage principles and must be in accordance with the Drainage Strategy Update. 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.

In the event that notice is served under Article 5 of the **dDCO**, **Annex 2A.1** Sizewell B Relocated Facilities Drainage Strategy must be complied with in respect of the relocated facilities works.

Where separate Level 1 or Level 2 control documents include measures that are relevant to the measures within this document, those measures have not been duplicated in this document, but cross-references have been included for context. Where separate legislation, consents, permits and licences are described in this document they are set out in the **Schedule of Other Consents, Licences and Agreements** (Doc Ref. 5.11(C)) (Schedule of Other Consents, Licences and Agreements - Revision 3.0).

For the purposes of this document the term 'SZC Co.' refers to NNB Nuclear Generation (SZC) Limited (or any other undertaker as defined by the dDCO), its appointed representatives and the appointed construction contractors.

Storm and surface water approach

This **Drainage Strategy** has been developed (see **Section 1.1**) 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 (see **Section 2**) for the Sizewell C construction site is to mimic the existing environmental runoff patterns. The 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 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 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 (AD) 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 (see **Section 2.3**) 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 (**Section 3.4**) 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 (**Section 3.4**) is sub-divided into separate Water Management Zones (WMZs) where surface water will be managed in accordance with the uses within each of the WMZs, using SuDS techniques, infiltrating where possible. Detention basins within each WMZ will 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 (**Section 3.4**) is storage with infiltration where possible.

Storage will 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 surface water run-off associated with the bypasses, access roads, park and ride sites and freight management facilities will use the same SuDS techniques (see **Section 4**).

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 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 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 (see **Section 3.5**) 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 or used as a resource in construction activities.

Land East of Eastlands Industrial Estate

The preferred approach (see **Section 3.5**) 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 proposal (see **Section 4.2**) 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 will 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 Drainage Strategy

1.1.1 This document has been prepared to set out the site wide **Drainage Strategy** of the Sizewell C Project.

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

1.1.3 This **Drainage Strategy** 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 will 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.

1.1.4 This strategy sets out the drainage requirements for each of the Sizewell C Project sites.

1.1.5 Water Management Zones (WMZ) are proposed for construction stage of the main development site (MCA, TCA, LEEIE) and for each of the associated development sites. The proposals have been informed by information from ground investigations, including groundwater levels, infiltration rates, and watercourse connectivity. The Drainage Strategy sets the design parameters such as the design return period.

1.1.6 This report identifies WMZs and covers the MCA, the TCA, the accommodation campus and the LEEIE. In addition, the report considers the Drainage Strategy of AD 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.

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

1.1.8 All general arrangement layouts shown in this document are indicative and will be set out in the details submitted to East Suffolk Council pursuant to Requirement 5 or Suffolk County Council pursuant to Requirements 13A and 22.

1.2 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
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

Term / Abbreviation	Definition
MCERT	EA Monitoring Certification Scheme
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
TMO	Temporary Marine Outfall
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 **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 **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. The details submitted to East Suffolk Council (Requirement 5) or Suffolk County Council (Requirements 13A and 22) must include the justification for moving to the relevant stage. These stages are:

- 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 Drainage Strategy

2.2.1 The principal aim of this **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, the Lead Local Flood Authority, the Environment Agency and the Internal Drainage Board.

2.2.2 In addition, the approach will satisfy the following criteria as detailed in Construction Industry Research and Information Association (CIRIA) 753 (Ref. 1.9) (the 'CIRIA SuDS Manual'), 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 allowing the detailed design to consider local land use, land take, and future management scenarios which will be submitted for approval pursuant to Requirements 5, 13A and 22.

2.2.4 Active design decisions will be taken to balance the interests of different stakeholders (Environment Agency, Suffolk County Council, East Suffolk Council, East Suffolk Internal Drainage Board, Suffolk Wildlife Trust, the RSPB, Natural England, NGL) 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 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. It is recognised that SuDS structures performance is to normally drain down to half depth within 24 hours. For extreme storms with low outflow rates it may be necessary to extend storm durations beyond 1440 minutes to ensure the critical performance figure is achieved.

Requirement	Description
Return Period	All return periods will have a climate change allowance applied, in accordance with the Environment Agency Guidance (Ref. 1.11), 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 main development 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 will keep water out as much as possible. The platform drainage on the MCA has taken this into consideration. The WMZs also provide compensatory areas into which exceedance events may flow in a controlled manner. Drainage features will be located outside of fluvial floodplains where the design allows.

b) Climate change allowance

2.3.4 In accordance with current Environment Agency guidance (Ref. 1.4) as shown in **Plate 2.2**, it is 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, the Sizewell link road and the two village bypass will be designed in accordance with the Design Manual for Roads and Bridges (DMRB) (Ref 1.10), 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)[1]

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

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

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 because of its proximity to the coast, not the AD sites.

2.3.8 In addition to a "fit for purpose assessment of flood risk", the Environment Agency and ONR require a flood risk assessment 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. SZC Co. has submitted a series of FRAs for the main development site and associated development sites:

- **Main Development Site Flood Risk Assessment** (**FRA**) [AS-018]
- **Main Development Site FRA Addendum** [AS-157]
- **Sizewell Link Road FRA** [APP-136] and **Sizewell Link Road FRA Addendum Revision 2** [REP5-045]
- **Two Village Bypass FRA** [APP-119] and **Two Village Bypass FRA Addendum** [AS-171]
- **Yoxford Roundabout and Highway Improvements** [APP-139]
- **Northern Park and Ride FRA** [APP-115]
- **Southern Park and Ride FRA** [APP-117]
- **Freight Management Facility FRA** [APP-141]
- **Rail FRA** [APP-143]

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

Return Period (years)	Drainage Criteria	Description
		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 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 such that, in the event of a flood, it could be quickly brought back into use without significant refurbishment;
- 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.

2.3.12 SZC Co. has submitted Flood Risk Emergency Plans for the main development site, two village bypass and Sizewell link road, as part of the respective flood risk assessments.

e) Storm water management

2.3.13 Proposed drainage systems utilising various SuDS techniques will be designed to accommodate the predicted flows for all rainfall return periods listed in **Table 2.2**.

2.3.14 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.

2.3.15 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

2.3.16 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 to allow for climate change. This is in accordance with current guidance from the Environment Agency.

2.3.17 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

2.3.18 SuDS will be designed in accordance with C753 CIRIA SuDS Manual (Ref 1.9).

2.3.19 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.

2.3.20 Under extreme rainfall events such as 100 years it is recognised that with very low infiltration rates and low allowable discharge rates it will be difficult to achieve half drain down within 24 hours. Where this occurs a suitable alternative such as a high level overflow will be appropriate.

2.4 SuDS maintenance

2.4.1 The types of SuDS construction e.g. porous car-parks, infiltration structures etc., normally have a refurbishment requirement of between 20-30 years. The lifetime of the temporary AD 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 will be programmed within the detailed designed process submitted for approval pursuant to Requirements 5, 13A and 22.

2.4.3 A SuDS Maintenance Plan in accordance with the SuDS Manual C753 (Ref. 1.9) must be submitted as part of the details submitted pursuant to Requirements 5, 13A and 22 and must be implemented as approved.

2.4.4 The SuDS 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 will be maintained in accordance with the advice from the manufacturer. This will include routine and long-term actions that can be incorporated into a maintenance plan.

2.4.7 **Table 2.3** is taken from CIRIA and provides a breakdown of typical maintenance requirements. This includes 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 C753 CIRIA SuDS Manual (Ref 1.9).

Table 2.3: 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.

Maintenance type	Indicative frequency	Typical tasks
		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 C753 CIRIA SuDS Manual (Ref 1.9) and the Simple Index Approach to ensure that treatment processes are effective to meet the water quality management requirements for the surfaces drained.

b) Protecting surface water

2.5.3 C753 CIRIA SuDS Manual (Ref 1.9) 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 C753 CIRIA SuDS Manual (Ref 1.9) 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[1]).

2.5.8 C753 The CIRIA SuDS Manual (Ref 1.9) 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.

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

d) Treatment

2.5.12 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.

2.5.13 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.

2.5.14 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.

2.5.15 For all sites, Sustainable Drainage Systems (SuDS) will be prioritised in the surface water drainage proposals where possible to aid pollution control. The surface water drainage design will be developed such that SuDS are proposed for treatment, maintenance, and sustainability benefits, in so far as can be practicable. The SuDS techniques proposed will provide flood reduction, pollution control and aim to mimic the existing drainage characteristics to prevent impact on designated habitats. The pollution and water quality risk will be assessed using the index approach as set out in Section 26.7.1 of C753 CIRIA SuDS Manual (Ref 1.9), to determine the effectiveness of the SuDS measures to treat different types of developments. A sequence of natural treatment methods will be proposed to build robustness within the drainage network by providing numerous options to initially treat runoff. On the AD sites some roads are subject to Design Manual for Roads and Bridges (DMRB Ref 1.10) in which case the environmental impact of discharging highway runoff is to be assessed using the Highways England Water Risk Assessment Tool (HEWRAT) methodology (Ref. 1.10).

2.5.16 In places where there is potential for increased risk of pollution or threat to receiving watercourses/sewers, proprietary systems will be considered and if necessary be used as a fail-safe method of treatment to supplement primary treatment observed using SuDS techniques. This will be explored further in future design stages on a risk management basis.

2.5.17 The proposed SuDS to be constructed across the Sizewell C sites are indicated in this strategy (**Sections 3** and **4**). The detail for each WMZ and AD site will be developed at the detailed design stage and submitted for approval pursuant to Requirements 5, 13A and 22.

2.5.18 **Annex 2A.15** provides the surface water treatment assessment for WMZ1 as a worked example for the higher risk WMZ on the main development site, to provide confidence in the approach to be taken for all WMZs.

2.6 Approach taken in determining the land take requirement for storage volume to manage storm water runoff

2.6.1 This Drainage Strategy has been guided by C753 CIRIA SuDS Manual (Ref 1.9)*.* That document is considered to be the most applicable guidance for ensuring the design represents the best solution to protect the local environment and designated habitats.

2.6.2 Where practicable storm water runoff will be returned to ground using local source control elements as well as larger regional detention basins.

2.6.3 On the main development site, there is a very wide variation in infiltration capability across the site. The local source control elements and the detention basins have been sized using infiltration to ground as much as possible. The infiltration rates from site investigation reports from 2014 – 2020 have utilised the poorest infiltration rates to determine the worst case scenario for sizing SuDS structures. This conservative approach has been applied to ensure sufficient space has been allocated within the development site for the purpose of managing storm water runoff. As the knowledge of the site progresses in subsequent design updates, further local testing will be possible. This will ensure drain down times of the SuDS structures are within acceptable limits. If infiltration rates do not indicate sufficient runoff acceptance within an area then infiltration management will be supplemented with runoff to local watercourses at runoff rates (greenfield) previously agreed with stakeholders. Further advice and liaison will be provided to stakeholders as the design progresses, both to fulfil Requirement 5 and in respect to other post-DCO consents.

Table 2.4 Summary of Volume Required by SuDS Structures in the main development site

WMZ	Max Critical Volume Required by SuDS Structures (m^3)			Critical Event (100 RP + CC)			Storage Volume Available in the MDS (m^3)
	FSR	FEH 1999	FEH 2013	FSR	FEH 1999	FEH 2013	
WMZ-1	11231	14660.9	15067.6	2880 min Winter	2880 min Winter	2160 min Winter	17328
WMZ-2	9327.8	12221.1	12771.8	2160 min Winter	2160 min Winter	2160 min Winter	17695
WMZ-3	11814.5	15513.7	16016.4	2880 min Winter	2880 min Winter	2160 min Winter	17341
WMZ-4	7969.3	10647.2	11263.3	960 min Winter	1440 min Winter	1440 min Winter	25689
WMZ-5	7641.5	10213.3	10803.2	1440 min Winter	1440 min Winter	1440 min Winter	17274
WMZ-6	14418.3	19117.2	20216.7	1440 min Winter	1440 min Winter	1440 min Winter	22376
LEEIE East	15381.1	20579.7	21641.3	1440 min Winter	1440 min Winter	1440 min Winter	23221
LEEIE West	2698.8	3623.2	3812.3	1440 min Winter	1440 min Winter	1440 min Winter	4000

2.6.4 This data is a worst case assessment based on infiltration tests carried out in 2014 - 2020. Further assessment into infiltration rates will be undertaken as detail design progresses and these values may vary. A summary of infiltration test locations is provided in **Annex 2A.2**, and Annex A within **Annex 2A.3**. A review of existing infiltration and permeability test data is provided for the MDS as **Annex 2A.16**. Further details for **Table 2.4** can be found in **Annex 2A.3**, **Annex 2A.4** and **Annex 2A.5**.

2.6.5 The AD sites follow a similar approach to the MDS above and details for the volume analyses can be found in **Annex 2A.6** – **Annex 2A.12**.

2.7 Foul water management

2.7.1 The 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. The details submitted to East Suffolk Council (Requirement 5) or Suffolk County Council (Requirements 13A and 22) will include the justification for moving to the relevant stage. These stages are:

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

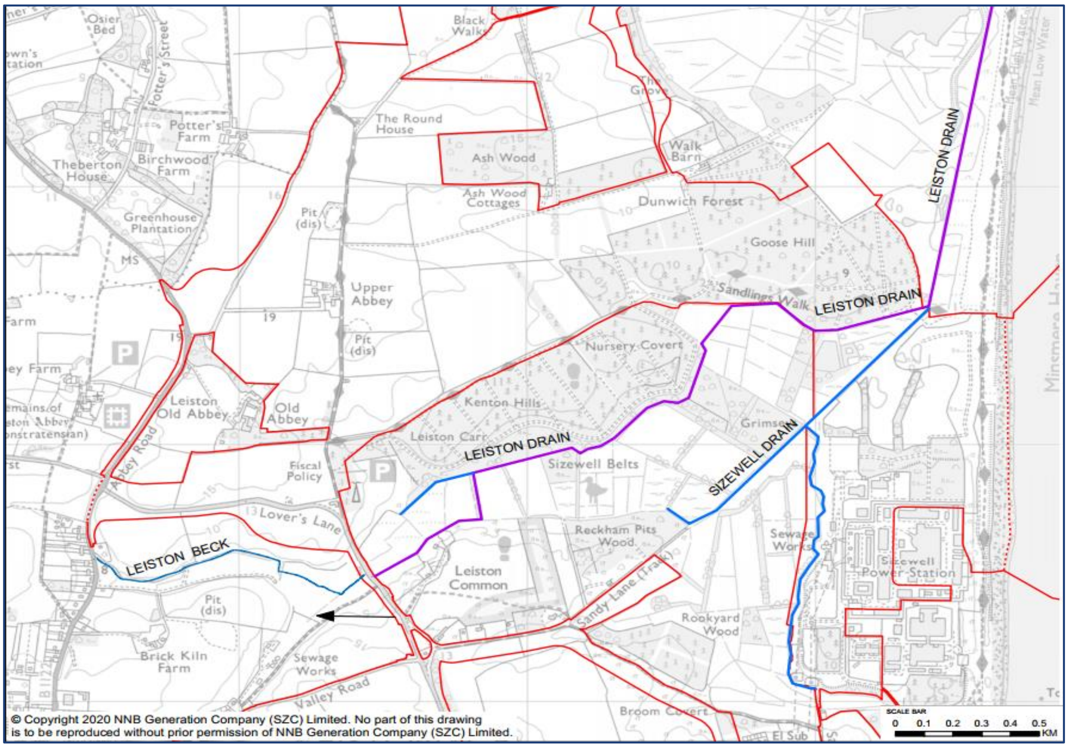
3 MAIN DEVELOPMENT SITE

3.1 Overview of existing 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



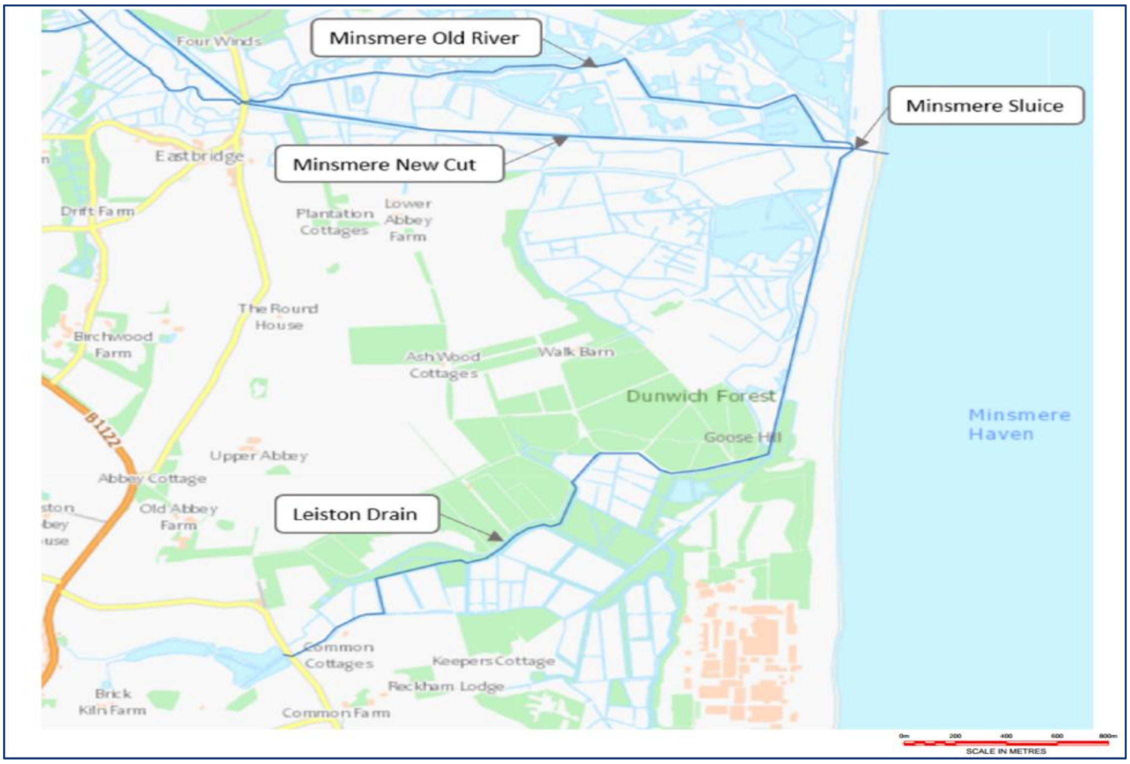
3.1.3 Indicative directions of the surface water overland flow paths, based on general topography and ground levels, are shown in **Figure 2A.2**.

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[1]



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 drained to Minsmere River and under normal operation of Minsmere Sluice, there should be no flow from the main

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

development site / TCA catchments via Leiston Drain into Minsmere River. As a result, Minsmere River is not considered further as part of this strategy. This aspect is assessed further in **Appendix M** to **Comments at Deadline 6 on Submission from Earlier Submissions and Subsequent Written Submissions to ISH1-ISH6** [REP6-024].

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 **Main Development Site Flood Risk Assessment** (FRA) [AS-018] and **Main Development Site FRA Addendum** [AS-157] indicate 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 **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).

c) Sizewell Drain

3.1.16 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.

3.1.17 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.

3.1.18 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 and Sizewell Drain catchments.

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[1].

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

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

development flood risk, it is irrelevant as to whether flooding is due to coastal or fluvial events, so the map does not distinguish source.

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 strategy), 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 storm water 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** (FRA) [AS-018] and **MDS FRA Addendum** [AS-157] provide 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** (FRA) [AS-018] and **MDS FRA Addendum** [AS-157] provide 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 will 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. Refer to **Chapter 19, Volume 2** of the **Environmental Statement** [APP-297] for further details.

3.3 Strategic water management

a) Strategic design criteria

3.3.1 The drainage design criteria which will be applied in developing the detailed designs which must be submitted for approval pursuant to Requirements 5, 13A and 22 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 **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 are intended to predominantly discharge to groundwater subject to satisfactory infiltration rates.
- 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 will be reinstated upon completion of the construction phase in accordance with the **outline Landscape and Ecology Management Plan** (Doc. Ref. 10.22) (secured pursuant to Requirement 14).

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 Rev 3**.

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 considered individually in this 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 a 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 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 Drainage Strategy methods as it is predominantly water resource storage. Further details for the Water Resource Storage Area can be found in **Chapter 3 Volume 2** of the **Environmental Statement** [APP-184], as updated by the **ES addenda** [AS-181] for **Change 5**.

c) Infiltration testing

3.3.22 Infiltration testing on the main development site has been carried out as part of previous investigations in 2014 - 2020, through both trial pits and boreholes. The approximate locations and indicative infiltration rates of these locations are shown in **Figure 2A.5**.

3.3.23 Further details on infiltration testing, including locations and application in source control calculations, can be found in **Annex 2A.2**, **Annex 2A.3**, **Annex 2A.4** and **Annex 2A.5**.

3.4 Water Management Zone assessment

3.4.1 Following an initial assessment of baseline topography and proposed working levels, provided as **Annex 2A.13**, 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 requirements and are shown in **Figure 2A.4 Rev 3**.

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

3.4.3 Further detail for all Water Management Zones can be found in can be found in **Annex 2A.3**, **Annex 2A.4** and **Annex 2A.5**.

Plate 3.4: Site plot plan with construction areas

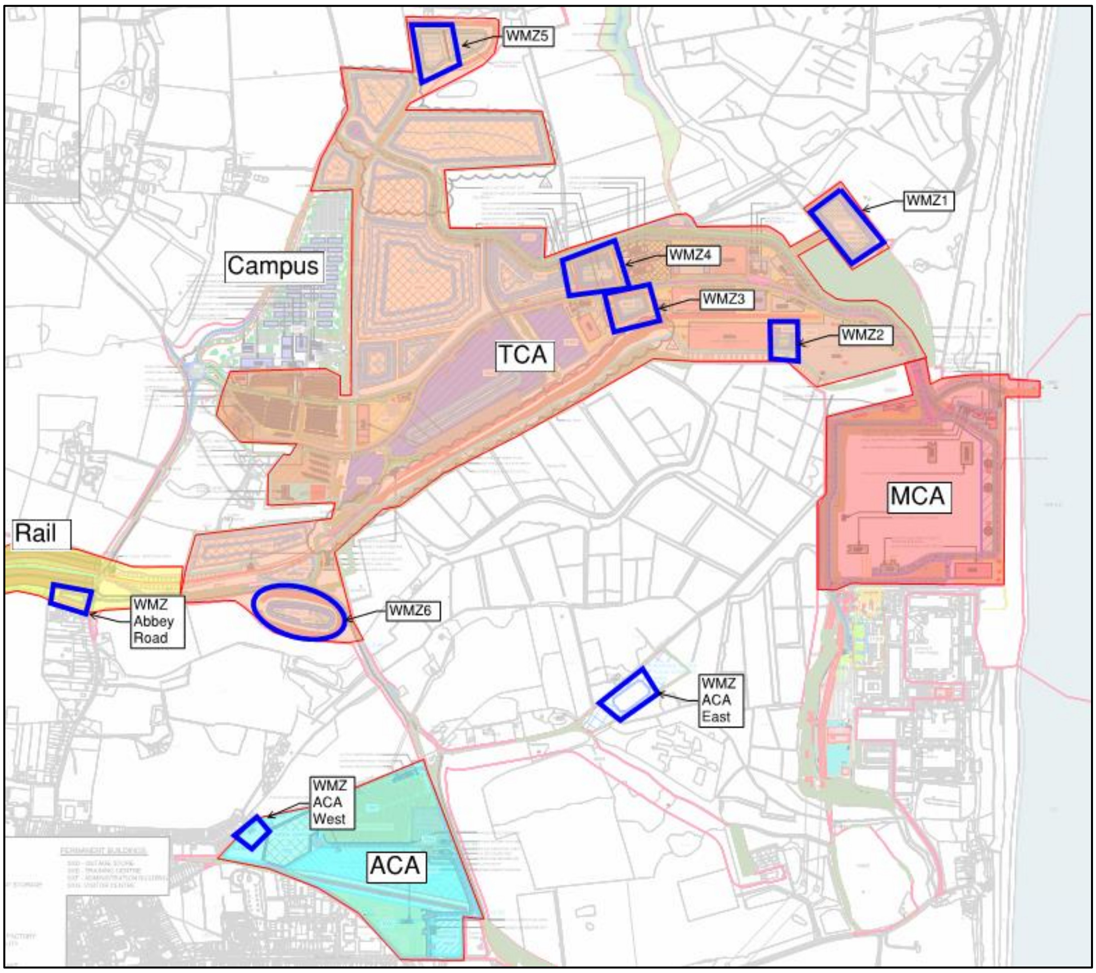
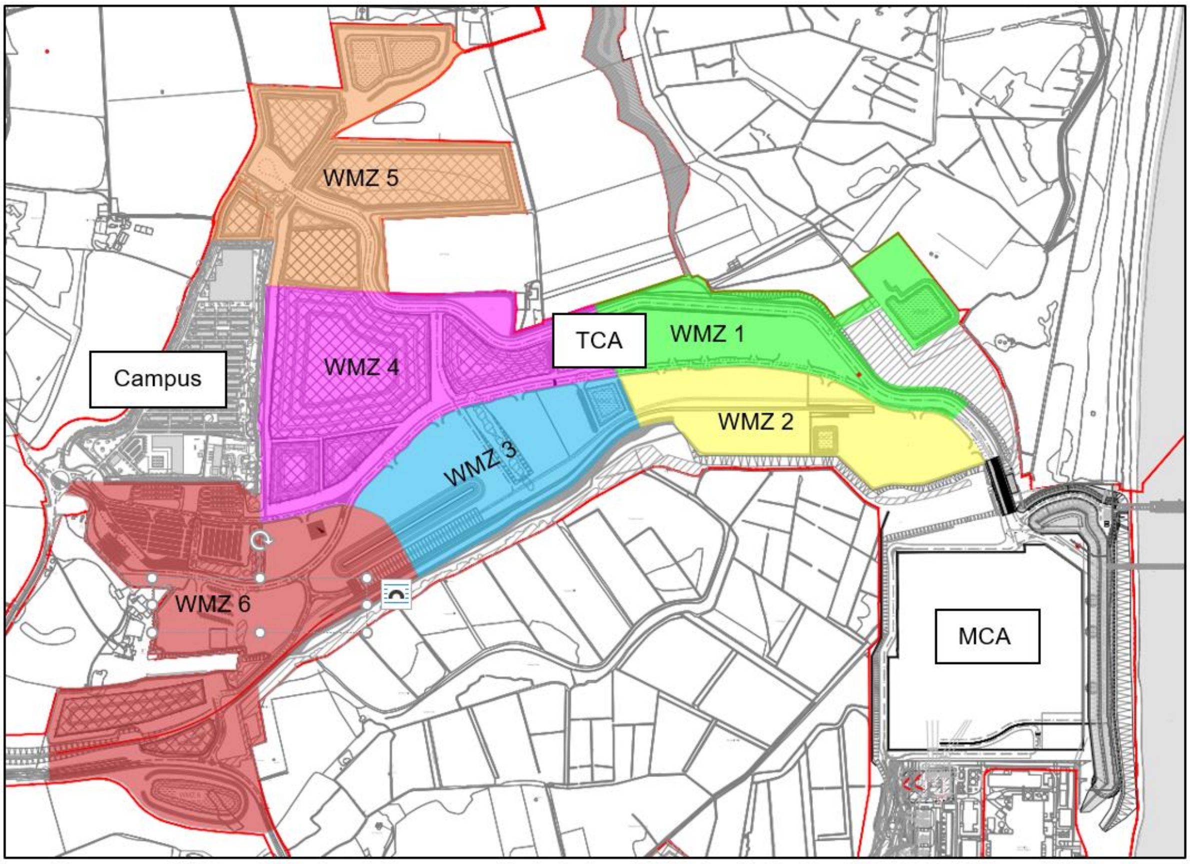


Plate 3.5: Site plan showing Water Management Zone catchment areas



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

3.4.4 These WMZs, which discharge by both controlled greenfield rate and infiltration, are shown in **Figure 2A.4 Rev 3.**

3.4.5 Prior to completion of the CDO, a Temporary Marine Outfall (TMO) is proposed to allow surface water from the main construction area to discharge to the sea. The TMO will also provide redundancy for WMZs 1 and 2. Further deatil on construction sequencing is provided in the **Construction Method Statement** (Doc Ref. 10.3).

3.4.6 Surface water from the TCA will be collected, attenuated and discharged to ground or local watercourses under normal conditions. However, whilst the CDO is under construction, if the site is subject to an extreme storm or the receiving watercourses locally are inundated with surface water due to external factors, the TMO could be used to discharge surface water to sea. This offers additional protection to the Sizewell Marshes SSSI and

Minsmere South Levels from excess volumes. Further details of the TMO can be found at paragraph 3.4.57 below and within **Annex 2A.14**.

3.4.7 The use of the outfall would not have a significant impact on the input for surface water into the Sizewell Marshes SSSI as it would be used only when there was excess water in the SSSI. The use of the outfall would be subject to detailed design and approval through Requirement 5.

i. Water Management Zone 1

3.4.8 WMZ-1, shown in **Plate 3.6**, indicatively serves the proposed temporary haul road during construction as well as part of the site access road.

Plate 3.6: Water Management Zone 1

3.4.9 The proposed strategy is to drain the surface water run-off through infiltration techniques where possible, which will subsequently convey the surface water into a detention basin which will allow infiltration.

3.4.10 It is proposed that surface water runoff in WMZ-1 be primarily managed close to source.

3.4.11 WMZ-1 includes contractor compounds enclosed by the haul road to the north and main access road to the south and contains the concrete batching plant and several common user facilities.

3.4.12 The drainage in this catchment includes road edge swales to the north of haul road collecting the road runoff and overland runoff from the land inside the site boundary. Another network is proposed north of the main access road surrounding the contractors' compound to drain the runoff from the road, access passages and buildings. Both networks discharge into the WMZ-1 basin to the north east, where there is a high level overflow connection to the CDO which will allow for very extreme events beyond the 1 in 100 year return period.

3.4.13 The invert of the WMZ-1 basin is in close proximity to the groundwater table, therefore the basin is proposed to be lined with an impermeable membrane and a permanent outfall is proposed from the WMZ-1 basin to the nearby land drain.

3.4.14 The detention basin that forms part of the design will be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. A change in its size/shape may be required at detailed design stage. For further detail please see **Annex 2A.3** and **Annex 2A.5**.

3.4.15 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 will be provided in the bigger structures. These can be cleaned out periodically thereby protecting the SuDS structures and runoff to watercourses. As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

ii. Water Management Zone 2

Plate 3.7: Water Management Zone 2

3.4.16 WMZ-2 includes contractor compounds with the main access road to the north and contains the railhead in the centre of the catchment. The drainage in this catchment includes road edge swale to the south of the main access road collecting the road runoff and runoff from the compound area north of the railhead.

3.4.17 A separate network made up of filter drains is proposed at the compound perimeter to cater for the runoff immediately south of the rail head. Both networks discharge into the WMZ-2 basin, where there is a high level overflow connection to the CDO which will allow for very extreme events beyond the 1 in 100 year return period. An outlow to the Leiston Drain south of the WMZ-2 basin is proposed.

3.4.18 The ground investigation reports indicate that infiltration rates vary across the site and infiltration is possible. 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.

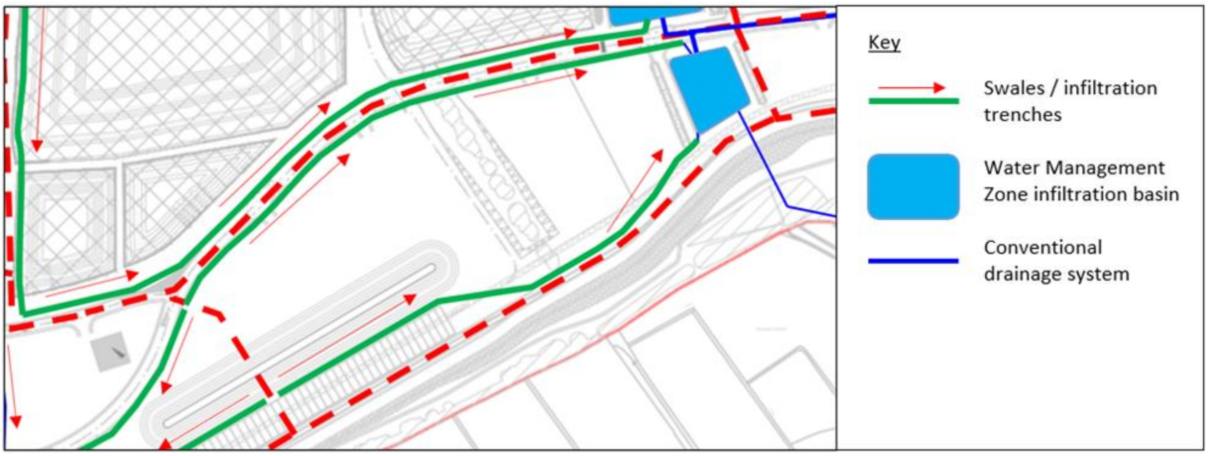
3.4.19 The detention basin that forms part of the design will be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. Further details for this area can be found in **Annex 2A.3** and **Annex 2A.5**.

3.4.20 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.

3.4.21 Any treatment will be 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. As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

iii. Water Management Zone 3

Plate 3.8: Water Management Zone 3



3.4.22 WMZ-3 is enclosed by roads on three sides and the rail to the south. The runoff is divided to drain into the road drainage swales proposed along the roads forming the periphery drainage.

3.4.23 A separate network has been designed to cater for the runoff from the unloading area platform and the railway drainage. The peripheral drainage discharges to the WMZ-3 basin to the east of the catchment.

3.4.24 The existing row of trees in this catchment will become a natural low point within this catchment since the ground level in the TCA is being raised. An outfall network crossing the railway will discharge from this low point to the existing drain outside the site boundary.

3.4.25 The detention basin that forms part of the design will be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. Further details for this area can be found in **Annex 2A.3** and **Annex 2A.5**.

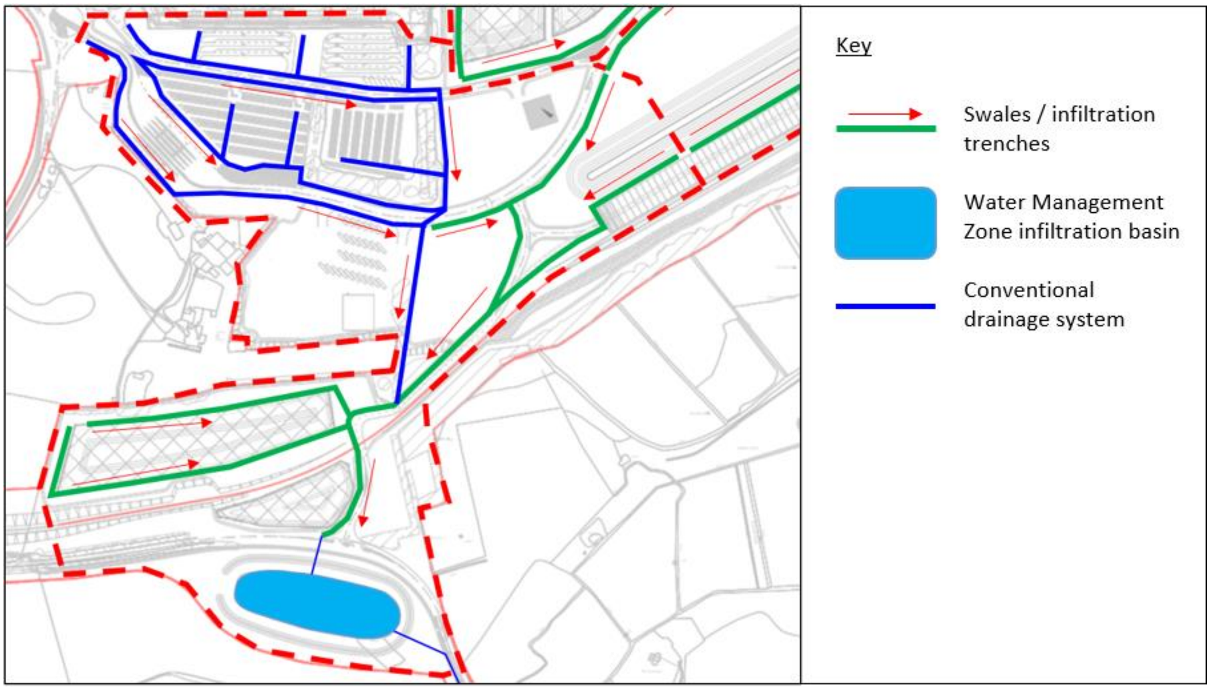
3.4.26 During construction, storm water runoff may have a high concentration of silts from fine particles contained within the soil or present on the surface of exposed substrata. Over time this can blind the surface of the basin/pond or the faces or base of other structures such as porous surfaces or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

3.4.27 Again, any treatment will be carried out as close to the potential pollution area as possible, however where pollutant load is high, strategically positioned filters, semi-permeable barriers and settling forebays will be provided in the bigger structures which can be cleaned out periodically thereby protecting the SuDS structures or runoff to watercourses are proposed. As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

3.4.28 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.

iv. Water Management Zone 6

Plate 3.9: Water Management Zone 6



3.4.29 WMZ-6 comprises the Green Rail Route, plaza area, secondary access roads and two storage areas.

3.4.30 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.

3.4.31 The rail drainage consists of filter drains adjacent to the track, cut off drains at the top of the cutting and toe ditches at the bottom of the embankment.

The plaza drainage consists of filter drains all along the road verges. Perimeter swales are proposed at the storage areas and the road drainage swales along the secondary access road. At the level crossing and at the existing tree pit location, alternative filter drains, and carrier drains are provided as appropriate. All the drainage networks discharge to the WMZ-6 basin located to the south of the catchment.

3.4.32 An overflow is proposed from the WMZ-6 basin to the Leiston Drain near Lover's Lane.

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

3.4.34 The detention basin that forms part of the design will be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. Further details for this area can be found in **Annex 2A.3** and **Annex 2A.5**.

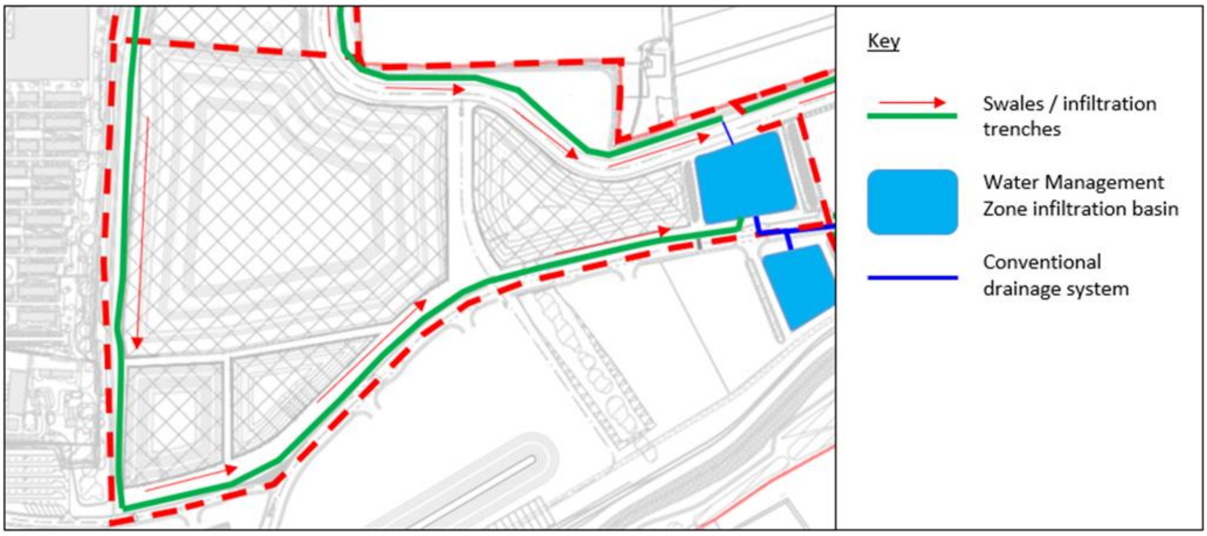
3.4.35 As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref. 1.9) requirements will be carried out to inform the detailed design which will be approved in accordance with Requirement 5.

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

3.4.36 These WMZs are intended to predominantly discharge by infiltration only. There is a very wide variation in infiltration capability across the site. The local source control elements and the detention basins have been sized using infiltration to ground as much as possible. If further detailed testing reveals that infiltration rates do not indicate sufficient runoff acceptance within these WMZs then infiltration management will be supplemented with runoff to local watercourses at runoff rates (greenfield) in accordance with the SuDS hierarchy.

i. Water Management Zone 4

Plate 3.10: Water Management Zone 4



3.4.37 This WMZ largely comprises the material storage area and stockpiles, and is enclosed by the haul road, secondary access and main access road. A part of the catchment to the north shares a common boundary with WMZ-5, which is also identified to be the localised high point. Perimeter road swales have been proposed along the roads to drain the runoff from the catchment. Two such networks, one from the north and the other from the south, discharge to the WMZ-4 basin located to the east of the catchment.

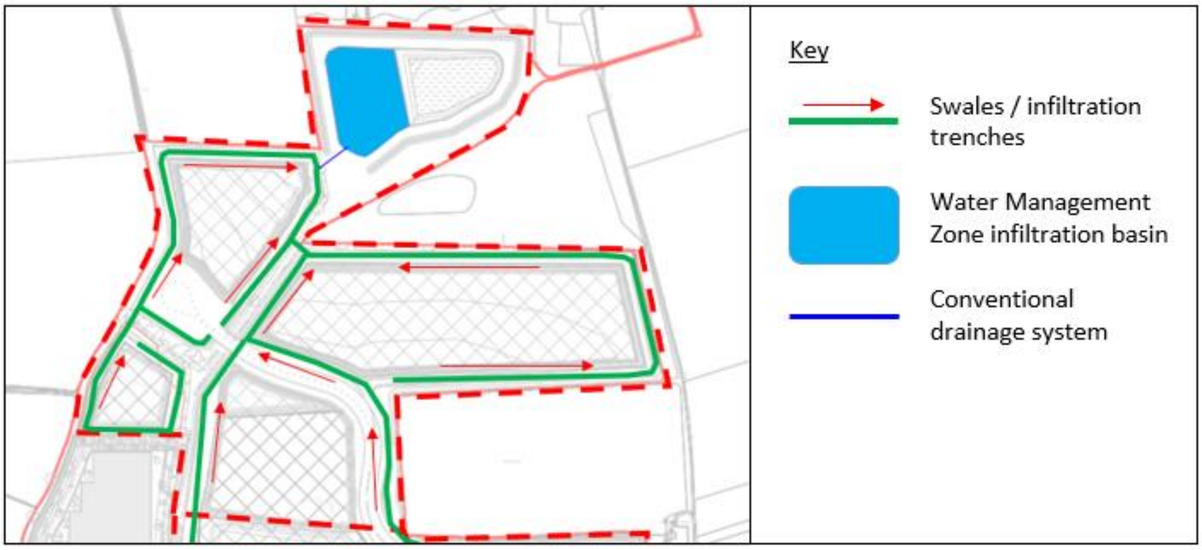
3.4.38 Surveys to date have indicated that infiltration is possible in this area and therefore conventional infiltration type drainage will be applied where practicable.

3.4.39 The detention basin that forms part of the design will be retained for exceedance storms and balancing excess volume that exceeds infiltration capacity. Further details for this area can be found in **Annex 2A.3** and **Annex 2A.5**.

3.4.40 As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref. 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

ii. Water Management Zone 5

Plate 3.11: Water Management Zone 5



3.4.41 This catchment largely comprises the borrow pits and stockpiles, which includes part of the haul road, and is enclosed by the site boundary access roads. Two drainage networks along the site boundary have been designed as perimeter swales, and there is a swale demarcating the storage areas, which is also identified to be the localised low point. All three networks discharge to the WMZ-5 basin located to the north of the catchment.

3.4.42 The proposed strategy is to drain the surface water run-off through infiltration techniques. Surveys to date have indicated that infiltration is possible in this area and therefore conventional infiltration type drainage will be applied where practicable.

3.4.43 If further detailed testing reveals that infiltration rates do not indicate sufficient runoff acceptance, then WMZ-5 basin will overflow into the Water Resource Storage Area (WRSA). The WRSA has an outfall which drains to a private drain on the eastern flank of the flood mitigation area. Further information on the details of of WMZ-5 basin can be found in **Annex 2A.3** and **Annex 2A.5**. The outfalls are shown on **Figure 2A.4 Rev 3**.

3.4.44 Where the runoff for material storage areas are located the surface water will be managed by providing trench infiltration or swales to capture runoff locally and maximise the source control philosophy. As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref. 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

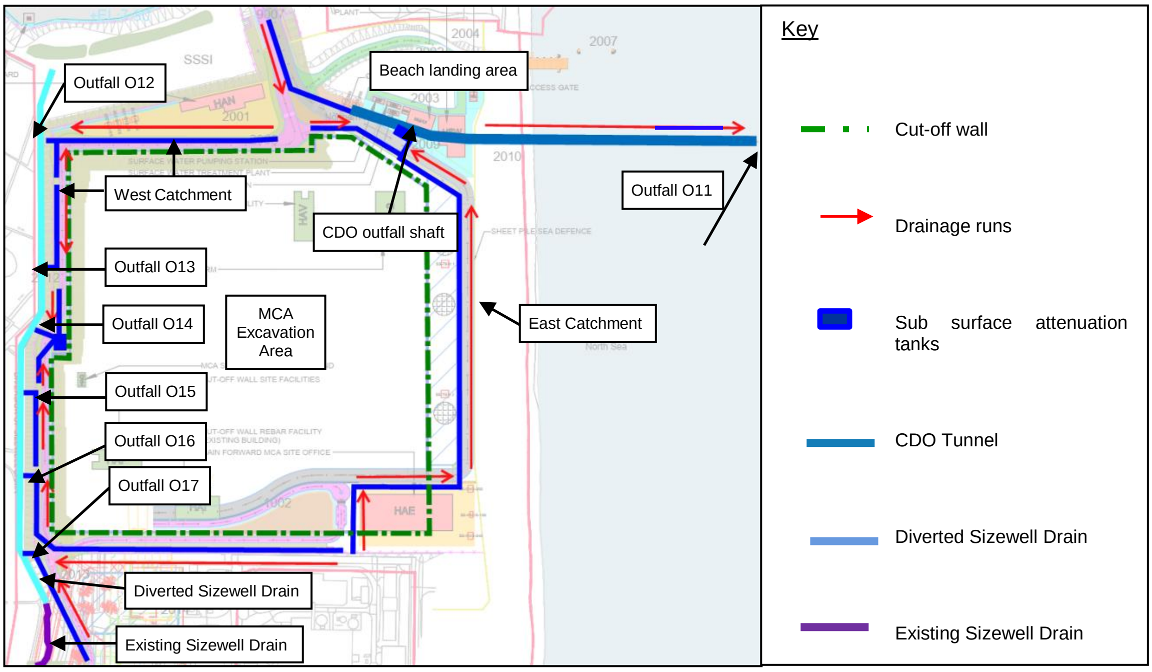
c) Water Management Zones 7, 8 and 9 (Group 3)

3.4.45 WMZs 7,8 and 9 constitute the Main Construction Area (MCA).

3.4.46 The MCA lies east of the Sizewell Marshes SSSI. The Sizewell Drain runs diagonally across the north-west corner of the MCA and needs to be realigned to pass along the western edge of the proposed MCA and reconnect to the Leiston Drain. The existing ground largely comprises an area of flat grassland, with the southwest corner occupied by existing Sizewell B infrastructure. To the north lies Dunwich forest, to the west is the Sizewell Belts Nature Reserve and to the east is the Suffolk Coast Path and North Sea.

3.4.47 The MCA is where the main nuclear islands and associated operational infrastructure will be sited.

Plate 3.12: Water Management Zones 7,8 and 9



3.4.48 WMZ-8 on the west side of the MCA is proposed to have six permanent construction outfalls along the diverted Sizewell Drain to accommodate areas external to the cut-off wall. This catchment, approximately 5 ha, considers the main access roads to the north, south and west of the MCA and a link road to Sizewell B. Currently, filter drains are proposed along the verge and attenuation is required to allow the flow to be restricted to greenfield runoff rates.

3.4.49 The discharge from WMZs 7 and 9 will 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.

3.4.50 The collection of surface water across WMZs 7, 8 and 9 will be designed to suit the sequence of construction events. Surface water will be collected and held in temporary attenuation ponds within WMZs 7, 8 and 9, before being treated using proprietary devices if required.

3.4.51 Prior to completion of the CDO, a Temporary Marine Outfall (TMO) is proposed to allow surface water from the main construction area to discharge to the sea. Further deatil on construction sequencing is provided in the **Construction Method Statement** (Doc Ref. 10.3).

3.4.52 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 or to the foreshore via the TMO 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 will be treated where practicable.

3.4.53 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-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. The feasibility of harvesting surface water for re-use on site will be assessed at the detailed design stage and reported within the details submitted for approval pursuant to Requirements 5.

i. Combined Drainage Outfall (CDO)

3.4.54 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.

3.4.55 On completion of cold comissioning the CDO will 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 will 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).

3.4.56 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.

3.4.57 An access shaft will 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.

ii. Temporary Marine Outfall (TMO)

3.4.58 The TMO is proposed in order to allow excess surface water runoff from the main construction area to be discharged to the sea during construction operations prior to the completion of the CDO.

3.4.59 As previously described in **section 3.4 a)**, the TMO also offers redundancy in the surface water management for WMZs 1 and 2.

3.4.60 The TMO is proposed to be installed early in the construction programme. It is anticipated that the TMO will remain in place for a period of 15 months.

3.4.61 Surface water will be temporarily pumped from the main construction site over the temporary sea defences and into a chamber before discharging through a gravity pipe towards the shoreline, above the mean high water mark.

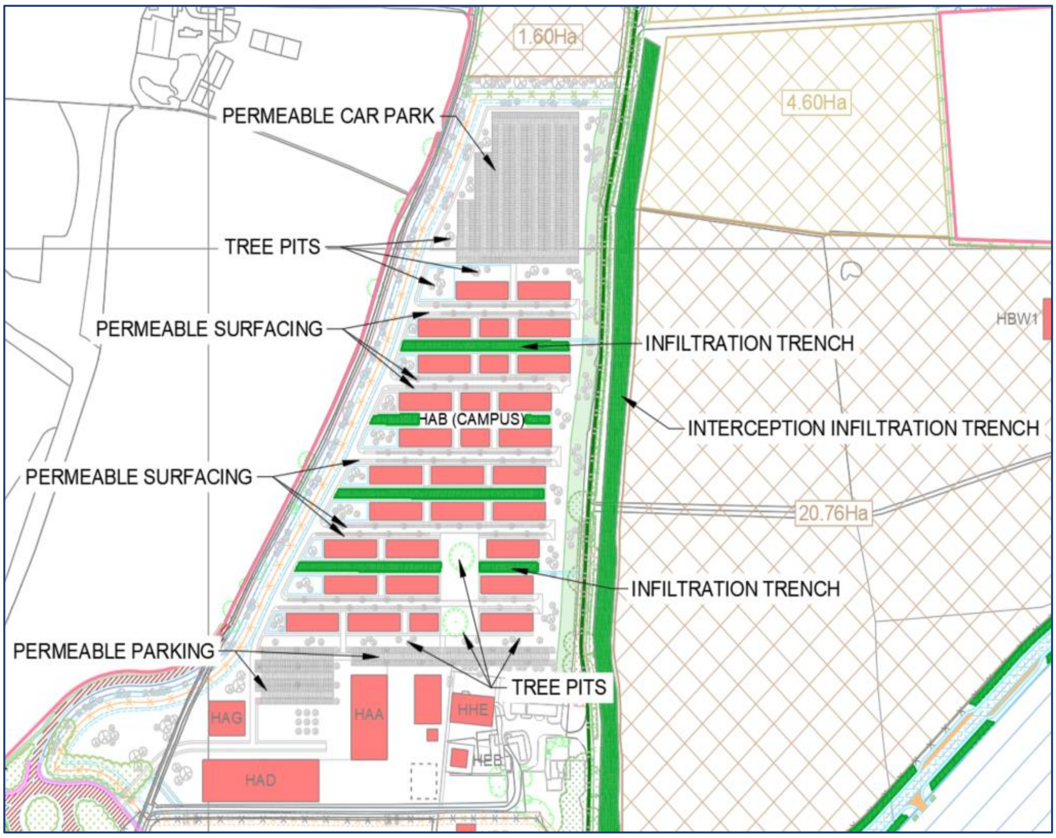
3.4.62 The temporary outfall will be located south of both the permanent and new, temporary beach landing facilities. The TMO will allow excess surface water runoff to be discharged to sea via the TMO.

3.4.63 The temporary outfall will be controlled through conditions set by the Environment Agency through discharge permit applications.

3.4.64 On completion of the CDO, the TMO will no longer be required, and will be removed.

d) Water Management Zone 10

Plate 3.13: Proposed techniques in Water Management Zone 10



3.4.65 WMZ-10 will indicatively provide attenuation and infiltration for the proposed accommodation campus site during construction.

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 will be returned to its former use upon completion of construction pursuant to Requirement 16.

3.4.67 The campus is located in the western end of the TCA. No watercourses are local in the vicinity of the campus to facilitate a direct connection for surface water discharge. Rainfall runoff will be stored below ground and will allow gradual infiltration.

3.4.68 The necessary attenuation storage will primarily be located beneath the car parks and paved 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 underlying soil. The ground investigation reports indicate that infiltration rates vary across the site. If infiltration is insufficient to manage all of the run-off then it will be supplemented by discharge at greenfield rates to watercourse via the TCA.

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 will 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 will 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 will 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 will 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.

e) Land East of Eastlands Industrial Estate

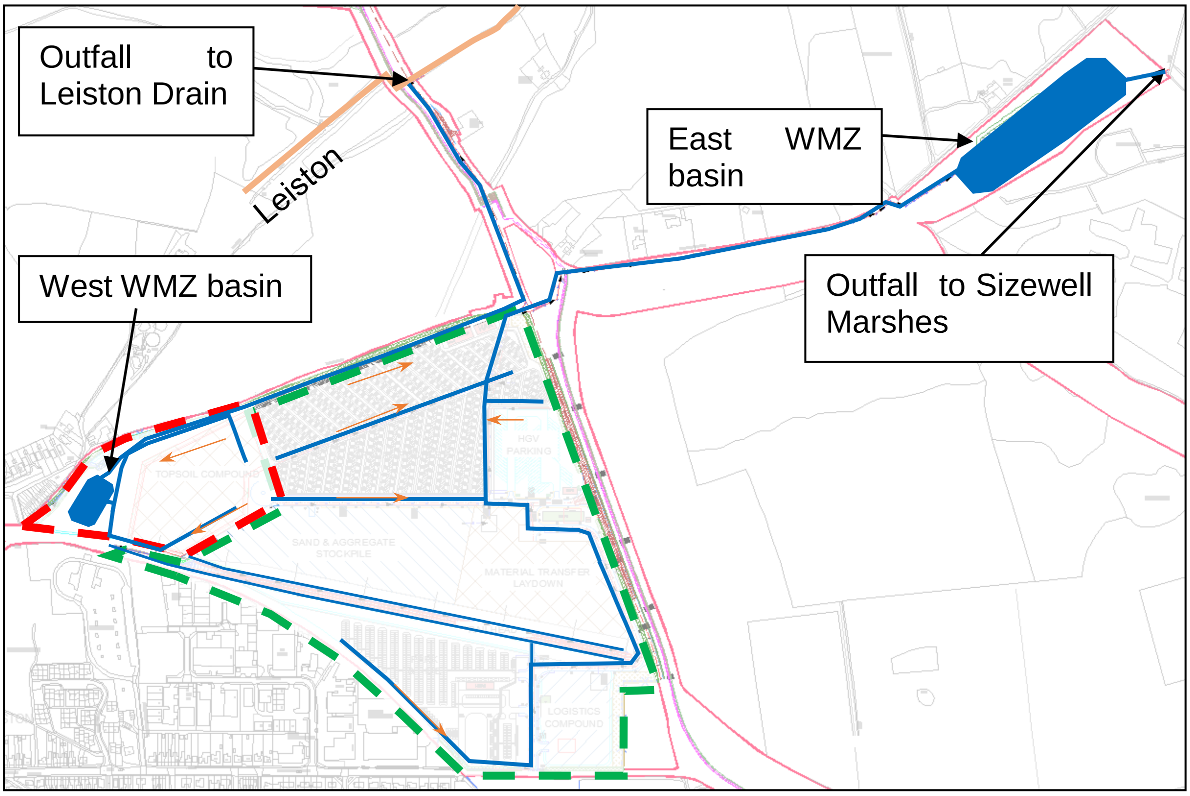
3.4.78 LEEIE would serve a variety of uses including topsoil and aggregate storage, a park and ride facility and a caravan park as set out in **Chapter 3 Volume 2** of the **Environmental Statement**, as updated by the **ES addenda** [AS-181].

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

3.4.80 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 and Sizewell Drain at greenfield rates. 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.

3.4.81 Two water management zone attenuation features are proposed to store runoff prior to discharge. Runoff from the topsoil compound area and the area west of this compound (dashed red line in Figure 3-7) will be captured in swales and attenuated in the West WMZ Basin, before discharging to the Leiston Drain near Lover's Lane. Surface water runoff from all other areas (dashed green line in Figure 3-7) within the LEEIE will be conveyed to the East WMZ Basin, before discharging to the Sizewell Marshes. The outflows will be limited to greenfield runoff rates.

Plate 3.14: Drainage layout at the Land East of Eastlands Industrial Estate



3.4.82 The Drainage Strategy within the LEEIE has been modified following agreement with the Environment Agency and Suffolk County Council to allow more runoff to be attenuated in the East WMZ basin and discharge to the Sizewell Marshes.

3.4.83 In order to accommodate the larger volumes of runoff from longer return period storms, the land to the east of the LEIEE will be used. This area will 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 Sizewell Drain. For further detail on this area refer to **Annex 2A.4** and **Annex 2A.5**.

3.4.84 Surface water within the earth material storage area will be managed by providing trenches or swales to capture runoff locally and maximise the source control philosophy. With infiltration being unlikely to be an effective technique for heavy or prolonged events, attenuation storage in the West WMZ basin will be used with a pumped discharge to take flow to the upper area of the site. Allowable outfall rates at greenfield runoff will be used as agreed with stakeholders.

3.4.85 The caravan pitches will be based on permeable surfacing where possible, to take advantage of any infiltration into the ground and reduce runoff.

3.4.86 The large car parking area for the park and ride facility permeable surfacing will again be utilised to allow for any infiltration into the ground. The surfacing will be robustly constructed, emulating the current drainage characteristics, whilst providing additional treatment of any incidental oil spills.

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

3.4.88 Any pollutant runoff from laydown or storage areas will be managed using SuDS techniques or proprietary products. As part of the detailed design a treatment train analysis to C753 CIRIA SuDS Manual (Ref. 1.9) requirements will be carried out to ensure pollutant loads are to recommended limits.

3.4.89 The site will be reinstated upon completion of the construction phase pursuant to Requirements 14 and 16.

3.5 Foul water management

a) Main development site

3.5.1 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 capacity of the accommodation campus is less than 10,000 therefore the site will not be required to comply with the Urban Waste Water Directive (Ref. 1.8) in respect to advanced treatment requirements.

3.5.2 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.

3.5.3 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.

3.5.4 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, will be carefully considered. Where the rising main is temporary, consideration can be made for alternative routes that maximise the flexibility for construction phasing.

3.5.5 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.

3.5.6 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.

3.5.7 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**.

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

3.5.9 Typical approaches during construction 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.

3.5.10 The permanent sewage treatment plant will 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.

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

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

b) Land East of Eastlands Industrial Estate

3.5.13 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.

3.5.14 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.

3.5.15 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 is cess pits with tankering to the TCA where foul water may be treated and disposed of via the CDO. The details will be submitted for approval pursuant to Requirements 5.

4 ASSOCIATED DEVELOPMENT SITES

4.1 Water Management Zone assessment

4.1.1 The following sections set out the Drainage Strategy for each of the AD sites.

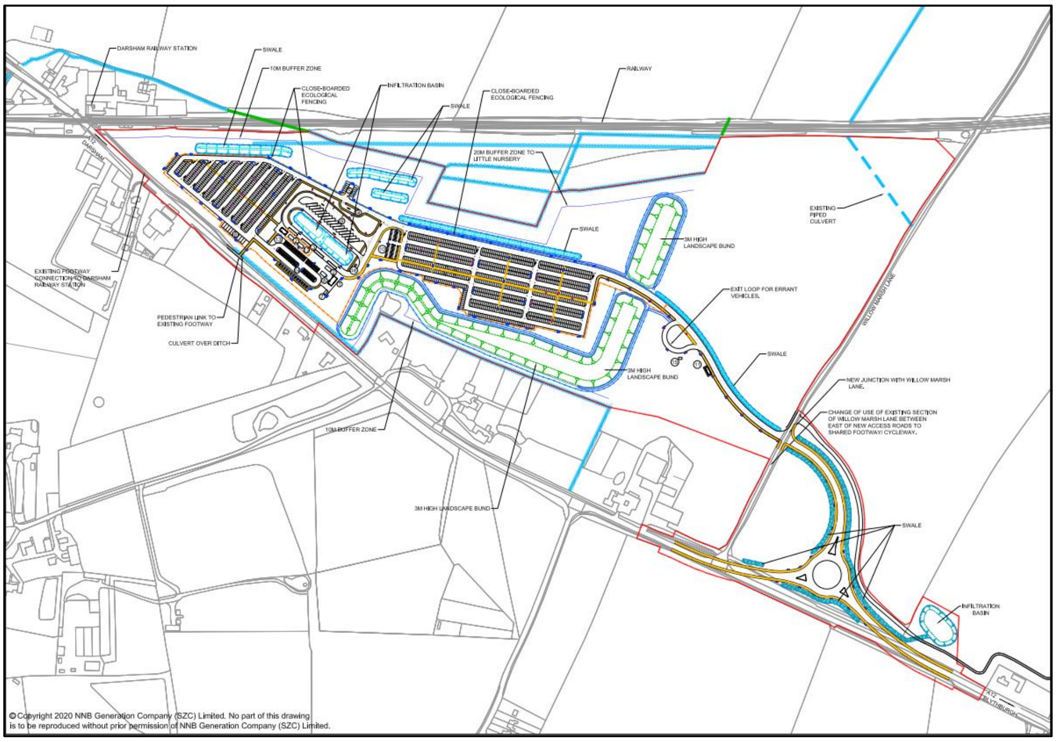
a) Northern Park and Ride

4.1.2 The northern park and ride forms one of the AD which are required to mitigate traffic impacts arising from the main development site.

4.1.3 The site is located alongside the A12 at Darsham and 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.

4.1.4 The general layout of the northern park and ride site is shown below in **Plate 4.1**. Further details can be found in **Annex 2A.6**.

Plate 4.1: Northern Park and Ride



4.1.5 The northern park and ride will provide a transport hub from which construction workforce are driven to site by shuttle thus reducing the construction traffic needing to access the main development site.

4.1.6 Full details of its facilities are contained in **Volume 3 Northern Park and Ride Chapter 2 Description of the Northern Park and Ride** of the **ES** [APP-350], as updated by the **ES addenda** [AS-182], and are described in summary below.

4.1.7 The site will consist of workforce parking, welfare, security and amenity buildings. The workforce parking includes car parking spaces, accessible spaces, minibus/van spaces, pick up and motorcycle spaces.

4.1.8 The northern park and ride site, the site entrance and the access from the A12 will generate surface water runoff which will require removal, treatment as necessary, and disposal.

4.1.9 The northern park and ride facility and its associated access and A12 road changes will remain in place and use during construction of the Sizewell C power station. Once construction is complete the site will be closed, decommissioned, and returned to current agricultural use pursuant to Requirement 24.

4.1.10 The proposed access roundabout will be removed and the A12 will be returned to its current alignment pursuant to Requirement 24.

4.1.11 As part of ground investigations and infiltration testing trial pits were excavated within the northern park and ride site.

4.1.12 A single BRE365 infiltration test was carried out at each location. Since there was no discernible drop in water in the trial pit over 24 hours, second and third tests were not undertaken.

4.1.13 The results demonstrate that infiltration is not viable and therefore surface water runoff from the development site must be disposed of via local watercourse. Further details can be found in **Annex 2A.6**.

4.1.14 Full details on surface water, groundwater, geology, and hydrogeology are provided in **Volume 3, Chapter 12** of the **ES** [APP-376], as updated by the **ES addenda** [AS-182].

4.1.15 The proposed design for these facilities is to drain the surface water run-off through carrier drains and discharge into attenuation basins and swales.

4.1.16 Runoff from the internal roads and the bus/HGV standing areas with impermeable surface will be drained via surface outlets, gullies, linear channels and drains etc. These will discharge into underground carrier drains which will convey the runoff to the same attenuation basins and swales.

4.1.17 Bypass interceptors will be installed downstream of the bus/HGV standing areas in order to remove hydrocarbon and silt contaminants which will improve the water quality of discharge to the attenuation basins and swales.

4.1.18 The car parking areas will have a permeable surface allowing runoff to permeate into and be temporarily stored in the sub-base. This will assist with attenuating peak flow rate, provide some storage and initial treatment of the runoff. The sub-base will allow flow to drain into the carrier drains.

4.1.19 The underground carrier drains will discharge all surface water into a series of cascading attenuation basins and swales which will provide suitable final treatment in accordance with CIRIA C753 The SuDS Manual (Ref. 1.9).. They will also provide attenuation storage for all runoff required in order

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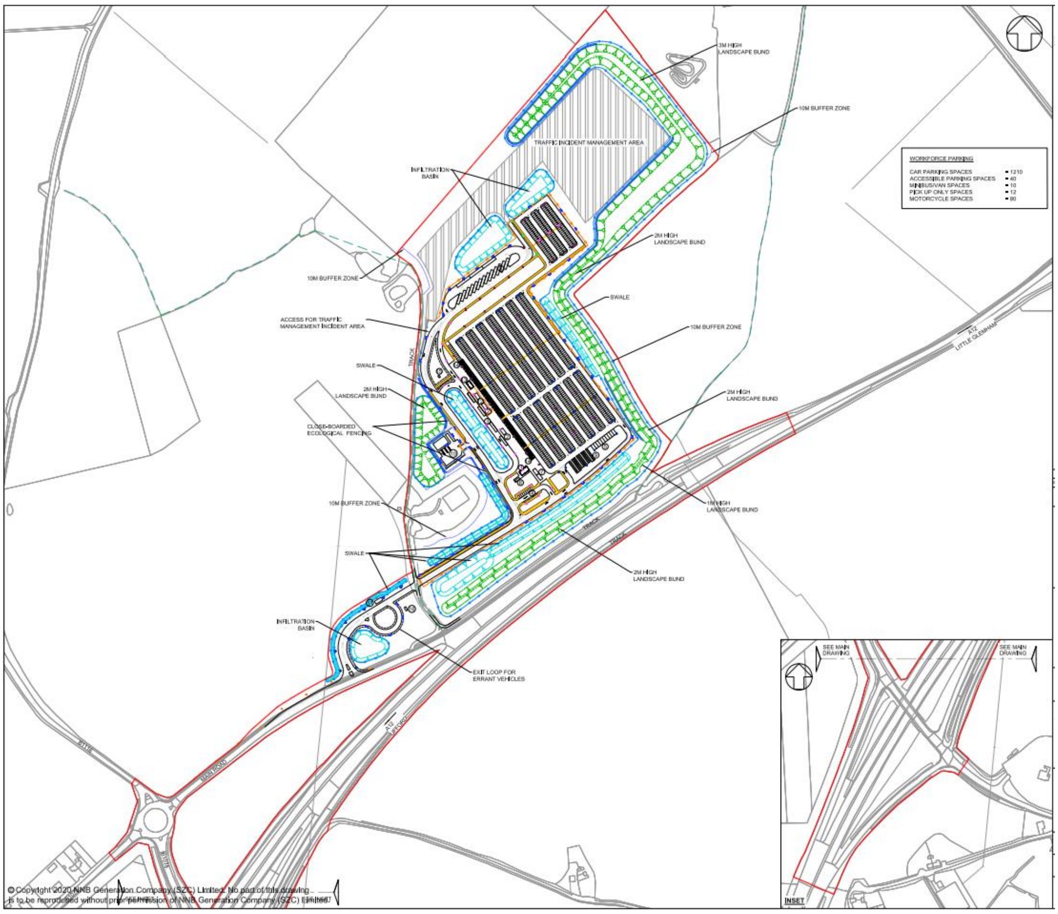
that discharge to watercourse from the site is limited to the equivalent greenfield runoff.

b) Southern Park and Ride

4.1.20 The southern park and ride site is located alongside the A12 at Wickham Market. Its function is to provide a transport hub from which construction workforce are driven to site by shuttle thus reducing the construction traffic needing to access the main development site.

4.1.21 The general layout of the southern park and ride site is shown below in **Plate 4.2**. Further details can be found in **Annex 2A.7**.

Plate 4.2: Southern Park and Ride



4.1.22 Full details of its facilities are contained in **Volume 4 Southern Park and Ride Chapter 2 Description of the Southern Park and Ride** of the **ES** [APP-380], as updated by the **ES addenda** [AS-183], and are described in summary below.

4.1.23 The site will consist of workforce parking, welfare, security and amenity buildings. The workforce parking includes car parking spaces, accessible spaces, minibus/van spaces, pick up and motorcycle spaces. It also has a Traffic Incident Management Area. This area is a holding park in which vehicles can be diverted in the event of an incident on the highway network or at the construction site.

4.1.24 The southern park and ride site and the site access entrance will generate surface water runoff from which will require removal, treatment as necessary and disposal.

4.1.25 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.

4.1.26 As part of ground investigations and infiltration testing three trial pits were excavated within the southern park and ride site. The results demonstrate that infiltration is only viable at one location at a higher elevation in the north of the site.

4.1.27 These results demonstrate that disposal of surface water runoff by infiltration is achievable but only at the north. The results of further infiltration testing will be taken into account throughout the design stage. Further details are provided in **Annex 2A.7**.

4.1.28 Full details on surface water, groundwater, geology, and hydrogeology are provided in **Volume 4 Chapter 12** of the **ES** [APP-407] as updated by the **ES addenda** [AS-183].

4.1.29 The strategy for the surface water run-off associated with the southern park and ride is storage and infiltration SuDS techniques where practicable.

4.1.30 All surface water runoff is to be contained within the site and removed by infiltration to ground. Due to the proven lack of infiltration in the middle of the site, it is intended that that runoff will be removed and collected in the lowest elevation in the south west and then pumped to the north where infiltration is viable. If further infiltration testing demonstrates that infiltration is viable in the south west corner of the site, then this will be modified to remove the pumping requirement.

4.1.31 Runoff from roofs will be drained via downpipes and gullies, as appropriate to underground carrier drains and discharge into attenuation basins and swales.

4.1.32 Runoff from the internal roads, the bus/HGV standing areas and the Traffic Incident Management Area, which must have an impermeable surface will be drained via surface outlets, gullies, linear channels and drains etc. These will discharge into underground carrier drains which will convey the runoff to the same attenuation basins and swales or in the north to infiltration basins.

4.1.33 Bypass interceptors will be installed downstream of the bus/HGV standing areas in order to remove hydrocarbon and silt contaminants which will improve the water quality of discharge to the attenuation basins, swales and infiltration basins.

4.1.34 The car parking areas will have a permeable surface allowing runoff to permeate into and be temporarily stored in the sub-base. This will assist with attenuating peak flow rate, provide some storage and initial treatment of the runoff. The sub-base will allow flow to drain into the carrier drains.

4.1.35 In the centre and south parts of the site, the underground carrier drains will discharge all surface water into a series of swales and attenuation basins which will provide suitable treatment in accordance with CIRIA C753 The SuDS Manual (Ref. 1.9)..

4.1.36 If further infiltration testing demonstrates that infiltration is not viable in the south west corner of the site, the swale/attenuation basin network will discharge into a pumping station which will pump runoff to the infiltration basins to the north.

4.1.37 In the north part of the site, the underground carrier drains will discharge all surface water into one of two infiltration basins by gravity. The infiltration basins will provide suitable treatment in accordance with CIRIA C753 The SuDS Manual (Ref. 1.9)..

4.1.38 The attenuation storage for the central and south areas is provided using underground storage in order to maximise the use of the area and reduce land take.

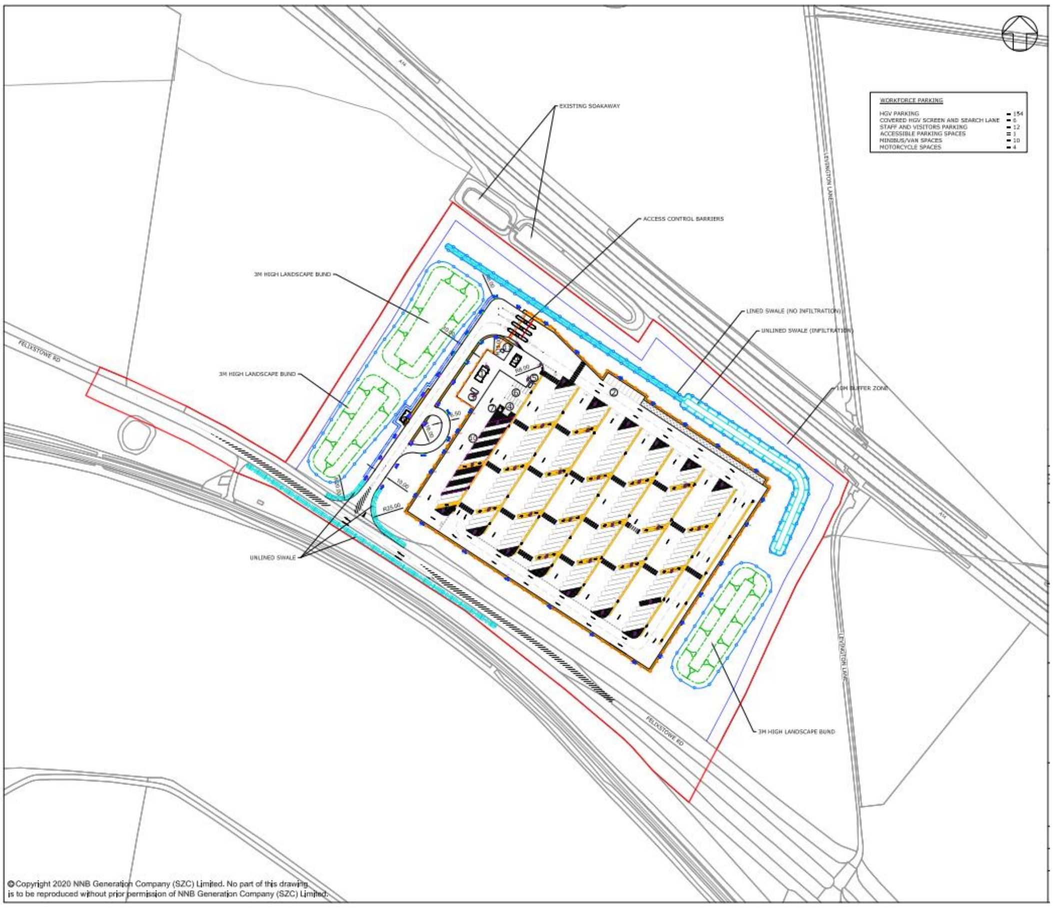
c) Freight management facility

4.1.39 The proposed freight management facility is to be located alongside the A14 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.

4.1.40 The site will consist of parking for approximately 150 HGVs, workforce parking, welfare, security and amenity buildings. The workforce parking includes car parking spaces, accessible spaces, cycle spaces and motorcycle spaces.

4.1.41 The general layout of the freight management facility site is shown below in **Plate 4.3**. Further details can be found in **Annex 2A.8.**

Plate 4.3: Freight Management Facility



4.1.42 The freight management facility and site entrance will generate surface water runoff will require removal, treatment as necessary and disposal.

4.1.43 The site entrance and access from Felixstowe Road will generate highway runoff which will require to be removed, treated as necessary and disposed.

4.1.44 The freight management facility and its associated access and local road changes will remain in place and use during construction of the Sizewell C power station. Once construction is complete the site will be closed, decommissioned and returned to current agricultural use pursuant to Requirement 24.

4.1.45 It is also intended that the proposed access will be removed and Felixstowe Road will be returned to its current alignment pursuant to Requriement 24.

4.1.46 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.

4.1.47 As part of ground investigations and infiltration testing three trial pits were excavated within the site.

4.1.48 Three BRE365 infiltration tests were carried out at each location and the results demonstrate that disposal of surface water runoff by infiltration is achievable. Further detail is provided in **Annex 2A.8**.

4.1.49 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 8 Chapter 12** of the **ES** [APP-536], as updated by the **ES addenda** [AS-187].

4.1.50 The strategy for the surface water run-off associated with the freight management facility is storage and infiltration SuDS techniques where practicable.

4.1.51 All surface water runoff is to be contained within the site and removed by infiltration to ground. This philosophy will ensure no additional impervious areas are added to the existing drainage network.

4.1.52 Surface water runoff will be drained via downpipes and gullies, as appropriate to underground carrier drains. All of the internal roads and the HGV parking areas will have an impermeable surface and will be drained via surface outlets, gullies, linear channels and drains etc. These will discharge into underground carrier drains.

4.1.53 Bypass interceptors will be installed on the carrier drains downstream of the bus/HGV standing areas in order to remove hydrocarbon and silt contaminants which will improve the water quality of the runoff before discharge to ground.

4.1.54 The underground carrier drains will discharge all surface water runoff into two underground attenuation storage tanks from where it will infiltrate to ground.

4.1.55 The use of underground attenuation storage tanks rather than infiltration basins is proposed to maximise the space within the site. The tanks are proposed to be located beneath the landscaped bunds located on the east and west sides of the site with additional storage volume being provided by swales.

4.1.56 The swales will be located along the full length of the northern side of the site and the lowest part of the eastern side of the site. Since ground levels fall from south to north the swales will also intercept runoff from surface water overland flow which does not drain into the underground drainage network.

4.1.57 The swales will also remove surface water runoff by infiltration to ground with the exception of the western portion of the swale adjacent to the A14 infiltration basin facility, where this length of swale will be lined.

4.1.58 For further details on the proposed drainage arrangements for the Freight Management Facility please see **Annex 2A.8**.

d) Sizewell Link Road

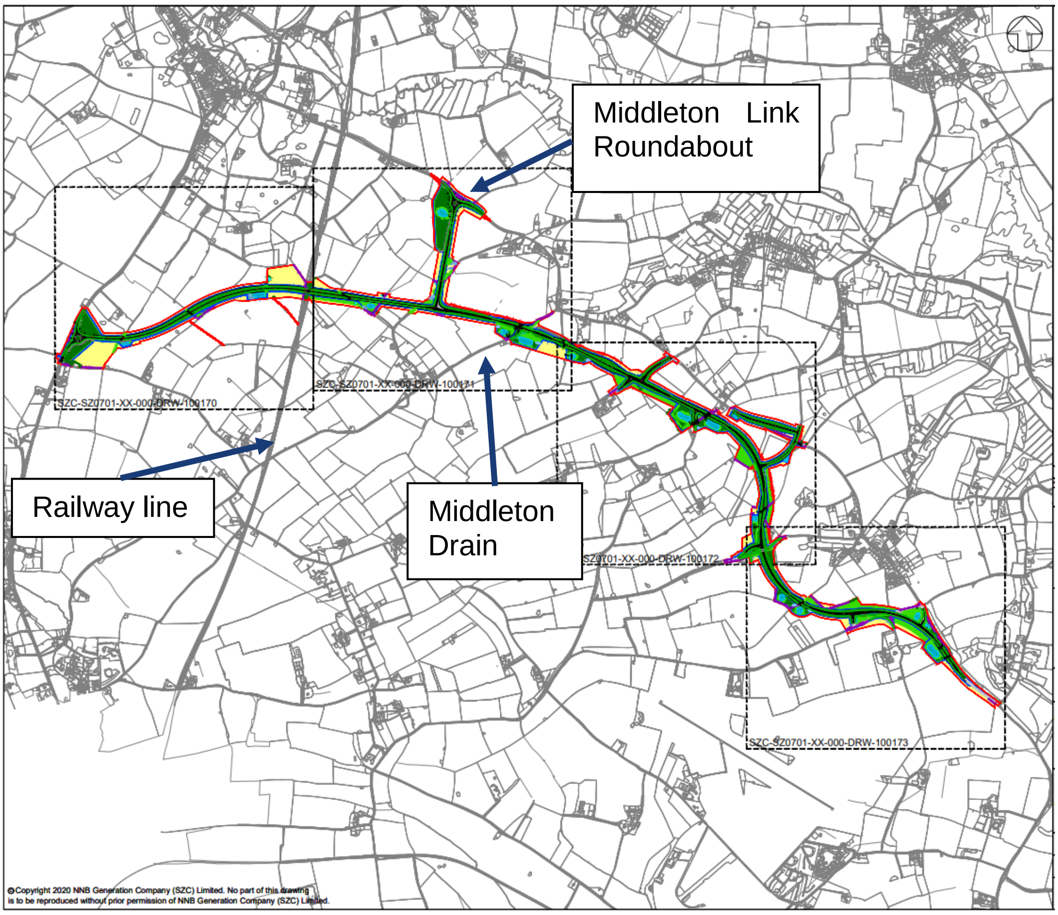
4.1.59 The Sizewell link road is a proposed permanent single carriageway road that would run 6.8km from the A12 just south of Yoxford in an easterly direction, joining the B1122 south of the town of Theberton.

4.1.60 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.

4.1.61 The road will create a new route around the south of the villages of Yoxford, Middleton Moor and Theberton, helping to reduce the amount of traffic on the B1122 during the peak construction phase of the Sizewell C Project.

4.1.62 The general layout of the Sizewell link road is shown below in **Plate 4.4**.

Plate 4.4: Sizewell Link Road



4.1.63 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 6, Chapter 12** of the **ES** [APP-476], as updated by the **ES addenda** [AS-185].

4.1.64 The Sizewell link road will be designed to Suffolk County Council's (SCC) adoptable standards, confirmed to be:

- Design Manual for Roads and Bridges (DMRB)/ Manual of Contract Documents for Highway Works (MCHW)
- CIRIA C753 The SUDS Manual (Ref. 1.9).
- Sustainable Drainage Systems (SuDS) a Local Design Guide Appendix A to the Suffolk Flood Risk Management Strategy, Suffolk County Council, May 2018

4.1.65 The Sizewell link road will generate highway surface water runoff which will require removal, treatment as necessary and disposal at a controlled rate of discharge.

4.1.66 The strategy for the surface water run-off associated with the Sizewell link road is storage and attenuation using SuDS techniques where practicable, with discharge to local watercourses.

i. Highway Drainage Design East of the Railway

4.1.67 Geotechnical investigations have demonstrated that it is not possible to remove highway runoff by infiltration to ground. For the Sizewell link road and its side roads located to the east of the East Suffolk railway line there are watercourses to which discharge by gravity can be made.

4.1.68 For the Middleton Link roundabout there is no watercourse shown on available OS based plans, however, a 750 mm culvert was found at this location crossing below the B1122. This culvert discharges into a deep ditch to the north which discharges into a tributary of the Minsmere River.

4.1.69 The proposed drainage arrangement at the Middleton Link roundabout is to discharge to an attenuation basin. The basin will also receive highway runoff from swales located on either side of the road, to the north of the link road crest point. The Sizewell link road will then discharge to the existing culvert and ditch at an acceptable attenuated flow rate.

ii. Highway Drainage Design West of the Railway

4.1.70 It has been confirmed through testing that infiltration is not possible west of the railway and surveys have confirmed that gravity drainage to nearby watercourses is not possible.

4.1.71 It is proposed that surface water from the Sizewell link road west of the railway will be attenuated in basins.

4.1.72 Surface water will then be pumped to the east of the railway and into the Middleton Drain. If an alternative outfall be located that would eliminate the need for a second pumping station and rising main across the railway discharging into the Middleton Drain west catchment.

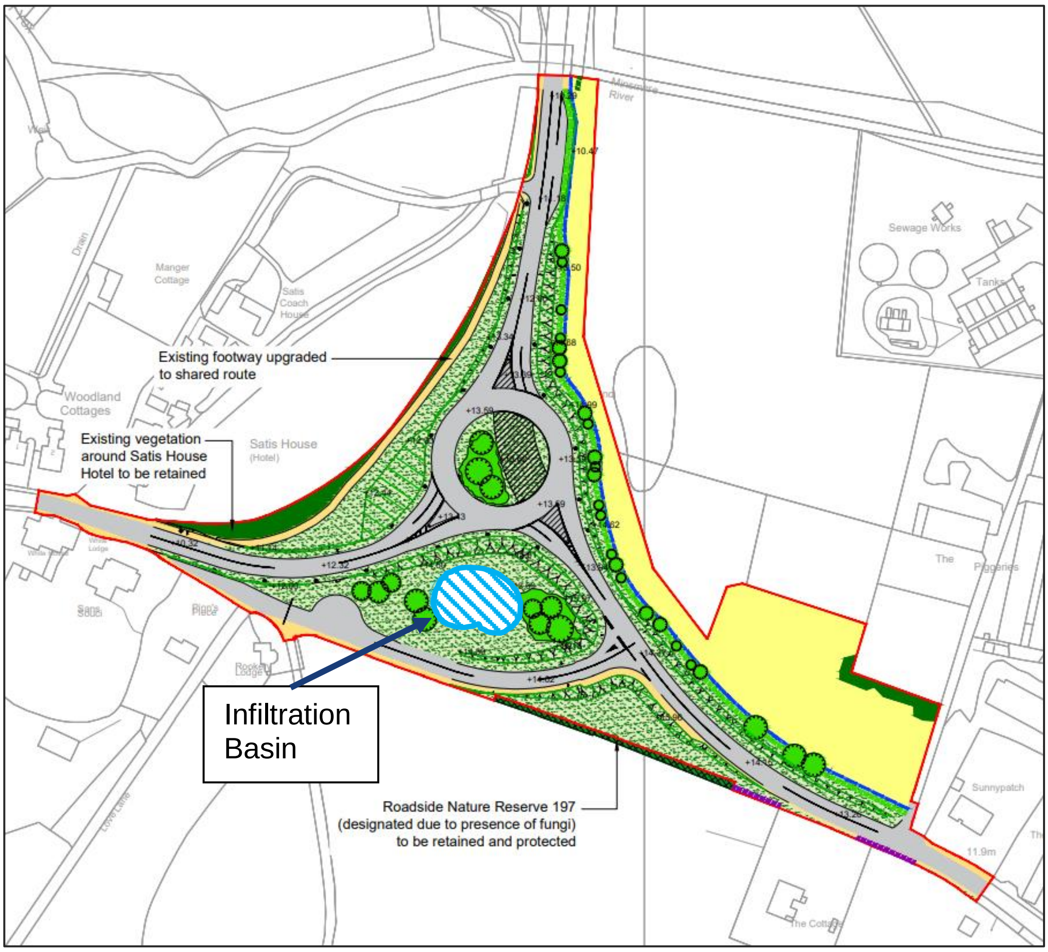
4.1.73 These features will form part of the permanent drainage of the link road, and management and maintenance arrangements will be submitted to Suffolk County Council for approval pursuant to Requirement 22 to ensure that the drainage performs as intended for the life of the link road. For further details on the proposed drainage arrangements for the Sizewell link road please see **Annex 2A.9**.

e) Yoxford roundabout

4.1.74 The proposed Yoxford roundabout consists of a new three arm roundabout, which includes the realignment of the existing A12 and B1122 Middleton Road, and the removal of the existing A12 / B1122 junction.

4.1.75 The general layout of Yoxford roundabout is shown below in **Plate 4.5**.

Plate 4.5: Yoxford Roundabout



4.1.76 The Yoxford roundabout will modify the existing public highway and once constructed will continue to form part of the highway network maintained by Suffolk County Council (SCC). It will be designed to meet SCC adoptable standards, confirmed to be:

- Design Manual for Roads and Bridges (DMRB Ref 1.10)/ Manual of Contract Documents for Highway Works (MCHW)
- CIRIA C753 The SUDS Manual (Ref. 1.9).
- Sustainable Drainage Systems (SuDS) a Local Design Guide Appendix A to the Suffolk Flood Risk Management Strategy, Suffolk County Council, May 2018

4.1.77 The Yoxford roundabout highway modifications will continue to generate surface water highway runoff which will require removal, treatment as necessary and disposal.

4.1.78 The results of Geotechnical Investigation with infiltration rate testing at the site of the infiltration basin demonstrate that it is possible to remove highway runoff by infiltration to ground.

4.1.79 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 7 Chapter 12** of the **ES** [APP-507], as updated by the **ES addenda** [AS-186].

4.1.80 The strategy for the surface water run-off associated with the Yoxford roundabout is storage and infiltration SuDS techniques.

4.1.81 It is proposed to convey run-off from impermeable highway surfaces into gullies and filter drains and convey surface water to infiltration features located adjacent to the highway and the proposed roundabout.

4.1.82 These features will form part of the permanent drainage of the roundabout, and a management and maintenance plan will be required to ensure that the drainage performs as intended for the life of the roundabout.

4.1.83 For further details on the proposed drainage arrangements for the Yoxford roundabout please see **Annex 2A.10**.

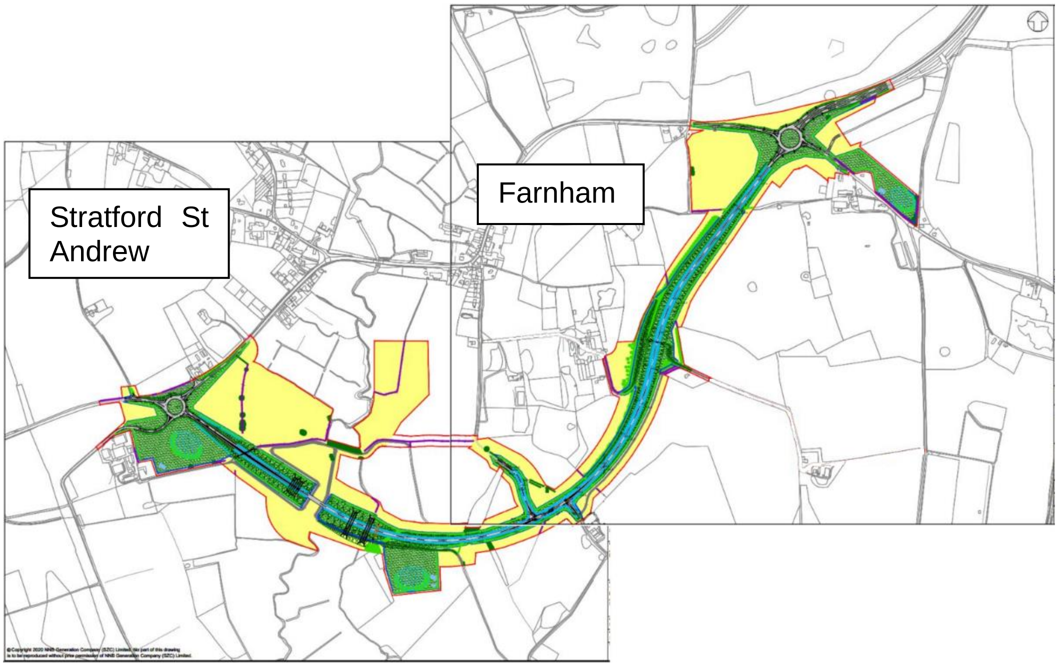
f) Two village bypass

4.1.84 The two village bypass consists of a new 2.4 km long single carriageway road bypassing the villages of Stratford St Andrew and Farnham. The new bypass will connect to the existing A12 via at grade roundabouts at both the western and eastern ends of the scheme. The roundabout at the western end ties in with the existing A12 Main Road and the roundabout at the eastern end ties in with Friday Street.

4.1.85 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.

4.1.86 The general layout of the two village bypass is shown below in **Plate 4.6**.

Plate 4.6: Two Village Bypass



4.1.87 The two village bypass will be designed to Suffolk County Council's (SCC) adoptable standards, confirmed to be:

- Design Manual for Roads and Bridges (DMRB) (Ref 1.10)/ Manual of Contract Documents for Highway Works (MCHW)
- CIRIA C753 The SUDS Manual (Ref. 1.9).
- Sustainable Drainage Systems (SuDS) a Local Design Guide Appendix A to the Suffolk Flood Risk Management Strategy, Suffolk County Council, May 2018

4.1.88 The two village bypass will generate highway surface water runoff which will require removal, treatment as necessary and disposal.

4.1.89 The results of geotechnical investigation infiltration testing undertaken at the proposed location of the three infiltration basins and at locations along the line of the two village bypass demonstrate that it is possible to remove highway runoff by infiltration to ground. Further details can be found in **Annex 2A.11**.

4.1.90 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 5 Chapter 12** of the **ES** [APP-441], as updated by the **ES addenda** [AS-184].

4.1.91 The strategy for the surface water run-off associated with the two village bypass is storage and infiltration SUDS techniques.

4.1.92 The proposed strategy is to convey run-off from impermeable highway surfaces into swales, filter drains and infiltration features located adjacent to the proposed bypass. A SuDS management train with the combination of swales, filter drains and infiltration basins is proposed.

4.1.93 These features will form part of the permanent drainage of the bypass, and a management and maintenance plan will be required to ensure that the drainage performs as intended for the life of the bypass.

4.1.94 For further details on the proposed drainage arrangements for the two village bypass please see **Annex 2A.11**.

g) Green Rail Route and Rail Extension proposals

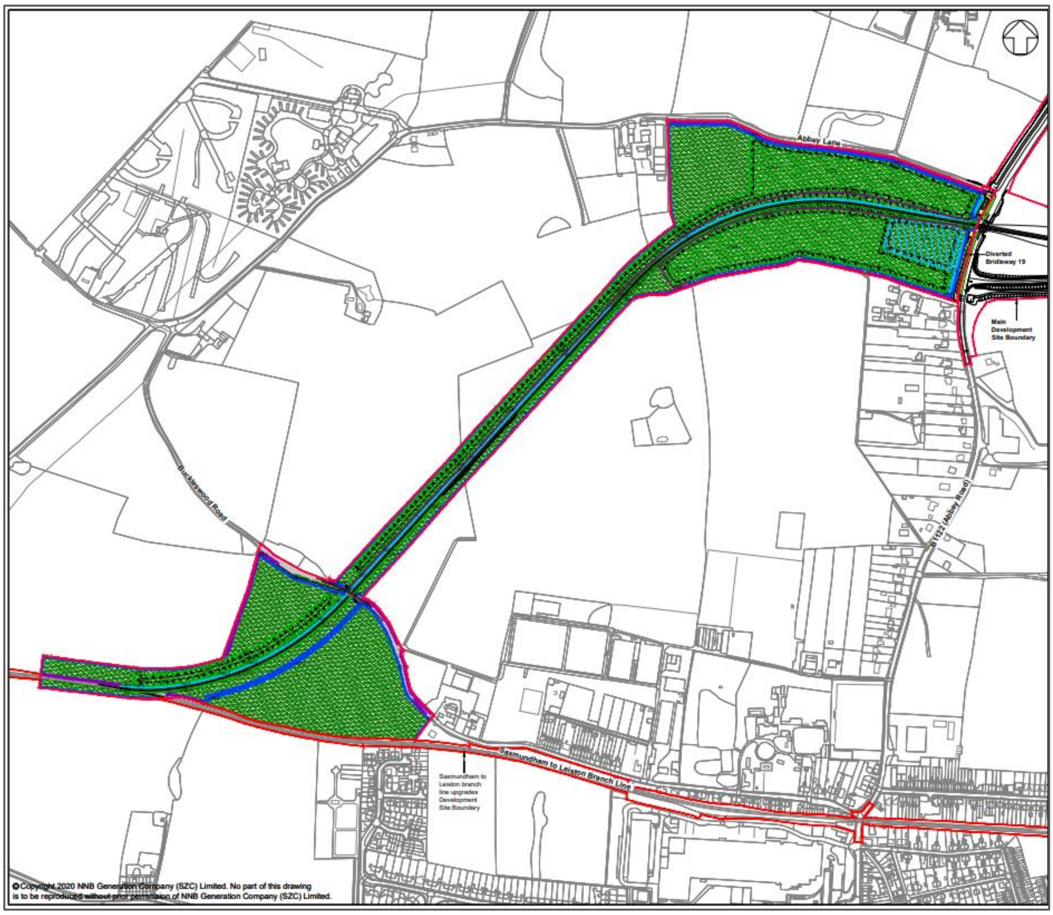
4.1.95 The construction of the Sizewell C Project will require the delivery of substantial amounts of construction materials by rail. SZC Co. has developed an integrated transport strategy for the use of rail in the delivery of freight during construction, reducing heavy goods vehicle (HGV) movements on local roads.

4.1.96 The rail proposals comprise a temporary rail extension west to east rail route that would connect the existing Saxmundham to Leiston branch line to the Sizewell C main development site, known as the rail extension route, and upgrades to the existing Saxmundham to Leiston branch line.

4.1.97 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.

4.1.98 The general layout of the green rail route and rail extension is shown below in **Plate 4.7**.

Plate 4.7: Green Rail Route and Rail Extension



4.1.99 Full details on surface water, groundwater, geology, hydrogeology and findings from the site visit are provided in **Volume 9 Chapter 12** of the **ES** [APP-570], as updated by the **ES addenda** [AS-188].

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

4.1.101 The Saxmundham to Leiston branch line will not change the existing impermeable area.

4.1.102 The proposed rail extension route may produce additional runoff which will be managed by the inclusion of swales alongside the track with the potential for a larger infiltration structures at low points or adjacent to the cuttings, if required.

4.1.103 Where the rail extension route is in cutting, the drainage infrastructure will be designed to collect runoff from the both sides of the track and the cutting.

Swales are proposed to the north of the route (between the landscape bund and the track). Runoff which does not infiltrate will pass though the sub-ballast to the swales.

4.1.104 Where the rail extension route is at grade or on embankment, the drainage infrastructure will be designed to collect runoff from the track and any overland flow which is interrupted by the embankment or track. Swales will be provided on the north side of the track (between the landscape bund and the track),

4.1.105 There is also the potential for a larger infiltration basin at the eastern end of the site, between the landscape bund and the southern boundary to provide for additional temporary storage.

4.1.106 Rail track drainage systems will 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.

4.1.107 Where collector drains and carrier drains are used to convey surface water away from the rail, the surface water will be treated in swales and infiltration trenches adjacent to the track.

4.1.108 For further details on the proposed drainage arrangements for the two village bypass please see **Annex 2A.12**.

4.2 Foul water management

4.2.1 Only the following sites require foul water management.

a) Northern park and ride

4.2.2 The northern park and ride site 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.

4.2.3 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. Details will be submitted for approval pursuant to Requirement 5 and 22.

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

b) Southern park and ride

4.2.5 The southern park and ride site 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.

4.2.6 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.

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

c) Freight management facility

4.2.8 The freight management facility site 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.

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

4.2.10 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 will be specified. Tankering to works is an alternative option should the flow be insufficient for the low-flow package treatment plant.

4.2.11 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.

4.2.12 Testing is being carried out to confirm the acceptability of the solution. The specific arrangements require further investigation, and details will 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 will follow Sport England's Artificial Surfaces for Outdoor Sport Design Guidance Note[1] and employ SuDS techniques to attenuate and limit flow from the site to greenfield runoff rates.

5.1.3 Details will be refined at the design stage.

[1] 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://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1003416

https://designatedsites.naturalengland.org.uk/SiteDetail.aspx?SiteCode=S1000721&S

https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK0012809

https://designatedsites.naturalengland.org.uk/SiteGeneralDetail.aspx?SiteCode=UK9009101

https://rsis.ramsar.org/ris/75

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

1.9 The SUDs Manual (C753), CIRIA, 2015, ISBN 978-0-86017-760-9

1.10 Highways Agency et al. (2009). Volume 11, Section 3, Part 10: Road Drainage and the Water Environment, HD45/09. http://www.standardsforhighways.co.uk/ha/standards/dmrb/vol11/section3/hd4509.pdf

1.11 Flood and coastal risk projects, schemes and strategies: climate change allowances.

Flood and coastal risk projects, schemes and strategies: climate change allowances - GOV.UK (www.gov.uk)

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

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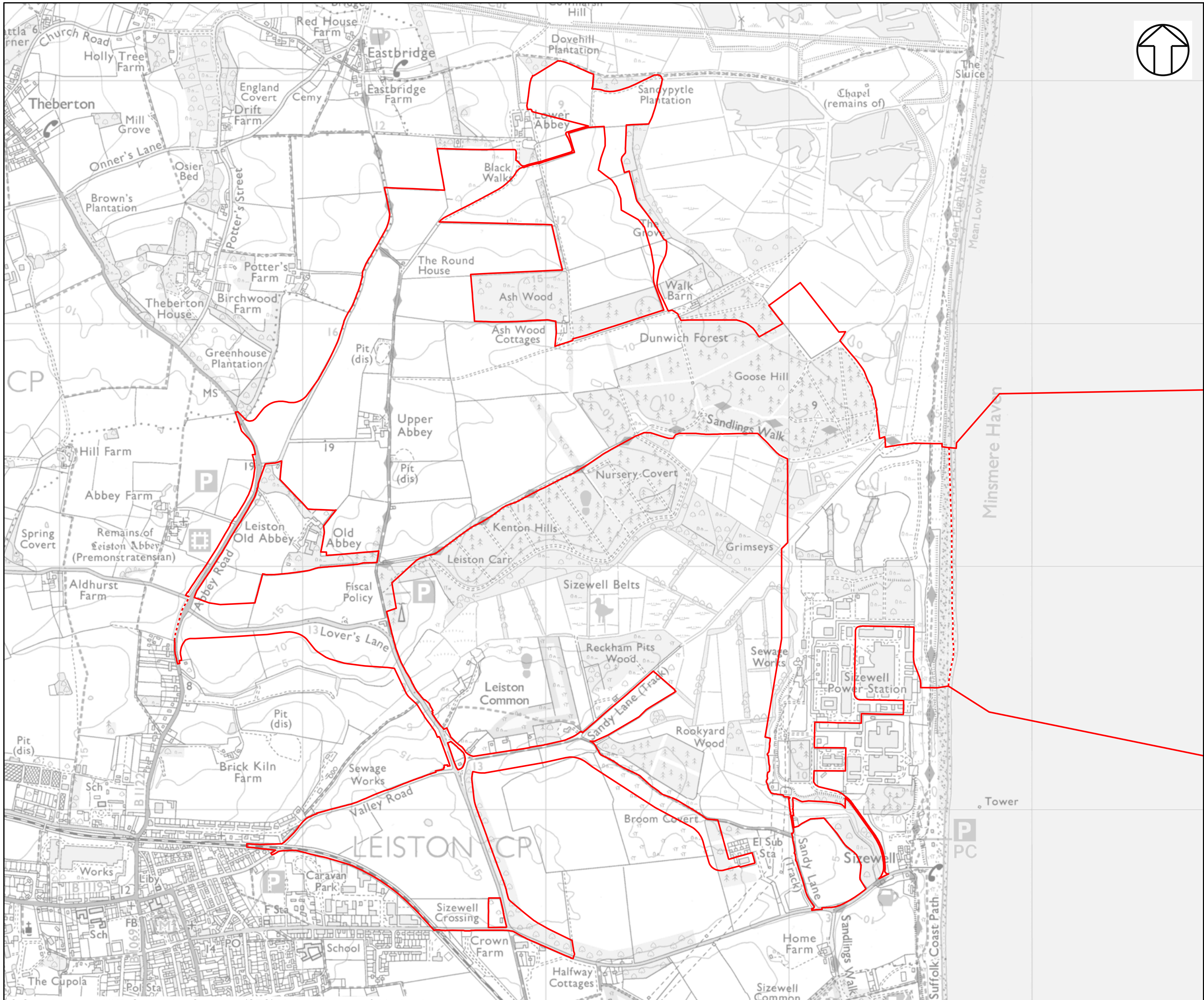

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NOTES

KEY

SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY

DEMARCATION LINE

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DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
LOCATION PLAN AND SITE BOUNDARY

DRAWING NO:
FIGURE 2A.1

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AUG 2021	NK	1:15,000 @A3

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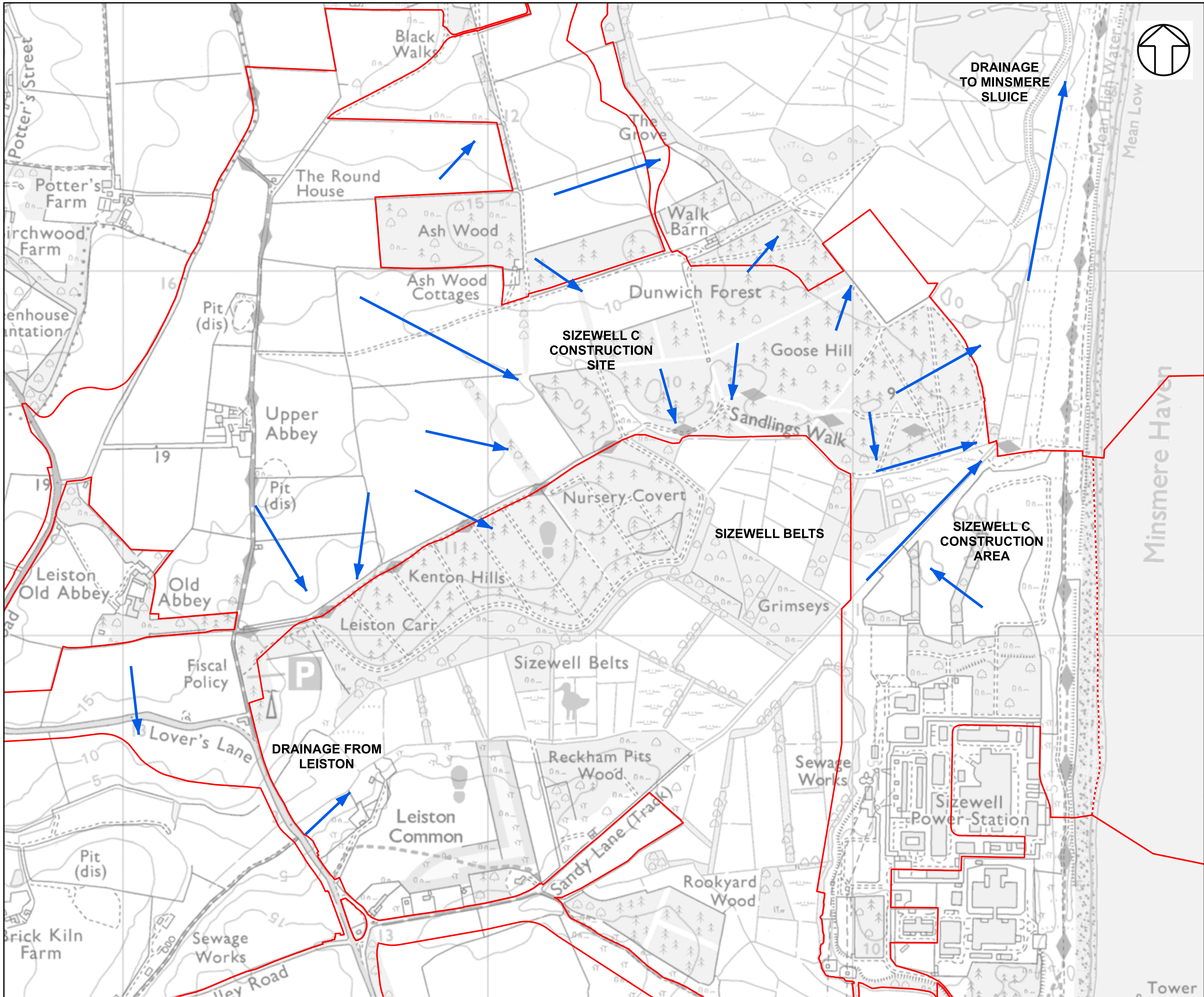

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NOTES

KEY

- SIZEWELL C MAIN DEVELOPMENT SITE BOUNDARY
- DEMARCATION LINE
- INDICATIVE WATER PATHWAYS

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DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
TOPOGRAPHY AND SURFACE WATER OVER LAND FLOW PATHS

DRAWING NO:
FIGURE 2A.2

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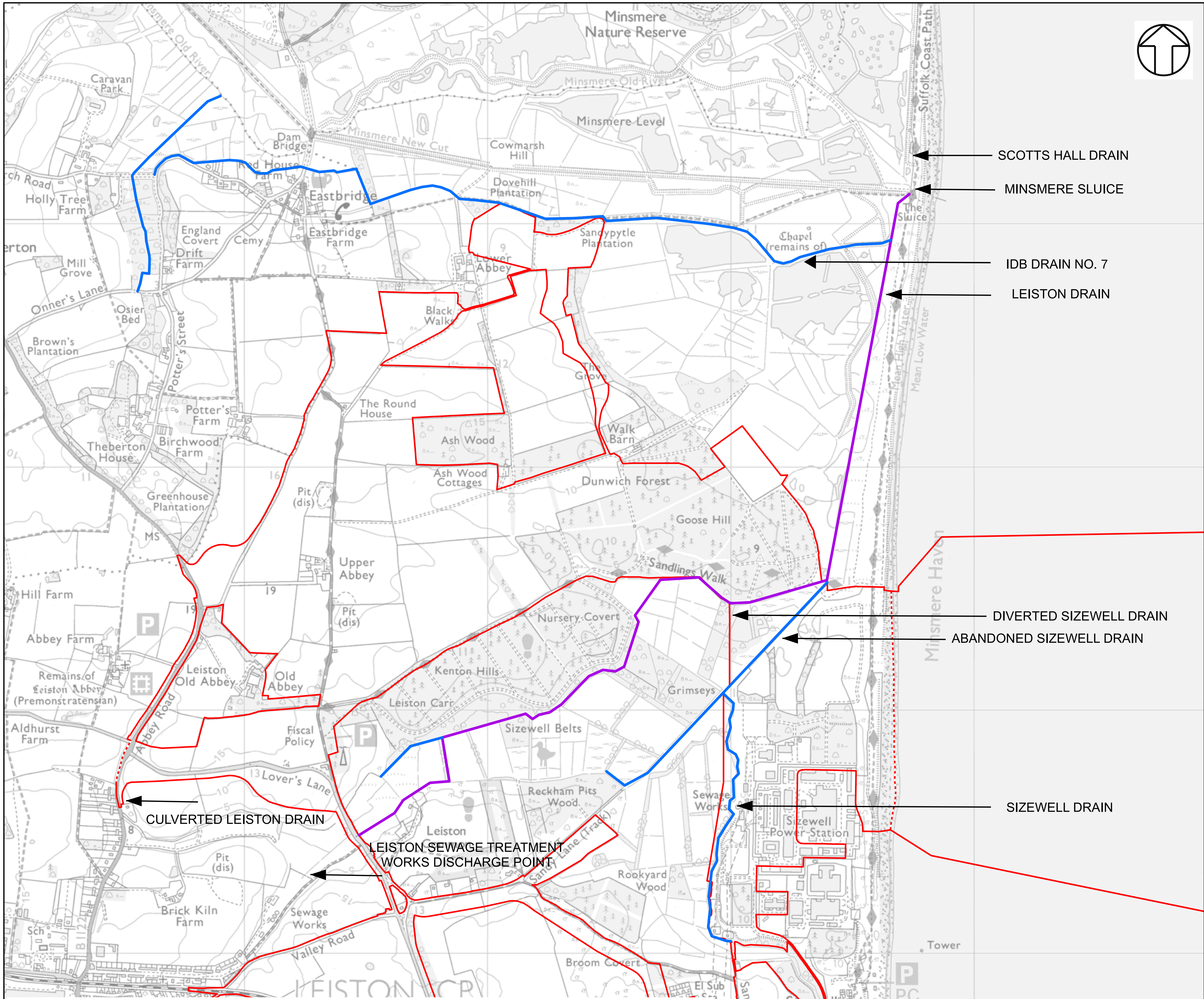

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NOTES

KEY

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

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Watercourses derived from OS MasterMap data.

SZC
eDF ENERGY
CGN

DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
LOCAL WATERCOURSES

DRAWING NO:
FIGURE 2A.3

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AUG 2021	NK	1:15,000 @A3

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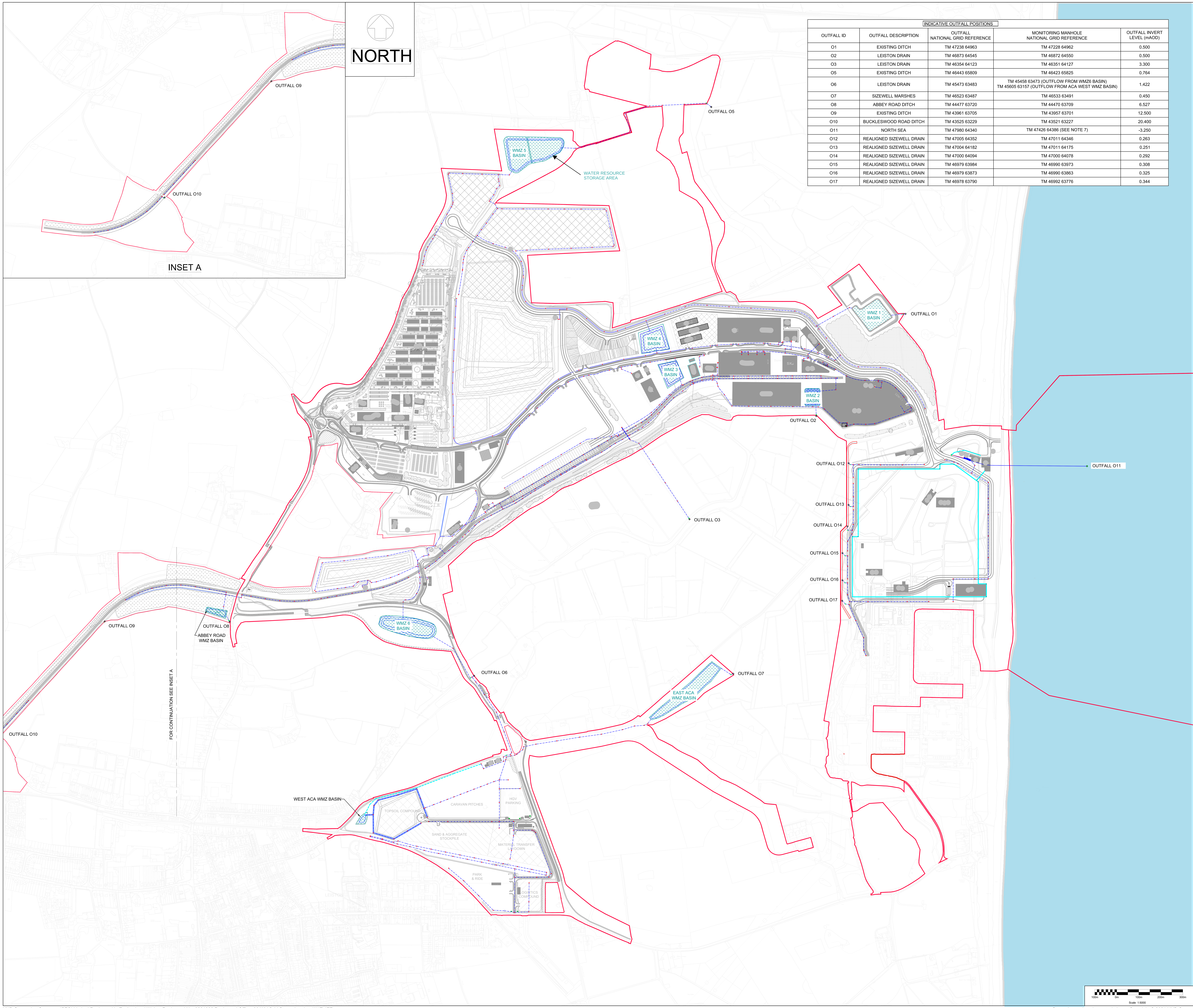

INDICATIVE OUTFALL POSITIONS

OUTFALL ID	OUTFALL DESCRIPTION	OUTFALL NATIONAL GRID REFERENCE	MONITORING MANHOLE NATIONAL GRID REFERENCE	OUTFALL INVERT LEVEL (mAOD)
O1	EXISTING DITCH	TM 47238 64963	TM 47228 64962	0.500
O2	LEISTON DRAIN	TM 46873 64545	TM 46872 64550	0.500
O3	LEISTON DRAIN	TM 46354 64123	TM 46351 64127	3.300
O5	EXISTING DITCH	TM 46443 65809	TM 46423 65825	0.764
O6	LEISTON DRAIN	TM 45473 63483	TM 45458 63473 (OUTFLOW FROM WMZ6 BASIN) TM 45605 63157 (OUTFLOW FROM ACA WEST WMZ BASIN)	1.422
O7	SIZEWELL MARSHES	TM 46523 63487	TM 46533 63491	0.450
O8	ABBEY ROAD DITCH	TM 44477 63720	TM 44470 63709	6.527
O9	EXISTING DITCH	TM 43961 63705	TM 43957 63701	12.500
O10	BUCKLESWOOD ROAD DITCH	TM 43525 63229	TM 43521 63227	20.400
O11	NORTH SEA	TM 47980 64340	TM 47426 64386 (SEE NOTE 7)	-3.250
O12	REALIGNED SIZEWELL DRAIN	TM 47005 64352	TM 47011 64346	0.263
O13	REALIGNED SIZEWELL DRAIN	TM 47004 64182	TM 47011 64175	0.251
O14	REALIGNED SIZEWELL DRAIN	TM 47000 64094	TM 47000 64078	0.292
O15	REALIGNED SIZEWELL DRAIN	TM 46979 63984	TM 46990 63973	0.308
O16	REALIGNED SIZEWELL DRAIN	TM 46979 63873	TM 46990 63863	0.325
O17	REALIGNED SIZEWELL DRAIN	TM 46978 63790	TM 46992 63776	0.344

LEGEND:
PROJECT BOUNDARY

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DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
WATER MANAGEMENT ZONE LOCATIONS & INDICATIVE OUTFALL POSITIONS

DRAWING NO:
FIGURE 2A.4
Rev. 3

DATE:	DRAWN:	SCALE :
FEB 2021	NK	1:10,000 @A3

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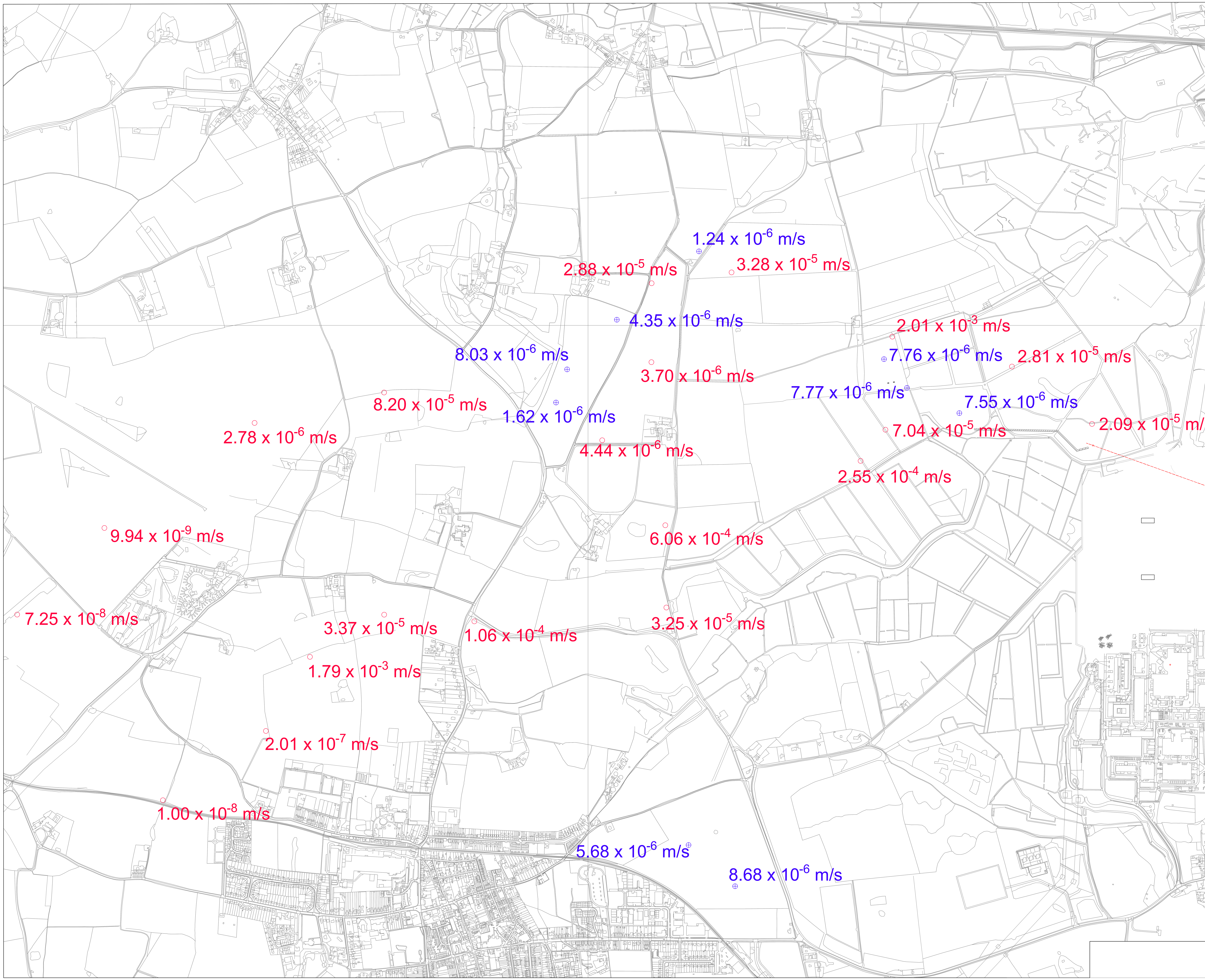

NOTES

KEY

INFILTRATION TESTS (STRUCTURAL SOILS - 2017)

INFILTRATION TESTS (STRUCTURAL SOILS - 2014)

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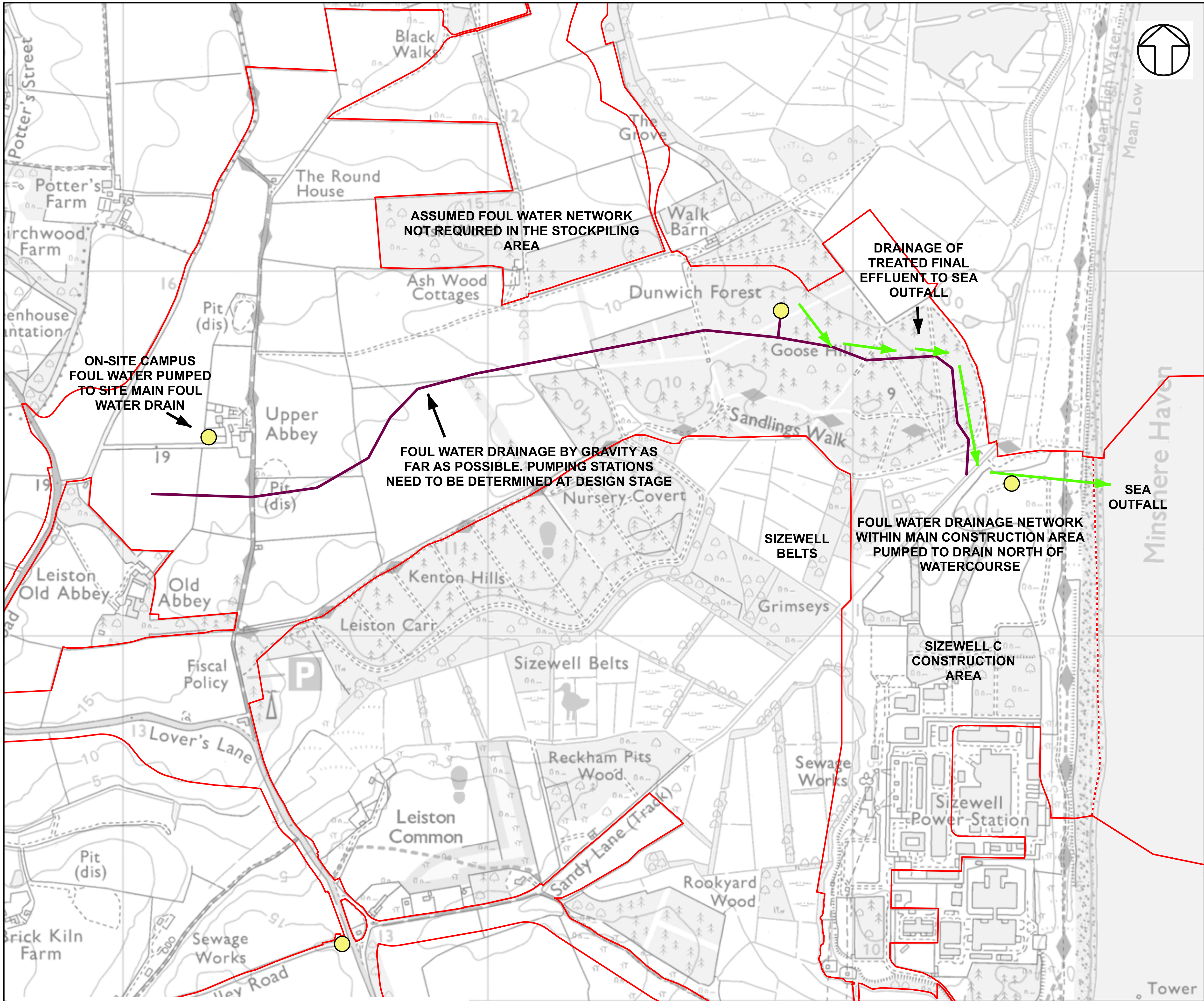
EDF ENERGY SZC CGN

DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
LOCATIONS OF INFILTRATION TESTS

DRAWING NO:
FIGURE 2A.5

DATE:	DRAWN:	SCALE :
Aug 2021	NK	



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NOTES

KEY

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

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EDF ENERGY SZC CGN

DOCUMENT:
SIZEWELL C
DRAINAGE STRATEGY

DRAWING TITLE:
INDICATIVE FOUL DRAINAGE LAYOUT

DRAWING NO:
FIGURE 2A.6

DATE:	DRAWN:	SCALE :
AUG 2021	NK	1:10,000 @A3

SCALE BAR
0 100 200 300 400 500 Meters

ANNEX 2A.1: SIZEWELL B RELOCATED FACILITIES DRAINAGE STRATEGY (NOVEMBER 2020, FINAL)

VOLUME II:
TECHNICAL APPENDICES

3.2 Drainage Strategy

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ABBREVIATIONS

AOD	Above Ordnance Datum
CIRIA	Construction Industry Research and Information Association
FEH	Flood Estimation Handbook
FoS	Factor of Safety
FSR	Flood Studies Report
SSSI	Site of Special Scientific Interest
SuDS	Sustainable Drainage Systems

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APPENDICES

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1. INTRODUCTION

1.1 Overview

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 is a hybrid application seeking:

- Outline planning permission, with all matters reserved, for up to 9,500 square metres Gross External Area (GEA) to provide administration, storage, welfare and canteen facilities and a visitor centre of up to 1,000 square metres GEA. Detailed planning permission is sought for demolition of some existing structures and redevelopment to include a training centre and interim visitor centre, an outage store, laydown area, car and cycle parking, landscaping, associated infrastructure (including utilities, plant and highway works), tree felling and other relevant works;
- Detailed planning permission for demolition of some existing structures and redevelopment to include an interim visitor centre, an outage store, laydown area, car and cycle parking, landscape, associated infrastructure (including utilities, plant and highway works), tree felling and other relevant works.

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 and maintained. 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 Drainage Strategy, as part of the Sizewell B Relocated Facilities Project.

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

- Proposed outage store;
- Outline development zone facilities;
- Pumping station removal;
- Proposed outage car park in the existing western car park;
- Operational car park;
- Western access road;
- Proposed training centre
- Proposed administration building;
- Proposed visitor centre; and
- The outage laydown area.

1.1.6 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, and 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 Introduction

2.1.1 This section of the Drainage Strategy outlines the site wide drainage strategy, applicable to all relocated facilities inside and outside Sizewell B power station. Details regarding facility specific drainage strategies can be found in **Sections 6** and **7**.

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 The existing site surface water drainage is illustrated in **Figure 3.1**.

2.2.3 The outage store and outline line development zone will connect to the southern branch of the surface water drainage network (shown in blue in **Figure 3.1**).

2.2.4 There will be no increase or adverse alteration in surface water run-off draining into the northern branch of the surface water drainage network (shown red in **Figure 3.1**).

2.2.5 The drainage strategy for the relocated facilities is summarised as:

- New assets outside the station – drainage by infiltration, independent of existing site (i.e. inside the station) piped networks.
- Existing impermeable run off that currently is pumped to the northern branch of the surface water drainage network is to be intercepted by a new pumping station discharging to the northern branch. This solution maintains the existing flow paths.
- Assets inside the Station – drainage direct to existing site piped networks, with exceedance flows addressed through overland flow.

2.2.6 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 within the station site, availability of existing drainage features, and the nature of the subsoil.

2.2.7 The overarching surface water drainage philosophy for the site wide facilities follows the conventional Sustainable Drainage System (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 with appropriate flow control(s) in place;
- 6: Discharge rainwater to a surface water sewer / drain with appropriate flow control(s) in place; and
- 7: Discharge rainwater to a combined sewer with appropriate flow control(s).

2.2.8 Rainwater harvesting has not been considered in forming a part of the drainage strategy, as these features cannot be considered as contributing to attenuation storage. For attenuation calculations rainwater harvesters are considered to be full as this is the likely worst case scenario so cannot contribute to attenuating rain water run-off. The possible implementation of rainwater harvesting to reduce the annual rainfall run-off from buildings can be considered for each proposed facility. Rainwater harvesting, if practical, offers savings on water usage for high water usage buildings. It is not proposed for the outage store or training centre building.

2.2.9 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. They are effective to reduce annual run-off, however this is not needed as run-off is being discharged to the ground via infiltration. Therefore the possible implementation and use of green roofs for the all the proposed facilities has not been seen as beneficial to the drainage strategy and therefore is not provided.

2.2.10 The drainage design is being co-ordinated to account for site constraints including the location of the existing and proposed underground utilities, whilst 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 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; and
- 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, re-allocation of land within Sizewell B station, future management scenarios, and the needs of the user.

2.3.4 Active decisions will be made that balance the views 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 and/or safely convey the run-off from exceedance storm events, without putting public and/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 (this is not expected to apply as current proposals do not include discharge to watercourses);
- Drainage infrastructure to provide no surface flooding 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 plus 20% uplift for climate change; and
- Construction drainage will not be covered as part of this drainage strategy.

b) Water Quality Criteria

- Reduce urban run-off pollutants and improve surface water quality by infiltration through treatment system(s) such as permeable paving before discharge, either by infiltration to ground;
- to ground or overland flow to watercourse.

c) Amenity and Ecology Criteria

- Provide amenity and ecological benefits, wherever practicable;
- Avoid impacts on the Sizewell Marshes Site of Special Scientific Interest (SSSI).

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 rainstorm.

2.4.4 Intercepting 5mm of every rain storm has positive implications for water quality and quantity for draining lightly polluted areas such as car park run off. This principal will be implemented into the design of the new car parking wherever practicable. This is appropriate for Coronation Wood but not relevant for the outage store or outline development zone which do not have car parking and do not rely on infiltration.

2.4.5 Appropriate oil/fuel controls, such as formal oil separators and deep trapped Gullies are being implemented into the surface water drainage networks where there 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 (Ref. 1).

2.4.6 Ground water levels, infiltration rates and ground conditions at the various proposed sites have been investigated in order to develop a suitable drainage design. Test results (Ref. 7) have shown better infiltration rates than the reference rates used at concept design and have been used to size the infiltration drainage. 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 building the dry store with soakaway drainage on an area of car park that formerly drained to the station's southern surface water catchment.) Therefore, with this reduction in impermeable area (0.715 Ha) it is anticipated that the existing drainage network will not require global alteration to increase capacity, as the only new run-off to this system is from the proposed welfare facility(addition of 0.06 Ha impermeable area) There will be no increased risk of surface water flooding.

2.4.8 Existing impermeable run-off that currently is pumped to the northern branch of the surface water drainage network is to be intercepted with a new pumping station and pumped to the northern branch of the surface water drainage network to maintain existing flow paths.

3. EXISTING SURFACE WATER DRAINAGE

3.1 Introduction

3.1.1 The existing surface water drainage network as illustrated in **Figure 3.1** 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.

3.2 Existing Northern Branch

3.2.1 The northern branch includes 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 car park) to the surface water network within the Sizewell B site.

3.3 Existing Southern Branch

3.3.1 The southern branch is entirely a gravity sewer network and drains run-off from Sizewell B including the area of the outline development zone and the proposed outage store.

Figure 3.1 Existing Surface Water Drainage Network

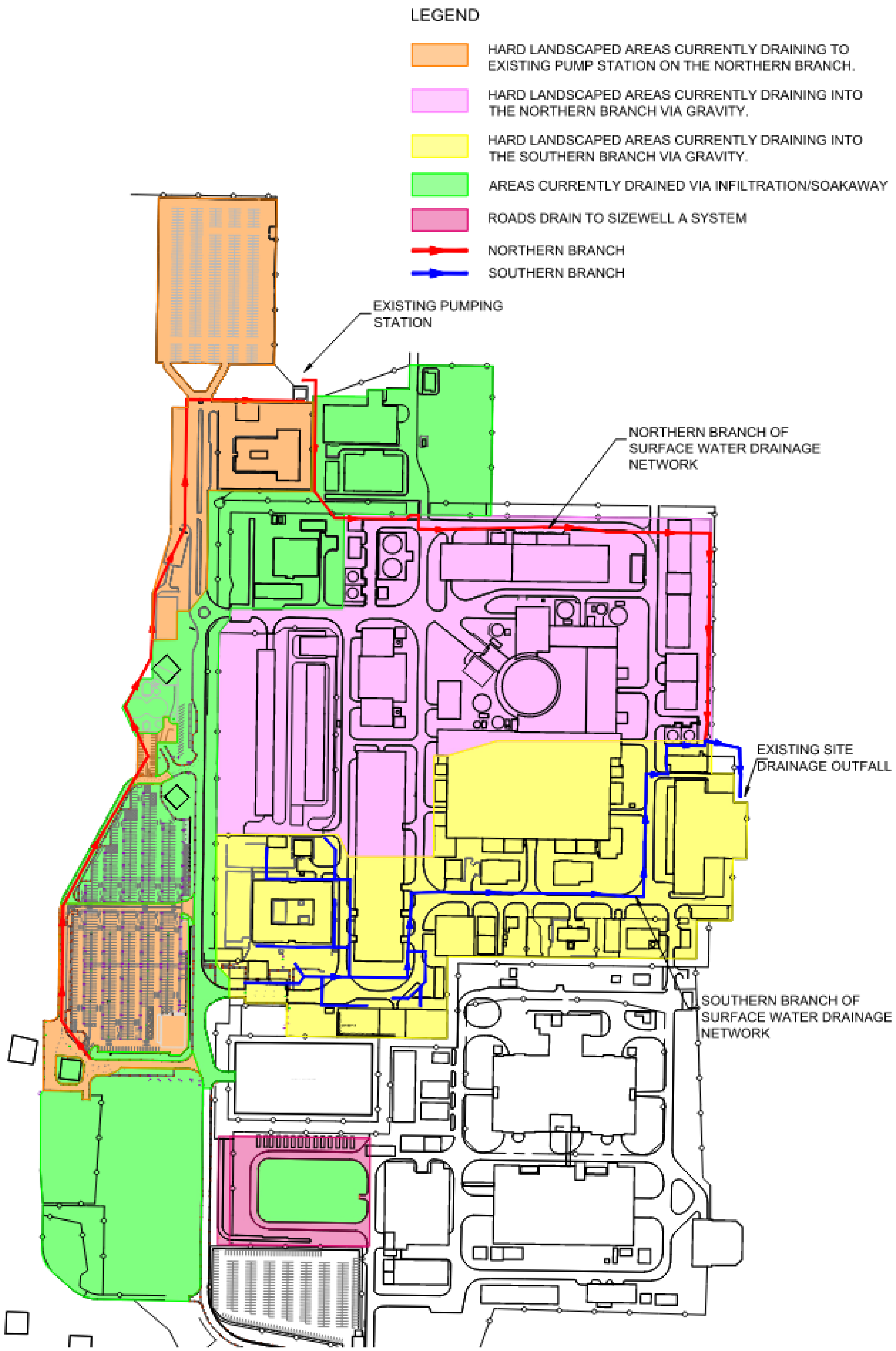
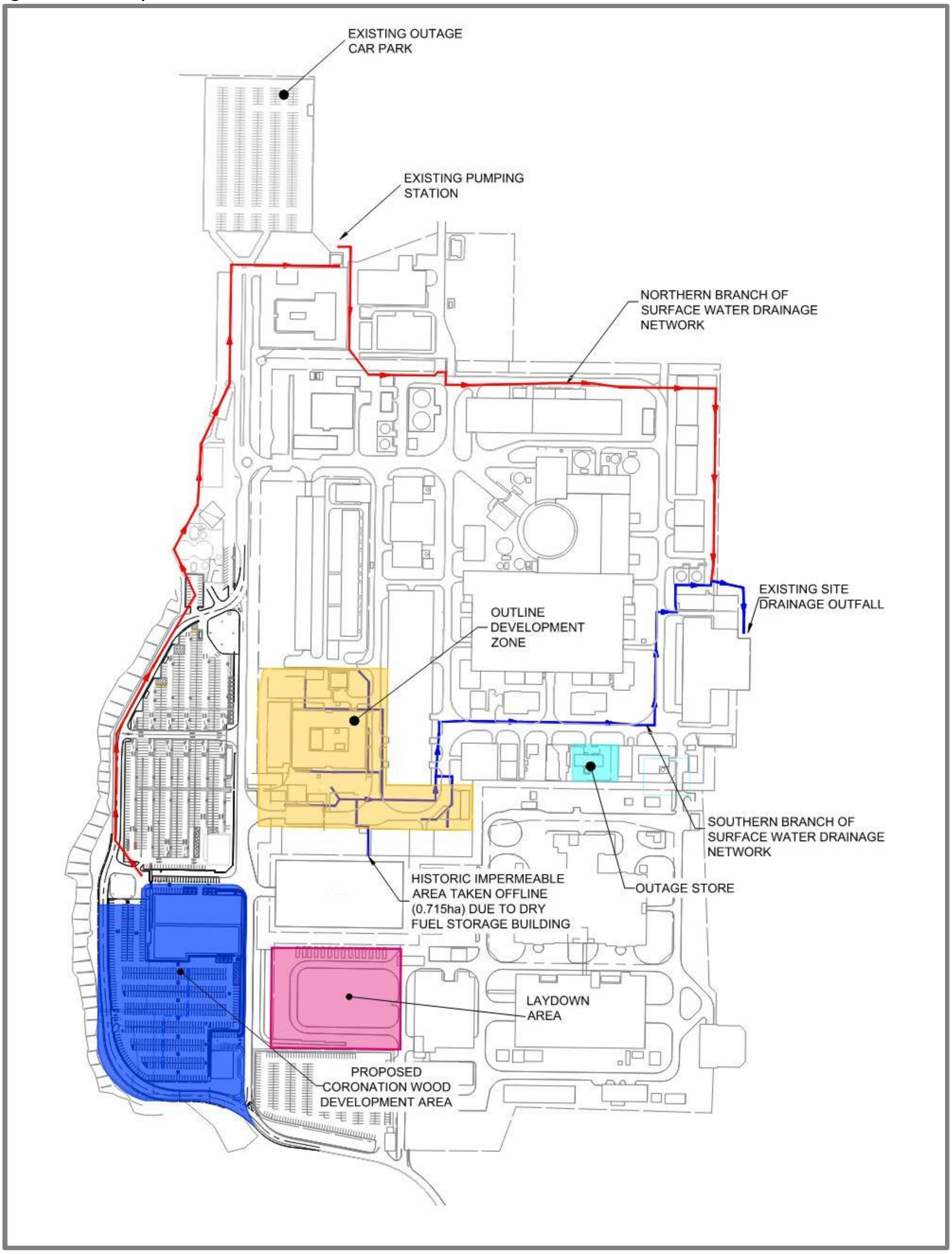


Figure 3.2 Proposed Facilities



3.4 Northern Branch Existing Pumping Station

3.4.1 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 existing outfall to the east of the site.

3.4.2 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.

3.4.3 The area shown in purple in **Figure 3.1** drains via gravity to the northern branch and in turn to the outfall.

3.4.4 Proposals for managing the removal of the pumping station are described in **Section 7.**

3.4.5 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.

4. DESIGN PARAMETERS

4.1 General Principles

4.1.1 The surface water drainage networks for the proposed development will be designed using industry standard hydraulic design software with rainfall events calculated using the Flood Studies Report (FSR) to the following requirements (based on Summer/Winter storm events from 15 minutes to 1440 minutes duration).

4.1.2 All return periods will have a climate change allowance applied, in accordance with the Environment Agency Guidance (Ref. 2) to allow for anticipated changes in the peak rainfall intensity (see The climate change recommendations within this Drainage Strategy are based on the latest Government guidance from government website).

4.1.3 As indicated in **Figure 4.1** the Sizewell B Power Station site lies 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. Whilst there are areas within the site boundary of the proposed development which are within Flood Zones 2 and 3 (including the area to the north which is to be cleared for the main development site of Sizewell C and areas within Pillbox Field), no changes to the drainage of these areas is proposed.

4.1.4 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 that is recommended to be carried out at the earliest opportunity as the design progresses to identify the location of any flooding due to topography changes.

Figure 4.1 Flood Map (Rivers and Sea) [Environment Agency]

4.1.5 In accordance with Environment Agency guidance (Ref. 2) and the Suffolk Local Flood Risk Management Strategy (Ref. 3) we have used the recommended 20% climate change allowance to assess the drainage options. This is based on a low flood risk vulnerability classification and total potential change anticipated for the '2050s'.

4.1.6 The climate change recommendations within this Drainage Strategy are based on the latest Government guidance from government website, last updated on 22 July 2020 (Ref. 2).

Figure 4.2 Peak Rainfall Intensity Allowance in small and urban catchments (use 1961 to 1990 baseline) [Environment Agency]

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%

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.

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

4.1.8 Causeway Flow + hydraulic modelling software will be used to assist the design of the below ground pipework and infiltration facilities. Following the Flood Studies Report (FSR) method (Ref Flood Studies Report, Natural Environment Research Council, 1975 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.

4.1.9 It is also recommended that the Flood Estimation Handbook 13 (Ref. 5) 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. This is applicable for the large catchment so for detailed design FSR is predominantly used and FEH13 for checking for exceedance and identifying flood channel routes if applicable. Routes should then be checked as necessary to ensure that critical areas are not inundated.

4.1.10 The long-term use and end-state scenarios of this site indicate a design life of 50-60 years. Some types of construction, e.g. porous paving, infiltration structures etc. require site specific maintenance requirements. Maintenance and renewal plans for the drainage are being drawn up with the detailed design of each facility and passed to the Station to manage.

a) Attenuation

4.1.11 As outlined in **Section 2**, attenuation tanks are not proposed 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 existing marine outfall.

4.1.12 Where required, and for facilities outside the Sizewell B Power Station, a simple model will be used to assess the preliminary attenuation storage and run-off volumes required. Proposals for storage will be designed to cater for the 100-year critical event, with an additional allowance of 20% for climate change. This value is appropriate for a period up to 2069 which covers the station design life. Proposals with infiltration will use a 1 in 30 year event with 20% climate change allowance as identified in **Section 1.1**.

4.1.13 The rate of discharge of the run-off from impermeable areas will be reduced, where practicable, to the equivalent Greenfield or Brownfield run-off rate for the site by attenuation storage and ground water infiltration. 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. Attenuation storage will be employed when the rate of inflow from the upstream drainage system is greater than the subgrade infiltration rate or the allowable rate of discharge to the downstream drainage network. The attenuation storage will empty once the event has passed.

b) Soakaways

4.1.14 Soakaways will only be adopted for facilities outside the Sizewell B Station Perimeter (**Section 2.2**) and will be designed in accordance with SuDS Manual (Ref. 1).

4.1.15 A factor of safety (FoS) will be applied to the observed/assumed infiltration coefficient to reflect the possible reduction in 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. An appropriate factor of safety in accordance with CIRIA C753 will be applied as shown in **Table 4.2**.

Table 4.2 Factor of Safety (FoS) 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

4.1.16 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 an assumed infiltration rate of 1×10^{-5} m/s, results a value of 6.7×10^{-6} m/s being used in calculations. A FoS of 1.5 is being applied to the infiltration rates established from the site investigations at detailed design stage.

4.1.17 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 as set out in the requirement of building regulations Part H (Ref. 6).

4.1.18 The boreholes carried out during a soil investigation in 2016 did not encounter ground water at shallow depths. Therefore, despite the fact that groundwater fluctuates the expected groundwater level is sufficiently deep at between +0.2 m AOD and +0.8m AOD that it would appear not to present any impediment to infiltration techniques.

4.2 Overarching Assumptions

4.2.1 The recent ground investigation report (Ref. 7) in Coronation Wood has identified infiltration rates ranging from 1.3 x 10^{-5} to 5.2 x 10^{-5} m/s. Infiltration rates appropriate to the location of the infiltration structure are adopted.

- A site investigation in 2016 established a groundwater level of ~ +1.0m OD (the highest recorded level was +0.8m AOD). Ongoing monitoring of the 2016 boreholes identified a maximum water level of 0.715m AOD. 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 are saturated. The proposed soakaways extend 2m below the proposed ground level which gives at least 4m clearance to the ground water level of +1.0m AOD.
- With the significant reduction in drainage area from the relocated facilities principally the outage parking, training centre and visitor centre from the northern branch station surface water sewer, the northern branch will have spare capacity and is in a suitable condition to accepted reduced flows for a relocated new pumping facility.
- 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 may be allowed to infiltrate into the surrounding ground. This is being validated by additional intrusive site investigations.
- It has been established that surface water run-off from relocated facilities within the Sizewell B station perimeter can be discharged into the existing site wide drainage network, on the basis 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 drainage within the station is described in **Section 3.2** and **3.3**.

5. CONSIDERATION OF SIZEWELL B RELOCATED FACILITIES END STATES

5.1.1 The planning application seeks consent for 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.

5.1.2 The indicative phasing of the construction and demolition activities is set out within the Outline Construction Environmental Management Plan (see **Environmental Statement, Volume II, Appendix 3.3**). 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.

5.1.3 Furthermore, in the event that Sizewell C Power Station is not developed, the area to the north of the Sizewell B Station will be landscaped in accordance with the Landscape Restoration Plan submitted with the planning application.

6. FACILITIES WITHIN THE SIZEWELL B STATION PERIMETER

6.1 Overview

6.1.1 Due to the congested nature of below ground utilities within the Sizewell B station perimeter, and as per section 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 within the station site, availability of existing drainage features, and the nature of the subsoil., the implementation of large SuDS features such as soakaways are deemed impracticable. Justification for each facility in accordance with the surface water drainage hierarchy outlined in **Section 2** is given below.

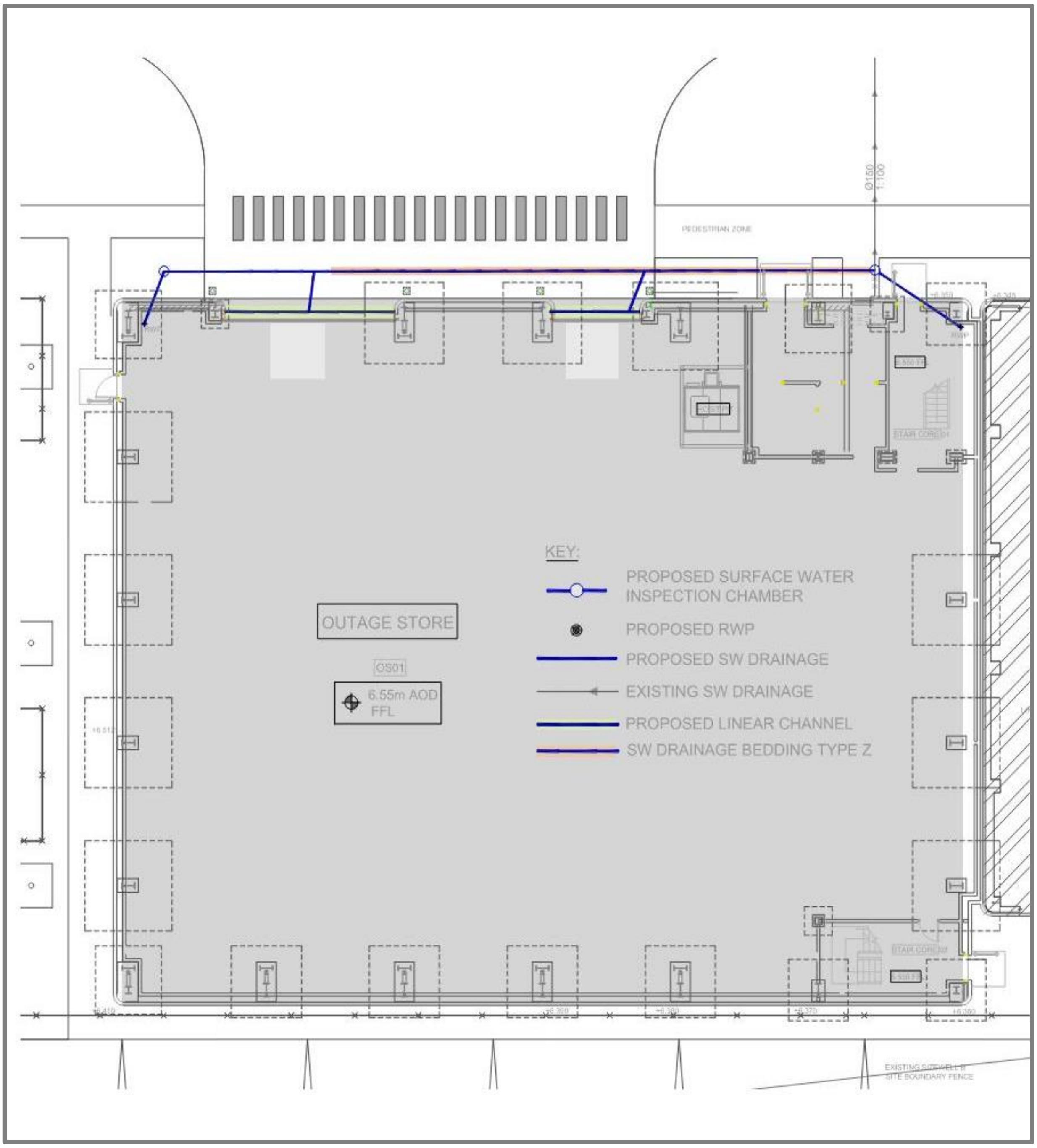
6.2 Proposed Outage Store

6.2.1 The proposed drainage strategy for this facility is to collect run-off at roof level and convey the water directly via a gravity pipe at the front of the store into the existing station southern drainage system (blue sewer marked on **Figure 3.2**), as shown in **Figure 6.1**.

6.2.2 The current site of the proposed outage store is hard paved with a small storage building. The existing connection to the existing southern surface water drainage branch is to be reused for the surface water runoff from the outage store. In addition, as discussed in section Overarching Assumptions, the southern surface water drainage branch has spare capacity.

6.2.3 The routes for below-ground drainage pipes are the result of detailed design for the proposed outage store and which has confirmed that the design standards in this report are achieved.

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

6.2.4 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 this existing developed site that can be considered impermeable land. The development will not result in any significant increase in impermeable surfacing, and therefore will not alter the balance between permeable and impermeable land.

6.2.5 The surface water from the roof is proposed to be drained via roof falls and gutters to downpipes directed to the front (north) of the building. An underground drain will connect the downpipes and yard drainage with the southern drainage sewer.

6.2.6 Slot drains with trapped outlets are proposed to collect run-off from the widened access and protect the proposed building from water ingress. The maintenance requirements will issued to the client for inclusion in the site maintenance plan.

6.2.7 Due to the congested nature of below ground utilities at the proposed location of the proposed outage store and in accordance with **Section 2.2**, sustainable drainage systems (SuDS) are not used at this location.

6.2.8 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 has been validated via assessment of the existing drainage network hydraulic modelling.

c) Assumptions

6.2.9 The drainage assumes that no downstream amendments to the station drainage have been made to reduce its as designed capacity.

d) Constraints

6.2.10 Underground utilities within the vicinity of the proposed outage store are congested. The proposed locations for the drainage connections avoid retained service infrastructure.

6.3 Outline Development Zone

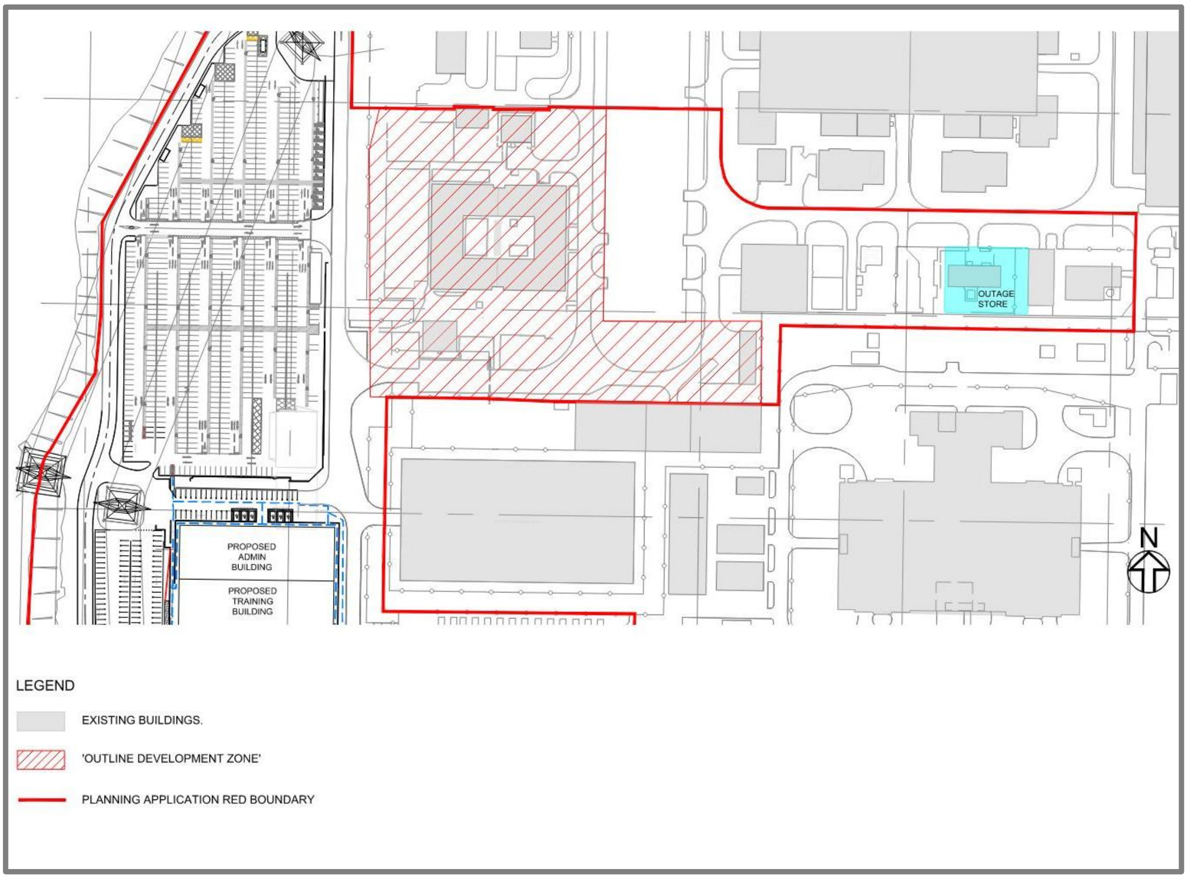
6.3.1 Proposed canteen, storage and welfare facilities within the station form part of the outline development zone. This zone is illustrated in **Figure 6.2**.

6.3.2 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; and
- where entrances to the site will be.

6.3.3 Facilities within the outline development zone will follow the overarching drainage principles and strategy defined in **Section 2**. 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 Introduction

7.1.1 This section outlines the specific drainage strategies to be applied to the proposed facilities outside the main Sizewell B power station site perimeter. Drainage outside the station generally consists of two elements:

- Areas currently draining via infiltration (areas in green on **Figure 7.1**). These comprise existing car parking to the west of Sizewell B and the Coronation Wood development area in which some of the new development is proposed.
- Areas which currently drain to an existing pumping station which is due to be demolished (areas 1 to 7 in orange on **Figure 7.1**). These areas are dealt with in **Section 7.2**).

7.1.2 The Coronation Wood development (shown in **Figure 7.2**) will consist of the following proposed new developments:

- Car park (see Section 7.3);
- Western access road (see Section 7.4);
- Training centre building (see Section 7.5);
- Administration building (see Section 7.6); and
- Visitor centre (see Section 7.7).

7.1.3 The Coronation Wood development area proposals are to be located on primarily permeable surfaces and so any development at these sites has the potential to alter the existing drainage characteristics. The outline drainage strategy to be adopted for this area is to ensure that there is no change in drainage characteristics and the run-off is managed and discharged effectively.

7.1.4 In general, there is greater scope to implement sustainable drainage (SuDS) features, such as soakaways and swales, outside the Sizewell B station perimeter. 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 approach.

7.1.5 Other facilities described within this section are the temporary visitors centre, Pillbox Field and the outage laydown.

Figure 7.1 Drainage Catchments outside Sizewell B Perimeter

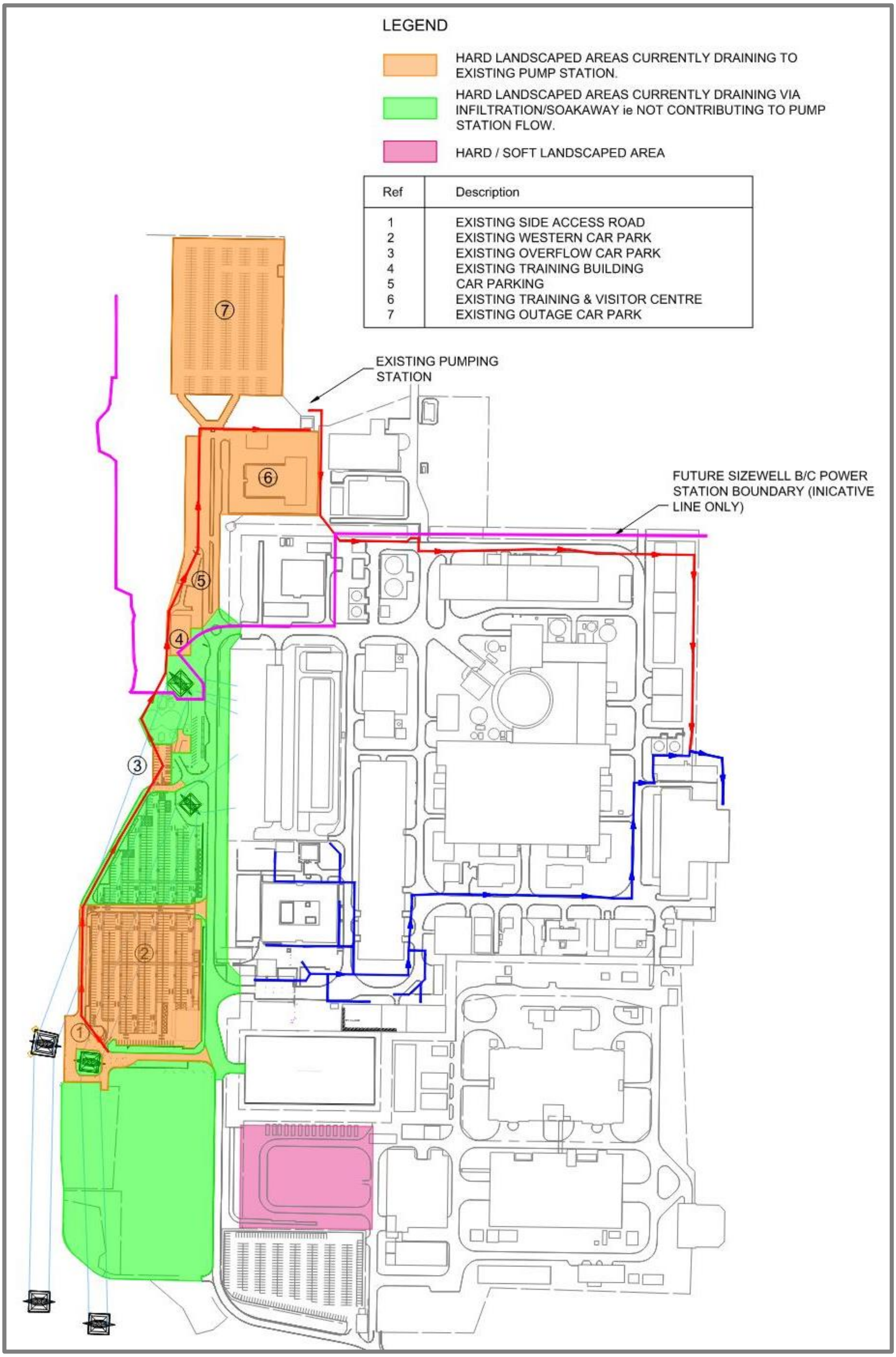
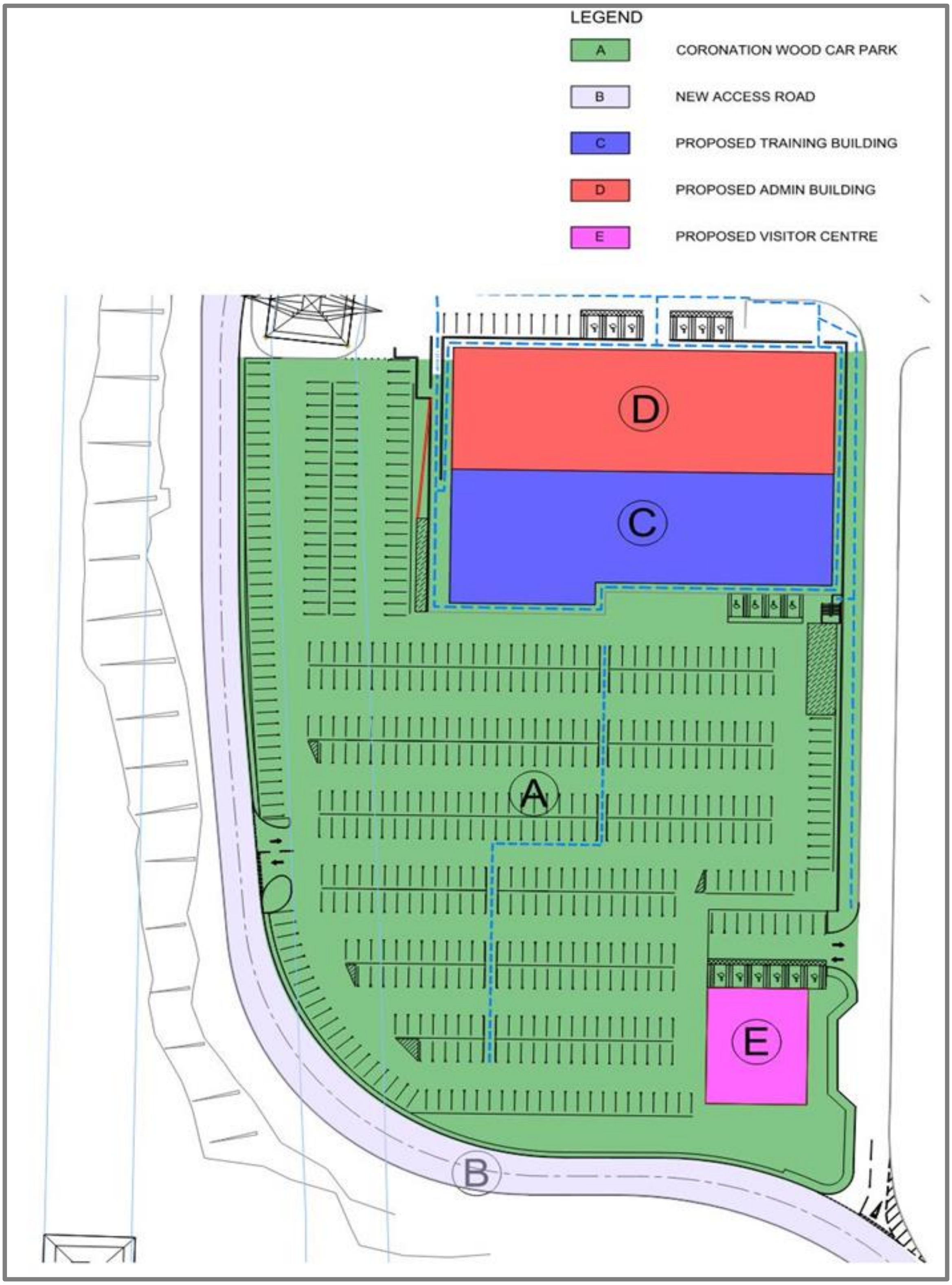


Figure 7.2 Coronation Wood Area Layout



7.2 Existing Car Parks

7.2.1 As part of the Sizewell B Relocated Facilities Project, a number of existing Sizewell B facilities located to the north of the site, as shown in **Figure 7.1**, will be relocated to enable the construction of Sizewell C at this location. This will include the decommissioning of the existing Sizewell B 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.

7.2.2 Areas shown in green on **Figure 7.1** 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.

7.2.3 The areas shown in amber on **Figure 7.1** currently drain by gravity to the pumping station, which then pumps into the station northern drainage that flows to the outfall. Flows from these areas must be addressed prior to the decommissioning of the pumping station.

7.2.4 Areas 4, 5, 6 and 7, as shown in **Figure 7.1**, will be developed from their current state and incorporated into the surface water drainage for the Sizewell C site who will ensure a suitable drainage solution, serving these areas, is in place in advance of the existing Sizewell B pumping station being decommissioned.

7.2.5 The remaining areas 1, 2 and 3 will require alternative long-term drainage solutions when the pumping station is decommissioned. The preferred solution is to provide a new pumping station within the existing site boundary and maintain the existing method/philosophy of draining this part of site to the northern branch of the existing drainage system. This would maintain the process of pumping of surface water, with a reduction in a continuing energy and maintenance cost. Existing flow paths would be maintained.

7.2.6 A new smaller pumping station / oil separator and attenuation facility could be constructed adjacent to the foul water treatment plant. It would need to be coordinated with the existing infrastructure and not impede current or future site operations, as well as not interrupting any future development plans.

7.2.7 The current pumping station has a 5.03 ha catchment with a 300mm diameter rising main with a capacity to pump 130 l/s into the existing 1050 mm diameter northern branch.

7.2.8 The proposed pumping station would have a 2.5 ha catchment which is equivalent to 1.8 ha when the ground permeability is taken into account. Hydraulic modelling based on the FEH hydrology has determined the likely requirement for storm water attenuation versus pumping rate. For a 15 l/s discharge 450m^3 storage is predicted. For a 30 l/s discharge 360m^3 storage is required (see Appendix B for modelling output). The 30 l/s pump rate is significantly less than the current flow for pumped drainage into the northern station drainage. The storage required for the 30 l/s rate can be accommodated outside the Sizewell B Power Station Perimeter.

7.2.9 An alternative is a discharge to the existing southern branch drainage. This has some 0.7 ha spare capacity (see section Overarching Assumptions). However, this is insufficient for the 1.8 ha catchment so attenuation would be required with additional detailed modelling of the southern drainage to confirm that flooding would not occur as a result of these additional flows.

7.2.10 Another alternative would be a gravity outfall. However, topography does not permit gravity drainage to the existing outfall.

7.2.11 The creation of a new piped outfall at an alternative location would require a piped discharge to the water courses within the adjacent Sizewell Marshes SSSI. Increasing run-off and potential increased risk of pollution to the SSSI should be avoided and only considered if other options are not available. This is not the case, so this option has not been pursued.

7.3 Proposed Car Parking

7.3.1 The proposed operational car parking as highlighted on **Figure 7.3** is to be relocated within the Coronation Wood development at the site of the redundant Sizewell A reservoirs (2 no.) and Coronation Wood.

7.3.2 The drainage strategy developed for the Coronation Wood development zone enables the drainage of all roofs and paved surfaces in the zone to be via infiltration facilities / soakaways under the operational car park. This philosophy will ensure no additional impervious areas are added to the existing site wide drainage network. Trapped gullies and oil separators will be used to control oil spillages.

7.3.3 Prior to construction of the proposed facilities, soft landscaping and woodland will be removed (the Sizewell A reservoirs have already been demolished), and earthworks will be carried out to create a suitable formation. Infiltration facilities will be formed from permeable materials.

7.3.4 illustrates a system of linked trench soakaways which are proposed to be located under the car parking and provide drainage for the buildings and car parking. Separate soakaways are shown draining the western perimeter road.

Figure 7.3 Combined Parking and Road Layout

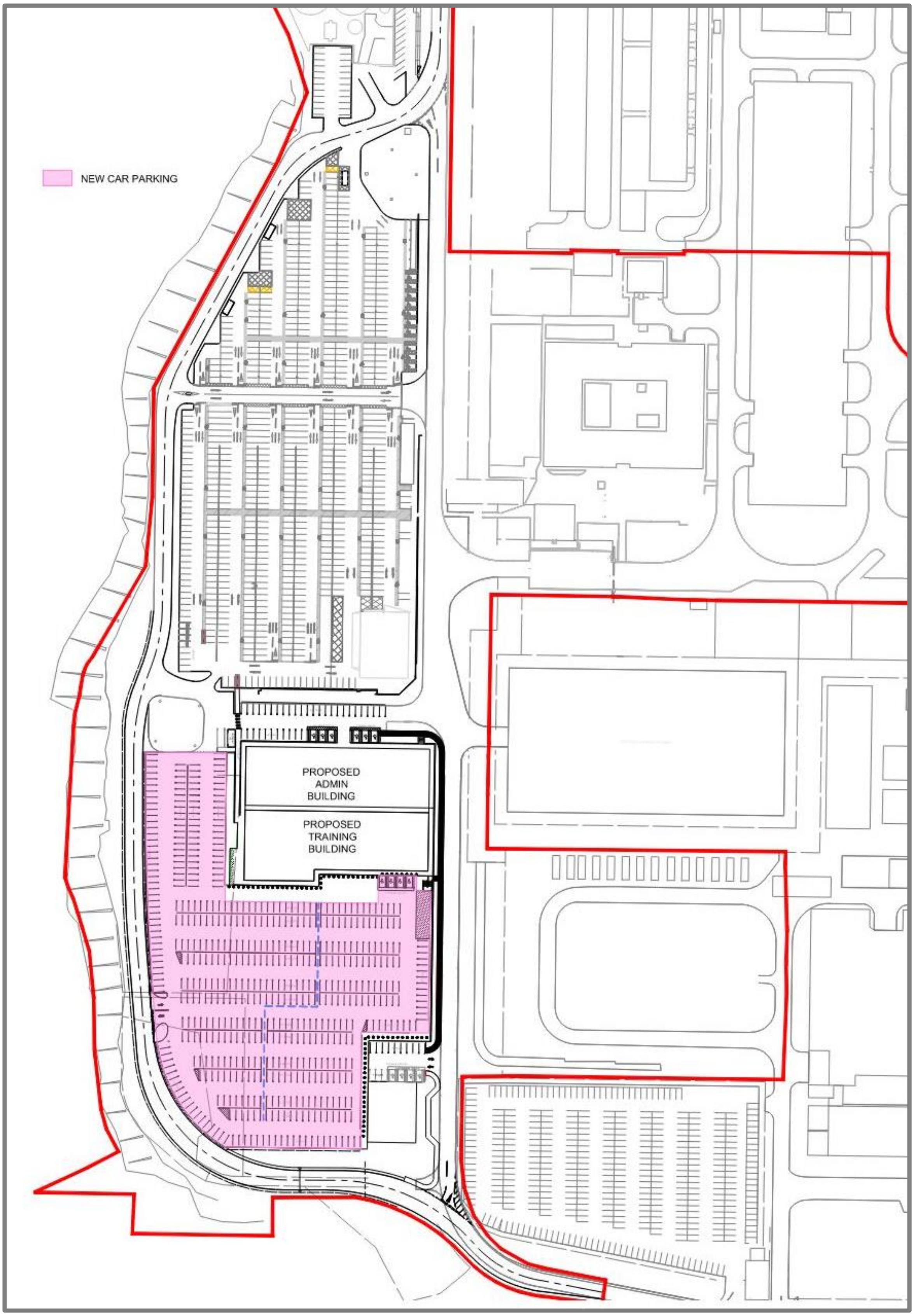
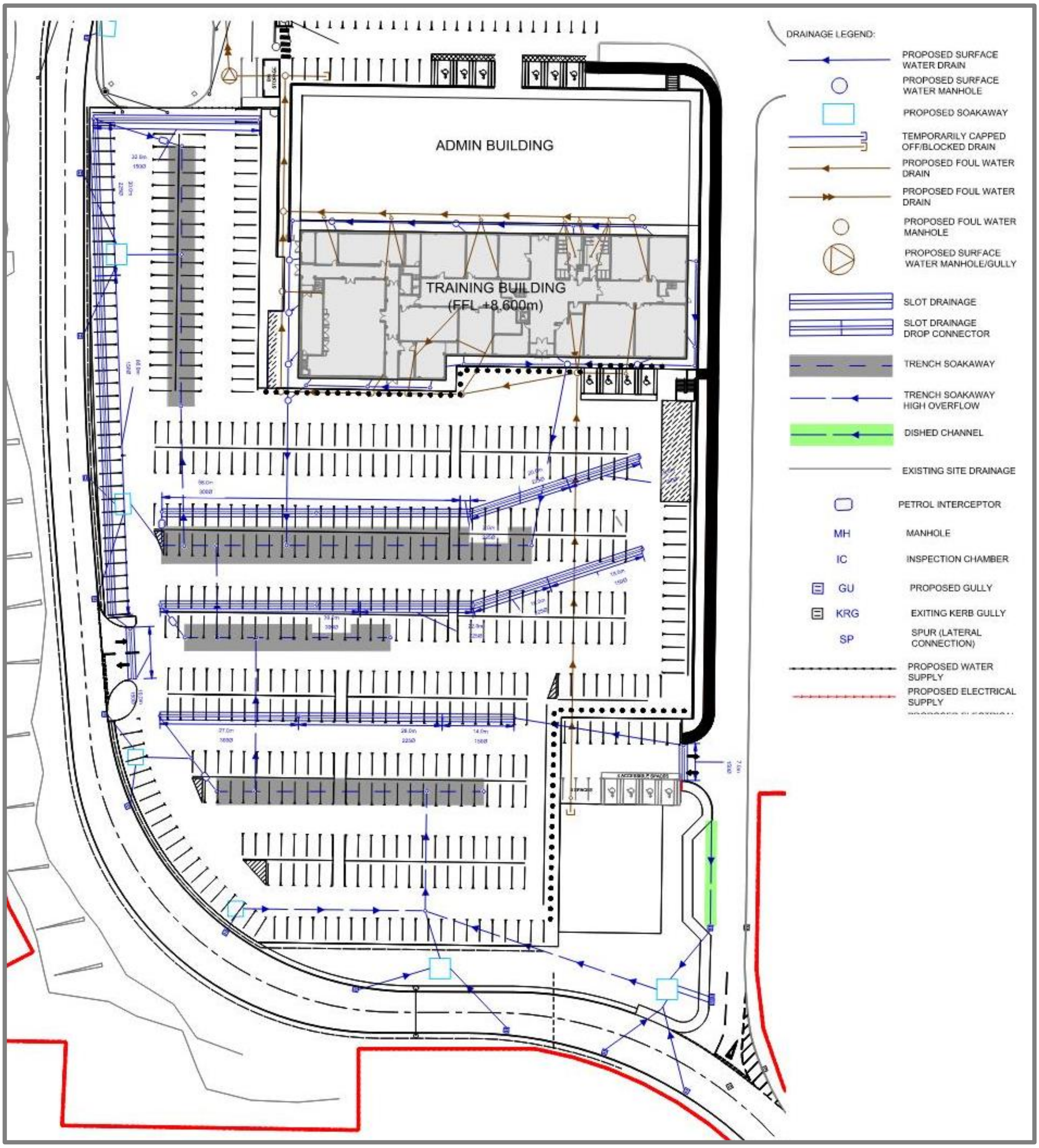


Figure 7.4 Car Park and Perimeter Road Proposed Drainage Strategy



a) Surface Water Drainage Hierarchy

Table 7.1 Proposed Development and Car Park Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	Not appropriate for the car park.
2. Infiltration	✓	Car park run off from the Impermeable paving will be collected via slot drains, catchpits and directed via oil separators to infiltrate directly into the ground under the car park via trench soakaways. Oil / hydrocarbon / silt interception systems using industry standard oil separator will be in place due to the close proximity of the Sizewell Marshes SSSI and oil spillage risks associated with large numbers of parked cars.
3. Attenuation (ponds, swales)	X	The provision of sales, or similar features, could be incorporated along the western boundary of the car park or Western Access road within the soft landscaping (as shown in **)** but would impact on the available car parking provision, potentially affect the stability of the existing ground adjacent to the SSSI and limit soft landscaping options and therefore impact on the viability of the overall scheme. As conventional infiltration is expected to provide an adequate solution, ponds and swales will not be adopted.
4. Attenuation (tanks)	X	Whilst a below ground attenuation tank could provide a solution, storing and attenuating flows to the northern drainage system. This would add additional flows that would need to be pumped and potentially increase the loading on the existing sewer. This option is not to be adopted ahead of the conventional infiltration that 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 the sensitive nature of the area and should be avoided if possible.
6. Discharge – surface water drain	X	The viability of soakaways has been confirmed so discharges where practicable can be discharged back into the ground or into the existing Station surface water drainage network utilising existing outfalls.
7. Discharge – Combined drain	X	Discounted - there are no known combined drains in the vicinity.

b) Surface Water Drainage Design

7.3.5 The proposed car park area and buildings are to be situated at the location of the demolished Sizewell A reservoirs and Coronation Wood, in close proximity to the Sizewell Marshes SSSI along the western boundary.

7.3.6 The proposed location of the car park area and building currently consists of permeable soft landscape surface, together with demolished underground concrete structures and pipework.

7.3.7 The underground infrastructure, soft landscape and woodland will be demolished, cleared and removed and suitable measures will be employed to provide a foundation layer on which the surface car park and buildings will be situated.

7.3.8 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.

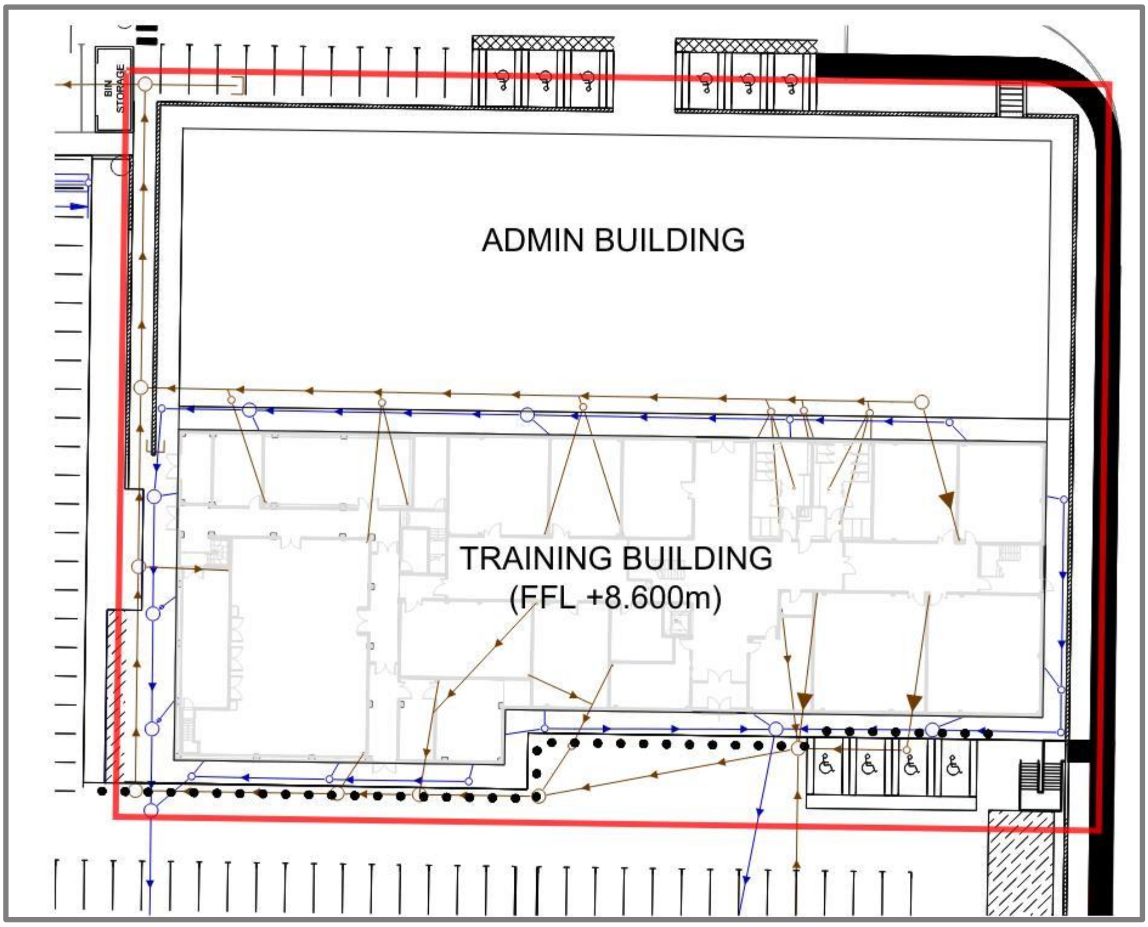
7.3.9 An impermeable paving solution similar to the existing western car park will be employed for the car park enabling the surface water to collected treated and directed to underground infiltration facilities emulating the current drainage characteristics, whilst providing suitable treatment of any incidental oil spills.

7.3.10 Run-off conveyed from the roof of the proposed Training Building, Administration Centre and Visitor Centre will be piped to the infiltration system incorporated under the car parking area.

7.3.11 Test results (Ref. 7), from a recent ground investigation comprising trial pits and infiltration tests, have been used to validate the design assumptions within this strategy and to inform the detailed design.

7.3.12 Infiltration facilities will be located a minimum 5 m from building perimeters. The 5 m exclusion zone surrounding the proposed training centre building and proposed admin building is illustrated in **Figure 7.5**.

Figure 7.5 Infiltration Systems - 5m Exclusion Zone



7.3.13 The 5 mm interception storage required to comply with good SuDS practice for the 2 ha Coronation Wood development area is calculated to be 100 m^3. This can be adequately intercepted and captured within the infiltration systems provided for this development.

c) Assumptions

7.3.14 It is assumed that sufficient inspection and maintenance will be undertaken during the life of the car park to ensure the condition of the proposed surfaces and and/or other drainage and SuDS features remain at an adequate level. An allowance for maintenance and minor refurbishment is being defined within the detailed design stage.

d) Constraints

7.3.15 The Sizewell Marshes SSSI are adjacent to the western perimeter of the main site and therefore direct and uncontrollable discharge of surface water into the nearby water-courses prior to adequate water quality controls are not desirable.

7.3.16 The Sizewell A reservoirs have been demolished. We understand that the concrete bases are retained but have been perforated to allow infiltration. Any proposed infiltration facilities above these will take this into account.

7.4 Western Access Road

7.4.1 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 deep trapped gullies, which will provide pollution protection before subsequently conveying the surface water into soakaway chambers as illustrated in **Figure 7.4**. This will ensure no additional impervious areas are added to the existing side wide drainage network.

a) Surface Water Drainage Hierarchy

Table 7.2 Western Access Road Surface Water Drainage Hierarchy

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	Not relevant for roads as no permanent occupancy in nearby buildings 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 will be achieved and managed using deep trapped gullies following Highway standard practise.
3. Attenuation (ponds, swales)	X	Swales etc. could be incorporated along the eastern boundary of the access road within the soft landscaping but would limit the opportunity to provide other forms of soft landscaping as well as reducing the amount of parking that can be provided. As trench conventional infiltration techniques provide an acceptable solution swales and ponds are not considered practicable in this location.
4. Attenuation (tanks)	X	If infiltration rates were to be worse than expected then a below ground attenuation tank volume of 150 m^3 would be required to attenuate run-off and discharge at a rate in the order of 1 l/s. However, recent site investigations have found higher infiltration rates than previously expected so attenuation tanks are not considered for the design.
5. Discharge – watercourse	X	Sizewell marshes SSSI runs close to the western site boundary, therefore, direct discharge into any watercourses is deemed undesirable and is being avoided. Strict restrictions on the water quality of the run-off discharging into it would be expected.
6. Discharge – surface water drain	X	If soakaways are not viable, then attenuation and discharge into the existing Station surface water drainage network will be progressed. An existing surface water 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.

b) Surface Water Drainage Design

7.4.2 The proposed location of the western access road currently consists of permeable soft landscaped surfacing, in close proximity to the Sizewell Marshes SSSI along the western boundary. 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. Test results (Ref. 7) from a recent ground investigation comprising trial pits and infiltration tests, have been used to validate the design assumptions within this strategy and to inform the detailed design.

7.4.3 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.

7.4.4 The surface water associated with the impermeable road surface will be directed to strategically located deep trapped 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.

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

c) Assumptions

7.4.5 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. Maintenance and minor refurbishment requirements are to be advised as part of the detailed design with the station including these requirements in the station maintenance work schedules.

d) Constraints

7.4.6 The Sizewell Marshes 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 is not permitted.

7.4.7 Surface water is not being proposed to discharge directly to adjacent water courses. However, infiltration structures are being proposed adjacent to existing watercourses. With the provision of silt traps and oil separators together with the filtration provided by the natural ground, water quality will be maintained to at least to the same levels as the existing green field runoff.

7.5 Proposed Training Building

7.5.1 The drainage strategy for proposed training centre is to convey run-off from roofs and surrounding impermeable areas into trench soakaways beneath the proposed car park, as illustrated in **Figure 7.4**.

7.5.2 The overarching strategy for the surface water run-off associated with the training centre is infiltration.

7.5.3 Existing services cross the development site and have been identified. Co-ordination with the proposed building and its drainage is part of the ongoing detailed design.

a) 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 the varied occupancy and use of the building harvesting of rainwater is not proposed.
2. Infiltration	✓	Run-off will be disposed of by infiltration by using a discrete system of linked trench soakaways located beneath the proposed car park. Oil/hydrocarbon/silt treatment will occur prior to infiltration to avoid the risk of polluting the groundwater especially due to the close proximity of Sizewell marshes SSSI.
3. Attenuation (ponds, swales)	X	Due to the lack of space at and around this facility green attenuation features have not been considered. Attenuation is being provided within the infiltration structures.
4. Attenuation (tanks)	X	If infiltration rates were to be worse than expected then a below ground attenuation tank volume of 877 m^3 would be required to attenuate run-off and discharge at a rate in the order of 1 l/s. However, recent site investigations have found higher infiltration rates than previously expected so attenuation tanks are not considered for the design.
5. Discharge – watercourse	X	Sizewell marshes 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. Discharging into the SSSI is not considered as an acceptable solution.
6. Discharge – Surface water drain	X	Connection into the existing surface water drainage network will only be considered if infiltration is not possible.
7. Discharge – Combined drain	X	Not proposed at this stage.

b) Surface Water Drainage Design

7.5.4 The site of the proposed training centre currently consists of soft landscaping and trees and therefore the construction of the proposed training building will alter the balance between permeable and impermeable land.

7.5.5 The proposed drainage system will drain surface water into the ground via infiltration systems and will therefore emulate the current greenfield run-off characteristics, such that the existing drainage network is not subjected to additional loading.

7.5.6 The surface water will be drained from the proposed training building roof via rainwater downpipes. Channel drains and/or filter drains will be used to drain any surface water away from the foundations.

7.5.7 The surface water run-off will then be conveyed via new below ground pipework into the proposed car park linked infiltration trenches.

7.5.8 Impermeable paving is proposed around the vicinity of the proposed training centre to drain surface run-off away from building foundations. These surfaces will be connected to the linked infiltration trenches in the car park. Test results (Ref. 7) from a recent ground investigation comprising trial pits and infiltration tests, have been used to validate the design assumptions within this strategy and to inform the detailed design

c) Assumptions

7.5.9 Sufficient inspection and maintenance will be undertaken during the life of the proposed training building to ensure the drainage or remains in good working order. Maintenance and minor refurbishment requirements will be passed by the designers to the station for inclusion in the routine maintenance schedules.

d) Constraints

7.5.10 Sizewell Marshes SSSI runs adjacent to the western perimeter of the main site and therefore direct and uncontrollable discharge of surface water into the nearby water-courses prior to adequate water quality controls is not permitted.

7.5.11 Surface water is not being proposed to discharge directly to adjacent water courses. However, infiltration structures are being proposed adjacent to existing watercourses. With the provision of silt traps and oil separators together with the filtration provided by the natural ground, water quality will be maintained to at least to the same levels as the existing green field runoff.

7.6 Proposed Administration Building (Outline Planning)

7.6.1 The proposed administration building, 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 administration building is infiltration.

7.6.2 The proposed drainage strategy is to convey run-off from roofs and surrounding impermeable areas into the linked infiltration trench under the proposed car park as illustrated in **Figure 7.4**.

7.7 Proposed Visitor Centre (Outline Planning)

7.7.1 The proposed visitor centre, part of the outline planning application, will follow the same drainage strategy as the proposed training building. The overarching strategy for the surface water run-off associated with the proposed visitor centre is infiltration.

7.7.2 The proposed drainage strategy is to convey run-off from roofs and surrounding impermeable areas into the linked infiltration trench under the proposed car park as illustrated in **Figure 7.4**.

7.8 Temporary Visitor Centre

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

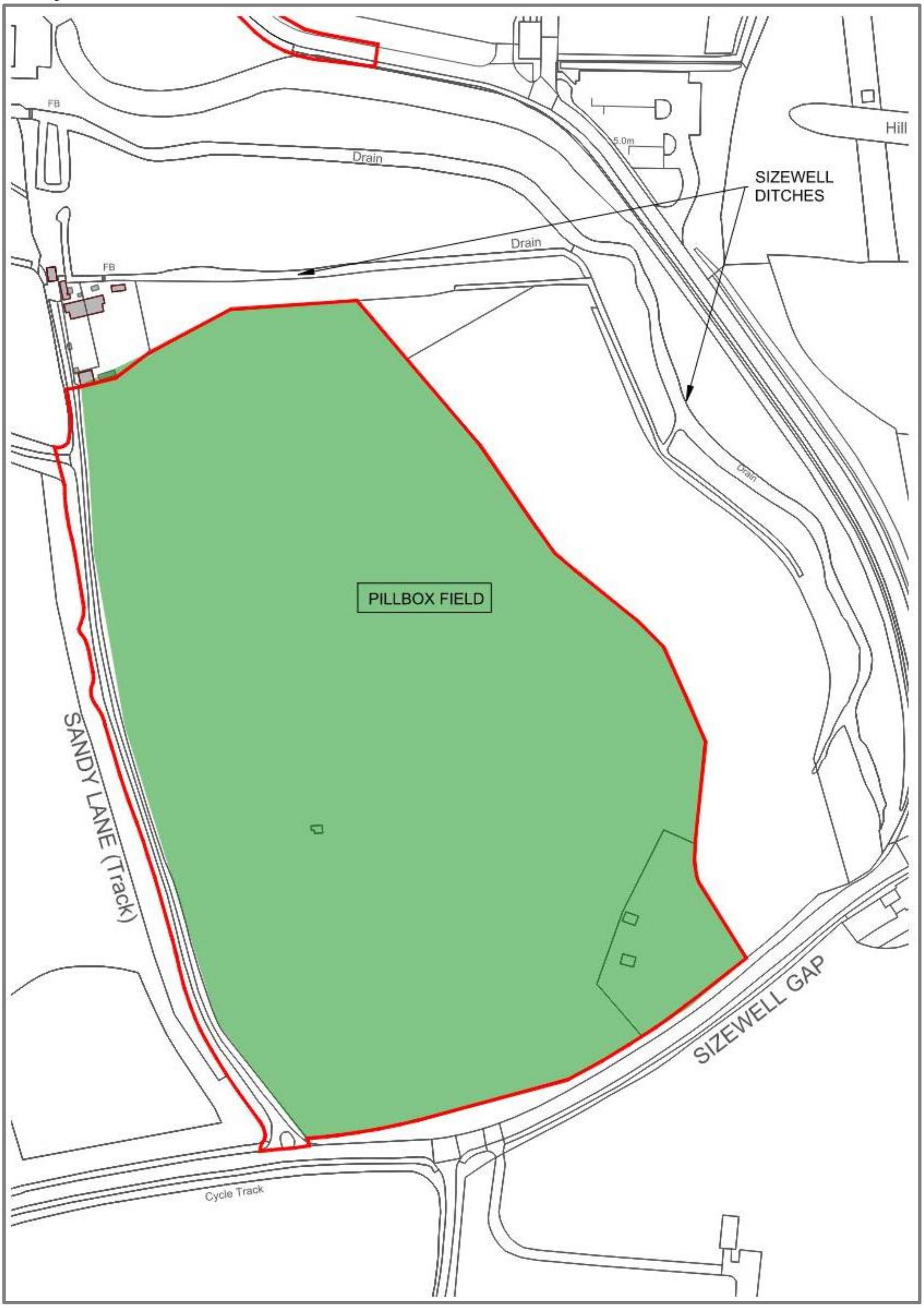
7.8.2 The drainage at this location will not be altered. The drainage strategy for the temporary visitor centre is to follow the current drainage principles and drain to the existing site gravity sewers.

7.9 Pillbox Field

7.9.1 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 7.6**.

7.9.2 The proposal is for this land to be soft landscaped leaving its surface drainage characteristics unaffected.

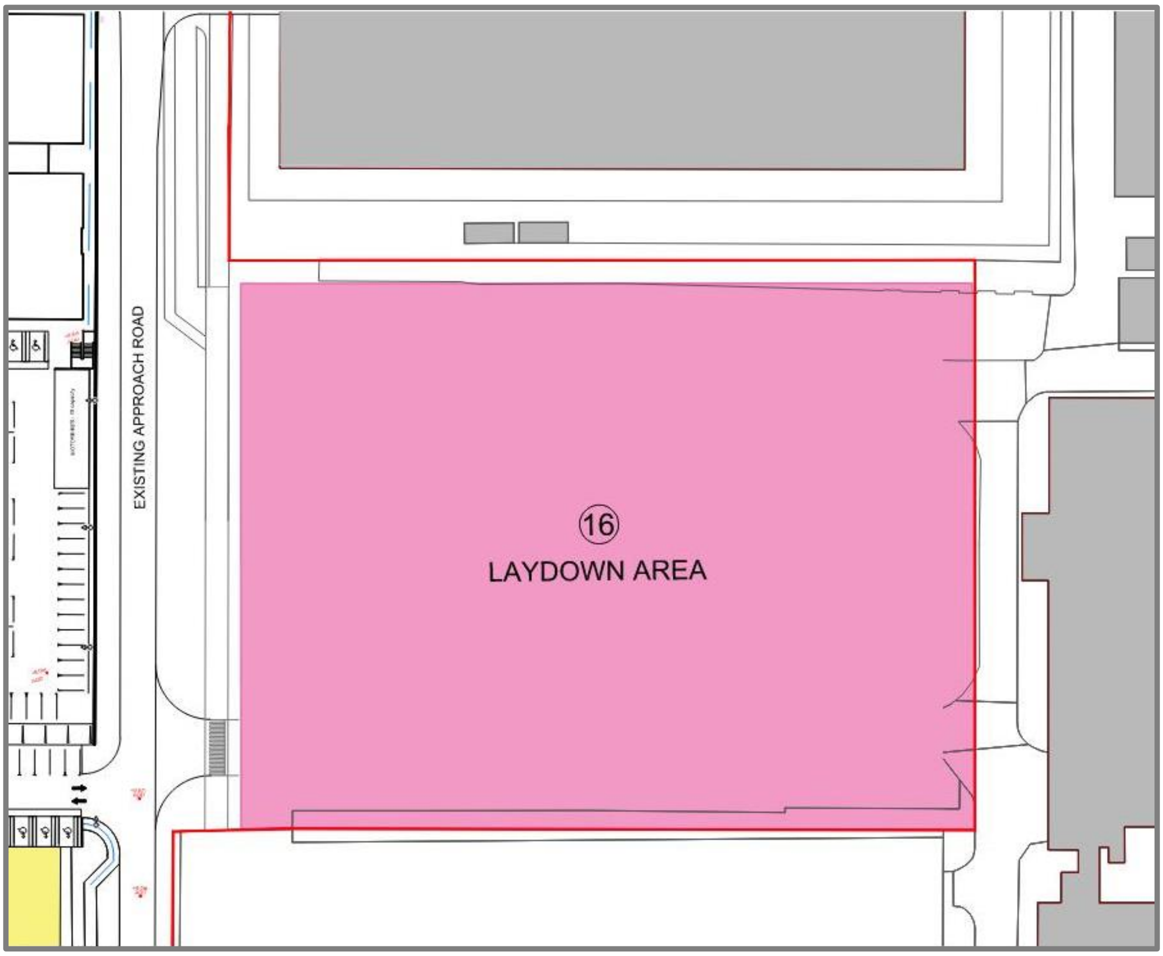
Figure 7.6 Pillbox Field – Plan



7.10 The Outage Laydown Area

7.10.1 The outage laydown area provision is to be provided in Area 16 shown in **Figure 7.7**. This area is within the original boundary of Sizewell A power station and was an electrical switch house. In its current form it comprises impermeable concrete slabs, asphaltic areas and permeable gravel areas. The area drains to existing soakaways and to the Sizewell A piped system (as indicated in **Figure 3.1**)

Figure 7.7 Outage Laydown Area



7.10.2 Subject to detailed design the assumption at this time is that run-off from asphaltic surfaces will be routed to new soakaways for infiltration.

a) Surface Water Drainage Hierarchy

Table 7.4 Outage Laydown Area

Drainage Principle	Feasibility	Reason
1. Rainwater Harvesting	X	Not relevant for roads as no permanent occupancy in nearby buildings therefore deemed to be not viable.
2. Infiltration	✓	Run-off will be disposed of by infiltration by using a discrete system of linked trench soakaways located beneath the proposed laydown area. Oil/hydrocarbon/silt treatment will occur prior to infiltration to avoid the risk of polluting the groundwater. There is some infiltration currently in this area and rates from tests in adjacent areas show this to be feasible.
3. Attenuation (ponds, swales)	X	Due to the lack of space at and around this facility green attenuation features have not been considered. Attenuation is being provided within the infiltration structures.
4. Attenuation (tanks)	X	If infiltration rates were to be worse than expected then a below ground attenuation tank would be required to attenuate run-off and discharge at a rate in the order of 1 l/s. However, recent site investigations have found higher infiltration rates than previously expected so attenuation tanks are not considered for the design.
5. Discharge – watercourse	X	Sizewell marshes 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. Discharging into the SSSI is not considered as an acceptable solution.
6. Discharge – Surface water drain	X	Connection into the existing surface water drainage network will only be considered if infiltration is not possible.
7. Discharge – Combined drain	X	Not proposed at this stage.

b) Surface Water Drainage Design

7.10.3 The site of the proposed outage laydown area currently comprises impermeable concrete slabs, asphaltic areas and permeable gravel areas. The concrete slab drains to existing soakaways and asphaltic areas drain to the Sizewell A piped system.

7.10.4 The proposed drainage system will drain surface water into the ground via infiltration systems to emulate greenfield run-off characteristics, and the existing drainage network will not be subjected to additional loading.

7.10.5 The surface water will be drained from the laydown area to infiltration trenches or chambers via channel drains and/or filter drains and below ground pipework, subject to the detailed design and surfacing design.

7.10.6 Trial pits and infiltration test results have been recently undertaken in Coronation Wood and, on the basis of these results, it is expected that infiltration is a suitable drainage solution.

7.10.7 Infiltration test results inferred from the DFSB to the north (ESG report 2012) and from the Coronation Wood investigation to the west (Ref. 7) suggest an infiltration rate between 1.3 x 10^{-5} m/s to 5.2 x 10^{-5} m/s. This would be adequate for the likely drainage design in this area and, in addition, the site currently utilises infiltration for the existing facilities.

c) Assumptions

7.10.8 Infiltration rates in this area are the same as other adjacent areas and therefore suitable for an infiltration solution.

d) Constraints

- Existing hard surfaces, concrete slabs and asphalt, will have to be cleared to allow new surfacing and drainage to allow infiltration.
- Surface water is not being proposed to discharge directly to adjacent water courses. However, infiltration structures are being proposed near to existing watercourses. With the provision of silt traps and oil separators together with the filtration provided by the natural ground, water quality will be maintained to at least to the same levels as the existing green field runoff.

8. References

Ref. 1. C753, The SuDS Manual, Ciria, 2015

Ref. 2. https://www.gov.uk/guidance/flood-risk-assessments-climate-change-allowances

Ref. 3. Suffolk Flood Risk Management Strategy, Suffolk Flood Risk Management Partnership, March 2016

Ref. 4. Flood Studies Report, Natural Environment Research Council, 1975

Ref. 5. Flood Estimation Handbook, Centre for Ecology & Hydrology,1999

Ref. 6. The Building Regulations 2010, Approved Document H, Drainage and waste disposal, HM Government, 2015

Ref. 7. Geotechnical factual report on Ground Investigation Sizewell B Power Station – Coronation Wood, CET Infrastructure, October 2020

APPENDIX A SURFACE WATER DRAINAGE PLANS

Figure A.1 Existing Site Drainage Plan

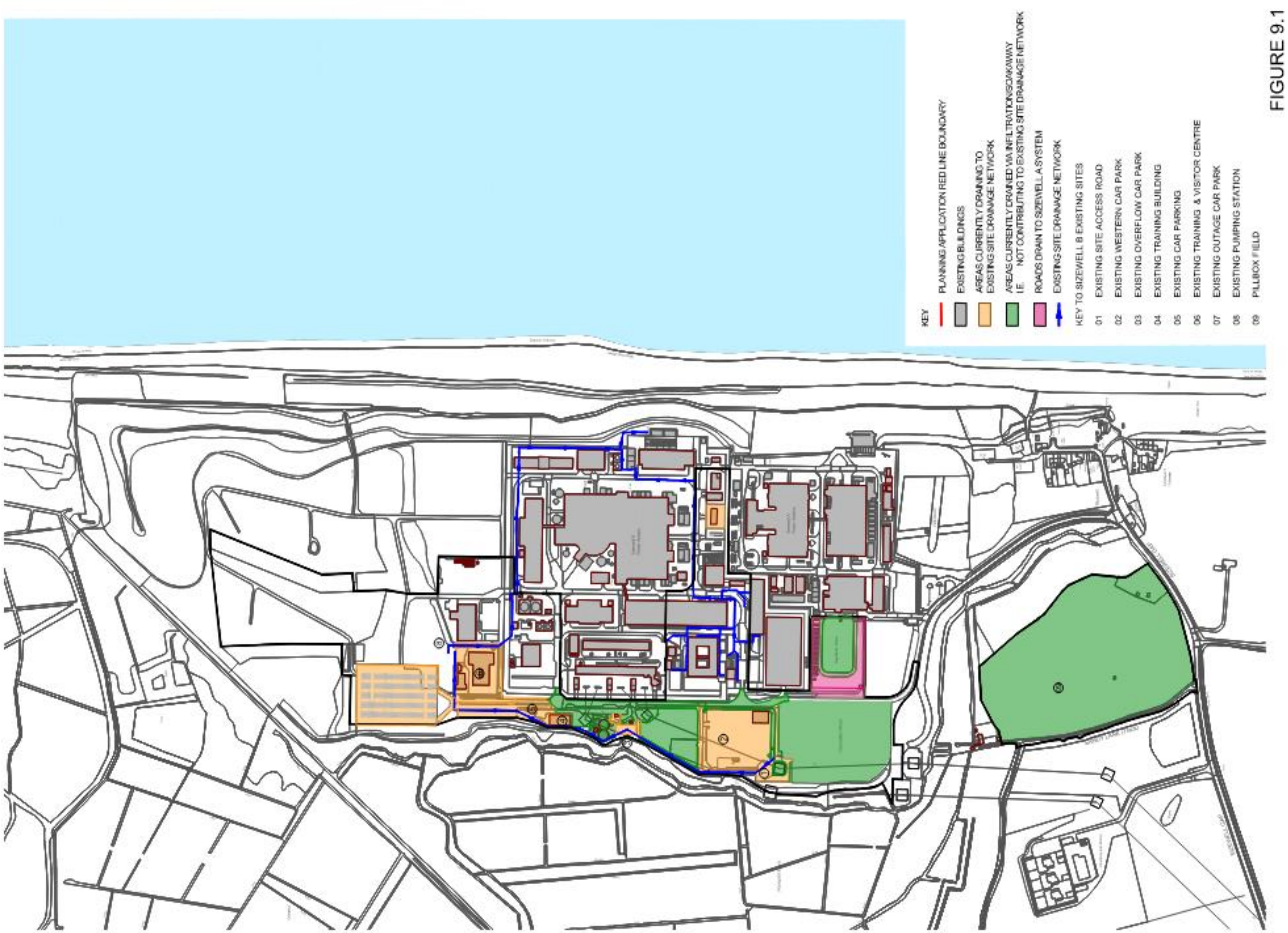
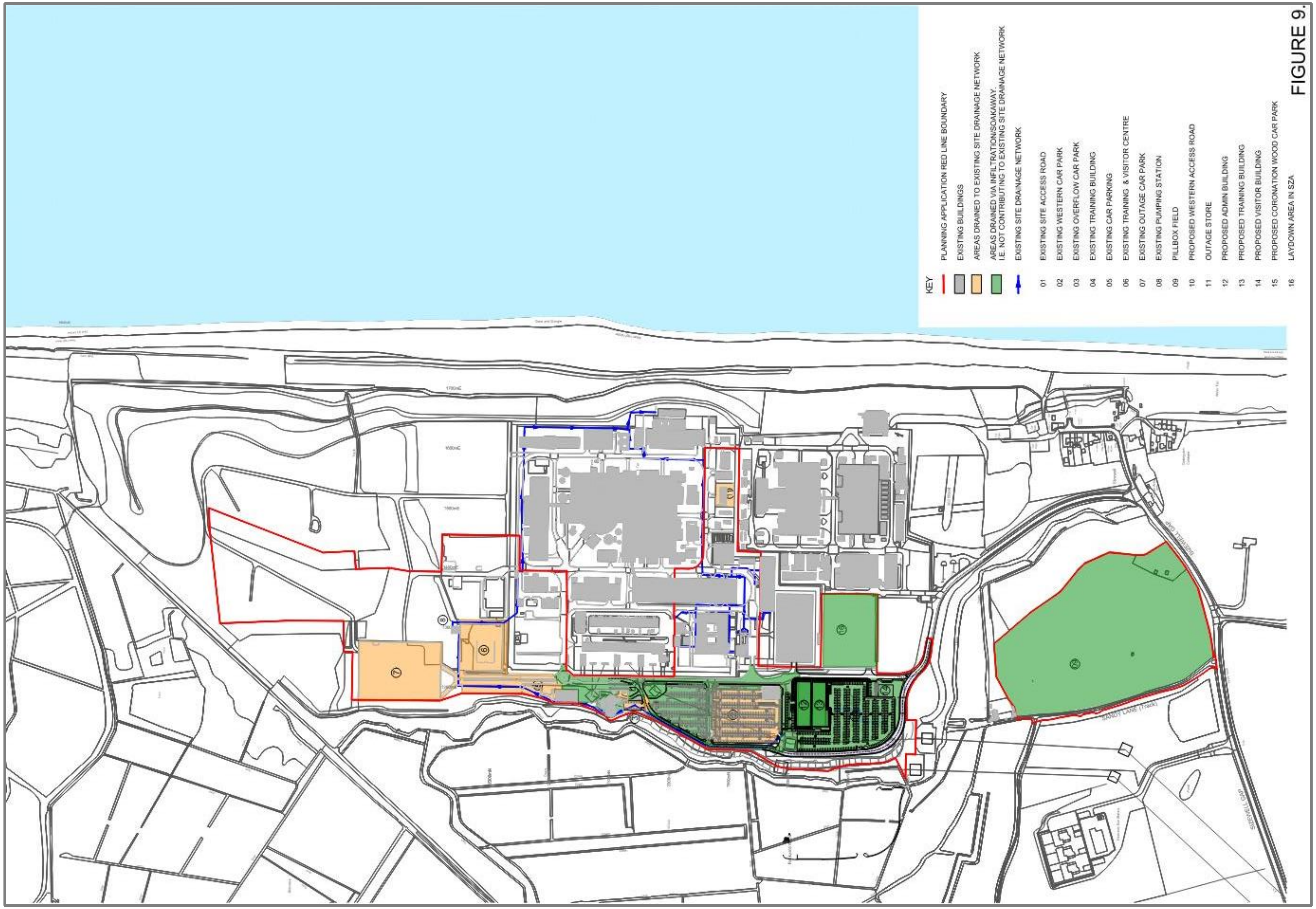


Figure A.2 Proposed Site Drainage Plan



APPENDIX B SURFACE WATER PUMPING AND STORAGE REQUIREMENT FOR DISCHARGE TO THE NORTHERN BRANCH OF DRAINAGE NETWORK

Design Settings

Rainfall Methodology	FSR	Maximum Time of Concentration (mins)	30.00
Return Period (years)	100	Maximum Rainfall (mm/hr)	50.0
Additional Flow (%)	0	Minimum Velocity (m/s)	1.00
FSR Region	England and Wales	Connection Type	Level Soffits
M5-60 (mm)	18.200	Minimum Backdrop Height (m)	0.200
Ratio-R	0.400	Preferred Cover Depth (m)	1.200
CV	0.750	Include Intermediate Ground	✓
Time of Entry (mins)	10.00	Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.358	10.00	5.951	1200	647038.104	263361.118	1.701
2	0.299	10.00	5.897	1200	646996.808	263361.692	1.917
3	0.293	10.00	5.930	1200	647038.569	263394.615	1.880
4	0.272	10.00	5.909	1200	646997.273	263395.188	2.159
5	0.165	10.00	5.742	1200	646970.125	263346.519	1.897
6	0.040	10.00	5.684	1200	646970.709	263391.457	2.117
7	0.155	10.00	5.812	1200	646971.398	263441.546	2.512
8	0.073	10.00	5.000	1200	647004.484	263502.999	2.121
9	0.065	10.00	4.427	1200	647044.435	263536.245	1.217
10	0.075	10.00	4.424	1350	647041.642	263565.589	2.624
10_OUT			4.400	1350	647034.258	263583.241	2.630
11			4.400	1200	647028.852	263594.749	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	41.300	0.600	4.250	3.980	0.270	153.0	150	10.85	50.0
1.001	2	4	33.499	0.600	3.980	3.750	0.230	145.6	150	11.52	50.0
2.000	3	4	41.300	0.600	4.050	3.750	0.300	137.7	150	10.85	37.2
1.002	4	6	26.825	0.600	3.750	3.567	0.183	146.6	150	11.69	35.7
3.000	5	6	44.942	0.600	3.845	3.567	0.278	161.7	250	10.95	37.0
1.003	6	7	50.094	0.600	3.567	3.300	0.267	187.6	250	12.57	34.3
1.004	7	8	69.794	0.600	3.300	2.879	0.421	165.8	250	13.40	33.1
1.005	8	10	72.789	0.600	2.879	2.319	0.560	130.0	250	14.15	32.1
4.000	9	10	29.477	0.600	3.210	2.859	0.351	84.0	250	10.36	38.1
1.006	10	10_OUT	19.134	0.600	1.800	1.770	0.030	637.8	450	14.51	31.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.810	14.3	48.5	1.551	1.767	0.358	0.0	150	0.825
1.001	0.830	14.7	89.0	1.767	2.009	0.657	0.0	150	0.846
2.000	0.854	15.1	29.5	1.730	2.009	0.293	0.0	150	0.870
1.002	0.828	14.6	118.2	2.009	1.967	1.221	0.0	150	0.843
3.000	1.097	53.9	16.6	1.647	1.867	0.165	0.0	95	0.970
1.003	1.018	50.0	132.6	1.867	2.262	1.427	0.0	250	1.037
1.004	1.084	53.2	141.9	2.262	1.871	1.582	0.0	250	1.104
1.005	1.225	60.1	143.9	1.871	1.855	1.654	0.0	250	1.248
4.000	1.527	75.0	6.7	0.967	1.315	0.065	0.0	50	0.954
1.006	0.797	126.8	153.7	2.174	2.180	1.794	0.0	450	0.808

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	10_OUT	11	12.715	0.600	4.250	3.050	1.200	10.6	150	14.58	50.0

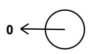
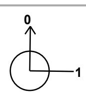
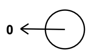
Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	3.113	55.0	243.1	0.000	1.200	1.794	0.0	150	3.171

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	41.300	153.0	150	Circular	5.951	4.250	1.551	5.897	3.980	1.767
1.001	33.499	145.6	150	Circular	5.897	3.980	1.767	5.909	3.750	2.009
2.000	41.300	137.7	150	Circular	5.930	4.050	1.730	5.909	3.750	2.009
1.002	26.825	146.6	150	Circular	5.909	3.750	2.009	5.684	3.567	1.967
3.000	44.942	161.7	250	Circular	5.742	3.845	1.647	5.684	3.567	1.867
1.003	50.094	187.6	250	Circular	5.684	3.567	1.867	5.812	3.300	2.262
1.004	69.794	165.8	250	Circular	5.812	3.300	2.262	5.000	2.879	1.871
1.005	72.789	130.0	250	Circular	5.000	2.879	1.871	4.424	2.319	1.855
4.000	29.477	84.0	250	Circular	4.427	3.210	0.967	4.424	2.859	1.315
1.006	19.134	637.8	450	Circular	4.424	1.800	2.174	4.400	1.770	2.180
1.007	12.715	10.6	150	Circular	4.400	4.250	0.000	4.400	3.050	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.000	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.002	4	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
4.000	9	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.006	10	1350	Manhole	Adoptable	10_OUT	1350	Manhole	Adoptable
1.007	10_OUT	1350	Manhole	Adoptable	11	1200	Manhole	Adoptable

Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
1	647038.104	263361.118	5.951	1.701	1200		0	1.000	4.250	150
2	646996.808	263361.692	5.897	1.917	1200		1	1.000	3.980	150
							0	1.001	3.980	150
3	647038.569	263394.615	5.930	1.880	1200		0	2.000	4.050	150

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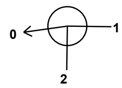
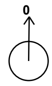
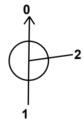
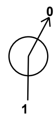
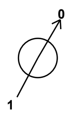
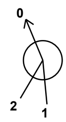
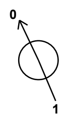
Manhole Schedule

Node	Easting (m)	Northing (m)	CL (m)	Depth (m)	Dia (mm)	Connections		Link	IL (m)	Dia (mm)
4	646997.273	263395.188	5.909	2.159	1200		1	2.000	3.750	150
							2	1.001	3.750	150
							0	1.002	3.750	150
5	646970.125	263346.519	5.742	1.897	1200		0	3.000	3.845	250
6	646970.709	263391.457	5.684	2.117	1200		1	3.000	3.567	250
							2	1.002	3.567	150
							0	1.003	3.567	250
7	646971.398	263441.546	5.812	2.512	1200		1	1.003	3.300	250
							0	1.004	3.300	250
8	647004.484	263502.999	5.000	2.121	1200		1	1.004	2.879	250
							0	1.005	2.879	250
9	647044.435	263536.245	4.427	1.217	1200		0	4.000	3.210	250
10	647041.642	263565.589	4.424	2.624	1350		1	4.000	2.859	250
							2	1.005	2.319	250
							0	1.006	1.800	450
10_OUT	647034.258	263583.241	4.400	2.630	1350		1	1.006	1.770	450
							0	1.007	4.250	150
11	647028.852	263594.749	4.400	1.350	1200		1	1.007	3.050	150

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	18.200	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
100	25	0	0

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Node 10_OUT Online Pump Control

Flap Valve	x	Invert Level (m)	0.770	Switch off depth (m)	0.850
Replaces Downstream Link	✓	Switch on depth (m)	0.900		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.800	30.000	5.000	30.000

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	225

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	240.0	0.0	1.500	240.0	0.0	1.501	0.0	0.0

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Results for 100 year +25% CC Critical Storm Duration. Lowest mass balance: 99.82%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	84	5.951	1.701	34.4	1.9238	107.8362	FLOOD
240 minute winter	2	84	5.897	1.917	34.7	2.1681	100.1531	FLOOD
240 minute winter	3	92	5.930	1.880	28.1	2.1263	63.1137	FLOOD
240 minute winter	4	132	5.883	2.133	42.7	2.4124	0.0000	FLOOD RISK
240 minute winter	5	132	4.724	0.879	15.9	0.9936	0.0000	SURCHARGED
240 minute winter	6	136	4.699	1.132	55.1	1.2799	0.0000	SURCHARGED
240 minute winter	7	136	4.354	1.054	69.9	1.1924	0.0000	SURCHARGED
600 minute winter	8	435	4.179	1.300	61.5	1.4704	0.0000	SURCHARGED
600 minute winter	9	435	4.049	0.839	3.0	0.9487	0.0000	SURCHARGED
600 minute winter	10	435	4.049	2.249	68.2	363.3381	0.0000	SURCHARGED
600 minute winter	10_OUT	435	4.046	2.276	30.7	3.2582	0.0000	OK
240 minute winter	11	4	3.050	0.000	30.0	0.0000	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)	Discharge Vol (m³)
240 minute winter	1	1.000	2	11.2	0.639	0.786	0.7271	
240 minute winter	2	1.001	4	20.4	1.159	1.390	0.5897	
240 minute winter	3	2.000	4	13.5	0.766	0.893	0.7271	
240 minute winter	4	1.002	6	42.2	2.397	2.884	0.4722	
240 minute winter	5	3.000	6	15.7	0.322	0.292	2.1978	
240 minute winter	6	1.003	7	55.0	1.124	1.100	2.4497	
240 minute winter	7	1.004	8	69.7	1.426	1.311	3.4131	
600 minute winter	8	1.005	10	61.7	1.390	1.025	3.5595	
600 minute winter	9	4.000	10	3.0	0.749	0.040	1.4415	
600 minute winter	10	1.006	10_OUT	30.7	0.759	0.242	3.0317	
600 minute winter	10_OUT	Pump	11	30.0				1116.8

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APPENDIX C SURFACE WATER INFILTRATION REQUIREMENT FOR CORONATION WOOD AREA

Design Settings

Rainfall Methodology	FSR
Return Period (years)	30
Additional Flow (%)	0
FSR Region	England and Wales
M5-60 (mm)	18.200
Ratio-R	0.400
CV	0.750
Time of Entry (mins)	10.00
Maximum Time of Concentration (mins)	30.00
Maximum Rainfall (mm/hr)	50.0
Minimum Velocity (m/s)	1.00
Connection Type	Level Soffits
Minimum Backdrop Height (m)	0.200
Preferred Cover Depth (m)	1.200
Include Intermediate Ground	✓
Enforce best practice design rules	x

Nodes

Name	Area (ha)	T of E (mins)	Cover Level (m)	Diameter (mm)	Easting (m)	Northing (m)	Depth (m)
1	0.358	10.00	5.951	1200	647038.104	263361.118	1.701
2	0.299	10.00	5.897	1200	646996.808	263361.692	1.917
3	0.293	10.00	5.930	1200	647038.569	263394.615	1.880
4	0.272	10.00	5.909	1200	646997.273	263395.188	2.159
5	0.165	10.00	5.742	1200	646970.125	263346.519	1.897
6	0.040	10.00	5.684	1200	646970.709	263391.457	2.117
7	0.155	10.00	5.812	1200	646971.398	263441.546	2.512
8	0.073	10.00	5.000	1200	647004.484	263502.999	2.121
9	0.065	10.00	4.427	1200	647044.435	263536.245	1.217
10	0.075	10.00	4.424	1350	647041.642	263565.589	2.624
10_OUT			4.400	1350	647034.258	263583.241	2.630
11			4.400	1200	647028.852	263594.749	1.350

Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.000	1	2	41.300	0.600	4.250	3.980	0.270	153.0	150	10.85	50.0
1.001	2	4	33.499	0.600	3.980	3.750	0.230	145.6	150	11.52	50.0
2.000	3	4	41.300	0.600	4.050	3.750	0.300	137.7	150	10.85	37.2
1.002	4	6	26.825	0.600	3.750	3.567	0.183	146.6	150	11.69	35.7
3.000	5	6	44.942	0.600	3.845	3.567	0.278	161.7	250	10.95	37.0
1.003	6	7	50.094	0.600	3.567	3.300	0.267	187.6	250	12.57	34.3
1.004	7	8	69.794	0.600	3.300	2.879	0.421	165.8	250	13.40	33.1
1.005	8	10	72.789	0.600	2.879	2.319	0.560	130.0	250	14.15	32.1
4.000	9	10	29.477	0.600	3.210	2.859	0.351	84.0	250	10.36	38.1
1.006	10	10_OUT	19.134	0.600	1.800	1.770	0.030	637.8	450	14.51	31.6

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.000	0.810	14.3	48.5	1.551	1.767	0.358	0.0	150	0.825
1.001	0.830	14.7	89.0	1.767	2.009	0.657	0.0	150	0.846
2.000	0.854	15.1	29.5	1.730	2.009	0.293	0.0	150	0.870
1.002	0.828	14.6	118.2	2.009	1.967	1.221	0.0	150	0.843
3.000	1.097	53.9	16.6	1.647	1.867	0.165	0.0	95	0.970
1.003	1.018	50.0	132.6	1.867	2.262	1.427	0.0	250	1.037
1.004	1.084	53.2	141.9	2.262	1.871	1.582	0.0	250	1.104
1.005	1.225	60.1	143.9	1.871	1.855	1.654	0.0	250	1.248
4.000	1.527	75.0	6.7	0.967	1.315	0.065	0.0	50	0.954
1.006	0.797	126.8	153.7	2.174	2.180	1.794	0.0	450	0.808

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Links

Name	US Node	DS Node	Length (m)	ks (mm) / n	US IL (m)	DS IL (m)	Fall (m)	Slope (1:X)	Dia (mm)	T of C (mins)	Rain (mm/hr)
1.007	10_OUT	11	12.715	0.600	4.250	3.050	1.200	10.6	150	14.58	50.0

Name	Vel (m/s)	Cap (l/s)	Flow (l/s)	US Depth (m)	DS Depth (m)	Σ Area (ha)	Σ Add Inflow (l/s)	Pro Depth (mm)	Pro Velocity (m/s)
1.007	3.113	55.0	243.1	0.000	1.200	1.794	0.0	150	3.171

Pipeline Schedule

Link	Length (m)	Slope (1:X)	Dia (mm)	Link Type	US CL (m)	US IL (m)	US Depth (m)	DS CL (m)	DS IL (m)	DS Depth (m)
1.000	41.300	153.0	150	Circular	5.951	4.250	1.551	5.897	3.980	1.767
1.001	33.499	145.6	150	Circular	5.897	3.980	1.767	5.909	3.750	2.009
2.000	41.300	137.7	150	Circular	5.930	4.050	1.730	5.909	3.750	2.009
1.002	26.825	146.6	150	Circular	5.909	3.750	2.009	5.684	3.567	1.967
3.000	44.942	161.7	250	Circular	5.742	3.845	1.647	5.684	3.567	1.867
1.003	50.094	187.6	250	Circular	5.684	3.567	1.867	5.812	3.300	2.262
1.004	69.794	165.8	250	Circular	5.812	3.300	2.262	5.000	2.879	1.871
1.005	72.789	130.0	250	Circular	5.000	2.879	1.871	4.424	2.319	1.855
4.000	29.477	84.0	250	Circular	4.427	3.210	0.967	4.424	2.859	1.315
1.006	19.134	637.8	450	Circular	4.424	1.800	2.174	4.400	1.770	2.180
1.007	12.715	10.6	150	Circular	4.400	4.250	0.000	4.400	3.050	1.200

Link	US Node	Dia (mm)	Node Type	MH Type	DS Node	Dia (mm)	Node Type	MH Type
1.000	1	1200	Manhole	Adoptable	2	1200	Manhole	Adoptable
1.001	2	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
2.000	3	1200	Manhole	Adoptable	4	1200	Manhole	Adoptable
1.002	4	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
3.000	5	1200	Manhole	Adoptable	6	1200	Manhole	Adoptable
1.003	6	1200	Manhole	Adoptable	7	1200	Manhole	Adoptable
1.004	7	1200	Manhole	Adoptable	8	1200	Manhole	Adoptable
1.005	8	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
4.000	9	1200	Manhole	Adoptable	10	1350	Manhole	Adoptable
1.006	10	1350	Manhole	Adoptable	10_OUT	1350	Manhole	Adoptable
1.007	10_OUT	1350	Manhole	Adoptable	11	1200	Manhole	Adoptable

Simulation Settings

Rainfall Methodology	FSR	Skip Steady State	x
FSR Region	England and Wales	Drain Down Time (mins)	240
M5-60 (mm)	18.200	Additional Storage (m³/ha)	0.0
Ratio-R	0.400	Check Discharge Rate(s)	x
Winter CV	0.840	Check Discharge Volume	x
Analysis Speed	Normal		

Storm Durations

240	360	480	600	720	960	1440

Return Period (years)	Climate Change (CC %)	Additional Area (A %)	Additional Flow (Q %)
30	20	0	0

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Node 10_OUT Online Pump Control

Flap Valve	x	Invert Level (m)	0.770	Switch off depth (m)	0.850
Replaces Downstream Link	✓	Switch on depth (m)	0.900		

Depth (m)	Flow (l/s)	Depth (m)	Flow (l/s)
0.800	20.000	5.000	20.000

Node 10 Depth/Area Storage Structure

Base Inf Coefficient (m/hr)	0.00000	Safety Factor	2.0	Invert Level (m)	1.800
Side Inf Coefficient (m/hr)	0.00000	Porosity	1.00	Time to half empty (mins)	184

Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)	Depth (m)	Area (m^2)	Inf Area (m^2)
0.000	360.0	0.0	1.500	360.0	0.0	1.501	0.0	0.0

Node 11 Soakaway Storage Structure

Base Inf Coefficient (m/hr)	0.04680	Invert Level (m)	3.050	Depth (m)	3.000
Side Inf Coefficient (m/hr)	0.04680	Time to half empty (mins)	928	Inf Depth (m)	2.000
Safety Factor	1.5	Pit Width (m)	20.000	Number Required	1
Porosity	1.00	Pit Length (m)	30.000		

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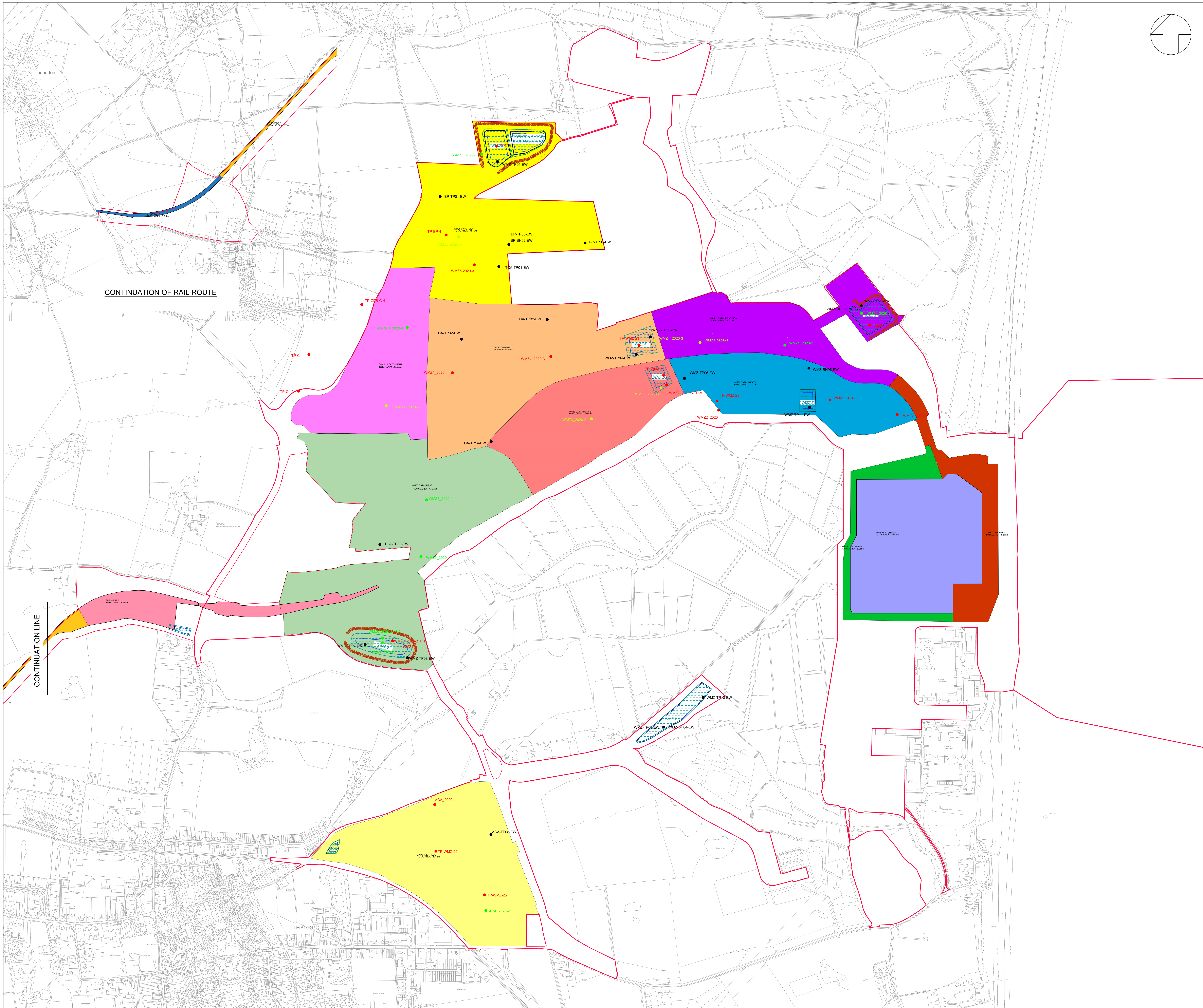
Results for 30 year +20% CC Critical Storm Duration. Lowest mass balance: 99.89%

Node Event	US Node	Peak (mins)	Level (m)	Depth (m)	Inflow (l/s)	Node Vol (m³)	Flood (m³)	Status
240 minute winter	1	92	5.951	1.701	25.2	1.9238	63.4634	FLOOD
240 minute winter	2	96	5.897	1.917	27.0	2.1681	43.9896	FLOOD
240 minute winter	3	104	5.930	1.880	20.6	2.1263	21.1306	FLOOD
240 minute winter	4	128	5.782	2.032	42.4	2.2980	0.0000	FLOOD RISK
240 minute winter	5	128	4.299	0.454	11.6	0.5136	0.0000	SURCHARGED
240 minute winter	6	128	4.284	0.717	53.2	0.8112	0.0000	SURCHARGED
240 minute winter	7	128	3.938	0.638	64.0	0.7216	0.0000	SURCHARGED
240 minute winter	8	128	3.255	0.376	69.1	0.4254	0.0000	SURCHARGED
240 minute winter	9	128	3.252	0.042	4.5	0.0475	0.0000	OK
480 minute winter	10	368	2.897	1.097	65.0	396.4155	0.0000	SURCHARGED
480 minute winter	10_OUT	368	2.896	1.126	20.5	1.6115	0.0000	OK
960 minute winter	11	1050	4.159	1.109	20.0	666.4952	0.0000	OK

Link Event (Upstream Depth)	US Node	Link	DS Node	Outflow (l/s)	Velocity (m/s)	Flow/Cap	Link Vol (m³)
240 minute winter	1	1.000	2	11.0	0.624	0.767	0.7271
240 minute winter	2	1.001	4	20.2	1.150	1.379	0.5897
240 minute winter	3	2.000	4	13.7	0.776	0.905	0.7271
240 minute winter	4	1.002	6	41.9	2.380	2.865	0.4722
240 minute winter	5	3.000	6	11.6	0.259	0.215	2.1978
240 minute winter	6	1.003	7	53.1	1.095	1.063	2.4497
240 minute winter	7	1.004	8	64.0	1.309	1.203	3.4131
240 minute winter	8	1.005	10	69.1	1.422	1.148	3.5595
240 minute winter	9	4.000	10	4.5	0.842	0.060	0.1575
480 minute winter	10	1.006	10_OUT	20.5	0.687	0.162	3.0317
480 minute winter	10_OUT	Pump	11	20.0			
960 minute winter	11	Infiltration		6.2			

ANNEX 2A.2: LOCATION OF GEOTECHNICAL INVESTIGATIONS ON MDS AND INFILTRATION TESTING CONFIDENCE



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NOTES:

KEY:

- PROPOSED INFILTRATION & PERMEABILITY TESTS IN UPCOMING TCA &ACA GI
- INFILTRATION TEST_CONFIDENCE CATEGORY 4
- INFILTRATION TEST_CONFIDENCE CATEGORY 3
- INFILTRATION TEST_CONFIDENCE CATEGORY 2
- INFILTRATION TEST_CONFIDENCE CATEGORY 1

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DOCUMENT:

Annex 2A.2: Location of Geotechnical Investigations on MDS and Infiltration Testing Confidence

DRAWING TITLE:

SIZEWELL C - GEOTECHNICAL INVESTIGATIONS - LOCATIONS

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