Cambridge Waste Water Treatment Plant Relocation Project

Anglian Water Services Limited

Design and Access Statement

Application Document: 7.6

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Contents

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Executive Summary

Executive Summary

“A landscape-led approach, enabelling sustainable growth and creating a place where water, people and open space come together.”

The Design and Access Statement (DAS) describes the Cambridge Waste Water Treatement Plant Relocation Project (CWWTPRP) objectives and the design principles and considerations that have informed site selection and design development which define the form and appearance of the Proposed Development as currently envisaged. This design has been advanced sufficient for Development Consent Order (DCO) consenting purposes to deliver a ‘clean consent’ within parameters defined by the draft DCO (Application Document Ref 2.1) and with limited discharge requirements to enable prompt commencement of the Proposed Development if and when consent is secured. The detailed design of a number of elements of the Proposed Development (for example, the precise shape and dimensions of some structures and choice of technology) has, however, been left flexible to enable further refinement of the design and engineering optimization to be provided after the contractor is appointed and further survey results are obtained. The degree of design uncertainty is, however, quite narrow and the information contained in this document is intended to guide the design of these remaining details of the CWWTPRP going forward through the discharge of requirements stage.

The Design Objectives set out in this document will be used to guide the design details that are proposed to be reserved by the DCO requirements, such as the design and external appearance of plant and buildings, materials and landscape planting. Illustrative material is included to help articulate what may be built, noting that the precise details may vary at the point that approval is requested to discharge relevant DCO requirements. Requirement 7(2) of the draft DCO (Application Document Ref 2.1) requires that the details submitted must include an explanation of how they accord with the Design Objectives set out in Section 11 of this Design and Access Statement or an explanation of why this is not reasonably practicable.”

The CWWTPRP involves the construction of a new Waste Water Treatment Plant (WWTP) together with the associated development of waste water and treated effluent transfer infrastructure, comprising a Waste Water Transfer Tunnel from the existing Cambridge WWTP to the proposed WWTP, Final Effluent (FE) pipeline and Storm Pipeline jointly referred to as the FE and Storm Pipeline with an outfall to the River Cam, and two new pipelines (rising mains) (hereafter the Waterbeach Pipeline) from the Waterbeach New Town development area to the proposed WWTP, either via the existing Cambridge WWTP or direct when the existing Cambridge WWTP is decommissioned. Other associated development includes a new permanent access road connecting the proposed WWTP to the local road network at Horningsea Road and the interception and diversion of several rising mains at the site of the existing Cambridge WWTP to relocate their discharge point from the existing inlet works to the Waste Water Transfer Tunnel.

A particularly important element of the Proposed Development is the landscaped area which surrounds the proposed WWTP. A circular earth bank, woodland blocks, hedges, glades and biodiverse wildlife grassland are features of the comprehensive landscape masterplan embedded as a core part of the design to mitigate the landscape and visual impacts of the Proposed Development, to expand and create recreational opportunities and biodiversity rich areas to expand the network of rights of way.

The DAS describes how national policy requirements for good design and access provision are met and how guidance on design quality have been considered. It describes the steps taken to appraise the context of the development and how the design of the development takes that context into account. It also explains the policy adopted as to access and what account has been taken of the outcome of consultation. It also explains how specific issues affecting the design of and access to the Proposed Development have been addressed.

A structured approach to the design of the CWWTPRP has been adopted, taking on board national policy and guidance, through;

1. Defining the requirements, project objectives and project elements for site selection purposes

2. Site selection and consideration of alternatives

3. Establishment of Design Principles and Design Objectives

4. Design development (including integration of components into local site context and mitigation of potential impacts) through the Applicant’s Design Team, Technical and Community Working Groups, Design Review Panels and statutory and non-statutory consultation.

The requirements for the CWWTPRP are closely aligned to the wider water industry commitment to net zero carbon by 2030. The proposed WWTP is designed to reduce concentration in final treated effluent discharges of phosphorus, ammonia, total suspended solids and biological oxygen demand. The proposed WWTP should provide greater resilience and improved storm management, meaning storm overflows and Combined Sewer Overflows (CSOs) are far less likely to occur (as described in the Storm Model report – Application Document Ref. 5.4.20.10).

The final proposals presented in this Design and Access Statement have evolved following an iterative process of consultation and detailed

design development involving key design stakeholders including the local community, the Cambridge Quality Panel and the Design Council. The clear messages received from the responses to the consultation material have informed design development, including use of organic 'natural' screening on the top of the earth bank, tree and hedgerow planting rather than building an 'engineered' looking screen and use of 'natural' materials that blend into the landscape.

The design principles and objectives developed to define how the CWWTPRP will fulfil the criteria of 'good design' consistent with the advice in Section 3.5 of the National Policy Statement (NPS), have informed the CWWTPRP design requirements; that is, designs for the components of the CWWTPRP (such as the buildings, principal structures and landscape). These components, and the outstanding detailed design elements which will be developed prior to construction under further approval requirements, will be carried out in accordance with these design principles and objectives. Alternative designs, or where details have not yet been submitted for approval, must accord with the Design Objectives set out in Section 11 of this DAS, subject to reasonable practicability (for example, as a result of new regulatory requirements, abnormal ground conditions, and change to permitting requirements).

Explanation is provided of how the design principles and requirements have informed both the landscape and architectural design at a site-wide scale, in response to the site context and the likely way that the Proposed Development will continue to be developed in accordance with the Design Objectives and the site parameter plans.

Building upon consultation and engagement with stakeholders, technical working groups, technical consultants and feedback from the local community, the design has been refined over time to respond to these concerns, objectives and ideas. The resulting design is a comprehensive and coherent landscape, which integrates the plant into its setting and provides a green and richly diverse landscape feature at the north-eastern edge of Cambridge.

The proposals seek to ensure an appropriate balance is achieved between the functional requirements of the plant and the sensitivity of building within the Green Belt, acknowledging the limitations of this type of infrastructure to achieve enhancements to the quality of the area (NPS paragraph 3.5.1). Justification as to why the design has been developed in the way it has, and why each of the key components of the scheme are located where they are, is set out in the context of land take, site and plant layout, access and amenity, landscape and biodiversity. Specific design responses on plant layout, operational optimisation, odour, height of structures, buildings and people, materials, colour and lighting are described.

The landscape design for the proposed WWTP has emerged through an iterative process, informed by the landscape and visual constraints and opportunities (eg for visual integration) which are apparent on the site and in the surrounding context. The resulting design is therefore landscape and visually led.

A multifunctional approach has been adopted to deliver landscape enhancement, visual screening, ecological habitat creation and recreational opportunities for local communities. This approach provides mitigation for potential environmental impacts that have been identified through the Environmental Impact Assessment (EIA), including impacts on landscape character and visual amenity process and also for enhancement of the local environment.

The proposed WWTP will be operationally net zero carbon, be energy neutral and will target a 70 per cent reduction in capital carbon using sustainable construction techniques. Re-using excavated material on site will reduce the carbon emissions and traffic impact from construction. Reduction in the carbon footprint of the new plant has been achieved through the following design responses:

- Using the carbon impact as a key decision-making factor during the "Risk Opportunity and Value" design process; and

- Considering issues such as the physical sizing of infrastructure and choice of construction materials to reduce the amount of capital carbon that will be produced.

Taking into account the ultimate purpose of the infrastructure and operational, safety and security requirements which the design has to satisfy (NPS paragraph 3.5.4) and the recognition that "good design is a key aspect of sustainable development" (National Planning Policy Framework (NPPF) paragraph 126), this DAS concludes that from a design perspective the Proposed Development:

i) is sustainable and as attractive, durable and adaptable as it can be, sufficient to satisfy the requirements on the decision maker at NPS paragraph 3.5.2:

ii) is sympathetic to local character and history (NPPF paragraph 130);

iii) so far as opportunities arise, enhances local distinctiveness and the character and quality of the area; and

iv) is innovative and promotes a high level of sustainability within the national policy context as set out in the sections on 'good design' in the NPS (including section 3.5 and paragraphs 4.5.14, 4.8.19, 4.9.8 and 4.9.12).

1.

Introduction

1. Introduction

‘Good design is about ensuring attractive, usable, durable and adaptable places and contributing to sustainable development’ - *para 3.5.1 NPS*

1.1 Introduction

1.1.1 This Design and Access Statement (DAS) has been prepared as part of the Cambridge Waste Water Treatment Plant Relocation Project (CWWTPRP) Development Consent Order (DCO) application and has been prepared pursuant to Regulation 5(2)(q) of the Infrastructure Planning (Applications: Prescribed Forms and Procedures) Regulations 2009 to assist in the determination of the application. The purpose of this DAS is to describe the design principles and concepts that have been applied to the development of the proposals for this proposed Waste Water Treatment Plant (WWTP) and associated infrastructure works and how issues relating to access to the development have been dealt with.

1.2 Purpose of the DAS

1.2.1 The DAS describes the project objectives and the design principles and considerations that have informed site selection and design development which define the form and appearance of the Proposed Development as currently envisaged. This design has been advanced sufficient for DCO consenting purposes to deliver a ‘clean consent’ within parameters defined by the draft DCO (Application Document Ref 2.1) and with limited discharge requirements to enable prompt commencement of the Proposed Development if and when consent is secured. The detailed design of a number of elements of the Proposed Development (for example, the precise shape and dimensions of some structures and choice of technology) has, however, been left flexible to enable further refinement of the design and engineering optimization to be provided after the contractor is appointed and further survey results are obtained. The degree of design uncertainty is, however, quite narrow and the information contained in this document is intended to guide the design of these remaining details of the CWWTPRP going forward through the discharge of requirements stage.

1.2.2 The DAS helps to demonstrate that the CWWTPRP will be delivered consistently, and in accordance with the design principles set out herein, so that the design quality of the overall CWWTPRP can be assured. It does this by explaining and justifying the design proposals, setting out how the design has been developed and, importantly, the Design Objectives that will be used to develop the design further. In particular, the Design Objectives will be used to guide the design details that are proposed to be reserved by the DCO requirements, such as the design and external appearance of plant and buildings, materials and landscape planting. Illustrative material is included to help articulate what may be built, noting that the precise details may vary at the point that approval is requested to discharge relevant DCO requirements. Requirement 7(2) of the draft DCO (Application Document Ref 2.1) requires that the details submitted must include an explanation of how they accord with the Design Objectives set out in Section 11 of this DAS or an explanation of why this is not reasonably practicable.

1.2.3 The DAS describes how national policy requirements for good design and access provision are met and how guidance on design quality have been considered. It describes the steps taken to appraise the context of the development and how the design of the development takes that context into account. It also explains the policy adopted as to access and what account has been taken of the outcome of consultation. It also explains how specific issues affecting the design of and access to the development have been addressed.

1.2.4 This document explains the functional and operational needs and the design rationale underpinning the proposed location, layout and design for the new waste water treatment plant and Sludge Treatment Centre (STC), connecting infrastructure (including tunnels, pipelines, pumping stations, maintenance and ventilation shafts) and associated development. It also sets out how the design has been developed by an understanding of relevant planning policies and guidance and local site context, and how it has been informed by stakeholder and public engagement throughout the design development process.

1.2.5 This document focuses on the permanent above ground elements with reference to below round structures for context.

1.3 Content and Structure of Document

1.3.1 In the absence of any specific guidance relating to the preparation and reporting of Design and Access Statements for Nationally Significant Infrastructure Projects (NSIPs), the DAS has been prepared in line with planning regulations and national guidance relating to applications for more general development proposals:

- Articles 4(2) and 4(3) of the Town and Country Planning (Development Management Procedure) (England) (Amendment) Order 2013

- Design and Access Statement: How to Read, Write and Use Them, produced by CABE (2007); and

- Guidance on Information Requirements and Validation, published by the Department for Communities and Local Government (2010)

1.3.2 The DAS is structured as follows:

- In Section 2 – the project objectives for this infrastructure project are described.

- In Section 3 – the approach to consultation and how it has informed the design is summarised.

- In Section 4 – the site site selection process (including the evolution of design to inform site selection) is summarised.

- In Section 5 – the site context and constraints are summarised.

- In Section 6 – the evolution of design from site selection onwards to deliver good design is described.

- In Section 7 – the design response to the site context is described.

- In Section 8 – the landscape proposals are summarised.

- In Section 9 – the design of the proposed WWTP site is described.

- In Section 10 – the connecting infrastructure is described.

- In Section 11 – conclusions are drawn.

1.4 Summary of Proposals

1.4.1 The CWWTPRP involves the construction of a new waste water treatment plant together with the associated development of waste water and treated effluent transfer infrastructure, comprising a Waste Water Transfer Tunnel from the existing Cambridge WWTP to the new proposed WWTP, Final Effluent (FE) pipeline and Storm Pipeline jointly referred to as the FE and Storm Pipeline with an outfall to the River Cam, and two new pipelines (rising mains) (hereafter Waterbeach Pipeline) from the Waterbeach New Town development area. A permanent access road will connect the proposed WWTP to the local road network at Horningsea Road. Several rising mains at the site of the existing Cambridge WWTP will be intercepted and diverted to relocate their discharge point from the existing inlet works to the new waste water transfer tunnel.

1.4.2 Photovoltaic panels will harness solar energy for conversion into electricity to service some of the energy demand. A landscaped area will surround the proposed WWTP.

1.4.3 Although this DAS includes descriptions of many aspects of the Proposed Development when explaining the design development process, a full description of the CWWTPRP and the processes involved is provided in Chapter 2 of the Environmental Statement (Application document reference 5.2.2). Given the scale and geographical spread of the project, the project description distinguishes between the 'Main Development' and the 'Connecting Infrastructure':

- Proposed WWTP – the proposed WWTP (including inlet and Terminal Pumping Station, stormwater management, Inlet Works, primary/secondary/tertiary treatment, treated wastewater collection chamber), STC, utilities provision and connection, ancillary on-site buildings (including the Gateway Building, substation and workshop), internal road network, fencing and lighting, renewable energy generation systems, utilities and site drainage.

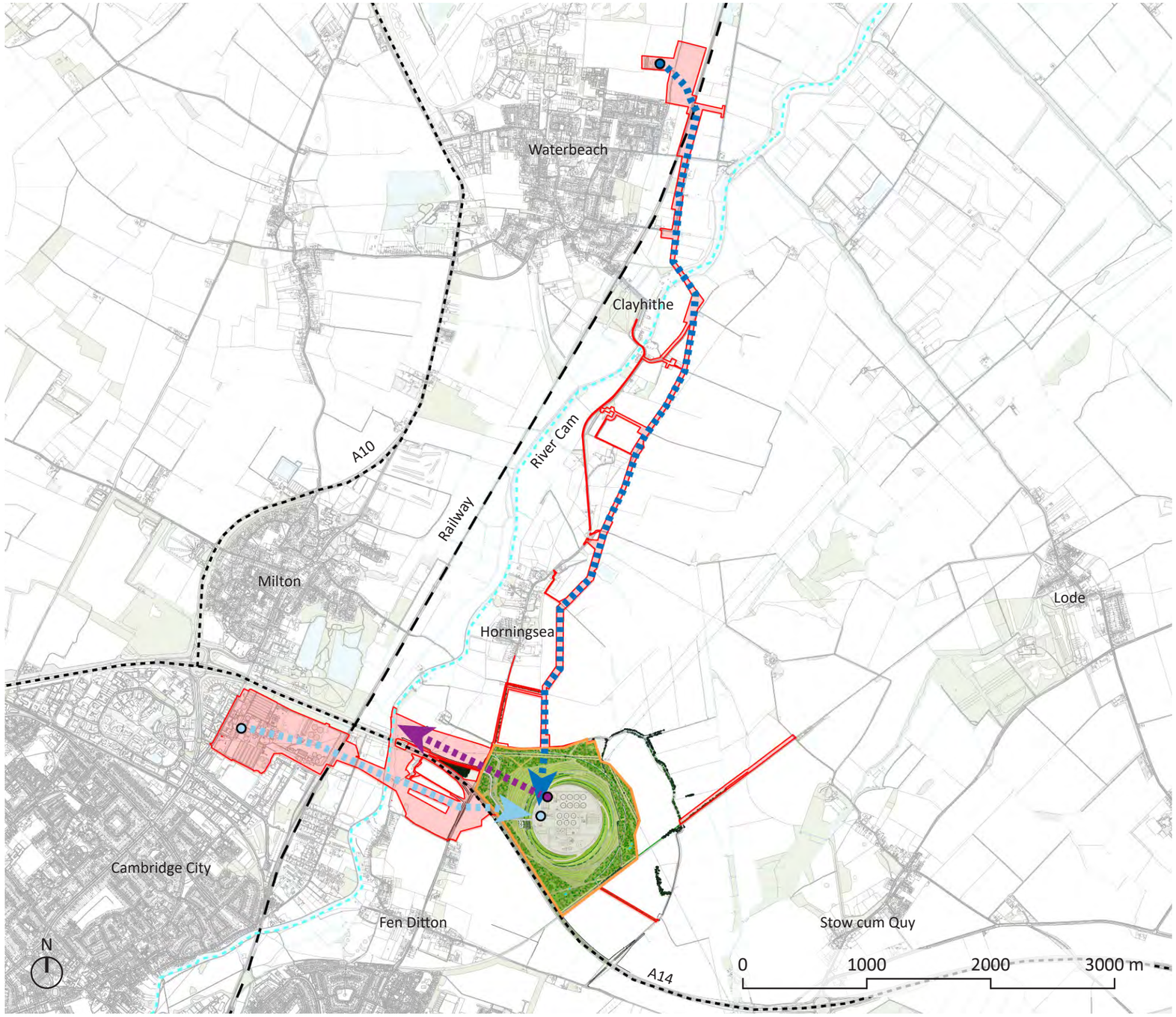
- Connecting Infrastructure – the transfer tunnel/ pipeline and temporary intermediate shafts, FE and Storm Pipeline, Waterbeach Pipeline, off-site highway network alterations, permanent access road, Milton diversions, Fen Ditton rising main and outfall structure.

1.4.4 A third and particularly important element of the Proposed Development is the landscaped area which surrounds the proposed WWTP. A circular earth bank, woodland blocks, hedges, glades and biodiverse wildlife grassland are features of the comprehensive landscape masterplan embedded as a core part of the design to provide environmental mitigation and enhancements and to mitigate the landscape and visual impacts of the Proposed Development, to expand and create recreational opportunities and biodiversity rich areas to expand the network of rights of way.

1.4.5 This DAS uses this same terminology in describing the site context and how considerations have been reflected in the design response. Unless otherwise described in this document, the Generic Glossary (Application Document Reference 1.4) explains the terminology used in the Proposed Development and general terminology and abbreviations.

1.4.6 The CWWTPR has been subjected to formal EIA procedures, the outcomes of which are reported in an Environmental Statement (Application document reference 5.2). Information contained in the ES is referenced in this DAS, and reference should be made to the ES and to the suite of other documents (including particularly the Explanatory Memorandum (Application Document Ref 2.2), Consultation Report (Application Document Ref 6.1) and Planning Statement (Application Document Ref 7.5)) for full details of the project components and their relationship to the receiving environment, the need for the project, and the existing planning policy context.

1.4.7 The need for the Proposed Development is set out in the Planning Statement (Application Document Reference 7.5). The CWWTPRP will allow Anglian Water Services Limited to continue to provide critical waste water treatment and recycling services to residents in Cambridge and Greater Cambridge in a modern, low-carbon facility.



Key

- Scheme Order Limits
- Proposed WWTP Site
- Transfer Tunnel
- Waterbeach Pipelines
- Outfall Pipelines

1.5 The Importance of Good Design

1.5.1 Existing policy set out within the National Policy Statement for Waste Water (March 2012) ('the Waste Water NPS') makes clear the requirements for good design in waste water projects. Section 3.5 of the Waste Water NPS addresses 'Criteria for "good design" for waste water infrastructure'. Whilst acknowledging the limitations of this type of infrastructure to achieve enhancements to the quality of the area (para 3.5.1), the Waste Water NPS makes clear that:

"*.... the decision maker needs to be satisfied that waste water infrastructure developments are* ***sustainable and****, having regard to regulatory and other constraints,* ***are as attractive, durable and adaptable*** *(including taking account of natural hazards such as flooding)* ***as they can be***" (para 3.5.2)

… taking into account "the ultimate purpose of the infrastructure and bear[ing] in mind the ***operational, safety and security requirements*** which the design has to satisfy" (para 3.5.4)

1.5.2 This requires the applicant to demonstrate to the decision maker that it has (paragraph 3.5.2 – 3.5.4):

i) taken into account both aesthetics and functionality (including fitness for purpose)

ii) taken independent professional advice on the design aspects of the proposal – in particular through the use of the Design Council CABE to provide design review

iii) ensured that the design is as visually attractive as possible by the use of good architecture and appropriate landscaping

iv) considered siting re lative to existing and currently planned landscape character, landform and vegetation

v) carefully considered design and the sensitive use of materials in any associated development (eg control rooms and pumping stations)

vi) considered alternative designs and given the reasons why the favoured choice has been selected, demonstrating that all proposed and alternative infrastructure meets the relevant EU or UK technical standard for design, construction, installation and maintenance, where such standards exist.

1.5.3 Paragraph 126 of the NPPF ties the principle of good design to sustainable development. Whilst some issues of good design relate to visual appearance and aesthetics, NPPF paragraph 130 makes clear that decisions should ensure that developments are "sympathetic to local character and history, including the surrounding built environment and landscape setting".

1.5.4 Improving the quality of design in national infrastructure projects has been given particular focus since the publication of the first National Infrastructure Assessment by the National Infrastructure Commission (chaired by Sir John Armitt) in 2018. The NIC Design Group identifies four design principles to guide infrastructure design. They are:

- Climate – Mitigate greenhouse gas emissions and adapt to climate change.
- People – Reflect what society wants and share benefits widely.
- Places - Provide a sense of identity and improve our environment.
- Value - Achieve multiple benefits and solve problems well.

1.5.5 Other sources of information on design in infrastructure projects which are have provided guidance in the development of these proposals have included:

- Frame Projects, National Infrastructure Design Principles: Primary Research Report, January 2020
- Publica, Developing Design Principles for National Infrastructure, July 2018
- NIPA insights II, Towards a Flexibility Toolkit, May 2019
- MHCLG National Design Guide, October 2019
- South Cambridgeshire Local Plan 2018

1.6 The CWWTPRP Design Approach

1.6.1 Taking on board the guidance provided in the documents referenced above, the approach to the design of this project has been structured as follows:

i) Preparation of 'Statement of Requirements', outlining requirements, project objectives and project elements for site selection purposes

ii) Site selection and consideration of alternatives

iii) Establishment of Design Principles

iv) Design development through four principal vehicles:

• **Applicant's Design Team** - Comprising operational, engineering design,architectural and environmental capabilities made up from members of AW operational and engineering teams, @One alliance members and appointed consultants including architects, landscape architects and the EIA team with the role of making sure good design is prioritised from the early stages of the project, providing a continual emphasis on that design vision throughout and holding the overall project team to account for delivering those design objectives.

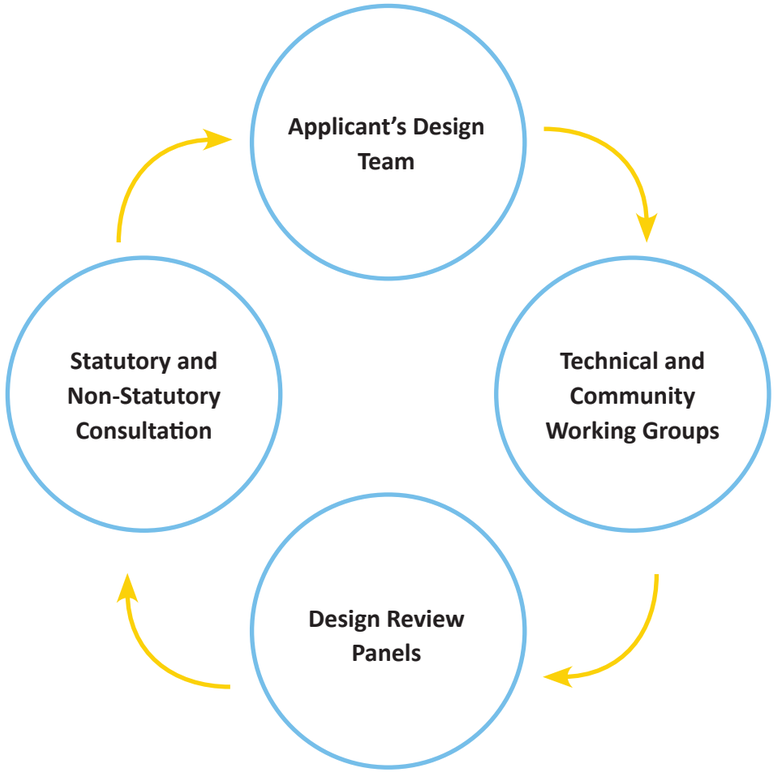
• **Technical and Community Working Groups** - In the case of Technical Working Groups comprising individuals from the Applicant's Design Team together with officers and representatives from the affected local authorities, Cambridgeshire and Peterborough Combined Authority, Greater Cambridge Partnership and regulators) covering water resources, biodiversity and ecology, traffic and access, landscape and heritage. The Community Working Group comprises representatives of the immediately surrounding parish councils and the principal objection group ('Save Honey Hill') and, chaired by an independent member of the Greater Cambridge community, is used as a sounding board on project development and design evolution.

• **Design Review Panels** - Selected panels providing an independent and impartial evaluation of the design at appropriate stages as it progresses for both formal design review and an 'internal' project challenge function with representation from local and national experts in design, architecture, transport, landscape and engineering. The Cambridgeshire Quality Panel has provided two stages of formal design review focussing on how the project is addressing the principles of the Cambridgeshire Quality Charter, 'Character, Climate, Community and Connectivity' as reviewed at different stages in the design process. The Design Council (through the NIC Design Group) has offered a number of stages of design review advice on an 'internal' project challenge basis.

• **Statutory and Non-Statutory Consultation** - Engagement with landowners and others with an interest in the land affected, the local community, statutory consultees, local authorities, elected representatives and a wide range of community groups, local nature conservation bodies, community interest groups and local business owners. Consultation comprising an initial non-statutory phase followed by two statutory pre-application consultation phases in accordance with Sections 42, 43, 47 and 48 of the Planning Act 2008 (the 2008 Act).

1.6.2 Through this approach, the design process commenced on day one of the project, continuing through site selection and submission of the DCO application up to approval of the design details that are proposed to be reserved by the DCO requirements.

1.6.3 It has allowed an aspirational approach to be taken to the design of the CWWTPRP that exemplifies the proposals as an NSIP incorporating novel technologies which help reduce the footprint of the proposed WWTP to 22 ha, about half the size of the existing Cambridge WWTP. This leaves the remainder of the site for landscaped areas, environmental mitigation and enhancements to screen the proposed WWTP and for recreation to produce a scheme which is innovative and which promotes a high level of sustainability within the national policy context as set out in the sections on 'good design' in the NPS (including section 3.5 and paragraphs 4.5.14, 4.8.19, 4.9.8 and 4.9.12).



A cyclical design approach where input and feedback from each vehicle fed into the holistic design process.

2.

Project Objectives

2. Project Objectives

'In considering applications the examining authority and the decision maker should take into account the ultimate purpose of the infrastructure and bear in mind the operational, safety and security requirements which the design has to satisfy' - *para 3.5.4 NPS*

2.1 Introduction

2.1.1 The principal objective of the CWWTPRP is to release a significant area of brownfield land on and surrounding the existing Cambridge WWTP in North East Cambridge for development, in particular for housing.

2.1.2 Relocation, through the development of a proposed WWTP, and decommissioning of the existing Cambridge WWTP, will enable the delivery of South Cambridgeshire District and Cambridge City Council's Area Action Plan for a new, low carbon city district in North East Cambridge which could create 8,350 homes and 15,000 jobs over the next 20 years.

2.1.3 At the core of this project is the design of the proposed WWTP and its connecting infrastructure. The proposed WWTP will not only treat the flows currently being treated at the existing Cambridge WWTP but will also be required to treat an increased volume of waste water due to the predicted growth in the greater Cambridge area. The proposed WWTP will also treat that waste water to a higher standard to comply with a new discharge permit that will be issued to the Applicant by the Environment Agency (EA).

2.1.4 The design must allow for both WWTPs (existing and proposed) to operate for an interim period at the same time so that all discharges to the River Cam are compliant with agreed permit consents. The design of the proposed WWTP must not only perform within its regulated requirements but also respond and be sensitive to the context in which it is situated (including the surrounding landscape setting and character), reflecting stakeholder feedback as well as following the NIC good design principles and complying with the Waste Water NPS.

2.1.5 The relocation of the Waste Water Treatment Plant will allow Anglian Water Services Limited to continue providing vital waste water services to customers across Cambridge and the Greater Cambridge area. It will treat all waste water and wet sludge from the Cambridge catchment just as the existing Cambridge WWTP currently does, plus that from the growth indicated and being planned within the catchment, with the ability and resilience to expand further to deal with future population growth and changing regulatory requirements.

2.1.6 This chapter describes the CWWTPRP requirements for the proposed WWTP and the key engineering, community, landscape, stakeholder requirements as well as Anglian Water Services Limited's corporate and sustainability objectives that have informed the proposed design.

2.2 The Waste Water and Sludge Treatment Process

2.2.1 The existing Cambridge WWTP receives waste water from the Cambridge catchment either directly from the connected sewerage network or tankered to the plant from homes and businesses that are not connected. This waste water is then treated and the treated effluent discharged through an outfall to the nearby River Cam. The existing Cambridge WWTP is an integrated WWTP, as would be the new Plant. Integrated WWTP incorporate a sludge treatment function, in the form of a Sludge Treatment Centre (STC), which treats the sludge derived from waste water from the catchment, and the "wet sludge" produced by other satellite plants which do not have integrated STC.

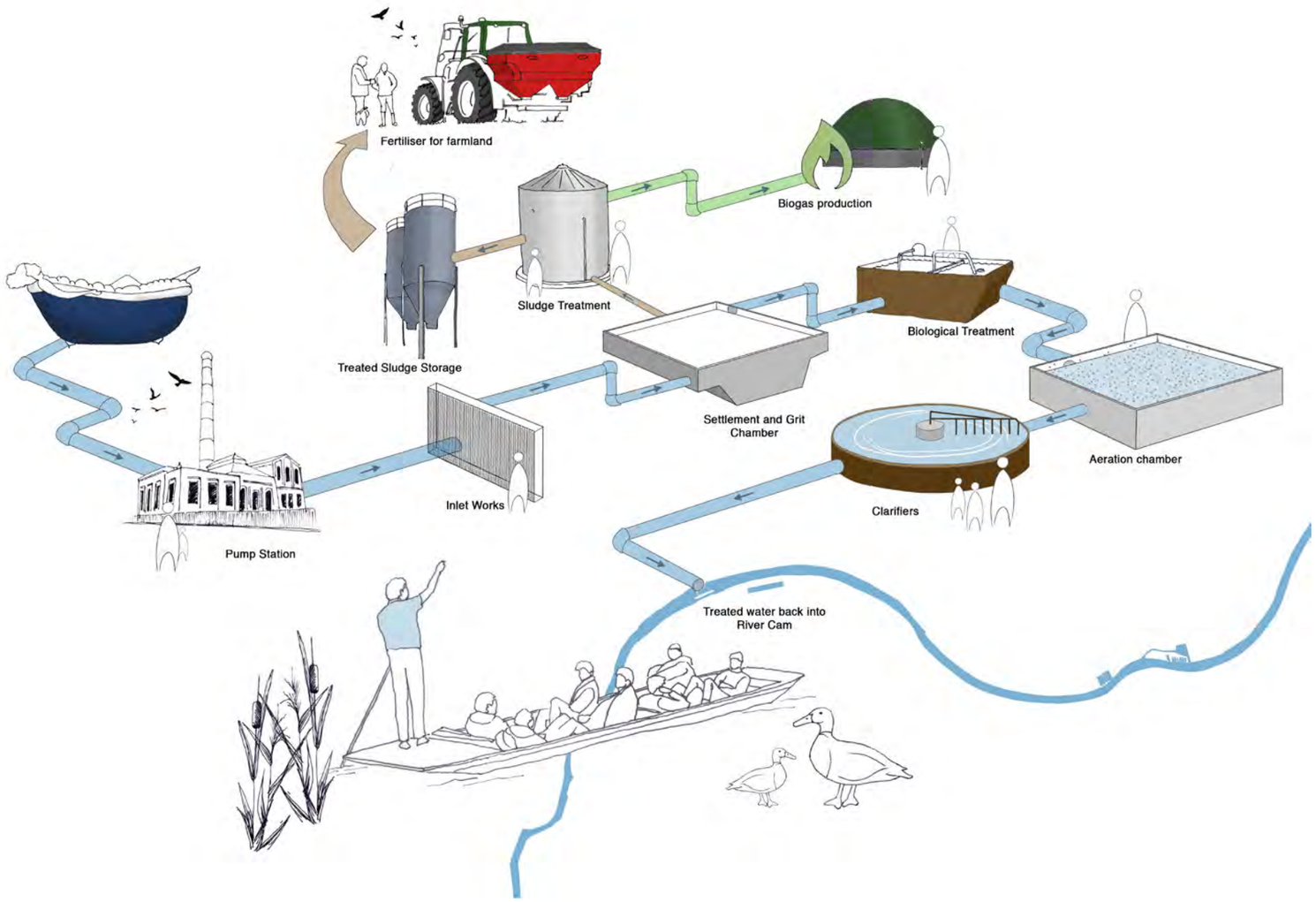
2.2.2 Rather than being a mere like for like replacement of the existing plant, the design of the proposed WWTP must be improved in order to satisfy the Industrial Emissions Directive (IED) and Final Effluent permitting processes:

- To comply with legislative changes to the IED permit, for example by utilising secondary containment on all sludge related pipework and assuring the digesters are easily inspected and not hidden in the ground

- To include the latest innovations in treatment technology, for example the Membrane Aerated Biofilm Reactor (MABR) technology for the secondary treatment process.

- To minimise odour emissions by reducing or removing odour from source, for example by covering the TPS and inlet works, reducing turbulence where possible.

2.2.3 The Applicant and water industry have a comprehensive set of design specifications that guide how a modern, efficient WWTP are designed. The Applicant will utilise these in the development of the proposed WWTP design and only deviate from them to achieve efficiencies and where practicable compromising with requirements asked of it by statutory consultees and stakeholders in delivering a 'good design'.



2.3 Project Components

2.3.1 The proposed WWTP needs to receive and treat waste water from the Cambridge catchment and discharge the treated effluent to the River Cam. In addition, the proposed WWTP needs to treat the sludge derived from the waste water from the catchment as well as receiving and treating sludge produced by other satellite WWTPs in the region that do not have an integrated STC.

2.3.2 The key components of the proposed WWTP and its connecting infrastructure around which the design of the project has been (and continues to be) developed are as follows:

2.3.3 **Waste Water Transfer Tunnel and Shafts** - A new transfer tunnel to convey waste water by gravity from a connection to the main incoming sewer at the existing Cambridge WWTP to the proposed WWTP. The transfer tunnel will have an internal diameter of 2.4m and be designed to convey the waste water and storm flows for a 1 in 100 year storm event including an additional 20% allowance for climate change. The transfer tunnel will discharge to a Terminal Pumping Station at the proposed WWTP that will lift the flows to the inlet works and transfer the storm flows into the storm system. Construction of the tunnel will involve six vertical shafts including two permanent shafts, (one at either end of the tunnel) and four temporary intermediate shafts spaced at intervals along the sewer route. The intermediate shafts will be backfilled on completion of the tunnel construction. The maximum spacing between the shafts is subject to the proposed 'pipe-jacking' method of construction for the transfer tunnel and the proposed locations of the intermediate shafts will be selected so as to minimize disturbance to the local community.

2.3.4 **Integrated WWTP and STC** - A proposed WWTP designed to treat waste water flows conveyed by the sewer tunnel as well as trade and septic tanker imports from the Cambridge catchment. The proposed WWTP will be sized for a design horizon of 2041 based on a 300,000 population equivalent (PE). The design basis is in alignment with the population growth estimates being used in the emerging Greater Cambridge Local Plan. The proposed WWTP will be designed to produce a treated effluent quality that is within the discharge consent requirements set out in the final permit which will be agreed with the Environment Agency (EA). The table below suggests indicative values of the permit guided by the EA's pre-application response to Anglian Water Services Limited:

Parameter	Value
$BOD_{5\ ATU}$	11 mg/l
Ammoniacal nitrogen as N	3 mg/l
Suspended solids	14 mg/l
Total iron as Fe	4,000 µg/l
Total phosphorus as P	0.4 mg/l (Annual average)

2.3.5 A new STC designed to process up to 16,000 Tonnes Dry Solids (TDS) per year with optional future expansion to 25,000 TDS per year. This process capacity will be larger than the existing STC at the existing Cambridge WWTP due to a change in the discharge consent and to incorporate the additional predicted population growth. The integrated WWTP will also include:

- Ancillary on-site buildings, including work offices, substation building, workshop, Discovery Centre, vehicle parking including electrical vehicle charging points, security fencing and lighting.

- Renewable energy generation via anaerobic digestion which is part of the sludge treatment process that produces gas that will either be fed directly into the local gas network heating homes or, if this option becomes impracticable, burnt in Combined Heat and Power engines to produce electricity.

- Renewable energy generation via solar photovoltaic and battery energy storage system.

2.3.6 **Outfall** - Buried pipelines to convey final effluent and storm overflows from the proposed WWTP to a new outfall to the River Cam. A new outfall structure on the bank of the River Cam to discharge the final effluent and storm overflows to the river.

2.3.7 **Access Road** - A new vehicle permanent access road suitable for Heavy Goods Vehicles (HGVs) bringing sludge to the STC for treatment. Considerations of road safety, Design Manual for Roads and Bridges (DMRB) guidance, stakeholder feedback, traffic analysis and operational considerations all to be taken into account in delivering an access that suits both construction and operation with no significant impact on the surrounding road network and local community.

2.3.8 **Waterbeach Pipeline** - Two new pipelines (rising mains) from Waterbeach to the proposed WWTP.

2.3.9 **Environmental Measures** - Environmental mitigation and enhancements including improved habitats for wildlife, landscaping, earth bank and increased recreational access and connectivity where possible.

2.4 Project Design Principles

2.4.1 The overarching project design principles that have been developed by Anglian Water Services Limited and its advisors at the outset of the project to inform the entire design process are summarized in the table adjacent. This includes informing decisions on the selection of the site, the preferred masterplan, the landscape design and the layout of the plant, associated development and connecting infrastructure.

2.4.2 Collectively, the design principles help to define and establish how the project will fulfill the criteria of 'good design' for waste water infrastructure as set out in Section 3.5 of the Waste Water NPS.

2.4.3 These principles apply to the whole of the project and have been informed by consultation with the Design Council, the Local Authorities, Cambridgeshire Quality Panel, local stakeholders and also through public consultation, as outlined in Chapter 3.

PROJECT DESIGN PRINCIPLES	
Design Principle 1	The waste water treatment plant and its associated structures will accord with good design principles and provide value for money.
Design Principle 2	The design will deliver the functional needs of Anglian Water Services Limited and the requirements of the contract with Homes England. It will meet all relevant environmental, regulatory and governance standards.
Design Principle 3	The design will respect the site's location and landscape setting. The design will demonstrate sensitivity to the local communities and take a practicable and considered approach to odour sources and their effects. As acknowledged by the National Policy Statement, the aesthetic design is likely to be constrained to some extent by the functional elements of the project.
Design Principle 4	The development of the design will take into account consultation responses from communities and stakeholders.
Design Principle 5	The design will be flexible, consider future needs and be resilient to climate change. It will help to meet the AWS target of being carbon neutral by 2030
Design Principle 6	The principles of sustainability will be integral to the design, incorporating good environmental practice and mitigation and where possible, enhancement
Design Principle 7	The design will align with Anglian Water Services Limited's Health, Safety and Well-being initiatives, protecting the workforce at all times and providing a safe site for operational staff and site visitors
Design Principle 8	The design process will utilise trusted and experienced partners and encourage a shared understanding between different professional disciplines and skills, facilitated by the use of a design panel and a design review process. It will employ early engagement and enterprise principles and drive behaviours of collaboration and engagement

2.5 Strategic Objectives

2.5.1 The strategic objectives for the project that are in line with Anglian Water Services Limited ’s corporate objectives are summarized in table below:

Measure	Objective
Capital Carbon Reduction	Construction of the project is to result in a 70% reduction in capital/embedded carbon compared to a 2010 baseline determined utilizing 2010 construction and delivery techniques.
Operational Carbon Reduction	The new WWTP will be operationally carbon net zero
Energy Neutrality	The proposed plant will be energy neutral – meaning the proposed WWTP will produce as much green energy or more than it consumes from the national grid
Odour Impact	The odour emissions from the proposed WWTP are to have negligible impact on known receptors outside of the earth bank. This will include residences and amenity as described in the IAQM.
Biodiversity Net Gain (BNG)	The project will mitigate ecological impacts and achieve a minimum of 20% BNG.
Impact on Surroundings	• The design of the project is to reduce the visual impact of the proposed WWTP on the nearby villages of Fen Ditton, Horningsea and Stow-cum-Quy as far as is practicable. • Construction and operation of the WWTP and associated infrastructure is to be arranged so as to minimise impact on the environment and local communities as far as is practicable. • The project is to improve connectivity for non-motorised users (NMU). • The project is to have minimal impact on the proposed development of the 5,600 new homes on the existing Cambridge WWTP site.

Design Process

2.6 Engineering Constraints

2.6.1 In addition to the strategic objectives for the project, there are various engineering considerations and public commitments that have influenced the design of the proposed WWTP and connecting infrastructure including the following:

• The new transfer tunnel conveying waste water to the proposed WWTP must be connected to the existing Riverside sewer at the existing Cambridge WWTP.

• Construction and subsequent operation of the CWWTPRP components must not to pollute the ground water.

• The proposed WWTP is to tie-in to existing landform and levels and the masterplan is to be led by the landscape character and setting.

• The layout of the proposed WWTP is to allow for additional process plant to treat additional flows and changes in consent from future development in the catchment and requirements for improved river quality.

• The layout of the proposed WWTP is to be arranged so that process units that generate the most odour emissions to the environment are located furthest from the site boundary as far as is practicable.

• The design of the proposed WWTP plant is to avoid the height of structures extending above the earth bank as far as practicable so as to minimize visual impact from the surrounding area.

• The road access to the proposed WWTP is to tie-in to the existing road network safely.

• The Gateway Building at the entrance to the proposed WWTP is to be designed to Building Research Establishment Environmental Assessment Method (BREEAM) Excellent standard.

• Part of the Gateway Building will be used for education and discovery for both the Applicant and invited visitors.

• The new outfall to the River Cam is to be located upstream of Baits Bite Lock.

• The installation of the new consented outfall will not interfere with the navigability of the River Cam.

2.7 The 'Risk Opportunity Value' Process

2.7.1 The Applicant's design approach utilises Anglian Water Services Limited's adapted Risk Opportunity & Value (ROV) process to make process design decisions.

2.7.2 For each of the key process selection decisions required throughout the outline design phase for the proposed WWTP and associated development and connecting infrastructure, several different factors are considered for 'good design' including visual impact, land take as well as community and societal impacts.

2.7.3 The ROV process compares:
- Capital cost
- Operational cost
- Whole life cost
- Capital Carbon
- Operational carbon
- Operational & Process Risk – including odour risk
- Visual impact
- Land take

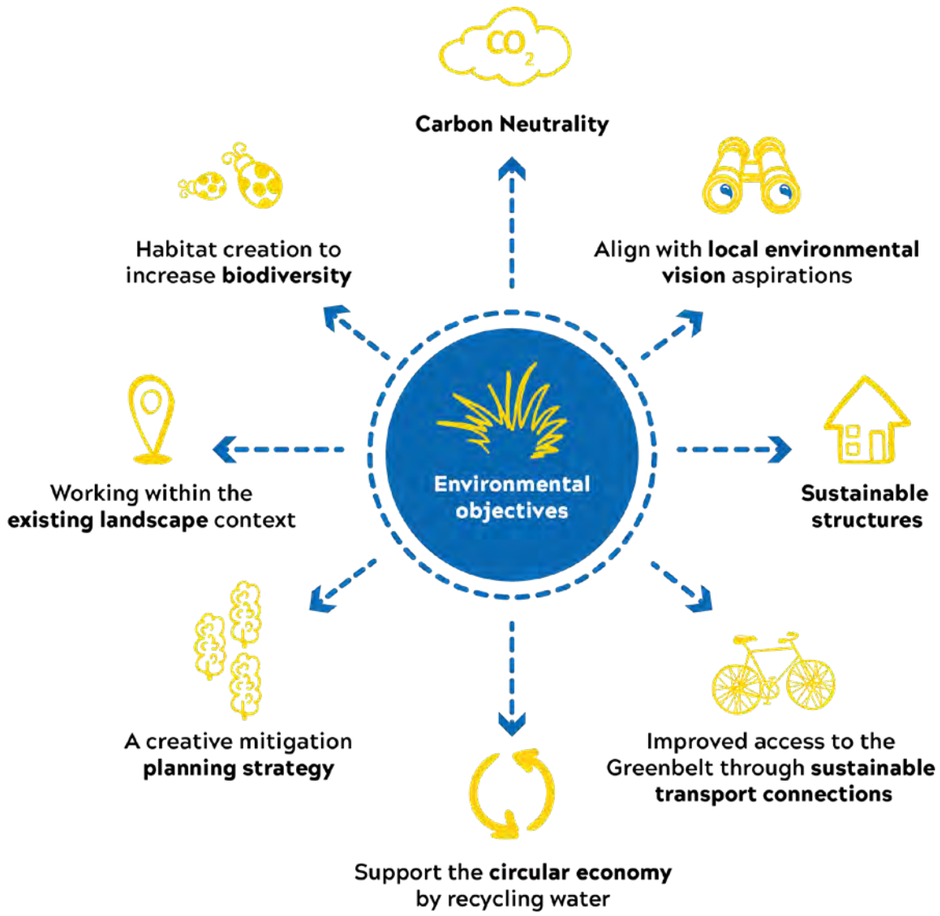
2.7.4 The supply chain is engaged across all of the ROVs in order to incorporate the latest technology available and to provide learning from across the industry. Attendees at the ROV meetings include designers, construction and operational staff as well as representatives from Anglian Water Services Limited's engineering, innovation and carbon teams. There is typically a broad range of options taken forward for ROV assessment, particularly in terms of both technology development (traditional approach vs novel processes) and capital expenditure/ investment versus operational expenditure/investment.

Sustainability Objectives

2.8 Anglian Water Services Limited's Corporate Objectives

2.8.1 The CWWTPRP design has been developed having regard to Anglian Water Services Limited's 'six capitals', as established in their Net Zero 2030 strategy. These objectives help Anglian Water Services Limited keep its responsibility to customers, communities and the environment at the front of its mind when making business decisions. Anglian Water Services Limited has developed definitions and a set of metrics for each of the capitals to help it understand, track and report on its impact on them.

2.8.2 A holistic set of design objectives were formed at the outset of the project, as outlined in the adjacent diagram. These have governed the design approach and decision making process throughout the design stages.



CWWTPRP Environmental Design Objectives

Anglain Water Services Limited's 'Six Capitals'

2.9 Water UK Context

2.9.1 A few of the key areas, pertinent to the wider UK water industry, which have directed Anglian Water Services Limited's approach and that are addressed within the design are described below.

2.9.2 **Transition to Net Zero 2030** - The requirements for the project are closely aligned to the wider water industry commitment to net zero carbon by 2030. This has influenced Anglian Water Services Limited's thinking in all aspects of the design and has placed a much greater priority on both embedded and operational carbon in decision making within the outline design phase.

2.9.3 **River Water Quality** - The proposed WWTP is being designed to reduce concentration in final treated effluent discharges of phosphorus, ammonia, total suspended solids and Biological Oxygen Demand (BOD), compared to the existing Cambridge WWTP. This means that when the proposed WWTP starts to operate, water quality in the River Cam will improve.

2.9.4 **Storm Overflows** - Storm overflows play a vital role in combined waste water network systems as they work like pressure release valves to protect homes and businesses from flooding during periods of extreme rainfall. The Environment Agency (EA) issues permits for our storm overflows.

2.9.5 The proposed WWTP will provide greater resilience and improved storm management, meaning storm overflows and Combined Sewer Overflows (CSOs) are far less likely to occur (as described in the Storm Model report – Application Document Ref. 5.4.20.10). This means that, as Greater Cambridge continues to grow, the proposed WWTP will be able to treat a greater volume of storm flows to a higher standard than would be the case at the existing Cambridge WWTP. It is important to note that at the proposed WWTP there will be no new CSO discharge points and that all storm overflows from the proposed WWTP will be treated via settlement in large storage tanks to reduce effluent biosolids and mechanical screening to remove non-biodegradable solids such as nappies, sanitary products, and wet wipes.

Water UK Net Zero 2030 Routemap

By 2030 we aim to see:

1. Low emissions vehicles
100% of fleet passenger vehicles are electrified and 80% of commercial vehicles (LGVs and HGVs) converted to alternative fuels to cut carbon and air pollution.

2. Water and energy saving
New strategies to tackle leakage and help customers save water, alongside smarter and more efficient networks and catchments.

3. Process emissions
Targeting a reduction of up to 60% from our 2018-19 baseline by 2030, with monitoring of emissions to inform research and detailed pathways ahead of PR24.

4. Renewable power
Up to 3GW of new solar and wind power coupled with energy efficiency measures and suitable storage to provide up to 80% of sector demand, relieve pressure on grid generators, and minimise the need for offsets.

5. Green gas
Biomethane from sewage waste is injected into the grid to heat up to 150,000 homes, use in hard to decarbonise sectors, or to generate low-carbon power when generation from renewables is low.

2.10 Carbon Targets

2.10.1 As a new infrastructure asset, the project will support Anglian Water Services Limited's net zero carbon commitment, in line with both Anglian Water Services Limited's Net Zero 2030 strategy and the Water UK Net Zero 2030 Routemap.

2.10.2 As part of the ongoing design work after DCO application submission, Anglian Water Services Limited will continue to develop the design to meet operational and capital carbon targets. Data on the CWWTPRP's predicted carbon footprint (both operational and embedded) are provided in Chapter 10 of the Environmental Statement (Application Document reference 5.2.10).

2.10.3 The new facility is being designed to:

- be operationally net zero;
- be energy neutral; and
- reduce Anglian Water Services Limited's capital (embodied) carbon by 70 per cent against a 2010 baseline using the Anglian Water Services Limited carbon modelling process, thereby reducing the impact of the project.

2.10.4 The carbon footprint of the new plant will be reduced through:

- Using the carbon impact as a key decision-making factor in Anglian Water Services Limited's adapted ROV process.
- Considering issues such as the physical sizing of infrastructure and choice of construction materials to reduce the amount of capital carbon that will be produced.

2.10.5 Anglian Water Services Limited will be using the latest in sustainable, low carbon construction techniques and products to minimise the impact of delivery, such as reviewing construction methodologies, material selection and carbon in the supply chain in order to reduce capital carbon. Options currently being explored further include:

- advanced process selection to reduce the overall size of the plant;
- planned use of modern low-impact construction techniques;
- innovative low-carbon construction material selection (e.g., low carbon concrete, alternative materials for tunnels and pipelines);
- off-site fabrication and manufacture to help reduce waste and optimize construction phase activity;
- local sourcing of construction materials.

2.10.6 Generating and feeding renewable bio-methane into the national grid will reduce carbon emissions, displacing natural gas from fossil fuels currently in the system. It is anticipated that this will result in a calculated reduction of 4,680 tonnes (t) of carbon dioxide (CO_2) equivalent (e) per year - against the 2010 baseline solution, taking this element of the plant from a being a net carbon emitter to a net remover of CO_2 from the atmosphere.

"Our purpose is to bring environmental and social prosperity to the region we serve through our commitment to Love Every Drop"

Our net zero strategy to 2030

2.11 Renewables

2.11.1 The sludge treatment process creates renewable energy through anaerobic digestion. The biogas produced will be fed into the local gas network, thereby heating homes and businesses. Biogas generated by this process may also be used on-site to generate heat for use in the sludge treatment process.

2.11.2 Solar power generation is integrated into the proposed WWTP layout to generate low carbon electricity. This can be achieved by installing photovoltaics panels (PVs) on the southern side of the north edge of the earth bank, over car parking within the earth bank and on some building roofs. This could provide up to 7 megawatt hours (MWh) of clean electricity per year. Solar PV and energy storage technologies are rapidly evolving, so the parameters of the DCO application seek to maintain flexibility to allow the latest technology to be utilised at the time of construction.

2.11.3 These renewable energy solutions will make the new plant energy neutral, meaning it will produce, on average, as much energy as it consumes. If a “gas-only” biogas option is progressed, more energy will be produced than needs to be utilised in the proposed WWTP, offering scope for the proposed WWTP to be a net exporter of energy.

2.12 Drainage and Flood Mitigation

2.12.1 Key sustainability measures in relation to flooding include:

• siting of the proposed WWTP and access outside of the River Cam floodplain;

• design of the outfall to continue operating during flood conditions. The design will function during the predicted river levels associated with the 1 in 100-year design flood event plus a 40% allowance for climate change (in line with the latest Environment Agency advice);

• river flood modelling is ongoing to inform the detailed design, incorporating the latest peak river projections published by the Environment Agency, as well as the latest UK climate change projections (Chapter 20, Application document reference 5.2.20);

• design of the outfall is being conducted according to the methods set out within CIRIA Culvert, screen and outfall manual(C786) (CIRIA, 2019) that include provision for climate change using UKCP18 and refer to the Environment Agency guidance;

• design of the surface water drainage network within the proposed WWTP to include a 40% allowance for climate change;

• the use of sustainable drainage systems (SuDS) along the new access road;

• sizing of the drainage network to operate during rainfall events including an allowance for climate change and to greenfield flow rates (modelled peak rainfall runoff on vegetated land cover);

• design supported by numerical modelling considering 1 in 100-year design rainfall event with a 40% allowance for climate change in line with Environment Agency guidelines;

• drainage for the access road will link into proposed swales that will be designed to the appropriate capacity; and

• the drainage network will include SuDS where possible (with any potentially contaminated waterflow going back into the treatment works) and will utilise natural mitigation measures where possible such as vegetated cover and landscape design.

2.13 Buildings Certifications

2.13.1 The Gateway Building at the entrance to the proposed WWTP site will be designed to BREEAM Excellent standards, WELL and / or NABERS and be one of the most sustainable buildings Anglian Water Services Limited own and run. It will utilise solar energy, waste heat from the proposed WWTP, grey water collection & use, utilise low carbon construction techniques and plan to have a green roof.

3.

Consultation

3. Consultation

3.1 Background

3.1.1 The design for the Proposed Development, as presented in this Design and Access Statement, has been informed through an iterative approach to consultation in compliance with the requirements of the 2008 Planning Act.

3.1.2 The Consultation Report (Application Document Reference 6.1) details in full the consultation that has been undertaken, the comments that have been received, and how the Applicant has had regard to this feedback. This includes describing changes to the design of the Proposed Development resulting from the feedback received.

3.1.3 This Chapter of the Design and Access Statement highlights the important role of consultation with a wide range of stakeholders in informing the design process.

3.2 Early Engagement

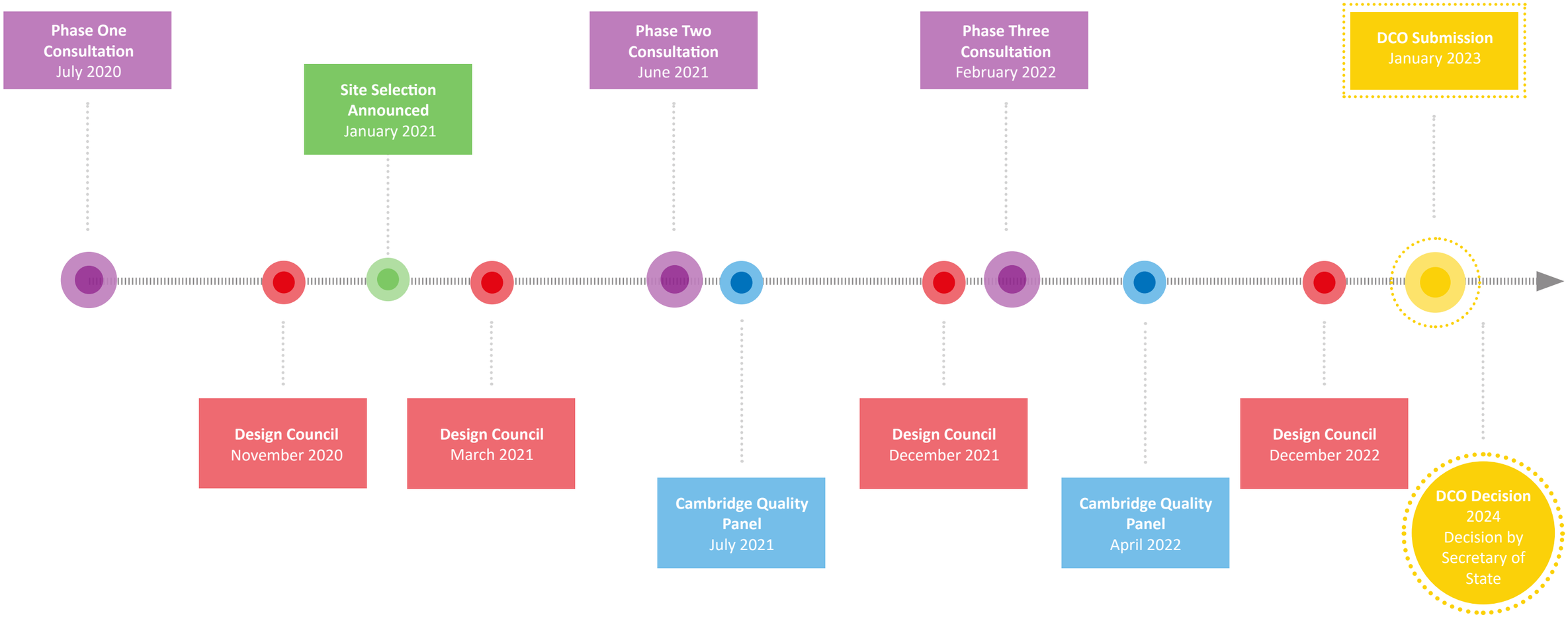
3.2.1 Early engagement and non-statutory consultation was undertaken to inform the selection of a site for the Proposed Development. This involved early engagement with stakeholders and landowners followed by a phase one (non-statutory) community consultation commencing in July 2020.

3.2.2 During this first (non-statutory) phase of community consultation, the Applicant shared their site selection methodology and three possible site areas, alongside potential tunnel and pipeline corridors.

3.2.3 The Applicant considered the consultation feedback they received alongside a range of key assessment criteria to inform the identification of a preferred site for the Proposed Development.

3.2.4 In January 2021, the Applicant announced the identified site for the Proposed Development as being the site area north of the A14 between Fen Ditton and Horningsea. Details of this decision are available through the Site Announcement documents at www.cwwtpr.com/document-library.

Timeline of the consultation process



3.3 Initial design development

3.3.1 To inform the design proposals of the Proposed Development, the Applicant sought advice from the Design Council, an independent charity and the Government's strategic advisor on design. Engagement with the Design Council continued throughout the development of design proposals.

3.3.2 At this stage, the Applicant also established a series of Technical Working Groups (TWGs) to consult technical consultees on the design and assessment of the Proposed Development before, during and after the formal Section 42 consultation phase.

3.4 Consultation to inform design

3.4.1 In June 2021, the Applicant published a Statement of Community Consultation (SoCC) (Application Document Reference 7.4) setting out how it would carry out its statutory consultation to inform the application for the Proposed Development.

3.4.2 This SoCC was prepared in accordance with Section 47 of the Planning Act 2008 and associated guidance. Relevant local authorities were consulted on a draft of the SoCC, and their feedback informed the approach set out in the published statement.

3.4.3 Feedback from local authorities included a suggestion to meet with the Cambridgeshire Quality Panel. The Applicant subsequently engaged the Cambridgeshire Quality Panel at strategic stages of the design process.

3.4.4 The SoCC also confirmed the Applicant's commitment to holding a series of Community Working Groups (CWG). The CWG is comprised of an independent Chair and representatives from local authorities, local parish councils and representatives from the community group Save Honey Hill. Meetings have been held throughout the development of proposals to enable a dialogue and guide the evolution of the project plans from a local perspective.

3.5 Phase Two Consultation Proposals

3.5.1 In June 2021, the Applicant commenced a second phase of community consultation (statutory under section 47 of the 2008 Planning Act). This consultation presented emerging preliminary design proposals, showing how the Proposed Development could look to local residents and visitors and it might operate.

3.5.2 Feedback was sought on a range of topics including proposals for landscaping and visual features, options for vehicle access to the site, and proposed mitigation measures.

3.6 Phase Three Consultation Proposals

3.6.1 In February 2022, the Applicant commenced a third formal phase of consultation with community, technical and landowner stakeholders (statutory under sections 42 and 47 of the 2008 Planning Act). This consultation presented detailed design proposals for the Proposed Development, including preliminary environmental information and proposed comprehensive mitigation measures.

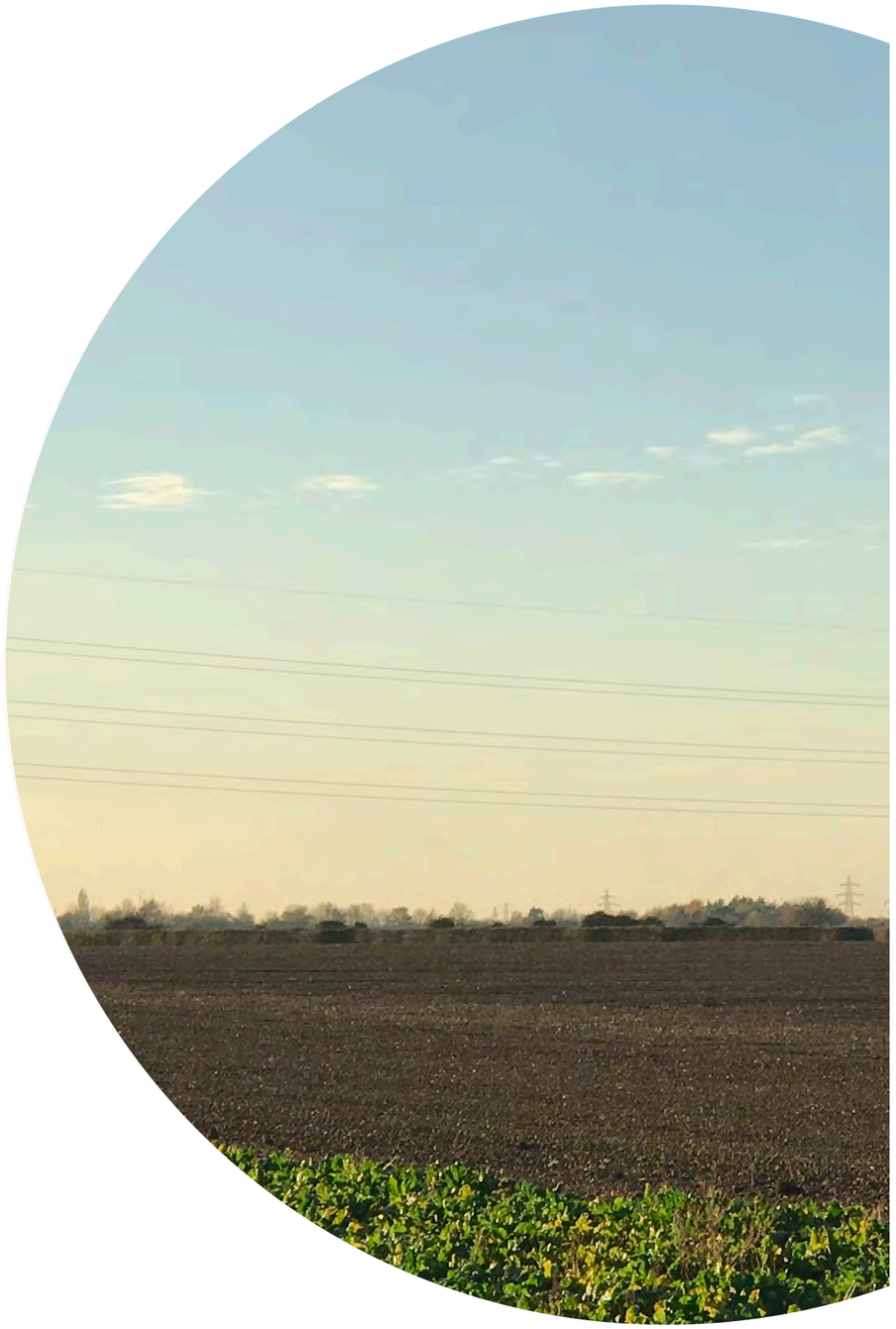
3.6.2 Feedback was sought on all aspects of the proposed design, including the landscaping plan, odour mitigation measures, the gateway building, potential recreational initiatives, traffic and vehicle access to the site, and measures to manage the construction phase.

3.7 Influence of consultation feedback on design process

3.7.1 The Applicant has had regard to consultation feedback received throughout the pre-application phase. Feedback has been considered alongside a range of technical and environmental factors to inform the design evolution of the Proposed Development.

Key issues raised through consultation which have influenced the design of the Proposed Development include:

- Informing the Applicant's methodology for identifying a site area for the Proposed Development;
- The evolution of design proposals for mitigating the visual impact of the Proposed Development through a circular earth bank, more organic and subtle architectural finishes, and an extensive plan for landscaping and screening;
- Reviewing the engineering design to reduce the maximum heights of structures and the tallest elements within the Proposed Development;
- Integrating opportunities for increased recreational access and connectivity through the Proposed Development;
- The Applicant committing to delivering the lowest 'negligible' odour levels for existing high sensitivity receptors (people's homes and public rights of way) in line with the Institute of Air Quality Management (IAQM) guidance through minimising odour at source;
- Development of a comprehensive outline landscape, Ecology and Recreational Management Plan (LERMP) (Application Document Reference 5.4.8.14) setting out the proposed measures for the implementation, establishment and management of a range of habitats across the Proposed Development to deliver a net gain in biodiversity;
- The design of a new permanent access road to the Proposed Development off the A14 and associated mitigations to manage the potential impact of traffic on the local road network.
- The development of a series of management plans to manage and mitigate potential impacts during the construction phase.
- For a full account of the feedback received through consultation, and the Applicant's consideration of this feedback, please see the Consultation Report (Application Document Reference 6.1).



4.

Site Selection

4. Site Selection

‘We welcome and support the ambition for this scheme to be landscape led. Once a preferred site is selected, we encourage you to continue exploring how this scheme can contribute to re-wilding the landscape, enhancing recreation opportunities, and developing new wetlands...’ - *Design Council, November 2020*

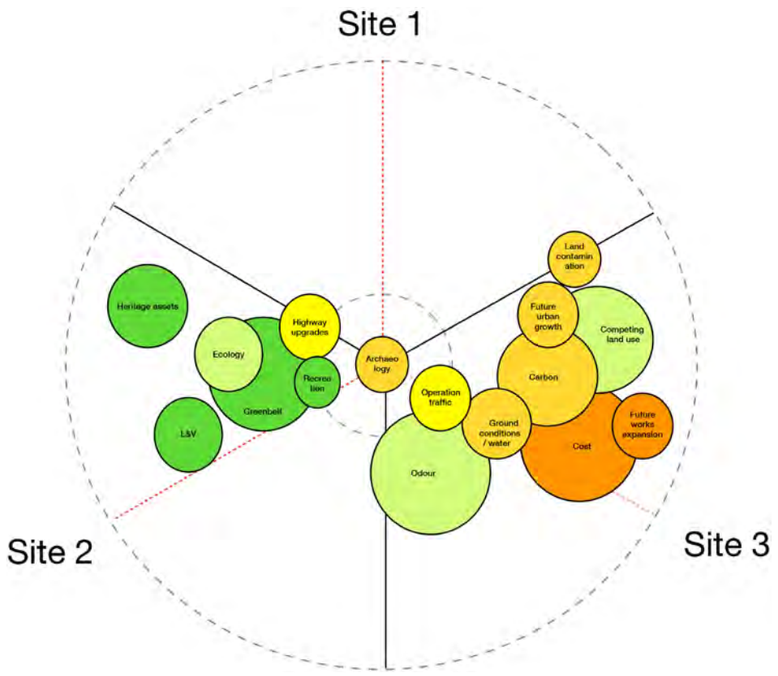
4.1 Site Selection Process

4.1.1 The selection of the site for the proposed WWTP was a result of an extensive process undertaken by Anglian Water Services Limited, commencing with an Initial Options Appraisal and Stage 1 Initial Site selection exercise which eliminated areas of land with particular constraints (for example, flood zones and proximity to protected and statutory designated sites) and sites of insufficient size having regard to the Statement of Requirements. 14 out of an initial 99 potential site areas within or immediately adjacent to the Cambridge and Waterbeach catchment areas were identified at the end of these stages. Stage 2 ‘Coarse Screening’ and Stage 3 ‘Fine Screening’ involved further ‘sieving’ through assessment of the technical and operational suitability of these remaining site areas against environmental, community, operational, planning and economic criteria including their potential to minimise environmental and community impacts and their ability to comply with national and local legal, regulatory and planning frameworks for waste water treatment plants. This resulted in the 14 site areas being reduced to 7 with a final shortlist of 3 sites capable of accommodating the proposed WWTP being selected for more detailed appraisal in Stage 4 ‘Final Site Selection’. The diagram adjacent provides an overview of this step by step process.

4.1.2 The final 3 site area options were put forward for Phase 1 of public consultation to assist with the site selection process in July 2020.

4.1.3 A technical analysis was undertaken to appraise each of the three sites against one-another with regards to several key factors, including carbon, odour, heritage, visual impact and cost.

4.1.4 In November 2020 the Design Team discussed the site selection process with the Design Council, which focused on process rather than content. The team presented the initial approach to design, including the overall design aspirations for the project, consideration of context, landscaping and environmental considerations. Preliminary design sketches were discussed (as shown right) to demonstrate the team's approach to designing with respect to the constraints and opportunities of the site context to achieve the Project Objectives.



Site selection technical bubble appraisal

Map of the 3 proposed sites at Phase 1 consultation

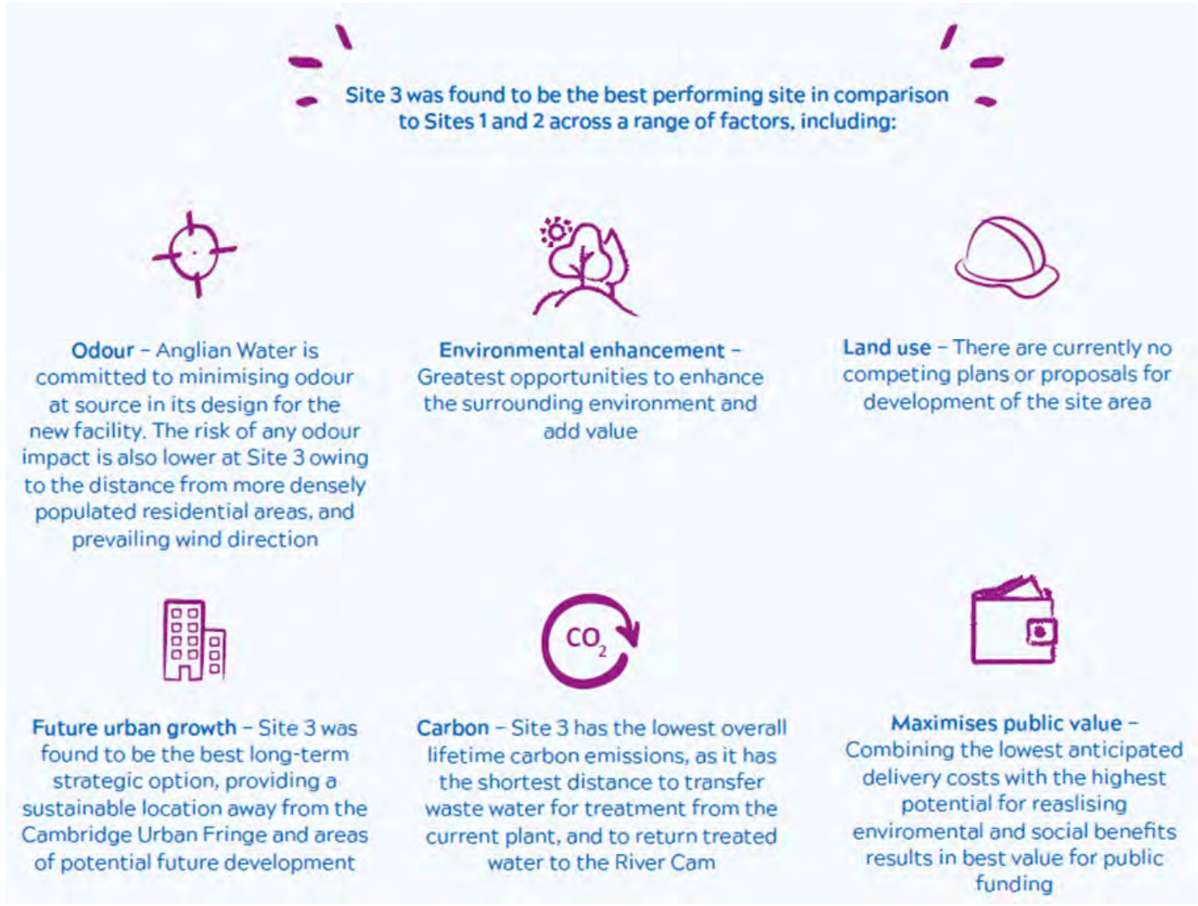
Initial sketch proposals for Sites 1, 2 and 3 discussed with the Design Council

4.2 Site Selection

4.2.1 In January 2021, following the extensive consultation, the site area between Horningsea and Fen Ditton (Site 3) was found on balance to perform best across a range of key assessment criteria and to also present greater opportunities to protect and enhance the surrounding environment.

4.2.2 The site was considered to provide the greatest opportunity to deliver wider benefits to communities and the environment, such as delivering improved habitats for wildlife and creating increased access and connectivity, and therefore to deliver on many of the things local communities fed back as being important to them. Environmental impact risks to landscape and heritage assets (including to heritage setting from landscape screening) were recognised but were considered to be capable of being appropriately mitigated.

4.2.3 Availability of a larger area of land in which to position the proposed development and mitigate impacts, particularly by visual screening, was an important consideration in the site selection. So too was the opportunity to deliver significant enhancements to the environment (through biodiversity net gain) and to connectivity between the city and the countryside (including Stourbridge Common, Ditton Meadows and the River Cam corridor green links) consistent with a number of the aspirations of the Wicken Fen Vision, the Cambridgeshire Green Infrastructure Strategy 2011 and the adopted South Cambridgeshire Local Plan 2018. The risk of heritage impacts on Biggin Abbey were considered to be capable of mitigation by sensitive routing of the 'treated effluent tunnel/pipeline corridor'. Potential impacts on the setting of Biggin Abbey and other heritage assets were considered to be capable of mitigation by appropriate landscape screening, having regard amongst other factors to the somewhat degrading existing setting of Biggin Abbey from the A14.



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5.

Site Context and Character

5. Site Context and Character

‘decisions should ensure that developments are sympathetic to local character and history, including the surrounding built environment and landscape setting, while not preventing or discouraging appropriate innovation or change’ - *para 130 NPPF*

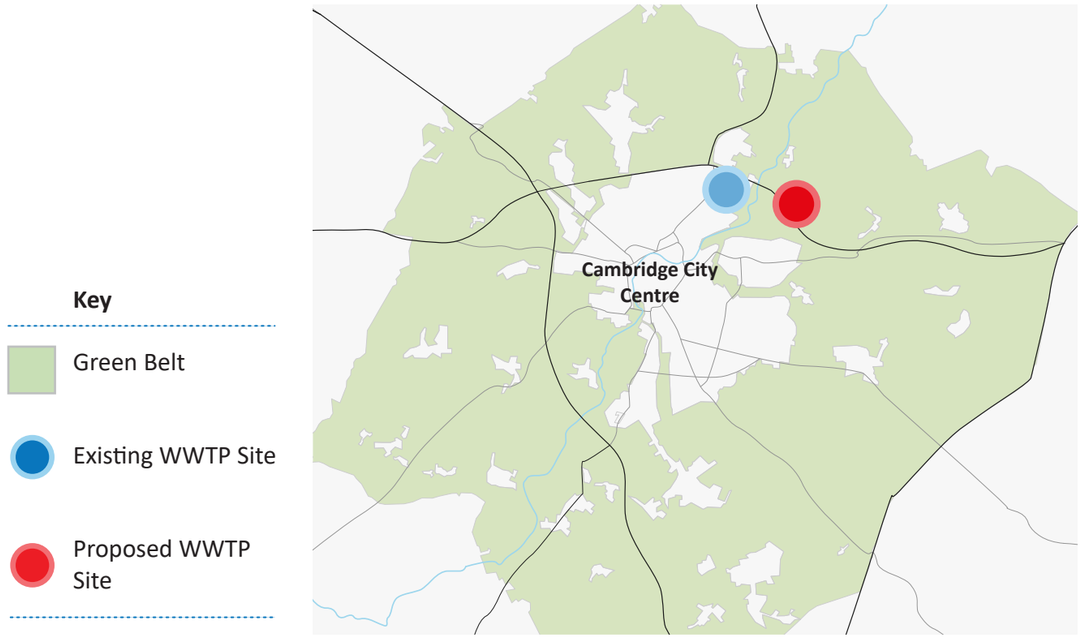
5.1 Location

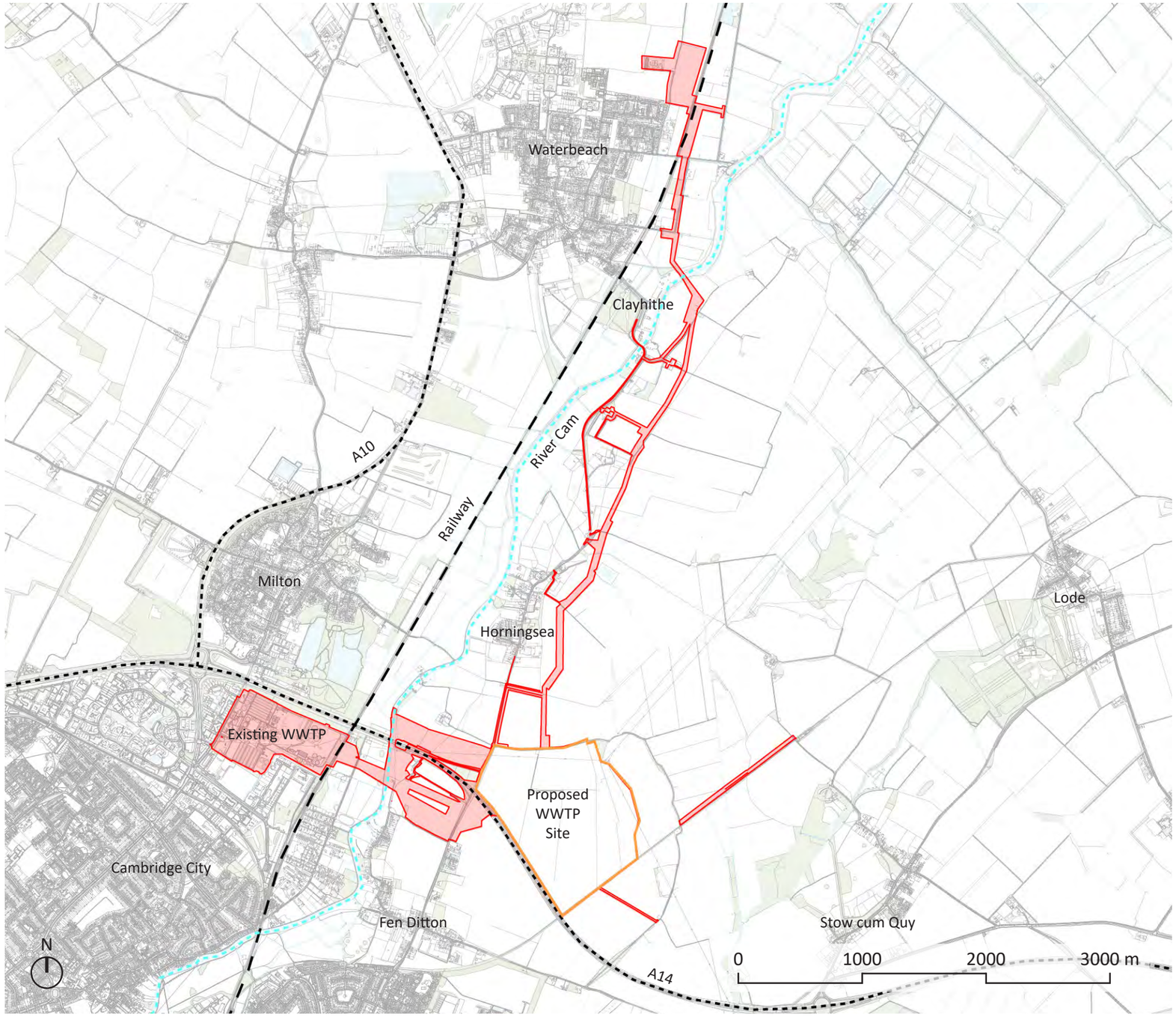
5.1.1 The full extent of the Proposed Development within the Scheme Order Limits, as defined in the Location Plan and Scheme Order Limits Plan (Application Document Reference 4.1), stretches from the north-eastern edge of Cambridge eastwards across the Fen Line (London – Kings Lynn) railway line, River Cam and A14 trunk road and then northwards flanking the eastern side of Horningsea before again crossing the River Cam and extending up to the north-eastern edge of Waterbeach, again crossing the Fen Line railway line.

5.1.2 Most of the area contained within the Order Limits lies within the Cambridge Green Belt and on arable farmland. This is an open landscape of large fields, separated by low hedgerows and drainage ditches, and woodland belts along field boundaries and around settlement edges. There are gentle undulations in the landscape which appears to be almost flat but generally slopes gently down towards the River Cam in the west. There is little existing built development visible from the land required for the proposed WWTP or the pipeline corridors, though cranes are apparent on the skyline in views south. The A14 detracts from the openness of the landscape where it rises to cross the River Cam but generally, it has a fairly discreet visual presence, being mainly at ground level or in slight cutting. It is lined with trees and scrub for much of its length but passing tall vehicles can be seen above the vegetation. Pylons and powerlines are prominent features of the landscape. The River Cam towpath, Fen Rivers Way, Harcamlow Way and the cycle path along B1047 Horningsea Road provide important recreational walking and cycling routes between Cambridge and the landscape to the north-east.

5.1.3 The largest part of the area contained within the Order Limits is the site of the proposed WWTP. This location will accommodate the major permanent visible elements of the Proposed Development and be the focal point for operations. The remainder of the area contained within the Order Limits comprises the Waste Water Transfer Tunnel, FE and Storm Pipeline, Waterbeach Pipeline and associated works. This area is relatively narrow and linear, encompassing different character areas.

5.1.4 The Environmental Statement describes the current environmental status and context of the Scheme Order Limits and surrounding area (the environmental baseline conditions), including in respect of landscape, ecology and transport and traffic. A summary of these two site areas, the Main Development Site and the Connecting Infrastructure, is provided below.





Key

Scheme Order Limits

Proposed WWTP Site

5.2 Proposed WWTP Site

5.2.1 The site is located in a generally low lying and open area of agricultural land that characterises the Fen landscape northeast of the city of Cambridge.

5.2.2 It is located 2km to the east of the existing Cambridge WWTP and lies between the villages of Horningsea to the north, Stow Cum Quy to the east and Fen Ditton to the south-east within the administrative boundary of South Cambridgeshire District Council. The busy transport corridor of the A14 lies immediately to the west of the site, with the site being located east of Junction 34 and north-west of Junction 35. The local roads in the vicinity of the site include B1047 Horningsea Road to the west, High Ditch Road to the south and Low Fen Drove Way to the north and east. The site is currently accessed from the Low Fen Drove Way for agricultural purposes. Low Fen Drove Way is an unclassified road and public byway.

5.2.3 The proposed WWTP site is approximately 94ha in size. The proposed WWTP itself will occupy a circular area of approximately 22ha lying in the centre of the site with the remainder of the site comprising landscaped areas to screen the proposed WWTP, access roads and ecological and recreational mitigation land.

5.2.4 The boundaries are defined to the west by the A14 and B1047 Horningsea Road, to the north by an agricultural track known as Low Fen Drove Way; and to the south by a former railway track which is a designated County Wildlife Site. The eastern boundary is not defined on the ground.

5.2.5 The existing fields are internally delineated by a series of ditches that run in a generally parallel alignment. Some of these are associated with native hedgerows for part of their lengths. The hedgerows are generally intact and managed. The hedgerow on the western boundary with the A14 ranges from 2 to 4m height above ground level (AGL) , tapering to 1m in the north-west corner, and the easternmost hedgerow and hedgerow along the County Wildlife site ranges from 2 to 4m height AGL and contains scattered tree groups.

5.2.6 Other existing vegetation includes a continuous and linear run of native hedgerow along the cutting banks of the A14; and groups of trees clustered in the northeast of the main site as well as a second grouping within the eastern part of the site. A number of the pylon bases are enclosed by native scrub vegetation, enclosed in fencing.

5.2.7 The landform of the site is low-lying and undulating with a slight rise from east to southwest, and a localised plateau at around 10m in the northern part of the site.

5.2.8 The eastern corner lies at +5.80m above ordnance datum (AOD); the western corner at +6.98m; the southern corner at +11.06 and the northern corner at +9.06m. The landform peaks at +12.5m on the southwestern boundary with the A14.

5.2.9 Lines of pylons cross the northern and eastern edges of the core site and come together with a third line at the northeastern part of the site; these are visually prominent in the open landscape.

5.2.10 The context of the site is predominantly rural and related to the local villages of Horningsea, approximately 680m to the north (as measured from the main site's northern boundary); Stow Cum Quy, approximately 1.69km to the east; and Fen Ditton, approximately 625m to the southwest. The site sits within a 'notch' formed by these settlement edges.

5.2.11 The nearest occupied buildings to the site are 'the Gatehouse' (on Low Fen Drove Way to the north-east), Biggin Abbey (on the opposite side of B1047 Horningsea Road to the west) and the properties on the southern edge of Horningsea (north of the site, east of Horningsea Road). More distant are Quy Mill Hotel (east) and properties east of B1047 Horningsea Road at Fen Ditton (south of the A14).

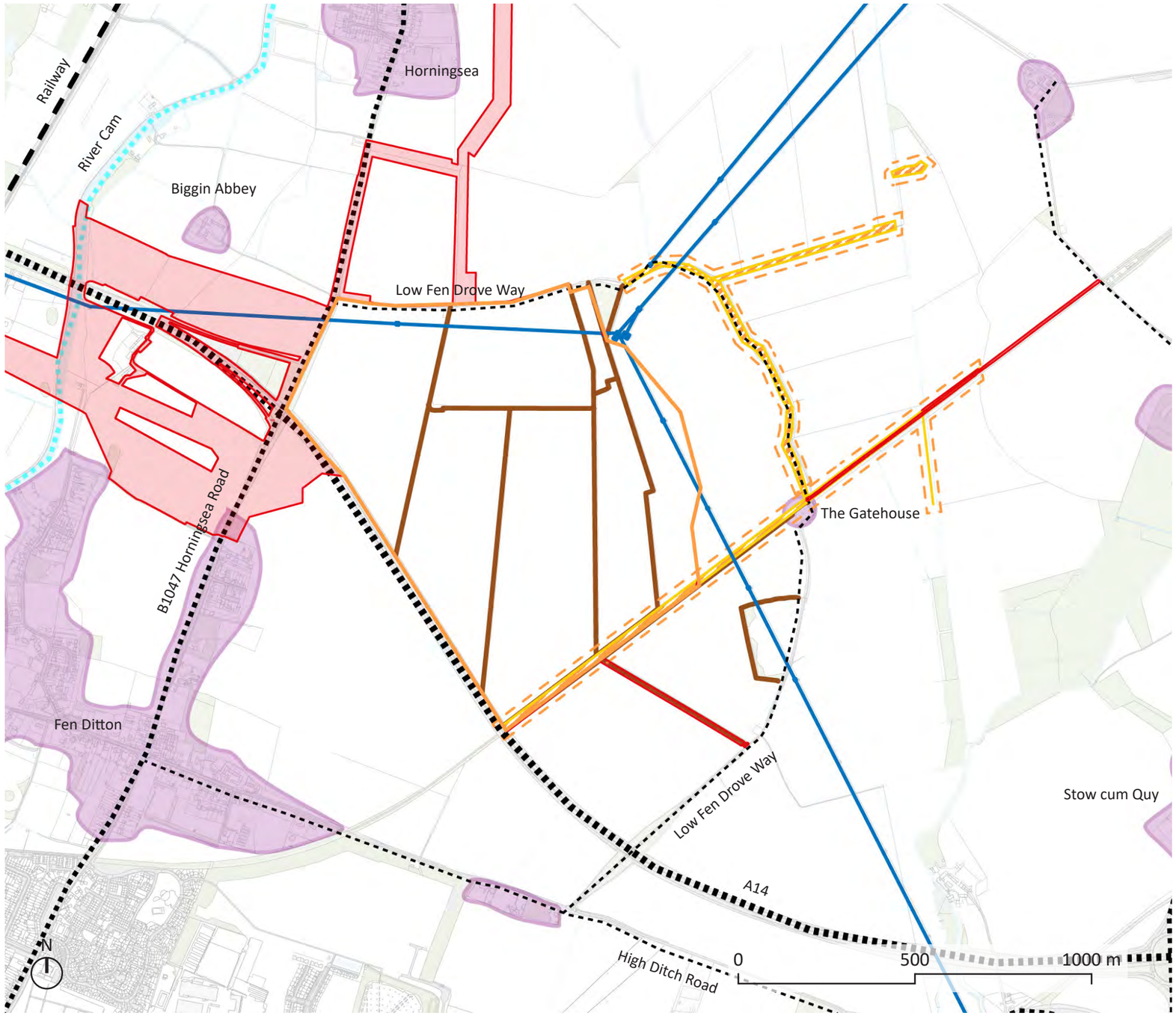
5.2.12 The Cam River corridor lies to the west of the site, running through a broad, relatively flat valley in northeast to southwest alignment.

5.2.13 The context of the site is associated with a number of planning and landscape designations, including Green Belt, heritage assets and ecologically rich or distinct areas. These are defined in the the development plan and in supplementary planning documents principally comprising:

- Cambridgeshire and Peterborough Minerals and Waste Local Plan 2021 (MWLP);
- South Cambridgeshire Local Plan 2018 (SCLP); and
- Cambridge City Local Plan 2018 (CCLP).

5.2.14 The principal designations are shown in the figure overleaf. The figure also shows land which is subject of extant planning permissions (for example at Waterbeach New Town) or has been put forward for potential development (albeit not currently proposed for allocation).

5.2.15 The site sits in the southern tip of the Wicken Fen Vision Area. Wicken Fen Vision is a scheme promoted by the National Trust for extending Wicken Fen to the outskirts of Cambridge.


Railway
River Cam
Horningsea
Biggin Abbey
Low Fen Drove Way
The Gatehouse
B1047 Horningsea Road
Fen Ditton
Low Fen Drove Way
Stow cum Quy
A14
High Ditch Road
N
0
500
1000 m
Key
Scheme Order Limits
Proposed WWTP Site
Site Field Patterns
Pylons
Roads
Local Wildlife Site 20m Buffer
Local Wildlife Site
Nearby Settlements

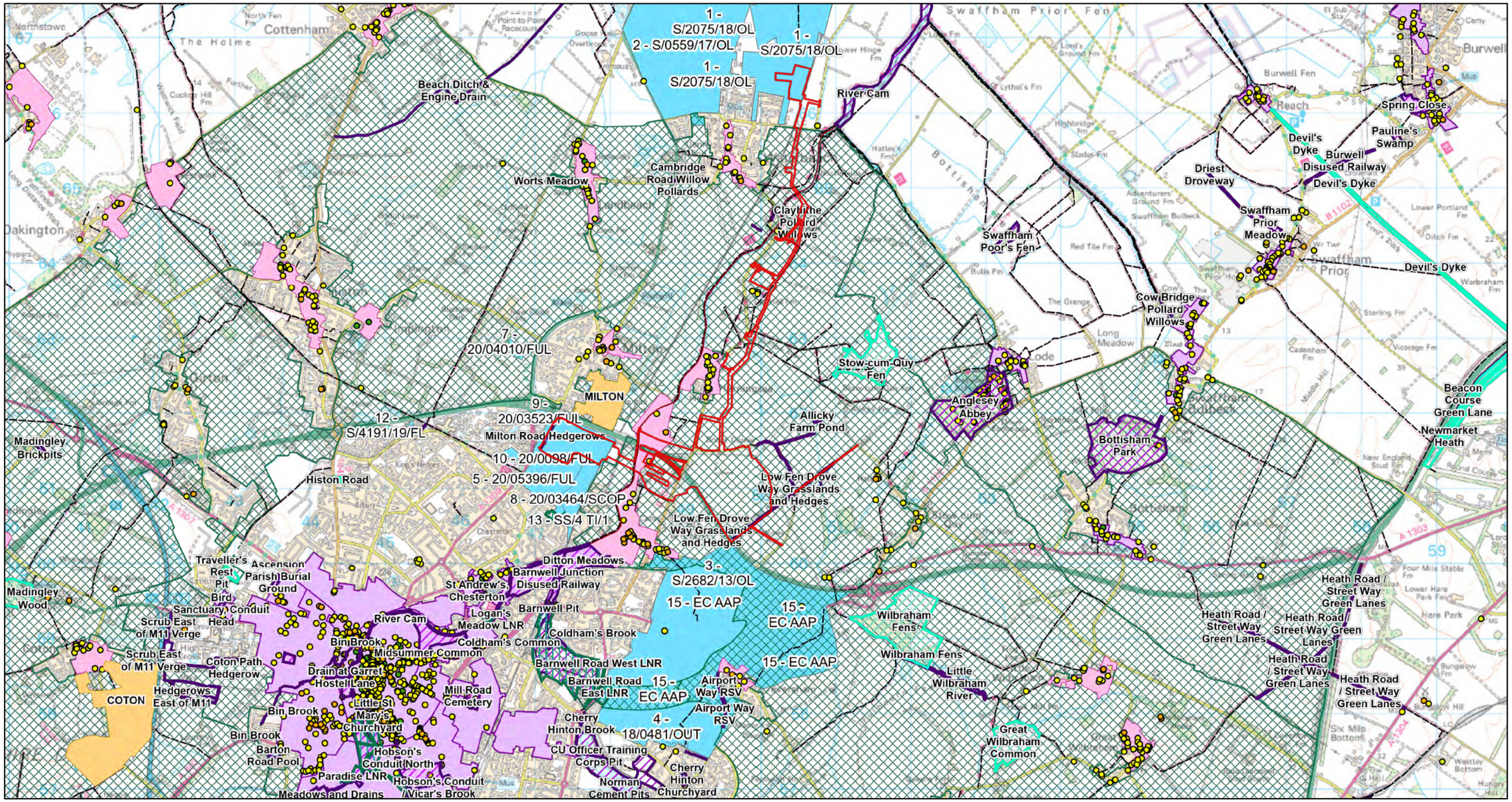
Site Context Designations

0 0.5 1 2 mi
0 1 2 4 km

- Scheme Order Limits
- Local Nature Reserves
- Sites Of Special Scientific Interest
- Country Parks
- Local Wildlife Site - Area
- Local Wildlife Site - Line

Listed Buildings
- Grade I
- Grade II
- Grade II*

- Conservation Areas (Greater Cambridge Planning)
- Conservation Areas (Historic England)
- Public Right Of Way
- Green Belt
- Cumulative Effects Assesssment Sites




PRIVATE
ROAD

5.3 Connecting Infrastructure (Pipelines)

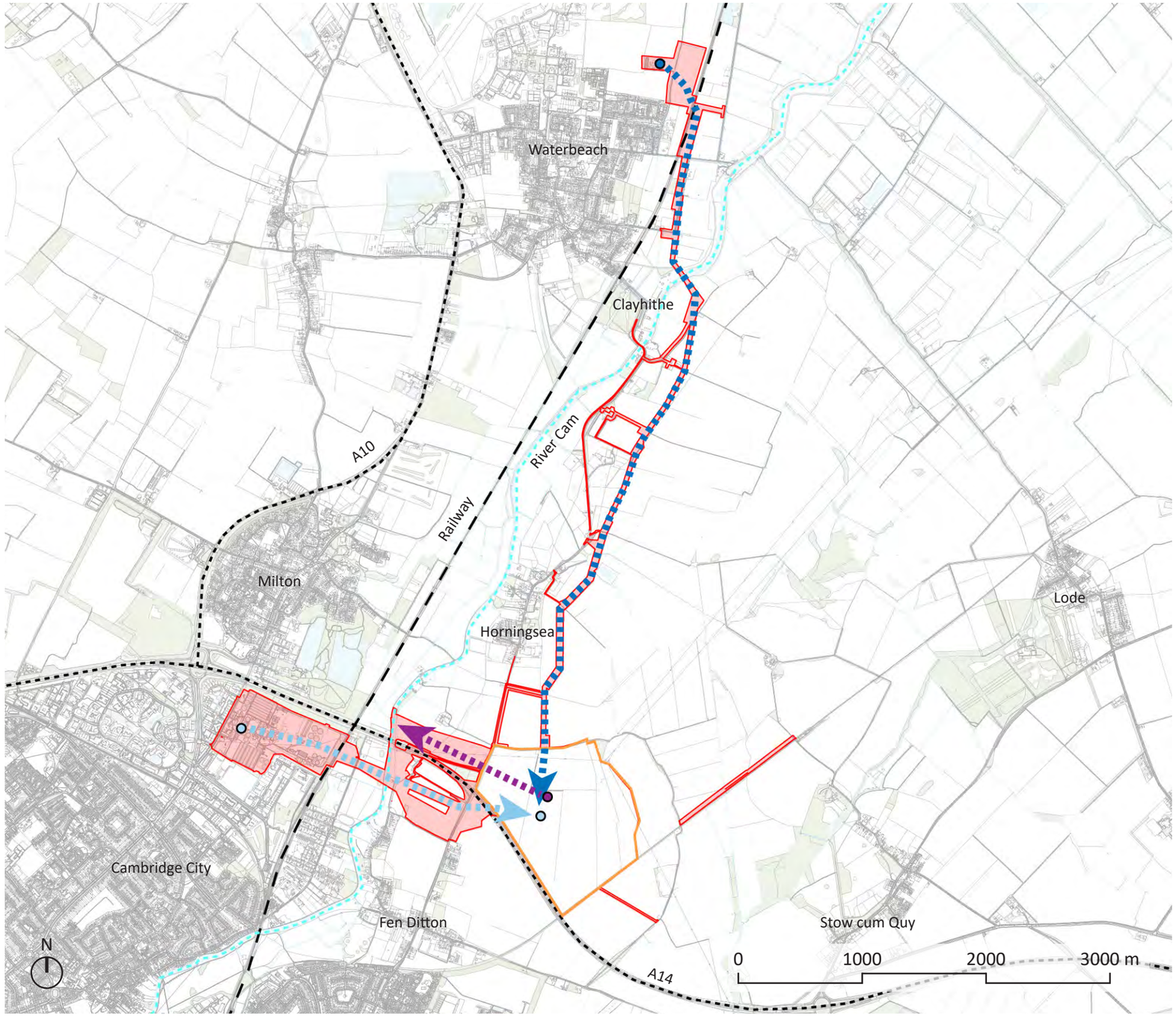
5.3.1 The Transfer Tunnel corridor is a wide area extending eastwards with an approximate length of 2.4km from the existing Cambridge WWTP to the proposed WWTP crossing below the existing railway line, the River Cam, B1047 Horningsea Road and the A14 along its route. This area lies immediately adjacent to Poplar Hall (a grade II listed building) and Red House Close which are in residential occupation.

5.3.2 The FE and Storm Pipeline corridor extends west from the boundary of the proposed WWTP for an approximate length of 1.25km to a new discharge location on the east bank of the River Cam approximately 90m downstream of the existing outfall from the existing Cambridge WWTP, and 30m downstream of the A14 bridge. It crosses Horningsea Road and runs parallel to the A14 to a section of the River Cam directly north of the A14 bridge and upstream of Baits Bite Lock. The proposed corridor is in the field to the south of the driveway to Biggin Abbey, a grade II* listed building.

5.3.3 The Transfer Tunnel and FE and Storm Pipeline corridors pass under arable fields and rough pasture close to the River Cam. The Outfall on the River Cam is situated close to the A14 bridge. The landscape here is open to the east, with views across the river towards Horningsea Road and the land required for the proposed WWTP.

5.3.4 The Waterbeach Pipeline corridor extends southwards from the Waterbeach New Town development area for a total length of approximately 8.4km (circa 5.6km to the proposed WWTP and circa 2.8km from the proposed WWTP to the existing Cambridge WWTP). From the Waterbeach New Town development area, the new main/pipeline routes east/south east crossing under the railway but avoiding the new Waterbeach railway station platform before continuing southwards through fields. It crosses to the east side of the River Cam after about 1.9km and continues southward to the east of the village of Horningsea before crossing under the A14. It then continues southward for approximately another 400m before routing west and connecting into the existing Cambridge WWTP, crossing under Horningsea Road, the River Cam, Fen Road and the railway en-route. The landscape along the route of the Waterbeach pipeline is almost flat, with a gradual fall towards the River Cam. Consequently, there will be no elevated views of the construction works.

5.3.5 Most of the route comprises agricultural land and rough pasture. Arable fields are typically separated by narrow field margins with ditches, hedgerows and occasional tree groups. The route is largely outside of any ‘sensitive’ areas or areas of significant landscape, historical, cultural or archaeological significance. A small section of the pipeline passes through the Fen Ditton Conservation Area. The proposed pipeline passes through Mineral Safeguarding Areas (MSA) for chalk and sand and gravel, as identified in the MWLP but will not impact any current mineral extraction areas.



Key

- Scheme Order Limits
- Proposed WWTP Site
- Transfer Tunnel
- Waterbeach Pipelines
- Outfall Pipelines

Landscape

5.4 Landscape Context

5.4.1 The site is located within a distinctive ‘fen’ landscape, generally characterised by its open views and low-lying topography.

5.4.2 Green infrastructure in the landcape context is both linear and irregular in character and pattern. Vegetation typically follows field boundaries and consists of hawthorn-dominated hedgerows, often aligned with field drains. Shelterbelts and some blocks of woodland are also present, with larger blocks scattered amongst the landscape, associated with parks such as Milton Country Park, or historic sites such as Anglesey Abbey or Biggin Abbey. These belts and blocks are often linear in form but also follow more meandering or rounded lines such as the vegetation belt along Low Fen Drove Way, just east of the site, or along the River Cam. Vegetation becomes more frequent within villages and at settlement edges.

5.4.3 Fields are generally medium to large in scale, with smaller fields located at the edge of settlements and adjacent to the river Cam. A number of medium scale parallel fields lie directly east of Low Fen Drove Way.

5.4.4 Topography is gently undulating and generally lies between +5m and +12m AOD (above ordnance datum), with some localised rises. Nearby settlements are located on higher ground, such as Stow cum Quy at +15m AOD and Fen Ditton at +11m AOD, whereas Horningsea is located in the river corridor at approximately +4m AOD.

5.4.5 Man-made landforms and earthworks contribute to the character of the local landscape particularly in an open landcape. Historic dykes such as Devil’s Dyke and Fleam Dyke are notable in the Cambridgeshire landscape and there are ancient earthworks at Wandlebury Hill and Belsar’s Hill. Ridge and furrow is evident at Godmanchester Common, Belsar’s Hill, and more locally at Girton.

Existing Green Infrastructre patterns

5.4.6 The Cambridge River corridor sits within a broad plain and includes marshland and grazing meadows. A hierarchy of ditches and linear field drains form a pattern across the agricultural landscape. Drainage is influenced by the typically wet, clay soils over marly chalk.

5.4.7 Land use to the east of the Cambridge settlement edge is predominantly arable and there are scattered farmsteads in the area.

5.4.8 Urban elements interrupt the otherwise rural landscape, including the transport corridor the A14 and the frequent presence of pylons, which are prominent in the open landscape.

Images of local landscape context

1. Long views across a relatively low lying landscape
2. Meanderting tree belt on Low Fen Drove Way
3. Linear field ditch and associated Hawthorn hedgerow
4. Pylons and the A14
5. Hillfort at Belsar's Hill
6. Ridge and furrow at Godmanchester Common

5.5 Landscape Character: Regional and Local

5.5.1 Landscape Character has also been studied at a local level through published studies, including Cambridge Green Belt Study (November 2015) and more recently the Greater Cambridge Landscape Assessment (February 2021). These studies define and describe the distinct areas of landscape around Cambridge.

5.5.2 The main development site lies within a Landscape Character Area (LCA) defined by the Cambridge Green Belt Study as the Eastern Fen Edge. The key characteristics of the Eastern Fen Edge LCA are set out below.

5.5.3 Refer to the Landscape and Visual Impact Assessment for a more detailed analysis of the landscape character of the site and its local context.

Key characteristics of the Eastern Fen Edge LCA:

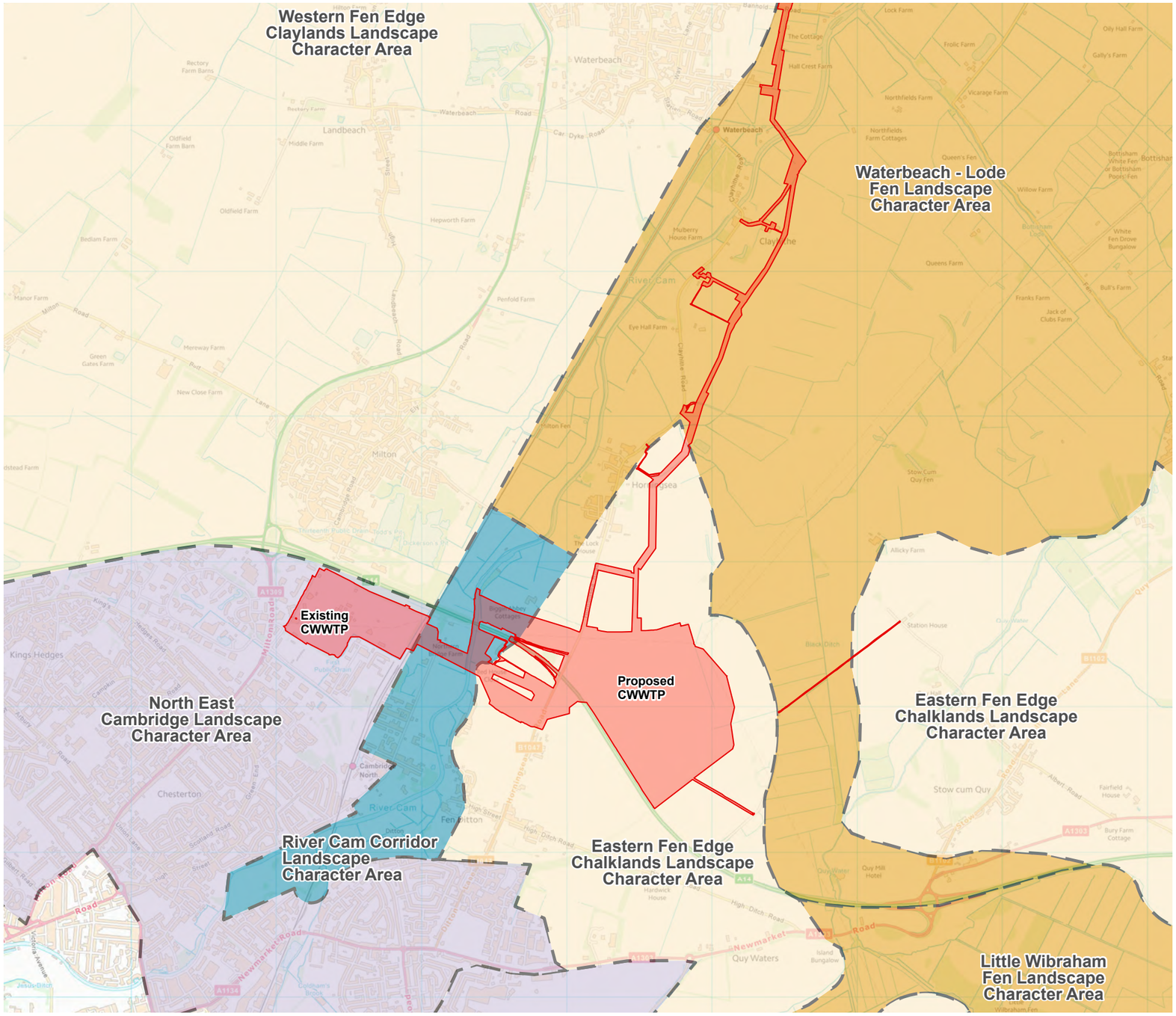
- A low-lying, gently undulating open landscape with long views across large fields;
- Predominantly arable farmland with low hawthorn hedge or ditch boundaries;
- Scattered woodland copses and shelter belts across higher land and a concentration of woodland around settlements;
- Small villages with historic, linear form and traditional vernacular; and
- Masts and pylons are prominent vertical elements.

Opportunities for Green Infrastructre across the LCA:

- Conserve and enhance priority habitats including fen, grazing marsh and grassland within and around SSSIs;
- Create wildlife corridors to connect and expand these habitats where possible; and
- Minimise negative impacts from recreationg pressure on sensitive ecological sites through habitat buffers and educating visitors.

KEY

- CWWTP Site boundary
- Eastern Fen Edge LCA
- River Cam Corridor LCA
- Waterbeach-Lode Fen Landscape LCA



Local Landscape Character

5.6 Landscape Designations and Constraints

5.6.1 There are number of statutory and policy designations in the context of the site that are relevant to landscape.

5.6.2 Anglesey Abbey, to the east of the proposed WWTP, is a Registered Park and Garden. The Abbey contains a 20th century garden within the site of an Augustinian Priory.

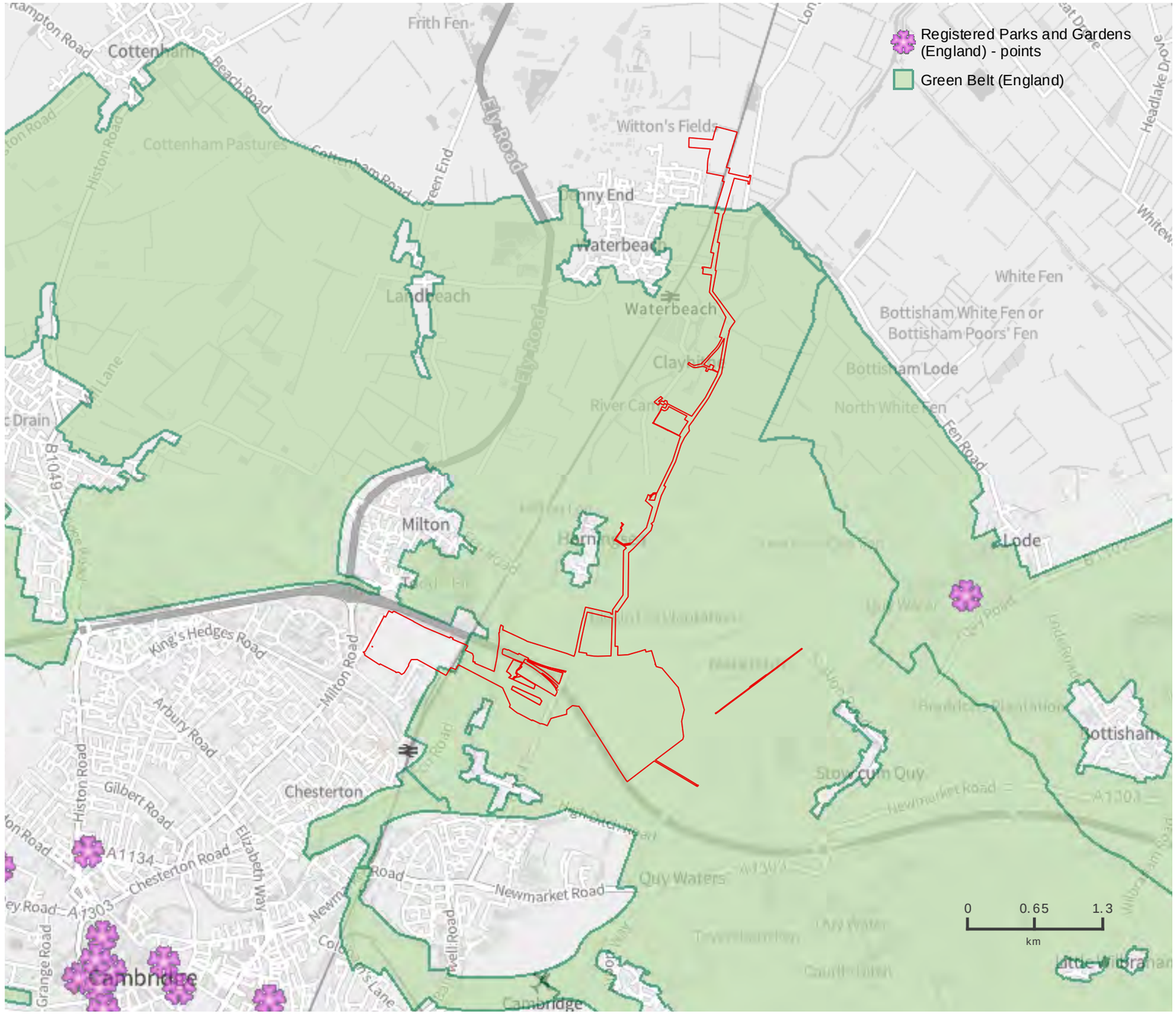
5.6.3 The site is located within the Cambridge Green Belt. The Greater Cambridge Green Belt Assessment (August 2021) assessed the landscape within the Green Belt in terms of its contribution to the three purposes of the Green Belt set out in the Cambridge Local Plan. The assessment found the land in the study area provides a low contribution to Purpose 1 (to preserve the setting of Cambridge) and a moderate contribution to Purposes 2 and 3 (to preserve the green separation between existing villages and urban expansion of Cambridge and to protect green corridors between open corridors and the urban areas).

"Local planning authorities should plan positively to enhance the beneficial use of the Green Belt, such as looking for opportunities to provide access, to provide opportunities for sport and recreation, to retain and enhance landcapes, visual amenity and biodiversity; or to improve damaged and derelict land."

-Paragraph 145, National Planning Policy Framework

National Planning Practice Guidance (NPPG) on the Green Belt endorses the preparation of supporting landscape, biodiversity or recreational need evidence to identify appropriate compensatory improvements, including:

- new or enhanced green infrastructure;
- woodland planting;
- landscape and visual enhancements (beyond those needed to mitigate the immediate impacts of the proposal);
- improvements to biodiversity, habitat connectivity and natural capital;
- new or enhanced walking and cycle routes; and
- improved access to new, enhanced or existing recreational and playing field provision."



5.7 Strategic Landscape and Ecological Initiatives

5.7.1 The proposed WWTP site is located within, or in close proximity to, a number of strategic landscape and ecological initiatives.

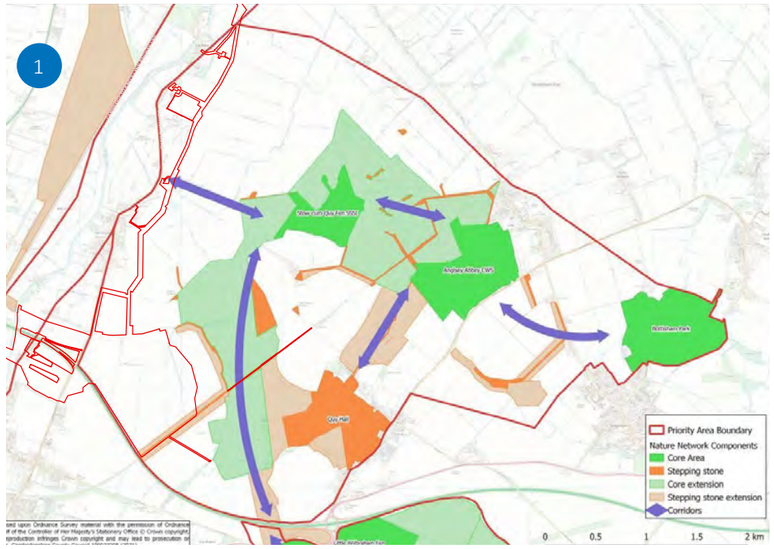
5.7.2 The **Wicken Fen Vision** is long term initiative to create a diverse fen landscape for wildlife and people stretching from Wicken Fen to the edge of Cambridge. The core zone of the site is located at the southwestern tip of the Vision's extent.

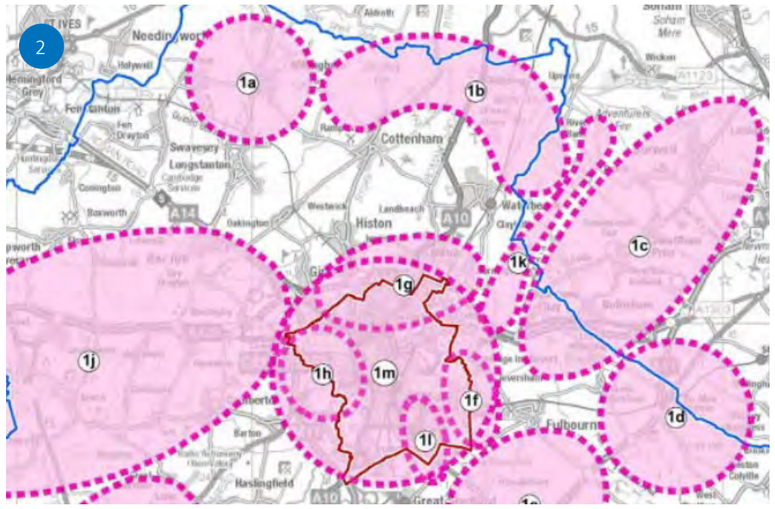
5.7.3 The expansion of the nature reserve will be achieved through restoration of natural processes and careful management of water and grazing, to evolve a mosaic of habitats for a wide variety of abundant wildlife. The reserve will be accessible to people, with opportunities for volunteering, education and interpretation.

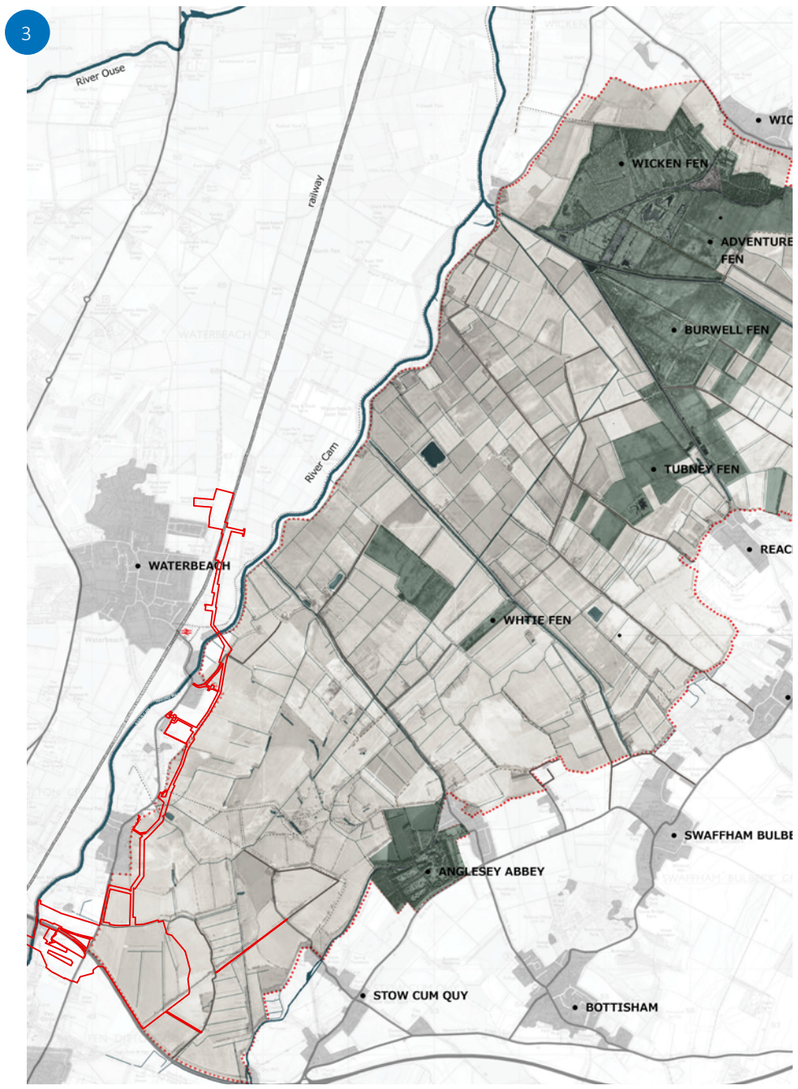
5.7.4 The **Cambridge Nature Network** consists of individual nature parks, nature reserves and farm habitats, linked together by nature-friendly farmland and wildlife-rich towns and villages. In a March 2021 report, CNN has identified the area around the site as the 'Wicken Fen Vision South Priority Area'.

5.7.5 The CNN report also highlights the limited accessibiity to natural open spaces.

5.7.6 The **Greater Cambridge Green Infrastructure Opportunity Mapping Report** sets out broad opportunity zones for the theme of landscape, cultural heritage and sense of place, amongst others. The Main Application Site falls within two of these zones: the North-east Cambridge to Waterbeach Corridor (1k) and the Wicken Fen Vision (1c).







1. Extract from Cambridge Nature Network Report (Bedfordshire/Cambridgeshire/Northamptonshire Wildlife Trust, March 2021)
2. Extract: Extract from Greater Cambridge Green Infrastructure Opportunity Mapping (South Cambridgeshire District Council and Cambridge City Council, LUC 2020)
3. Extract from Wicken Fen Vision Map 2017

5.8 Ecology Designations and Constraints

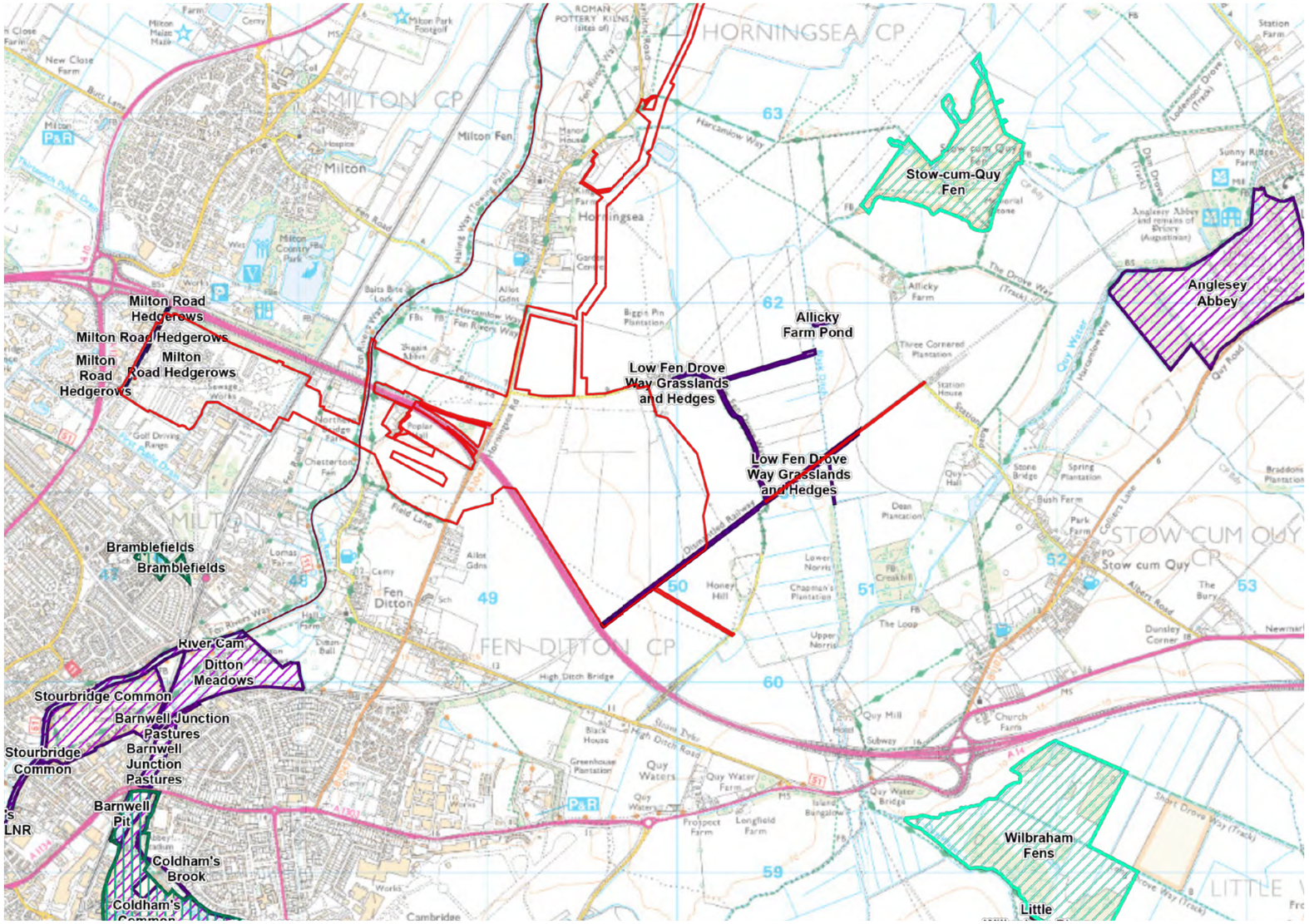
5.8.1 There are areas in the context of the proposed WWTP that are designated as important ecological and wildlife sites.

5.8.2 The SSSI at Stow cum Quy, some 1.75km to the north-east of the proposed WWTP is designated for its floristically rich areas of Calcareous loam pasture and its open pools formed on Chalk Marl, which are rich in aquatic plants.

5.8.3 The SSSI at Wilbraham Fens is an example of a Fen habitat with fen and neutral grassland with associated scrub and open water communities, with substantial areas of willow and hawthorn scrub.

5.8.4 In addition to other designations, Anglesey Abbey is also classifed as a Local Wildlife Site.

5.8.5 Adjacent to the proposed WWTP on its southern boundary is the Low Fen Drove Way Grasslands and Hedges County Wildlife Site, which follows a narrow linear route along the disused railway. The site is likley a key foraging/commuting link for birds and bats, as well as supporting various invertebrates.



Built Environment and Heritage

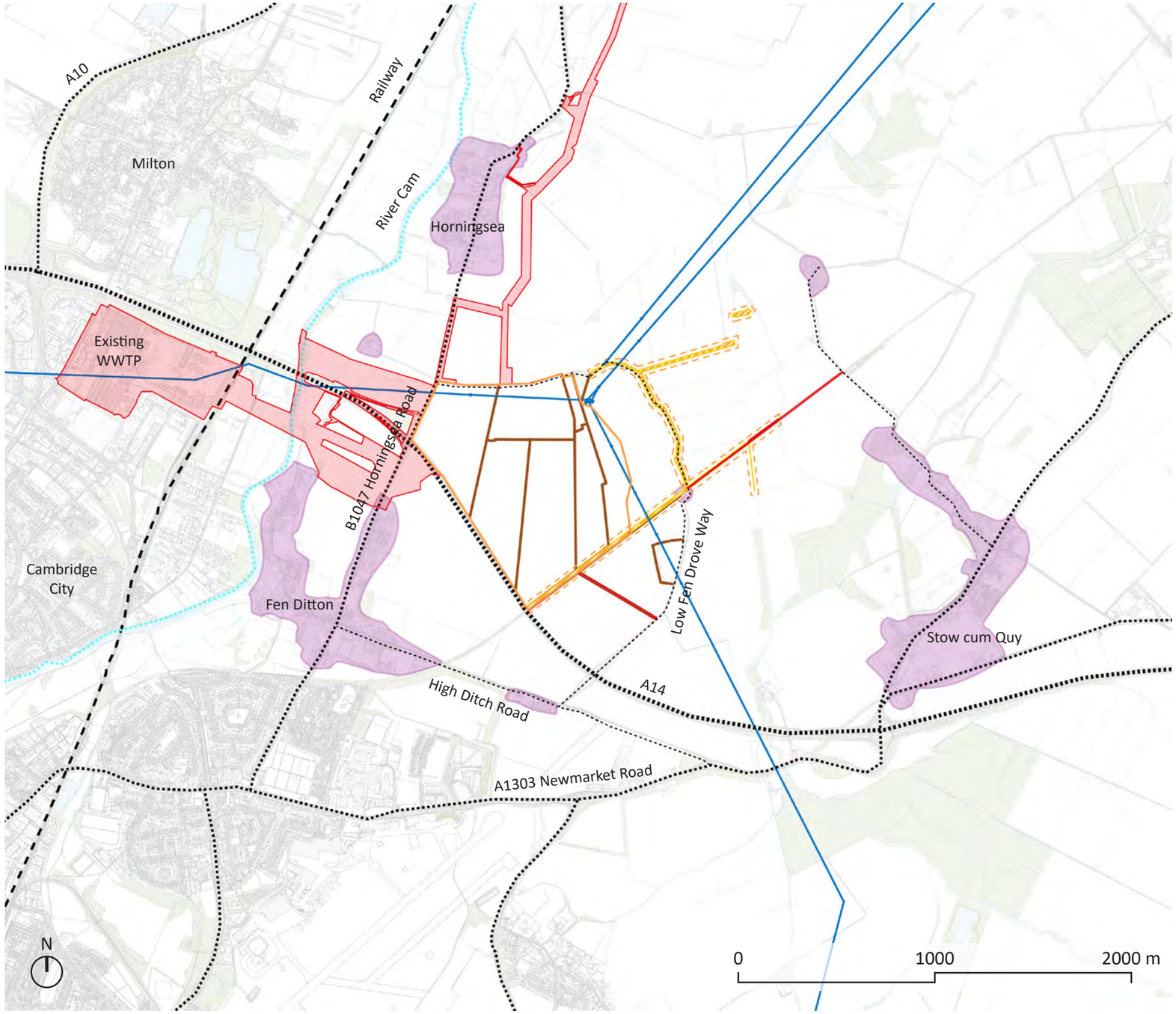
5.9 Built Environment Context

5.9.1 The character of areas within the Scheme Order Limits varies. To the south, in the area comprising the Waste Water Transfer Tunnel corridor and the proposed WWTP, the character reflects its urban edge location. Noise from the A14 is apparent and this character extends beyond the north side of the A14 as far as Biggin Abbey. From this area northwards, the character becomes more rural and quiet with interruptions only arising immediately along the route of the B1047 from busy traffic periods congestion.

5.9.2 Away from the road network, the Public Rights of Way (PRoW) routes are lightly used and provide recreational access to peaceful and pleasant areas of countryside and wildlife and connections to more distant villages and features.

Horningsea

Fen Ditton



Key

- Scheme Order Limits
- Proposed WWTP Site
- Site Field Patterns
- Pylons
- Roads
- Local Wildlife Site 20m Buffer
- Local Wildlife Site
- Nearby Settlements

Local Context Site Photos

5.10 Historic Environment

5.10.1 There are no scheduled monuments within the Scheme Order Limits. There are four scheduled monuments within the 1km study area, as follows:

- Multi-phased settlement east of Milton (HE001);
- Horningsea kilns, site of (HE002);
- Car Dyke (HE003); and
- Waterbeach Abbey (site of) (HE004).

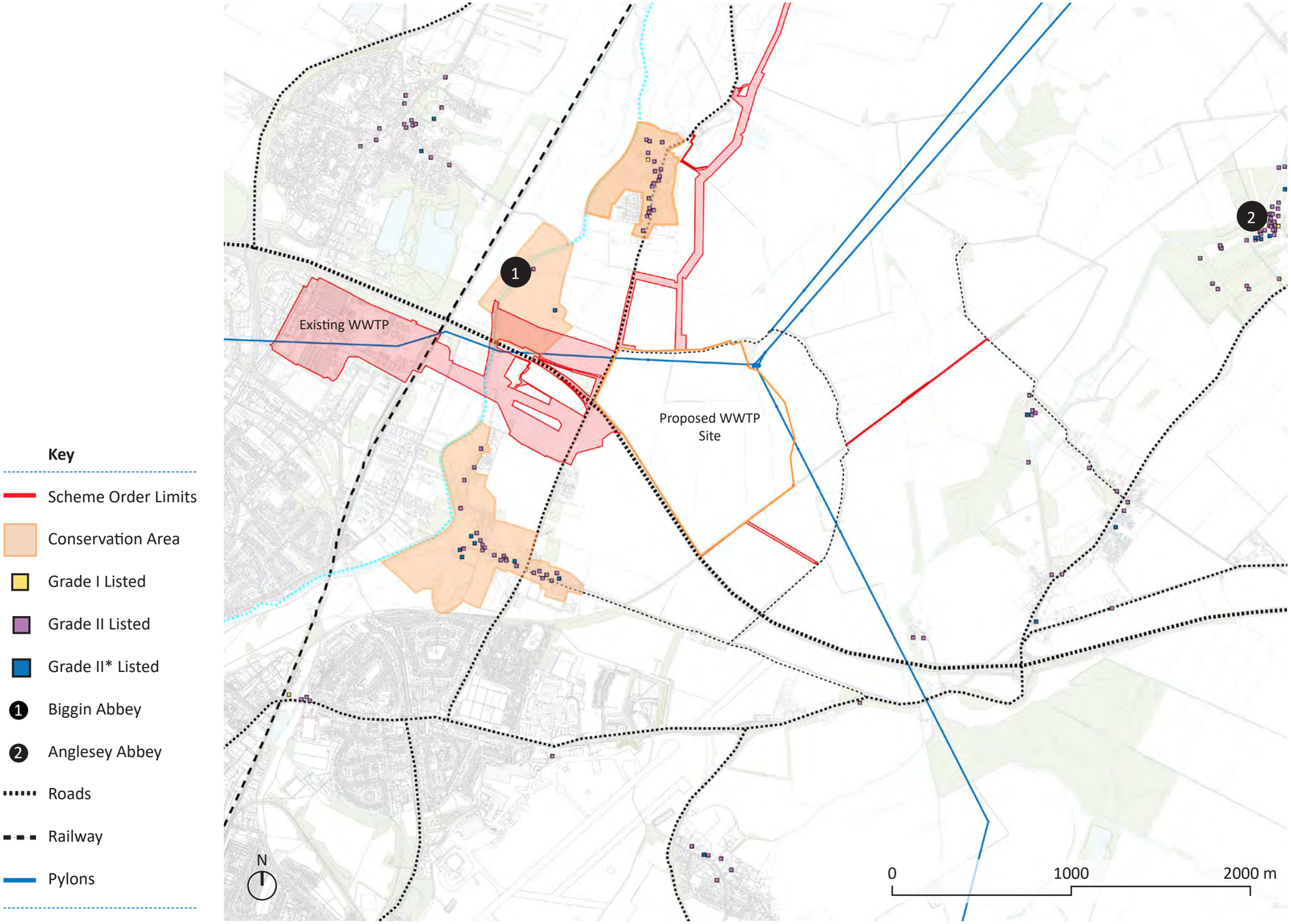
5.10.2 The nearest of these is the site of the Horningsea Kilns (HE002), which is approximately 200m south of the Scheme Order Limits. A further 36 scheduled monuments are identified within the Zone of Theoretical Visibility (as assessed in Chapter 15: Landscape and Visual of the ES). There are a further 21 monuments recorded in the Cambridgeshire Historic Environment Record (CHER) within the Scheme Order Limits. An additional 192 assets are identified by the CHER within 500m of the Scheme Order Limits and there is potential for archaeology across a large area of the site.

5.10.3 There are no designated built heritage assets situated within the Scheme Order Limits. However, one listed building is surrounded by the Scheme Order Limits; Poplar Hall is a Grade II listed early 17th century timber-framed farmhouse. There are two conservation areas which lie partially within the Scheme Order Limits: Baits Bite Conservation Area(HE095) and Fen Ditton Conservation Area (HE096). An additional three conservation areas lie within the 1km study area. There are no non-designated built heritage assets within the Scheme Order Limits. In addition, there are 21 non-designated built heritage assets identified within 500m of the Scheme Order Limits. There are a further 457 listed buildings and 18 conservation areas situated outside of the study area but identified by the ZTV.

5.10.4 There are two designated historic landscape assets which are partially within the Scheme Order Limits (Baits Bite Conservation Area and Fen Ditton Conservation Area) as noted above. An additional three conservation areas lie within the 1km study area, also noted above. There are no additional designated historic landscapes within 1km of the Scheme Order Limits. The Grade II* registered park and garden of Anglesey Abbey (HE181) falls partially within the ZTV (2km east of the Scheme Order Limits). In addition, 900m east of the Scheme Order Limits is the non-designated parkland associated with the Grade II* listed building Quy Hall (HLCA62). This historic landscape asset falls partially within the ZTV.

5.10.5 The Main Development Site is located in a rural landscape that largely owes its character to late post-medieval enclosure and modern agricultural practices. Character elements of earlier landscapes do survive but this character is degraded by the A14 dual carriageway and the pylons and powerlines which are a prominent feature in the landscape. The area is located on low chalklands at the Fen edge and includes part of a low hill called Honey Hill. This is situated at the point where the River Cam Valley widens out into the Cambridgeshire fens. The flat, agricultural, fenland landscape surrounding Biggin Abbey forms its setting. Likewise, the fields around Horningsea have a historical relationship to the village and provide context to its agricultural development.

5.10.6 In respect of the Connecting Infrastructure site area, Eye Hall (HE080), Barn to East South East of Eye Hall (HE081) and Granary to East of Eye Hall (HE082) (all Grade II listed and of high value) are located approximately 100m south of the Scheme Order Limits for the Waterbeach pipeline and set in relation to one another in the flat agricultural Fen-edge landscape north-east of Horningsea, with the Horningsea Conservation Area and Waterbeach Conservation Area nearby.



Key

- Scheme Order Limits
- Conservation Area
- Grade I Listed
- Grade II Listed
- Grade II* Listed
- 1 Biggin Abbey
- 2 Anglesey Abbey
- Roads
- Railway
- Pylons

5.11 Access and Amenity

5.11.1 Ditton Lane and the B1047 Horningsea Road extend northwards from Newmarket Road (A1303) in Cambridge through Fen Ditton, Horningsea, Clayhithe and Waterbeach, ultimately joining the A10 west of Waterbeach. The B1047 is a well-used single carriageway road used by traffic accessing and leaving the eastern side of Cambridge. At morning and evening peaks the road is busy through Fen Ditton and along the section of the B1047 Horningsea Road crossing over the A14 at junction 34 immediately to the west of the proposed WWTP.

5.11.2 There is an existing combined cycleway and footpath located along the western side of Horningsea Road, which starts approximately 400m south of the Horningsea Road overpass above the A14. This route provides access for pedestrians and cyclists from Horningsea to Fen Ditton, including for parents and children going to and coming from Fen Ditton Community Primary School.

5.11.3 Low Fen Drove Way is an adopted highway for approximately 700m from Horningsea Road and then becomes a byway (Horningsea 17 byway) to the south of Horningsea for approximately 1.3km and is open to all traffic. The final 1.2km is adopted highway where it joins High Ditch Road. It is presently an unmade road which provides access to the fields which comprise the Main Development Site. Ditton Lane and B1047 Horningsea Road are served by the Landbeach-Cambridge bus route 19 that runs services twice in the morning at 07:00 and 09:30 and twice in the afternoon at 12:30 and 17:55.

5.11.4 The B1047 passes through Horningsea which is a small attractive linear village with buildings mostly arranged alongside the B1047, together with two narrower lanes leading down to the river to the west. The southern part of the village has cottages and public houses, many at right angles to the road with boundary fences, railings and long walls. The character changes at the northern end of the village where fine gault brick walls surrounding the large farms define the road to the west, with farm buildings and fences lining the road to the east. The High Street is surfaced in red tarmac throughout its length within the village as part of a traffic calming initiative, reflecting the popularity of this route for traffic accessing the north-eastern side of Cambridge.

5.11.5 The area surrounding the Scheme Order Limits includes a number of green spaces and recreational areas, linked by an extensive PRoW network.

5.11.6 National Cycle Route 51 passes from Cowley Road through Chesterton before crossing over the River Cam and heading north and then east to Fen Ditton. A newly built cycle way, the Chisolm Trail, crosses over the River Cam via the newly built Abbey-Chesterton Bridge and forms part of the wider cycle network.

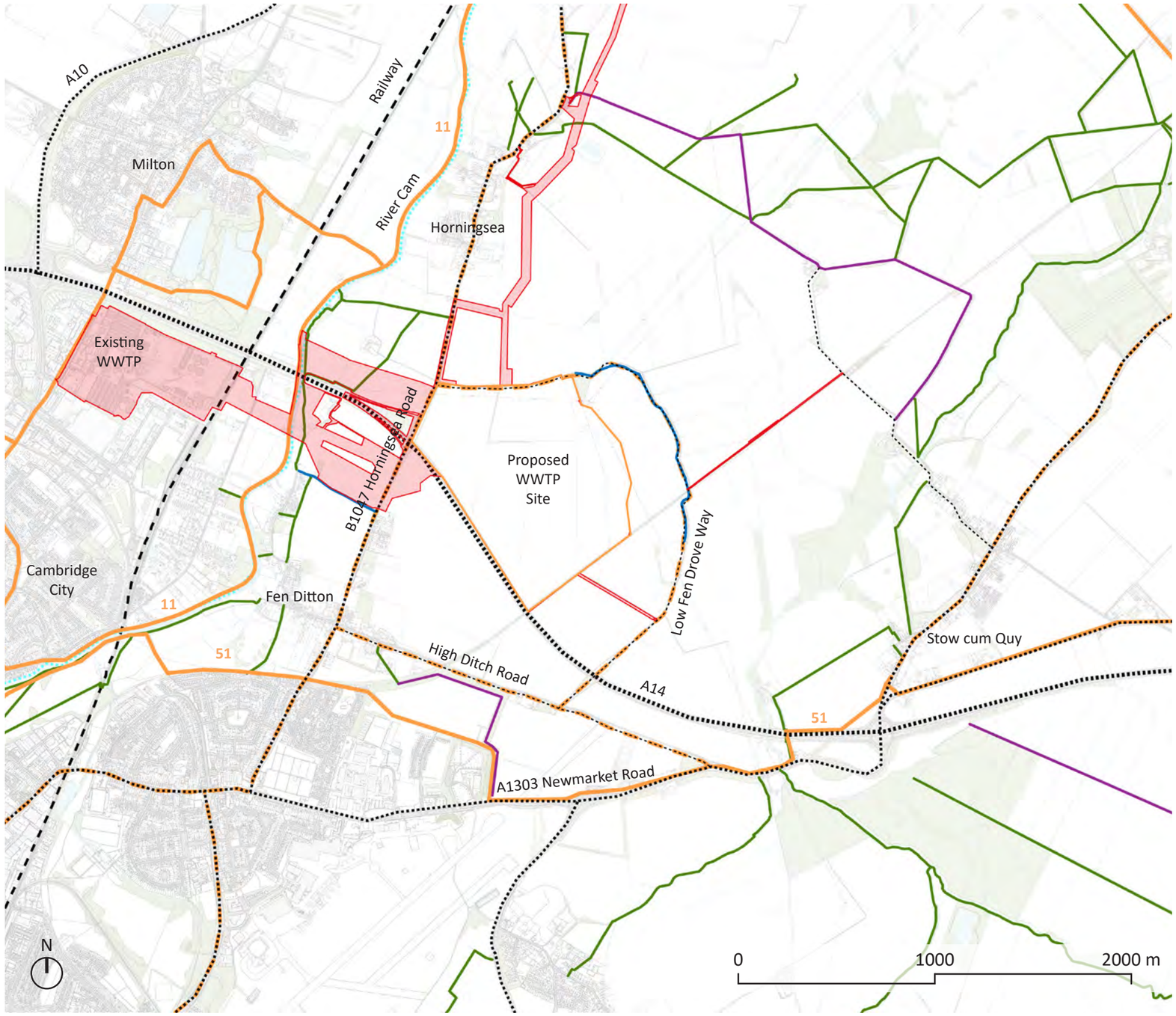
5.11.7 Fen Ditton Recreation Ground is located on the northeastern edge of the village, at the junction of Green End, Stanbury close and Church Street. This open space is connected by PRoW 85/3 (footpath), which runs north through the village. PRoW provision includes PRoW 85/6 (a footpath) providing a connection along the eastern bank of the River Cam from Horningsea to Fen Ditton. This footpath changes into PRoW 130/3 (a byway) and PRoW 85/5 (a byway), providing access to the B1047.

5.11.8 Horningsea is linked to other areas of recreation and settlements by a network of PRoWs. To the south, the Honey Hill area is accessible from Low Fen Drove Way and is used by local residents as part of a walking and cycling loop. This access is currently informal and unauthorised. Access is provided from the south of the village to the River Cam by a small network of PRoW which include PRoW 130/1 which provides access from Horningsea Road and connects to PRoW 85/7 and PRoW 85/6 to the River Cam, and PRoW 162/1 which runs along the west of the River Cam and provides a connection from Horningsea to Fen Road. There is currently a gap in the network which is proposed to be addressed through the introduction of a new bridleway connection to the northeast of the Proposed Development. This will provide an enhanced connection for walkers, cyclists and equestrian users to the existing formal PRoW network.

5.11.9 The River Cam is a popular location which provides connectivity between communities and a range of recreational opportunities. Recreational uses include rowing, punting, swimming, kayaking, fishing, and motor boating. The River is also a designated County Wildlife Site (CWS)from Clayhithe Bridge to the north.

5.11.10 In addition to water-based activities, the River Cam is used by groups for angling as well as for walking along the PRoW located on both the eastern and western banks.

5.11.11 Milton Country Park is located in the south of Milton on Cambridge Road and provides popular open and recreational space for the local community.



Key

- Scheme Order Limits
- Roads
- National Cycle Routes
- Other Cycle Routes
- PRoW Pedestrian Routes
- PRoW Bridleways
- Existing Byways

Local Recreation Routes

6.

Evolution of Design

6. Evolution of Design

'High quality design can improve the visual and environmental experience for visitors and the local community alike ' - *para 4.15.12 NPS*

6.1 Evolution of Design Overview

6.1.1 The design of the proposed WWTP and the associated works on the proposed WWTP site has followed a complex, multi-faceted approach to develop the final proposals which meet the Project Objectives outlined in Chapter 2. The process has been long and detailed since the announcement of the site selection in January 2021.

6.1.2 This Chapter discusses how design proposals have evolved and explains this evolution in a series of key themes that have been pursued throughout the design process. It outlines the options the team have investigated to explain how the final proposals have been subsequently developed, and explains why decisions were made to select the final proposals. The section is structured to balance chronological design decisions with thematic design development.

6.2 Design Decision Process

6.2.1 In addition to the engineering design decisions required to deliver an efficient and dependable WWTP, the Applicant has made design decisions utilising a bespoke process and involving the entirety of the Applicant's team, as outlined in Chapter 1. These decisions were worked through by means of professional workshops starting off firstly with understanding what the metrics of measurement are including qualitative feedback from stakeholders before the final decision on options were made. The workshops then used these agreed metrics to agree the decisions based on professional judgement, evidence where appropriate and consultee feedback. Expertise represented at these workshops include: engineering, architecture, landscape architecture, planning, legal, land, ecological, landscape assessors, consultation team, the Applicant and selected advisors depending on the decision to be made. This process has been created because the Applicant realised early in the design process that to create a 'good design' it had to incorporate the views and professional opinions into the design of more than just pure engineering and business as usual processes.

6.2.2 This Chapter focuses on the main design decisions requiring this unique and bespoke decision making process. Throughout the design phase of the project many smaller decisions have been made utilising smaller versions of the above and then approved by the Applicant's Integrated CWWTPRP team. This involves areas such as mitigation commitments, green space usage, traffic and transport commitments as well as the functionality of the Discovery Centre.

6.3 Optimise Land Take

6.3.1 The masterplan has sought to minimise the total land take for the development. This includes minimising land required for development through efficient planning, and optimising the area around it to integrate the development into the countryside and best mitigate its impact on the landscape and Green Belt.

6.3.2 The original site boundary was set by a number of constraints, including:

- A 500m buffer around listed buildings in Horningsea village to the north east and Biggin Abbey to the east.
- A 400m buffer around an isolated residential property located on Low Fen Drove Way.
- The 100m buffer along the alignment of the A14 to the south west.
- Odour offsets from key receptors / local villages.

6.3.3 Through further study on the optimum location of the proposed WWTP works within the selected site, the boundaries of the Proposed Development were refined. The area north of Low Fen Drove Way was considered insufficient to accommodate the treatment plant and associated landscaping without adversely affecting Horningsea or bisecting the northern part of Low Fen Drove Way. It was considered that these visual, amenity and recreational impacts would be significant and needed to be avoided or reduced.

6.3.4 Safe construction and operation of the project necessitated a buffer around the existing high voltage power lines across the site. It was considered that the land to the North and East of those power lines was of insufficient size to accommodate the treatment plant and it would not be practical to split the treatment plant either side of the buffer around the power lines. In addition, following discussion with UK Power Networks, it was not considered practical or economic to bury or divert the over-head power lines.

6.3.5 A further constraint arose from the County Wildlife Site (CWS) associated with the dismantled railway. It was concluded that the location of any construction works should fall outside of a 50m buffer around the CWS, to ensure that its features, included protected species, were not adversely affected. Furthermore, consultation with local authorities and other stakeholders highlighted a long-term strategic aspiration to utilise the route of the former railway for recreational initiatives, it was therefore considered important not to prejudice this potential.

6.3.6 These considerations also excluded the potential of utilising the land to the South-East of the railway line, which would be of insufficient size to accommodate the works. The grassland in the immediate vicinity of the area known as Honey Hill, to the east of the site, was also considered to be of higher biodiversity value, providing a further constraint against development.

6.3.7 These studies concluded that the project should be located within the area defined by the A14, B1047 Horningsea Road, Low Fen Drove Way and CWS; an area of 94 ha total with well-defined boundaries comprising 22 ha for the proposed WWTP and 72 ha to mitigate the effects of the development on sensitive receptors and accommodate the landscaped earth bank, private access road and cycle way, recreational pathways and landscaping, visual impact mitigation and biodiversity planting without leaving small parcels of excluded peripheral land incapable of beneficial continuing agricultural use.

Maximum original site boundary based on distance offsets from key contraints

Final land take

6.4 Plant Footprint

6.4.1 When determining the size of the proposed WWTP footprint, an exercise was undertaken to overlay the existing works with the proposed to determine whether the land take was reasonable. The diagrams show the two plant works overlaid.

6.4.2 The existing Cambridge WWTP occupies approximately 40 hectares of land. The proposed WWTP will occupy a circular area of approximately 22ha.

6.4.3 The proposed WWTP enclosure provides sufficient space for the optimisation of the processes, whilst providing space for the provision of future expansion.

Overlay of existing Cambridge WWTP site over proposal.

Overlay of original 'optimised plant layout' over proposal.

6.5 Layout Option Appraisals

6.5.1 Once the site had been selected, 3 initial design options were developed for the site, each responding to the key constraints in slightly different ways. These included:

- Option 1 ('the triangle') was based on a slightly adapted optimised functional layout for the plant works, supported by a landscape plan aligned with existing field patterns.
- Option 2 ('the rotunda') utilised retained excavation spoil to construct a landscaped feature in the local environment, inspired by ideas of the circular economy, water and fluidity as, well as past and present landscape features including local dykes and hillforts. The circular layout also presented an opportunity to develop a consistent approach to landscape impacts, regardless of vantage point.
- Option 3 ('the green fingers') proposed a linear arrangement with a sculptural landscape of retained spoil delineating a fragmented treatment plant.

6.5.2 All three designs utilised a 22ha footprint for the proposed WWTP, within a wider landscaped area bounded by Horningsea Road to the West, Low Fen Drove Way to the North and East and the A14 to the South, totalling 127ha. This landscaped area would also accommodate associated development such as access roads, new paths to mitigate potential adverse effects on the users of existing PRoW and emerging requirements for Biodiversity Net Gain (BNG).

6.5.3 The 3 design options were presented to and discussed with the Design Council in March 2021, and high-level technical appraisals were carried out for each option by the design team. The Design Council commended the landscape-led approach to design, and expressed a preference for the "the design simplicity and all-round potential" of the rotunda option.

6.5.4 The rotunda design was the option agreed to be taken forward by the client team. The benefits of the rotunda option included:

- The compact perimeter means the spoil produces the maximum shielding effect.
- It creates a democratic relationship to the surroundings.
- The circle is accessible from any angle of approach which meant decisions over the positioning of the permanent access road were not compromised by the layout.
- The distance of the Transfer Tunnel from the existing Cambridge WWTP and the length of the FE and Storm Pipeline is reduced relative to the other options.
- The uninterrupted geometry of the proposed WWTP secure enclosure allowed the adoption of an optimised arrangement of the plant, reducing both embodied and operational carbon.
- Simplifying security requirements by having a single line of security around the circle perimeter.

6.5.5 The triangle option was discounted against the rotunda option because of factors including:

- Sub-optimal arrangement of the plant due to fragmentation and separation of the plant works
- Greater lengths of pipework and connections.
- Greater distance for the Transfer Tunnel from the existing Cambridge WWTP and for the discharge pipework.
- Sub optimal location of the odour emitting elements
- Increased perimeter would have greater impact on key visual receptors
- Increased perimeter would reduce the height of the earth works and thus reduce its shielding effect
- Larger footprint would bring the plant closer to key receptors

6.5.6 The green fingers option was discounted against the rotunda option because of factors including:

- Water treatment submerged below greened bridging structures, so much of the proposed WWTP works would be sunken into the ground.
- Covering WWTP requires mechanical vent to prevent dangerous build up of fumes.
- Sub-optimal arrangement of plant due to fragmentation and separation of the plant works
- Increased pipe lengths.
- Adds material and increases embodied energy and carbon to submerge the plant works.
- Presents a sub-optimal working environment for staff.

Option 1- The Triangle

Option 2- The Rotunda

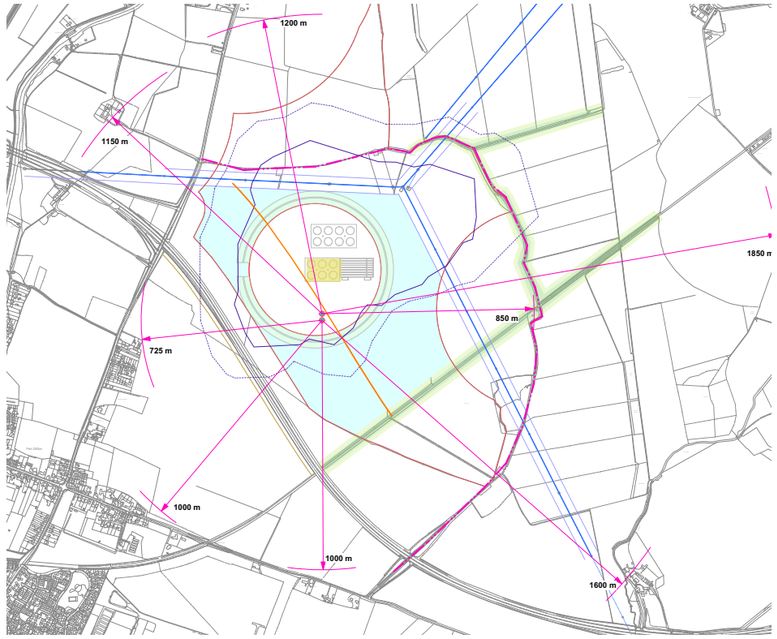
Option 3- The Green Fingers

6.6 Micrositing

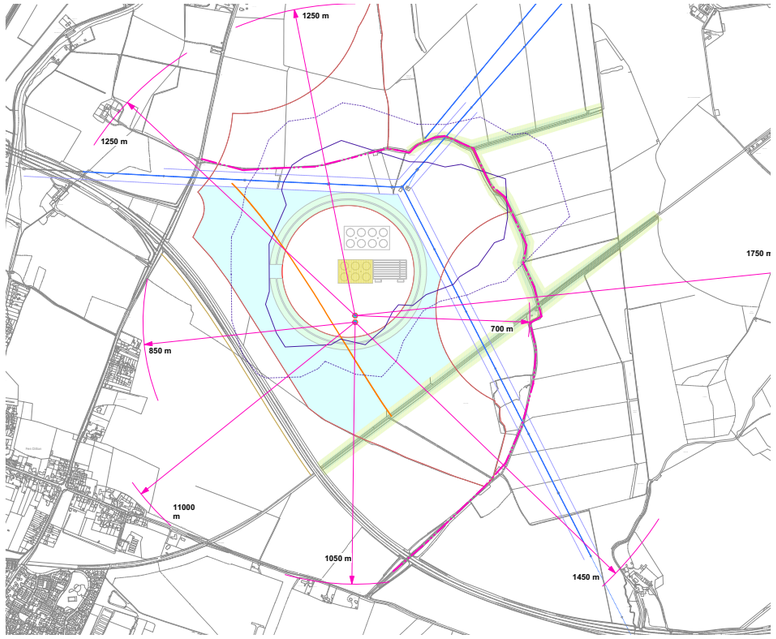
6.6.1 Once the rotunda layout was selected, a process was carried out to locate the rotunda within the existing field patterns. Several options for the centre of the circle were proposed and analysed against key constraints, including:

- The position of the digesters (the tallest structures on the site) with respect to the surrounding settlements.
- The distance from the centre of the rotunda to the surrounding settlements.
- Proximity of the boundary of the earth bank to surrounding settlements.
- Proximity of the line of the secure boundary of the proposed WWTP works to surrounding settlements.
- Availability of sufficient area around the edge of the earth bank to create a landscape buffer to reduce visual impact.

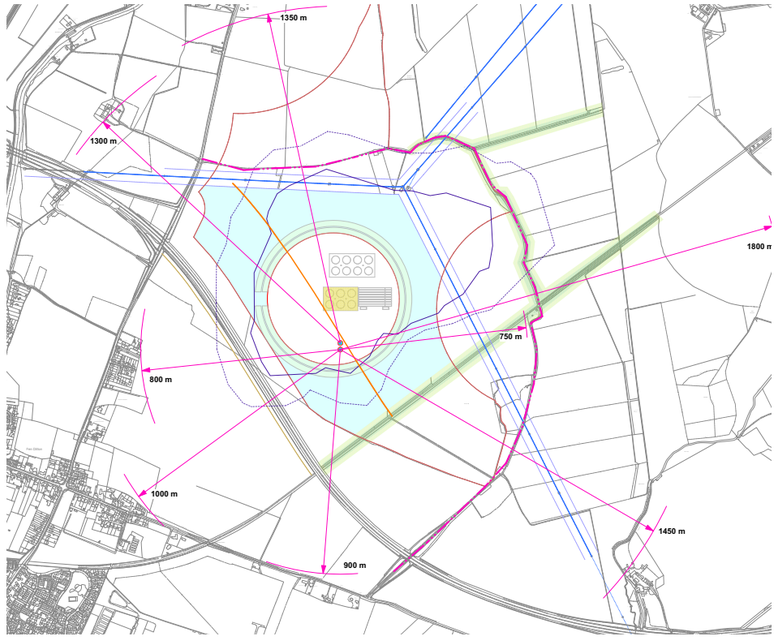
6.6.2 Having studied the constraints of each of the options, the CWWTPRP team agreed that positioning the rotunda as centrally as possible within the site performed best against the key constaints.



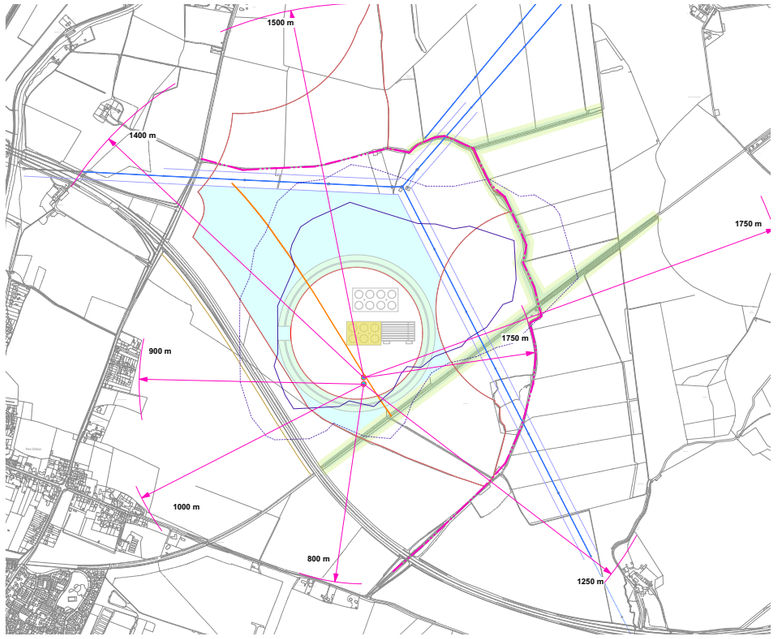
North East



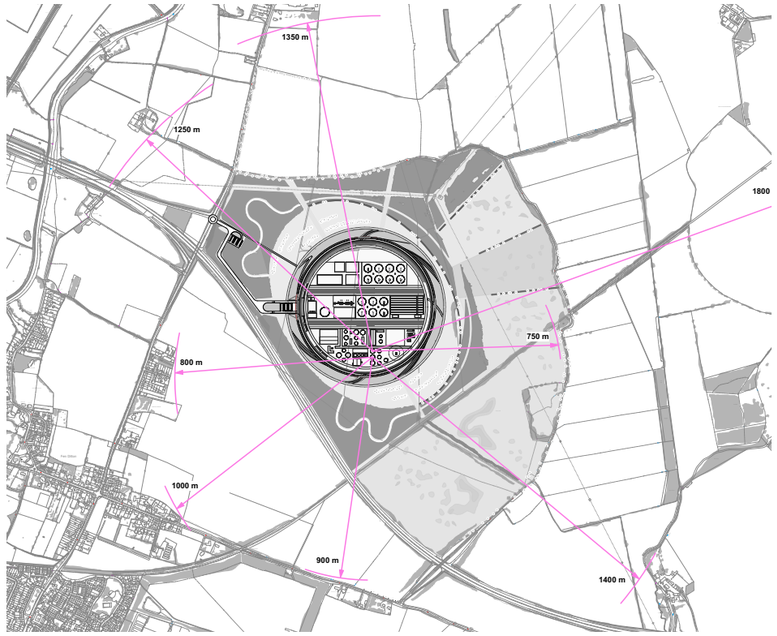
North West



South East

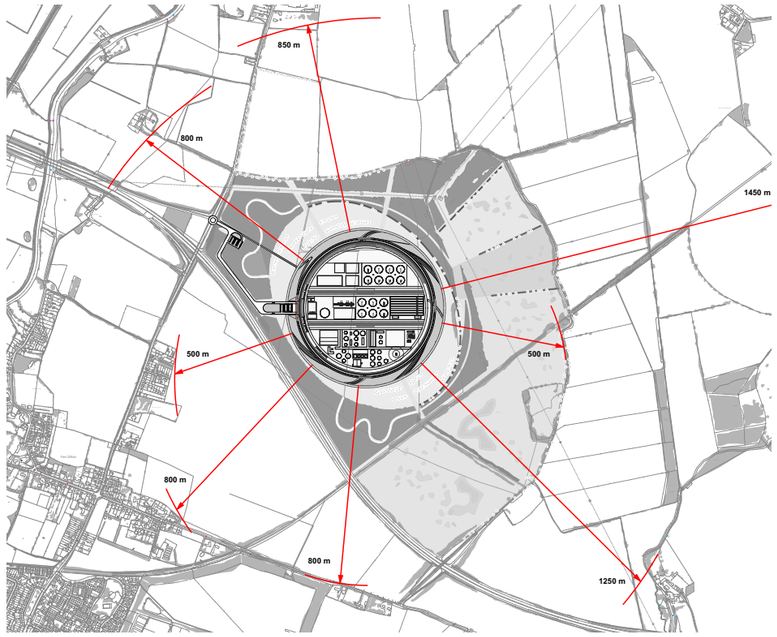


South West

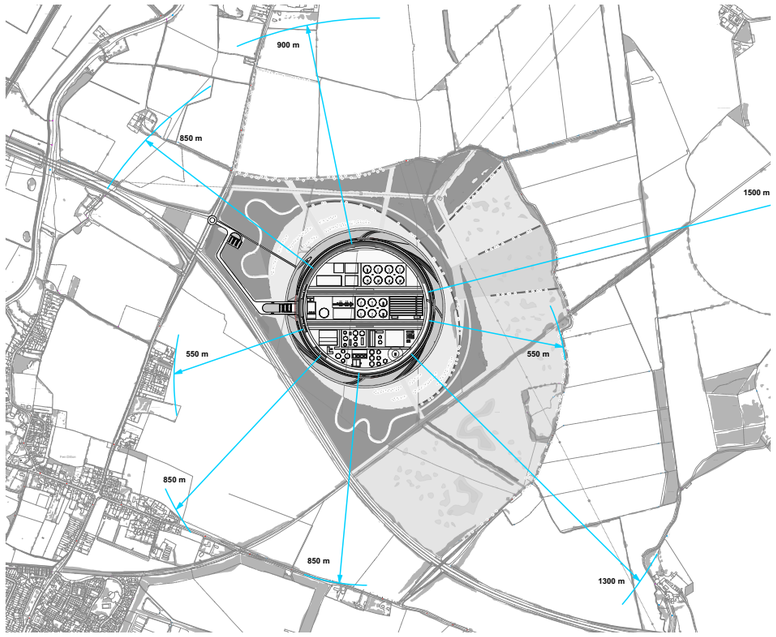


Distances from digesters to settlements

Distances from the centre of the proposed WWTP to settlements



Distances from edge of earth bank to settlements



Distances from the secure boundary to settlements

Diagrams showing analysis of final rotunda location against key micrositing constraints.

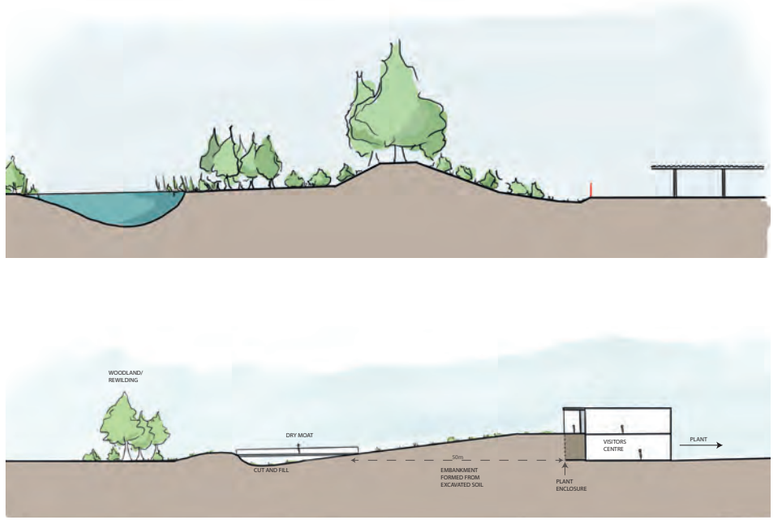
6.7 Earth Bank Sizing and Screening

6.7.1 It was understood from the outset of the project that the tunnelling of new Transfer Tunnel from the existing Cambridge WWTP to the proposed WWTP would generate a volume of spoil from below ground. The intention from the outset was for the spoil to be retained on the site to avoid having to dispose of it off-site. Disposal off-site would result in several detrimental environmental impacts, such as increased traffic disturbance, disposal of waste elsewhere affecting those sites (dust, ecology, water) or filling landfill.

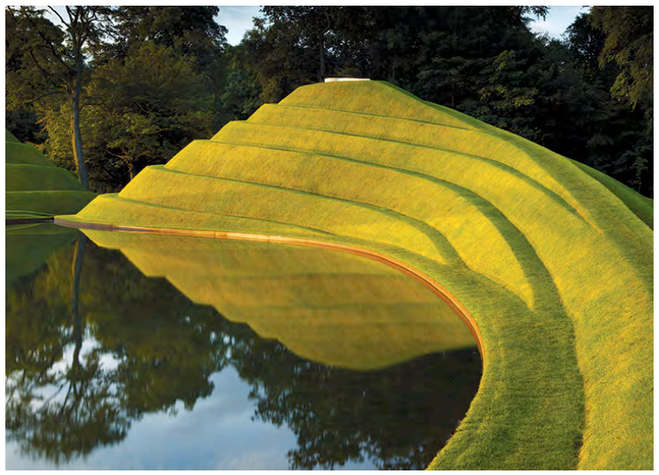
6.7.2 To dispose of the spoil on-site, it could either be distributed evenly across the site area, or clustered together to create a vertical landscape feature for screening the proposed WWTP works from the surroundings. The CWWTPRP team took the decision from the beginning to use the spoil as an earth work feature, and each of the initial layout appraisals for the site utilised this spoil in different ways.

6.7.3 The volume of spoil on the site that could be made available for forming the earth works has been a limiting factor for the scope of the earth bank design throughout. There has always been clear intention that the team would only use spoil available on the site, and would not import spoil from another source. The available amount of spoil is therefore limited to the spoil from creating the new pipelines, and a small amount generated from scraping the existing topography to set a level datum line for the proposed WWTP.

6.7.4 Once the 'rotunda' layout option was selected, several studies were undertaken into the relationship between the new earth bank with buildings, structures and landscape features. This included options for the building being freestanding, integrated into or under the earth, and the buildings being sunken. Options were reviewed against carbon requirements and a decision was made to visually integrate the Gateway Building in a way that it appears to be part of the landscape, but retaining walls would be minimised to reduce carbon and capital cost.



Studies into the relationship between the earth bank and the buildings and structures



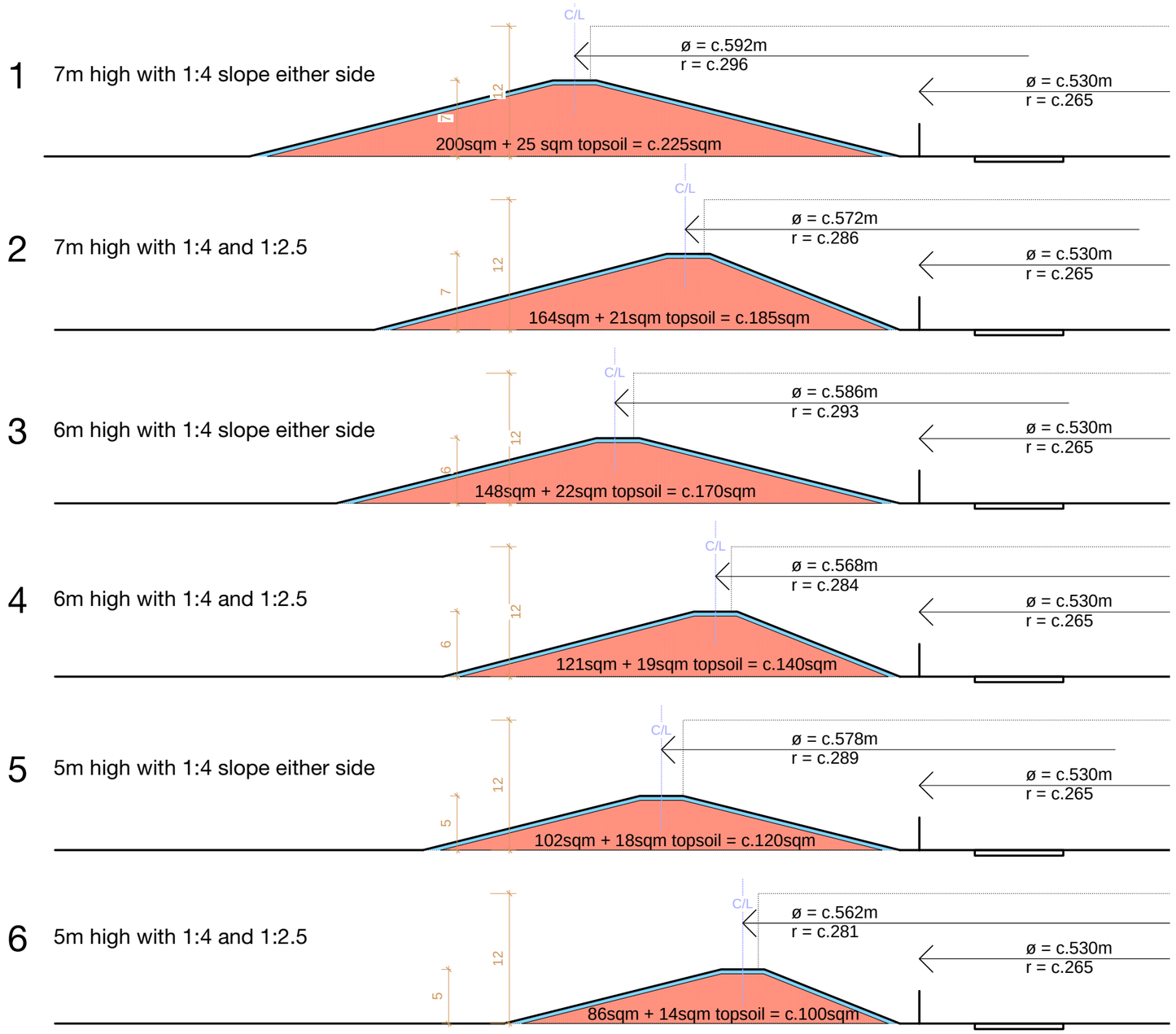
Precedent imagery of earth works and landscape design features looked into at early design stages

6.7.5 Technical studies were carried out to determine the height and gradients of the earth bank, and the amount of spoil that would be needed to create the sectional profile while tying into existing levels on site. This included a range of heights from 5m to 7m, and gradients ranging from 1:2.5 to 1:5.

6.7.6 The gradient of the earth bank as discussed in Chapter 8 was determined by a series of technical parameters, including:

- Amount of topsoil available
- Efficiency of PV panels once laid on the slope
- Maintenance of trees and mowing grassland
- Accessibility of pedestrian paths on the bund

6.7.7 Once the gradients were agreed, the overall height of the earth bank was determined by the amount of spoil available on site, which was calculated at being 5m high. Any height above 5m could only be achieved through importing additional spoil from off-site.



Studies on sectional gradient profiles of the earth bank

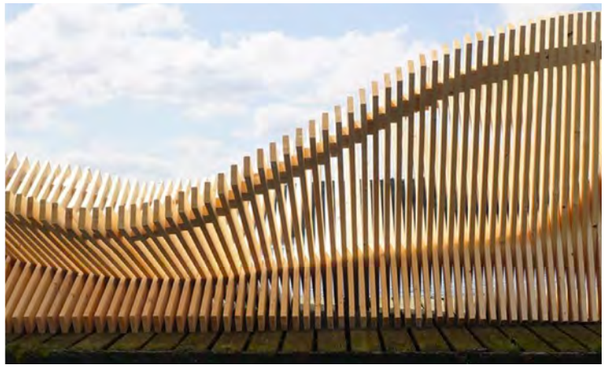
6.7.8 The requirement for an overall screening height of 12m (combining the earth bank and secondary screening) was agreed to be necessary to visually screen all but the tallest structures within the proposed WWTP from the nearby villages. Longitudinal sections were developed and analysed to set this height requirement based on the topography and proposed sizes of the proposed WWTP works, and photomontages were produced to assess the environmental impact.

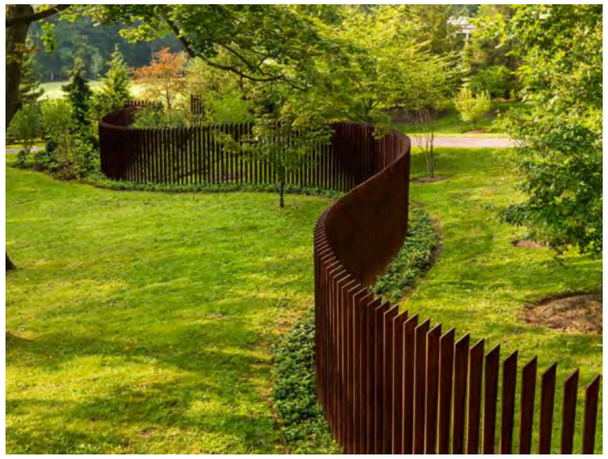
6.7.9 Several options for the additional screening to be used in conjunction with the earth bank were developed and discussed with the CWWTPRP team. Options proposed included an 'engineered' screen, including the use of coloured metal or timber to create a textured or sculptural form, or a 'planted' screen using tree planting for a more natural aesthetic.

6.7.10 Screening options between an 'engineered' or 'planted' screen were put forward at Phase 2 of public consultation, and the options were reviewed from a visual impact and carbon perspective.

6.7.11 The CWWTPRP team agreed to proceed with the proposal for a planted screen. This was the clear preference from public consultation and contains the lowest capital carbon.

Material screening option studies





Precedent imagery of sculptural screening features considered

6.8 Vehicular Access

6.8.1 Following the site selection announcement in January 2021, the initial design stages included the development of preliminary site access options for how the proposed WWTP should be accessed both during construction and once the site becomes operational. This took on board feedback received during the Phase 1 consultation, responses to the site selection announcement and feedback provided by stakeholders. This feedback, along with initial modelling of operational traffic flows, informed the design of a series of permanent access road options for consultation with stakeholders.

6.8.2 An initial long list of site access options were assessed against a variety of economic, environmental, safety and social and strategic factors and through preliminary consultation with the Local Highway Authority (Cambridgeshire County Council) and Highways England. Using the high-level information and evidence gathered in these assessments and consultations, the long list of options was sifted, and views were sought during the second stage of consultation on three options for vehicular access to the site, as follows:

• Option 1: Access off Junction 34 of the A14 (Fen Ditton) - utilising the existing A14 slip road to access the site via Junction 34 of the A14, and off Horningsea Road. Sub-option 1A involved a 'Ghost Island Junction', which included road markings to create an additional lane for traffic waiting to turn right off the B1047 Horningsea Road onto a new road to the proposed WWTP. Sub-option 1B involved reconfiguring the existing junction between the A14 east bound exit slip road and B1047 Horningsea Road into a 4-arm signalised junction also connecting to a new road to the proposed WWTP.

• Option 2: Access off Junction 35 (Quy) - utilising J35 south off the A14 and the existing highway network of Newmarket Road, High Ditch Road and Low Fen Drove Way, and involving works to improve the existing highway network to mitigate the impacts of HGV traffic movements along the proposed routes including improvements to the existing bridge on Low Fen Drove Way as it crosses over the A14.

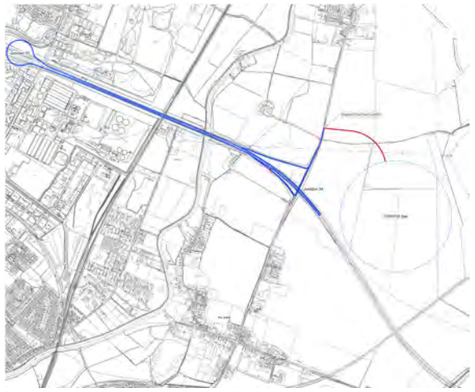
• Option 3: A new junction on the north side of the A14 - involving construction of a new dedicated on/off slip road on the north side of the A14 only, between the current junctions 34 and 35 with a new road connecting to the proposed WWTP.

6.8.3 Using the findings from the traffic assessment and the consultation responses from the local community and other stakeholders, a detailed, wider appraisal assessing the options against 22 different criteria was undertaken. Highway and transport technical advice concluded that there were significant Department of Transport (DfT) policy challenges to the delivery of Option 3, that there were significant technical and cost challenges to the delivery of Option 2 and that Option 1 provided a viable site access option, with acceptable transport impacts, and was the best performing access option across a range of other, non-highways, criteria including land use, green belt, air quality, carbon, operational management, and cost.

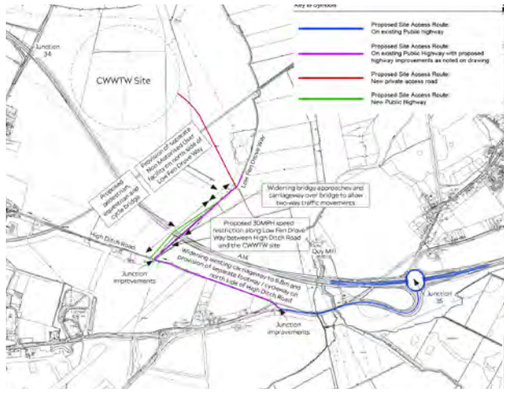
6.8.4 For the reasons set out in the Preliminary Environmental Information Introductory Paper, Option 1 was selected as the preferred permanent access option for the project. Subsequent discussions with the local community working group and further technical analysis, including development of mitigation, concluded that access sub-option 1b should be selected as the preferred option for the permanent access road. This option minimises the amount of construction and operational traffic which will use Horningsea Road, allowing direct access to the site from junction 34 of the A14, by crossing Horningsea Road under signal control, rather than having to travel along Horningsea Road before accessing the site.

6.8.5 By confining vehicle movements to the immediate area around junction 34, segregating cyclists and pedestrians from motorised vehicles via a separate dedicated entrance located at a point approximately 135m north of the vehicle entrance on Horningsea Road, incorporating improvements and mitigation measures to the existing highways network and securing temporary and permanent traffic restrictions as set out in the Traffic and Transport Chapter of the Environmental Statement (Application Document Reference 5.2.19), significant impact on the surrounding road network and local community is avoided.

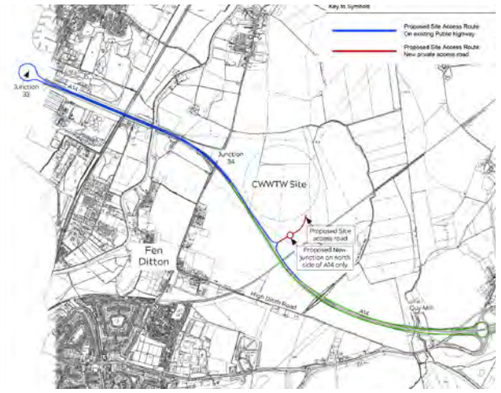
6.8.6 Following the selection of access option 1, the layout described above was checked to ensure conclusions on design layout, including potential impacts on the severance of agricultural land, remained valid. The central location of the rotunda was considered by the project team to be compatible with the preferred access arrangement from Junction 34.



Option 1



Option 2



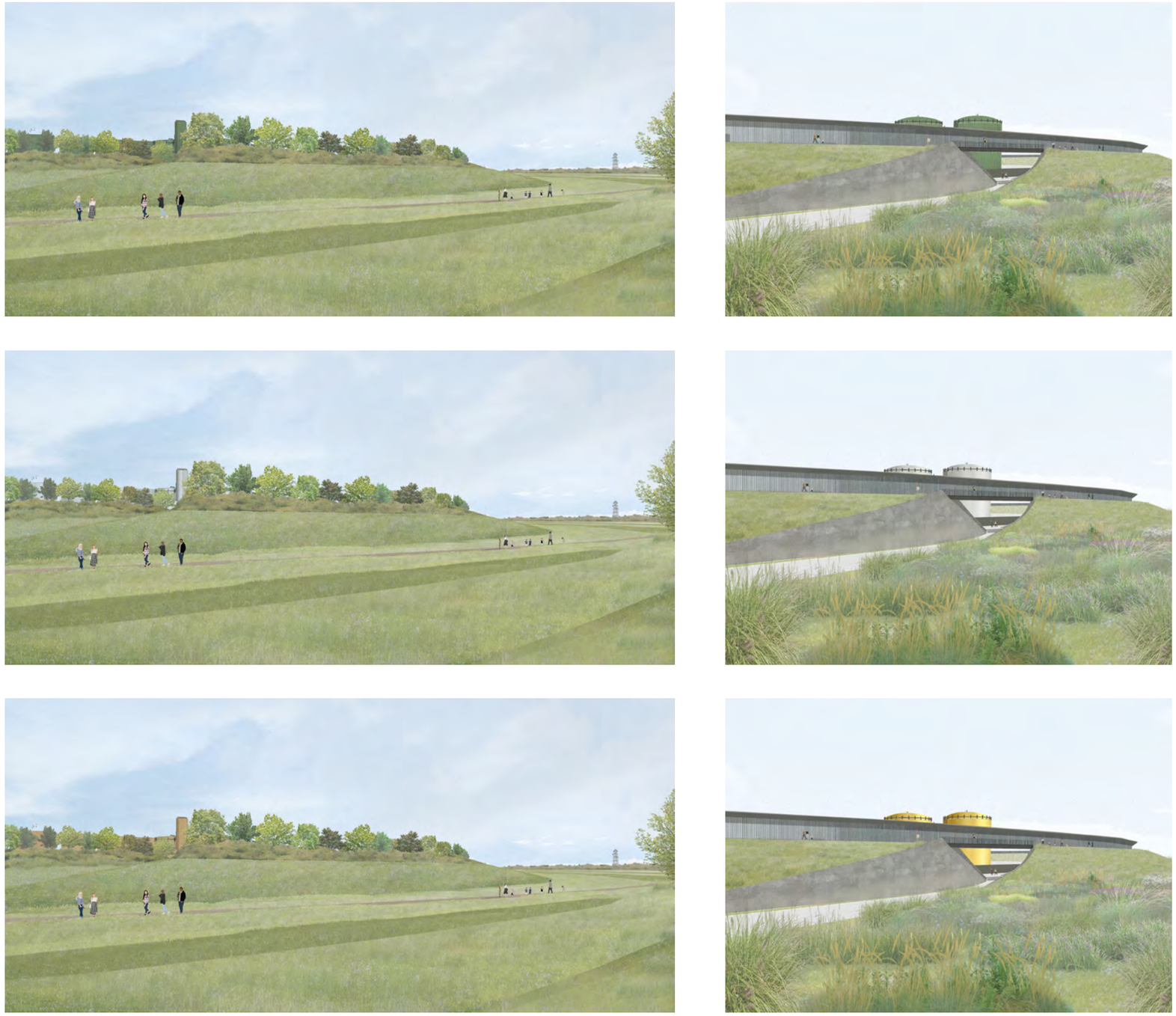
Option 3

6.9 Visibility of Tall Structures

6.9.1 As discussed earlier in this Chapter, the positioning of the digesters, which are the tallest structures within the proposed WWTP, was very important from a visual and micrositing perspective. Once positioned, option studies were undertaken into the visibility of the taller structures.

6.9.2 The Design Team carried out colour and material option studies, to explore whether the taller structures should be brightly coloured to deliver a feature in the landscape, or coloured to blend in with the landscape.

6.9.3 The Design Council offered advice suggesting the taller structures should be bold and brightly coloured, however the CWWTPRP team determined that this approach was not appropriate for the Green Belt setting. It was decided that the structures should be in line with the strategy to blend the structures of the proposed WWTP into the landscape. For more information on the final proposals on the site colour strategy, please see Chapter 7.



Colour option studies for taller plant structures

6.10 Gateway Building as a 'Bridge'

6.10.1 From the outset, the design aspiration for the Gateway Building as part of the 'rotunda' layout was for it to be integrated into the earth bank. Its design is therefore determined by the height and proportion of the earth bank, which has evolved as technical studies into the availability of spoil and screening have progressed.

6.10.2 The building design originated as a bridge, connecting the pedestrian path on top of the earth bank at either side of an opening for vehicular access to the proposed WWTP. At Phases 2 and 3 of public consultation, the earth bank height was assumed at 7m high, which would provide a 2-storey building below the ridge of the earth bank, and a third story on top of the bank containing the Discovery Centre.

6.10.3 Following more analysis of the amount of spoil available on site, the earth bank was reduced to 5m height. Due to a minimum clear opening of 5.5m required for vehicular access, it was found that there would not be enough spoil on site to create the bridging design. The aesthetic of the building being integrated into the earth bank was retained, but the bridge link was removed from the scheme so the building became a peninsula growing from the earth bank.

6.10.4 Throughout the design evolution, Design Team carried out various design explorations to inform the final proposals, including the width of the opening 'slice' through the earth bank to determine how visible the building is, the relationship between the building and the visitors car parking area, and the materiality of the building.

Phase 2 consultation material option studies

Design Council proposals, December 2021

Phase 3 consultation proposals, January 2022

Design development before DCO submission

6.11 Landscape Character

6.11.1 The landscape masterplan has evolved over time through an iterative process influenced by feedback from public consultation and stakeholders; analysis of the site, its context and landscape character; and the integration of inputs from various disciplines as part of the EIA process including ecology, civil and highways engineering, odour, and assessments of impacts on visual amenity.

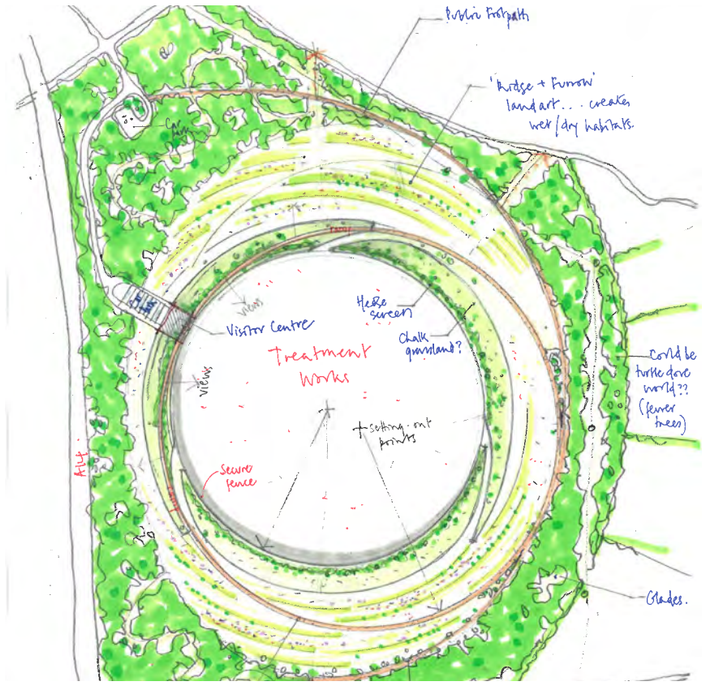
6.11.2 The initial concept in the selected location was a strong response to the key need for 'in the round' screening of the plant. A circular earth bank, set within an oval of biodiverse wildflower grassland, was to be surrounded by defined woodland blocks and radiating arcs of tree bands that echoed the earth work form, like ripples from a drop of water. Rides and woodland paths would provide recreational opportunities as well as carefully directed views. Plant ventilation would be achieved through 'slices' in the earth bank.

6.11.3 Landscape precedents for this (first) concept included the dyke and hillfort landforms present in the fen landscape, as well as woodland blocks local to the context, such as those at Creakhill and Anglesey Abbey.

6.11.4 Feedback from the Cambridgeshire Quality Panel indicated that a more organic and fragmented approach was desirable. An analysis of close and long-range views by landscape architects also showed that an organic screen on the top of the earth bank would help assimilate the landform into the landscape. Visualisations and viewpoints tested during the LVIA process demonstated that screening could be achieved with narrower or less dense woodland planting.

6.11.5 Following this a second iteration was developed that presented a softer approach in all aspects: the earth bank was formed by a series of overlapping arms; the woodland would be less defined at the edges, with more transitional edges and glades of varying density; and a screen of hedge and hedgerow trees would be planted on top of the earth bank. The mitigation planting and its long-term development and monitoring was then considered through the

Landscape masterplan presented at 2nd Public Consultation



A more organic and 'fractured' design approach

Dyke in an open landscape

Ridge and Furrow

'Ripple' concept

Woodland at Wicken Fen

development of the LERMP (Application Document Reference 5.4.8.14). Developing discussions with ecologists were fruitful and the 'ripples' of tree arcs were replaced by radiating undulations, inspired by 'ridge and furrow' landforms, that presented small variations in aspects and habitats.

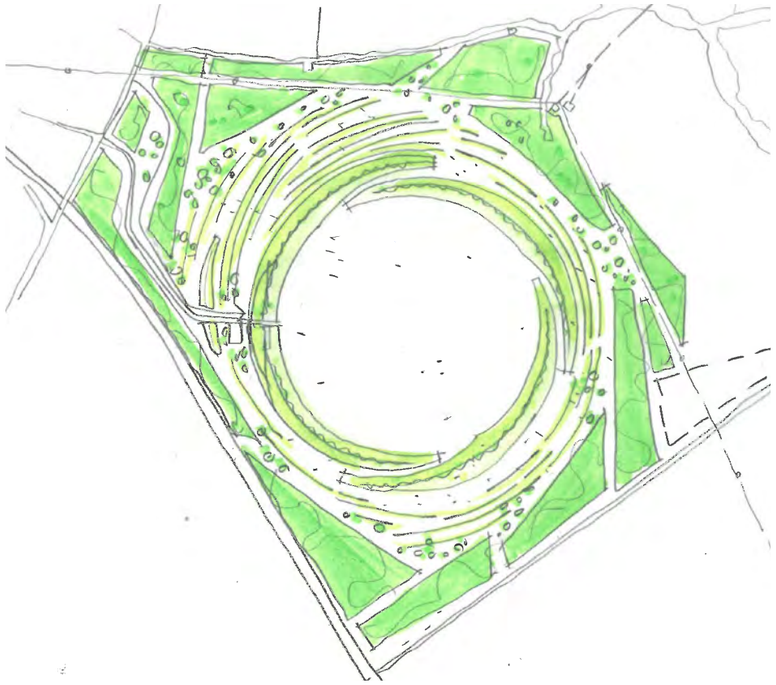
6.11.6 An updated design was presented with these improvements at the third public consultation. Post-consultation, feedback from Greater Cambridge Planning Service (CGPS) included a request for more linear blocks of woodland, characterisic of the local landscape. Thus the woodland was refined again to suit in the final Masterplan. The more angular blocks resulted in some 'farming-friendly' re-shaping of the scheme order limits resulting in slight reductions of the landtake on the eastern edge. The more defined woodland blocks do not diminish the transitional areas of woodland scrub and glade: these are still present in the interior of the blocks with their open margins and varied habitats.

6.11.7 In regards to SuDs and drainage, coordination with engineers resulted in the final design including swales near the entry roads, but also a feature swale at the Visitor Centre with nectar rich planting.

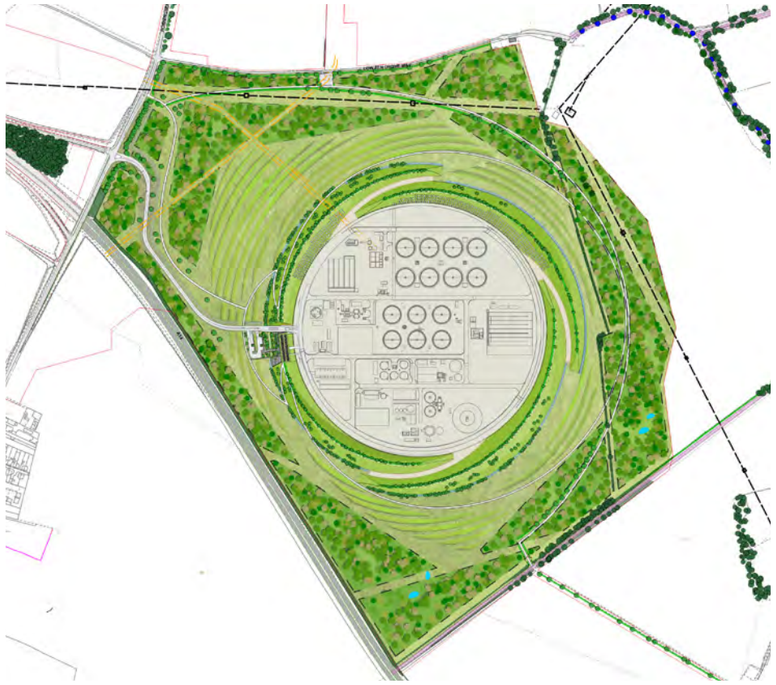
6.11.8 Regarding ecological development, it was clear that the gradients of shade, moisture, aspects and vegetation would provide excellent habitat variety. Seasonal ponds, hibernacula, deadwood piles and bee banks were detailed and the LERMP was coordinated to maintain and monitor these features for success. Finally, a dialogue discussing species mixes was ongoing with the GCPS in the months prior to submission. The design was amended to include large growing poplars at the damper areas at the base of the earth bank, larger supplied species at initial plantings, and a tweak of the tree and native mixes to reduce risk of failures during the uncertainty of climate change.

Landscape masterplan presented at 3rd Public Consultation

Existing tree cover in context



Angular woodland blocks to align with local landscape patterns



Final Masterplan

6.12 Amenity and Access Routes

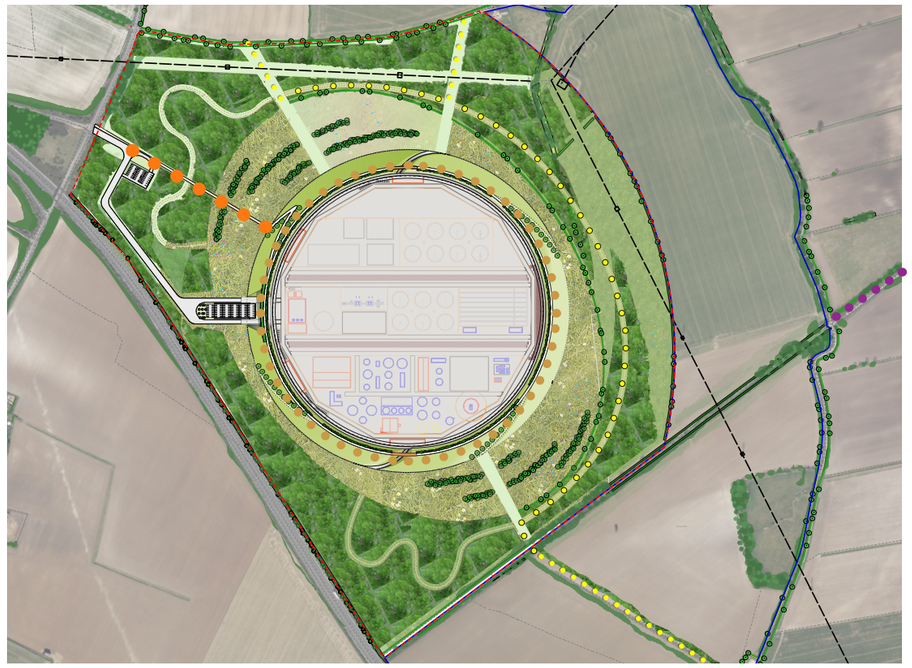
6.12.1 A key objective of the Proposed Development is to expand and create recreational opportunities, employing new routes through the proposed WWTP site, adding a new bridleway, and linking to existing routes that expand the network of PRoW. As the masterplan and LERMP developed, this strategy was integrated into the layout of routes and paths.

6.12.2 A new bridleway to the east of the proposed WWTP was proposed early in the process, linking permissive path Low Fen Drove Way with routes to Stow cum Quy and further east. By the second public consultation, routes included woodland rides, both angular and meandering, and routes that included the opportunity to experience views from the top of the earth bank.

6.12.3 As the masterplan developed, ecologists advised that 'pedestrian and dog-free' areas would benefit the wildlife habitats that were being proposed, and therefore the meandering 'rides' were reduced. It was realised that the calcareous loam grassland was a potential opportunity for learning, and the wildflowers and undulating landform would add to user experience. The circular walks on the earth bank were therefore reduced to the visitor centre, and in lieu, extended in the grassland itself as wide arcs. These in turn linked to the eastern woodland path, reflecting the 'ripples' concept that influences the overall design.

6.12.4 Car parking external to the plant has been reduced and made 'greener' through the masterplan iterations. The final visitors car park is nestled in trees and in landform adjacent to the Gateway Building. Visitor paths are kept neatly distinct from the HGV weighbridges area.

6.12.5 Overall, paths have become better linked and made more legible and user-friendly in the final masterplan, in line with overarching strategy and long term objectives.



Second public consultation: Circular path atop the earth work bank and two external car parks

Final masterplan: 'People- and dog-free' zones for wildlife, linked and accessible paths with varied user experiences, and a single small car park

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7.

Masterplan Proposals

7. Masterplan Proposals

"Infrastructure can play a key role in making a positive contribution to the environment, for example through the provision of natural habitats or connecting corridors for wildlife or encouraging greater use of natural water catchment management to mitigate the impact of flooding" - *National Infrastructure Comission*

7.1 Introduction

7.1.1 The final architectural, engineering and landscape design proposals submitted in the DCO submission, to achieve the Project Objectives set out in Chapter 2, are explained in the next few chapters. All key design decisions have been made in respect of the site context and character established in Chapter 5, as far as reasonably practicable subject to the technical constraints of delivering the proposed WWTP, and are a product of the evolution of design process demonstrated in Chapter 6.

7.1.2 Chapters 7-9 focus on the design proposals for the proposed WWTP and surrounding landscaping on the proposed WWTP site. This Chapter specifically illustrates the key design features of the masterplan proposals at a site-wide scale, in response to the wider site context. Chapter 8 discusses the landscape proposals which are to be delivered through the LERMP. Chapter 9 discusses the engineering works and buildings of the proposed WWTP within the Main Plant Area in more detail. Chapter 10 discusses the proposals for the Connecting Infrastructure. Chapter 11 sets out the Design Objectives which were developed and have been applied to the design process to ensure that the CWWTPRP fulfils the criteria of 'good design' set out in section 3.5 of the NPS, while achieving the Project Objectives. The Design Objectives are a framework of key drivers of the design that have been developed over the course of the design evolution up to the submission of the DCO application. Designs submitted within this application have been informed by these Design Objectives which will also establish a set of principles to be used to guide detailed design after approval of the DCO application. Any further detailed design to be carried out after DCO approval must accord with these Design Objectives, subject to reasonable practicability (for example, as a result of new regulatory requirements, abnormal ground conditions, and change to permitting requirements).

7.1.3 This section provides justification as to why the key components of the scheme are located where they are proposed. It outlines the strategic response as a whole including: the masterplan approach, the layout of the site, the optimisation of the plant layout, the character and materials strategy developed for the site and access and recreational amenity routes.

7.2 A place where water, people and open space come together

7.2.1 The CWWTPRP team, stakeholders and Cambridgeshire Quality Panel consider that the design should be led by the rural context. While some urban influences are present (most notably the A14), the status of the site within Green Belt and the need to reduce impacts on openness in an area of relatively flat topography reinforces the need to minimise intrusive alien elements in the landscape.

7.2.2 An urbanised "statement" architectural design which emphasises those alien elements, including large plant structures such as the digesters, is not considered to be appropriate or desirable in this location. This view has been reinforced during consultation by feedback from a range of stakeholders who expressed a strong preference for a more natural design.

7.2.3 A landscape-led approach has been adopted by the CWWTPRP team, taking inspiration from the past and present rural landscape character. The proposed WWTP is laid out within a circular 'rotunda' configuration, shielded within a sculpted earth bank in the centre of the site. The combination of the earth bank with enhancements to the surrounding landscape serve a variety of functions, including visual screening, recreational opportunities and biodiversity net gain.

7.2.4 The earth bank is a democratic intervention that provides a unified view from 360 degrees around the plant works. This means that no view from the surrounding villages, historical assets, or position in the greenbelt is prioritised or impacted any more than another.

7.2.5 For more information on the landscape approach, please see Chapter 9, and also refer to the LERMP.

Key

Scheme Order Limits

N

0 500 1000 m

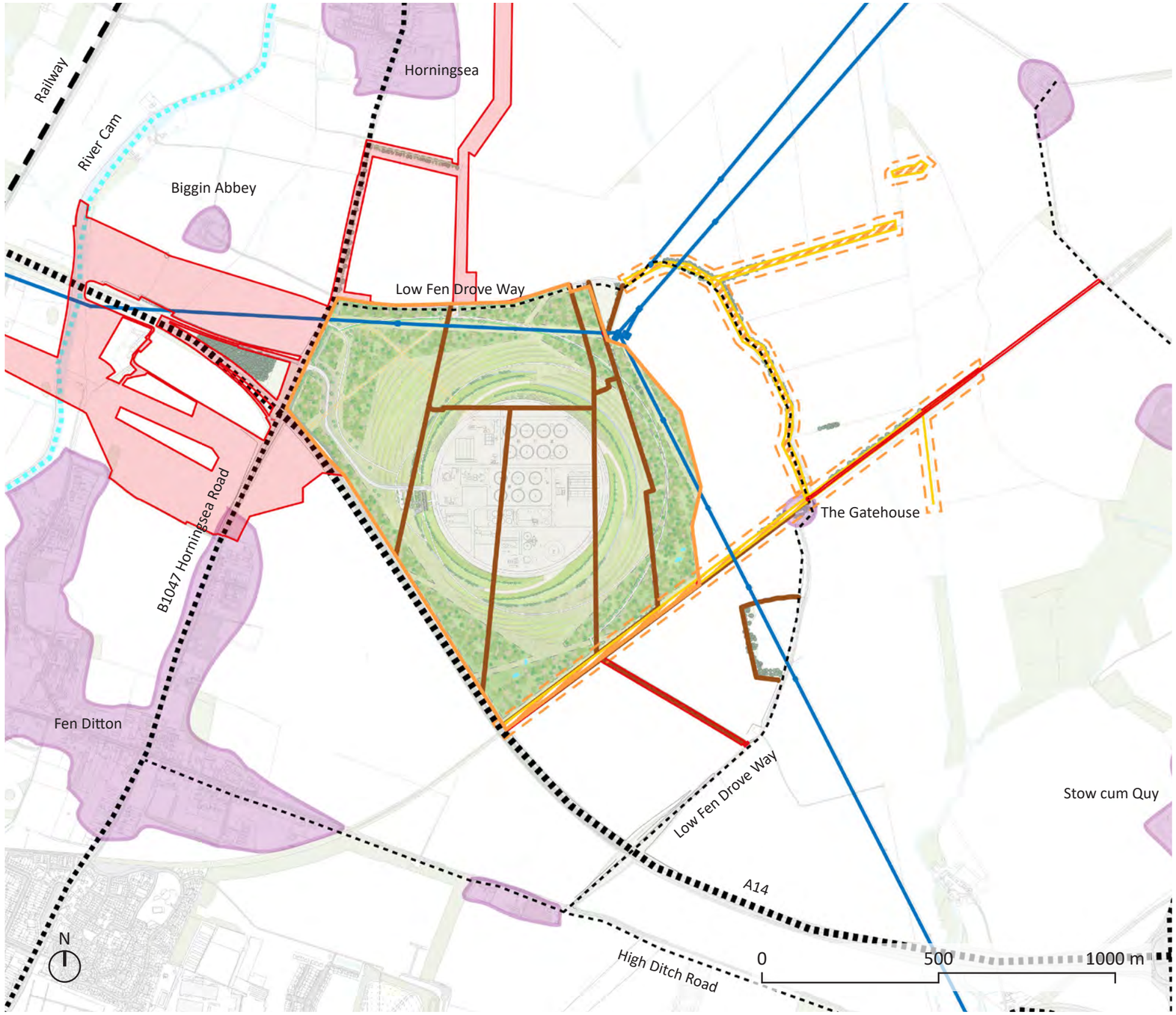
Site Layout

7.3 Site Layout

7.3.1 The proposed WWTP is located relatively centrally within the site, surrounding by a newly formed landscape. This decision was determined following the micrositing exercise undertaken as described in Chapter 6.

7.3.2 The positioning of the plant works on the site was agreed through balancing a variety of factors in response to the existing site context, including:

- Proximity to key sensitive receptions, including Biggin Abbey and the neighbouring conservation areas of Fen Ditton and Horningsea.
- Capitalising on the screening effect of the existing landscape features within the County Wildlife Site.
- Minimising impact on existing wildlife within the landscape.
- Location of protected species.
- Proximity to existing road infrastructure.
- Using the existing topography to assist with the gravity-led water treatment process.



Plant Layout

7.4 Optimised Layout

7.4.1 The layout of the principal components of the proposed WWTP has been carefully considered to balance the constraints of the site context with the operational and engineering objectives to suit the process requirements set out in Chapter 2.

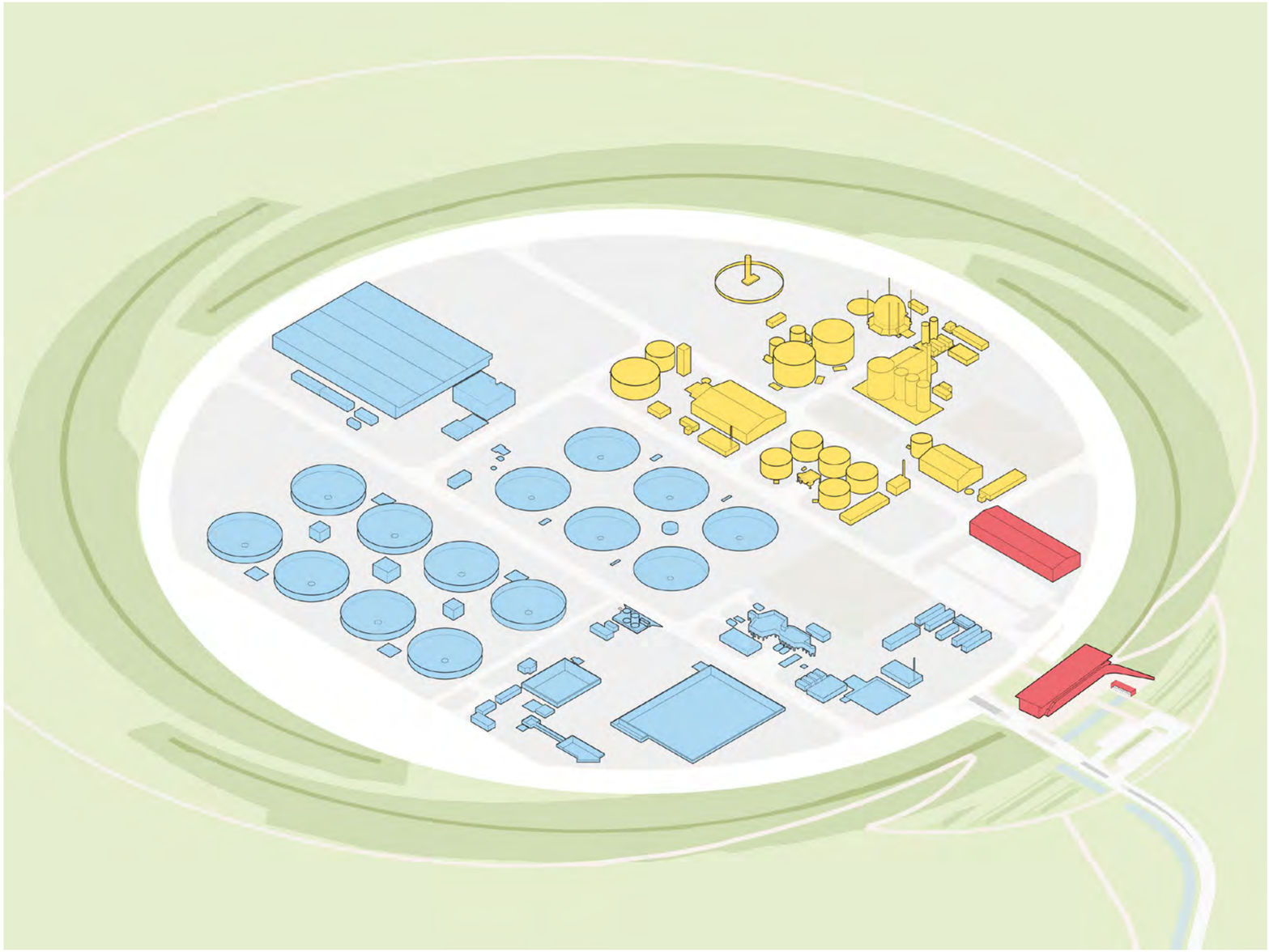
7.4.2 As discussed in Chapter 6, the 'rotunda' design was selected for the site layout based on several factors, including being deemed the most efficient layout for the process requirements and positioning of the Connecting Infrastructure.

7.4.3 Within the 'rotunda', the layout of the proposed WWTP has been optimised from an engineering perspective by efficiently arranging the separate components of the works. The adjacencies and connections of the components have been carefully considered in both plan and section.

7.4.4 The plant processes are separated into 3 distinct zones: the Water Recycling Centre (WRC), the Sludge Treatment Centre (STC) and the Buildings and Ancillary Spaces.

7.4.5 The two principle processing zones, the WRC and the STC, have been positioned relative to one-another and within the wider context based on a number of considerations. These considerations are outlined in greater detail in the subsequent chapters, and broadly include:

- Simplifying connections within and between the two processing zones.
- Odour profiling and heights of structures.
- Visual impact.
- Operational journeys within the plant zones, including vehicular and pedestrian.
- Carbon reduction, including embodied and operational.



Key

- Water Recycling Centre
- Sludge Treatment Centre
- Buildings

7.5 Optimising the Water Recycling Centre

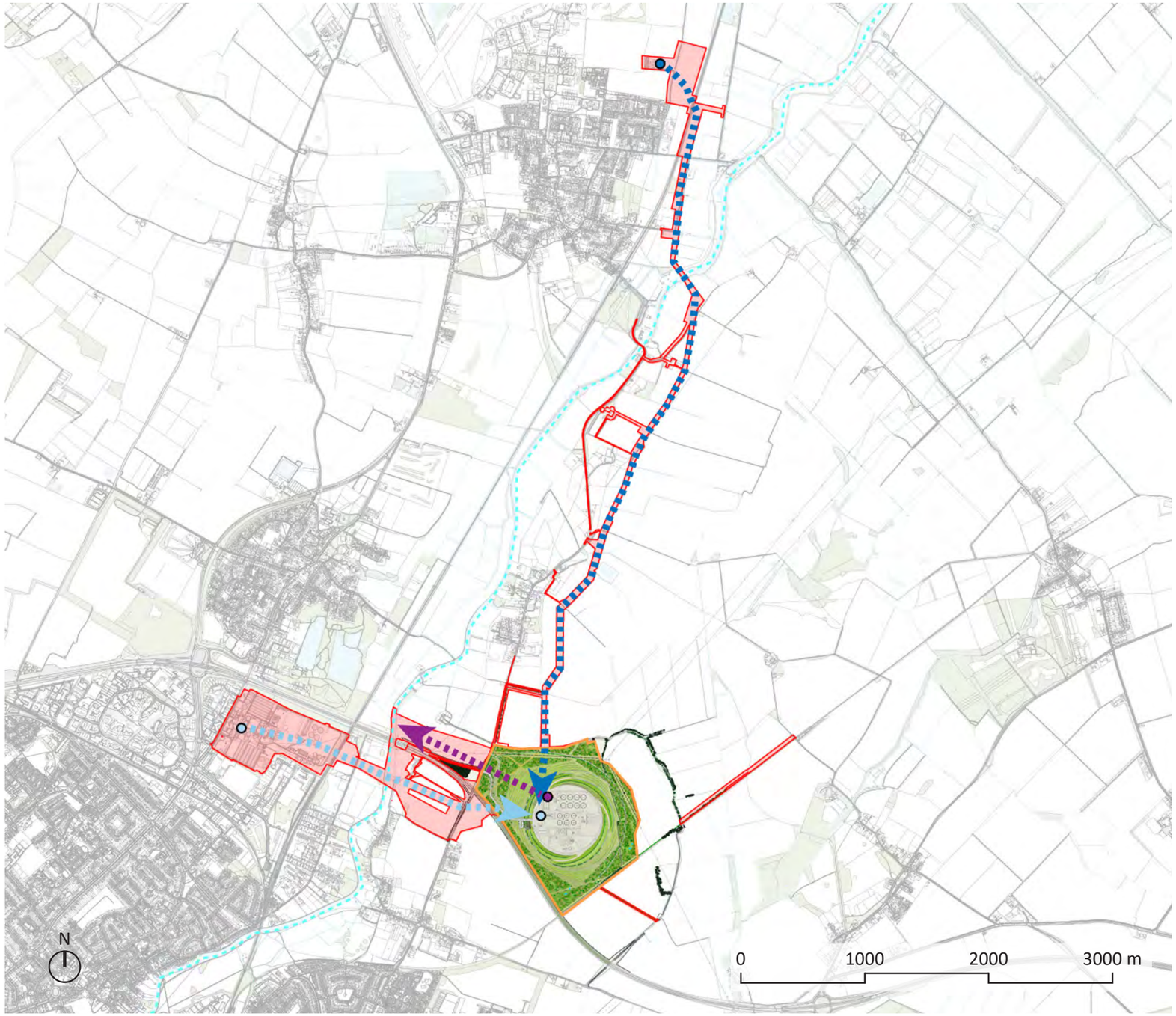
7.5.1 In plan configuration, the WRC has been designed to optimise the incoming and outgoing connection points to the existing networks. This minimises the amount of tunnelling below ground to form new connections, reducing costs and the amount of material used.

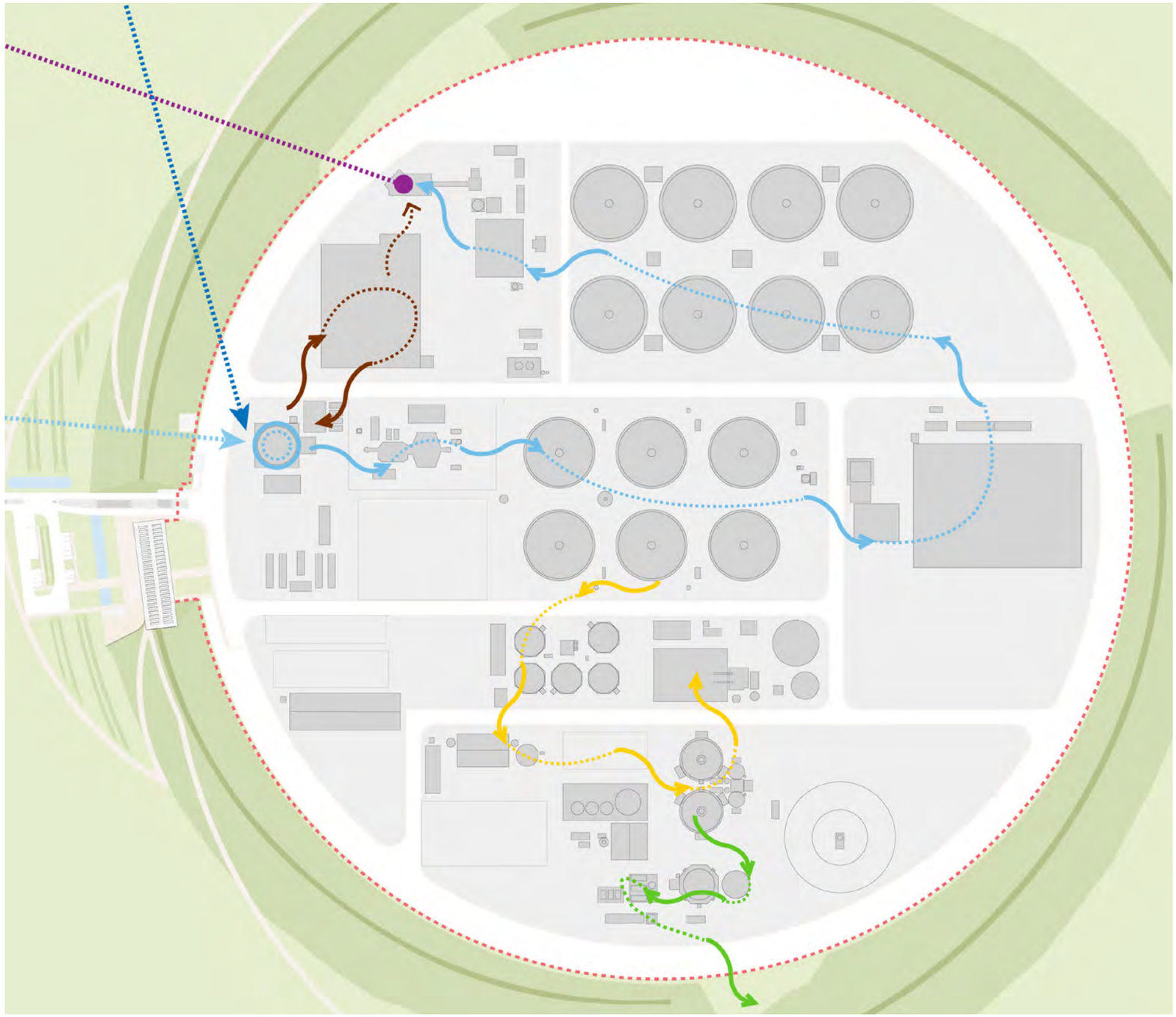
7.5.2 The incoming connection from the Transfer Tunnel is at the Terminal Pumping Station (TPS). This has been located on the west side of the works, as close as possible to the existing Cambridge WWTP.

7.5.3 The Water Discharge Outlet is located in the north-west corner of the works, as close as possible to the river. The water recycling route has therefore been designed in a linear 'there-and-back' arrangement.

7.5.4 The STC has been positioned directly adjacent to the Primary Settlement Tanks to minimise the distance the solids have to travel before the sludge treatment process.

7.5.5 In sectional configuration, each of the stages of the WRC have been positioned vertically to take advantage of gravity. Levels have been designed so material has to be pumped as few times as possible on site. Designing out pumping reduces the risk of faults in the mechanical systems, while minimising maintenance requirements and operational energy usage.





Key

- Transfer Tunnel
- Waterbeach Pipeline
- FE and Storm Pipeline
- Water Recycling Route
- Storm Water Route
- Sludge Treatment Route
- Gas to Grid Route

7.6 Odour

7.6.1 The impact of odour has been fundamental to the positioning of the main processes of the works, and design measures have been taken to minimise the effect of odour on key receptors, including workers and the surrounding villages.

7.6.2 The most significant odour emitters are in the STC. To mitigate their odour impact, the tanks and equipment have either been connected to the biogas collection system for renewable energy generation, or to odour control systems. Other significant odour risk contributors have also been covered and odour controlled. The remaining structures and equipment have been positioned with the more significant odour emitters centrally within the 'rotunda', notably the Primary Settlement Tanks, to maintain as large a distance as possible from surrounding receptors.

7.6.3 It is proposed that the Gateway and Workshhop Buildings will be mechanically ventilated, to ensure healthy working environments are provided to people working and visiting the site when within the buildings.

7.6.4 The diagrams adjacent illustrate the predicted odour contours calculated from the DCO design of the new WWTP, using 2 different metrics for calculation. Please refer to Chapter 18 of the Environmental Statement for more information (Application Document Reference 5.2.18).

Odour contours using conservative basis as per previous consultations

Odour contours using industry standards

Key

- 20 Odour Units
- 10 Odour Units
- 5 Odour Units
- 3 Odour Units
- 1.5 Odour Units

Key

- 0-5m high (below top of earth bank)
- 5-12m high (within planted screen zone)
- 12m+ high (above planted screen zone)

7.7 Heights of Structures

7.7.1 The anticipated heights of the engineering structures within the proposed WWTP 'rotunda' has informed their location on the site, based on the topography and visual impact of the tallest structures.

7.7.2 As discussed in Chapter 6, the digesters within the STC are the tallest, and therefore their location has heavily influenced the layout of the rest of the plant. The key visual receptors in terms of visual impact are the local villages of Horningsea and Fen Ditton, and therefore the digesters have been located almost equidistant between the two, and as far away from and the listed building at Biggin Abbey as possible within the constraints previously discussed.

7.7.3 Due regard has also been given to the positioning, screening and finishes of the other taller elements within the proposed WWTP. The structures have been divided into 3 separate categories based on their height and their relationship between the earth bank and natural planted screening zone, as indicated on the diagram adjacent. The relationship between the heights of structures and the colour and material strategy is discussed later in this chapter.

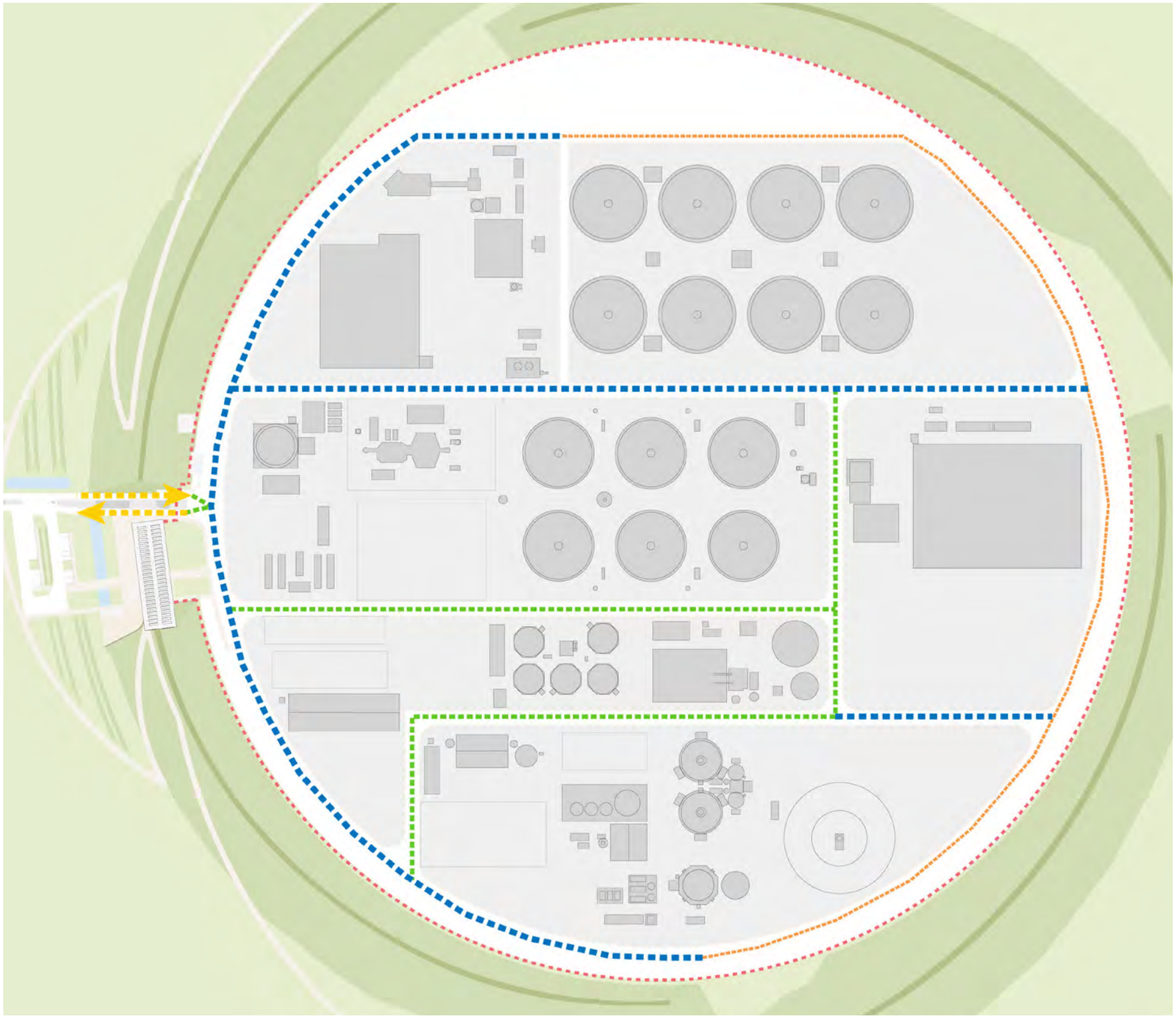
7.8 Operational Journeys

7.8.1 The layout of the proposed WWTP and internal road network within the 'rotunda' has been designed to take account of operational requirements and provide suitable access for operational vehicles including appropriate turning areas for HGV vehicles and hardstanding areas for a properly functioning and safe site.

7.8.2 A perimeter road around the proposed WWTP has been included to provide access to the various areas within the proposed WWTP for operational and emergency access. Other internal roads have been included to provide vehicular access to particular areas of the plant for operational activities including the following:

DELIVERIES	
Item	**Location**
Tankered cess waste from surrounding areas	Cess reception facility near the Inlet Works
Chemicals for dosing (ferric/ polymer)	Storage and dosing installations for: • primary and tertiary treatment stages • STC (liquor treatment plant, sludge thickening and dewatering)
Imported liquid sludge	STC – sludge screens feed tanks
Fuel	Storage tank for standby generators
Liquefied Natural Gas (LNG)	Vehicle parking area
Spares and consumables	Workshop
COLLECTION	
Item	**Location**
Screenings and grit	Inlet Works
Sludge cake	Sludge cake storage barn

7.8.3 Journeys by vehicles within the site have been optimised by:
- Locating the staff and HGV/LGV parking areas close to the main site entrance;
- Providing a separate parking area for visitors external to the proposed WWTP 'rotunda';
- Providing a separate entrance for pedestrians and cyclists located slightly to the north of the vehicle entrance to protect pedestrians and visitors from HGV movements;
- Locating the weighbridge at the main entrance to the proposed WWTP;
- Arranging the internal road network to minimise the distance travelled by operational vehicles involved in deliveries or collections;
- Providing layby areas for HGV/LGV vehicles adjacent to plant requiring regular deliveries or collections;
- Locating plant requiring regular deliveries or collections in the central area of the proposed WWTP and near the main site entrance where practicable;
- Including a system of one-way roads within the WWTP site, as shown in the adjacent diagram, arranged to minimise the risk of potential vehicle conflicts from HGV vehicles involved in deliveries or collections.



Key

- Entrance / Exit
- 2-Way Road
- 1-Way Road
- Secure Boundary
- 1 Way Road (Light traffic only)

7.9 Buildings, Workers and Visitors

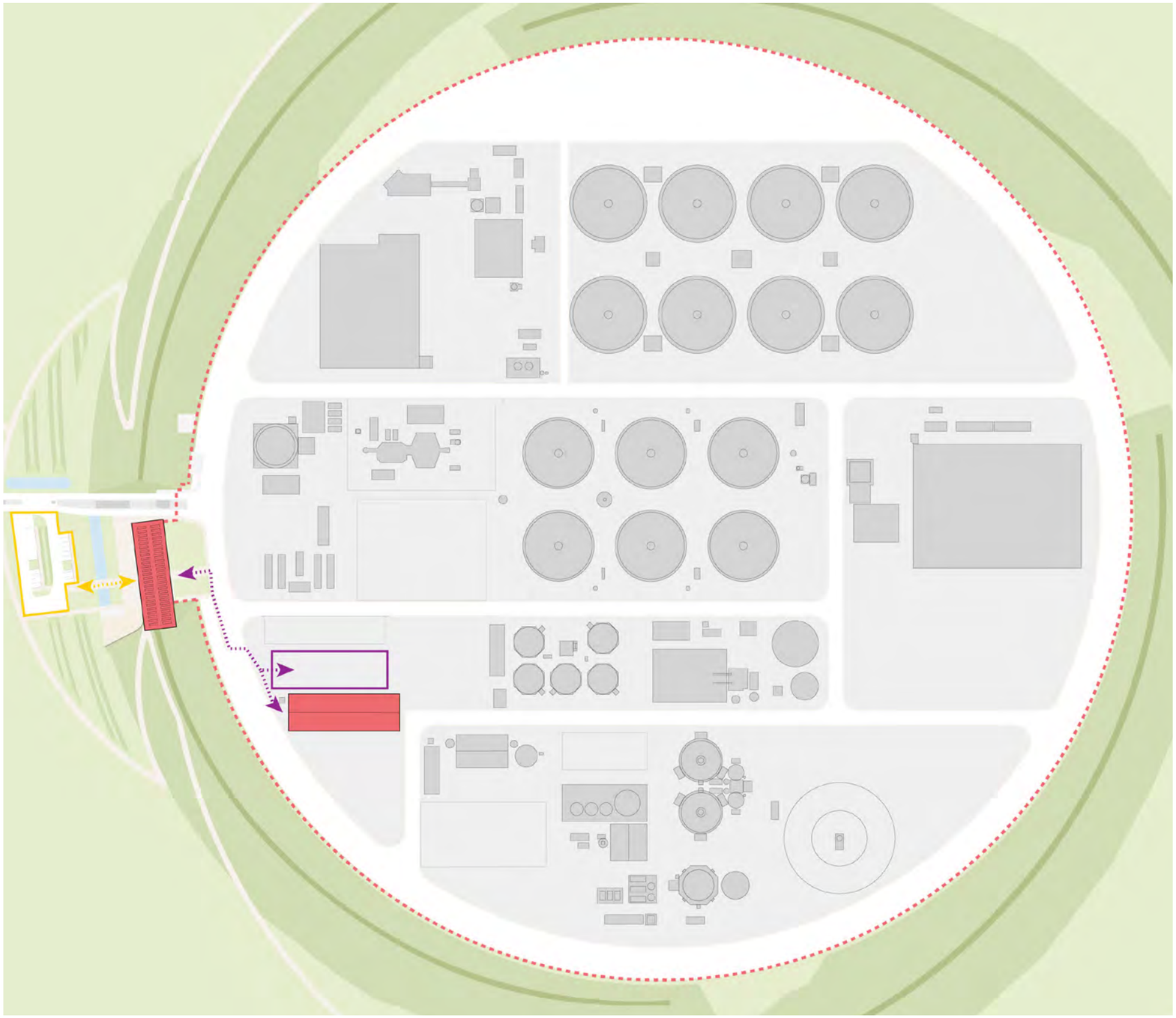
7.9.1 The buildings and associated car and cycle parking on site have been located with the convenience of workers and visitors in mind.

7.9.2 The Gateway Building provides the main arrival point for workers and visitors, located at the convergence of the primary access road, the pedestrian and cycle route, the earth bank and the plant works. It provides access to the controlled areas of the landscape, including onto the earth bank and into the secure works site, and provides passive surveillance of the whole works from the offices within.

7.9.3 The visitors parking is located in a landscape setting outside the earth bank. This keeps visitors away from any potential hazards of the operational WWTP, including keeping visiting groups of people away from large operational vehicles and sensitive equipment, and maintains security of the site.

7.9.4 The workshop building is located within the 'rotunda' but as close as possible to the Gateway Building, to simplify workers travel distances without impacting the process flows from the TPS.

7.9.5 The workers car park is located between the two buildings, to minimise walking distances for workers. It is within the 'rotunda' to reduce visual impact on landscape. It is assumed staff are more familiar with the potential operational hazards of the site.



Site Character and Materials

7.10 Site Character Context

7.10.1 The character and materials of all new build elements of the development are to adhere to an architectural design strategy which has been developed in line with the Project Objectives set out in Chapter 2.

7.10.2 The strategy has been developed following an iterative process to balance design aspiration and consultation feedback, as outlined in Chapter 6. It reflects the desire to pursue a 'natural' palette of materials in keeping with the landscape-led approach to design.

7.10.3 The design seeks to deliver a visually coherent and legible palette of materials across the engineering structures, buildings and landscape to establish a formal identity for the CWWTPRP while remaining sensitive to it's location in the green belt. The strategy is applicable in 3 distinct categories:

- All engineering and ancillary structures within the secure boundary of the 'rotunda' will be subject to a colour strategy dependent on the heights of the structures, as to blend in with either the groundscape at low level or the sky at high level, as detailed in this chapter and discussed further in Chapter 9.
- The landscape will be designed to a coherent palette, as detailed in Chapter 8.
- The Gateway Building will pursue a materials strategy to achieve it's concept as a structure set within the landscape design, as detailed in Chapter 9.

7.11 Site Colour Context

7.11.1 In pursual of a 'natural' colour scheme that is reflective of the local landscape context, photographic colour studies have been undertaken to understand the colours in the landscape from various viewpoints around the site. Studies have accounted for different weather conditions and different seasons to understand the range of colours in the landscape, as illustrated opposite.

7.12 Site Colour Strategy Within The ‘rotunda’

7.12.1 In order to blend in with the surrounding landscape, the strategy to be applied to the structures within the ‘rotunda’ has been developed so that low-level structures will be treated to blend in with the groundscape, adopting greens and browns of the surrounding field patterns. Taller structures will be coloured to blend in with the sky, which is acknowledged to be more difficult because the sky varies more frequently between hues of blues and greys.

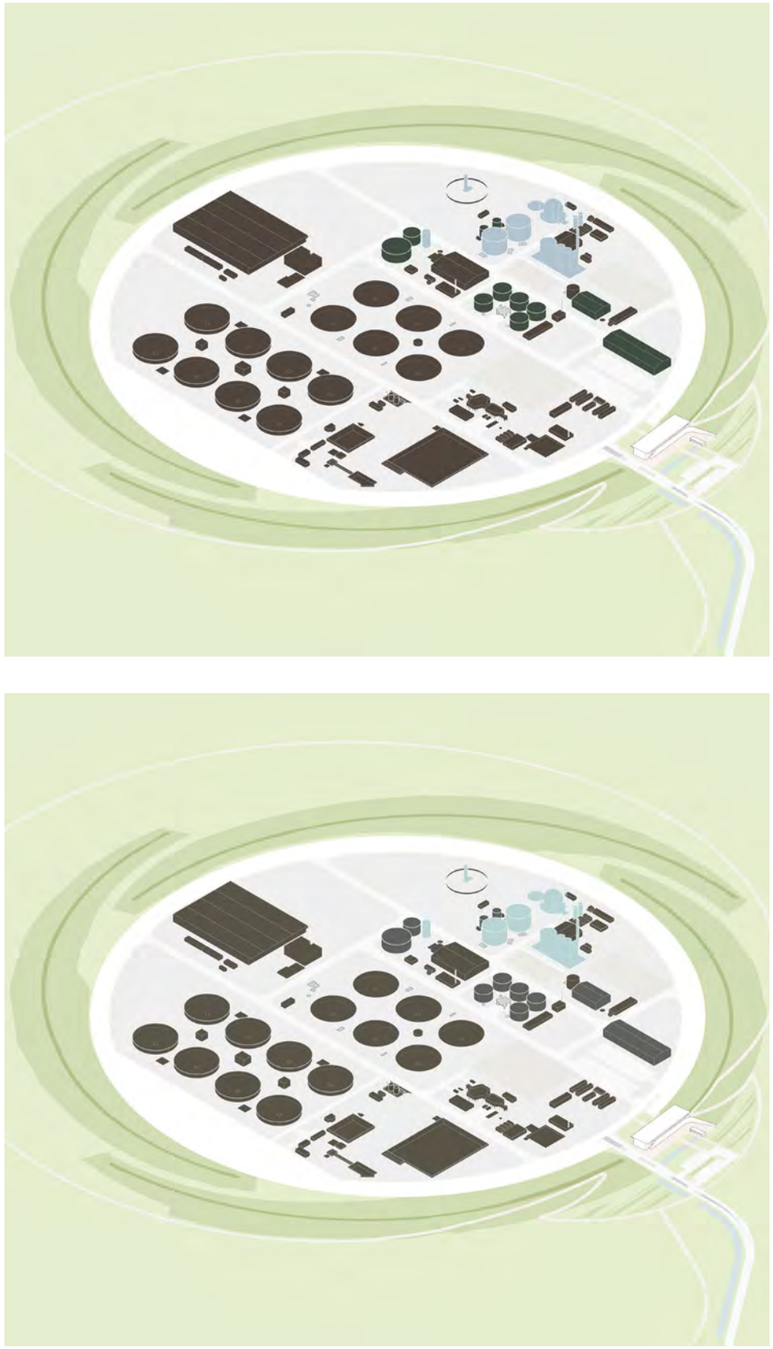
7.12.2 Low-level structures are to be defined as those lower than the anticipated height of the natural screening zone, which will set the ‘groundscape’ datum line in the landscape (<12m high). Taller structures are to be defined as those higher than the anticipated height of the natural screening zone (12m+), which will stand above this datum line.

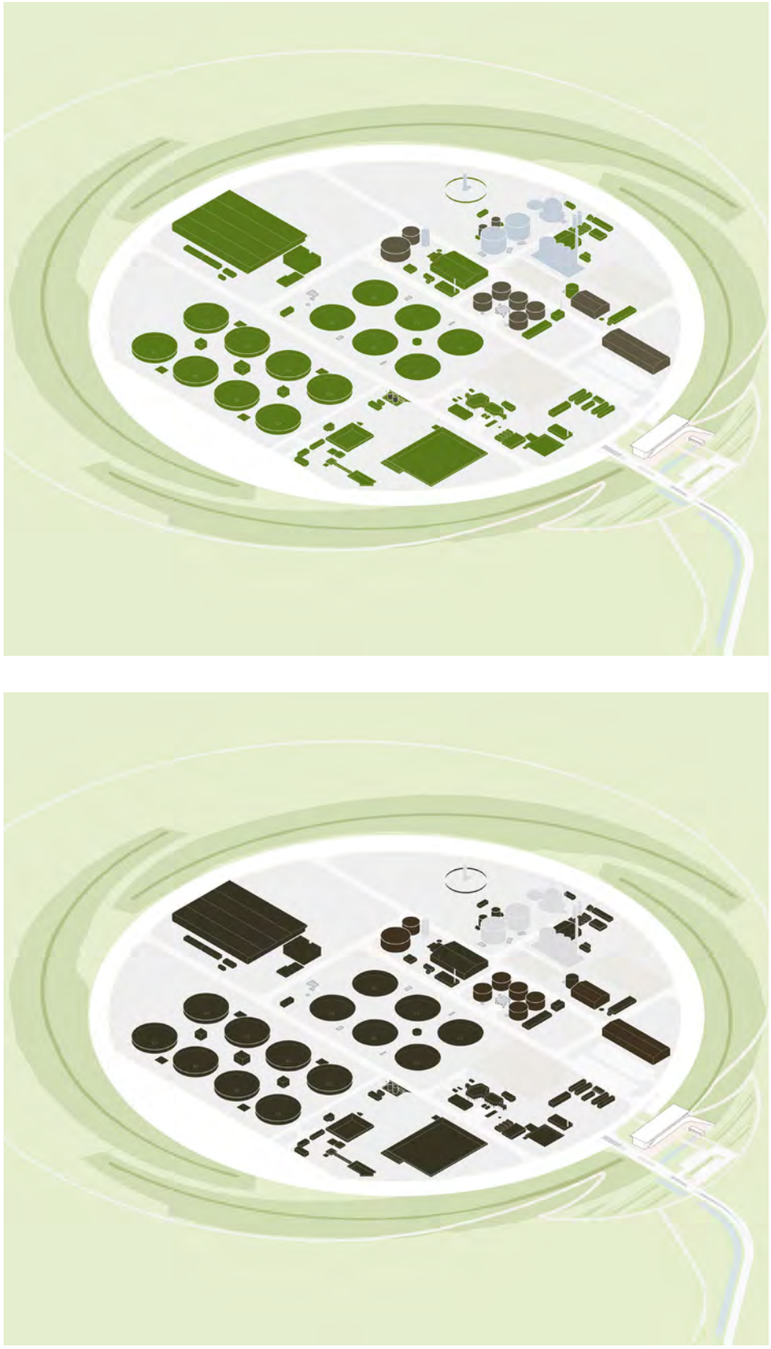
7.12.3 Based on the outputs of the photographic colour study, several colour options were developed combining different tonal shades for the structures. These were overlaid in photomontages, and examined from a visual impact perspective.

7.12.4 The CWWTPRP team agreed that a ‘winter’ colour-palette should be applied, because during winter months the natural screening is likely to be more sparse and therefore the structures will be more visible in the groundscape.

7.12.5 The final specific colour palette will be determined at detailed design stage, within the constraints of the availability and cost of materials while adhering to the overall strategy of visual coherence.

7.12.6 It is intended that colour-picked RBG values from photography will be translated into construction-industry norms, such as RAL colours.





Key

R66 | G77 | B68

R95 | G98 | B95

R219 | G220 | B221

Gateway Building

7.13 Detailed Materials Strategy Within The 'Rotunda'

7.13.1 The site colour strategy will be applied as far as is reasonably practicable, however it is understood that in some cases there are no or limited options for the materials to be used for some engineering structures, as stipulated in section 3.5.3 of the NPS for waste water.

7.13.2 The adjacent diagram illustrates the structures where it is anticipated the colour scheme for finishes can be applied. This excludes the large concrete structures, but typically includes all other structures, such as those finished in metal and plastic.

7.13.3 For the large concrete structures, it is anticipated that the coloured pigmentation of the concrete structures is beyond the commercial viability of the scheme. The fact that these are low-level structures also means that they will be screened by the earth bank, and therefore the concrete colour will not affect visual impact from outside the 'rotunda'.

7.13.4 The visual coherence of the finishes strategy goes beyond simply colour. At detailed design stage, further studies will be carried out to determine the textures of materials, including whether surfaces will be shiny or matt, and smooth or textured.

7.13.5 It is acknowledged that the colour, texture and material of the structures should be selected to take into account views from varying distances. This includes both distant views for people outside the earth bank, and close up views for workers within.

7.13.6 The detail of the finishes may be broken down further and accent colours may be used to define distinct areas within the plant to assist with wayfinding for operational workers, permitting they do not create a negative visual impact from the public domain.

7.13.7 Please see Chapter 9 for further details on how the materiality and finishes strategy has been applied to individual structures and buildings of the proposed WWTP.

Key

- Concrete Structures
- Coloured Structures
- Gateway Building

Access and Recreational Amenity

7.14 Access and Recreational Amenity

7.14.1 The design principle of connectivity has directly informed the access strategy for the CWWTPRP, including locating new access points and improving connectivity between existing routes. This includes considering routes used to directly serve the proposed WWTP, and the amenity routes that go through and around the surrounding landscape.

7.14.2 Various means of transportation have been considered when developing the design, including pedestrians, cyclists, equestrians and motorised vehicles: cars, vans, HGVs and service vehicles.

7.14.3 The new primary access road to the proposed WWTP for vehicles will be off Horningsea road, directly opposite Junction 34 exit of the A14. This was selected to simplify traffic movements to the site by accessing directly off main roads, and to minimise traffic disruption to the local road network. Upgrades to the pavements and cycle lanes are proposed to make the surrounding road network more pedestrian and cycle friendly for visitors and workers.

7.14.4 A separate entrance for pedestrians and cyclists is located slightly to the north of the vehicle entrance, to protect pedestrians and visitors from large HGV movements. This was selected as it was anticipated that this is where most users would approach the site from.

7.14.5 The permanent access junction is designed to segregate vehicles (delivery vehicles, private cars, and HGVs) from pedestrians and cyclists. The site access adds an additional arm to the existing signalised junction on Horningsea Road with the A14 off slip. Vehicles will enter the proposed WWTP directly from the A14 slip road, straight across the junction and into the proposed WWTP. Improvements to the eastern side of the B1047 Horningsea Road comprise the crossing island, the shared pedestrian/cycling access to the proposed WWTP and short section of shared pedestrian / cycleway to Low Fen Drove Way. On the western side of B1047 Horningsea Road the shared pedestrian/cycling will be widened and offset from the carriageway edge by a 1m wide grass verge to improve safety. This will extend over the A14 bridge and link to improved crossings at the top of the two A14 slipways. It is proposed to impose a speed reduction from 60 to 40 mph on Horningsea Road.

7.14.6 The proposed WWTP permanent access road from the public highway, visitor car park and paths will be integrated into the landscape through the use of surface materials appropriate to their landscape setting. The entrance to the proposed WWTP will be via the Gateway Building. This will provide the interface between the newly created landscape and the functional areas of the proposed WWTP. It will be a welcoming arrival point for visitors to the Discovery Centre and people working at the proposed WWTP.

7.14.7 Recreational connectivity is central to the design; Cambridgeshire has one of the lowest levels of natural green space available for public access in the UK. Two new connections to the existing PRoW are proposed. A new bridleway from Low Fen Drove Way to existing network of PRoW in the north-east and a permissive path from the proposed WWTP to Low Fen Drove Way. The project's paths will be connected to the wider network of PRoW, and a new bridleway will improve access to Quy Fen and Anglesey Abbey.

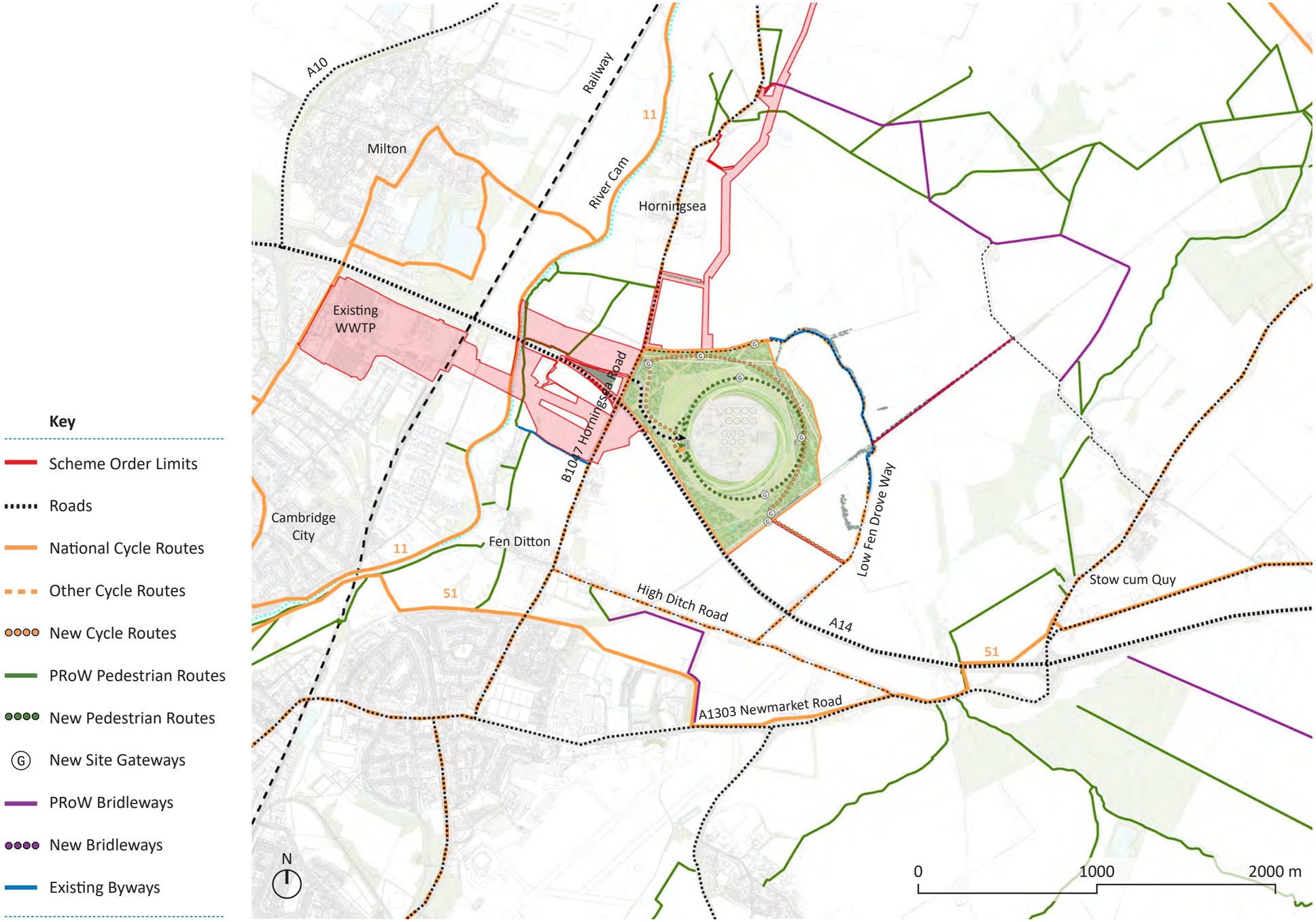
7.14.8 The new walking routes have been developed following stakeholder feedback including through technical working groups. During engagement, stakeholders highlighted a gap in the network to the north-east of the proposed WWTP location and the lack of connectivity between Low Fen Drove Way and Anglesey Abbey. Stakeholders also supported proposals for improving connectivity through the creation of the shorter circular walking routes.

7.14.9 The proposed new pedestrian route creates a walking loop between Horningsea and communities to the east. A new circular route of approximately 9.3km will be created from Horningsea, which connects into the existing PRoW network. A shorter circular walk of approximately 4.5km is also created through using the proposed path internal to the Proposed Development and Low Fen Drove Way. These connections provide additional recreational routes for nearby communities, better connect Horningsea to Stow-cum-Quy and promote outdoor physical activity, for local people and those visiting the area. For those walkers visiting the area by car, parking provision will not be provided by the Gateway Building. An area of hardstanding adjacent to and south of Low Fen Drove Way would be retained to allow a limited amount of informal parking, as has historically been the case.

7.14.10 The Proposed Development provides a new option for leisure cyclists to travel from the cycleway on Horningsea Road (part of the proposed Horningsea Greenway), through the landscape area and on to Low Fen Drove Way. From here, existing routes to access High Ditch Road can be used to travel south. The proposed new bridleway also provides connectivity for cyclists from Low Fen Drove Way to the existing network of PRoW to the north-east. This enhances the existing connections to areas such as Stow-cum-Quy and Anglesey Abbey.

7.14.11 A new bridleway from Low Fen Drove Way to the existing network of PRoW in the north-east provides connection for horse riders to travel to eastern routes and access areas such as Anglesey Abbey and Stow-cum-Quy. There is also the potential to travel to the B1047 Horningsea Road via Low Fen Drove Way. It is hoped that the proposed reduced speed limit on the B1047 Horningsea Road may increase the likelihood of horse riders using this route.

7.14.12 The UK is facing both a biodiversity crisis and an urgent need for green open space for public enjoyment and well-being. The design responds to this by providing places for both people and nature. Areas proposed for habitats sensitive to disturbance will not be available for open access by people whilst other areas will be open for all to enjoy. This amenity space will provide a recreational resource for the local community. The circular earth bank, which will enclose the proposed WWTP, is not a passive landscape feature. Access onto part of the earth bank via the paths provided will allow visitors to experience the surrounding sculpted features and wider landscape and to gain from the educational experience of views into an operational works from above. This use of the bank will be guided



Key

- Scheme Order Limits
- Roads
- National Cycle Routes
- Other Cycle Routes
- New Cycle Routes
- PRoW Pedestrian Routes
- New Pedestrian Routes
- New Site Gateways
- PRoW Bridleways
- New Bridleways
- Existing Byways

by interpretative material and appropriate signage.

7.14.13 The recreational facilities are designed to be inclusive and accessible for all. Visitor parking for the Discovery Centre will have 5% blue badge parking numbers in line with inclusive design standards. Any changes in level from the parking to the paths will provide accessible ramps. Signage, such as maps, fingerposts, trailheads will be legible by containing simple font types and font sizes large enough to be read by people who are visually impaired. Where appropriate, braille characters will be incorporated, particularly into key information signs.

7.14.14 Interpretation boards will include engaging content on the character and history of the local landscape and communities such as explaining the history of the Horningsea/Fen Ditton public byway and the history of the former railway.

7.14.15 Recreational paths will be designed in accordance with inclusive design standards, and be a minimum of 3.5 metres wide for shared use spaces. If this is not possible on certain links, it will be signed. Recreational paths will be paved with material which is firm stable and slip resistant.

7.14.16 To create safe and accessible crossings, the proposed pedestrian and cycle crossing point on Horningsea Road will have tactile paving and dropped kerbs. A central pedestrian island is proposed to allow pedestrians and cyclists to cross Horningsea Road in two stages, if necessary. The crossing will be a minimum of 3 metres wide and clearly demarcated.

Landscape and Biodiversity

7.15 Landscape and Biodiversity

7.15.1 The Landscape proposals arise as a response that takes account of all the influences set out previously in this document, including the efficient functioning of the proposed WWTP, the character of the landscape context, the constraints and opportunities particular to this site, the need for visual mitigation, the feedback from the public and stakeholders, and the objectives for sustainable design and ecological enhancement. Underpinning these varied inputs is the application of good design.

7.15.2 The CWWTPRP landscape proposals respond to the principles of good design set out in the Waste Water NPS and in 'Design Principles for National Infrastructure' through extensive and resilient planting that anticipate climate change, through accessible, enjoyable and safe spaces within the site and on its perimeter paths; and through making a positive contribution to the local landscape's natural environment and active interventions in ecology.

7.15.3 The Landscape Ecological and Recreational Management Plan (LERMP) forms the outline Implementation Plan to deliver landscape enhancement, visual screening, ecological habitat creation and recreational opportunities (including increased connectivity) for local communities. It specifies responsibilities, demonstrating how the design concepts will be delivered. For more information, please refer to Chapter 8.

8.

Landscape Proposals

8. Landscape Proposals

'Well-designed infrastructure supports the natural and built environment [and] makes a positive contribution to local landscapes within and beyond the project boundary' - *National Infrastructure Design Group*

8.1 Introduction

8.1.1 Over the period of the development of the masterplan and the associated environmental studies, the landscape design for the proposed WWTP has emerged through an iterative process, informed by the landscape and visual constraints and opportunities which are apparent on the proposed WWTP site and in the surrounding context, resulting design is therefore landscape and visually led.

8.1.2 A multifunctional approach has been adopted to deliver landscape enhancement, visual screening, ecological habitat creation and recreational opportunities for local communities. The plan is developed alongside LERMP, which sets out the management and monitoring of the landscape elements, along with the ecological and recreational features of the CWWTPRP.

8.1.3 This approach provides and then ensures mitigation for potential environmental impacts that have been identified through the Environmental Impact Assessment (EIA), including impacts on landscape character and visual amenity whilst also providing enhancement of the local environment.

8.1.4 Building upon consultation and engagement with stakeholders, technical working groups, technical consultants and feedback from the local community, the design has been refined over time to respond to these concerns, objectives and ideas.

8.1.5 The resulting design is a comprehensive and coherent landscape, which integrates the plant into its setting and provides a green and richly diverse landscape feature at the north-eastern edge of Cambridge. Together with the implementation of the LERMP, the landscape design provides a framework upon which the long-term growth, enhancement and success of the proposals are monitored and delivery ensured.

8.2 Landscape Principles

8.2.1 The landscape masterplan is driven by a set of principles for the development:

• To create a strong identity for the masterplan as a coherent, multi-functional landscape: an earth bank landform, a natural screen to mitigate views, and a recreational resource for the local community;

• To reduce visual impacts on the surrounding community and landscape through a combination of screening and assimilation into the local landscape;

• To utilise natural screening elements such as landform and tree planting, designed in patterns and at a scale that 'settles' the development into the local landscape character;

• To set a framework for the detailed design phase of the landscape, indicating robust species and materials that reduce risks due to climate change;

• To increase biodiversity of the site within an existing largely arable landscape;

• To create a mosaic of habitats and ecological features to enhance the site and link with existing and future wildlife networks beyond the site boundaries;

• To create a user-friendly landscape surrounding the plant;

• To improve access to the countryside with linked public routes through the woodland, and extending outside the core site to complete existing links to the wider landscape; and

• To provide a functional and welcoming entry to proposed WWTP and Gateway Building.

Visitors explore the ridge and furrow wildflower grassland

8.3 The Landscape Masterplan

8.3.1 The masterplan, shown right, is a culmination of these principles. The key features include:

• An earth bank 'rotunda' landform, approximately 5m in height, comprising four curved landforms, organic in shape with 'soft' edges and a flattened surface at the top. This will provide an instant screen to the majority of the elements of the proposed WWTP, and provides nearly equal visual mitigation 'in the round';

• A natural planted screen on the earth bank top and base, using native trees and shrubs that will be allowed to merge into a thicket, to soften the uppermost elements of the plant;

• Planting on the perimeter base of the earth bank, to include tree clusters and seeded calcareous loam wildflower grassland;

• An open grassland area surrounding the earth bank, featuring accessible paths traversing through gentle ridge and furrow topography;

• Woodland blocks of native tree and understorey planting as secondary screening, forming linear wedges and blocks that enclose the site and will over time screen the earth bank from the wider context;

• Rides and glades in the woodland, with varying densities of planting, to increase the variety of habitats and species that establish there;

• Linked paths for pedestrians: both circular internal paths and a wider path arc through the eastern woodland for public use by pedestrians and cyclists;

• Inclusive and user friendly experience through the site, with bench seating, informative interpretation boards, and paths cutting through an undulating 'ridge-and-furrow' landform;

• A vehicular permanent access road from Horningsea Road to the Gateway opening, with an angled layout that avoids direct lines of sight to the earth bank and proposed WWTP;

• A cycle path from Horningsea Road to the proposed WWTP, for visitors and staff, which also connects with the 'arc' of public path;

• A functional and welcoming entry to the Gateway Building, including drop off areas, limited areas of visitor parking, planted swales, cycle parking and outdoor seating, all set within tree clusters;

• A wide mosaic of habitats with a great diversity of grassland species and native tree, shrub, vine and forb species, to thrive in the various aspects of light and moisture present across the varied typologies to allow a wide transitional gradient of habitats;

• Seasonal ponds in woodland openings and bare scrapes on undulating landform to introduce new habitats;

• SUDs swales, used as drainage features but also as opportunities for moisture tolerant forb species; and

• Ecological features, such as hibernacula, deadwood piles, and bat and bird boxes, developed in tandem with ecologists, to target and encourage particular species.

1. Additional native tree and whip planting to reinforce existing vegetation
2. New tree planting to fill gaps in existing trees on Horningsea Road
3. New tree and hedgerow planting to Low Fen Drove Way
4. Woodland blocks, with open glades and rides
5. Staff cycle entry and route
6. Site entry
7. Permanent access road
8. Proposed WWTP
9. Earth Bank
10. Overlapping arcs of tree and ‘thicket’ whip screening
11. Gateway Building and Discovery Centre
12. Paths connecting visitor car park with earth bank top and wider site
13. Ridge and furrow set in open grassland meadow
14. New Permissive path
15. Existing hedgerow to be retained
16. Pylon and overhead lines
17. Easement for Outfall
18. Proposed bridleway

8.4 The Earth Bank Strategy

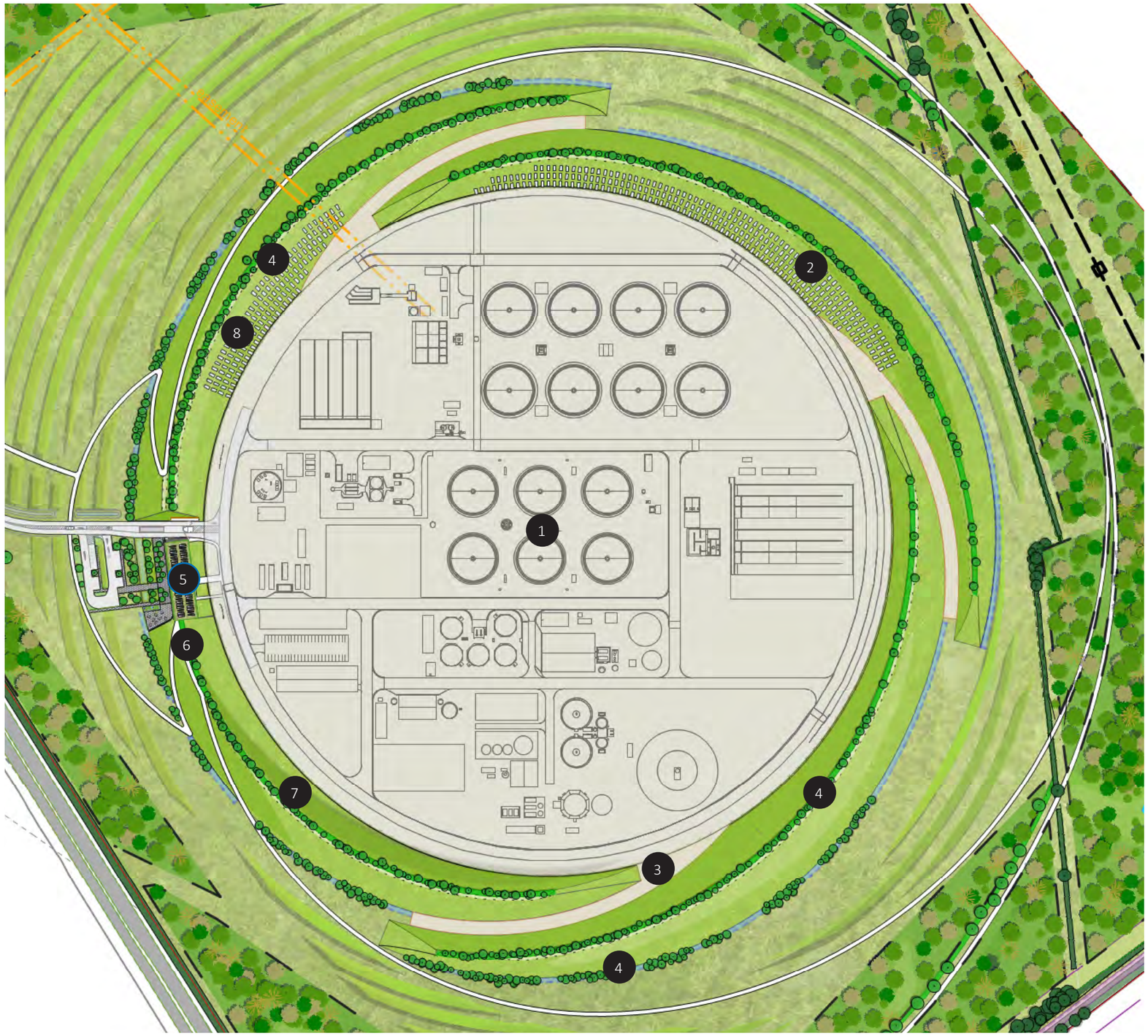
8.4.1 The central feature of the proposals is the circular landform. The earth bank, proposed at approximately 5m above existing ground levels, will screen the majority of the structures of the proposed WWTP, with only the taller elements (including the digester's at 20m high, gas holder at 16m high and boiler stack at 24m high) visible above the bank.

8.4.2 Planting on the earth bank will, by being raised, further screen the new infrastructure.

8.4.3 The earth bank will take the form of four overlapping, but separate, banks (the gaps between the banks are there to provide a flow of air across the proposed WWTP). The height of the earth bank has undergone considerable review regarding its effectiveness in the mitigation of landscape and visual impacts and its benefit in relation to cost, sustainability and function. In terms of scale, it is a substantial intervention in the landscape (being approximately 650m in diameter), with the footprint covering approximately 34ha of land to surround and contain the works. It will be entirely constructed using soils excavated during the construction of the proposed WWTP and the excavation of pipeline tunnels.

8.4.4 The profile of the 5m high earth bank will vary, with gradients generally between 1:3 and 1:4, but with 1:6 on some of the outer slopes and 1:2.5 at the narrow ends of the banks. A flattened top of 5.5m allows for a line of trees and a hedgerow along the top of the banks and maintenance. Gradients steeper than 1:2.5 are not desirable, for both reasons of potential erosion and safety during maintenance, and 1:4 is preferable for maintenance and access. Therefore the profile of a 5m height earth bank will have a minimum base width of 46m with a 1:3 slope.

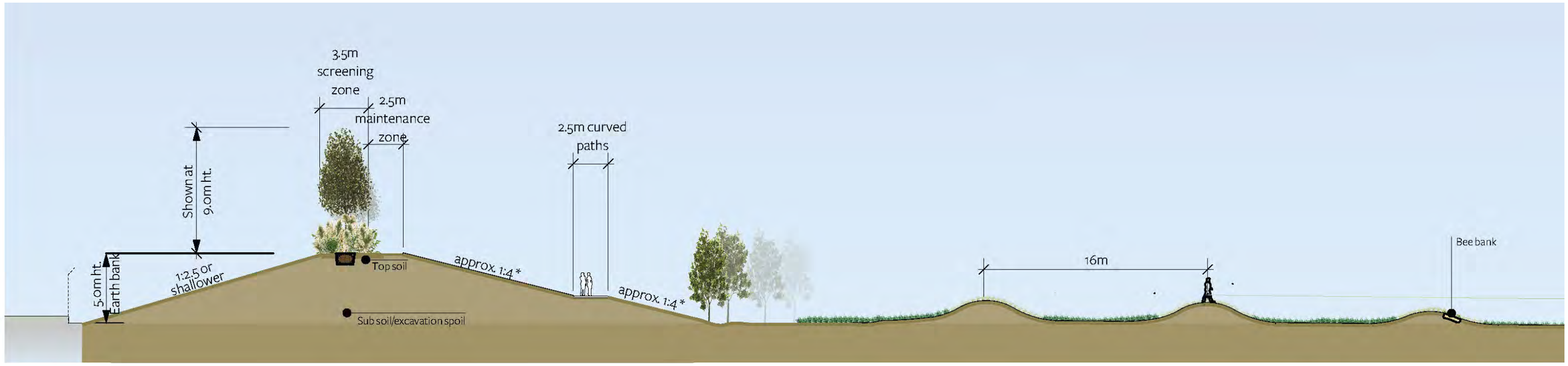
8.4.5 The design approach has aimed to find the right balance between the height and mass of the earth bank and its screening function. From ground level, the 5m height earth bank will be perceived as a long, linear form in the landscape, which from all but the closest locations, will not appear above the skyline. It will be integrated into its landscape setting with woodland, scrub, trees, hedgerow and meadows to soften its profile and appearance.



1. Proposed WWTP
2. Earth bank
3. Ventilation gaps
4. Planting on earth bank top and base;
5. Gateway Building and Discovery Centre
6. Paths connecting visitor car park with earth bank top and wider site
7. Maintenance path for managing vegetation
8. Solar panels on south-facing bank slope

Indicative elevation and section of the earth bank

Earth Bank: Long landscape elevation



Earth Bank section

8.5 Visitor Approach and Gateway Building

8.5.1 The landscape proposals around the Gateway building and Discovery Centre have been designed with multiple objectives:

• To form a welcoming entryway to visitors and staff, with an attractive space for seating and outdoor working, outside the front of the building;

• To provide a safe and accessible location for drop off, blue badge parking, cycle storage and parking, and a safely segregated entry to HGVs entering the plant;

• To strategically frame views toward the building, whilst providing semi-permeable green layering to the structure as a whole;

• To create an attractive, biodiverse SUDs swale as a feature to the front of the building; and

• To integrate and partly screen the car park surfacing and cars, by setting the car park in a gentle cutting; and by the continuation of the ridge and furrow landforms cutting through the car park verges, as low screening earthworks.

8.5.2 For more information on the Gateway Building design please refer to Chapter 9.

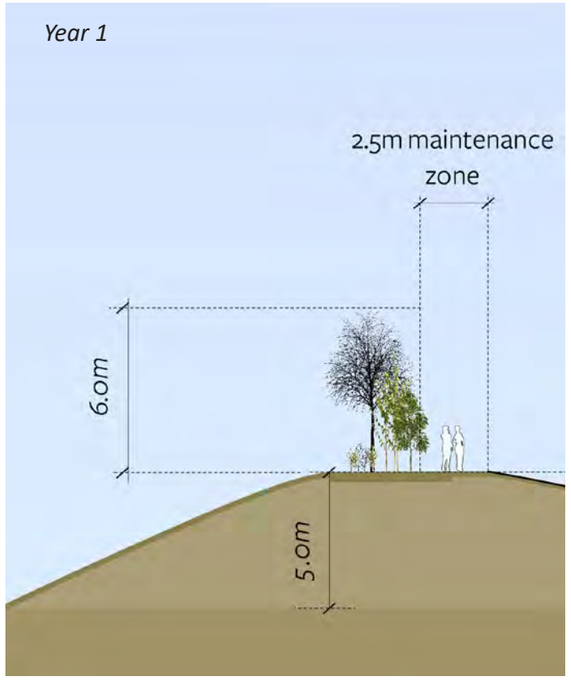
1. Gateway Building
2. Visitors car park
3. Weighbridge
4. Solar panels on roof with green roof seeding on surface
5. Seating and area for office breaks + covered cycle parking
6. Drainage SUDs feature with floriferous planting
7. Access to earth bank top via the 1st floor of the building
8. Drainage swales
9. Ridge and furrow earthworks

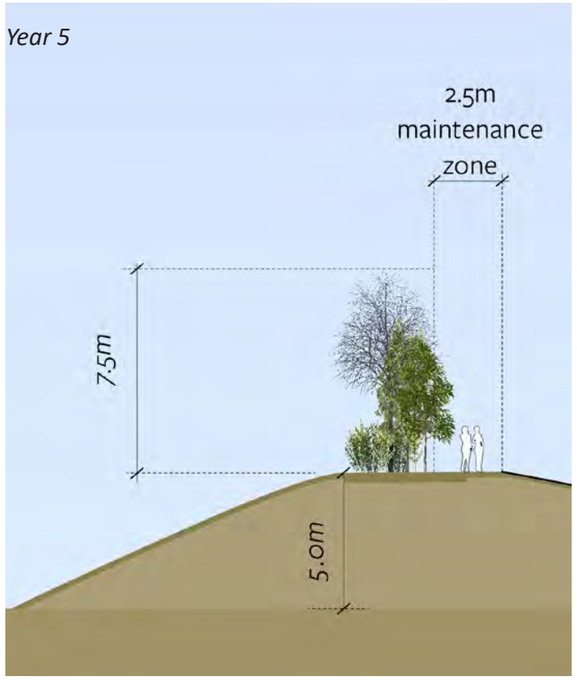
8.6 Mitigation through Green Infrastructure

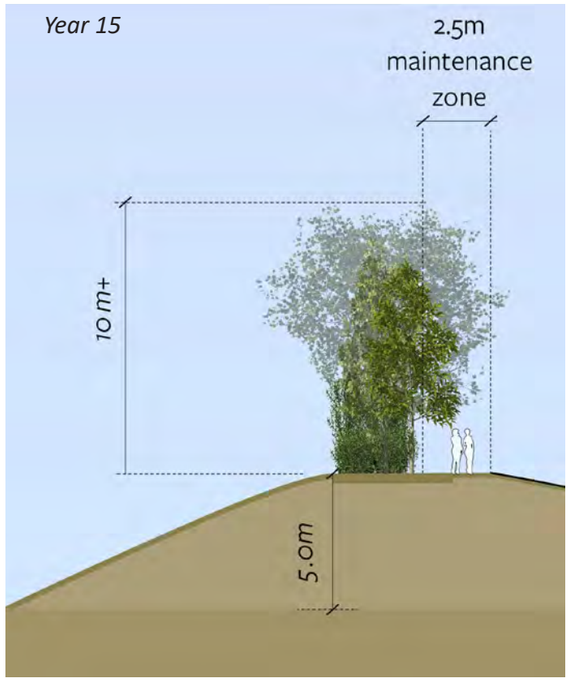
8.6.1 The proposed green infrastructure, including the earth bank planting, woodland blocks, hedgerows and hedgerow trees, are essential components of the visual mitigation strategy. The LERMP works in tandem, setting out the monitoring and management of the planting to ensure its success over the longer term.

8.6.2 The elements of this strategy include:

- Screening of the lower elements of the proposed WWTP with the earth bank;
- Screening of most of the upper elements of the proposed WWTP with a thicket of woodland planting on the earth bank, at the top and at the base, using tree and shrub species that are native, robust species that will form a thicket over time;
- The planting of large growing species such as Black Poplar (up to 30m height at maturity) at the base of the earth bank where run-off provides additional irrigation;
- Screening of close, middle and long distance views from the surrounding roads and from the wider context over time, through the planting of woodland blocks and shelterbelts;
- An early start on screening through the planting of a 7m width vegetation belt along the A14, Horningsea Road, and part of the length of the County Wildlife site. This will include intermittent Semi-mature and Heavy Standard trees, up to 6m height;
- An early start on screening to residents of Horningsea and travellers on Horningsea Road through the planting of trees between the existing tree line along Horningsea Road, trees and hedgerows along part of the east-west run of Low Fen Drove Way; and in an existing young shelterbelt at the village's southern edge;
- Soft, filtered screening of the Discovery Centre, car park and gateway through tree groupings and structural planting within and around the visitor car park;
- Mitigation of impacts on Landscape Character through the use of similar pattern and scale of woodland blocks and linear belts; and
- Retention of the perception of openness by introducing broad interruptions of the woodland blocks, which are angled to avoid views toward the proposed WWTP.







Potential growth rates to earth bank planting

1. Visualisation: View from Horningsea Road at 15 years
2. Visualisation: View from Fen Ditton at 15 years

8.7 Planting Proposals

8.7.1 The proposed tree and shrub planting is extensive across the proposed WWTP site, with proposals to plant over 1100 standard trees, 52000 young 'whip' native trees and shrubs, and over 5700 linear metres (l.m.) of native hedgerows.

8.7.2 The proposals for the top of the earth bank will comprise both tree and hedgerow species, which over time will grow into a thicket, with the largest supplied trees reaching between 8 to 10 m after 15 years. Together with the 5m height earth bank, this adds a total of 13 to 15 metres height to screen the majority of the proposed WWTP. Further tree planting is proposed in clusters, at the base of the earth bank. This will include species such as Black Poplar, a fast-growing native species which can grow ultimately 30m in height.

8.7.3 Plants on the earth bank are supplied at a range of sizes, utilising young whips and feathered transplants in the majority, but with scattered standard, heavy standard and some semi-mature trees planted amongst the new 'thicket'. Placement of the largest plants has been coordinated in order to screen the most sensitive views, including those from the north and north-west and from the south-west. Planting will be scheduled in winter when plants are dormant, in order to give the best chance of establishment. Irrigation, maintenance and close monitoring of the new plantings in the first two years will ensure their successful establishment.

8.7.4 Woodland blocks are utilised on the perimeter of the site and these are a key feature of the proposals, as secondary screening but also as substantial ecological and aesthetic elements to the landscape masterplan.

8.7.5 Tree cover in the local landscape is often present in long linear shelterbelts defining field edges, such as those at Lower and Upper Norris, and also in angular blocks, such as those at Creak HIll, Anglesey Abbey and LIttle Wilbraham Fen. The proposals take their cues from these patterns and masses.

8.7.6 The proposed angular woodland blocks are also designed with 'slices' or rides that cut long views into the site. These are carefully angled so that the views do not point toward the proposed WWTP. This approach means that some sense of openness can be perceived whilst still providing a substantial screen to the treatment plant.

8.7.7 The woodland blocks are planted with a variation in density, with the objectives of achieving screening as quickly as possible, but also to provide a gradient of aspects and shading that will allow a wider range of species and habitats to flourish. Grassy, semi-shaded glades and scrub margins are set within the interiors of the blocks, whilst the most dense planting, at 2.1m spacing is set at the edges. Key screening blocks along the western, northern and south-western edges include scattered standard and semi-mature trees to boost screening as early as possible.

8.7.8 A programme of initial planting is embedded in the mitigation strategy, as discussed on the previous page, to include band of 7m width woodland planting along the western and southwestern boundary; hedgerow and hedgerow tree planting along part of Low Fen Drove Way; tree planting; to fill in gaps on Horningsea Road, north of the core area of the site; and new transplants and tree planting to boost the existing planting to the south-east of Horningsea village. These will include standard trees, some semi--mature. Initial planting will be implemented at the first planting season (October to March) that aligns with the start of works.

8.7.9 The benefits of the new planting - woodland blocks, earth bank thicket and hedgerows with new hedgerow trees - will add substantially to the network of green corridors and ecological networks in this rural part of Cambridge.

8.7.10 The new landscape provides a new and substantial feature of green infrastructure, designed to mitigate the effects of the proposed WWTP, to create an aesthetically pleasing and user-friendly green space, and to provide exemplary wildlife benefits through a mosaic of new habitats.

8.7.11 The planting layout is set out in the Planting Strategy drawing, as right.

Key

Woodland zones

Woodland zone 1
Edges with 2.1m spacing

Woodland zone 2
Interior with 3m spacing

Woodland zone 3
Deciduous scrub margins. 3-7m random spacing

Glade

Grassland Zones
All ready-made seed mixes to be supplemented with additional species as per ecologists' recommendations

Grassland zone A: Calcareous/neutral loam grassland
EM5 Meadow mixture for loamy soils, supplemented by targeted species as advised by ecologist

Grassland Zone B: Woodland ground flora
EM10 Tussock mixture

Grassland Zone C: Lawn, low maintenance amenity
EL1 Flowering lawn

Grassland Zone D: Moisture tolerant mix
EP1 Pond edge mixture

Grassland Zone E: Wetland mix
EM8 Meadow mixture for wetlands

Initial Planting

Hedgerows and 'thicket' infill

Proposed native whip planting to supplement existing young whip planting ; infill and replace any existing that have failed

Existing Hedgerow

Existing Hedgerow to be removed

Proposed Hedgerow

Trees

Initial Planting: Woodland planting heavy standard

Initial Planting: Woodland planting semi mature

Tree - whip, 60-80cm height

Tree - 10-12cm girth, 300-350cm height

Tree - 14-16cm girth, 425-600cm height, +16-18cm girth, 450-625cm height

Tree - Semi mature
20+cm girth, 500+ height

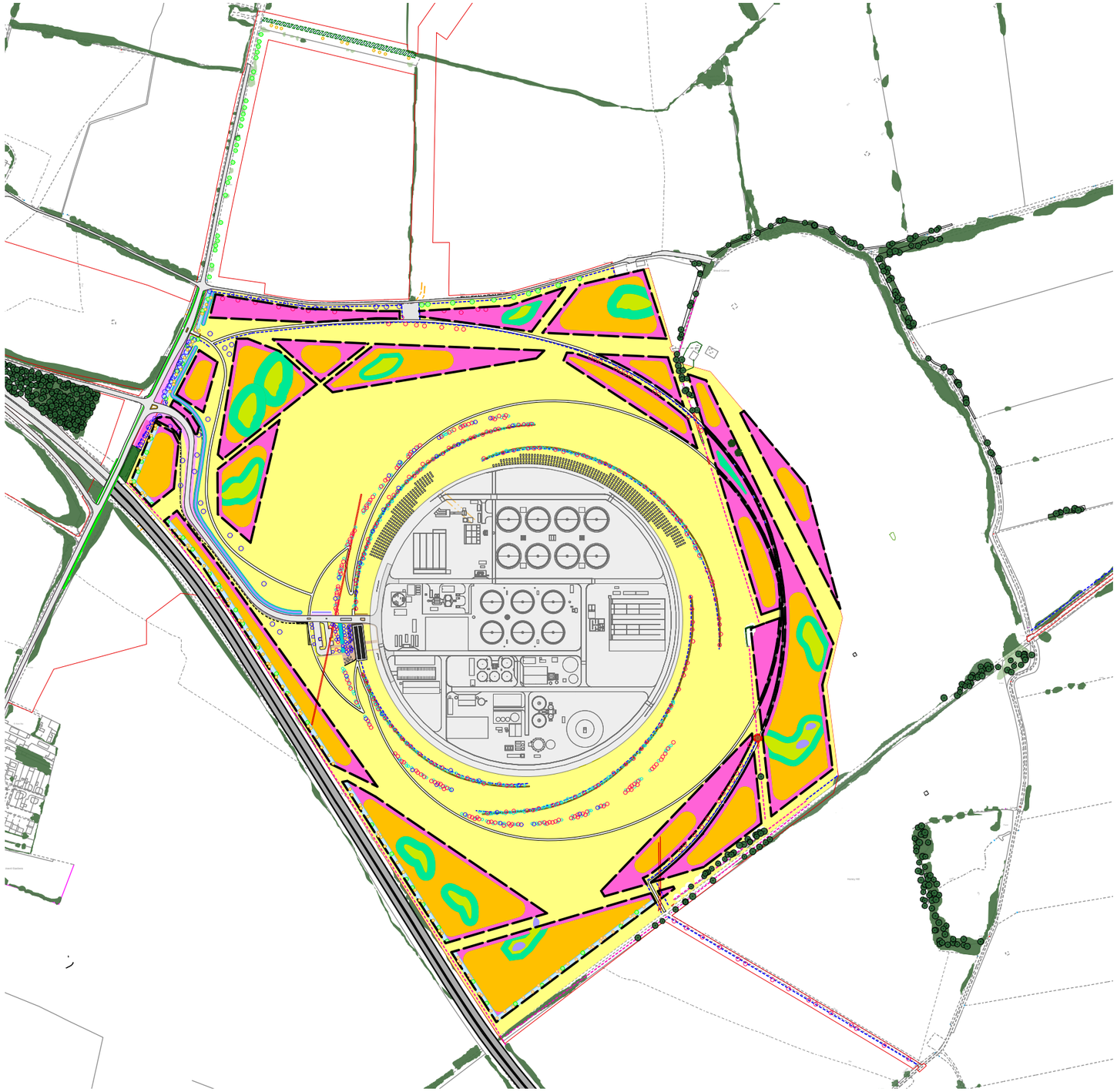
Bat roost tree
to be retained

Existing Tree

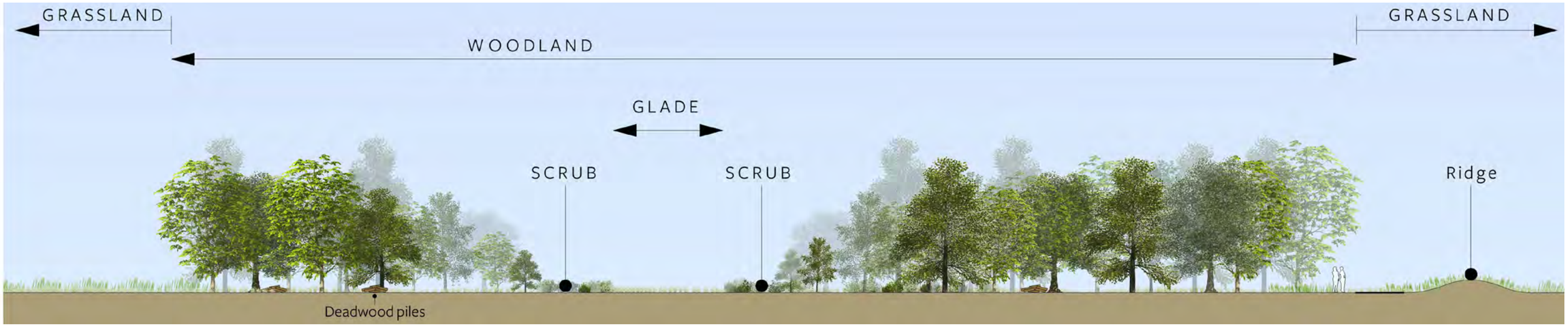
Existing vegetation in wider context

Proposed paths with self-binding gravel

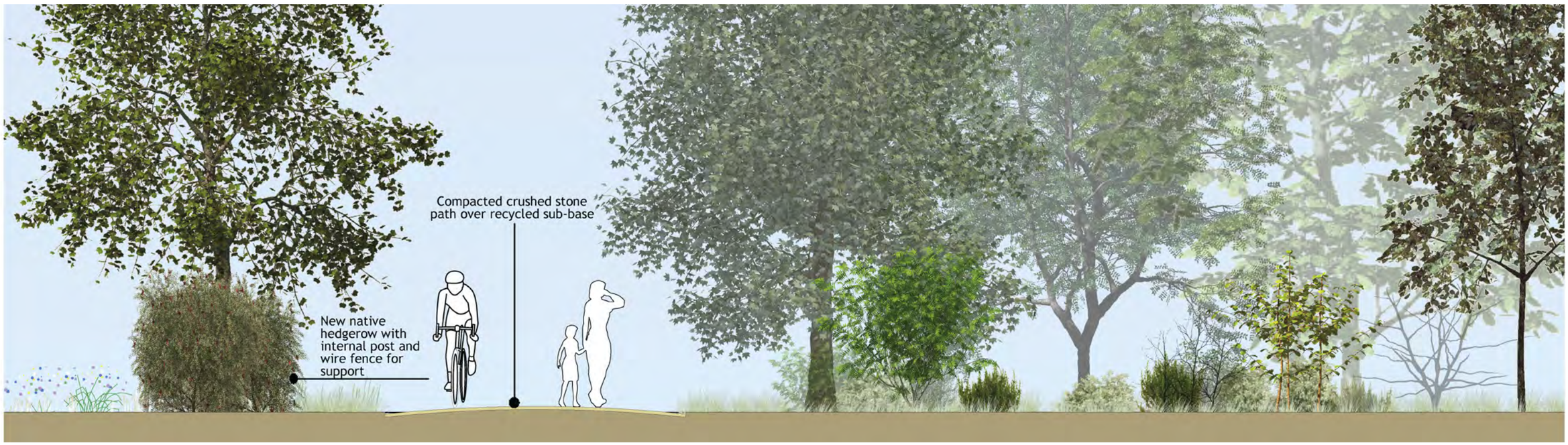
Proposed Infrastructure, car park and Treatment Plant



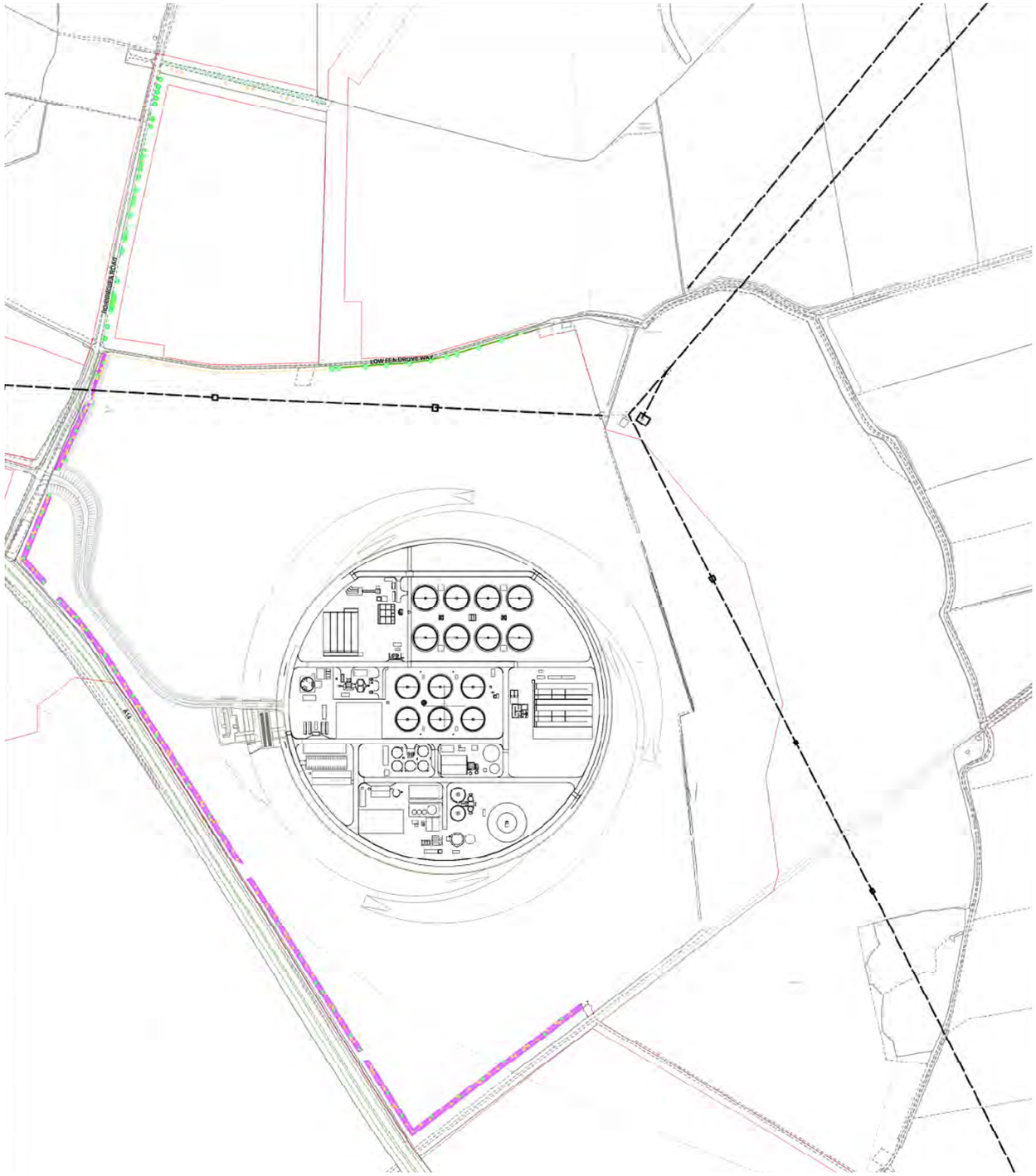
Typical woodland sections



Typical woodland block section



Public footpath through woodland



Key

Initial woodland margin planting: 1.11ha
Depth: 7m

Semi-mature tree planting
79 no. Native tree species

Heavy standard tree planting
114 no. Native tree species

Initial native hedgerow planting on Low Fen Drove Way: 321 l.m.

Proposed native whip planting to supplement existing young whip planting ; infill and replace any existing that have failed
1790 sqm

Scheme order limits

8.8 Species Selection

8.8.1 Species for the proposals have been carefully selected through discussions with the consulting ecologist, as well as with input from the landscape officers and ecologists at the Greater Cambridge Planning Service.

8.8.2 Tree and shrub species are almost entirely native except for a few that have been agreed with the GCPS, due to the particular non-native species' desirable growth habits and climate resilience.

8.8.3 Grassland species have been selected to suit the soil and to suit the anticipated moisture levels and aspects. Some individual species are targeted toward particular invertebrates or to create habitats for certain birds.

8.8.4 Densities, spacing, proportions and mixes have all been reviewed for effectiveness at screening, compatibility with landscape character, growth rates, disease resistance and adaptability to climate change including drought. Part of achieving these objectives is accomplished through diversity of species, with only the toughest species being used in large proportions.

8.8.5 An excerpt of the planting schedule is on the next page.


Quercus robur


Carpinus betulus


Crataegus monogyna


Populus nigra


Prunus avium


Ulmus americana 'Princeton'


Tilia cordata


Pyrus communis


Quercus ilex


Betula pubescens


Cornus sanguinea

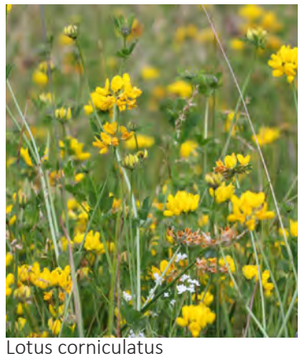

Viburnum opulus


Prunus spinosa

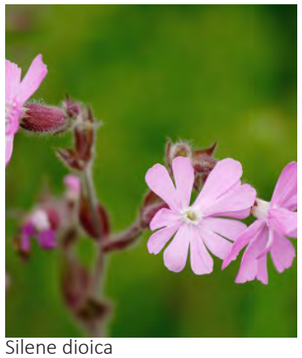

Ilex aquifolium


Crataegus laevigata


Knautia arvensis


Lotus corniculatus


Rhinanthus minor


Silene dioica


Oenanthe pimpinelloides

Images: Tree, hedgerow and calcareous grassland species

EARTH BANK TOP

%	species	common name
	TREES	
	Size distribution: Semi mature 6%; Heavy Standard 16-18cm 26%; Heavy Standard 14-16cm 26%; Standard 10-12cm 52%)	
35.0%	Acer campestre	Field maple
10.0%	Tilia cordata	Small leaved Lime
5.0%	Quercus robur	English Oak
7.5%	Carpinus betulus	Hornbeam
7.5%	Acer psuedoplatanus	Sycamore
10.0%	Quercus petraea	Oak
5.0%	Betula pubescens	Silver birch
5.0%	Prunus domestica	Wild Plum
5.0%	Pyrus communis	Wild Pear
10%	Malus sylvestris	Apple
	HEDGEROW THICKET	
	(1+1 transplants, 80-120cm ht, planted on 300mm centres on a triple staggered row, 9 per l.m.	
45.0%	Crataegus monogyna	Hawthorne
13.5%	Prunus spinosa	Blackthorn
7.5%	Carpinus betulus	Hornbeam
5.0%	Cornus sanguinea	Dogwood
5.0%	Viburnum opulus	Guelder Rose
5.0%	Ilex aquifolium	Holly
5.0%	Ligustrum vulgare	Wild privet
5.0%	Viburnum lantana	Wayfaring tree
5.0%	Euonymus europaeus	Spindle
	CLIMBERS (P9 or BR if appropriate)	
2.0%	Hedera helix	Ivy
2.0%	Tamus communis	Black bryony
100.0%	total plants	

EARTH BANK BASE

%	species	common name
	TREES	
	Size distribution: Semi mature 6%; Heavy Standard 16-18cm 26%; Heavy Standard 14-16cm 26%; Standard 10-12cm 52%)	
15.0%	Carpinus betulus	Hornbeam
20.0%	Tilia cordata	Small leaved Lime
20.0%	Acer psuedoplatanus	Sycamore
15.0%	Populus nigra	Black Poplar
15.0%	Salix caprea	Goat Willow
15.0%	Quercus petraea	Pedunculate Oak
100.0%	**total trees**	

WOODLAND BLOCKS

%	species	common name	
	TREES		
	Zone 1: dense spacing 2.1 to 3m; Zone 2: 3m spacing		
	(1+1 transplants, 80-100cm ht, except Ilex aquifolium: 2L, 40-60cm)		
30.0%	Acer campestre	Field maple	
7.5%	Quercus petraea	Sessile oak	Wet areas alternate: Populus nigra
7.0%	Ulmus glabra	Huntingdon Elm	Wet areas alternate: Populus nigra
5.0%	Carpinus betulus	Hornbeam	
5.0%	Malus sylvestris	Crab apple	Wet areas alternate: Salix cinerea
5.0%	Prunus domestica	Wild Plum	Wet areas alternate: Salix cinerea
5.0%	Pyrus communis	Wild Pear	Wet areas alternate: Salix cinerea
2.5%	Tilia cordata	~~Ash~~	
2.0%	Quercus robur	Pedunculate oak	Wet areas alternate: Populus nigra
2.0%	Betula pubescens	Downy birch	
2.0%	Betula pendula	Silver birch	
2.0%	Ilex aquifolium	Holly	
	FEATHERED TREES (Ftd, 100-150 cm ht)		
2.0%	Acer campestre	Field maple	
1.0%	Quercus petraea	Sessile oak	
2.0%	Ulmus glabra	Huntingdon Elm	
	SHRUBS (1+1 transplants 60-80cm ht)		
12.0%	Crataegus monogyna	Hawthorn	
2.0%	Corylus avellana	Hazel	Wet areas alternate: Cornus sanguir
1.0%	Prunus spinosa	Blackthorn	Wet areas alternate: Cornus sanguir
1.0%	Sambucus nigra	Elder	
1.0%	Viburnum opulus	Guelder rose	Wet areas alternate: Salix caprea
1.0%	Salix caprea	Goat willow	
1.0%	Viburnum lantana	Wayfaring tree	Wet areas alternate: Salix caprea
1.0%	Euonymus europaeus	Spindle	Wet areas alternate: Rhamnus catha
100%	**Total transplants**		
	STANDARD TREES		
	Scattered, irregular spacing		
	Size distribution: 25% 14-16cm girth, 50% 16-18cm girth.		
5.0%	Quercus robur	Pedunculate oak	
25.0%	Tilia cordata	Small leaved Lime	
35.0%	Acer campestre	Field Maple	
25.0%	Populus nigra	Black Poplar	
10.0%	Quercus petraea	Sessile oak	
100.0%	**Total trees**		

Plant schedule extract

SEED MIXES			
Zone A grassland: CALCAREOUS LOAM MEADOW GRASSLAND			Area
	SEEDED WILDFLOWER GRASSLAND	EM5 - Meadow Mixture for Loamy Soils	
	Calcareous Loam grassland mixture: 20% wildflowers and 80% grasses (subject to ecology)		
	WILDFLOWERS		
0.3%	Achillea millefolium	Yarrow	
1.0%	Agrimonia eupatoria	Agrimony	
0.6%	Betonica officinalis	Betony	
5.0%	Centaurea nigra	Common Knapweed	
1.0%	Galium album - (Galium mollugo)	Hedge Bedstraw	
1%	Galium verum	Lady's Bedstraw	
0%	Geranium pratense	Meadow Crane's-bill	
0%	Knautia arvensis	Field Scabious	
0%	Leontodon hispidus	Rough Hawkbit	
3%	Leucanthemum vulgare	Oxeye Daisy	
3%	Malva moschata	Musk Mallow	
1%	Plantago lanceolata	Ribwort Plantain	
1%	Poterium sanguisorba	Salad Burnet	
2%	Ranunculus acris	Meadow Buttercup	
1%	Rhinanthus minor	Yellow Rattle	
1%	Rumex acetosa	Common sorrel	
1%	Rumex acetosella	Sheep's Sorrel	
1%	Silene vulgaris	Bladder Campion	
20%	**Total**		
	GRASSES		
8.0%	Agrostis capillaris	Common Bent	
2.0%	Anthoxanthum odoratum	Sweet Vernal-grass (w)	
3.0%	Briza media	Quaking Grass (w)	
20.0%	Cynosurus cristatus	Crested Dogstail	
18.0%	Festuca ovina	Sheep's Fescue	
20.0%	Schedonorus pratensis	Meadow Fescue	
1.0%	Trisetum flavescens	Yellow Oat-grass (w)	
4.0%	Poa spp.	Meadow-grasses	
4.0%	Lolium perenne	Perennial Rye-grass	
80	**Total**		
	TARGETING SPECIES (e.g. Turtle Dove)		
	Lotus corniculatus	Common Bird's-foot-trefoil	
	Trifolium pratense	Red Clover	
	Trifolium repens	Early White Clover	
	Fumitory officinalis	Fumitory	
	Medicago lupilina	Black Medick	

Zone B Grassland:	WOODLAND GROUND FLORA	
	EM10 Tussock Mixture	supplied by Emorsgate
	Additional species:	
	Allaria petiolata	
	Arum maculatum	
	Borumus recmosus	
	Brachypodium sylvaticum	
	Digitalis purpurea	
	Galium mollugo	
	Geum urbanun	
	Hypericum hirsutum	
	Millium effusum	
	Silene dioica	
	Stachys sylvatica	
	Torillus japonica	
	Established shade:	
	Galium odoratum	Sweet Woodruff
	Primula vulgaris	Primrose
	Viola odorata	Wood violet
	Kindbergia praelonga	Common feather-moss
	Hedera helix	Ivy
	Hyacinthoides non-scripta	Bluebell
	Brachythecium rutabulum	Rough-stalked feather-moss
	Mnium undulatum	Hart's-tongue thyme-moss
	Circaea lutetiana	Enchanter's nightshade
	Lamiastrum galeobdolon	Yellow archangel
	Lysimachia nemorum	Yellow pimpernel
	Melica uniflora	Wood melick
	Carex sylvatica	Wood sedge
	Sanicula europaea	Sanicle
	Bromopsis ramosa	Hairy brome
	Oxalis acetosella	Wood sorrel
	Adoxa moschatellina	Moschatel
	Conopodium majus	Pignut
	Campanula trachelium	Nettle-leaved bellflower
	Milium effusum	Wood millet
	Veronica montana	Wood speedwell
	Carex remota	Remote sedge
	Allium ursinum	Ramsons
	Anemone nemerosa	Wood Anemone

Plant schedule extract

8.9 Ecology and Biodiversity

8.9.1 Along with visual mitigation and the benefits of an expanded green network, the landscape proposals have embedded habitat creation to deliver an overall benefit to biodiversity.

8.9.2 The Biodiversity Net Gain (BNG) assessment indicates that the outline Landscape Masterplan is expected to comfortably deliver a net gain of at least 20% for both habitat and linear features (hedgerows).

8.9.3 The newly planted areas will provide foraging and shelter habitat for a wide range of species such as invertebrates and birds whilst once the created woodland is mature, this may provide roosting habitats for bat species.

8.9.4 The transitional habitats provided by dense to open woodland, dry south-facing to damp north-facing ridge and furrow and the slopes and swales around the earth bank and permanent access road.

8.9.5 The proposals have taken into account the habitats and sensitivities of the adjacent Low Fen Drove Way Grasslands and Hedges County Wildlife Site (CWS). Enhancement and potential extension of the CWS by the creation of a new area of semi-improved neutral grassland buffering (minimum 15-20m wide) the northern boundary of the CWS has also been designed to ensure no shading or encroachment on the existing habitats associated with the CWS. It is also proposed to improve the condition of the CWS through habitat management proposals, which could include clearing scrub in areas to restore semi-improved neutral grassland and unimproved calcareous grassland. The aim is to buffer, enhance, and improve the resilience of the CWS, keeping tree planting away from the margins of the CWS to maintain the grassland, which is used by a diverse invertebrate assemblage.

8.9.6 Signage and interpretation boards will be used to divert pressure away from designated sites such as Stow-cum-Quy Fen SSSI and Low Fen Drove Way Grasslands and Hedges CWS, encouraging use of the alternative green space within the site.

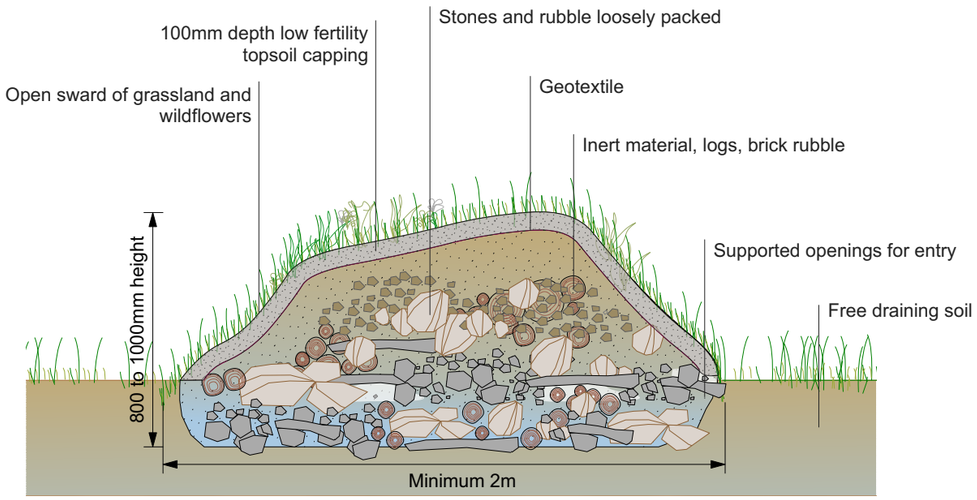
8.9.7 Quieter areas within the proposed WWTP site are retained as inaccessible to visitors or the public, so that habitats may have a chance to establish without regular disturbance from dog-walkers and pedestrians.

8.9.8 Habitat creation will aim to benefit Cambridgeshire and Peterborough Local Biodiversity Action Plan (LBAP) species amongst others such as turtle dove (Streptopelia turtur), barbastelle bat (Barbastella barbastellus), white-letter hairstreak butterfly (Satyrium w-album)and common lizard (Zootoca vivipara). The new landscape and ecology habitat creation has been designed to complement the Cambridge Nature Network opportunity areas for nature recovery, providing a new component and potential extension to the stepping stones, corridors and core areas such as Quy Hall, Little Wilbraham Fen, Stow-cum-Quy Fen SSSI

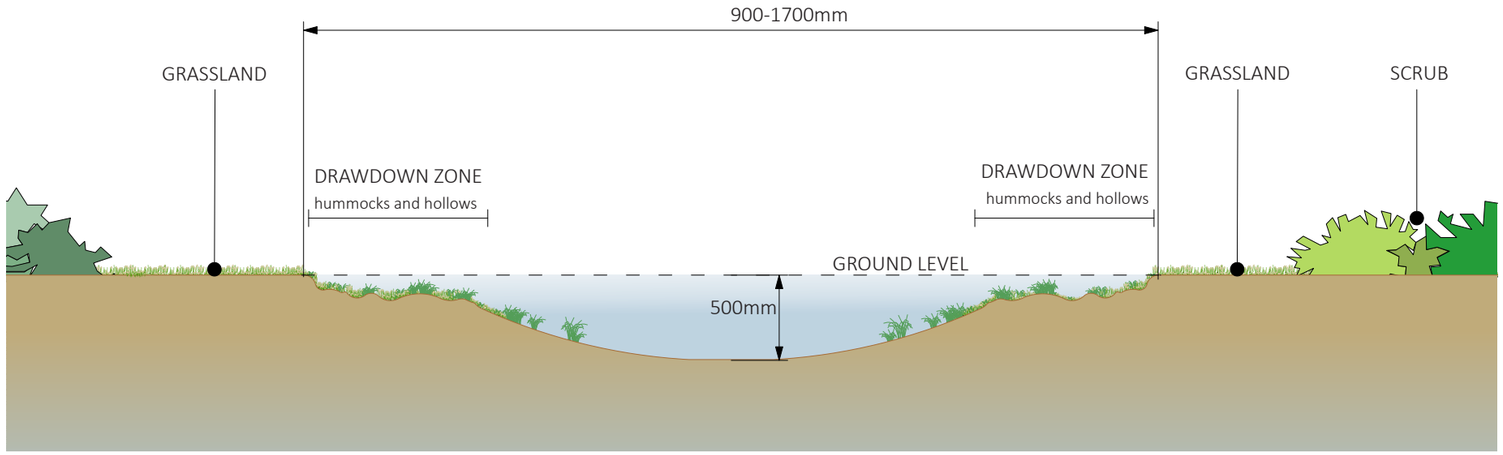
8.9.9 Compatibility and alignment with the National Trust's Wicken Fen Vision has also been considered when selecting the new habitats, particularly in respect of grassland types. The Proposed Development sits within the drier areas of the Vision, which proposes more rough grassland and coppice belts.

8.9.10 A number of site surveys and a range of habitat analyses have been carried out to establish a baseline and to build a picture of the most effective and beneficial biodiversity features to support the enhancement of the proposed WWTP site. Proposed features to support new habitats include Hibernacula, brashwood piles, bee beaches, seasonal ponds and bare scrapes on the ridge and furrow.

8.9.11 Overall the ambitious landscaping proposals surrounding the proposed WWTP will include extensive areas of habitat creation, to give a legacy of a more biodiverse environment than is currently present.



Section: Proposed typical Hibernacula



Section: Proposed typical seasonal ponds

Turtle Dove

Sandy ‘bee banks’

Bat roost

Calcareous loam grassland

Retained hedgerow

Native ‘whips’ in protection tubes

Key

Woodland zones

Initial planting: Woodland transplants
Refer to 775_01(MP)008 for further information

Proposed woodland blocks

Trees

Initial Planting: Woodland tree heavy standard
14-16cm girth/425-600cm height + 16-18cm girth/450-625cm

Initial Planting: Woodland planting semi mature
20+cm girth, 500+cm height

Tree - Whip transplant 1+1
60-90cm height; set within triple-staggered hedgerow plantin

Tree - Standard
10-12cm girth, 300-350cm height

Proposed tree: heavy standard
14-16cm girth/425-600cm height + 16-18cm girth/450-625cm

Proposed tree - Semi mature
20+cm girth, 500+cm height

Hedgerows and 'thicket' infill

Proposed native hedgerow

Proposed native whip planting to supplement existing young whip planting ; infill and replace any existing that have failed

Grassland Zones

All ready-made seed mixes to be supplemented with additiona species as per ecologists' recommendations

Grassland zone A: Calcareous/neutral loam grassl
EM5 Meadow mixture for loamy soils,

Grassland Zone B: Woodland ground flora
EM10 Tussock mixture

Grassland Zone C: Lawn, low maintenance amenit
EL1 Flowering lawn

Grassland Zone D: Moisture tolerant mix
EP1 Pond edge mixture

Grassland Zone E: Wetland mix
EM8 Meadow mixture for wetlands

Permanent water at base of proposed swale

Existing Hedgerow to be retained

Existing Hedgerow to be removed

Existing Tree to be retained

Existing vegetation in wider context

County Wildlife site
with 20m setback buffer

Proposed paths with self-binding gravel

Proposed ridge and furrow

Proposed Treatment Plant

Proposed Infrastructure and car park

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Key

- Proposed Bee banks and bare soil scrapes
- Proposed Deadwood and Brash piles
- Proposed Hibernacula
- Proposed seasonal ponds
- Proposed people and dog free areas for wildlife
- Bat roost tree to be retained
- Proposed Infrastructure and Treatment Plant
- County Wildlife site and 20m set back
- Scheme order limits

8.10 Conclusion

8.10.1 The landscape design and proposals have evolved through an iterative process that takes into account opportunities and constraints for the site, including sensitivities of ecology, heritage, landscape character and visual amenity as set out in the EIA, the objectives and aspirations for good design and sustainability, and feedback from the public and stakeholders. The solutions respond to these inputs with a coherent and integrated design.

8.10.2 The landscape masterplan also sets out a framework by which the longer term growth and development of the landscape can establish, and by doing so, assimilate into the local landscape and ensure mitigation is successful. Overall the landscape proposals will create a distinct sense of place, a functional landscape for the proposed WWTP, a contributing part of the local recreational landscape and a biodiverse and thriving landscape that is part of a larger ecological network.

9.

Engineering and Architectural Proposals

9. Engineering and Architectural Proposals

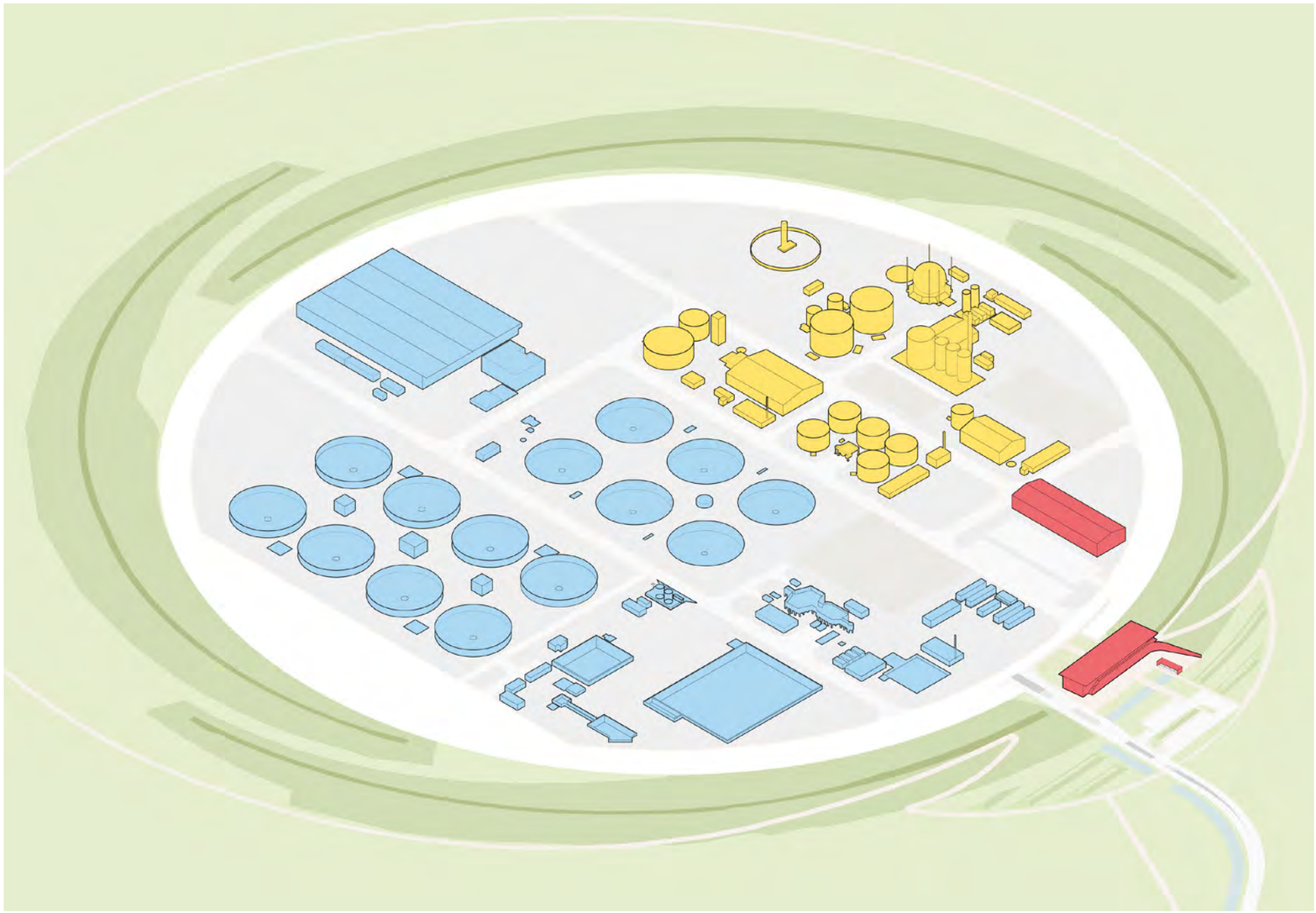
'The team's commitment to bold and innovative architecture and landscape design will help ensure the scheme is attractive for local inhabitants as well as visitors and the panel would like to commend them on this forward-looking and aspirational approach.' - *Design Council, May 2021*

9.1 Introduction

9.1.1 This section explains how the Project Objectives have been implemented in the design of the main components of the new plant works for the proposed WWTP within the 'rotunda'; namely the Water Recycling Centre (WRC), the Sludge Treatment Centre (STC) and the buildings.

9.1.2 Chapter 7 explains how these key components have been arranged in relation to one-another and the site constraints. This chapter explains how the elements within each component have been designed.

9.1.3 This section provides an overview of the key design aspects for each of the main components. For a more detailed description of each element please refer to the Project Description (Application document reference 5.2.2).



Water Recycling Centre

9.2 Water Recycling Centre Overview

9.2.1 The purpose of the WRC is to treat the wastewater from a population equivalent of 300,000, as well as storm flows, by removing contaminants using a range of processes (physical, chemical and biological) and to produce an effluent that meets the discharge consent requirements set by the EA and is therefore suitable for discharge to the River Cam.

9.2.2 The approach to the design for the WRC involves the following series of process steps:
- Terminal pumping station;
- Inlet Works;
- Storm storage;
- Primary settlement;
- Secondary biological treatment;
- Tertiary treatment; and
- Final effluent discharge to the River Cam.

9.3 Water Recycling Centre Function

9.3.1 The primary objective of each of the main components of the WRC is summarised below.

9.3.2 **Terminal Pumping Station (TPS)** - a single 20m diameter shaft at the end of the Transfer Tunnel conveying wastewater flows from the Cambridge catchment to the WRC. The TPS includes submersible pumps that will lift the untreated wastewater and storm flows from the Transfer Tunnel to the Inlet Works or the storm storage facility.

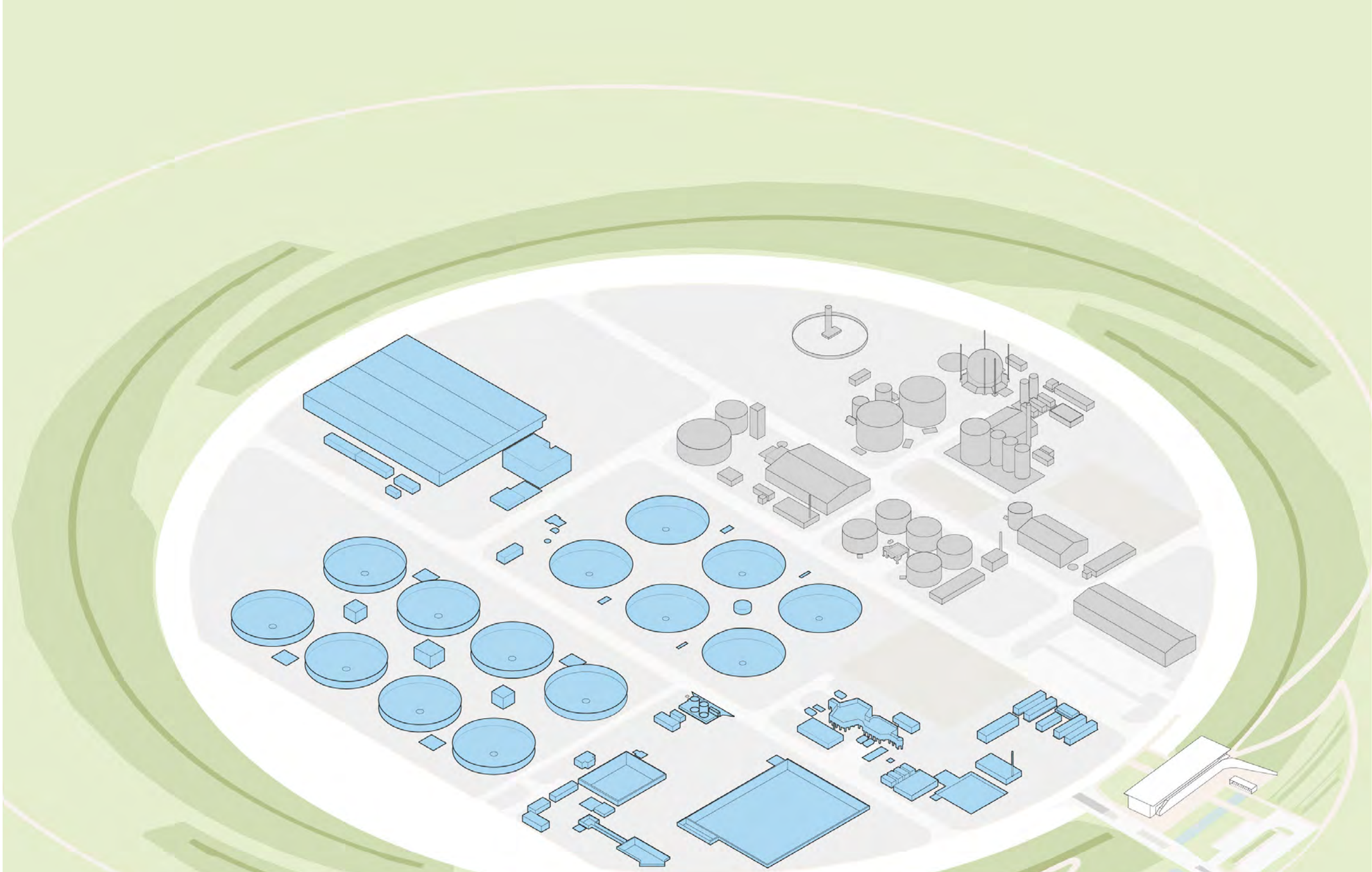
9.3.3 **Inlet Works** - consists of an elevated concrete structure with mechanical plant installed to:
- remove solid matter by screening in the form of plastics, rags, faecal matter and other large solids that would otherwise block pipes, pumps and other moving equipment in the downstream process; and
- remove grit that would otherwise settle out and accumulate in the Primary Settlement Tanks downstream, cause excessive wear in sludge pumps and reduce the volume available in the sludge treatment tanks.

9.3.4 **Storm Storage Facility** - provides temporary storage of flows in excess of the treatment capacity during storm events and reduce the risk of release of untreated wastewater to the environment.

9.3.5 **Primary Settlement Tanks** - designed to:
- remove settleable solids;
- reduce the suspended solids and organic loads to be forwarded to the secondary treatment stage; and
- facilitate phosphate removal.

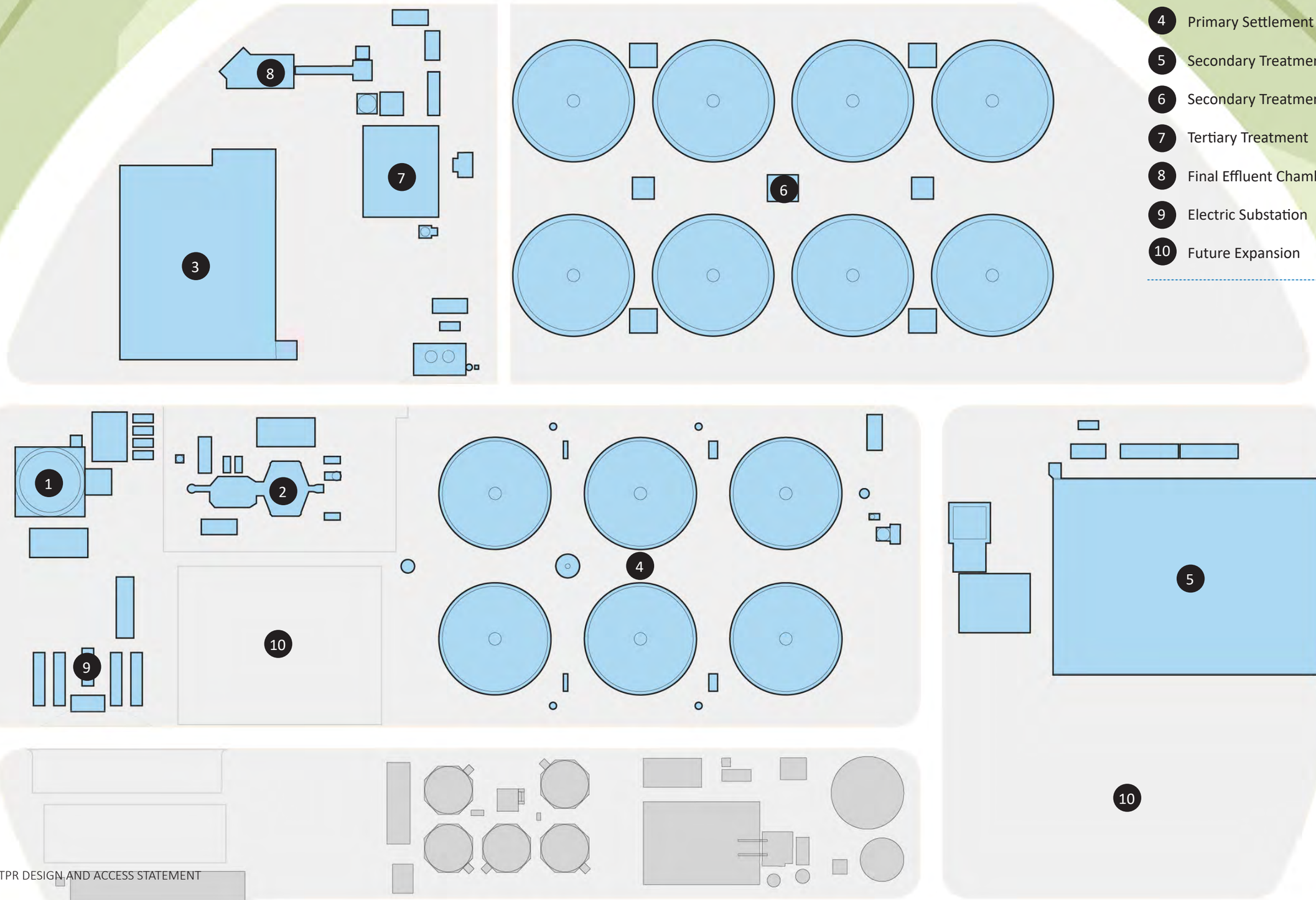
9.3.6 **Secondary Biological Treatment** - comprises an enhanced activated sludge process (ASP) followed by final settlement tanks (FSTs) that will:
- provide suitable conditions for the biological removal of soluble and poorly settling pollutants including ammonia and phosphate to achieve the required discharge consent; and
- minimise carry-over of biological solids to the Tertiary Treatment stage.

9.3.7 **Tertiary Treatment** - designed to:
- provide tertiary phosphate removal to comply with the strict discharge consent limit for effluent discharged to the River Cam; and
- provide final polishing of the effluent to comply with the discharge consent criteria for 'Biochemical Oxygen Demand' (BOD) and suspended solids.



Key

Water Recycling Centre



Key

1. Terminal Pumping Station
2. Inlet Works
3. Storm Storage Facility
4. Primary Settlement Tanks
5. Secondary Treatment (ASP)
6. Secondary Treatment (FSTs)
7. Tertiary Treatment
8. Final Effluent Chamber
9. Electric Substation
10. Future Expansion

9.4 Water Recycling Centre Layout

9.4.1 Key factors that have influenced the layout of the WRC include:

- Transfer Tunnel - The TPS has been located near to the western perimeter of the site in order to minimise the depth of the sewer tunnel and thereby minimise the energy required to lift the wastewater and storm flows to the surface.
- FE and Storm Pipelines - The final effluent and sampling chamber has been located in the north-west of the WRC site so as to minimize the length of the FE and Storm Pipelines and enable a gravity discharge of these flows to the outfall structure.
- Interprocess Pipework - The plant has been laid out in series so as to minimize the lengths of pipework between each of the processes.
- Odour producers - The most malodorous plant that is not odour controlled are the Primary Settlement Tanks. These tanks have therefore been located as near to the centre of the proposed WWTP in order to minimize their odour impact at the site boundary.
- Operational Considerations - Plant that involves regular access by vehicles for the delivery of materials/chemicals (eg: the workshop and dosing plant) or the collection of waste for disposal (eg: screenings and grit) have been located near the main site entrance to endeavour to minimize the distance travelled by vehicles around the site for safety reasons. The overall plant layout and distance between process tanks allows for access by vehicles/machinery for operation and maintenance purposes.
- Sludge transfer - The Primary Settlement Tanks have been located close to the sludge treatment plant in order to reduce the length of sludge pipelines and minimize their potential for blockage.
- Future Development and adaptation for change - The overall layout utilises the space available efficiently and also leaves sufficient footprint for the expansion of critical treatment processes (such as the ASP basins) to cater for increased flows from future population growth in the catchment beyond the design horizon as well as adaptation for change in discharge consent or water reuse.

9.5 Water Recycling Centre Design Considerations

9.5.1 In addition to aligning with the Regulatory requirements, Anglian Water Services Limited's strategies and wider UK carbon reduction targets for the project, the key considerations associated with the WRC design are:

- the flow and load calculations determined in conjunction with Anglian Water Services Limited;
- the pre-application response from the Environment Agency (EA) on the expected final effluent discharge parameter limits;
- the need to minimise impact of the WRC on the local population in terms of:
    - o construction;
    - o visual obtrusion from tall structures,
    - o noise;
    - o odour;
    - o light;
    - o increased traffic movements.

9.5.2 The design proposal for the main biological secondary treatment process is for a Membrane Aerated Biological Reactor (MABR) followed by an Activated Sludge Process (ASP). The advantage of this combined approach is that benefits from both technologies can be realised while maintaining an affordable scheme.

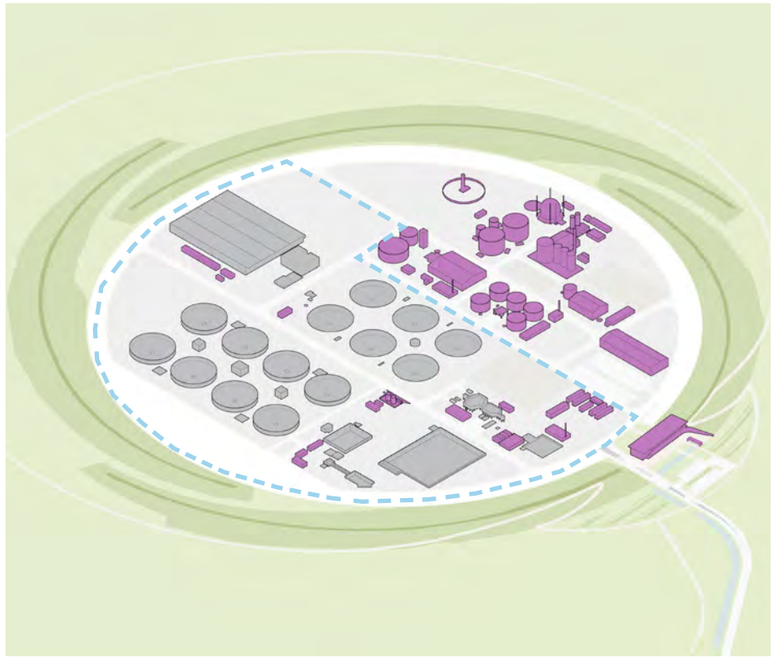
9.5.3 The MABR offers significant advantages in terms of oxygen transfer efficiency and resilience against load variation, and also provides a seeding effect of nitrifying micro-organisms that pass through to the ASP and thus reduce the required size of reactor basins and Mechanical and Electrical (M&E) equipment. Although generally requiring higher operational cost, the ASP provides robustness with a tried and tested technology that is dependable and efficient in terms of initial capital investment.

9.5.4 Another aspect of the WRC design in which an innovative approach has been taken is to use the Transfer Tunnel as inline storm storage, which forms part of the overall storm management approach. This reduces the overall footprint of the storm storage facility at the WRC and also reduces the depth at which the storm pumps are installed and thus reduces the overall depth of the TPS shaft.

9.6 Scale and Appearance

9.6.1 The WRC is predominantly a series of large-format, low-lying concrete tank structures with connecting pipework. The form and materiality is determined by the functionality of components and the supply-chain capabilities.

9.6.2 The site-wide colour strategy will be applied to the structures as discussed in Chapter 7. However, as previously discussed the concrete structures will not be subject to special finishes as they will not be visible from outside the earth bank. The smaller structures, such as the control kiosks, will be finished in metal and plastic which will be selected to adhere to the site-wide strategy.



Sludge Treatment Centre

9.7 Sludge Treatment Centre Overview

9.7.1 The role of the STC is to treat sludge arising from the proposed WWTP plus imported liquid sludges imported from other smaller WWTPs in the surrounding area up to 16,000 Tonnes Dry Solids (TDS) per year. The treatment will pasteurise the sludge to destroy harmful pathogens and make the sludge suitable for land applications.

9.7.2 A by-product of the sludge treatment process is biogas that will be utilised on site in steam raising boilers to generate heat for use within the sludge treatment process. Any surplus biogas will be cleaned, upgraded to biomethane and exported to the national natural gas network.

9.8 Sludge Treatment Centre Function

9.8.1 The primary objective of each of the main components of the STC is summarised below.

9.8.2 **Sludge import**, storage and screening facility - The STC will include dedicated sludge reception facilities for imported primary settled sludges from surrounding WWTPs. Sludge will be delivered by road tankers into reception tanks before being screened for rag and grit prior to thickening to remove excess water before the next stage of treatment. These tanks and screens will be odour controlled via one of the STC odour control plants.

9.8.3 **Sludge thickening plant** - Sludge from the proposed WWTP and imported liquid sludges will be stored in holding tanks and screened prior to thickening to reduce the volume for subsequent treatment.

9.8.4 **Sludge digestion plant** - The sludge digestion plant involves the following processes:

- a pre-digestion process that includes a 'pasteurisation' step that destroys or deactivates organisms, enzymes and pathogens and preconditions the sludge for optimum biogas production;
- anaerobic sludge digestion where the volatile solids are destroyed and biogas released as part of the process;
- a post-digestion stage that halts the digestion process and removes any remaining biogas.

9.8.5 **Digested sludge dewatering** - Digested sludge from the post-digestion tanks is dewatered to reduce the volume of sludge to be transported off-site. The mechanical dewatering process will produce a sludge "cake" with typically 22 to 25% dry solids content which is discharged to a cake barn prior to being transported off-site to be used as bio-fertiliser.

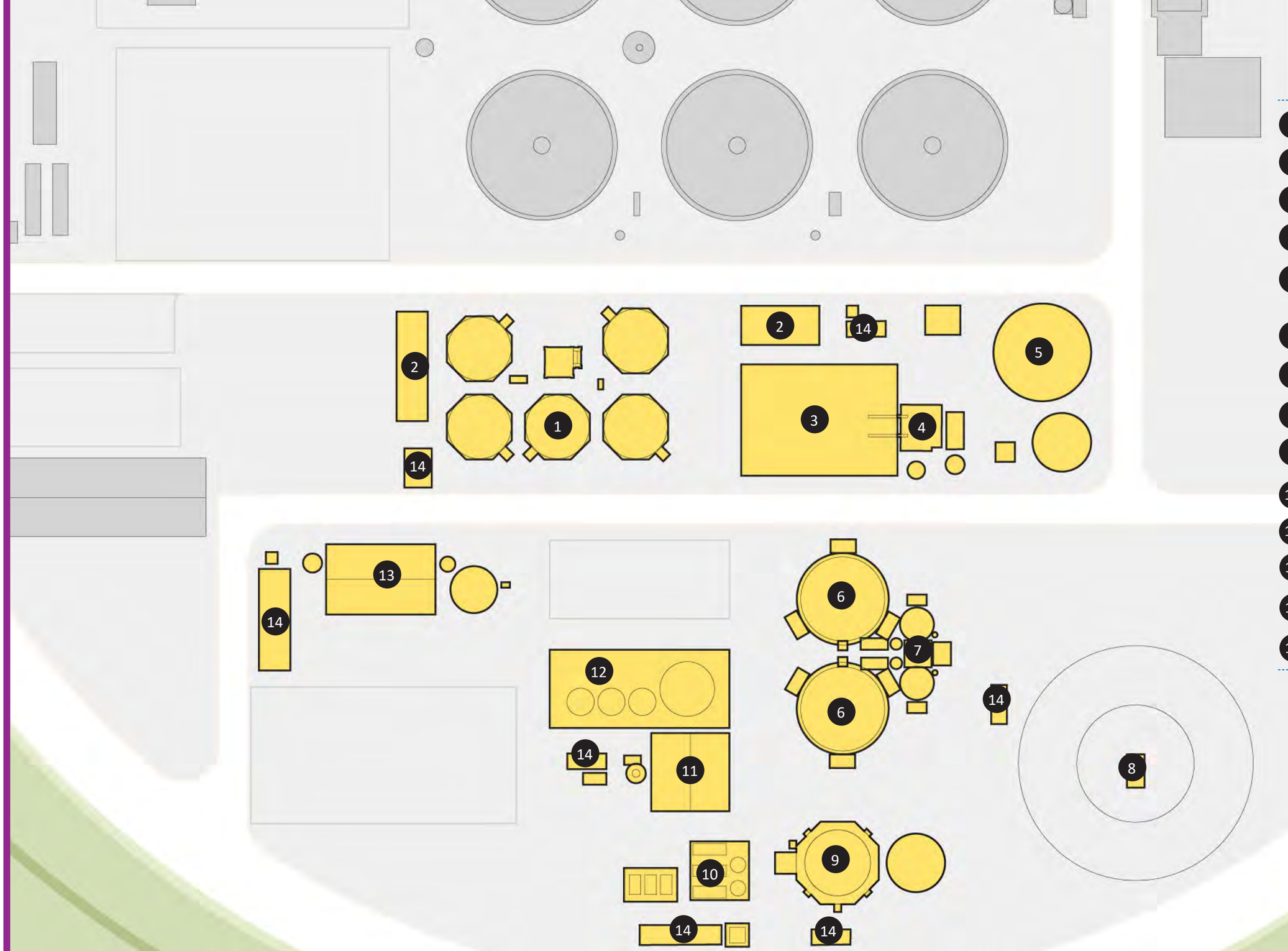
9.8.6 **Liquor treatment plant** - The water removed from the sludge during the dewatering process is known as centrate. This is discharged separately and either treated in a dedicated liquor treatment plant or returned to the Inlet Works for further treatment. Currently it is envisioned that a separate liquor treatment facility will be included. However, alternative solutions including nutrient harvesting continue to be evaluated for suitability and feasibility.

9.8.7 **Biogas storage and utilisation** - The biogas from the digestion process is stored in a gas bag and utilised on site to provide heat for the sludge digestion process. Excess biogas is cleaned-up using a biogas upgrading plant that removes impurities and enriched with propane for injection to the national gas network. The biogas system also includes a waste-gas burner that will be used to burn biogas in the event of a failure event on the site to protect personnel and the environment from potential harmful impacts associated with high concentrations of methane, in accordance with Environmental Permit requirements.

9.8.8 **Odour control plant** - Odour control plant will be provided within the STC to mitigate odour impacts. This is likely to comprise bio trickling filters followed by an activated carbon polishing unit.

Key

Sludge Treatment Centre



Key

1. Sludge Imports
2. Odour Control
3. Cake Barn
4. Dewatering
5. Liquor Treatment / Nutrient Recovery
6. Digesters
7. Post-digesters
8. Flare Stack
9. Gas Bag
10. Gas to Grid
11. Boiler House
12. HPH
13. Thickener Building
14. MCC

9.9 Sludge Treatment Centre Layout

9.9.1 The site layout has been designed in order to minimise where reasonably practicable the footprint of the STC and the pumping energy required by the process. The raw sludge holding tanks are located at the closest point to the Primary Settlement Tanks where the majority of thick sludges are generated on the WRC. The sludges are then pumped in a short loop around the STC to allow the process to be provided with heat, and for biogas and dewatered cake to effectively be utilised or exported from site.

9.9.2 The boiler and heat recovery plant are located adjacent to the HPH advanced digestion plant where heat is required.

9.9.3 The liquor treatment plant is located adjacent to the dewatering units where centrate liquors are generated and is also at the closest point to the WRC to minimise the pumping cost of returning to the process.

9.9.4 The gas utilisers (boilers, gas to grid plant, flare) have all been located in a compound at the south of the STC to allow an area of site where process safety considerations can be paramount and the associated risks carefully managed. Locating the gas to grid plant on the southern edge of site also minimises the length of the gas main connection into the national grid.

9.10 Sludge Treatment Centre Design Considerations

9.10.1 In addition to aligning with the Regulatory requirements, Anglian Water Services Limited's strategies and wider UK carbon reduction targets, the key considerations associated with the STC design are:

- STC capacity of 16,000 TDS (at Design Average Production Rates).
- Sludge produced is to be suitable for application to land (soil enhancer) with an enhanced treated product quality requirement – can be sold as Nutri-bio;
- Site heat to be provided from renewable means (biogas/ heat harvested from sewage/Combined Heat and Power (CHP)/other on-site processes);
- Biogas generated is to be used towards carbon neutrality target (CHP and alternate strategies, including the supply of biogas to the national grid or for potential use as fuel for the tanker fleet).

9.10.2 During the ROV process outlined previously, the areas evaluated were:

- Imports & Screening – Screening technology selection, type of sludge storage solution, mixing selection, type and number of screens/holding tanks.
- Sludge Thickening – Thickening technology selection.
- Digestion - Digester construction method, digester arrangement, digester material selection.
- Post Digestion – Post digestion technology and arrangement.
- Sludge Dewatering & Storage - Dewatering technology selection and cake storage solution.
- Liquor Treatment - Treatment or nutrient recovery, level of load returns to main process, technology selection.
- Biogas Upgrade – Biogas upgrade technology.
- Heat Generation & Recovery - Type of process heat generation, heat recovery arrangement.

9.11 Scale and Appearance

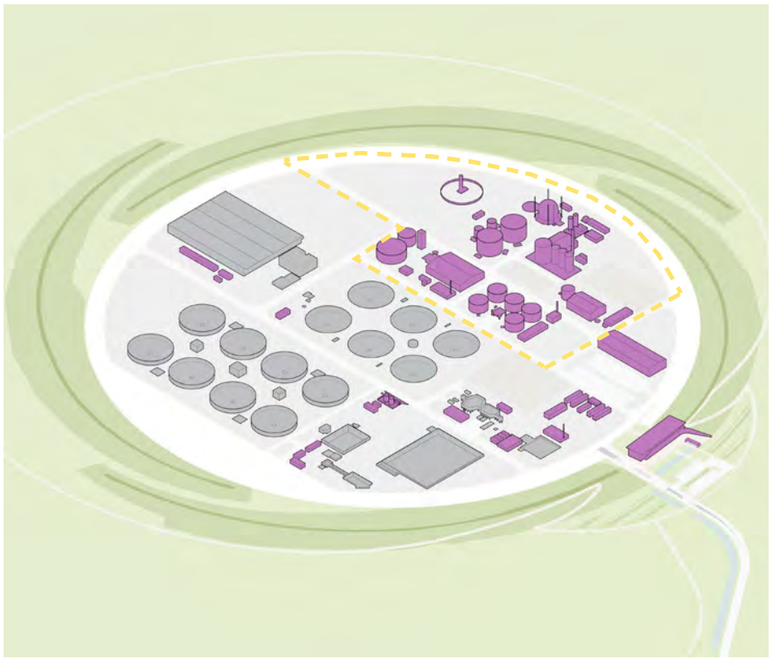
9.11.1 The STC is predominantly comprised of a series of variable sized vertical tanks and industrial building structures, as well as a membrane biogas holder and control kiosks.

9.11.2 The site-wide colour strategy will be applied to the structures as discussed in Chapter 7. It is anticipated that the majority of the tanks will be made from glass-coated steel, which will be finished in a colour to adhere to the colour strategy. The smaller structures, such as the control kiosks, will be finished in metal or plastic. The membrane of the biogas holder will also be selected to be in keeping with the site strategy.

9.11.3 The digesters are the tallest component on the proposed WWTP site, and will therefore be the most sensitive from a visual impact perspective. The digesters will be made of out glass-coated steel or concrete, the design for which will be finalised at detail design stage. The site-wide colour strategy will be applied, such as selecting a self-finishing colour for the steel or considering over-cladding of the structure.

9.11.4 The buildings such as the thickener building, boiler house and cake barn are likely to be steel framed building with metal cladding panels.

9.11.5 The surface grain and texture for all materials will be selected at detailed design stage. The preference is to use sinusoidal metal profiles rather than flat smooth surfaces as these reflect light in a more varied way to visually break up the surface of the large structures.



Gateway Building

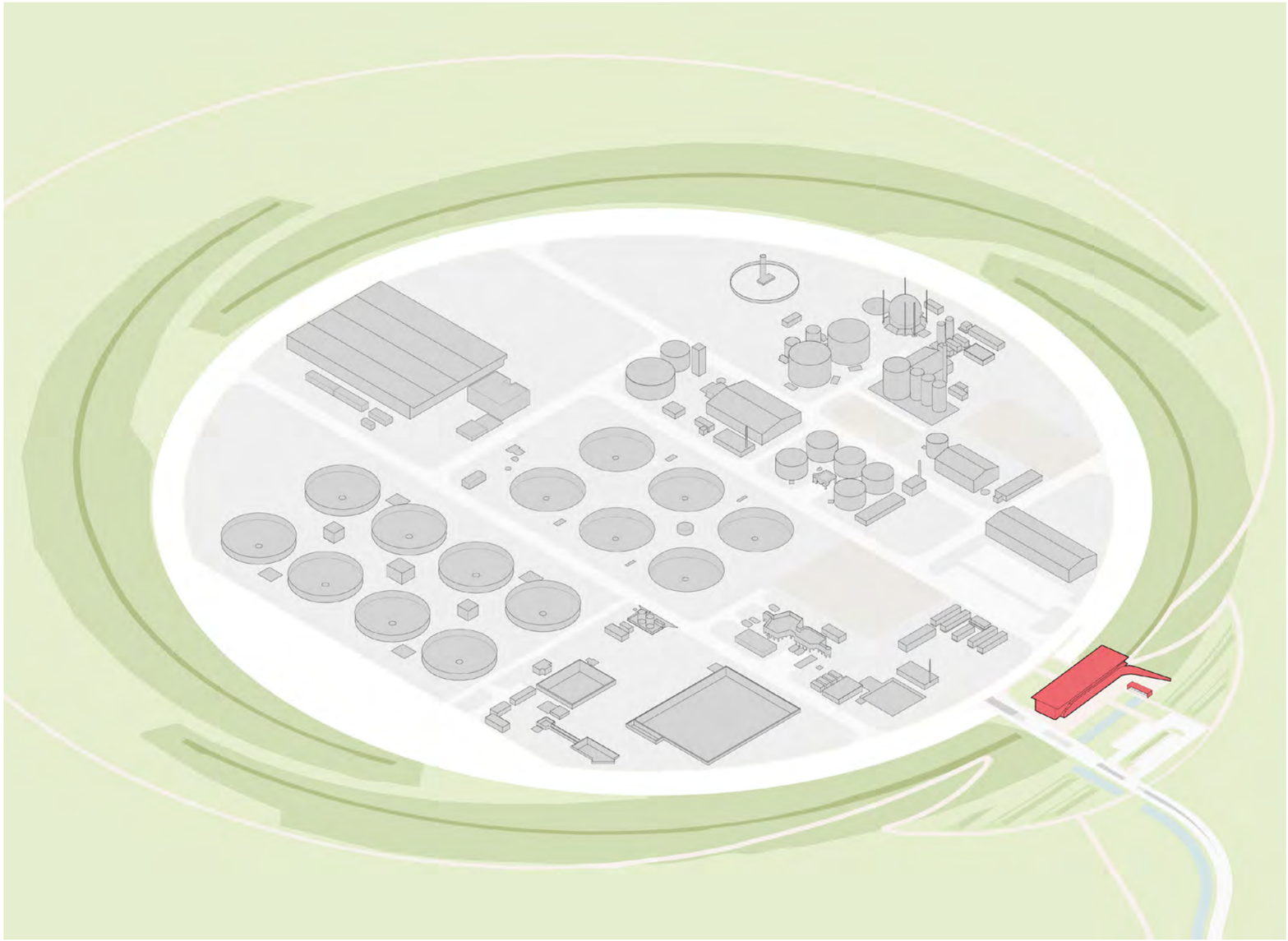
9.12 Gateway Building Overview

9.12.1 The Gateway Building has multiple roles within the masterplan of the CWWTPRP. It provides a welcoming arrival point for workers and visitors, monitors and controls access into the secure works site, and permits level access (at first floor) onto the earth bank as part of the discovery route around the landscape.

9.12.2 The building provides an identifiable focal point as the place of entry, both through the building's form and its use of materials. Its visual and functional integration into the earth bank will assist with its integration within the sculpted landscape, aligning with the aspiration to create a piece of landscape in the green belt, and not an urban architectural 'statement'.

9.12.3 The Gateway Building's public function requires it to reflect the status of the project as Anglian Water Services Limited's flagship WWTP and embody high quality design, including excellent levels of sustainability.

9.12.4 The form and materials of the building pick up on clues from the existing and proposed landscape; the earthy ground floor grows out of the earthwork, the vertical emphasis of the timber fins relate to the new planting, and the horizontal roof relating to the strong horizon typical of fen-edge landscapes.



9.13 Gateway Building Design Concept

9.13.1 The building is conceived as an extension to, and termination of, the earth bank. The rectangular geometry of the facility sits at a tangent to the circle of the 'rotunda' earth bank. The permanent access road sits at the centre of the circle due west of the proposed WWTP. The Gateway Building is oriented 7° off the centreline axis, as means of dislocating the geometry of the building from the road infrastructure and therefore improving the relationship of the building and visitor car parking with the landscape setting.

9.13.2 The building has a simple rectilinear form, which is approximately 50m wide, 16m deep and 8m tall. The volume is visually broken down to integrate with the landscape.

9.13.3 The ground floor of the structure is similar in height to the earth bank and is articulated as an apparently heavier element, which retains the side of the sloping ground. The top of the earth bank is approximately 5m high and slopes down to meet a terrace at first floor.

9.13.4 The first floor of the building is visually lighter in appearance. It sits as a pavilion above the earth bank, and in place of the planting on the top of the earth bank.

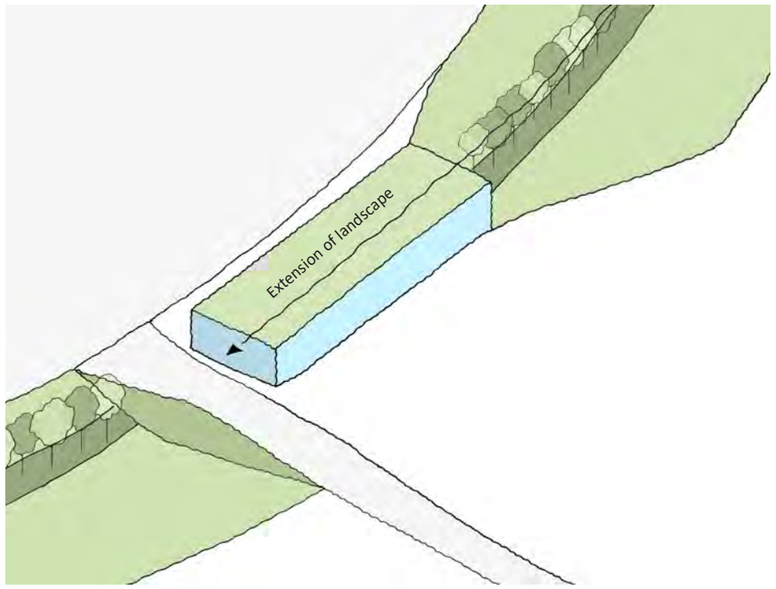
9.13.5 The building acts as the security line along the boundary of the proposed WWTP, in lieu of security fencing. The main circulation spine is at the centre of the building, providing a 'front' both inside the secure boundary of the proposed WWTP for workers, and outside for visitors.

9.13.6 The two-storeys of office accommodation is adjacent to the permanent access road into the site, providing overlooking and passive surveillance of the weighbridge and gates into the proposed WWTP.

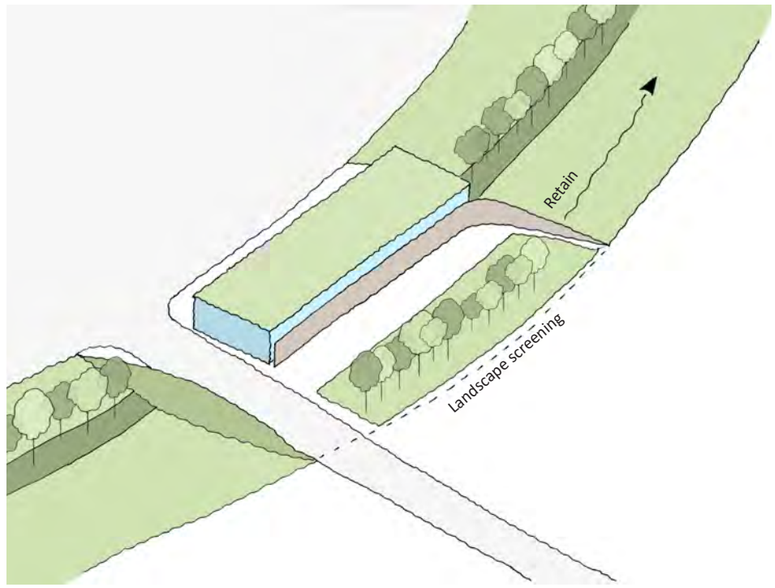
9.13.7 The Discovery Centre is located at first floor, offering views both into the proposed WWTP and out to the landscape. The space spills out onto a south-facing terrace on top of the earth bank, and acts as the start and end point for the discovery route out into the landscape.

9.13.8 The flat roof on the building maximises the available area for PVs across it's entire area. The roof will be a blue / green roof to assist with water attenuation and assist biodiversity.

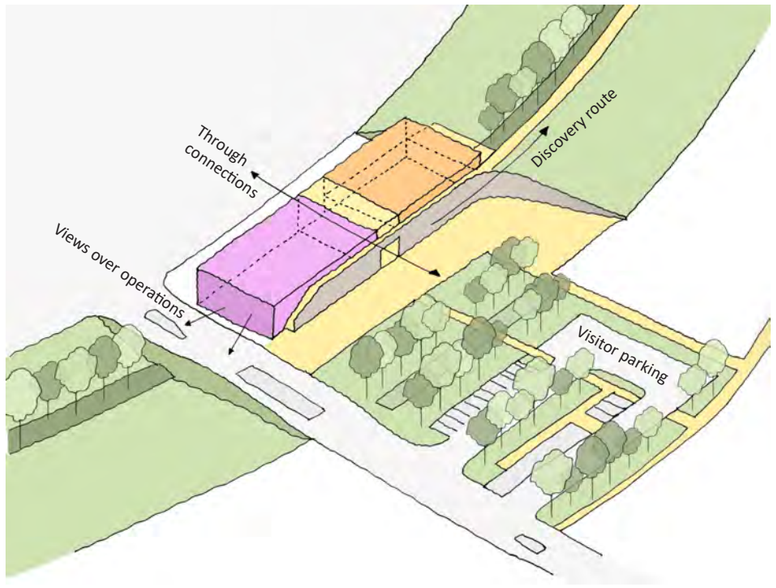
9.13.9 The plant equipment is located at ground floor adjacent to the earth bank, in the darkest location.



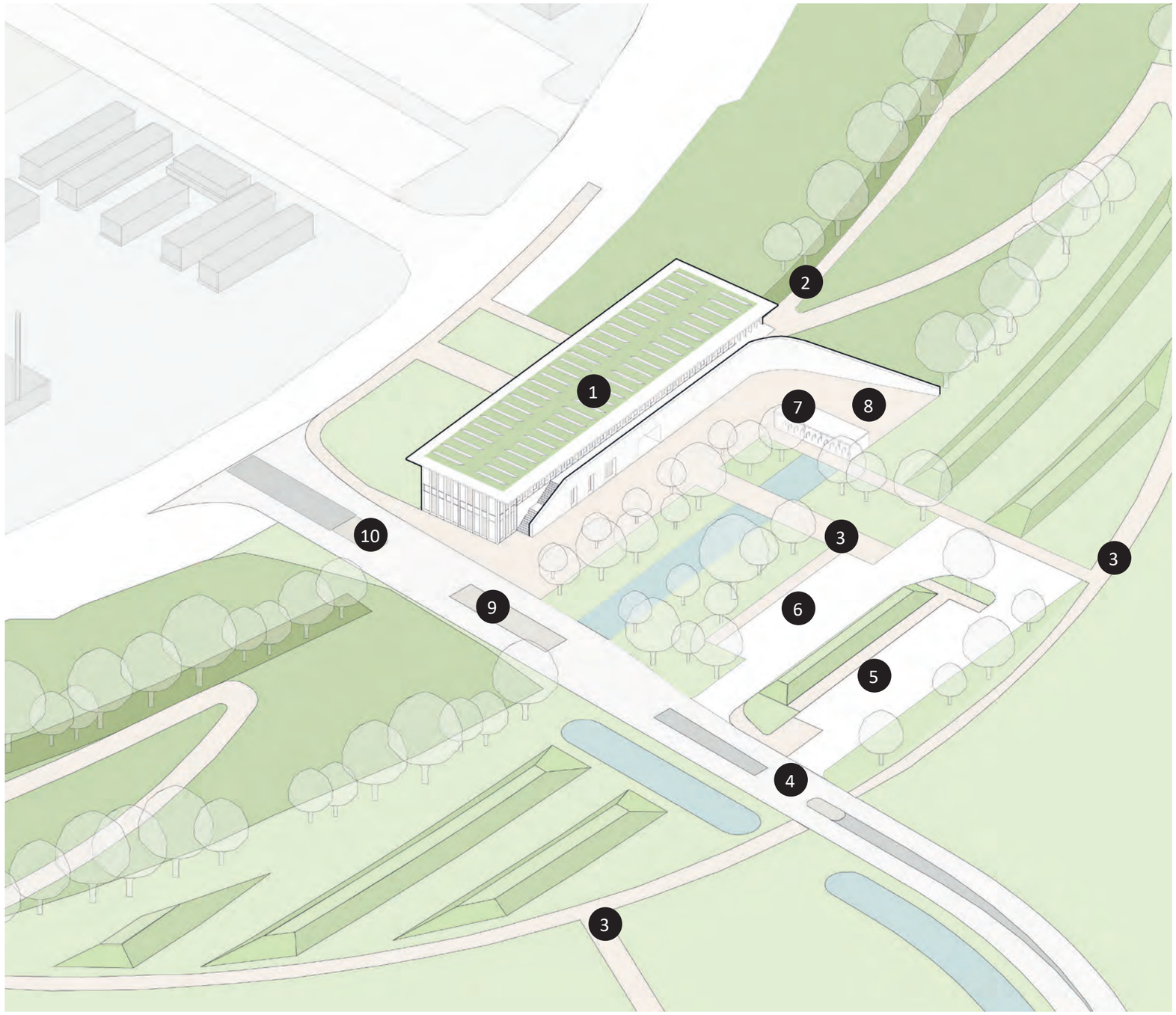
Building to be perceived as an extension of the earth bank.



Natural retaining wall to screen the building and retain the earth bank, with landscape screening in front of the building.



Organisation of functions to respond to the context, with visitor car parking set in the landscape outside the line of the earth bank.



Key

1. Gateway Building
2. Access to Earth Bank Path
3. Pedestrian Path
4. Primary Access Road
5. Coach Drop Off
6. Visitors Car Park
7. Bike Stores
8. External Seating Area
9. Weighbridge
10. Security Checkpoint

9.14 Gateway Building Facilities

9.14.1 The Gateway Building serves both public and private functions within a compact two storey structure to minimise the footprint of the building in the landscape. Circulation within the building will be organised to minimise cross-overs with the public-facing elements.

9.14.2 The building will be the main hub of the proposed WWTP for operational workers, providing offices, meeting spaces and welfare facilities. The blend of facilities will be adapted to suit the operational requirements.

9.14.3 It is envisaged that there will be two different organisations sharing the building; those associated with the WRC and STC respectively. The office spaces have therefore been divided between ground and first floor.

9.14.4 The Discovery Centre (located in the south end of the building at first floor) will deliver scheduled educational visits for people of all ages. It will facilitate views into the proposed WWTP works, as well as exploration of the earth bank and the surrounding landscape via a network of paths.

9.14.5 M&E equipment to serve the building will be contained within the building envelope, as far as reasonably practicable, to minimise visual impact of mechanical equipment on the landscape.

9.14.6 Dedicated visitors car and coach parking will be located outside the secure boundary of the proposed WWTP to maximise the safety of visitors who will be unfamiliar with the operations of the site. The car park will be set in the landscape, and will be screened to retain the rural feel of the site. Pedestrian access from the car park to the building will be via a sheltered route through the landscape, away from operational vehicles.

9.14.7 Covered cycle parking for visitors and workers will be situated in the landscape in front of the building, directly off the main access path. Its proximity to the building will provide passive surveillance of the cycle shelter.

9.14.8 An external seating space within the landscape will be provided for workers and visitors to use.

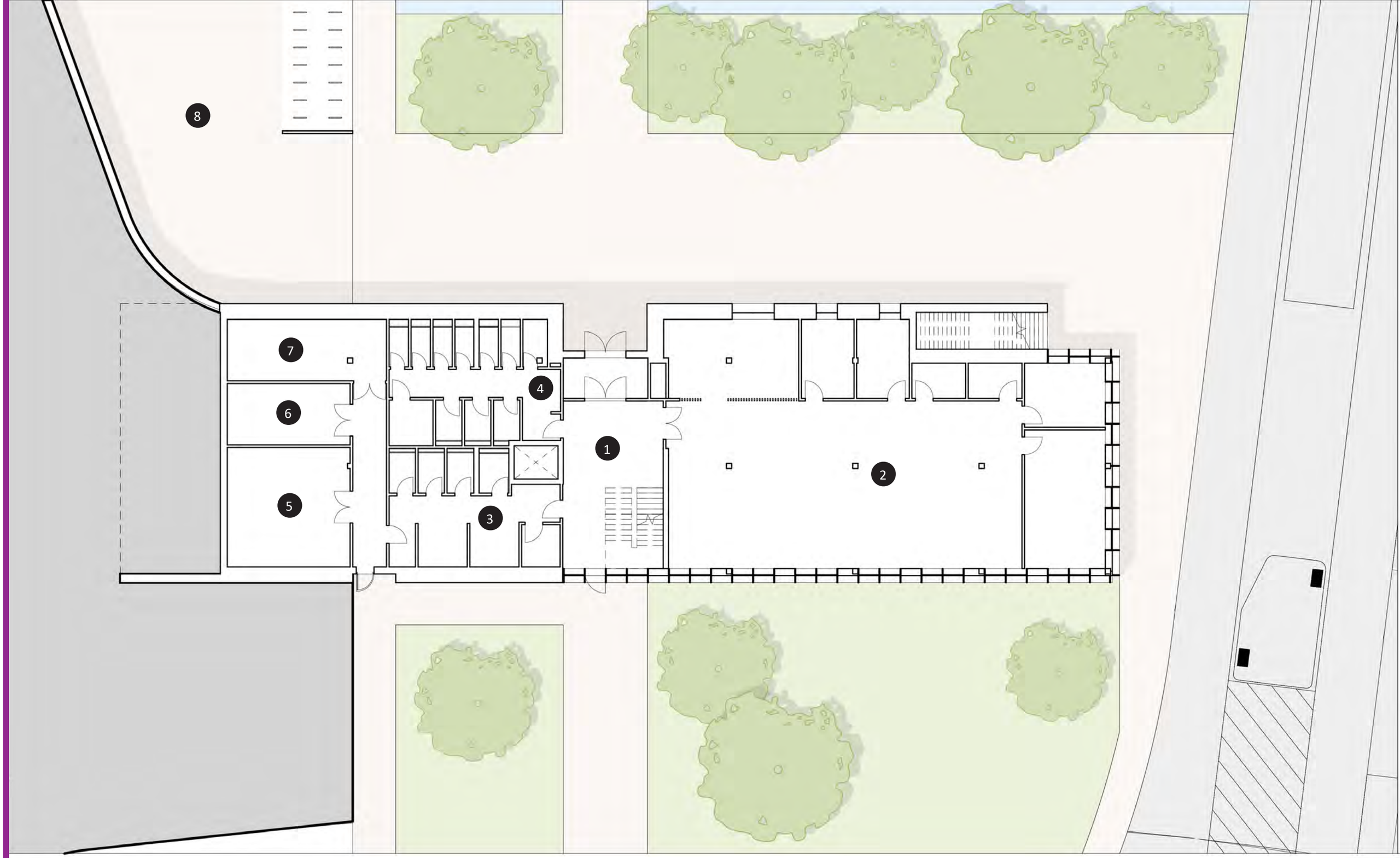
9.15 Visitor Experience

9.15.1 All visitors, whether they arrive on foot, by bike, car, or school bus, will arrive in the landscaped area in front of the main entrance.

9.15.2 The main entrance for visitors is in the middle of the building, directly addressing the landscaped forecourt. A shared circulation stair for the building leads up to the Discovery Centre, which will provide a self-contained unit through a set of double-doors directly off the central circulation space. This means that the only accommodation shared between visitors and office workers is the central circulation stair.

9.15.3 The Discovery Centre will contain all amenities required to facilitate education visits. This includes meeting rooms which can be combined through movable walls to create one large working space, along with associated storage, locker areas and WCs.

9.15.4 An external landscaped recreation area at ground floor, which is semi-enclosed by the retaining structure against the earth bank, provides a seating area for workers and visitors to eat lunch away from the proposed WWTP works.



Key

1. Lobby
2. Office
3. Messing Facilities
4. WCs and Showers
5. Air Handling
6. Water Tanks
7. LV Switchroom
8. External Seating Area

N

Key

9 Exhibition
10 Meeting Rooms
11 Offices
12 WCs
13 Store
14 Discovery Centre
15 Covered Terrace

N

9.16 Gateway Building Material Strategy

9.16.1 The Gateway Building sits in the line of the earth bank, and is to be perceived as a building within the landscape. It will therefore have its own material strategy that is separate from the site-wide colour strategy for the engineering structures.

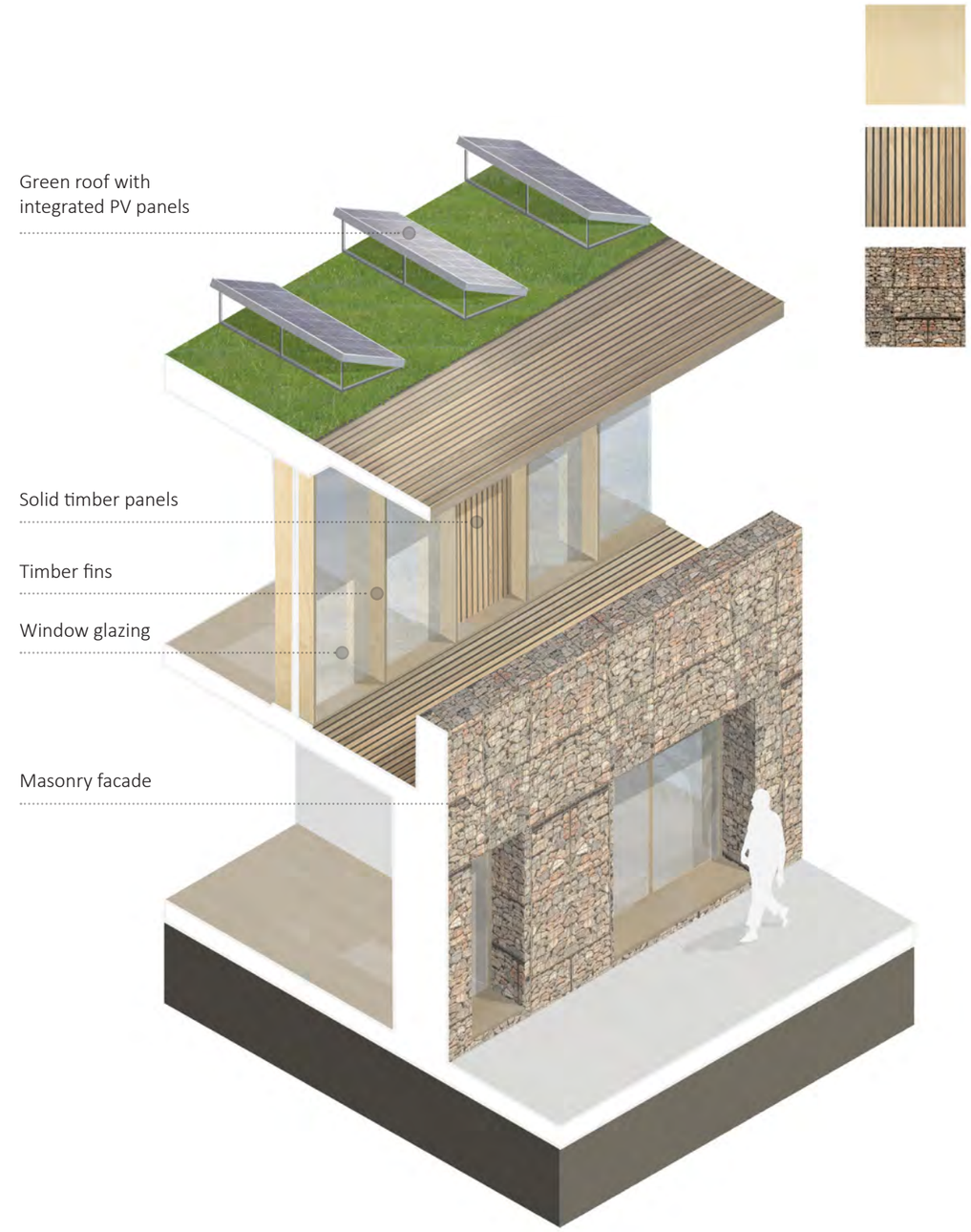
9.16.2 The CWTTPR team has pursued an aesthetic of ‘natural materials’, in line with the landscape-led approach and in response to consultation feedback. The tone of materials will take cues from the local landscape, and materials will be sourced locally as far as is reasonably practicable.

9.16.3 On the west (front) elevation, the ‘heavy’ retaining structure at ground floor will be made from gabion walling or masonry. The lighter pavilion at first floor will be made out of timber or metal, which wraps around on both floors on the other elevations. Large panels of glazing will provide daylighting to the internal spaces.

9.16.4 Vertical fins on the pavilion structure will provide solar shading to the glazing along the east and west-facades. If additional solar shading is required, other passive measures will be explored at detailed design stage. The depth of reveal of the masonry facade will provide such protection to the glazing.

9.16.5 The overhang of the flat roof provides a cover to the walkway along the front of the building, and solar shading protection to south-facing glazing.

9.16.6 The adjacent images show a series of indicative colour and texture studies undertaken. The final palette of materials will be selected at detail design stage.



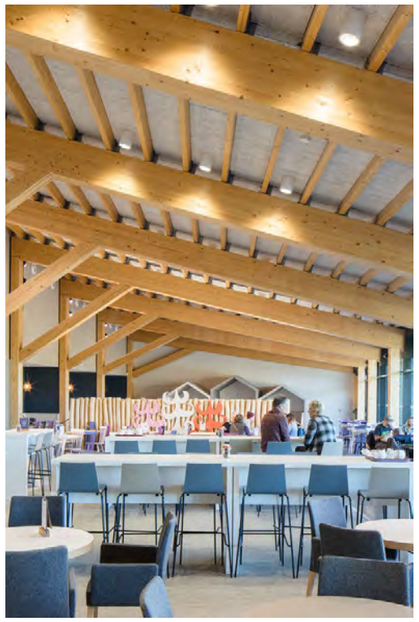
Colour palette options

West (Front Entrance) Elevation

East (Internal) Elevation

Precedent examples of buildings with similar form and materiality

Solrødgård Water Treatment Plant, Hillerød, Denmark



Gloucester Services, Gloucester, UK

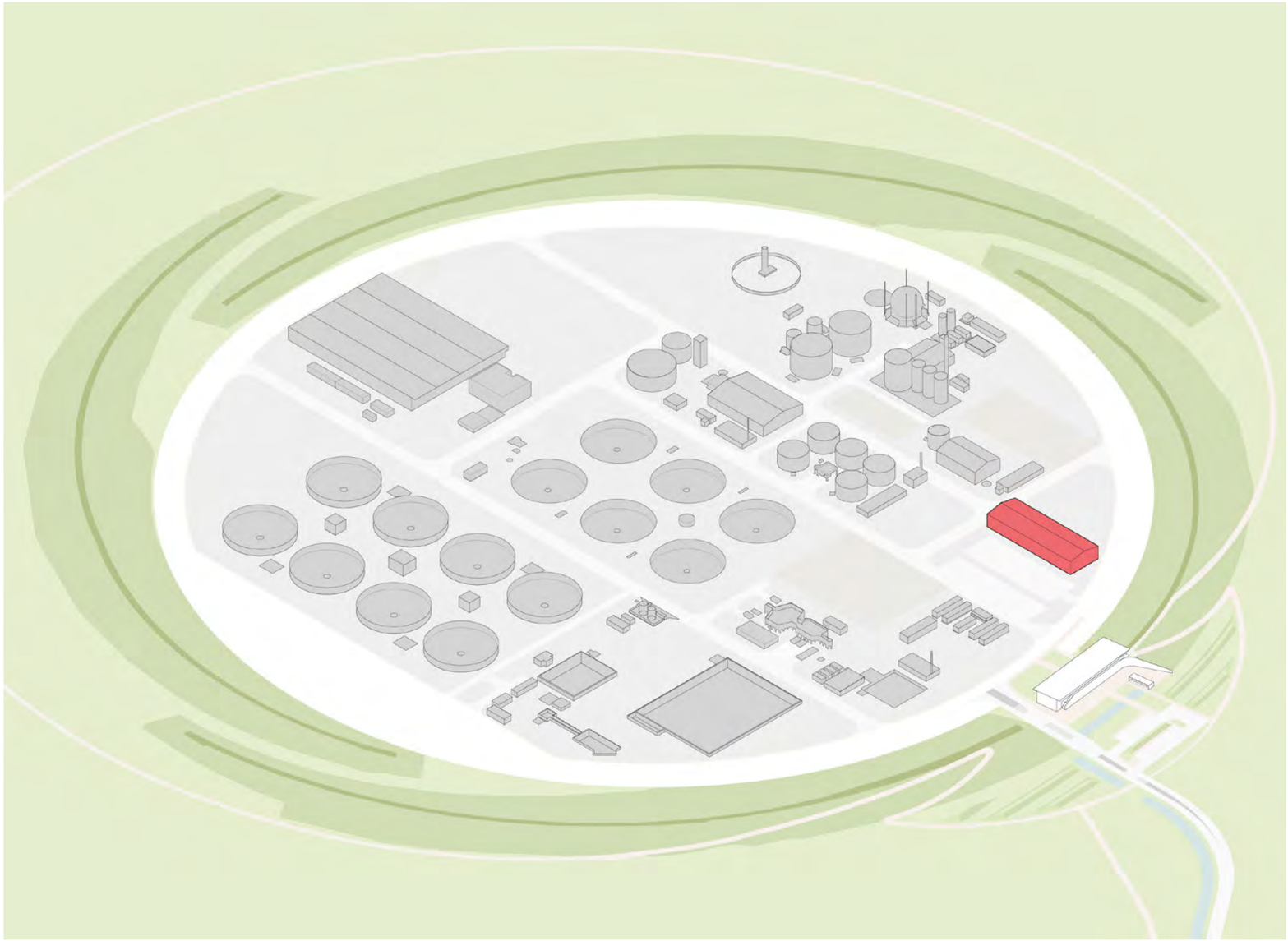
The Blackrock Police Training Centre, Bristol, UK

Workshop Building

9.17 Workshop Building Overview

9.17.1 The Workshop Building is a functional building within the 'rotunda', which will meet the operational requirements of the proposed WWTP.

9.17.2 As discussed in Chapter 7, the building is located directly adjacent to the staff car parking and within easy walking of the Gateway Building to simiplify circulation for workers within the proposed WWTP.



Key

Workshop Building

9.18 Workshop Building Concept

9.18.1 The Workshop Building has been designed to be rational and flexible to simplify adaptation to the evolving operational requirements for the proposed WWTP.

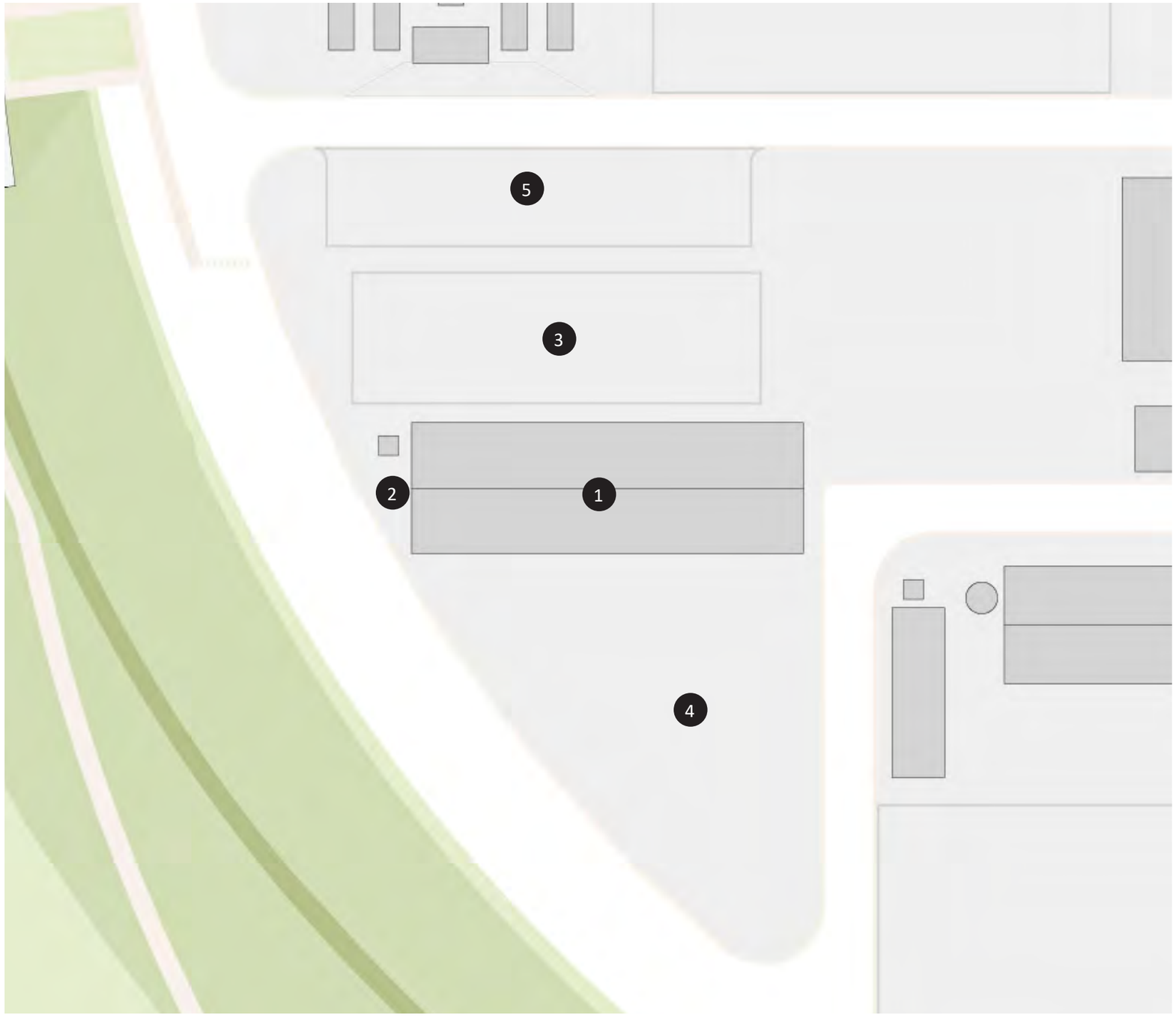
9.18.2 It is anticipated the building will have a steel portal frame structure. It is 15m wide, set by the requirements for the main workshop, and 60m long. The length of the building can be manipulated to suit operational requirements by extending the number of bays of the portal frame, within the extents of the road network on either side.

9.18.3 The building is orientated east-west along it's length and has a pitched roof to maximise the available area for PVs.

9.18.4 The spatial requirements of different functions in the building vary significantly, from WCs and showers to large-scale open-plan workshops. A palette of architectural components has been developed to satisfy this range of requirements.

9.18.5 Human scale doors and windows will provide access for workers and provide light to areas such as the kitchenette.

9.18.6 Large-format industrial doors will provide access to maintenance vehicles, and a high-level clerestory window will provide light to workshop spaces.



Key

1. Workshop Building
2. Entrance into Building
3. Staff Car Park
4. External Innovation Space
5. Lorry Park

9.19 Workshop Building Facilities

9.19.1 The Workshop Building facilitates the anticipated operational needs of the works and of Anglian Water Services Limited's general infrastructure. The building is designed to be flexible so it can adapt to the changing demands of the operational team over time.

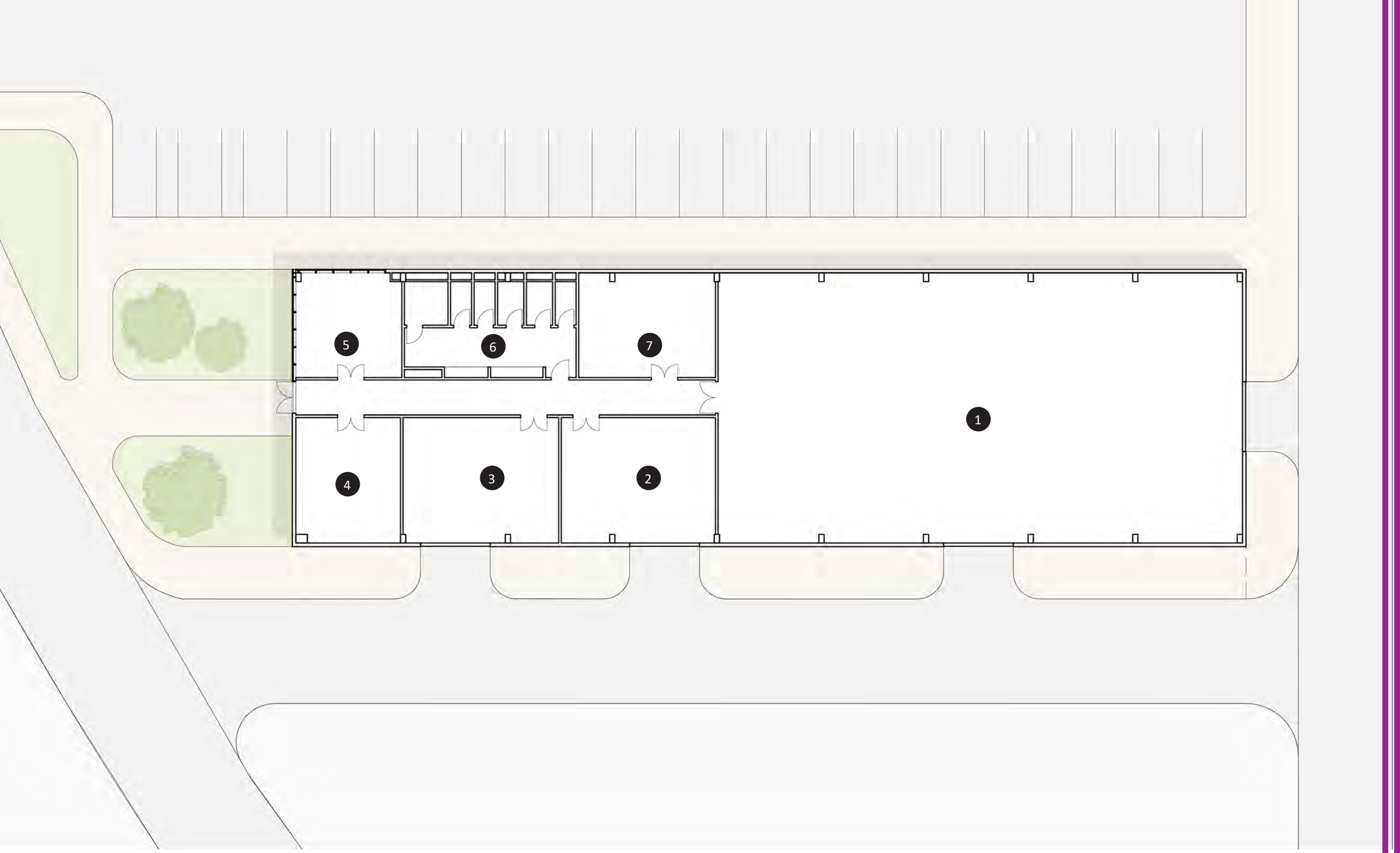
9.19.2 The building has a large maintenance workshop for maintaining the engineering works, and a smaller van maintenance bay for maintaining Anglian Water's fleet of vehicles.

9.19.3 The process laboratory allows the operational site team to carry out testing of various process elements, as required by Anglian Water Services Limited's discharge permit. It also allows the team to efficiently manage and optimise the site processes by having contemporary empirical data from the process streams.

9.19.4 The Innovation Space is provided to allow for new processes to be tested in a safe environment with no risk to site compliance or the wider environment. It also allows for optimisation of existing processes in a controlled environment.

9.19.5 A kitchenette space and messing facilities will be available for personnel working in the building.

9.19.6 Plant equipment to serve the building will be contained within the building envelope, as far as reasonably practicable.



Key

1 Workshop
2 Fleet Workshop
3 Innovation Space
4 Laboratory
5 Kitchenette
6 Messing Facilities
7 Plant

9.20 Workshop Building Material Strategy

9.20.1 As a structure within the earth bank, the site-wide colour and material strategy will apply to the Workshop Building. It has an anticipated eaves height of approximately 7.5m and ridge height of approximately 9m, and will therefore be coloured to visually integrate with the groundscape structures.

9.20.2 A simple, modular materials strategy for the building has been developed that can be adapted to suit the layout of the functions within the building, which will be cost efficient while maintaining visual interest.

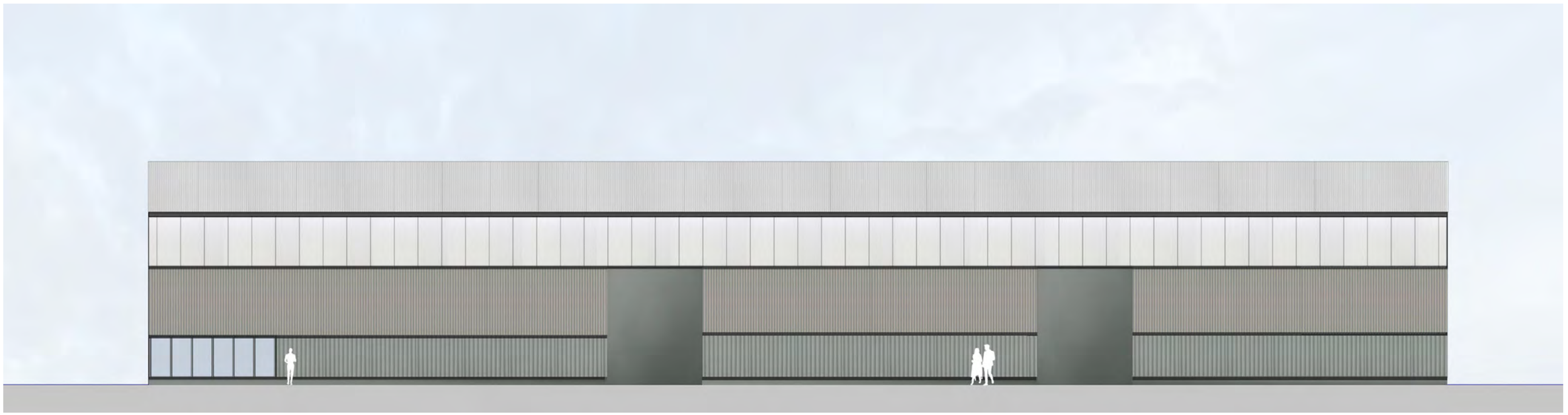
9.20.3 The elevation is banded horizontally to create a 3-tier facade, the heights of which are set by key datum heights of the architectural components. These include at the top of the human-scale entry doors, and the top of the industrial-scale doors.

9.20.4 Each tier will have a different grain and texture to create visual interest over a large surface area, given the scale of the building. It is anticipated that this will be achieved through the use of sinusoidal metal cladding, with each tier having a slightly different rhythm. The detail and orientation will be agreed at detailed design stage.

9.20.5 Human-scale windows at low-level will be glazed to allow light to enter the space, and opening lights will be introduced where appropriate. High-level clerestory windows into the workshop spaces are likely to be made from polycarbonate.

9.20.6 Accent colour will be used around thresholds to aid wayfinding. This can be achieved through the use of different colours around the different scale entrances to demarcate different zones.

9.20.7 Final materials selections will be made to be durable and low maintenance.

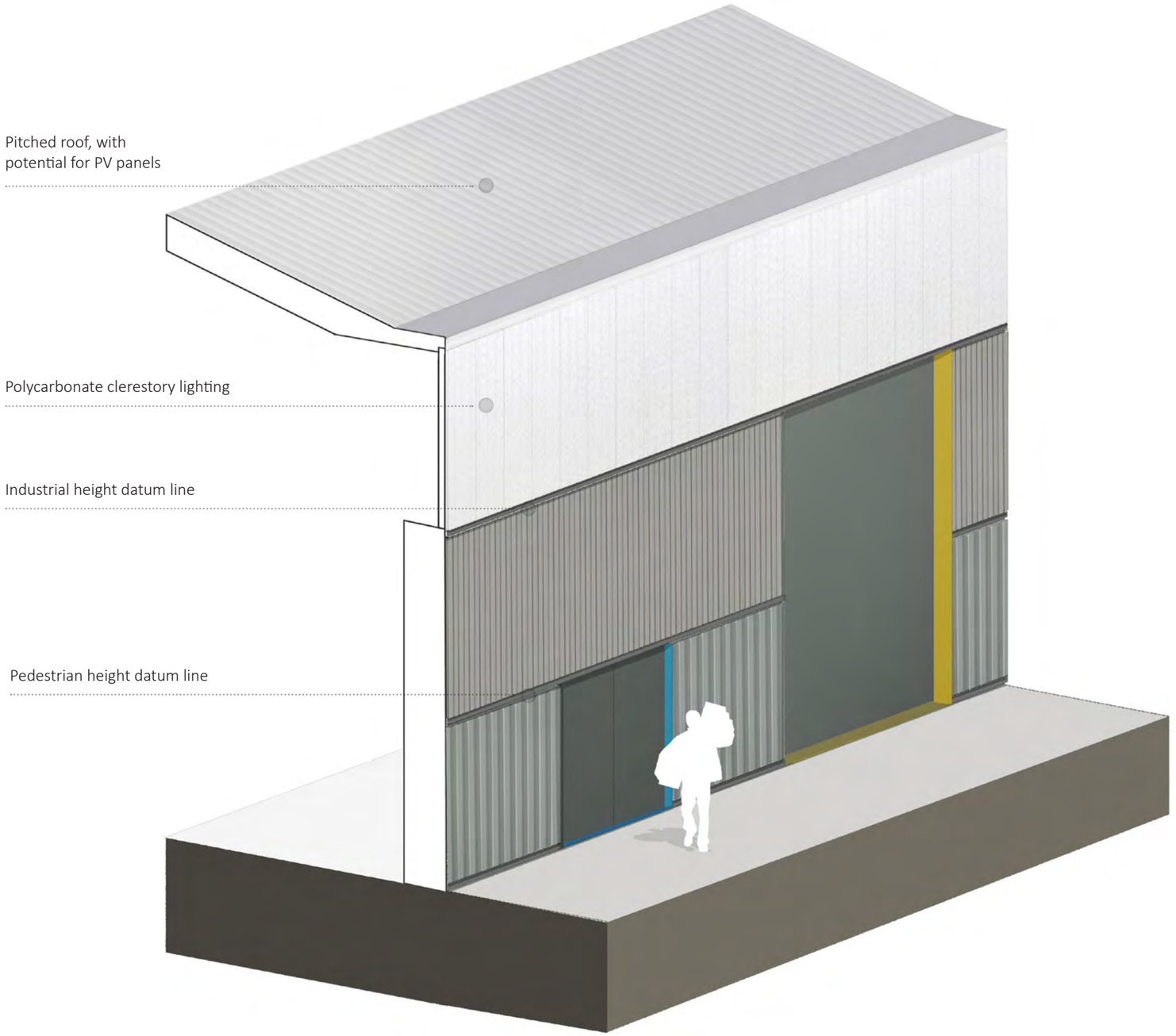


South Elevation

Precedent examples of buildings with similar form and materiality

Bloqs, Enfield, UK

JLR Engine Manufacturing Centre, Wolverhampton, UK



Lighting

9.21 Lighting

9.21.1 Road and task lighting will be provided around the proposed WWTP site to ensure the safety of operational staff and visitors. The lighting will be designed to minimise any off-site effects and use specifically designed down-lighting equipment that avoids light spillage and glare, with sharp cut off. The final lighting design will be confirmed during detailed design prior to commissioning of the proposed WWTP following the principles set out in the Lighting Design Strategy (Application Document Reference 5.4.2.5).

9.21.2 As a water industry facility, the minimum light design provision required to operate and maintain the Proposed Development are defined by the Water Industry Mechanical and Electrical Specifications (WIMES) 3.02(E).

9.21.3 Lighting will be designed to satisfy minimum light requirements to ensure the safety of people, while avoiding light pollution, sky glow and minimising light spill and glare. The following key lighting design principles will inform the detailed design:

- the lighting installation shall be designed on the basis of lowest life cycle costs;
- all lighting will be designed to point downwards and shaped to light the required areas only;
- a designer risk assessment will be used to remove or reduce permanent operational lighting from the Proposed WWTP's internal roads where possible, on the basis that the Applicant's operations staff can safely travel around most of the site after dark guided by vehicle headlights;
- task lighting will only be provided for those working areas where overnight reactive maintenance (not routine maintenance) or emergency repairs are is required, and where possible will be restricted in height to minimise visibility from outside the earth bank (although lighting on taller structures where access may be required will be visible if activated);
- all lighting of ground level walkways and internal accesses will be below 5m in height and below the height of the earth bank;
- pathway lighting will be provided where necessary to guide employees from the roadside (their van/truck) to the relevant task area/general inspection area. This will be controlled by passive infrared (PIR) sensors where possible;
- areas on top of tanks/structures (top of digesters) where lighting is critical for safety will be manually controlled to ensure that a PIR sensor does not time-out and switch-off whilst the employee is still on the tank;
- where lights are manual On/Off there will be an automatic reset from a daylight sensor each morning so such lights would only be on for one night in the worst case;
- lighting sources shall be selected to be aesthetically appropriate and to limit light pollution, improve energy efficiency and increase equipment longevity;
- all luminaires should lack UV elements. Metal halide, fluorescent sources should not be used;
- LED luminaires will be used where possible due to their sharp cut-off, lower intensity, good colour rendition and dimming capability;
- a warm white spectrum (ideally <2700 Kelvin should be adopted to reduce blue light component;
- luminaires should feature peak wavelengths higher than 550 nanometers to avoid the component of light most disturbing to bats;
- internal luminaires can be recessed where installed in proximity to windows to reduce glare and light spill;
- use of specialist bollard or low-level downward directional luminaires to retain darkness above can be considered. As these may cause glare, poor illumination efficiency, a high upward light component and poor facial recognition, their use should only be as directed by the lighting professional;
- column heights will be set to minimise light spill;
- only luminaires with an upward light ratio of 0% and with good optical control will be used – following ILP Guidance for the Reduction of Obtrusive Light;
- luminaires should always be mounted on the horizontal, i.e. no upward tilt;
- external security lighting should use both motion sensors and infra-red lighting with 30-minute timers;
- as a last resort, accessories such as baffles, hoods or louvres can be used to reduce light spill and direct it only to where it is needed;
- final design of street lighting required on a public highway, such as Horningsea Road, would be discussed and agreed with Cambridgeshire County Council as the Local Highway Authority with the aim to keep to a minimum and only placed for safety reasons;
- wherever possible, lighting installation components (lamps, control gear, luminaires, control systems etc.) shall satisfy the criteria detailed within the Energy Technology Criteria List' set by the Carbon Trust.

9.21.4 Lighting adjacent to the new access on Horningsea Road will be delivered in accordance with a design to be agreed with the local highway authority. This may include retrofit of adjacent lighting columns if appropriate and will meet safety and balance environmental effects, using soft, directional, downward facing lights, using bats as an indicator species.


P.RV 30

10.

Connecting Infrastructure

10. Connecting Infrastructure

'There is a need to generally maintain, extend or improve the infrastructure of varying ages, some of which dates back to Victorian times. Where appropriate, the replacement of infrastructure in poor condition, or at the end of its life cycle, particularly in large towns and cities, may also need to occur.' - *para 2.3.11 NPS*

10.1 Introduction

10.1.1 The associated off-site development required to support the CWWTP Relocation Project includes the following:

• **Transfer Tunnel** - A Transfer Tunnel to transfer wastewater from the existing Cambridge WWTP to the proposed WWTP including a connection to the existing 'Riverside' sewer tunnel that conveys wastewater from the Cambridge catchment to the existing Cambridge WWTP.

• **Diversion of existing pipelines** - The diversion at the existing Cambridge WWTP site of existing pipelines that currently convey wastewater directly to the existing Cambridge WWTP from around the Cambridge region so that their combined flows are conveyed to the proposed WWTP via the new Transfer Tunnel instead.

• **FE and Storm Pipeline** - Two gravity pipelines to transfer treated wastewater and settled storm effluent from the proposed WWTP to a new Outfall structure located on the River Cam.

• **Waterbeach Pipeline** - Two new pipleines (rising mains) to transfer wastewater from Waterbeach, initially to the existing Cambridge WWTP and subsequently to the proposed WWTP.

10.1.2 The majority of the infrastructure related to the connecting infrastructure will be below ground, including the new Transfer Tunnel and pipelines, however some aspects will be visible at ground level and will in some instances require above-ground installations and access.

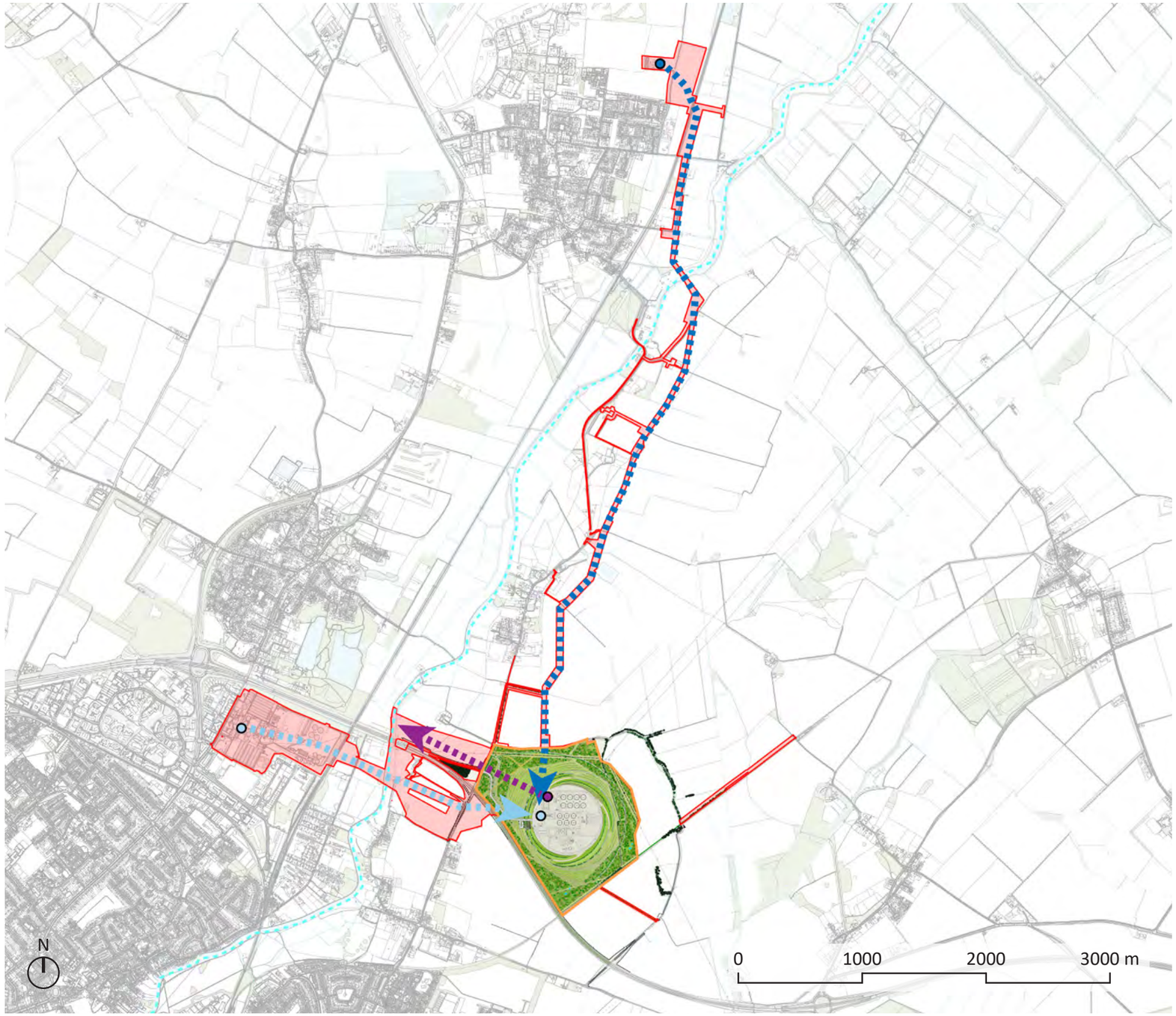
10.1.3 The facilities requiring access include:

• The interception shaft associated with the connection of the new Transfer Tunnel to the existing Riverside sewer at the existing Cambridge WWTP site, including an above ground ventilation column and adjacent odour control installation.

• A number of manholes along the route of a new sewer at the existing Cambridge WWTP to collect flows for diversion to the Transfer Tunnel and potential chemical dosing facility associated with the diversions.

• The Outfall structure to the River Cam, and at manholes along the route of the FE and Storm pipeline.

• Chambers along the route of the Waterbeach Pipeline for air valves and isolation valves.



Key

- Scheme Order Limits
- Proposed WWTP Site
- Transfer Tunnel
- Terminal Pumping Station
- Waterbeach Pipelines
- Outfall Pipelines
- Water Discharge Outlet

10.2 Transfer Tunnel and Associated Shafts

10.2.1 The wastewater currently arrives at the existing Cambridge WWTP via the following:
- a 2.1m diameter 'Riverside' sewer tunnel that is the main incoming sewer conveying wastewater from across Cambridge for treatment at the existing Cambridge WWTP.
- a number of other buried pipelines with diameters ranging up to 450mm conveying either pumped flows from pumping stations in the catchment or gravity flows from development in the vicinity of the existing Cambridge WWTP.

10.2.2 The flows in the Riverside sewer tunnel will require interception at a new shaft located at the existing Cambridge WWTP and a sewer tunnel extension to transfer the flows to the proposed WWTP.

10.2.3 It is proposed to construct the Transfer Tunnel extension using a 'pipejacking' method and this will involve the construction of two permanent shafts (one at the connection to the Riverside sewer and the other at the end of the tunnel that will form the TPS), as well as other intermediate temporary shafts located along the 2.4km tunnel route that will be required for construction purposes.

10.2.4 The tunnel alignment, and the positions of the temporary intermediate shafts have been determined to accommodate surface and sub-surface constraints as well as the geology and the topographic features including crossings of the River Cam, main-line Railway and the A14. The tunnel has been designed to be as straight as possible whist taking into consideration of these constraints to minimise H2S release. Pipejacking was chosen as the lowest carbon and most practicable solution over conventional tunnelling tequniques. It also gave greater assurance about aquifer and ground water protection over using a tunnel boring method that would require secondary containment.

10.2.5 The spacing of the shafts was determined by attaining maximum length between shafts but still making sure the buildability and resilience in design to give confidence the micro tunnel boring machine or pipe jacking system wouldn't fail and need to be retrieved in an unplanned way. Industry expertise within the CWWTPR team from both design and construction was utilised to guide this length of tunnel between shafts.

10.2.6 The placement of the intermediate shafts was done in a conscious and deliberate way to create as minimal likely significant effects to sensitive receptors. The original ideal location for shaft 4 was close to the residence at Red House Close. Following consultation feedback and further design challenges, the Applicant was able to move the shaft 4 location further east to significantly reduce the construction and remediation impacts at that receptor without compromising the assurance of tunnel delivery.

10.2.7 Shaft 3 is currently proposed to be constructed and used within the existing Cambridge WWTP so will cause no impact to any sensitive receptor as access will be through the existing Cambridge WWTP entrance. Shaft 5 is positioned approximately 450m away from its nearest receptor to the West and approximately 300m from its nearest receptor from the east but that has tree screening and a busy road between it and the receptor.

10.2.8 All the intermediate shafts will be back filled and raised to the ground and returned to the same condition as to before they are constructed. Initial requirements for vent stacks and access have been designed out to minimise the impact on nearby receptors and land owners/occupiers.

10.3 Ventilation Facility

10.3.1 The interception shaft for the Transfer Tunnel extension will require a ventilation facility to allow air to enter and exit the tunnel. The ventilation facility will control the airflow and, in some instances when required, reduce odour levels. The facility will include a permanent ventilation column extending to a height of up to 10m above ground level and an adjacent filter installation at ground level for odour control.

10.3.2 The installation will require access for a vehicle (eg: 10ton 'Hiab' truck or equivalent) to maintain the infrastructure and replace the carbon filter when required.

10.4 Diversion of Existing Pipelines

10.4.1 The existing rising mains and sewer that currently discharge to the existing Cambridge WWTP will need to be diverted so that their flows are discharged to the new interception shaft instead and conveyed via the Transfer Tunnel to the proposed WWTP for treatment. Diversion of these existing services will involve construction of a 750mm diameter sewer within the boundary of the existing Cambridge WWTP site to collect the diverted flows and convey them to the new interception shaft.

10.4.2 The new 'collector' sewer will be constructed using open cut trench excavation as well as trenchless techniques where the route crosses existing infrastructure that will need to remain in operation during construction.

10.4.3 The objective of the new Transfer Tunnel and pipeline diversions is to free up as much of the existing Cambridge WWTP site as possible to allow future re-development of the site to proceed.

10.4.4 Initial designs of the collection sewer were to install it in the carriageway or cycleway on Cowley road outside the entrance of the existing Cambridge WWTP. To reduce impact on the current users of Cowley road, the main carrier pipe has now been brought inside the boundary of the existing Cambridge WWTP. The design now only has connection points that go into Cowley road that will cause minor disturbance to the use of that road (HGV parking and Cycling connection from Milton).

10.5 Dosing Facility

10.5.1 Dosing currently takes place at several places in the network, typically at pumping stations, and is required to control septic conditions which cause odours and corrosion problems in the sewer network.

10.5.2 To allow the level of dosing to be enhanced in the flows entering the Transfer Tunnel at the interception shaft it is proposed that provision is made for an additional dosing facility to be located at the upstream end of the new collector sewer.

10.5.3 To minimise visual impact a containerised dosing installation is proposed in order to control the septicity of the diverted flows at the existing Cambridge WWTP. The dosing facility will require the following facilities:

- Dosing container (approximately 6m long by 2.5m wide and 3m high)
- Dosing system
- Electrical supply and control kiosk
- Safety shower and water supply

10.5.4 The facility will require HGV access for tankers to fill the dosing container.

10.6 Waterbeach Pipeline Design

10.6.1 A new 8.4 km long pipeline will be installed as part of the CWWTPRP from the Waterbeach New Town ("The New Town") development area to the existing Cambridge WWTP.

10.6.2 The new pipeline is required to support the build out of the New Town as there is insufficient capacity at the existing Waterbeach Water Recycling Centre (WRC) to accommodate the full flows from the development which when complete will have some 11,000 new homes with associated employment, retail, community and leisure uses.

10.6.3 The new pipeline will transfer waste water flows from both the New Town and the existing Waterbeach catchment to the existing Cambridge WWTP and ultimately the proposed WWTP for treatment.

10.6.4 The Waterbeach pipeline will comprise twin 500mm diameter pipes of PE material, the sizing of which is based upon the total predicted flows from both the New Town development and existing catchment.

10.6.5 Generally, the working corridor for the pipeline will be 30 metres in width. A wider corridor is shown on the Works Plans at the major infrastructure crossings ie the River Cam, the A14 and the railway, to provide flexibility in respect of the exact crossing point location. There are also a number of localised temporary laydown/storage areas.

10.6.6 The pipeline will be located at an average depth of 2-5 metres below ground level except where it passes beneath the River Cam, larger drainage ditches, the A14 and the railway where it will be a maximum of 20 metres deep. The exact depth will be determined through further, more detailed design including confirmation of the construction techniques and agreement with the owner of the feature being crossed under.

10.6.7 The pipeline will be installed through a combination of construction techniques primarily open cutting and Horizontal Directional Drill (HDD). Pipejack micro tunnelling will be used for the southern railway crossing.

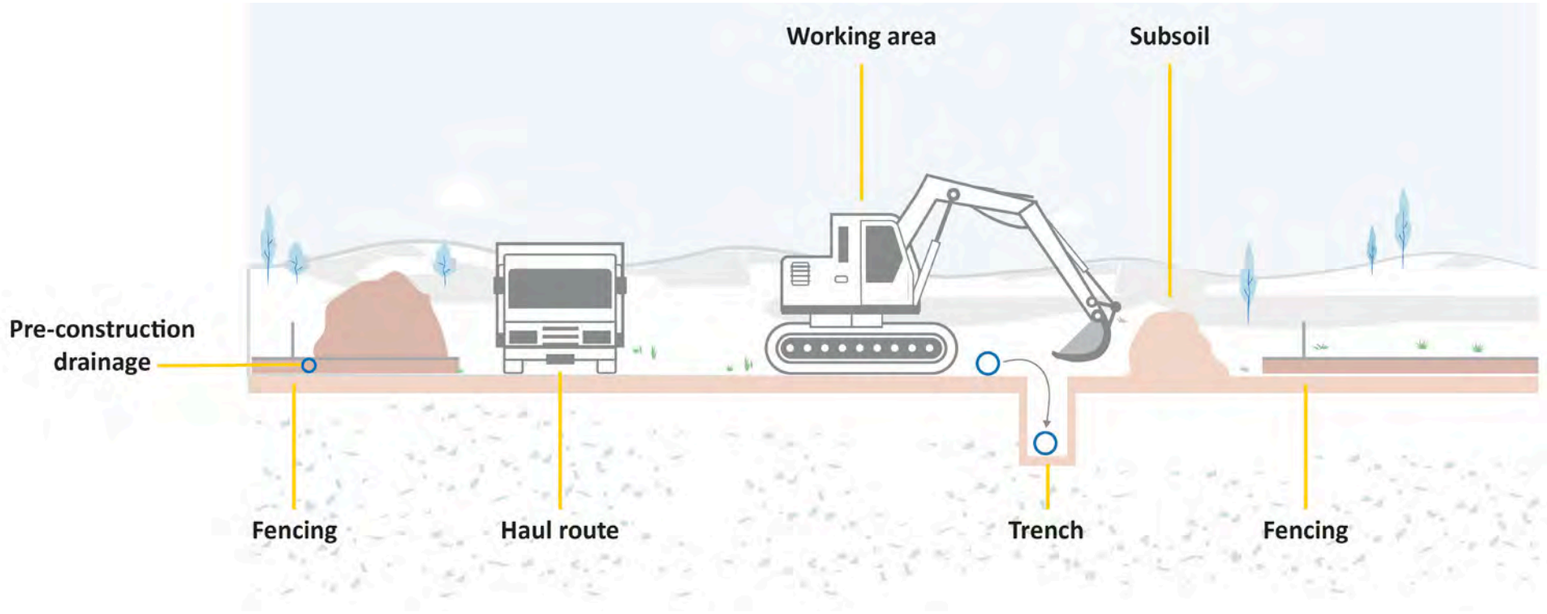
10.6.8 Where HDD is used a series of drill pits will be required. The final location of these will be dependent upon the length of the drill shot being undertaken. These will be backfilled once the drill shot is complete.

10.6.9 Where the pipeline is installed by open cut techniques, the topsoil and subsoil will be stripped and placed to one side of the working corridor whilst a trench in which to lay the pipeline is cut. This will then be back filed, and the topsoil reinstated.

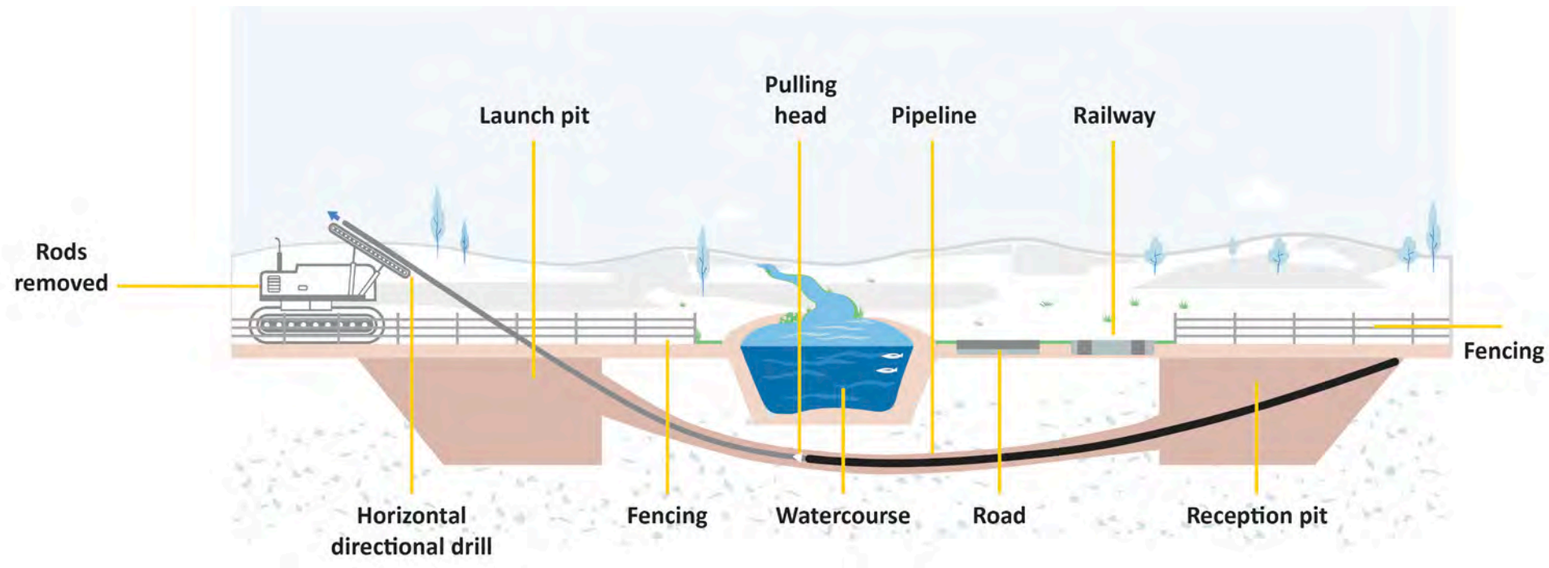
10.6.10 The only above ground permanent infrastructure associated with the Waterbeach Pipeline will be a series of air valves. The valves are used to remove air from the pipeline before it is commissioned and as required during operation. The final number of air valves is still to be determined, and it is expected to be in the region of 38 (19 per pipe). Post and rail fencing will be installed around the manhole if required, for instance where it is located away from a field edge, to ensure the manhole is protected during farming activities.

10.6.11 Once the Waterbeach Pipeline is operational, access will be required to the air valves for maintenance purposes and to the pipeline in the event of a leak being identified. Access is required along the whole length of the pipeline and the access locations have been spread to facilitate this. The accesses routes are along existing paths and farm tracks. No new accesses will be created. The access routes are identified on the Works Plans.

Trench construction techniques



Open cut trench construction technique



Trenchless construction technique

10.7 The Final Effluent and Storm Pipeline and the Outfall

10.7.1 A new outfall for the discharge of treated final effluent and settled storm flows to the River Cam is to be constructed on the east bank of the river close to the outfall for the existing Cambridge WWTP. The treated final effluent (FE) and storm flows are to be conveyed from the proposed WWTP to this outfall by gravity in two buried pipelines; a 1.5m diameter pipeline for the FE and a 1.8m diameter pipeline for the intermittent storm flows.

10.7.2 The two pipelines will be adjacent and their proposed route extends west from the proposed WWTP site, crossing Horningsea Road and running parallel to the A14 to a section of the River Cam directly to the north of the A14 bridge. This route crosses a set of overhead power lines and the B1047 Horningsea Road and both pipelines will be required to cross under a drainage ditch near the river.

10.7.3 The B1047 road crossing will require agreement with the Highways Authority and will either be carried out by an open-cut method (using a lane-by-lane diversion technique of the road) or by a trenchless method (such as pipe-jacking). The preferred crossing technique for the FE and Storm Pipeline across obstacles (including the road and drains) is to utilise open-cut techniques.

10.7.4 The proposed location for the new outfall is approximately 90m downstream of the existing outfall and river levels at this location are controlled by Baits Bite Lock, which is located approximately 500m further downstream of the outfall site.

10.7.5 The new outfall will comprise a rectangular reinforced concrete structure which will be mainly below ground level and be located close to the river so as to maximise the distance from the adjacent drainage ditch and to maintain the natural habitat of this ditch.

10.7.6 The structure will have separate outlets for the FE and storm flows and include non-return facilities to prevent sediment and debris from entering the structure from the river when not in use.

10.7.7 The local river bank, immediately up and downstream of the outfall, will be protected with sheet-piling and the river bed will require scour protection (rip-rap or similar) in the vicinity of the outfall. Openings will be provided in the sheet piling to irrigate the area behind the piling in order to maintain the natural habitat along the river bank. This will minimise the amount of river edge habitat being lost and help the local ecology recover after construction.

10.7.8 River levels above the bank will occur occasionally, as the result of significant storms, and will continue to flood over the river-bank and the outfall structure which will continue to operate and not impede the overland flows.

10.7.9 Permanent access to the outfall will be possible from one of the following three options:

- access from the south, via the Horningsea Road and an existing track (running parallel to the A14) that serves Popular Hall and provides track access to the Riverbank and to the field adjacent to the outfall;
- access from the south, from Fen Ditton, via an existing track (as far as the powerlines) and an existing footpath along the east bank of the river; and
- access from the river, using barges/rafts or similar.

10.7.10 Operational access to the outfall structure will be required for the following purposes:

- visual inspections of the outfall structure;
- water quality samples of the river; and
- occasional maintenance (for example should floating debris or silt/sediment require removal).

Existing outfall location on the River Cam

New outfall visualisation

11.

Conclusions

11. Conclusions

'The scheme is a National Strategic Infrastructure Project, not a conventional development. We encourage the team to consider the national importance of this DCO application, something which we hope will allow it to embrace the development of a ground-breaking, aspirational scheme' - *Design Council, January 2022*

11.1 Conclusion

11.1.1 The proposals seek to ensure an appropriate balance is achieved between the functional requirements of the CWWTPRP and the sensitivity of building within the Green Belt, acknowledging the limitations of this type of infrastructure to achieve enhancements to the quality of the area (NPS para 3.5.1). Justification as to why the design has been developed in the way it has, and why each of the key components of the scheme are located where they are, is set out in the context of land take, site and plant layout, access and amenity, landscape and biodiversity. Specific design responses on plant layout, operational optimisation, odour, height of structures, buildings and people, materials, colour and lighting are described.

11.1.2 In common with other NSIPs the CWWTPRP DCO is seeking flexibility in the approved design to allow certain final details (for example, in respect of building height, design and external appearance of plant and buildings, materials and landscape planting and detailed highway design) to be reserved by the DCO requirements and to evolve through agreement with key stakeholders after consent, when construction contractors have been appointed. The appointment of contractors will allow the detailed design to be finalised. Seeking this design flexibility reduces commercial risk (by allowing a variety of design solutions to be explored once consent has been obtained), provides opportunity to improve the efficiency of the design, reduce carbon and to further reduce any impacts the development design might have and minimises the potential for future, time-intensive, formal variations to the DCO which might needed to accommodate differing solutions.

11.1.3 This document describes the design principles and concepts that have been applied to the development of the proposals. The key design aspects described in Chapters 8, 9 and 10 conform with the 'Design Objectives' set out below which will also will be used to inform the design of the final details reserved by the DCO requirements.

11.1.4 A particularly important element of the Proposed Development is the landscaped area which surrounds the proposed WWTP. A circular bank, woodland blocks, hedges, glades and biodiverse wildlife grassland are features of the comprehensive masterplan embedded as a core part of the design to mitigate landscape and visual impacts of the Proposed Development, to expand and create recreational opportunities and biodiversity rich areas to expand the network of rights of way. This design has emerged through an iterative process, informed by the landscape and visual constraints and opportunities which are apparent on site and in the surrounding context. The resulting design is therefore landscape and visually led.

11.1.5 A multifunctional approach has been adopted to deliver landscape enhancement, visual screening, ecological habitat creation and recreational opportunities for local communities. This approach provides mitigation for potential environmental impacts that have been identified through the Environmental Impact Assessment (EIA), including impacts on landscape character and visual amenity process and also for enhancement of the local environment.

11.2 Design Objectives

11.2.1 The table below sets out the Design Objectives which were developed and have been applied to the design process to ensure that the CWWTPRP fulfils the criteria of 'good design' set out in section 3.5 of the NPS, while achieving the Project Objectives set out in Chapter 2.

DESIGN OBJECTIVES	
1.0	**VALUE**
1.1	Deliver the functional needs of Anglian Water and the requirements of the contract with Homes England.
1.2	Optimise land take to deliver the diverse range of Project Objectives.
1.3	Lay out the plant to be well-ordered and efficient, which will be largely determined by the functional and process needs of the works.
1.4	Pursue a sustainable approach to value, acknowledging social and environmental factors in addition to purely economic value. E.g enegy performance, carbon reduction, BNG and rection opportunities.
2.0	**VISUAL IMPACT**
2.1	Mitigate the negative visual impact of the development on the surroundings, including local villages and residents, through appropriate new planting and landforms.
2.2	Retain and enhance existing landscape features that contribute to screening to mitigate the landscape and visual impact.
2.3	Establish new planting and landforms at the earliest practicable opportunity.
2.4	Locate the tallest structures within the plant to minimise visual impact from key receptors.
2.5	Design associated infrastructure, including lighting and fencing, to minimise negative visual impact on the surroundings.
2.6	Minimise visual effects at night from lighting and light spill without compromising safety or security.
2.7	Consider potential effects of the development on designated and non-designated heritage assets.
3.0	**COMMUNITY**
3.1	Consider and respond to consultation feedback from local communities and stakeholders.
3.2	Minimise impact of odour, through layout of the plant and specification of equipment.
3.3	Consider holistic impact of the proposed WWTP on the key local receptors, namely the local villages of Horningsea and Fen Ditton.
3.4	Ensure that facilities for public use and enjoyment take into account the balance of other considerations including landscape character, the historic environment and ecology.
3.5	Minimise impact of noise and vibration on workers and surrounding environment.

DESIGN OBJECTIVES	
4.0	**CONNECTIVITY**
4.1	Maintain and enhance public safety in relation to existing networks (vehicular, pedestrian, equestrian and cycle).
4.2	Create enhanced recreational amenity (pedestrian, equestrian, cycle) by providing new connection routes integrated with existing networks.
4.3	Ensure the potential for future inprovements to access and recreational amenity is not unnecessarily restricted.
4.4	Consider the impact of additional traffic and transport on existing networks.
5.0	**LANDSCAPE AND BIODIVERSITY**
5.1	Create a strong identity for the site as a coherent, multi-functional landscape: an earthwork landform, a natural screen to mitigate views, and a recreational resource for the local community.
5.2	Minimise negative visual impact on the surrounding community and landscape.
5.3	Form a permanent screen to the majority of the plant infrastructure, utilising a rotunda earthwork bank as a solid screen that provides nearly equal visual mitigation ‘in the round’.
5.4	Soften the uppermost elements of the plant through the use of a natural planted screen on the earthwork bank top, sides and base, using native trees and shrubs that will be allowed to merge into a thicket.
5.5	Utilise new woodland as the key secondary screening element, by planting woodland belts and blocks on the boundaries of the site, in patterns and at a scale that assimilates the development into the local landscape character.
5.6	Increase biodiversity of the site through the introduction of a species rich grassland mixes within an existing largely arable landscape.
5.7	Create a mosaic of habitats for both woodland and grassland types, taking advantage of aspect and slope, moisture and shading to allow a wide transitional gradient of habitats.
5.8	Construct ecological features across the site to create additional habitats: hibernacula, deadwood, bare scrapes and four seasonal ponds.
5.9	Create a user-friendly landscape surrounding the plant, with bench seating, and paths cutting through an undulating ‘ridge-and-furrow’ landform.
5.10	Improve access to the countryside with linked public routes through the woodland, and extending outside the main development site to complete existing links to the wider landscape.
5.11	Provide a functional and welcoming entry to the Gateway Building, including drop off areas, limited areas of visitor parking, planted swales, cycle parking and outdoor seating, all set within tree clusters.
6.0	**CHARACTER**
6.1	Select materials (colour, texture and finishes) to be sympathetic to local character.
6.2	Where possible, treat the structures within the plant with an external colour palette that is responsive to the natural landscape within which they sit.
6.3	Consider potential effects on archaeology and historic landscape character.
6.4	Establish a sense of place and community for the workforce.
6.5	Consider the needs of workers and visitors, including access, daylight and thermal comfort.

DESIGN OBJECTIVES	
7.0	**CLIMATE**
7.1	Deliver the target of net zero carbon by 2030.
7.2	Consider the operational and embodied carbon when selecting key treatment processes.
7.3	Minimise potable water demand on site.
7.4	Select an overall water recycling process that is robust and resilient that can meet the EA discharge consent, with provision for future additional growth over time.
7.5	Design the tunnel sizing and storm management systems to be resilient to account for climate change uncertainties.
7.6	Design the drainage and flood risk infrastructure to be resilient to account for climate change uncertainties.
7.8	Select finishes to buildings and infrastructure which are durable, low maintenance and suitable for the environment.
7.9	Use materials efficiently, limiting unnecessary materials and reducing waste.
7.10	Pursue recognised and appropriate certification schemes, such as BREEAM for new buildings.
7.11	Encourage travel to the site by sustainable means, such as cycling and public transport.
7.12	Provide infrastructure to support low-emission vehicles, including electric vehicle charging stations.
8.0	**SAFETY + SECURITY**
8.1	Ensure the works are to be constructed, operated and maintained safely in accordance with all applicable regulations and consents.
8.2	Consider how designs could impact the safety of operational workers.
8.3	Clearly distinguish visitor routes for people who will be unfamiliar with the operations of the works.
8.4	Ensure appropriate security measures are in place throughout construction and operation to protect both workers and the infrastructure.

11.2.2 Consideration of the site context, the Project Objectives and consultation feedback have informed the Design Objectives. They have been established through consultation with Design Council, the Local Authorities, Cambridgeshire Quality Panel, local stakeholders and through public consultation, as outlined in Chapter 3.

11.2.3 The Design Objectives align with the core purposes and ambitions of the National Infrastructure Commission design principles, namely Climate, People, Places and Value; and with the four C's of the Cambridgeshire Quality Charter for Growth, namely Community, Connectivity, Character and Climate.

11.2.4 The Design Objectives are a framework of key drivers of the design that have been developed over the course of the design evolution up to the submission of the DCO application. Designs submitted within this application have been informed by these objectives.

11.2.5 The objectives also establish a set of principles to guide detailed design after approval of the DCO application. Any further detailed design to be carried out after DCO approval (as reserved by the DCO requirements) must accord with these Design Objectives, subject to reasonable practicability such as, for example, new regulatory requirements, abnormal ground conditions, availability of technology and change to permitting requirements. This approach will ensure the design is delivered within the parameters of the initial design intent, and will control the detailed design of key components of the CWWTPRP such as the buildings, principal structures and landscape. Use of the DAS in this way to inform later detailed design is consistent with similar approaches adopted in a number of consented NSIPs including, for example, the Sizewell C (Nuclear Generating Station) Order 2022 (specifically Schedule 2 Requirement 16) and the Lake Loathing (Lowestoft) Third Crossing Order 2020 (specifically Schedule 2 Requirement 3).

11.2.6 Based on its response to these Design Objectives in both the design details developed so far, and the approach it intends to take to the design of the final details to be reserved by the DCO requirements, Anglian Water Services Limited is able to demonstrate that, consistent with the requirements at paragraphs 3.5.2 – 3.5.4 of the NPS, it has:

i) taken into account both aesthetics and functionality (including fitness for purpose).

ii) taken independent professional advice on the design aspects of the proposal – in particular through the use of the Design Council CABE to provide design review.
iii) ensured that the design is as visually attractive as possible by the use of good architecture and appropriate landscaping.

iv) considered siting relative to existing and currently planned landscape character, landform and vegetation.

v) carefully considered design and the sensitive use of materials in any associated development (eg control rooms and pumping stations).

vi) considered alternative designs and given the reasons why the favoured choice has been selected, demonstrating that all proposed and alternative infrastructure meets the relevant EU or UK technical standard for design, construction, installation and maintenance, where such standards exist.

11.2.7 Taking into account the ultimate purpose of the infrastructure and operational, safety and security requirements which the design has to satisfy (NPS paragraph 3.5.4) and the recognition that "good design is a key aspect of sustainable development" (NPPF paragraph 126), this DAS concludes that from a design perspective the Proposed Development:

i) is sustainable and as attractive, durable and adaptable as it can be, sufficient to satisfy the requirements on the decision maker at NPS paragraph 3.5.2:
ii) is sympathetic to local character and history (NPPF paragraph 130);

iii) so far as opportunities arise, enhances local distinctiveness and the character and quality of the area; and

iv) is innovative and promotes a high level of sustainability within the national policy context as set out in the sections on 'good design' in the NPS (including section 3.5 and paragraphs 4.5.14, 4.8.19, 4.9.8 and 4.9.12).

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Get in touch

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You can view all our DCO application documents and updates on the application on The Planning Inspectorate website:

https://infrastructure.planninginspectorate.gov.uk/projects/eastern/cambridge-waste-water-treatment-plant-relocation/