

A proposed new reservoir in Lincolnshire

Main site design report



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1 Introduction

1.1 Background

Anglian Water is proposing a new reservoir in Lincolnshire that will secure water supply to our customers for future generations. This report describes the emerging design for the site proposed for the Reservoir. Responding to feedback from our first phase consultation, its purpose is to illustrate how the main reservoir site might be designed, and to invite feedback to inform the next stages of the Project's development.

The report focuses on the main site, which would include the reservoir and some connecting infrastructure, and which also has the potential to host visitor facilities, access routes, recreational paths and areas of new landscape and habitats. The preferred location of the main site was presented at Phase One Consultation in October to December 2022.

Beyond the main site, the Project includes associated water infrastructure, such as the transfer routes that will bring water to the reservoir and take it from the reservoir to the mains drinking water supply. The wider infrastructure is not the subject of this report but further information on this infrastructure can be found in other materials published alongside this report.

1.2 How the Project will be Consented

Nationally Significant Infrastructure Projects (NSIPs), such as the Lincolnshire Reservoir, have to apply for a Development Consent Order (DCO) under The Planning Act 2008 (PA 2008). A DCO would authorise the construction and operation of the Reservoir, and would also contain other powers required to facilitate this.

The National Policy Statement for Water Resources Infrastructure (NPS) sets out the policy requirements associated with developing and securing consent for an NSIP. The NPS covers topics such as biodiversity and environmental net gain, carbon and renewable energy, and recreation, all of which facilitate a consentable Project that could become a positive legacy for the local community and across the region.

The PA 2008 lays down strict legal rules as to the elements of an NSIP and its associated development that can be authorised by a DCO. It follows that not all potential land uses in and around the reservoir could be legally authorised by the DCO and it is

therefore likely that certain potential uses identified in this report would need to be brought forward separately (potentially by third parties) if it is ultimately considered that these would be appropriate long-term uses for the main site.

At this early stage, the precise scope of the DCO application for the Project is not yet fixed and will be informed by feedback received from this consultation, alongside other considerations. Nevertheless, in addition to describing the core elements of the Project that will fall within the DCO, this report aims to show possible long-term opportunities that might be unlocked at the main site, for the purpose of generating feedback and ideas. The full scope of the DCO application will be confirmed in a future phase of public consultation, and is likely to be more limited in scope and detail than some of the emerging design proposals described in this report.

1.3 The Emerging Design

The emerging design presented in this report reflects the emerging thinking of Anglian Water as to the design of the main site for the Lincolnshire Reservoir and how it could look. As such, references to the 'emerging design' in this report need to be read in light of this (as well as having regard to what can and cannot be consented through a DCO - see above).

The emerging design has been developed through a masterplanning exercise led by landscape architects and architects, working in close collaboration with a wide range of engineering and environmental disciplines to generate an integrated, landscape-led design. It has also been guided by feedback received from the Phase One Consultation (refer to Chapter 3), and by focused engagement with statutory planning and environmental bodies, as well as peer review from the Independent Design Review Panel (see section 8.7).

Masterplanning is the process of developing a design for a site as a whole. It weaves together the functional and operational requirements of the Project with an understanding of the constraints and opportunities presented by the site and

surrounding area. It also takes into consideration the concerns and aspirations of stakeholders and local communities as described above.

It is important to note that the emerging design presented and described in this report does not represent the final version of the reservoir design. Most elements of the design will be subject to continuing Project development, informed by responses to consultation and in parallel with work to better understand the environmental impacts of the Project. The environmental impact assessment (EIA) process for the project is still at an early stage. The emerging design has been informed by discussions with relevant environmental disciplines but is not yet underpinned by a full assessment of environmental impacts. The outcomes of the EIA will be a key factor in determining the final design and in shaping the environmental benefits it can deliver.

There will also be further work to progress the engineering technical design and to plan the construction of the reservoir. In addition (as set out above), further work is required to determine which land uses could be included in the DCO and which might need to be brought forward (potentially by third parties) separately in the future.

However, the size and scale of the reservoir is broadly fixed by virtue of its water capacity requirements, albeit the overall shape is not fixed at this stage (including the profile of the inner and outer embankments). It should also be noted that whilst the options appraisal process has identified the preferred land area within which the water treatment works and its related development are proposed, the locations within this area for buildings, structures and any mitigation works have not yet been determined.



2 Overview of Emerging Design

The emerging design represents initial ideas for how the reservoir could look and shows an arrangement of facilities and features that could be incorporated. A high-level overview of the design is described here, with the detail which underpins it set out in the later chapters of this report.

2.1 Emerging Design

The emerging design seeks to create a special place where water, people and nature can come together, using the distinctive landscape, heritage and folklore of the area as the context for a new nature-inspired visitor destination set around the reservoir.

The artist's impression shown opposite gives an idea of how the site could be designed to provide a rich, varied and immersive environment which blends high quality and diverse habitats alongside opportunities for people to connect with nature, encouraging health, wellbeing and social prosperity through recreational pursuits.

The design could include a central peninsula and a series of large lagoons within the reservoir to activate different parts of the site; this could establish potentially more active areas to the south, where many of the visitor facilities could be located and people could most readily access the waterspace, whilst more passive and tranquil areas, with a focus on nature, could be located elsewhere. Outside of the reservoir footprint the design illustrates potential multi-agency opportunities for habitat and flood mitigation works along parts of the Swaton Eau and Helpringham North Beck river corridors.

The design could create a more connected landscape with opportunities for walking, cycling and horse riding. Looping routes of various lengths could be provided around the reservoir with connections into the neighbouring settlements of Helpringham, Swaton and Screddington.

Care has been taken to demonstrate how features, particularly the embankments, could be integrated in a positive and sympathetic manner. In the emerging design, the form and shape of the reservoir is woven into the local topography, utilising the existing subtle ridgelines within the embankment design and avoiding straight lines and geometric shapes to promote a more natural and softer appearance.

The embankments could be designed using varied slope angles, support planting in places, and also could potentially accommodate a range of different land uses. In the emerging design, the shallowest slopes are those facing towards the east, respecting the setting of the settlements and important heritage features along the fen edge.

For a summary of the main engineering components of the reservoir please refer to Chapter 5, and for background on the site and its surrounding context please refer to Chapter 6. More detail on the emerging design can be found in Chapters 8 and 9.



Artist's impression of what the Lincolnshire Reservoir could look like looking from the south east showing indicative connecting infrastructure locations

3 Consultation

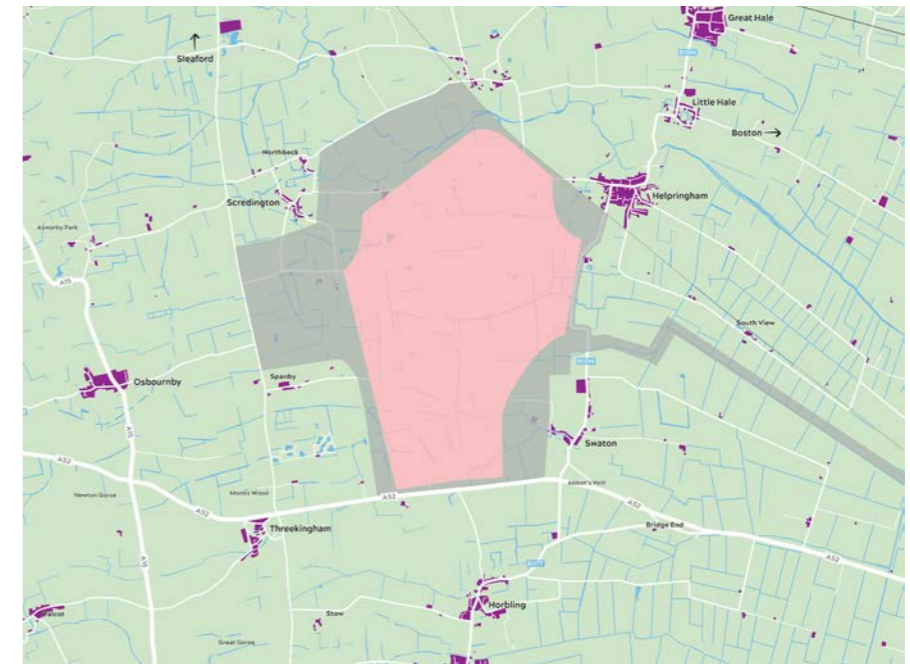
This chapter provides a summary of feedback in relation to the design of the reservoir from the Phase One Consultation which took place between 12 October and 21 December 2022. This early consultation gathered important opinions and information on our initial proposals and the responses received have helped to shape aspects of the ongoing design development of the reservoir.

3.1 Introduction

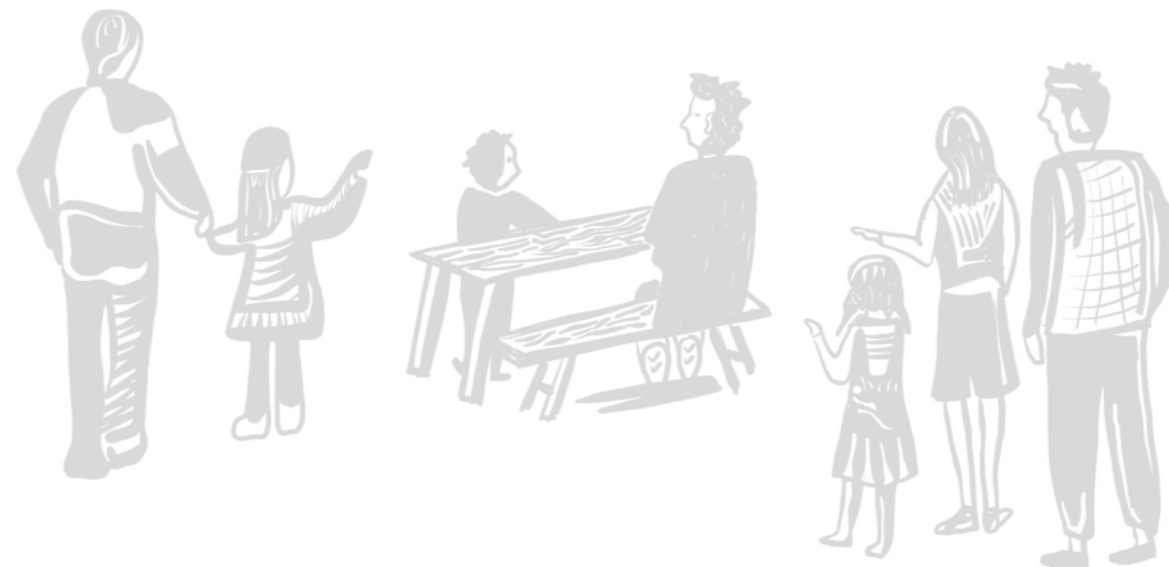
The purpose of the Phase One Consultation was to gather feedback and information on early proposals; this included the initial vision for the Project, and preliminary design ideas which were based around the overarching design principles being: climate, people, place and value.

Specifically, the Phase One Consultation requested feedback on:

- The pink area - identified for the reservoir and its embankments
- The grey area - identified as potentially being needed for supporting infrastructure and during construction. This is also where wildlife and environmental areas, spaces for leisure and recreation, education facilities and other uses could be incorporated
- The very early concept design for the reservoir and the features consultees would like to see considered in the design of the reservoir.



Phase One Consultation, pink and grey areas



3.2 Connectivity with Nearby Communities

Feedback from Phase One consultation

The Project should provide good connectivity and safe access to the reservoir for the surrounding communities. This included requests that the site be easily accessible on foot and bike and by integrating new or existing public transport connections.

Concern about the impact on local roads including the vulnerability of Sleaford to congestion, with suggestion that there should be new roads created in the area to mitigate against potential traffic congestion caused by the Project.

Concerns whether footpaths in the area, particularly Swaton, would be lost.

A Consultation Summary Report was produced following the Phase One Consultation.

Key themes of feedback from consultees included: connectivity with nearby communities, visual impacts including embankments, supporting local industry, access to nature and water, wildlife and nature, and outdoor recreation.

These themes have subsequently been considered in developing the design vision and evolving the indicative design principles (refer to Chapter 4). They also underpin many of the ideas which have inspired the emerging design (refer to Chapters 8 and 9).

Following Phase One Consultation, the Project Team has engaged with local planning authorities and statutory environmental bodies on the evolving design ideas; this engagement is summarised in section 8.7.

Features you'd like to see included in the reservoir

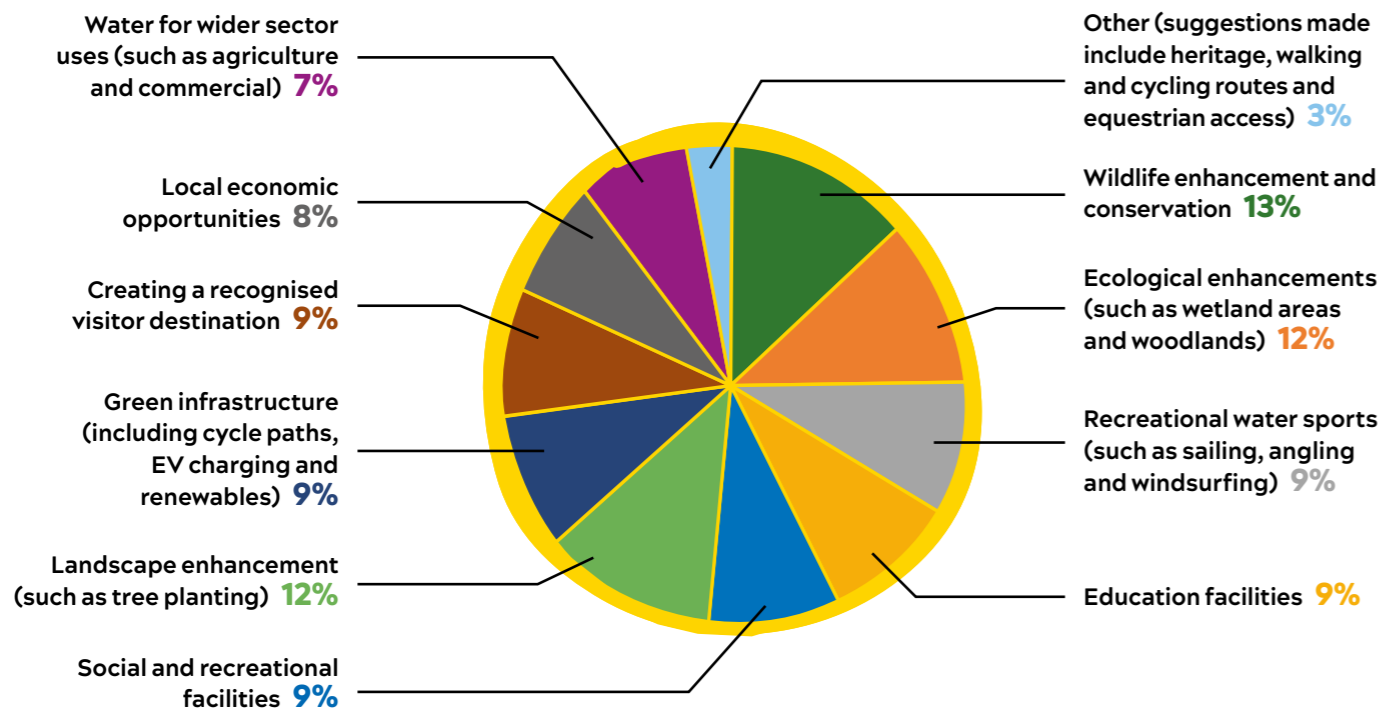


Chart summarising the breakdown of feedback received during Phase One Consultation

How the Project is responding:

Impacts on existing rights of way will be minimised wherever possible. The emerging design shows where potential new routes for walking, cycling and horse riding could be provided. This includes circular routes around the reservoir and opportunities to extend new routes into the surrounding communities including connecting into the existing rights of way network. Work is also progressing to understand the potential impact on local roads arising from the Project.

Proposals will be developed with engagement from consultees and shared at future consultation events.

Further details on how the Project is considering public access and connectivity can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 1, page 14 and Indicative Design Principle 4, page 15
- Chapter 6: Understanding the Site, Section 6.2 (Site Access) and Section 6.6 (Rights of Way)
- Chapter 7: Opportunities, Section 7.5. (Recreation Opportunities)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (potential route options and permutations); Section 8.9 (Additional Design Studies)
- Chapter 9: Emerging Design, Section 9.2 (Overall Approach); Section 9.3 (Illustrative masterplan); Section 9.6 (Component Areas)



3.3 Supporting Local Industry

Feedback from Phase One consultation

Concerns expressed over food security and about a large volume of good quality agricultural land taken for the reservoir, with suggestion that an area with poorer quality soil would be more appropriate.

Consideration should be given to additional water stewardship initiatives, and to work with local businesses and farmers to improve water management and conservation across the region.

Work proactively and collaboratively with partners to deliver multisector benefits.

Mixed views as to whether tourism would be beneficial to the local area, with some excited about the benefits it would bring (for businesses and job creation), whilst others opposing tourism because of the impacts on noise and traffic levels.

How the Project is responding:

The socio-economic impacts as well as the benefits which could be delivered or enabled by the Project are being considered. Further information will be provided at the next consultation and for the DCO application we will prepare a clear, public statement setting out the socio-economic benefits that could be provided by the delivery of the DCO project. We are also considering things that the Project itself might not deliver, but which the progress of the DCO project could catalyse or otherwise help to enable. This may include plans and policies which are owned and delivered by local authorities and other public agencies, or projects being considered by specific sectors of the economy.

Further details on how the Project is considering supporting local industry can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 6, page 16



3.4 Cultural Heritage

Feedback from Phase One consultation

People are passionate about preserving the history of the area, with many wanting assurances that the Project would take the appropriate steps to identify and protect sites of important historical and archaeological interest.

Specific concerns raised in respect to the potential impacts on Scheduled Ancient Monuments that will be impacted by the reservoir, including the Grade 2 listed Thorpe Latimer Farmhouse, Packhorse bridge and ancient footpaths between Sempringham Abbey and Haverholme Priory.

Importance equally attached to preserving local memorials and historic sites, including specific features of local significance such as a plane crash memorial located in Highgate.

Provide an opportunity to educate people regarding the way water has shaped the landscape in the area and how water has been, and is, managed in the area.

How the Project is responding:

The impact on heritage assets and the setting of these has been considered as part of the masterplanning process. A formal assessment will be undertaken as part of the EIA and will inform the final design. Preliminary measures includes consideration of how embankment profiles could be designed and integrated within the setting of settlements and heritage assets; opportunities for reinforcing historic landscape features such as hedgerows; and maintaining important views to and from key heritage features such as church spires. Opportunities for creative interpretation of local heritage as part of the Project will be considered further as the design evolves.

Further details on how the Project is considering cultural heritage can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 2, page 15
- Chapter 6: Understanding the Site, Section 6.7 (Heritage)
- Chapter 8: Design Development, Section 8.3 (consideration of reservoir shape response to heritage assets)
- Chapter 9: Emerging Design, Section 9.2 (Overall Approach); Section 9.3 (Illustrative Masterplan); 9.6 (Component Areas)



3.5 The Natural Environment

Feedback from Phase One consultation

Broad support for using the Project as an opportunity to enhance the local environment and biodiversity, such as through the creation of water channels, wetlands and habitats.

Concern that an embanked reservoir will restrict opportunities for habitat creation, recreation

Suggestions made to work with the RSPB, Woodland Trust and Lincolnshire Wildlife Trust to maximise environmental and biodiversity opportunities at the site.

Several concerns expressed over the impact on nature and biodiversity, specifically: impact on existing ecosystems; potential loss of woodlands; the introduction of non-native species; and potential negative impacts to local wildlife, especially during construction, fearing the biodiversity will be lost overall.

How the Project is responding:

The emerging design proposals include areas of land for environmental mitigation and to achieve Biodiversity Net Gain (BNG). The extent and nature of these areas will be informed through the Environmental Impact Assessment (EIA) process. Opportunities will be explored to co-ordinate habitat and biodiversity improvements with wider projects and initiatives, supported through regular engagement with environmental bodies and organisations charged with delivering these projects.

Further details on how the Project is considering the natural environment can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 3, page 15; Indicative Design Principle 7, page 16
- Chapter 6: Understanding the Site, Section 6.8 (Habitats and Biodiversity)
- Chapter 7: Opportunities, Section 7.7. (Nature-based Solutions)
- Chapter 8: Design Evolution, Section 8.4 - 8.7 (ecological mitigation as part of the permutation and option testing)
- Chapter 9: Emerging Design, Section 9.2 (Overall Approach); Section 9.3 (Illustrative masterplan); Section 9.6 (Component Areas)



3.6 Carbon and Renewable Energy

Feedback from Phase One consultation

Suggestions made to explore a range of green initiatives related to the construction and operation of the reservoir, including powering the reservoir with renewable energy.

Concern over the cumulative impact of development in the area, citing turbines, pylons and solar arrays. Questions were raised over the green sustainability of the Project specifically such as active travel routes and electric vehicle charging points.

Ensure the construction and operations will support ambition to become a net zero business by 2030.

How the Project is responding:

In November 2020, water companies unveiled a groundbreaking plan to deliver an operationally net zero water supply for customers by 2030 in the world’s first sector-wide commitment of its kind. Anglian Water led the development of this plan.

In order to achieve this ambition, the Project is exploring ways to reduce carbon emissions wherever possible and to include renewable energy generation on site and/or off site. Some initial ideas around the scale and location of renewable energy on the site are presented in the emerging design, albeit there is further technical work needed before definitive decisions on renewable energy generation can be made.

Further details on how the Project is considering carbon and renewable energy can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 9, page 17
- Chapter 7: Opportunities, Section 7.9 (Carbon and Renewable Energy)
- Chapter 8: Design Evolution, Section 8.4 - 8.6 (spatial arrangement of solar and battery storage as part of the permutation and option testing); Section 8.7 (Stakeholder Engagement)
- Chapter 9: Emerging Design, Section 9.2 (overall approach); Section 9.3 (Illustrative Masterplan)



3.7 Visual Impacts Including Embankments

Feedback from Phase One consultation

Concerns about the height of embankments, noting that they would impact the appearance of nearby communities. Respondents highlighted the need for embankments to be landscaped adequately to ensure they are visually appealing.

A general desire for the design of the Project to blend in aesthetically with the local area and to be accessible. This included specific suggestions that reservoir needs to look natural as opposed to man-made, with some stating that the external slopes of the embankment should reflect the gentle undulating nature of the existing landscape, instead of concrete bunding.

Bunding will need careful consideration and design to reduce height significantly and feather sufficiently into the landscape.

Request for more information on the location of associated infrastructure, due to concern over its possible proximity to nearby communities.



How the Project is responding:

The shape of the reservoir and the height and gradients of the embankments is being designed in a way which will consider and seek to reduce impacts on local views and historic features. The emerging design illustrates how tree planting, hedgerow and habitat areas together with varied slope profiles could help to integrate the embankments within the surrounding land, albeit recognising these are new landforms in the landscape. Further technical work, in particular a Landscape and Visual Impact Assessment (LVIA), will be undertaken as part of the EIA to assess the landscape and visual impacts; this assessment will help to identify mitigation and help refine the emerging design which is illustrated in this report.

Further details on how the Project is considering visual impacts including embankments can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 1, page 14
- Chapter 6: Understanding the Site, Section 6.3 (Topography); Section 6.5 (Landscape Character)
- Chapter 7: Opportunities, Section 7.4 (Embankment Integration and Tree Planting)
- Chapter 8: Design Evolution, Section 8.3 (Reservoir Shape); Section 8.4 - 8.6 (integration of embankments as part of permutation and option testing); Section 8.7 (Stakeholder Engagement)
- Chapter 9: Emerging Design, Section 9.2 (Overall Approach); 9.3 (Illustrative Masterplan); 9.4 (Embankment Integration); 9.5 (Embankment Height and Integration - Eye Level Views); 9.6 (Component Areas)

3.8 Recreation and Accessibility

Feedback from Phase One consultation

Support expressed for the potential for recreational activities at the site, with many seeing it as key to ensuring the site became a tourism and local attraction. However, some respondents had suggestions or expressed concern regarding these and how they would be implemented.

Request for sufficient space for a circular cycle (and walking) route around the reservoir which should be traffic free. Recognise that there will be pinch points with the A52 on the southern boundary and the railway line on the north-east boundary.

Suggestions that leisure and recreation amenities needed to include adequate infrastructure to ensure their viability, including multiple car parks, cafes, toilets, bins, and other waste facilities to prevent littering, as well as designated seating and picnicking areas.

Respondents with an interest in horse riding felt their interest was ignored or overlooked in the early stages of consultation, with several stating that the interest should be prioritised as it is popular locally.

How the Project is responding:

The scale and mix of recreational facilities are being developed in accordance with the requirements of the NPS and will consider an appropriate balance between areas providing recreational activity and areas for nature and environmental mitigation. Initial ideas are illustrated in the emerging design and include a mix of potential recreational facilities such as a Visitor Hub, areas of green space and indicative routes for walking, cycling and horse riding.

Further details on how the Project is considering recreation and accessibility can be found here:

- Chapter 4: Vision and Design Principles, Indicative Design Principle 4, page 15; Indicative Design Principle 5, page 16; Indicative Design Principle 8, page 17
- Chapter 7: Opportunities, Section 7.3 (Public Access to Water); Section 7.5 (Recreation); Section 7.6 (Public Access to Reservoir Infrastructure); Section 6.8 (Navigation)
- Chapter 8: Design Evolution, Section 8.3 (Reservoir Shape); Section 8.4 - 8.6 (potential arrangement of recreation and access features as part of permutation and option testing); Section 8.7 (Stakeholder Engagement); 8.9 (Additional Design Studies)
- Chapter 9: Emerging Design, Section 9.2 (Overall Approach); Section 9.3 (Illustrative masterplan); Section 9.4 (Embankment Integration); Section 9.6 (Component Areas)



4 Vision and Design Principles

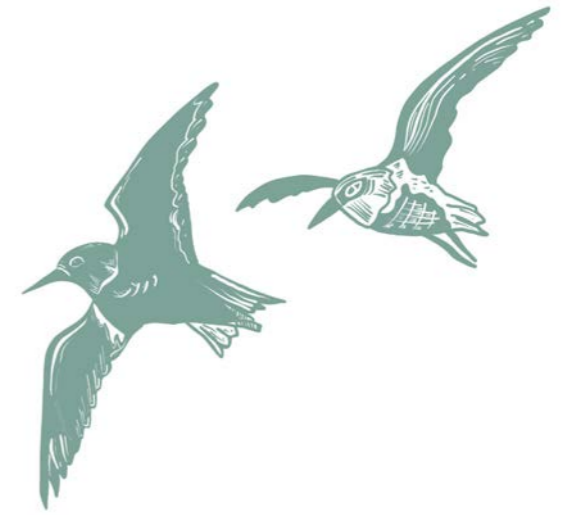
Good design is a key aspect of sustainable development, creating better places and helping make infrastructure projects beneficial and acceptable to communities.

Design visions and design principles are well-established means of promoting design quality in infrastructure projects. Their use is encouraged by both the Government and the National Infrastructure Commission. The design vision and indicative design principles for the Lincolnshire Reservoir are set out in this chapter. A more developed set of design principles will be presented at future consultations taking on board the further feedback received during second phase consultation.

Find out more and have your say

We would like to get your comments on our design vision and principles for the reservoir. Please see a guide to our proposals and Phase Two Consultation brochure for ways to provide your feedback:

www.lincsreservoir.co.uk/documents



4.1 Design Vision

A design vision succinctly sets out what the Project is aiming to achieve. It seeks to capture the big ideas and aspirations behind the Project and express them in a way that can be readily understood and captures peoples' imagination, whilst expressing the Project's distinctive location and context.

The Project Team have identified the key characteristics of the Lincolnshire Reservoir site which have informed the design vision in the box to the right:

The site lies in a transitional landscape, where raised limestone hills to the west meet low-lying fenland in the east. Historic villages including Helpringham and Swaton line the edge of the Lincolnshire Fens and, before they were drained, would have been at the end of the dry landscape.

Land within the Lincolnshire Reservoir site is mainly used for arable farming, and includes large fields, hedgerows, ditches and strips of sheltering woodland. This is a quiet and peaceful place, enjoyed by local people via a network of public rights of way. Flooding from watercourses, such as Swaton Eau, is a reminder of the tension between nature and human activity in this landscape.

The historic villages, landmark church spires, winding lanes and place names ensure layers of history remain prominent alongside more modern developments within the villages, such as housing.

Since the middle of the last century, the main change has been the introduction of modern farming practices. This has reduced biodiversity and human contact with the landscape, with far fewer people working the land. The effects of climate change present a further challenge to maintaining the balance between water, land and people.



The design vision for the Lincolnshire Reservoir is presented opposite.



Our Vision for Lincolnshire Reservoir

Supporting Thriving Communities and Nature



People

The Lincolnshire Reservoir will be at the heart of a revitalised countryside. Areas within and around it will be opened for public use, and leisure opportunities created on the water and in the surrounding landscape. New connections will be provided from nearby villages, so that people can access and enjoy water and nature.

Roots that run deep



Flourishing Symphony

Nature

The reservoir will be thoughtfully designed to respect and reveal the local area's rich character and heritage.

It will help the environment to thrive and to increase the presence and diversity of local wildlife.



The reservoir will promote a change to more regenerative land management, and diverse opportunities for local people, agriculture and businesses.



A Living Mosaic

Water

The reservoir will secure a resilient supply of water for people across Lincolnshire and the surrounding areas for decades to come. It will mean less water taken from sensitive groundwater sources, replenishing the environment and helping springs to flow.

It will protect water supplies for agriculture, while helping people and nature to reconnect.



Restorative

Reflective

Fen



4.2 Design Principles

Design principles are a set of instructions or guidelines underpinning how a project should be designed. They set out the requirements the design needs to achieve in order to meet the aspirations and objectives for the Project, avoid or minimise harm to the environment and local communities and deliver multiple benefits and positive outcomes across the whole life of the Project.

Therefore, design principles provide a means for a DCO to ultimately control and make sure these requirements are delivered during the construction and operation of the Project.

During the Phase One Consultation, the broad principles that are guiding the development of the reservoir design were presented, based around the topics of climate, people, place and value.

Based on the design vision set out on the previous page, along with technical and environmental constraints, and feedback from the Phase One Consultation, this section presents an initial set of indicative design principles for the Lincolnshire Reservoir. These principles have guided the development of the emerging design described in Chapter 9 of this report.

At this stage, the indicative design principles are relatively high-level and thematic. They will continue to be developed in response to the findings of the EIA process and further feedback from local communities, those affected by the Project and other stakeholders. Updated and more specific design principles

will be presented at future rounds of consultation and they will continue to be refined into a detailed set of design principles for inclusion in the DCO. As part of this iterative process, additional design principles may be introduced as the Project progresses to make sure all aspects of the design are comprehensively covered in the DCO application.

At present, the indicative design principles only address the main site. As they are developed further, they will be expanded to include the associated water infrastructure, such as the upstream and downstream transfers, in advance of the next phase of consultation.

The following icons are used to indicate how each indicative design principle relates to the themes of climate, people, place and value referenced in the Phase One Consultation.



Climate



People



Places



Value



Indicative Design Principle 1:

Well integrated and contextually responsive

The reservoir form and shape will respond positively to the local landscape character and topography, utilising the natural ridges, shallow valleys, planting and other natural features to integrate the embankments into the rural setting. The outer embankment profiles and appearance should be varied and contribute positively to the setting of neighbouring settlements and cultural assets. This aligns with the overarching design vision for the reservoir which promotes a strong landscape and nature led design.



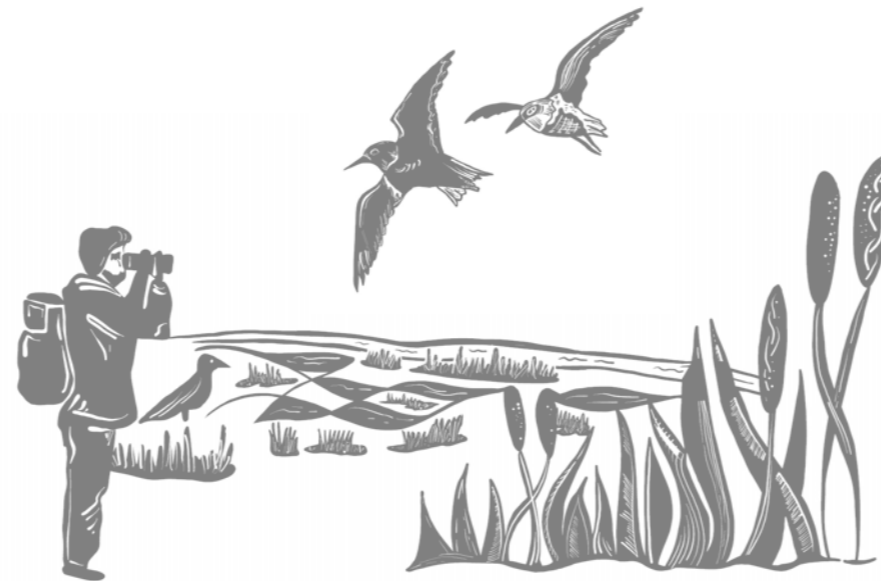


Indicative Design Principle 2:

A celebration of culture and heritage

The Project will respect and celebrate the rich cultural landscape and its heritage, inspired by a sense of place and time, reflected in the distinctive character of the surrounding villages, landmark church spires, winding lanes and remnants of historic settlements and land uses.

As catalyst and/ or enabler, the Project could achieve this in a range of ways that also help mitigate any potential harm or loss that might arise to heritage assets or their settings in accordance with the relevant legislation and planning policy. For example, heritage assets could be positively integrated into the design of the reservoir and different creative forms of interpretation developed within the design to reveal the layers of history in a positive and imaginative way.



Indicative Design Principle 3:

Restoration of nature

Create varied ecological conditions within and around the reservoir, providing opportunity for nature to thrive on land and in water. Design the reservoir in a manner that achieves the biodiversity and landscape mitigation requirements identified within the Environmental Impact Assessment, and meets the NPS policy which advocates for enhancement of the natural environment by providing net gains for biodiversity. The Project should create opportunities for wider scale ecological benefits, including optimising habitat connectivity, and reintroducing, at scale, habitats and species which have been lost or impacted particularly by intensive agricultural uses.



Indicative Design Principle 4:

Connected Communities

The reservoir would seek to enhance connectivity between the neighbouring communities of Scredington, Helpringham, Swaton, Spanby, Horbling and Burton Pedwardine, using the reservoir land as the conduit and as a destination in its own right, providing dedicated safe and attractive routes which avoid busy roads.

Where practicable, the reservoir design could promote active travel, including walking, cycling and horse riding, providing routes that connect into the wider Public Rights of Way network and align with local and regional Green Infrastructure strategies. Where necessary improvements to existing highways would be considered to create safe environments for users.





Indicative Design Principle 5:

A destination where people enjoy water and nature

The reservoir will deliver the foundations for creating a new multi-purpose and nature rich destination that will attract people from local communities and further afield. In doing so the reservoir would deliver opportunities to create many benefits not least health and wellbeing, nature recovery, education and economic.

These benefits could be achieved through a mix of passive and active recreational activity from inclusive and varied walking, cycling and horse riding routes to water-based recreation and facilities that maximise people's enjoyment of close physical and visual access to the water. Accessible areas would be designed so people can engage appropriately with nature, whilst ensuring there is a balance between undisturbed and accessible areas, to maintain ecosystem health and viability.



Indicative Design Principle 6:

Reimagined productive landscapes

The design would consider where agricultural practices could be incorporated within the landscape of the reservoir development to address as far as reasonably practicable the loss of agricultural land under the reservoir footprint, in accordance with national planning policy.

Where practicable, any proposed agricultural practices would be designed to complement other mitigation needs, such as encouraging agricultural practices that support both the long term health and productivity of the land while fostering biodiversity, ecological and climate change resilience.



Indicative Design Principle 7:

Nature based solutions to secure positive environmental outcomes

Work with nature and natural solutions when considering flooding, soil erosion and loss of habitat and biodiversity. Where practicable, incorporate natural solutions to: control attenuation of water in floodplains; design varied habitats to reflect the different types of soil and maintain soil condition; and deliver beneficial environmental and socio-economic outcomes as alternatives to engineered / carbon intensive solutions, as encouraged by planning policy and best practice. This could include exploring use of innovative natural processes, such as infiltration beds, to improve quality of the water within the reservoir and as part of the water transfer and recycling process; plus create hospitable environments for visitors (including shade, wind protection and erosion control).



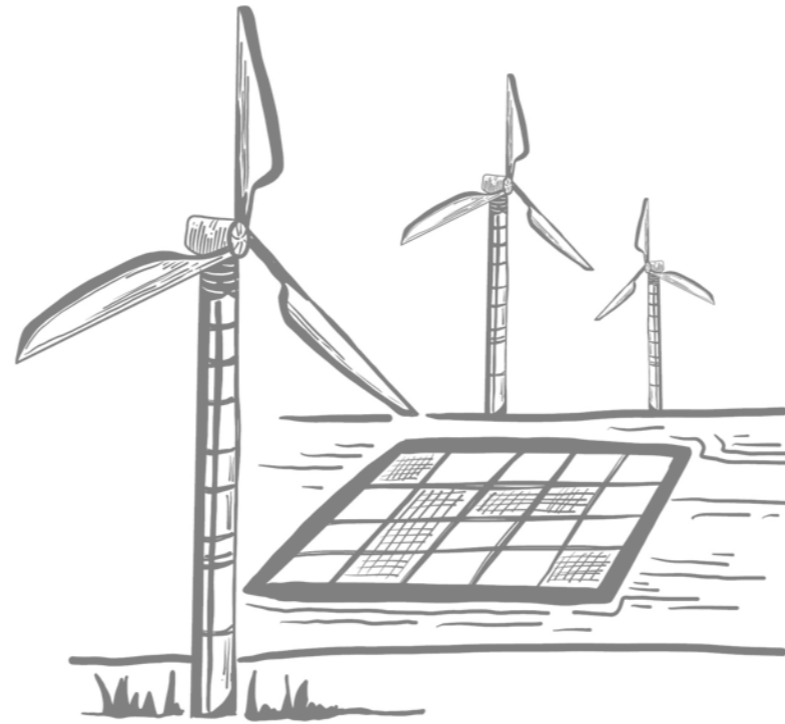


Indicative Design Principle 8:

Consistent access to water

Designate areas within the reservoir that maintain, until the most persistent drought conditions, a consistent water level, promoting inclusive recreational access to the water and favourable conditions for the establishment of marginal and wetland habitat

The creation of dedicated lagoons within the reservoir where water levels can be maintained will help facilitate access to the water via features such as beaches, jetties and pontoons and will also allow a range of wetland habitats to become established. From an earthworks and materials perspective the optimal areas for creating weirs and lagoons to hold water are those associated with the higher ground, located in the north, central and southern parts of the Lincolnshire Reservoir site.



Indicative Design Principle 9:

Decarbonised in operation

Design the reservoir to be constructed and operated to not just meet legislative and planning policy requirements to reduce greenhouse gas emissions, but also support Anglian Water’s objective to achieve net zero carbon emissions by 2030. The reservoirs and associated infrastructure would be designed to maximise efficient siting, positioning and use of materials, including maximising reuse of soil arisings on site.

Wherever practicable, opportunities would be explored to apply innovative new low-energy and nature-based processes and use renewable energy generation infrastructure as sensitively as possible.



Indicative Design Principle 10:

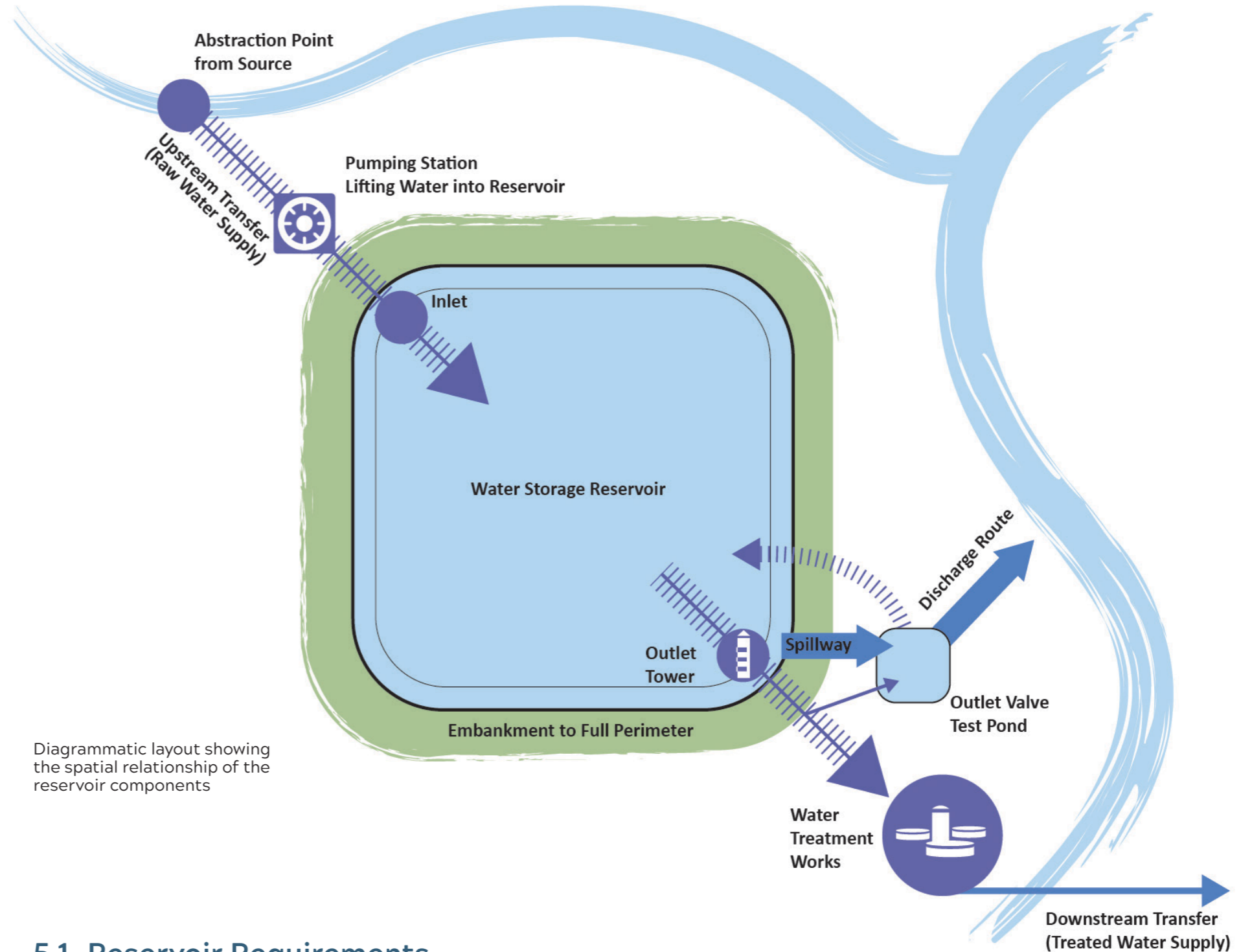
Well planned and seamlessly integrated operational infrastructure

Design and deliver integrated proposals that allow safe and secure access to these facilities for both operational staff and where appropriate, the public. Where practicable features should have dual use and celebrate the civic importance of the reservoir infrastructure. Maximise opportunities to use operational features to promote recreation and create intriguing places that also tell the story of how essential water management is and how it is delivered.



5 Technical Requirements

The following chapter provides a description of the main operational components of this type of reservoir, with reference to the relevant technical requirements which underpin the design; this covers the design of the reservoir embankments as well as other infrastructure associated with the circulation and treatment of water.



Diagrammatic layout showing the spatial relationship of the reservoir components

5.1 Reservoir Requirements

Reservoirs located within existing river basins or valleys require one constructed embankment (dam) to stem and store the natural flow of water. These are known as impounding reservoirs.

Reservoirs, such as the Lincolnshire Reservoir, which are in areas without appropriately scaled river basins or valleys, require newly constructed embankments on all sides and for water to be transferred both in and out, normally through pumping. These are known as non-impounding reservoirs.

Non-impounding reservoirs are made up of several components; these are shown in the generic diagram above.

A high-level description of each component follows. There is further information on opportunities associated with the design of some of these components in Chapter 7.



5.2 Water Transfer and Inlet

As the reservoir is designed as a non-impounding reservoir, the water needs to be abstracted from an existing source of water and then transferred into the reservoir via either an open channel system (existing watercourses or newly created channels), via buried pipelines, or by a combination of both forms of transfer. On reaching the reservoir, water will enter at the inlet point via buried pipes and a pumping system, taking it either over or through the embankment itself. The water inlet is typically located at the opposite end of a reservoir to the point of extraction (the outlet); this creates circulation in the water which in turn benefits water quality.



Example of a pumping station at Tinwell



5.4 Outlet Tower

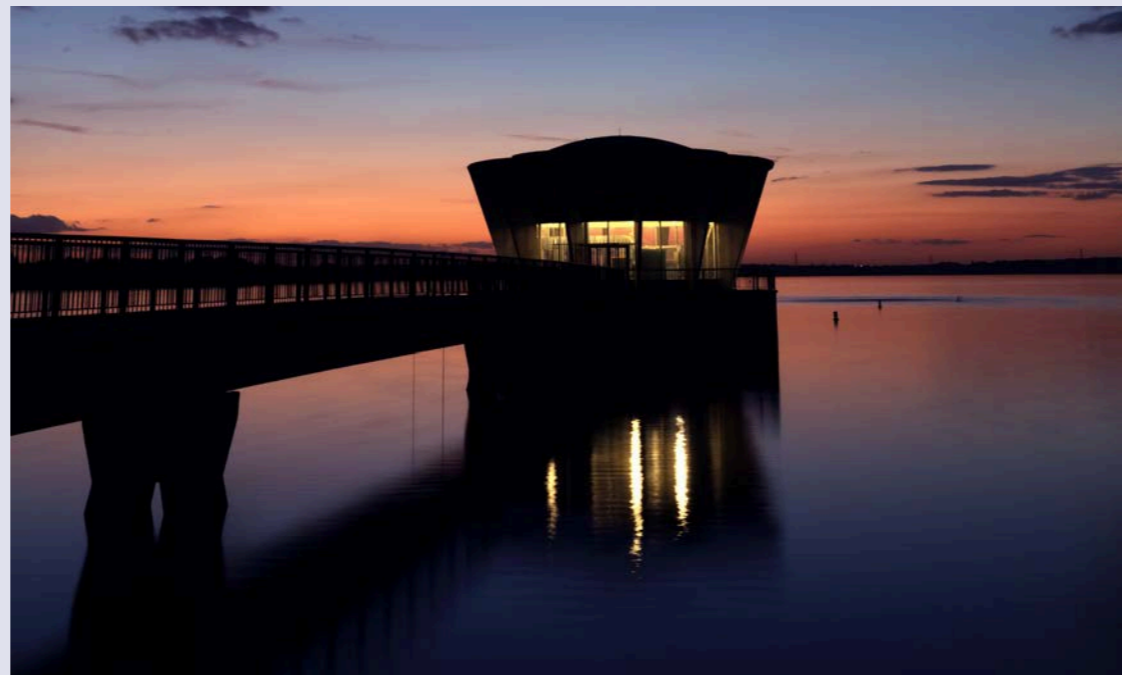
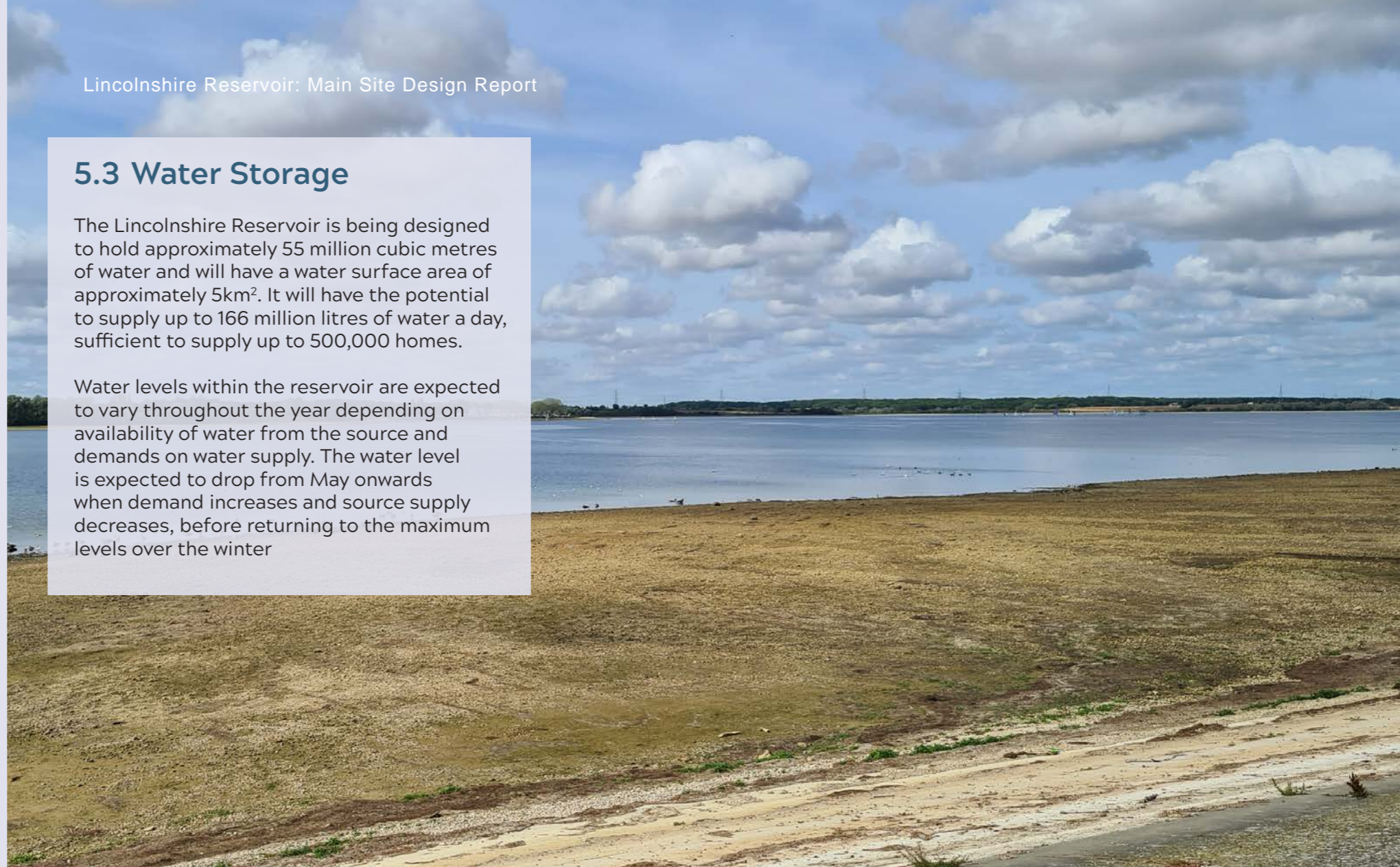
Water is removed from the reservoir via an outlet tower. The outlet tower is usually comprised of a vertical shaft structure with openings at three varying depths within the water. This allows the reservoir operator to extract from the level of the water with the preferred quality in a variety of environmental conditions. The majority of the infrastructure required for the outlet tower will be below water level, however, access into the shaft is required above water level and outlet towers often become prominent features of a reservoir.

The outlet tower is expected to be in regular operation and requires access by a walkway and/or tunnel for maintenance and operation.

5.3 Water Storage

The Lincolnshire Reservoir is being designed to hold approximately 55 million cubic metres of water and will have a water surface area of approximately 5km². It will have the potential to supply up to 166 million litres of water a day, sufficient to supply up to 500,000 homes.

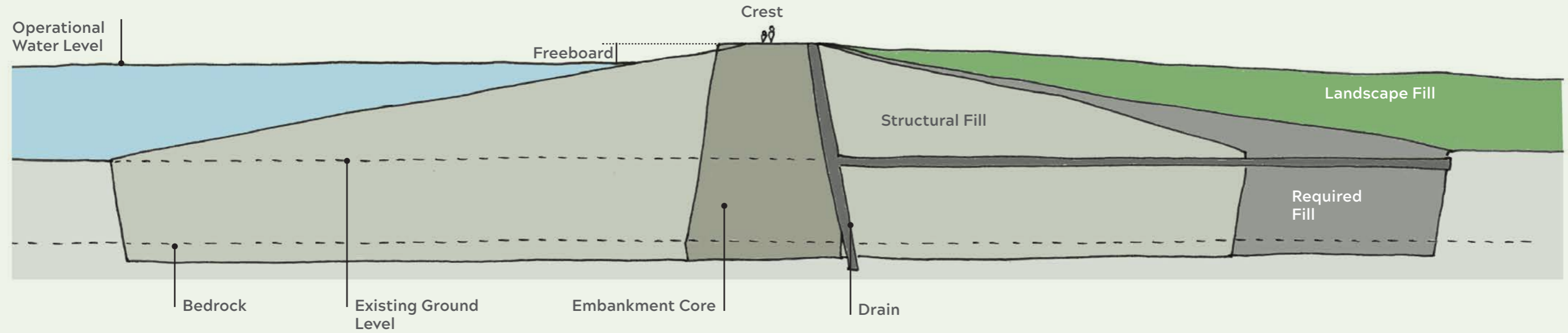
Water levels within the reservoir are expected to vary throughout the year depending on availability of water from the source and demands on water supply. The water level is expected to drop from May onwards when demand increases and source supply decreases, before returning to the maximum levels over the winter



Example of how water levels can vary throughout the year at Grafham Water

Example of a typical outlet tower and bridge

Typical Embankment Cross Section



5.5 Embankments

The embankments are earthworks constructed to form a continuous dam around the reservoir and hold water. The embankments will be constructed over the existing bedrock with the aim of using material obtained from within the bedrock layer (clay) found on site. This is formed in layers and compacted to provide stability and create a low permeability dam. This structural feature is referred to as the embankment core.

Either side of the embankment core will be a zone of structural fill, comprising other material excavated on site. This is not compacted to the same degree as the embankment core and its purpose is to act as ballast which holds the embankment core in place. A drain will be required between the embankment core and structural fill.

On the outer slopes (downstream) slopes of the reservoir, layers of landscape fill would be placed to protect the embankment core and structural fill. The landscape fill can comprise superficial material (material found above the bedrock layer including topsoil and subsoil).

In most places, the embankment crest is required to be raised above the maximum water level. This is referred to as the freeboard and its purpose is to prevent water overtopping the

embankment crest (typically by wave action). Localised sections of the embankment can be lowered (see reference to spillway opposite).





5.6 Water Treatment Works (WTW)

Once raw (untreated) water is transferred from the reservoir, it is conveyed to the WTW to be cleaned and treated to become suitable as potable (drinking) water. It is then transferred to the existing supply network via a pipeline. This is referred to as the downstream transfer.

The water treatment process requires specific filtration and treatment plant, some of which can be housed within buildings or structures.

The WTW will be set within a secure site with no public access to reduce the potential risk of contamination. The WTW will be located away from areas at risk of flooding to minimise potential risk of disruption to operations. There are opportunities to design both the site and buildings to complement their environment.



Hall Water Treatment Works



5.7 Managing Safety at the Reservoir

The reservoir is being designed in line with the latest national and international industry guidance and standards, and the legislation set out in the Reservoirs Act 1975.

This sets the requirements for good design, construction, surveillance and monitoring to ensure the integrity of the embankments. The design is also being developed to be resilient to anticipated future climate events, such as the potential for sea level rise or more extreme weather events.

While the failure of an embankment designed and constructed to current standards is a highly unlikely event, a clear plan for managing emergency situations is a further vital part of operating the reservoir. In addition to high quality design, construction and surveillance, a requirement is to be able to lower the reservoir's water level quickly in the event of an emergency (drawdown).

The plan for how such an emergency will be safely managed is in the early stages of development. The current work shows releasing water from the reservoir in a controlled manner into an upgraded Helpringham South Beck channel to the South Forty Foot Drain, then on to the sea, as the preferred option. This would avoid water being released into Swaton Eau, Helpringham Eau and North Beck. Assessment of options is continuing and will consider the potential environmental effects of an emergency drawdown event as part of the EIA.

Several safety features will be incorporated into the design of our reservoir. These include:

- monitoring and surveillance: as well as ongoing monitoring by skilled operatives and equipment, the potential for new intelligent monitoring equipment in the construction of the reservoir is also being considered.

- spillway: the spillway is a lowered section of embankment with a reinforced outer face. In the very unlikely case that the water level in the reservoir rises beyond the normal operating range, the spillway is designed to overtop, allowing the safe disposal of 'spilled' water.
- bottom outlet valve and pipe: the bottom outlet valve and pipe is designed to allow the water level within the reservoir to be lowered quickly in the event of an emergency that threatens the integrity of the embankment.
- test pond: each year the emergency procedure would be tested to ensure the necessary systems and plans are in place. At these times, water would be released into a test pond and held temporarily rather than being released. When the test is complete, the water would be pumped back into the reservoir. If there was ever a need to fully use the emergency procedure, the water would be released from the test pond into the watercourses closest to the reservoir.



Example of one of the ways that a spillway can be designed, Kinder Reservoir.

6 Understanding the Site

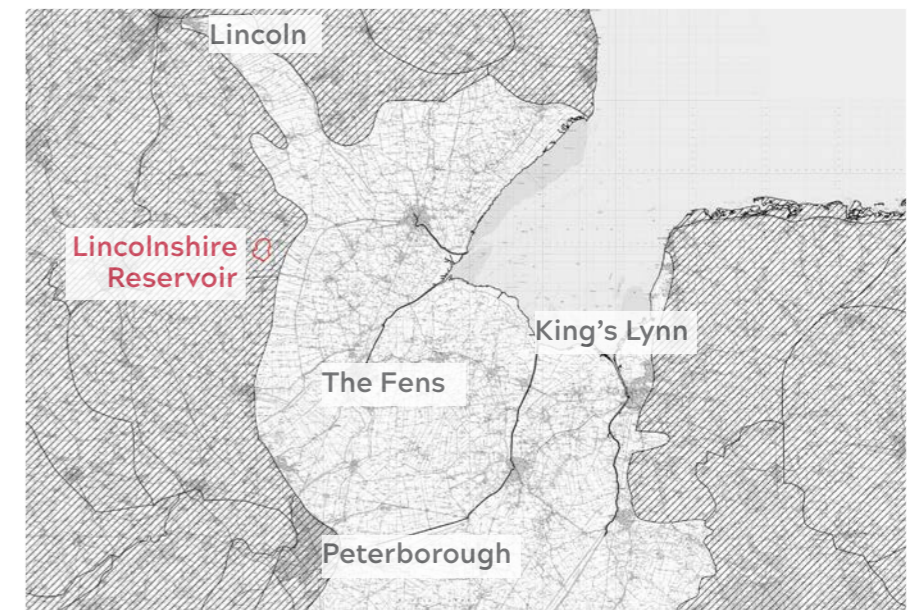
The environment and surroundings in which the Lincolnshire Reservoir will sit provide an important reference for the emerging design. The following chapter provides an overview of this context, looking at aspects of geography, ecology, human activity and cultural elements.

6.1 Geographical Context

The proposed Lincolnshire Reservoir is located within the East of England, towards the south of the District of North Kesteven, Lincolnshire a large diverse rural area stretching from the River Witham in the east and almost to the River Trent in the west. The district is characterised by small settlements and large areas of farmland.

The reservoir site is located just over 30km to the south of the city of Lincoln, approximately 7km south-east of the town of Sleaford, between the nearby settlements of Swaton, Screddington and Helpringham.

The site is situated within an area of gently undulating open countryside, dominated by arable farmland and small blocks of isolated woodland. It includes fields of varying size, generally defined by small drainage ditches and hedgerows.



The Fenland basin and surrounding uplands



6.2 Settlement Pattern and Access

A string of settlements runs approximately on a north-south alignment, where the land transitions from low lying, flat, open fenland to the more undulating topography further west.

Further west, a series of villages and towns are often located at the junction of north-south and east-west routes.

There are 3 settlements located nearby to the reservoir site; Helpringham, Scredington and Swaton.

The village of Helpringham is the largest of these settlements and lies to the north-east of the site. It is noted for its Grade I listed St Andrew's Church, of which the spire is a prominent landmark in the landscape.

Swaton is located to the south of Helpringham. The village is linear in character and lies at the lowest point of the reservoir site, below approximately 10m Above Ordnance Datum (AOD). The tower at St Michael's Church provides a vertical element within the wider landscape.

Scredington is located to the north-west of the site and is located further inland of the string of fen edge settlements. It has a more compact character, historically centred around a number of halls and moats. Similar to the neighbouring settlements, the Church of St Andrew and its spire provide a vertical landmark within the wider landscape.

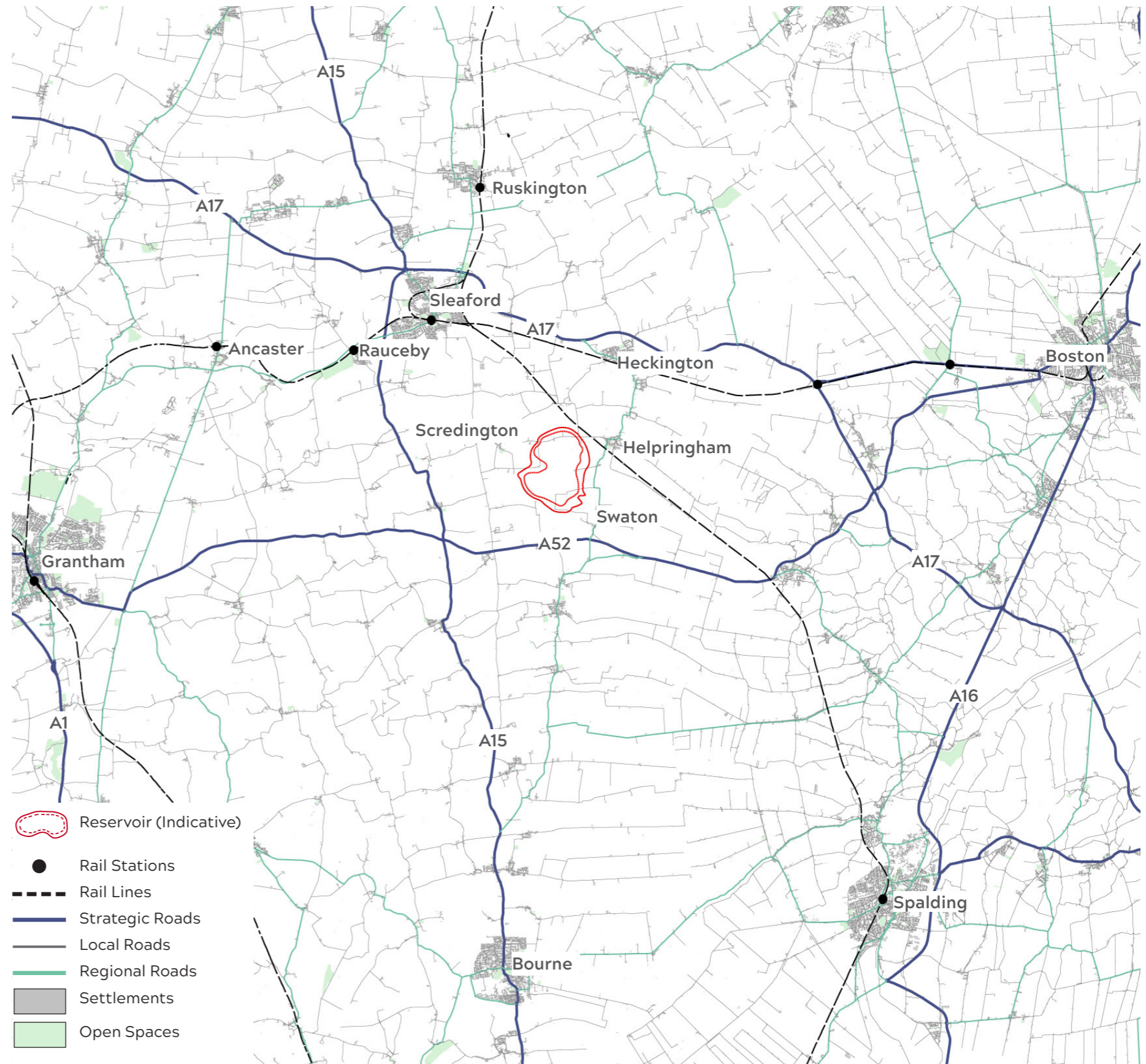
Access

To the south of the site, the A52 Holland Road runs east-west linking Nottingham and Grantham to Boston and Skegness, and providing a route from the Midlands to the coast.

To the west, the A15 road runs north-south and links Lincoln to Peterborough.

The junction between the A52 and A15 lies approximately 4km to the south-west of the site.

The road network within the site is typical of the wider landscape and follows a regular pattern with a series of east-west and north-south routes that align themselves with the undulating river valleys that cross the area. Although appearing as generally long, linear routes, the roads tend to be more winding in character following local topography.



Location of the Lincolnshire Reservoir site and surrounding transport network

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6.3 Topography

The Lincolnshire Reservoir site lies within a gently undulating landscape, that generally falls eastwards from the elevated areas of the Kesteven Uplands in the west, to the naturally low lying fenland areas to the east.

A series of watercourses drain off the elevated areas to the west into the fenlands creating a series of regular east-west valleys and subtle ridgelines that extend through this area.

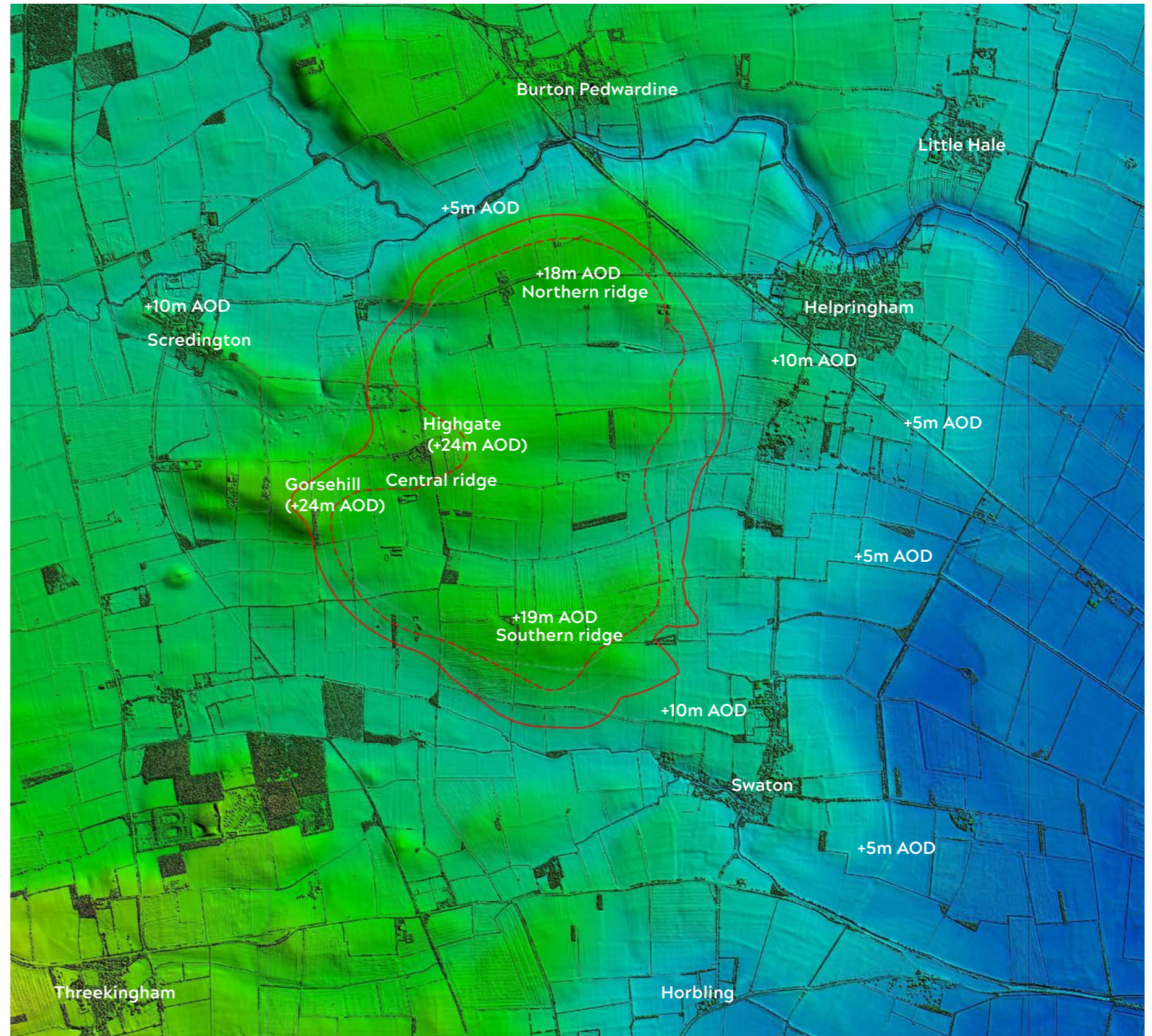
The most elevated and prominent of the three ridgelines lies central to the site and broadly aligns with Gorse Drove, leading towards existing properties on Highgate. There are local high points at Gorse Hill (24m AOD) and Highgate (24m AOD) before the land drops relatively quickly to the east to around 10m AOD.

Another less elevated ridgeline is located to the north of the site, and broadly aligns with the minor road that connects Helpringham and Screddington. This ridgeline lies at approximately 18m AOD and rises from the shallow river valley and flood plain of the Helpringham North Beck watercourse to the north.

To the south of the site is the third ridgeline, also rising to approximately 19m AOD. The Swaton Eau watercourse lies to the south of this ridgeline.



View from Church Lane, Screddington towards the central prominent ridgeline forming the horizon and the gentle undulating landscape



Lidar Image showing the topography of the Lincolnshire Reservoir site. (Lower elevation areas shown in blue, higher elevation areas in green)

6.4 Hydrology

A series of watercourses drain off the elevated areas to the west into the fenlands, eventually discharging into the South Forty Foot Drain further out to the east.

The watercourses within this landscape are winding in nature and follow a natural flow route albeit with heavily modified banks in places. This contrasts with the typically linear drainage ditches found further east within the fenland.

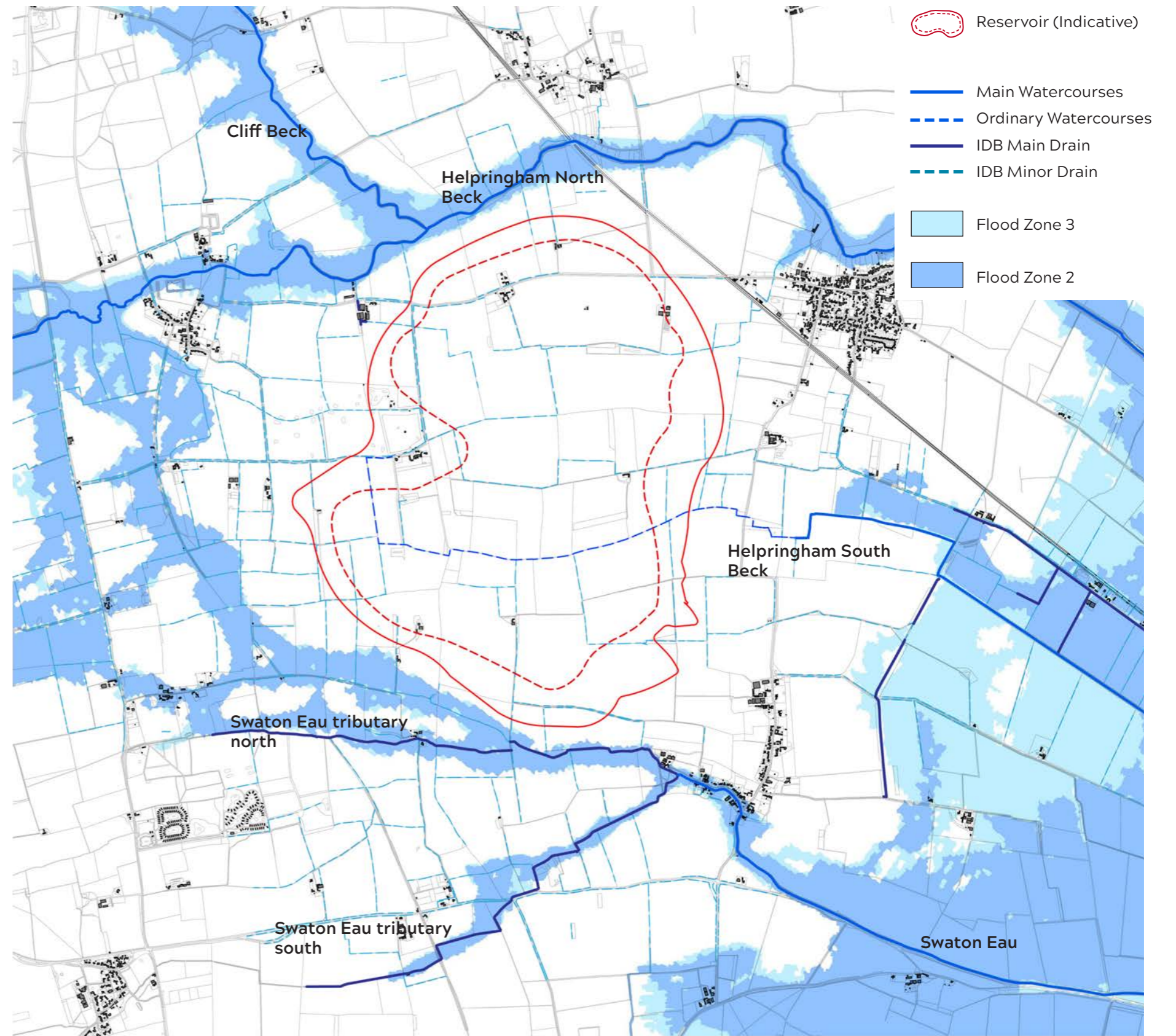
The main watercourses which lie in close proximity to the proposed reservoir comprise the Helpringham North Beck to the north, and Swaton Eau to the south. These are relatively small watercourses, lined in places by woodland blocks which help identify their presence in the landscape.

There are several smaller, watercourses that pass through the central area of the site, including the Helpringham South Beck which flows out to the South Forty Foot Drain.

The main watercourses are susceptible to overtopping, with flooding a significant issue during peak rainfall periods. Natural flood management features such as shallow scrapes and pools have been recently constructed on land to the west of Swaton in an attempt to address such impacts.



Existing view along Helpringham North Beck



Plan showing existing watercourses and extent of flood zones around the Lincolnshire Reservoir site.

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6.5 Landscape Character

The site is located within a transitional landscape, displaying distinctive features and characteristic of both the elevated areas to the west and the lowland fenland landscapes to the east. However, it is not wholly typical of either.

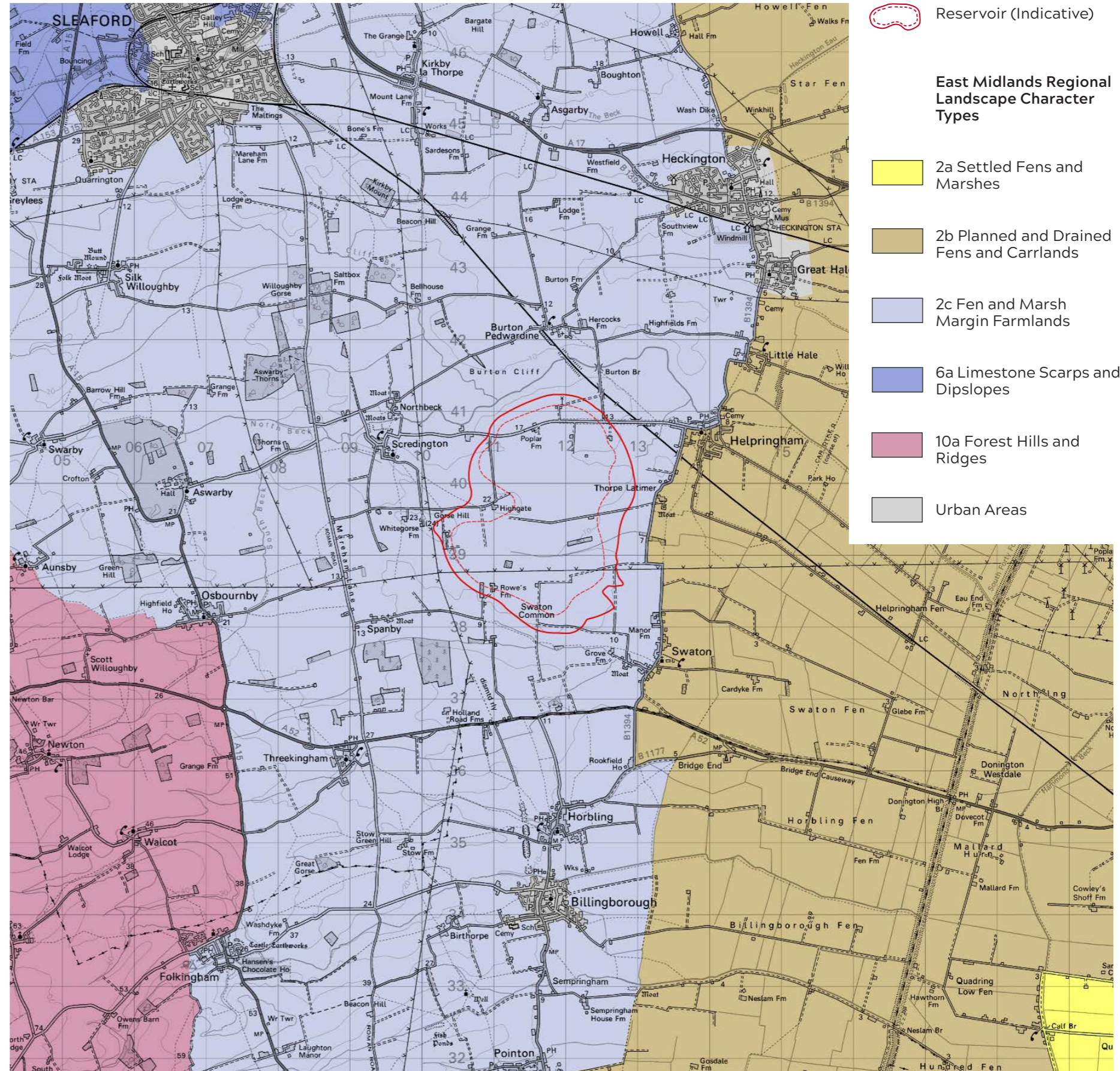
To the east, the drained fenland is a large scale, flat and open landscape of man made ditches and big skies. It has very little tree cover and extensive views out. To the west, the landscape is more elevated, with a series of plateaus and undulating ridges, with more extensive woodland cover.

The site is largely typical of the wider transitional character, substantially comprising gently rolling agricultural fields of varying size, often bounded by straight hedgerows and intersected by small rural roads and tracks which serve agricultural buildings, dispersed properties and local villages. Settlements are well integrated into the rural landscape with church spires forming prominent vertical features.

A small number of rectangular woodland blocks or copses punctuate the landscape and, when combined with the dense, well managed hedgerows with hedgerow trees, they create a fairly regular linear pattern.



Typical view of the rural character surrounding the Lincolnshire Reservoir



-  Reservoir (Indicative)
- East Midlands Regional Landscape Character Types**
-  2a Settled Fens and Marshes
-  2b Planned and Drained Fens and Carrlands
-  2c Fen and Marsh Margin Farmlands
-  6a Limestone Scarps and Dipslopes
-  10a Forest Hills and Ridges
-  Urban Areas

Plan showing Landscape Character Types

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6.6 Public Rights of Way (PRoW) Network

Footpath routes tend to radiate from the existing settlements out into the wider landscape.

There are no direct footpaths that connect the local settlements of Scredington, Helpringham and Swaton.

Over time, footpath routes may have been upgraded to form part of the highway network or lost entirely. This has led to a disconnected footpath network with a number of footpath links that terminate in the landscape.

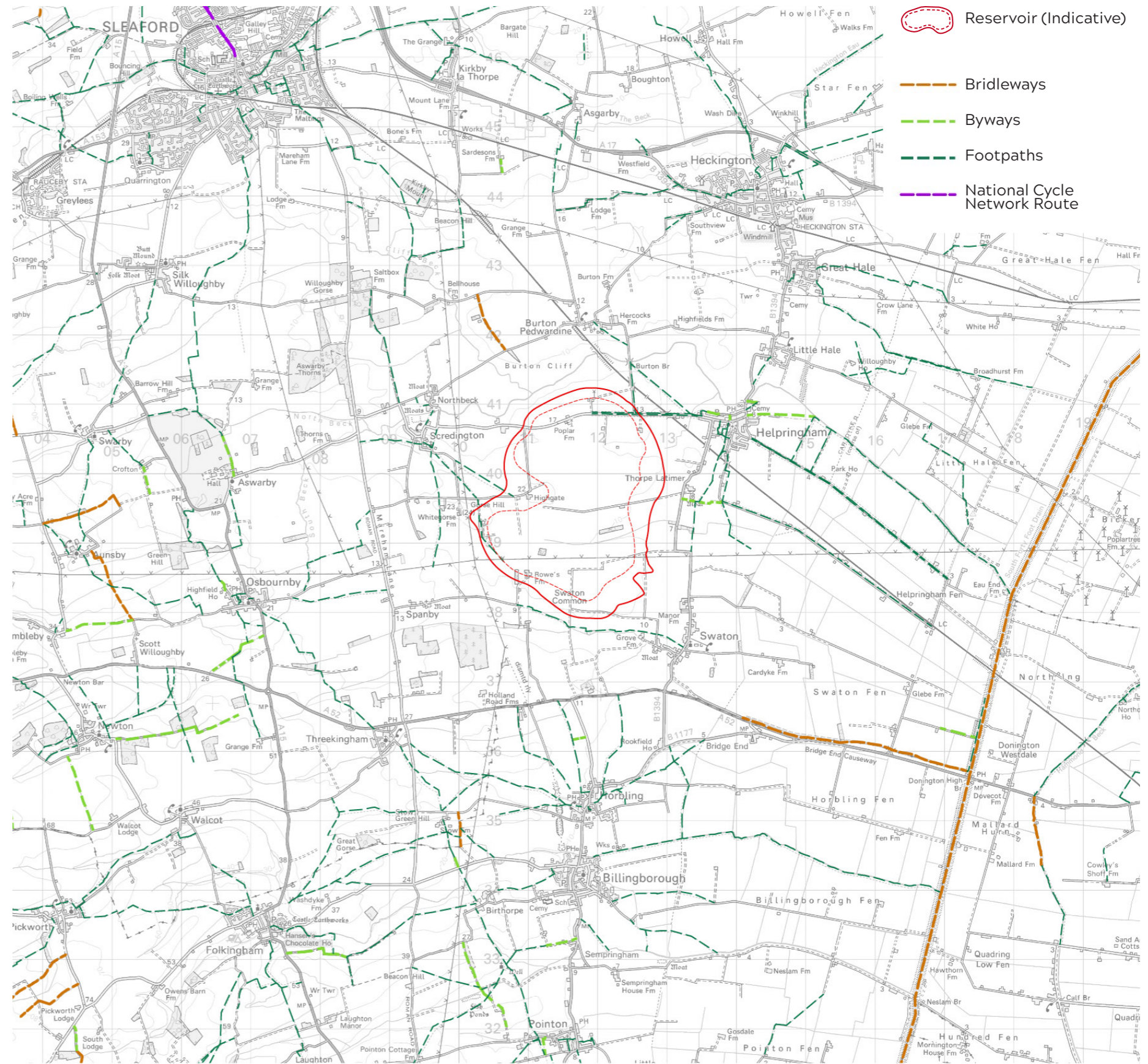
Further east, the footpath network becomes sparser within the drained fenland landscape. However, there are occasional long linear footpath links along drainage ditches that connect to the South Forty Foot Drain, especially from Helpringham. The South Forty Foot Drain has a bridleway designation along the majority of the route.

There are no National Cycle Routes within 5km of the site. The nearest National Cycle Network Route is Route 151 located to the north of Sleaford, linking Sleaford and Leasingham.

There are no dedicated off-road cycle routes within the site or immediate area.



Footpath sign near Swaton.



Plan showing the existing PRoW Network

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6.7 Heritage

The Lincolnshire Reservoir site and surrounding landscape exhibit a rich history, dating back thousands of years. There is a particular focus on the history of water management within the wider landscape.

The transition from the flat low lying fenland to the uplands would have acted as a 'frontier landscape' becoming the first areas of dry land that could be inhabited and used for cropping, whilst still being located close to the resource rich fenlands for grazing and wildfowl.

The Car Dyke to the east of the site is a Roman ditch. It is evidence of one of the earliest attempts to drain the fenland to provide productive land for food growing and habitation on drier land.

The Car Dyke delineates the western edge of the fens, representing the boundary between the uplands and reclaimed fen, and is frequently associated with a string of settlements located on the rising land. Sections of the Car Dyke have Scheduled Monument status, including a section located approximately 2km to the east of the proposed reservoir edge.

The string of settlements on the edge of the fens, including Swaton and Helpringham, are historic in nature and contain a number of listed buildings. Local churches and associated towers and spires are common and distinctive landmarks in the landscape.

To the south of Helpringham is Thorpe Latimer, which is a Grade II listed building and remains of a medieval moated site, post-medieval park and garden and remnants of ridge and furrow cultivation that can still be seen in the landscape.



View towards Scheduled section of the Car Dyke



Plan showing the existing heritage designations around the Lincolnshire Reservoir site.

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6.8 Habitats and Biodiversity

The majority of the Lincolnshire Reservoir site is dominated by arable land used for cropping and cereal growing.

Many of the fields used for agriculture are defined by dense hedgerow planting in a fairly regular pattern across the landscape. The majority of the hedgerows are either a species poor hawthorn hedgerow or a hawthorn hedgerow associated with a drainage ditch. Review of historic mapping suggests a number of former hedgerow boundaries have been lost due to the merging of fields across the landscape.

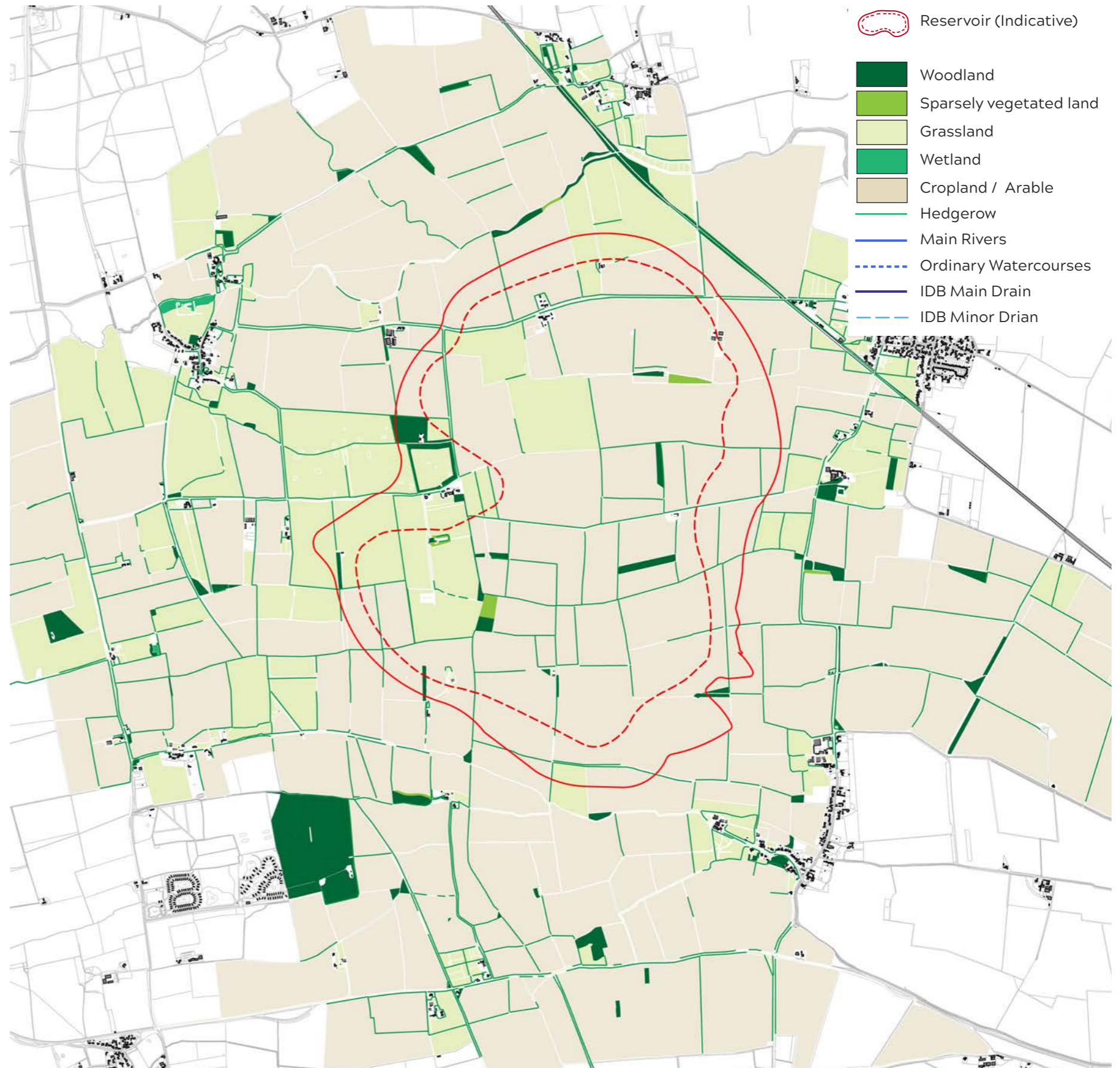
There are small pockets of woodland and tree shelter belts located around the wider landscape, mainly concentrated around the isolated farmsteads. These woodlands are likely to be of a low ecological condition given their size, origin and age. There are a small number of wet woodlands and plantations that follow the route of the existing watercourses to the north and the south of the site

There are two main watercourses that run through the Lincolnshire Reservoir site: Helpringham North Beck to the north and Swaton Eau located to the south. These watercourses have been heavily modified and have little bankside vegetation with the adjacent arable land often running right to the very edge.

Throughout the site are several drainage ditches, discharging into the watercourses mentioned above, to convey water out to the South Forty Foot Drain further east. These ditches are often dry, with poor water quality and little marginal species.



Fields to the west of Helpringham and Swaton. Anglian Water Lincs Reservoir Assets. Matthew Power Photography



Plan showing the existing habitat typologies found within and around the Lincolnshire Reservoir site

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7 Opportunities

The Project has considered ways in which the design of the reservoir (the core components including embankments) could be optimised and adapted to achieve multiple benefits beyond the supply of water. This chapter summarises the key design opportunities which are unique to the type of reservoir which is proposed.

7.1 Overview

A standard engineered non-impounding reservoir, such as that found at Covenham reservoir (below), present different challenges and opportunities for successful place making, habitat creation and integration within its landscape. Unlike impounding reservoirs (where a valley on an existing water course is dammed), the entire perimeter of a non-impounding reservoir is man-made embankment, usually built above existing ground levels. Each of these banks is carefully engineered to ensure it is safe and easy to maintain, which has often meant that non-impounding reservoirs have steep slopes with no naturalised banks where planting and people can easily access the water's edge.

For NSIPs such as the Lincolnshire Reservoir, the NPS requires the design to be adapted and improved to achieve multiple benefits for people, places and nature. Opportunities identified were discussed with reservoir experts to agree which of them could be taken forward.

The Project Team also looked at how key opportunities and challenges raised through feedback at Phase One Consultation could be addressed in the design proposals, such as opportunities to provide community access and new recreational facilities.



Covenham Reservoir - An example of a standard non-impounding reservoir. This approach would not meet the requirements of the NPS which will apply to the Lincolnshire Reservoir

7.2 Reservoir Shape and Form

Arriving at the preferred shape and height of a reservoir involves balancing multiple factors. For example, if the reach (width of the reservoir) can be reduced sufficiently in the direction of the prevailing wind (from the south-west), there is less distance for the wind to increase the size of waves, and therefore the freeboard above the high water level can be reduced. However, a long, thin reservoir is less desirable in terms of water quality as zones of dead-water might be created which may then need to be remedied through electrically powered plant. This is the case for creating bays and too many interruptions on the reservoir edge.

Optimising the shape is also closely related to achieving the best cut/fill balance for the Project. This involves balancing the amount of material needed from excavation with the amount of material needed to create the embankments. Achieving a good balance reduces the amount of work required to move materials and, in turn, reduces the Project's carbon footprint.



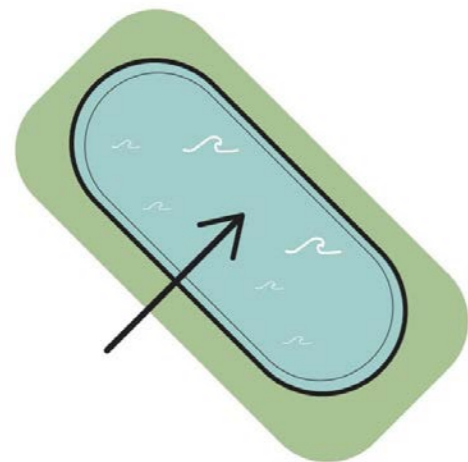
Erosion protection is required to the inner face of the embankment around its entire perimeter. In standard non-impounding reservoirs, it is usual to achieve this with a hard treatment such as concrete or rip-rap. Opportunities were identified that other forms of erosion protection could be possible. For example, there is a key opportunity around using lagoons and wetland creation on the inner face of the embankment to reduce the amount of engineered surfacing.



Beach is an example of a potential erosion protection treatment to the inner face of the reservoir. Amager, Copenhagen

The distinctive landscape character and topographical context established an important design driver which informed exploration of shape options. This led the Project Team towards exploring natural or organic forms, using the shape of the land and the presence of settlements and historic features as important references. The concepts of varying embankment profiles were assessed to look at the different implications on factors including access to the site, prominence in local views, setting of heritage assets, and carbon and constructability impacts.

More detail on shape testing in response to context is provided in Chapter 8.



There is little opportunity to minimise the size of waves unless the shape is significantly changed in this direction.



Size of waves and prevailing wind direction are factors in determining a suitable inner face treatment.

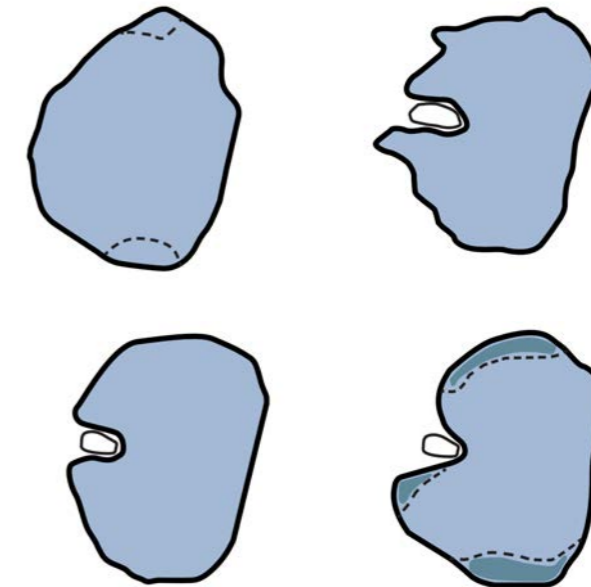
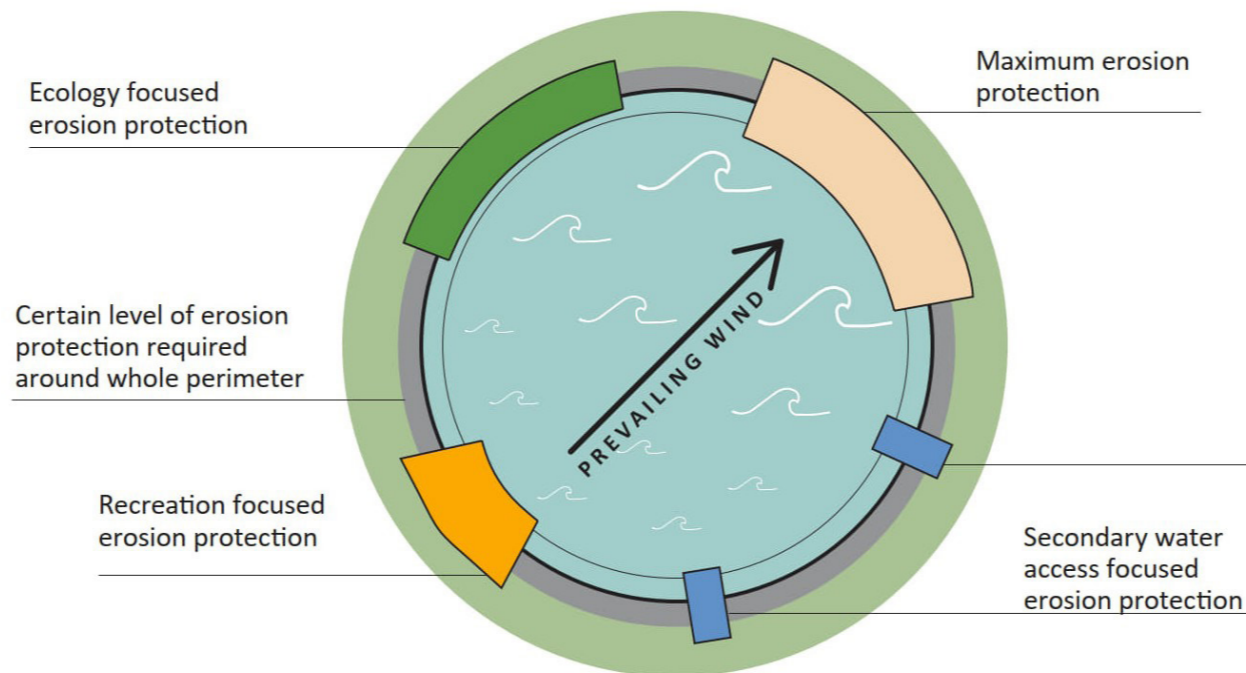


Illustration showing the stages of development in the reservoir shape

There is the opportunity to use a range of erosion protection materials around the inner face of the reservoir that align with the use or character.

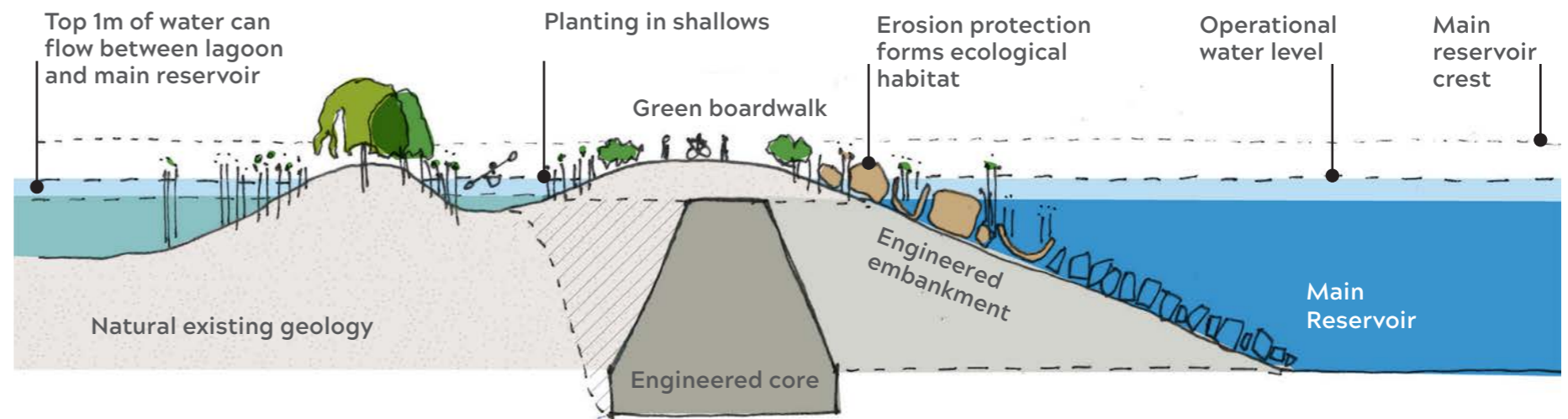
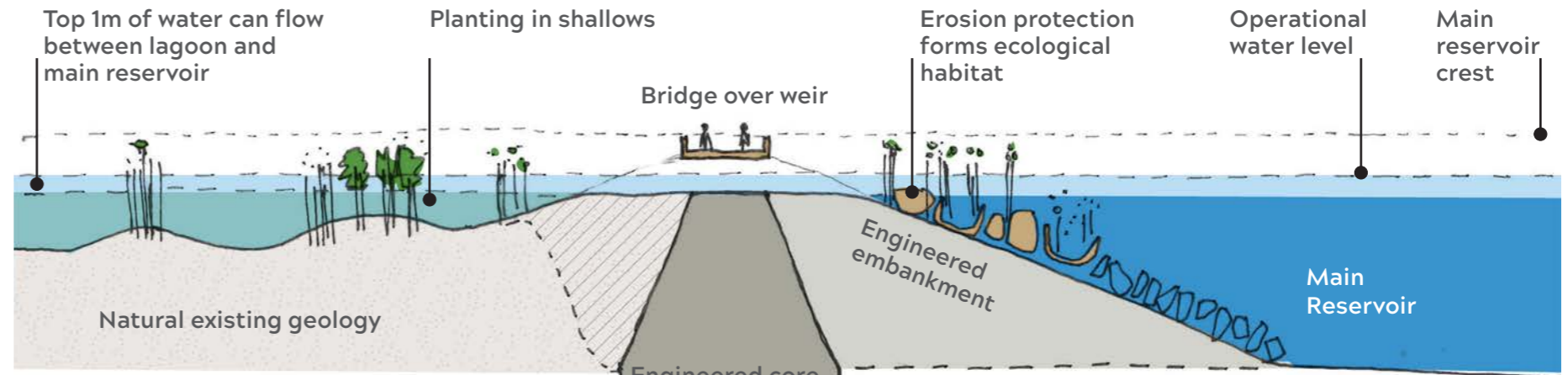


7.3 Public Access to Water

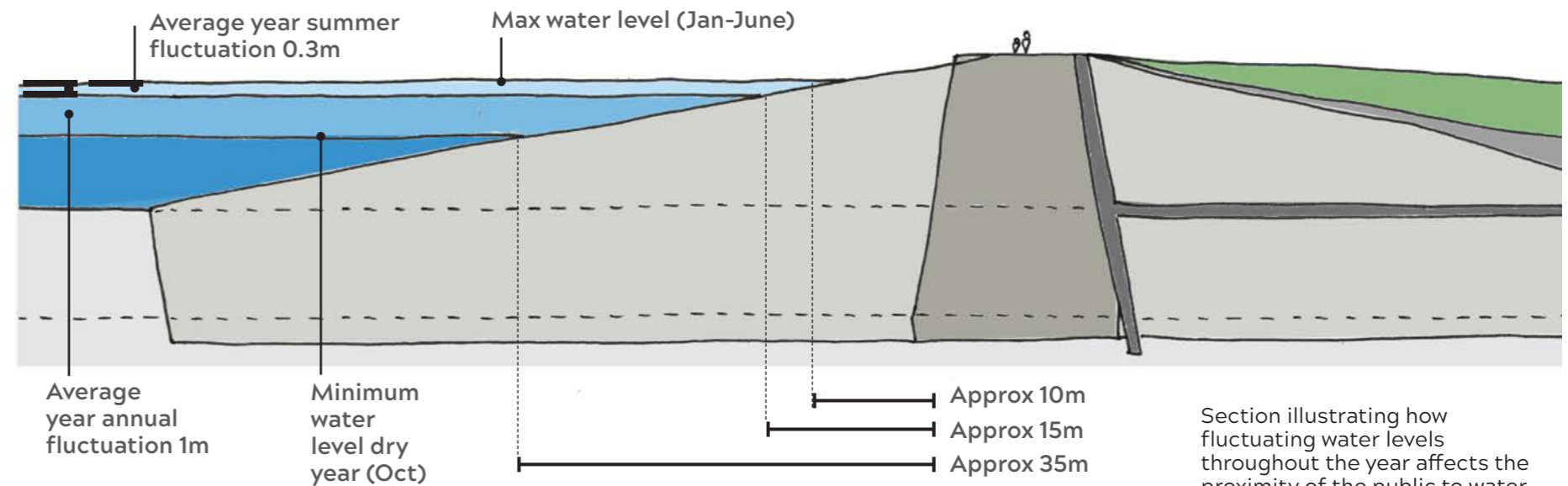
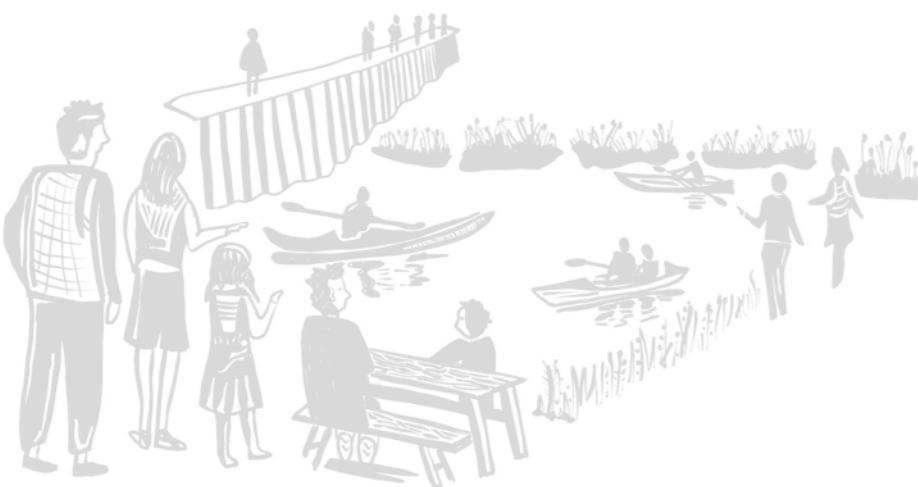
The new reservoir will be subject to fluctuating water levels arising from the annual cycle of filling and drawing down. In a typical year the water levels will drop during the summer months from the high spring level - this drop in water levels is likely to be greater in drought conditions, including extreme and severe drought events. Such fluctuations present challenges for gaining public access to the water and the establishment of marginal and wetland habitats on the inner embankment.

As a result of these fluctuations in water levels, the need for a freeboard, and the relatively slack gradients of the internal face of the embankment, the proximity of the water to people on the embankment crest will vary by approximately 20m over the course of an average year.

To overcome this, the Project Team developed the concept of establishing a series of internal weirs at three discreet locations within the waterbody to retain water at a much more consistent level. These areas, referred to as lagoons, have been successfully introduced at other reservoirs such as Rutland Water. At the Lincolnshire Reservoir, the shallow lagoons could utilise areas of naturally high ground to create the profile and inner embankments, or weirs, which contain the water. The areas with consistent water levels mean access structures (jetties) and beaches could be designed for more fixed levels enabling opportunities for activities like swimming and kayaking. It also makes successful establishment of marginal habitats more likely as the water levels can be varied but controlled to meet specific habitat requirements.



Sections illustrating potential ways that a lagoon created by an internal weir can bring people closer to the water.

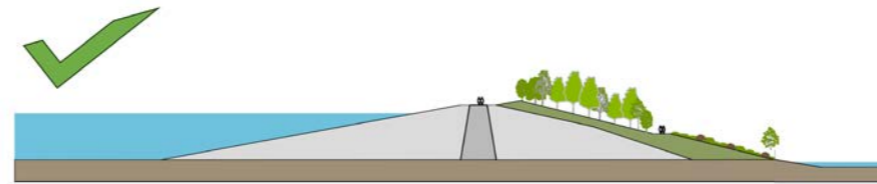
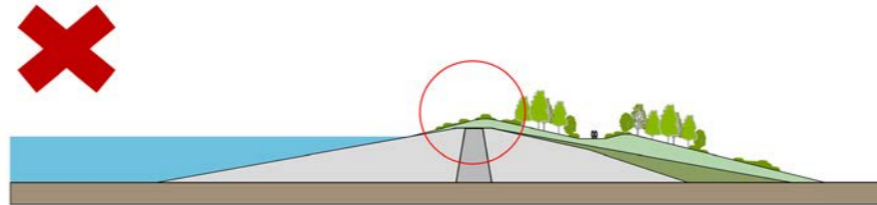


7.4 Embankment Integration and Tree Planting

In line with NPS requirements and the indicative design principles, the design is seeking to avoid creating a reservoir with monotonous embankment slopes that provide no shelter or integration with the surrounding landscape. Therefore, the Project Team looked at opportunities for planting and features on the embankments to improve accessibility and appearance

A number of scenarios were discussed in detail with reservoir safety experts and several key opportunities (and constraints) were identified:

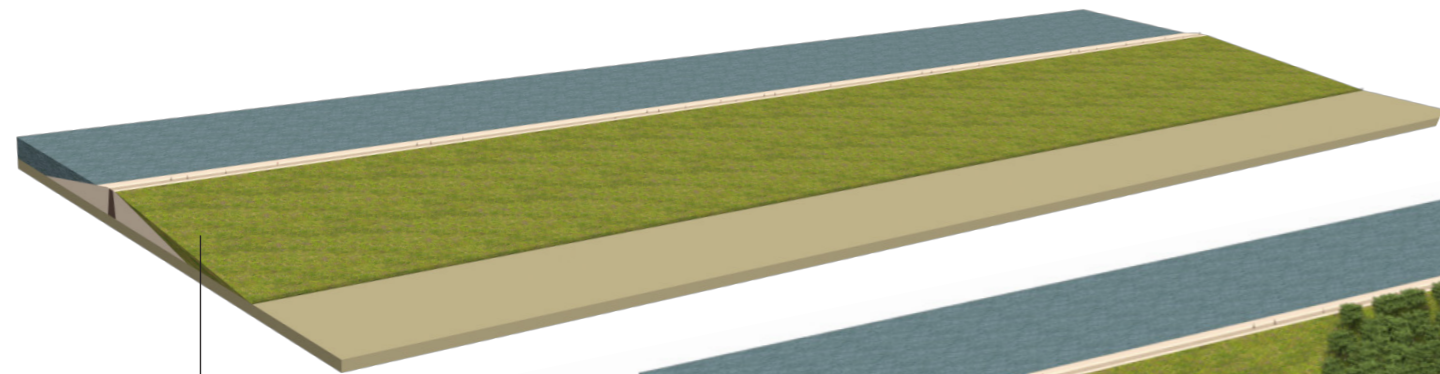
- 1 Additional “landscape” earthworks at shallower gradients could be placed on top of the engineering embankments and trees can be planted into the landscape earthworks, provided the tree roots do not penetrate the engineered embankments below. Further detailed work will be undertaken to determine which trees species will be most appropriate for this.
- 2 Landscape earthworks could extend above and overlap the crest of the engineered embankment. This is particularly important for providing shelter on what will be the most important recreational route. However, a 5m width of the engineering crest must remain level and uncovered by landscape earthworks so that the inspecting engineers can immediately identify any settlement in the embankment.



Example of ways in which tree planting near the embankment crest has been discussed and explored with input from the reservoir engineers

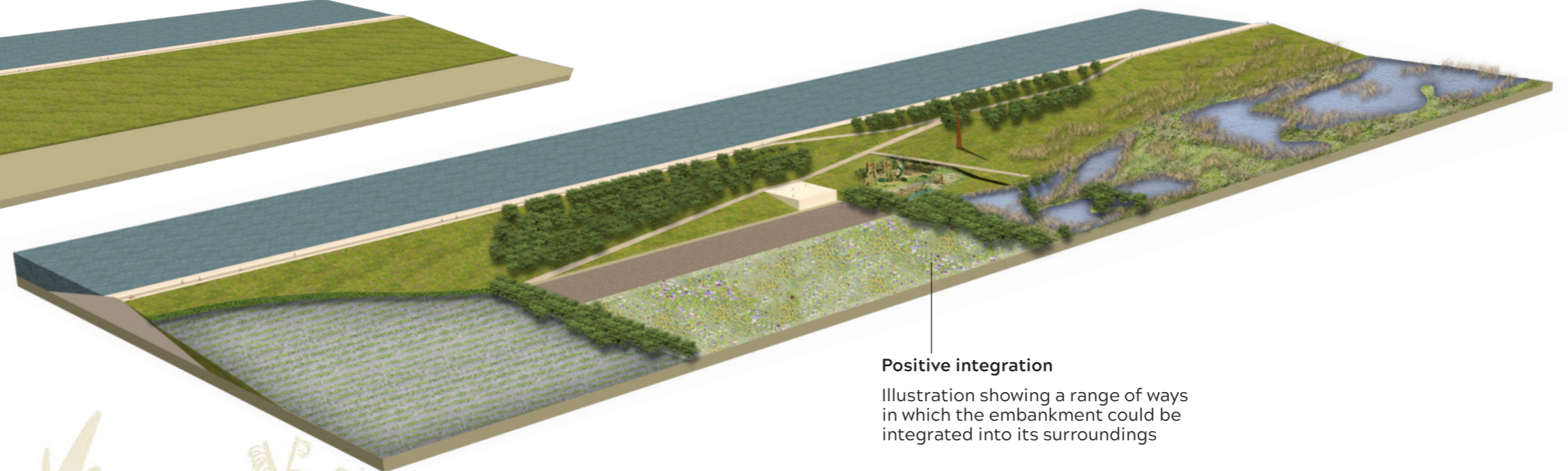
- 3 Whilst landscape earthworks could be established around the majority of the reservoir perimeter, there will need to be specific areas where the engineering embankment (planted with amenity grassland) is exposed for inspection.
- 4 Wetland could be provided beyond the outer extents (the ‘toe’) of the engineered embankment - but no areas of wetland can be built on the embankment itself.
- 5 Other infrastructure, such as parking and buildings, could be located on the embankments, subject to appropriate engineering design.

These opportunities are utilised in the emerging design, however it should be noted that the use of landscape earthworks on top of the embankments is contingent on the amount of material available from excavations on site. The extent of landscape earthworks, therefore, is constrained by the “cut/fill” balance of earthworks and likely to vary as the design develops.



Poor Integration

Monotonous embankments should be avoided



Positive integration

Illustration showing a range of ways in which the embankment could be integrated into its surroundings

7.5 Recreation

Anglian Water’s other reservoirs in the region such as Rutland Water and Grafham Water have become outdoor amenity destinations in their own right. Phase One Consultation showed local enthusiasm for a range of different recreational facilities at the Lincolnshire Reservoir.

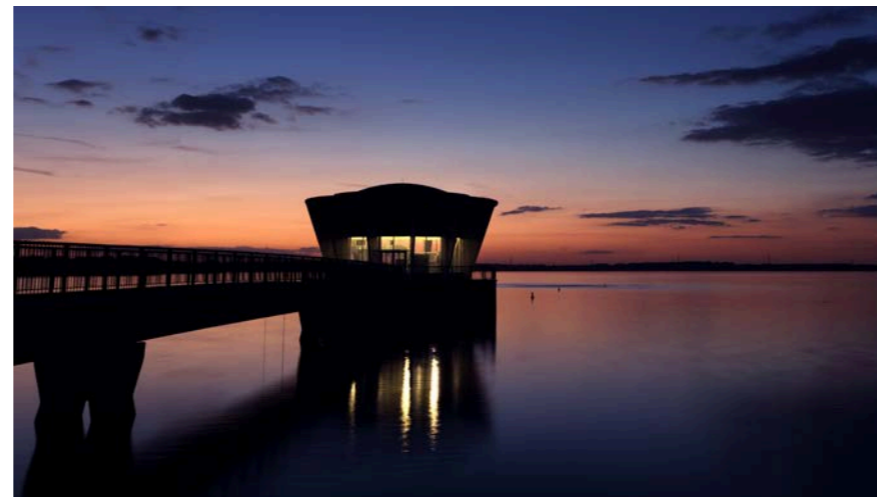
The recreational features at the reservoir could include a mix of different experiences and activities. Examples may include:

- Visitor centre
- Outdoor play facilities
- Nature and habitat areas
- Recreational routes for walking, cycling and horse riding - including circular loops around the reservoir
- Water based activities
- Angling facilities

In line with the NPS, some of these may be delivered as part of the DCO. Recreation facilities which cannot be consented through the DCO would require separate consents and might be promoted by other parties in and around the site after the reservoir is complete.



Illustration showing how access to water could be encouraged through water-based recreation



Example of a typical outlet tower and bridge

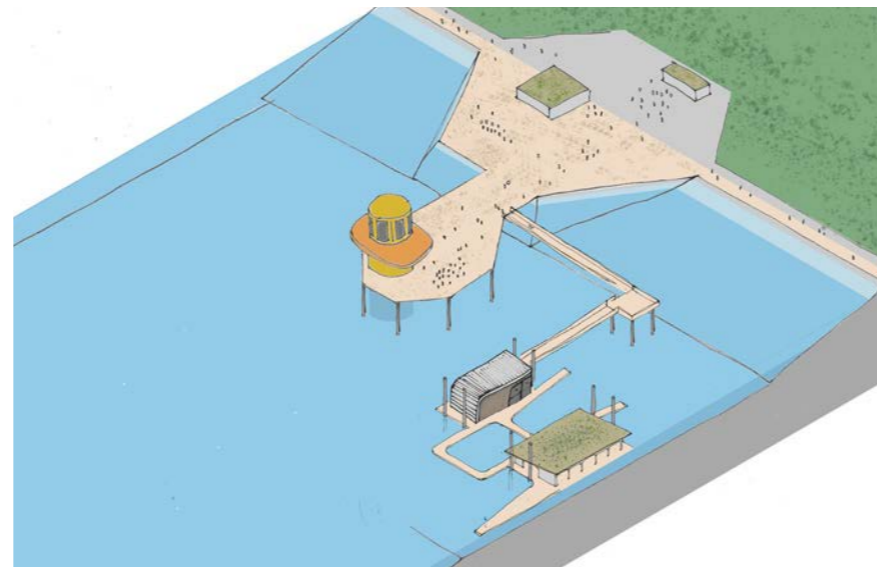


Illustration showing how access to water could be facilitated through required reservoir infrastructure

7.6 Public Access to Reservoir Infrastructure

In developing the emerging design the Project Team has looked at how the reservoir operational infrastructure could be used and integrated seamlessly into the design proposals and increase public understanding of the process and importance of water resource management.

After a review of the security and access requirements associated with critical assets, the following potential opportunities and constraints were identified:

- 1 The outlet tower will house operational equipment that needs to be secure from the public. Should public access be provided to appropriate sections of the tower via an access pier or walkway, it would need to be separate and secure from the operational assets. The outlet tower and its connecting bridge could be used to get people closer to the water when the water levels are lower, however control measures would be required to ensure that this could be achieved safely and they are not exposed to fast-flowing currents.
- 2 The spillway area has a lower crest (less freeboard) and could be located where improved (lower) access to the water and a slacker gradient up to the crest level is achievable, however care will need to be taken that public access does not increase the risk of erosion of the spillway surface on the outer embankment. The width and treatment of the spillway can also be varied on the outer embankments to balance the risk of erosion on the surface. For example, a wide spillway can have a more natural treatment. A narrower spillway would need to be hardened due to the greater depth and velocity of water being channelled down it.
- 3 The outlet valve test pond generally requires a harder surface treatment to prevent establishment of habitats that could be damaged by emergency use. Opportunities to use this large “basin” as a part of the public amenity areas are limited. When water is discharged from the reservoir into the pond, energy dissipation is required to reduce the force of the water. A visual feature could be made of this, for example a vertical jet creating a water fountain, but access would be restricted.



7.7 Nature-Based Solutions

Nature-based solutions (NbS) involve working with nature to address societal challenges such as climate change, environmental degradation and water security. Specifically, they are actions that involve the protection, restoration or management of natural and semi-natural ecosystems effectively and adaptively, simultaneously benefiting people and nature.

The Project Team are actively exploring opportunities to use multi-functional environmental approaches or interventions that could be beneficial at the reservoir once its full environmental impacts are understood.

Relevant examples of this ecosystems led approach could include restoring wetlands to mitigate floods and improve water quality, using woodland planting and natural grasslands to absorb carbon and integrating fruiting trees into agricultural landscapes to enhance soil health and provide alternative sources of income.

Further detailed assessment of the natural capital of the site (the natural resources that provide benefits to people and nature) will be undertaken to help inform how nature based solutions could be incorporated within the reservoir design to maximise the range of benefits.



Example of wetland creation to improve water quality in the River Ingol at Ingoldisthorpe

7.8 Navigation

Improved facilities for navigation emerged as a theme in feedback from Phase One Consultation. In considering potential opportunities, the Project Team has reviewed the local and regional context provided by the existing waterways, the type and size of vessel and precedents for marina infrastructure in the region, and at other regional studies and initiatives which provide context. Of relevance to the Lincolnshire Reservoir is the Boston to Peterborough Wetland Corridor Study which proposes to deliver 12 miles of new channel, connecting



Hartford Marina, Huntingdon

50 miles of existing navigable waterways to create a significant new wetland corridor.

Opportunities for a marina and navigable connection to the adjacent waterway system would need to consider how such facilities could support both the construction and operation of the proposed reservoir Project; and if it can be within the scope of the proposed DCO application, or if it represents an opportunity that would need to be delivered by a third party separately.



Hermitage Marina, Earith

7.9 Carbon and Renewable Energy

Anglian Water has a strong reputation for delivering significant reductions in the carbon footprint of its construction projects. It is generating and using an increasing amount of renewable energy and has committed to achieving net zero carbon emissions in operation by 2030. In line with these ambitions the Project is committed to:

- Reducing greenhouse gas emissions (i.e. a combination of what we refer to as capital carbon and operational carbon) to as low as reasonably practicable as per the National Policy Statement for Water Resources Infrastructure
- Achieving net zero operational carbon emissions as per Water UK's net zero Routemap
- Considering best value for water customers and;
- Maintaining an evidence based approach to identifying and driving low carbon opportunities.

Designers are required to avoid, reduce and offset carbon emissions. Opportunities for the scale and mix of renewable energy are being considered, this includes both onsite and offsite generation.

At the Lincolnshire Reservoir this could include a mixture of solar panels and wind turbines, balanced by battery storage. Of these, only solar and battery storage were considered during this first masterplanning stage, with one potential configuration shown in the emerging design for consultation.

This is however not a fixed proposal, and a significant amount of technical work is needed, including a full assessment of potential impacts and mitigation requirements through the EIA process, and acknowledging rapidly evolving technology, before the mix and amount of renewable energy provided as part of the Project is progressed.



8 Design Evolution

This chapter describes the evolution of the emerging design for the Lincolnshire Reservoir, beginning with high level exploration of design concepts, themes and opportunities, and followed by an iterative process of option testing, considering alternative potential design solutions and arrangements of key elements.

This process is underpinned by the visioning, site analysis and opportunities work described in earlier chapters. It is also informed by stakeholder engagement and peer reviews.

The outcome of this iterative and incremental process to date is the emerging design which is presented in Chapter 9.

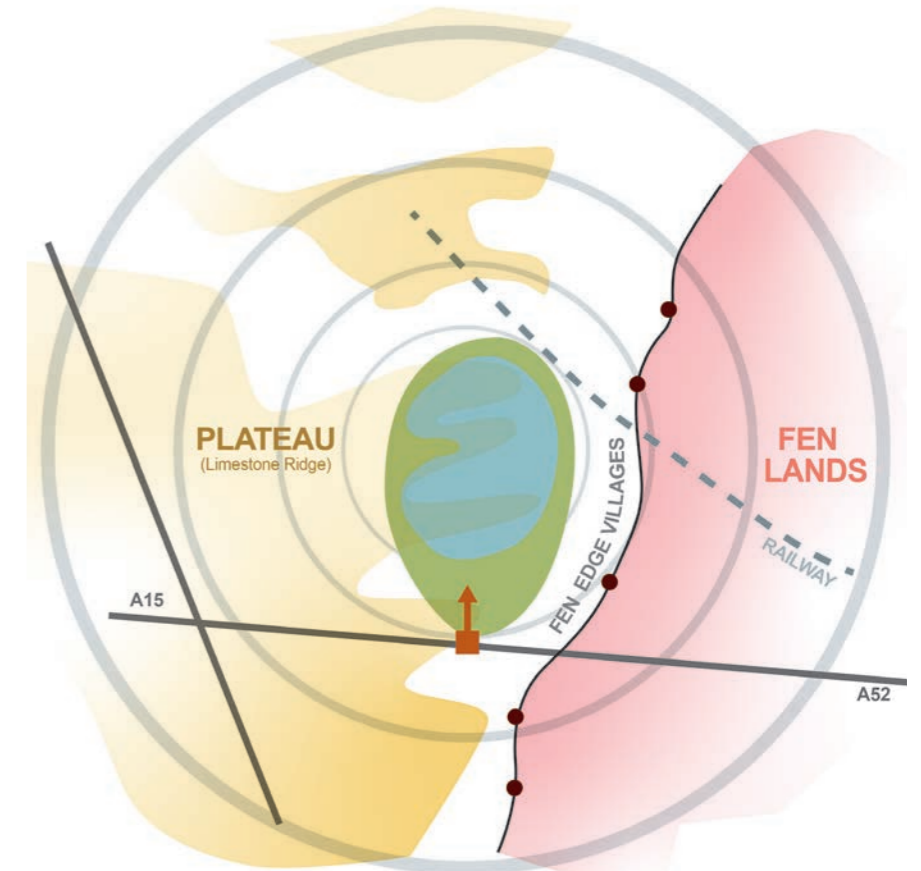
8.1 Formative Design Themes and Concepts

The emerging design for the Lincolnshire Reservoir is evolving from an early concept : 'Nature's Secret Garden'. This imagined a destination nestled discreetly between the Limestone plateau and the Fens, a place anchored in nature and inspired by its landscape setting, local heritage and folklore.

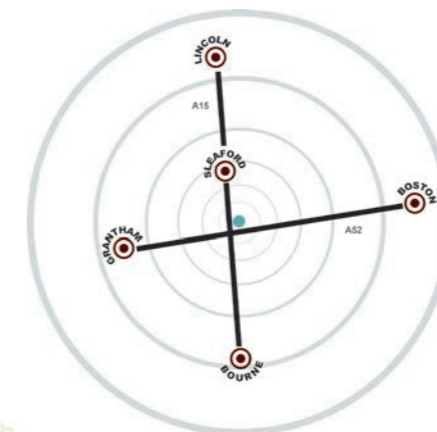
The concept was predicated on three key tenets:

- **A destination** hidden in plain sight at the confluence of major transport routes
- **A refracted landscape** - promoting creative interpretation of the distinctive 'frontier' landscape, bringing to the fore the transition from plateau to fenland through the landform, characterful spaces and rich habitats
- **Surprise and delight** - a unique and 'unexpected' place which is stimulating, educational, regenerative and transformational - a place which is equally respectful of its setting and local communities.

These tenets formed a narrative thread which has been woven into the design vision presented in Chapter 4 and throughout the stages of design evolution.



Refracting the surrounding landscape



A destination



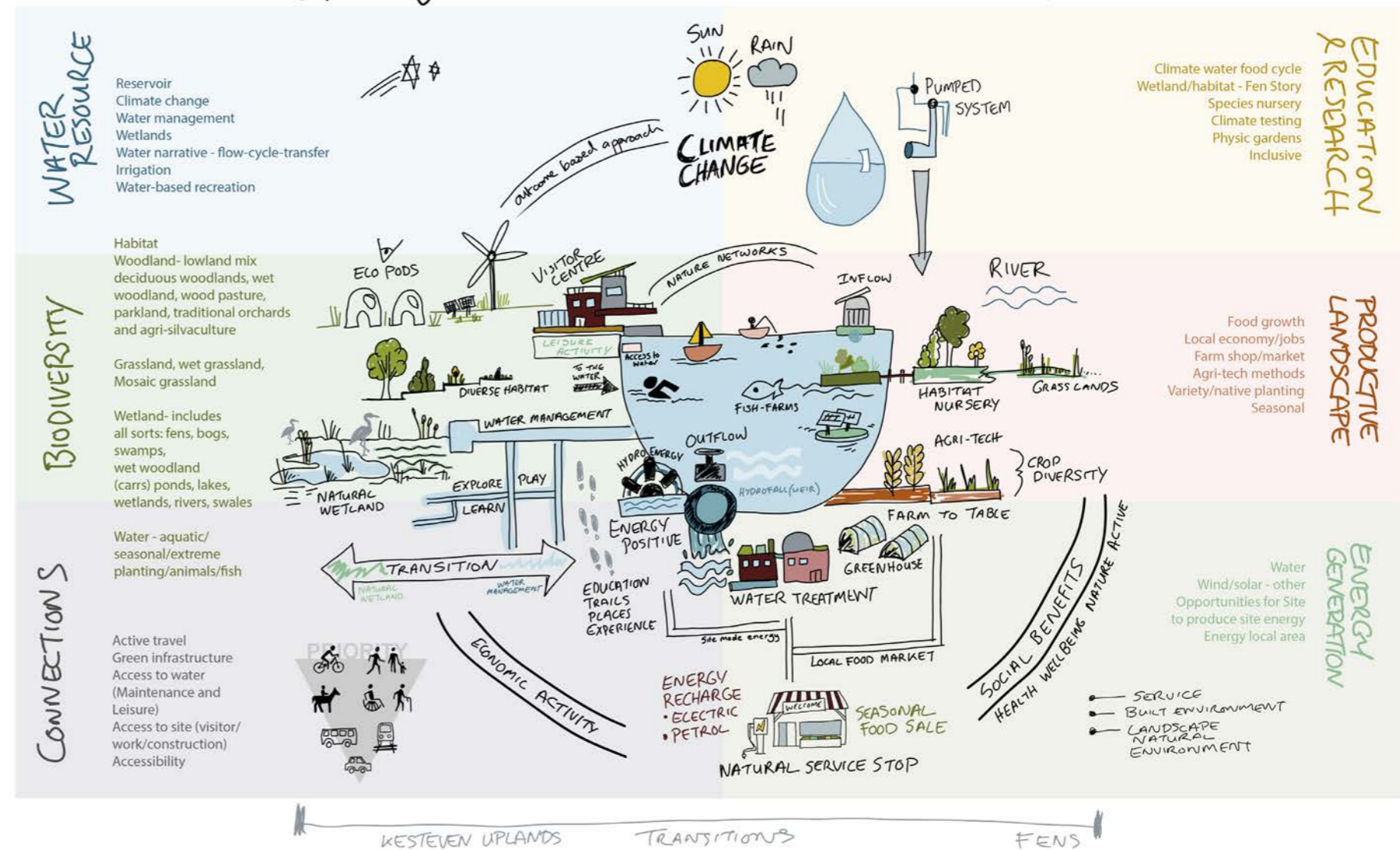
Surprise and delight

The essence of this early concept developed further as the understanding of the Project requirements and objectives matured and as knowledge of the site and its context became better known. Informed by the Phase One Consultation, initial high-level thinking around key design themes led to a palette of potential opportunities, giving shape to what the reservoir could deliver beyond its core function and purpose.

The illustration (right) imagines a series of possible design ideas arranged around the core reservoir. These individually could serve a particular purpose or function (linked to one of six themes) and collectively describe a multi-functional 'system' which has the capacity to generate positive social, economic and environmental outcomes. The design themes and potential elements which are illustrated opposite and summarised below represent opportunities to be explored through consultation and through further environmental impact assessment:

- **Water resources:** The Project creates unique opportunity for innovative approaches to water management, using the resource for a multitude of socio, economic and biodiversity benefits underpinned by climate change adaptation and resilience.
- **Biodiversity:** The Project represents a regional scale nature recovery opportunity, replenishing natural capital and promoting ecosystem services through large scale and connected ecological corridors.
- **Education:** The Project has the potential to educate and empower individuals in the sustainable use of water, inviting and facilitating research and innovation.
- **Reimagining the rural landscape:** The Project could form a part of a rural landscape delivering wider society benefits, including access to nature, green social prescribing, improved air and water quality, alongside increasingly sustainable farming practices.
- **Energy:** The Project could explore innovative approaches to renewable energy that could be used on site, including a range of technologies.
- **Connections:** The Project could promote active travel, using green infrastructure to connect communities and promoting social and health prosperity.

Optimising beneficial outcomes for people, nature and the planet.



Early concept sketch indicating high level design themes

8.2 Scale Comparisons

The Lincolnshire Reservoir is being designed to hold approximately 55 million cubic metres of water. This results in a reservoir with a water surface area of approximately 5km².

The perimeter of the embankment crest of the reservoir is approximately 8.8km in length and would take approximately two hours to walk at an average walking pace.

To put this into context and to help convey the scale of the reservoir, the indicative reservoir showing the main waterbody and embankments has been overlaid onto aerial plans of Rutland Water and the recreational and nature lakes to the south-west of Lincoln.

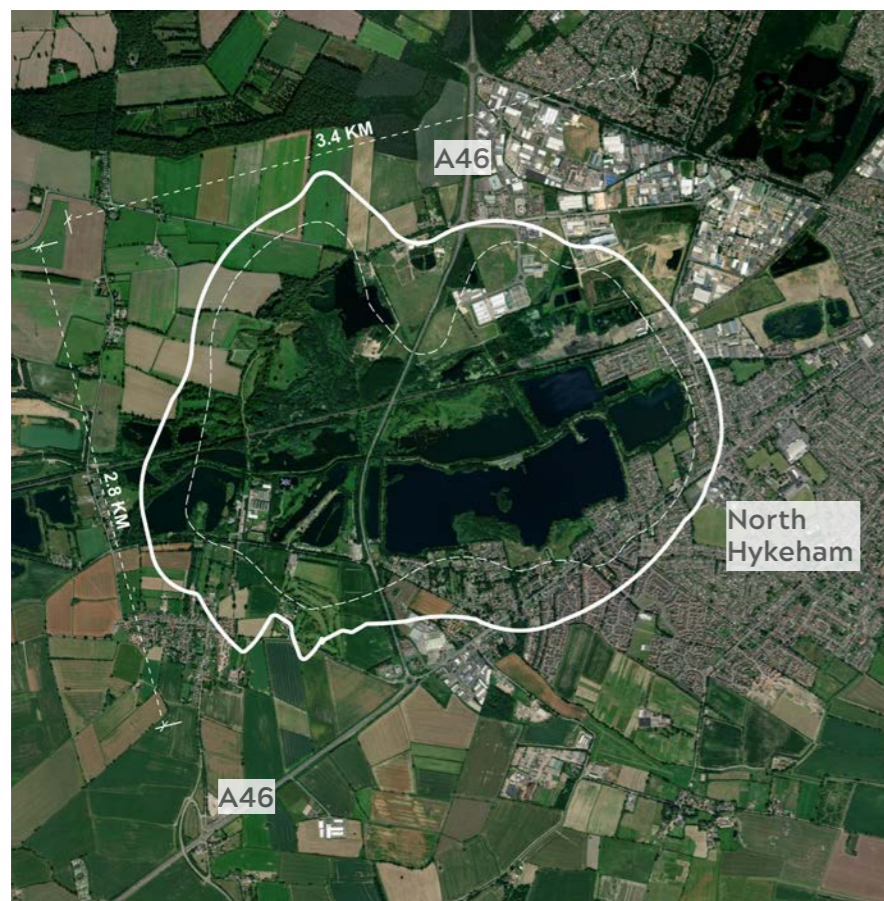


Illustration showing the indicative reservoir overlaid onto the recreational and nature lakes south-west of Lincoln showing it is similar in scale to the entire assemblage of lakes



Illustration showing the indicative reservoir overlaid onto Rutland Water showing comparison in size

8.3 Developing the Design: Reservoir Shape - A Response to Context

An early design exercise was undertaken to explore the shape and form of the reservoir, including testing the scale and profile of the embankments. This work was informed by feedback from Phase One Consultation (Chapter 3), by technical requirements (Chapter 5) and by an understanding of the other contextual drivers which represented both constraints and opportunities (Chapter 6).

Design Development

Feedback from Phase One Consultation helped set some important principles for the design development, establishing a strong preference for a more natural reservoir form which is well-integrated in its rural setting, respecting its proximity to neighbouring communities. (Refer to indicative design principle 1, section 4.2)

As a precursor to design testing, a limited set of guiding design considerations were developed; these were predicated on driving the design towards a contextually responsive shape outcome and comprised:

- The reservoir shape should reflect the strong east west patterns in the landscape (expressed by the subtle ridgelines and shallow river valleys).
- The design should retain as far as practicable the distinctive form and alignment of the three ridges.
- The embankment slope profiles and treatment should be varied, reflecting the transitional character of the landform and respecting proximity to settlements and the setting of heritage features.

Additional design considerations (impacting shape and form) included spatial constraints such as the presence of floodplains, watercourses, power lines and rail and road corridors; and operational demands such as achieving the required water storage volumes, achieving earthworks efficiencies and reducing carbon impact.

Concept design

Using these design considerations and constraints to drive the design, a generic concept was developed which comprised:

- a central peninsula to break up the scale of the water space, incorporate the existing ridgeline and create opportunities for visitors to gain a unique perspective of the reservoir
- an indented and sweeping northern, western and southern embankment shape reflecting the more complex landform the west.
- a straighter, less indented edge profile to the east reflective of the linear and geometric shapes of the Fens landscape which it addresses.

This concept design went through several stages of iterations with variations developed to optimise the scale and orientation of the peninsula, to achieve efficiencies in the earthworks volumes, and to accommodate internal zones with maintained water levels (lagoons). The incremental evolution in shape is illustrated in the figures to the right.

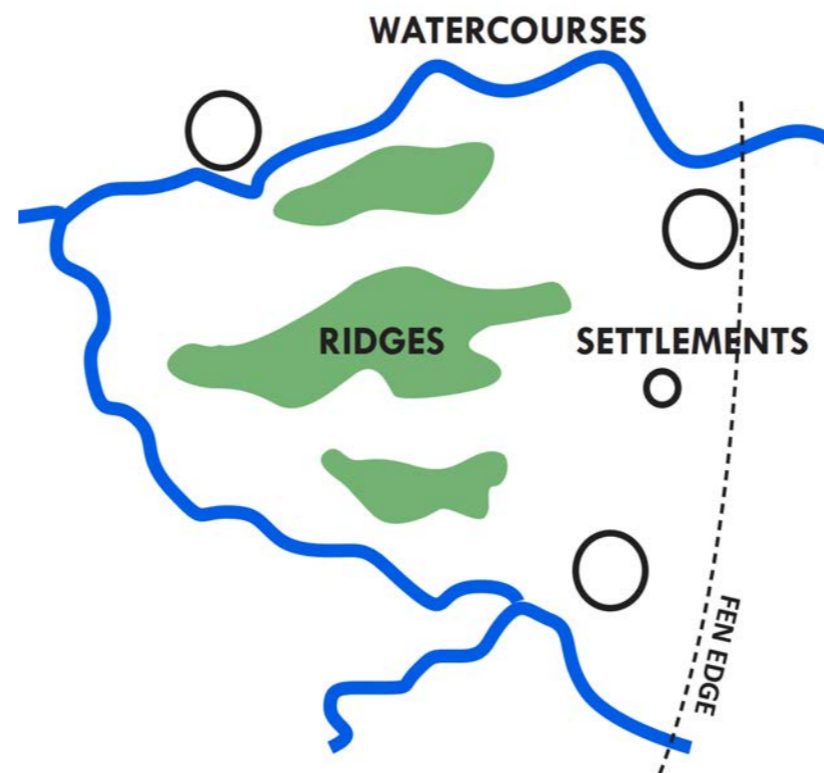


Illustration showing the key drivers to the reservoir shape

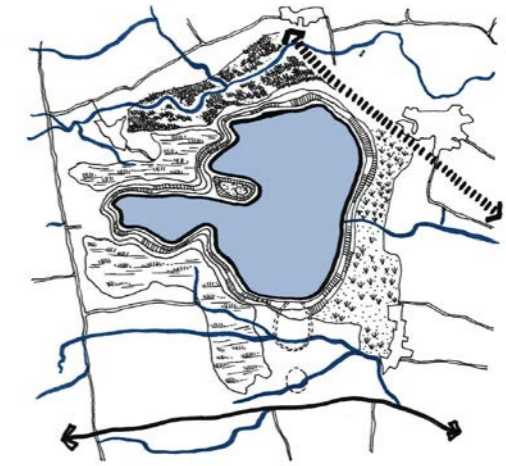


Illustration of early peninsula concept

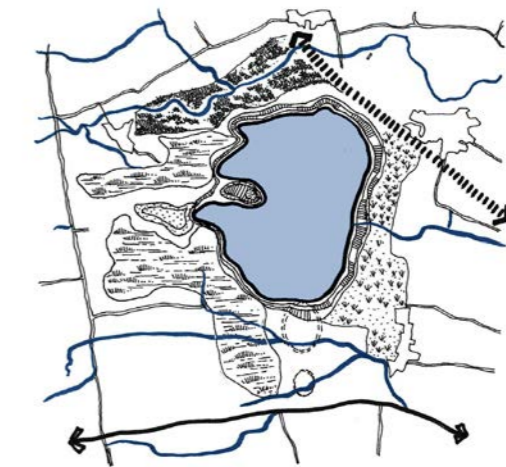


Illustration of early peninsula concept with reduced surface water area

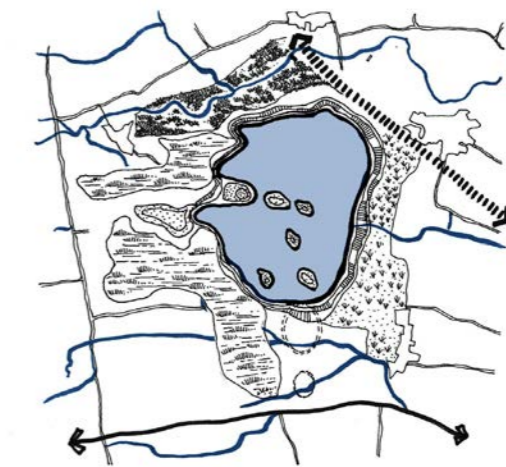
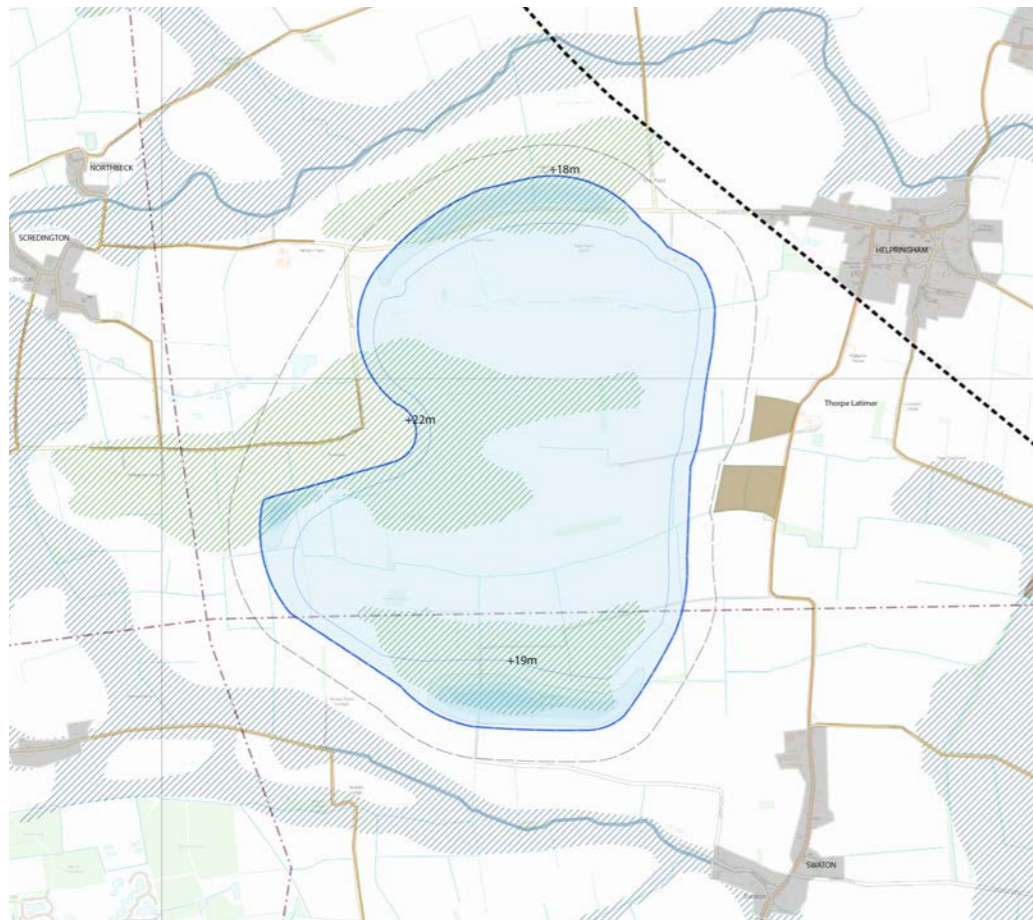


Illustration of Peninsula concept with inner islands

Shape Refinement

The conclusion of this early design exercise resulted in an ‘initial’ reservoir shape as illustrated (below). This subsequently became adopted into the early permutation plans which are described in the next section of this chapter.



Initial reservoir shape used for Phase 1 permutation testing (see section 8.4)

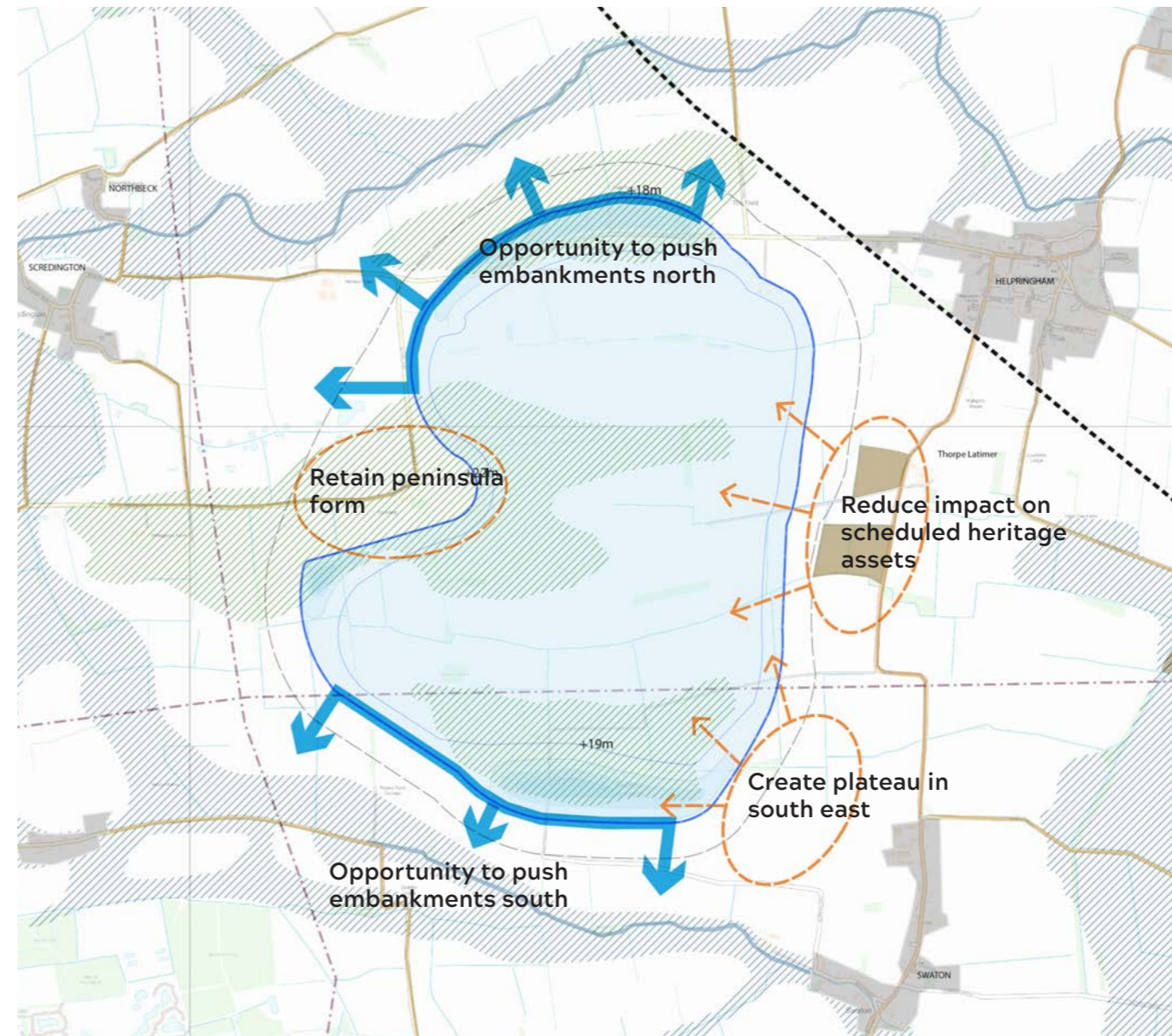
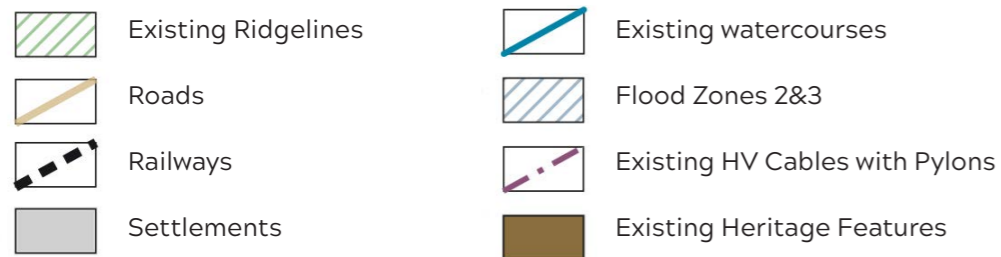
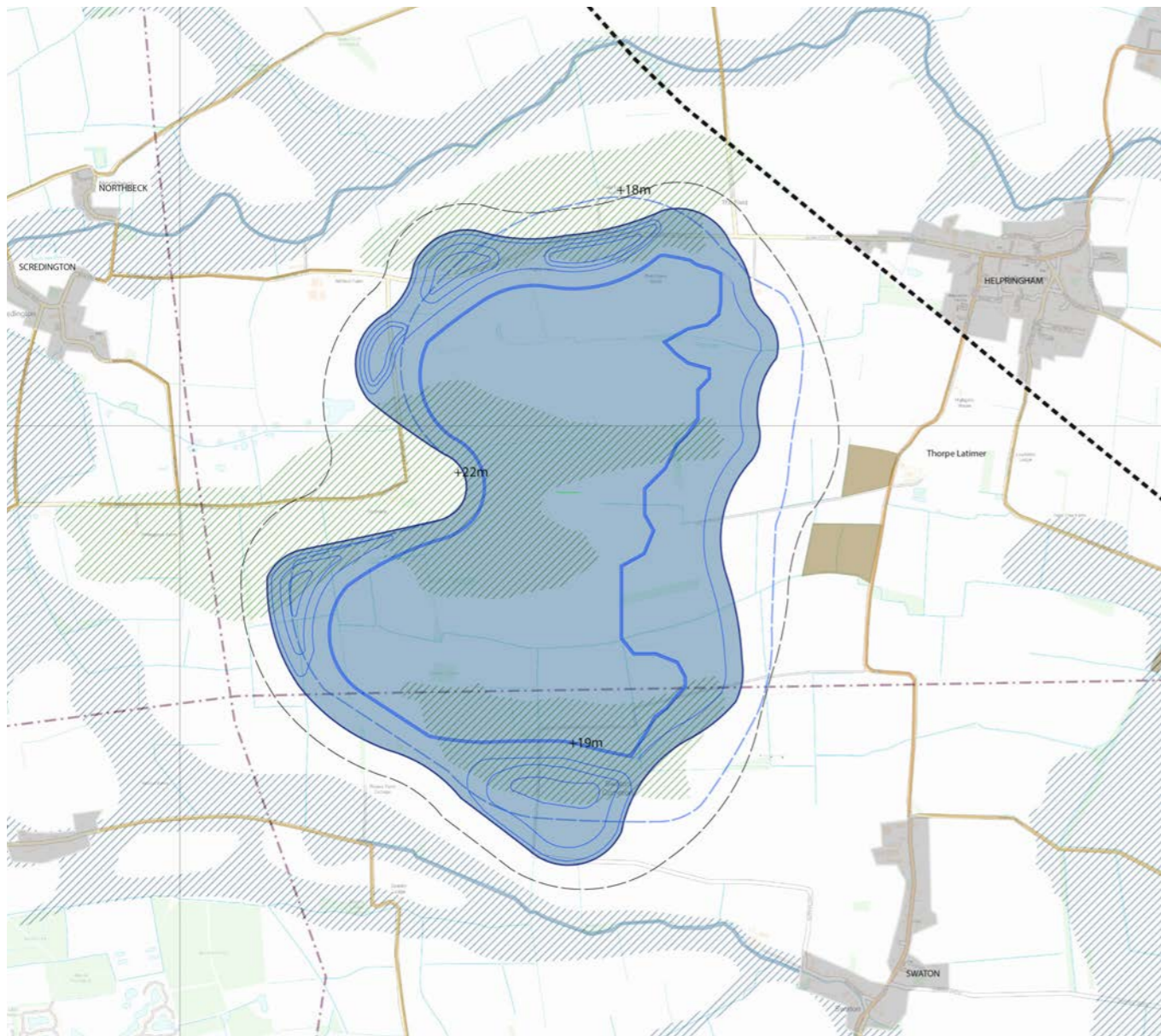


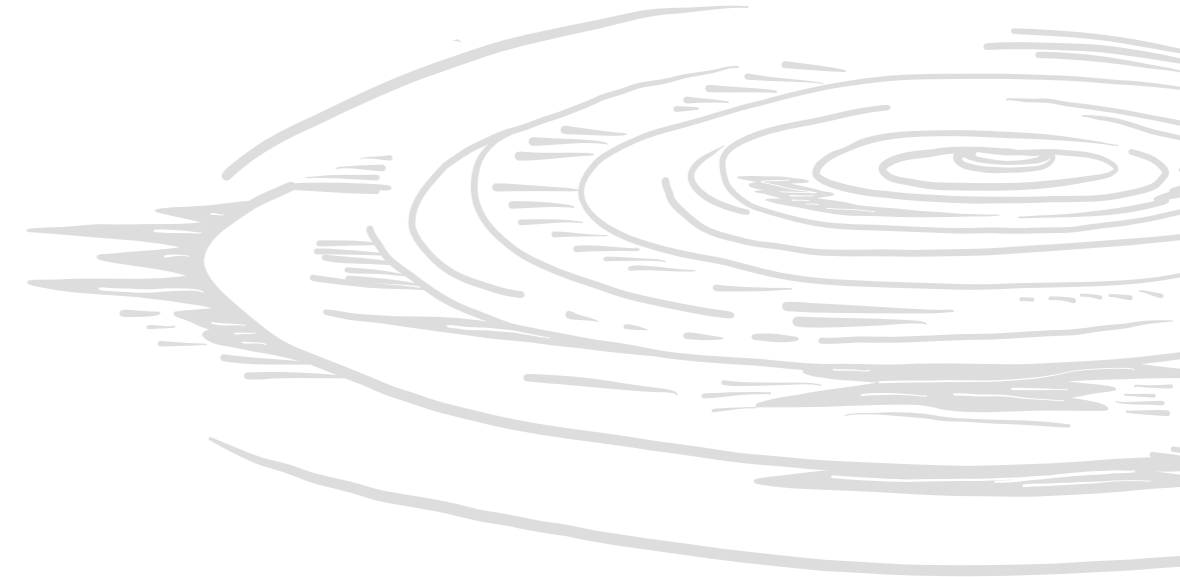
Illustration of key opportunities and constraints used to refine initial reservoir shape

Further development of the initial shape continued in parallel with the evolving masterplan. The key opportunities and constraints are summarised below and shown in the illustration (above)

- Retention of ridgeline as a peninsula to help break up the water and provide opportunities for visitor facilities.
- Proximity to scheduled heritage assets along the eastern perimeter. Opportunity to push the toe of embankment away from historic assets and slacken slopes as far as reasonably practicable.
- Opportunity to create a ‘plateau’ or development platform on top of the embankment crest in the south-east corner for recreational and visitor facilities and improve access to water.
- Opportunity to push embankments as far as reasonably practicable to the south-west and north-west to optimise earthworks balance, whilst cognisant that the embankments do not encroach into the adjacent floodplains.
- Western extent of reservoir embankments constrained by the existing 132kv overhead powerlines which are likely to be retained along their current alignment.











Preferred reservoir shape taken forward to Phase 2 optioneering (see section 8.6)



The outcome of this further refinement is illustrated in the figure (above).

- adaptation of areas to suit different potential uses of the reservoir including areas for habitat creation and recreational uses.
- ongoing optimization of the earthworks approach to achieve a more cost and carbon efficient solution.
- a more detailed understanding of the environmental sensitivities, especially the proximity of the embankments to settlements and historic assets.

	Existing Ridgelines		Existing watercourses
	Roads		Flood Zones 2&3
	Railways		Existing HV Cables with Pylons
	Settlements		Existing Heritage Features

8.4 Phase 1: Permutation Testing

This section describes the approach taken to explore, at a relatively high level using basic information gathered at the time of permutation testing, the design and spatial configuration of key components of the reservoir. This looked at potential interdependencies between different components, assessing which elements could work well together, and what efficiencies and multifunctionality could be gained by positioning elements nearer or further away from one another.

Alternative configurations of the key components were presented in the form of four distinct spatial permutations with each permutation using a common reservoir shape and location of the raw water inlet and outlet points. The key elements tested are summarised below:

Potential Visitor Hub and Site Access Point

The permutations explored alternative scale and locations of the main visitor hub, as well as inclusion of ancillary hubs. Alternative access options were explored from the existing highway network to the main visitor hub.

Extent and Location of Renewable Energy

A mixture of renewable energy sources could provide the resilience necessary to create power around the year. Potential zones suitable for renewable energy generation were explored.

Water Treatment Works

At the time of permutation testing, the Project was exploring a long-list of potential locations for the WTW based on the outcomes of the associated water infrastructure options appraisal work. Two locations for the WTW (in combination with other features) and an option for an 'offsite' WTW in a location away from the main site were explored in the four permutations.

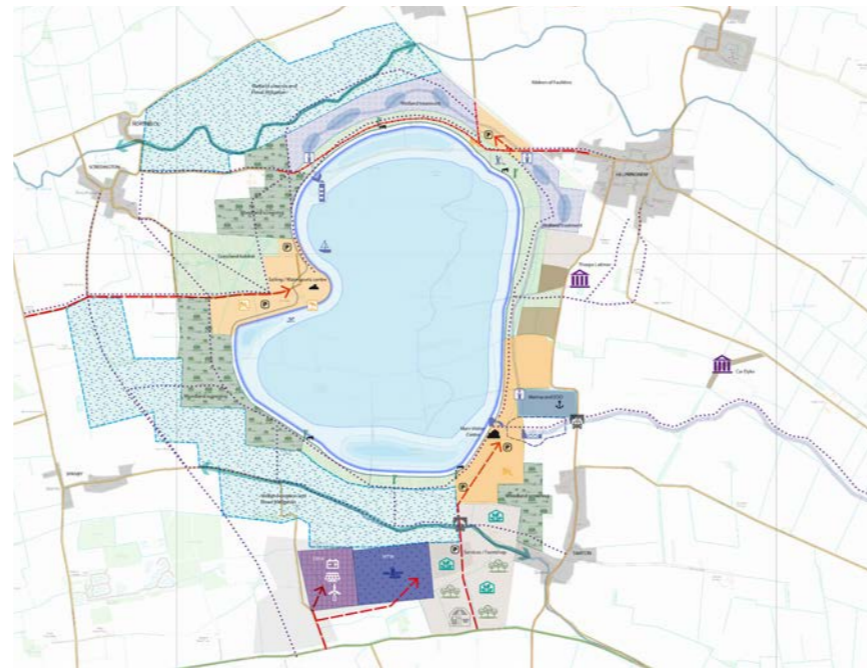
Ecological Mitigation

At the time of the permutation testing, little information was available on the extent and type of habitat replacement required resulting from impacts of the Project. Therefore ecological mitigation focused on loss of ditches and watercourses and considered two different approaches:

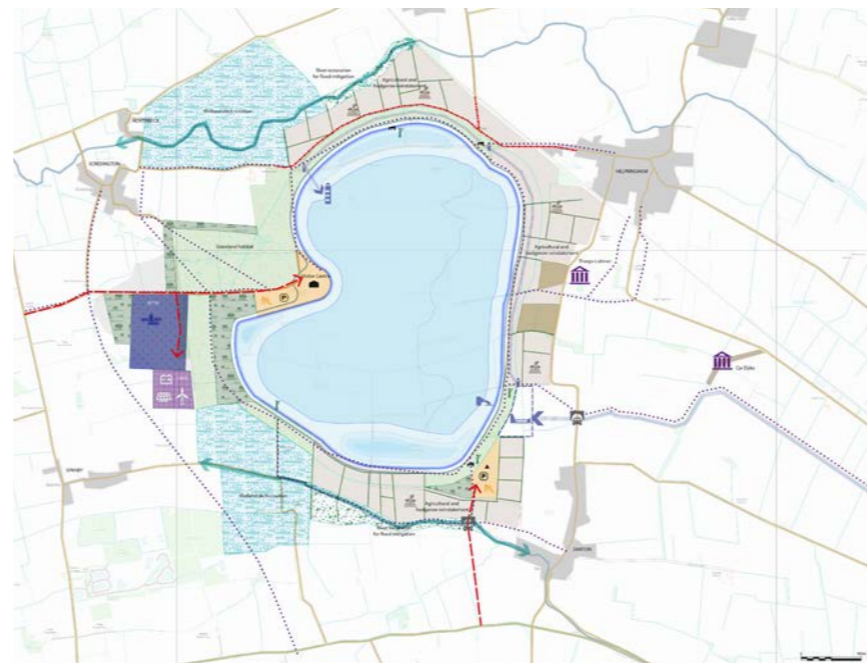
- (i) Creation of naturalised wetland habitats with a mix of ponds, channels and scrapes. or;
- (ii) Creation of connected ditches following a more linear form, providing a like for like replacement for the ditch habitats.

Flood Mitigation

Alternative scale, location and types of flood mitigation using natural flood management approaches such as wetland storage and river corridor improvements were explored.



Permutation Concept A



Permutation Concept B

Helpringham to Scredington Diversion

As the reservoir will encroach upon the existing road connecting Helpringham to Scredington, it will be necessary to divert this road. Potential diversion routes between Helpringham to Scredington are being considered, with early indicative options including along the embankment, offset from the embankment and off-site to the north of the reservoir.

Permutation A:

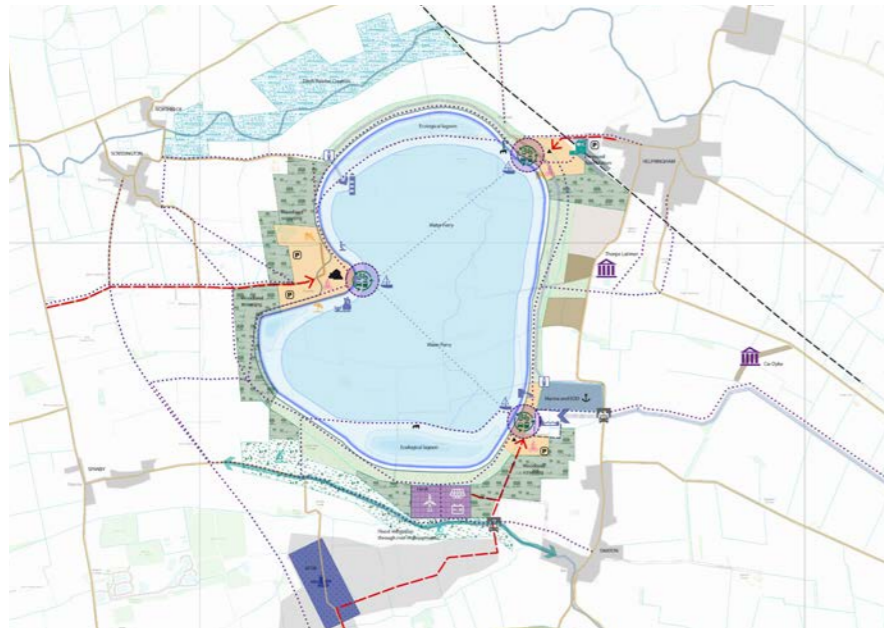
- Visitor Hub - Largest scale visitor hub in south-east corner with separate sailing / watersports centre located on the peninsula
- Site Access Point - Main access off A52, ancillary access off Mareham Lane
- Extent and Location of Renewable Energy - Larger scale located to south associated with Water Treatment Works
- Water Treatment Works - Located to south with separate access from A52
- Ecological Mitigation - Wetland mosaic (ponds, channels and scrapes)
- Flood Mitigation - Wetland storage within the flood plains north and south
- Helpringham / Scredington Road Diversion - Located on top of northern embankment

Permutation B:

- Visitor Hub - Local scale main visitor hub located on the peninsula
- Site Access Point - From the west off Mareham Lane
- Extent and Location of Renewable Energy - Smaller scale located to west associated with Water Treatment Works
- Water Treatment Works - Located to the west, off main access road from Mareham Lane
- Ecological Mitigation - Linear ditch replacement model
- Flood Mitigation - Improvements to rivers north and south
- Helpringham / Scredington Road Diversion - Along toe of northern embankment

8.5 Outcomes & Insight Taken Forward to Phase 2 Optioneering

An appraisal of the permutations testing was undertaken by a cross-discipline internal steering group (stakeholder engagement was not sought at this early stage). The appraisal aimed to identify 'best performing' elements from each permutation to be taken forward into a more focussed phase of design development. The appraisal was based on the basic information gathered at the time of the permutation workshops. The following summarises the main outcomes from this stage:



Permutation Concept C

Permutation C:

- Visitor Hub - Medium scale with ancillary hubs dispersed around the reservoir. Main hub located on the peninsula
- Site Access Point - From the west off Mareham Lane
- Extent and Location of Renewable Energy - Smaller scale located to south, separate from Water Treatment Works
- Water Treatment Works - Located to the south west, with main access road from A52
- Ecological Mitigation - Linear ditch replacement model
- Flood Mitigation - River Improvements just to the south
- Helpringham / Screddington Road Diversion - Offsite diversion

Visitor Hub:

The preference at this stage was to take forward two potential locations for the main visitor hub; one on the western peninsula and the second in the south-east. Provision of large scale secondary and tertiary visitor hubs was not supported and discounted at this stage; the potential provision of small scale/local facilities was not discounted.

Main Site Access:

This would be intrinsically aligned with the location of the main visitor hub and therefore two options; one from the A52 and the second from Mareham Lane were recommended to be taken forward. Dual use of the main visitor access to provide access to the Water Treatment Works and other core infrastructure was supported to minimise the number of roads within the Project.

Renewable Energy:

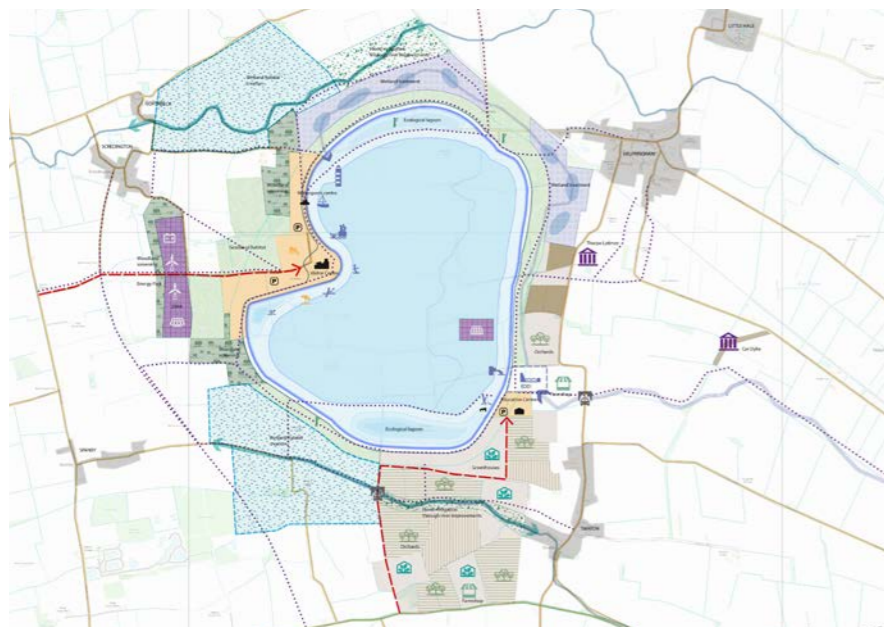
Battery storage should be located adjacent to the main power consumer, the WTW. Solar panels could be placed on the water or the land. Further work is required to assess which is most suitable. The viability of various renewable energy components on the different parts of the site could not be concluded at this stage and would be subject to detailed technical feasibility work and assessment through the EIA process.

Water Treatment Works:

The associated water infrastructure options appraisal process had not concluded at this stage and therefore the option to locate a WTW within the polygons identified in the appraisal retained into the next design stage.

Ecological Mitigation:

The concept of maximising opportunities for wetland habitat focussed on river corridors and within reservoir lagoons was supported, albeit the quantum of habitat needed to meet biodiversity net gain requirements and for onsite mitigation was not fully known and therefore should remain under review during subsequent design stages, informed by the EIA process and specialist technical work.



Permutation Concept D

Permutation D:

- Visitor Hub - Large scale located on peninsula, ancillary hub to south-east
- Site Access Point - From the west off Mareham Lane
- Extent and Location of Renewable Energy - Smaller scale located to the west, not associated with the Water Treatment Works
- Water Treatment Works - Located off site
- Ecological Mitigation - Wetland mosaic (ponds, channels and scrape)
- Flood Mitigation - Both wetland storage and river corridor improvements north and south
- Helpringham / Screddington Road Diversion - Offsite diversion

8.6 Phase 2: Optioneering

Following outcomes of the permutation testing, two spatial options were developed; Option 1 The Ridgeway Peninsula, and Option 2 Lakeview Estate. The options were developed incorporating preferred design elements taken forward from the first phase. The options also tested what potential recreational elements could be accommodated spatially, understanding that not every recreational element may form part of the eventual DCO.

The purpose of this stage was to explore more fully the relative benefits of the different spatial layouts and approaches. The Project Team sought feedback on the configuration and content of both options; the aim was not to select a single option in its entirety, rather to incorporate aspects of both to then be incorporated into a single emerging layout.

At this stage further refinement of the reservoir shape was undertaken as described earlier, with testing of the embankment heights and profiles.

The two-option design stage was supported by engagement with stakeholders in the form of in-person workshop sessions. A summary of this feedback is presented in section 8.7.

Options

The two options which were developed shared many common design elements and both were developed around an overarching concept of a nature-inspired visitor destination focused around water.

The aspects of the designs which set them apart were as follows:

- location for the main visitor activity and visitor hub;
- location of the Water Treatment Works;
- location of primary vehicular access into the reservoir;
- function and design of the lagoons.



Illustration showing options for location of main visitor activity and visitor hub



Illustration showing options for primary vehicular access



Illustration showing options for location of Water Treatment Works



Illustration showing options for function and design of lagoons

Option 1: The Ridgeway Peninsula

This option explored the use of the western peninsula as the location for the main visitor hub, taking vehicle access from Mareham Lane along a repurposed Gorse Drive.

The character of this area would be based around a wooded ridgeway concept using planting to create a natural but relatively enclosed area and setting up a dramatic 'reveal' of the reservoir at the end of the peninsula. A range of potential land and watersport activities were shown around the Visitor Centre and lagoon area, which incorporated a south facing beach and a boardwalk running the length of the outer edge of the lagoon.

A second and much smaller visitor hub was located to the south east, with access taken from the A52. This proposed limited activities and facilities based around a more natural and tranquil character including an ecological lagoon, agricultural land and walking routes out along the eastern and southern embankments.

Indicative local facilities such as a small car parking area and opportunities for seasonal food and beverage outlets were also shown adjacent to Helpingham in the north east of the reservoir.

In this option both the Water Treatment Works and renewable (solar) energy generation areas were located on land to the west.

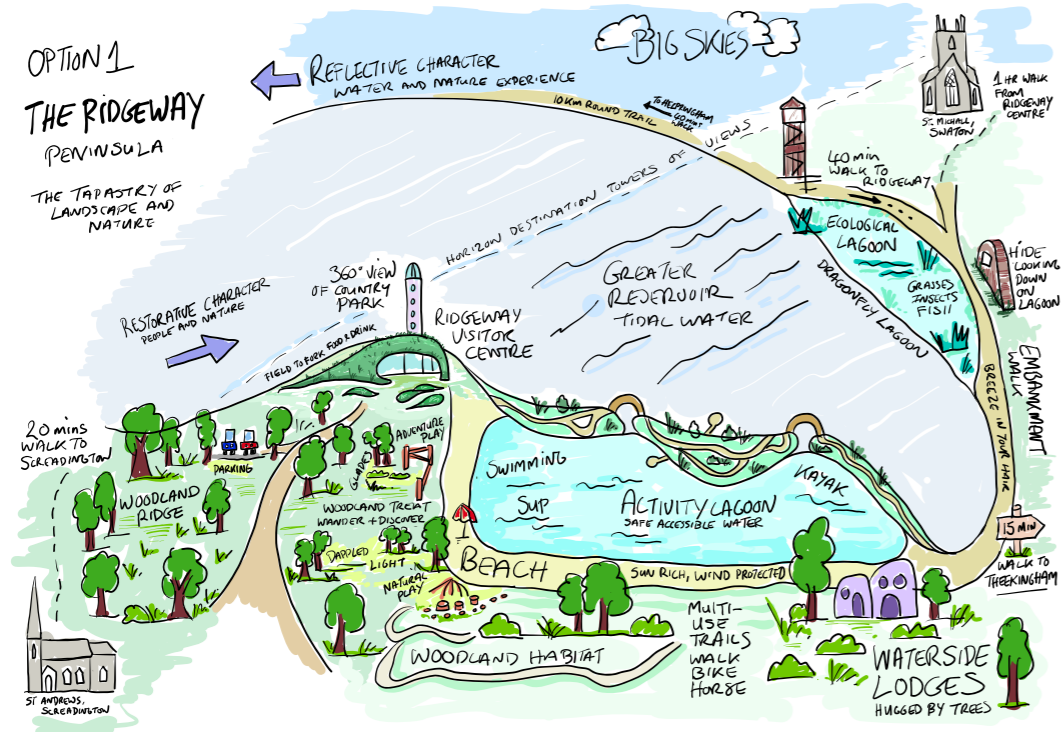
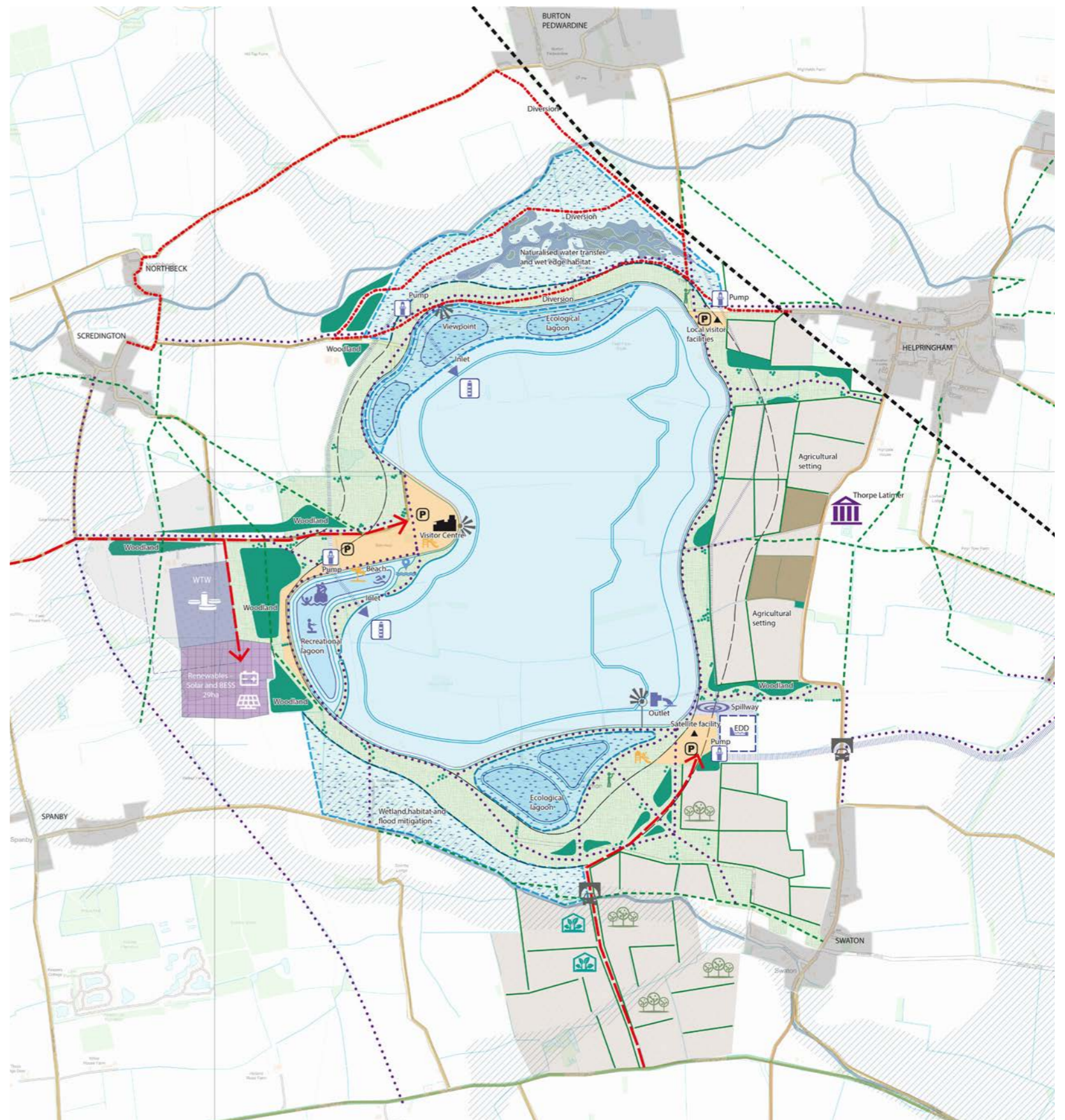


Illustration showing the spatial concept of the Ridgeway Peninsula option



Plan showing Option 1

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Option 2: Lakeview Estate

In this option the south eastern corner of the site formed the main visitor hub with the indicative visitor centre and associated facilities occupying a widened crest area located alongside a substantial lagoon and accessed from the A52.

The main inspiration for this area was based on combining elements of agricultural land, recreational activity, nature gardens and wilder landscapes, with the visitor centre and activity lagoon acting as the focal point. This also looked to maintain a green edge to Swaton with ideas around potential walks along Swaton Eau and connections to the reservoir routes and along the water transfer channel. The concept also played on the association of Swaton with its historic river port.

In this option the western peninsula was depicted as a secondary and less active visitor hub, evoking the sense of a hidden destination, inspired by nature, offering visitors the opportunity to experience the naturalised wetlands and open water and experience long views across to the fenland edge.

In common with Option 1, a local scale visitor hub was located adjacent to Helpringham.

In this option both the Water Treatment Works and renewable energy generation were shown on land to the south, set within the lower lying agricultural landscape along the A52 corridor.

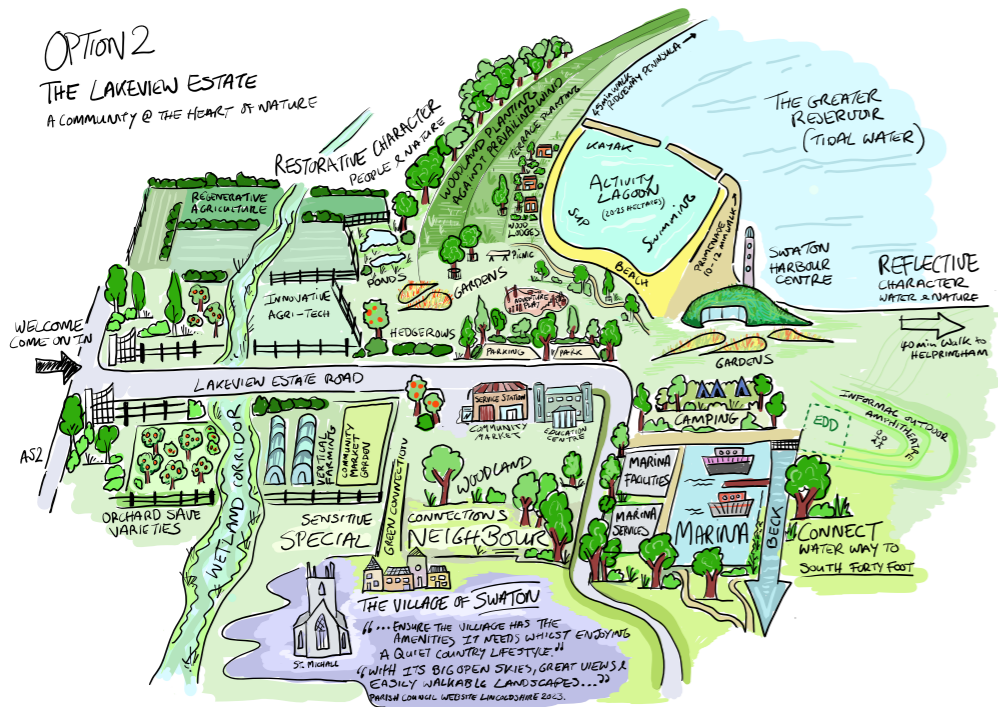
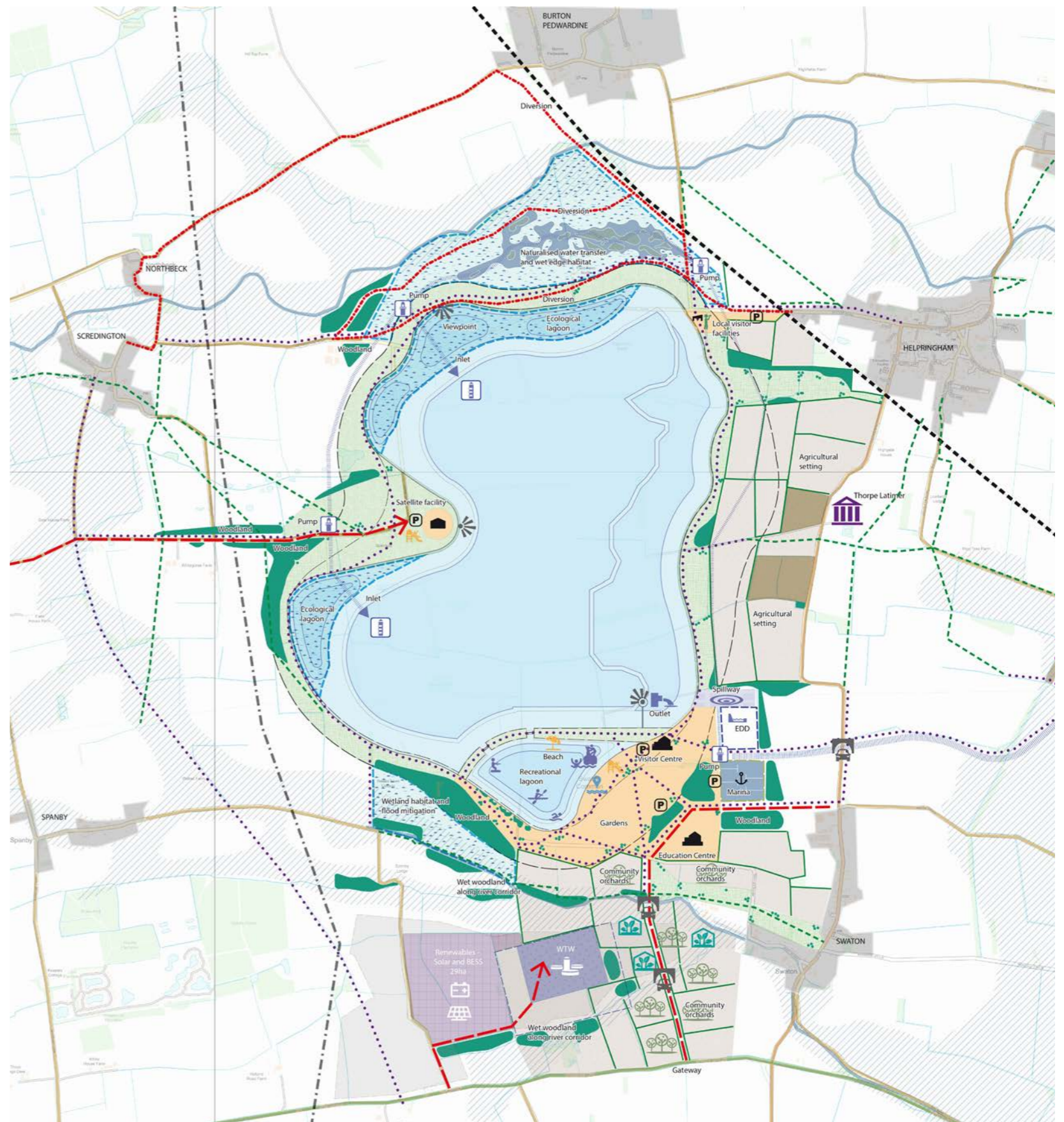


Illustration showing the spatial concept of the Lakeview Estate option



Plan showing Option 2

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8.7 Stakeholder Engagement

Following the Phase One Consultation and the subsequent development of the design vision and indicative design principles, the Project Team has engaged with stakeholders including the Local Planning Authorities and statutory environmental bodies. The purpose of this engagement was to help guide emerging design ideas and seek feedback on the two spatial options previously described. A summary of this engagement is provided below.

A separate peer review of the emerging design ideas and the two spatial options was undertaken by an Independent Design Review Panel (IDRP), commissioned by Anglian Water to provide professional independent peer review of the design proposals throughout the pre-DCO submission period. A summary of this engagement is provided overleaf.

Anglian Water will continue to engage with consultees and stakeholders throughout the DCO process, whilst a record of all engagement will be provided in a Consultation Report at the point of the DCO application.



Stakeholder Feedback Summary

The following is a summary of stakeholder responses received so far on the design ideas and the spatial options as described in section 8.6. These are grouped into several overarching themes.

Connectivity

- Wish to see promotion of links with the existing public right of way (PRoW) network.
- Consideration should be given to a range of transport options, with particular emphasis on public transport, cycling and walking opportunities.
- Lack of proposed connectivity between the reservoir and the railway (via a new station at Helpringham) represented a missed opportunity.

Visual Impacts including Embankments

- The integration of the embankments will influence how the Project is accepted locally, so it is important to communicate this clearly.
- Adopt a creative, inventive and imaginative approach to mitigating impacts of embankments. Draw inspiration from the local character.
- Consider the Grade I listed churches in the surrounding villages and the views between them.

Supporting Local Industry

- Promote design solutions which have potential to unlock economic opportunity; engage with organisations who represent businesses of all sizes and sectors.

The Natural Environment

- Supportive of the potential of the Project to unlock nature tourism opportunities.
- Look to maximise the opportunities for environmental net gain particularly around the Swaton Eau.
- Recognition that the Project could enable multiple benefits, including flood alleviation and mitigation.
- Do not consider nature and recreational activity as mutually exclusive elements in the design. They can often occupy the same space if designed well.

Cultural Heritage

- The eastern embankments should be considered and designed carefully due to the proximity of Thorpe Latimer.
- Consider impact on the historic landscape character, which could result in loss of sense of place and community, and impact on traditional livelihoods.
- Explore opportunities to allow people to positively engage with the historic environment.

Recreation and Accessibility

- Supportive of proposals to create a new public space, with the health and wellbeing benefits that it can bring.
- Support for the concept of lagoons and the opportunities that keeping water at a higher level could have on the Project for accessibility and recreation.
- Creating an asset for the local community and making it a 'destination' was recognised as vital to supporting growth in the visitor economy.
- Identified this part of Lincolnshire as a 'gap' area for major attractions compared with other anchor attractions to the north and south.

Renewable Energy and Carbon

- Reference should be made to the relevant policies of the adopted local plan policies.
- Consider scope for the renewable energy to be integrated into the visitor experience, with reference to the historic use of wind power in the landscape for fen drainage and agriculture.

Independent Design Review Panel

In December 2023, an Independent Design Review Panel (IDRP) attended a site visit followed by an in-person review workshop, during which the design ideas and two spatial options developed for the Lincolnshire Reservoir were presented.

Feedback provided at the workshop is summarised below and collated under common themes.

Connectivity with Nearby Communities

Opportunity for local connectivity is likely to bring significant value to the community. The panel recommended that these plans and their associated benefits are communicated clearly when speaking with the community and wider stakeholders.

Visual Impacts including Embankments

Recommendation to prepare visualisations from the ground level experience, in various locations, to communicate the visual impact that the reservoir designs will have in the existing landscape.

The IDRP suggested that interest can be created by adding diversity in viewpoints, creating more natural forms by distributing the landscape fill differently across the embankments.

Suggestions to work with artists as a way to develop more imaginative landscape options.

Supporting Local Industry

Clear communication is needed on how currently productive agricultural land will be affected. The Project should demonstrate how this proposal could provide new employment opportunities, such as regenerative farming. The panel also highlighted how opportunities for local education can address skill shortages.

Recreation and Accessibility

The perimeter route around the reservoir could be conceived as an experience, providing a high-quality leisure space. The open landscape means that the site will be sensitive to strong winds. Shelter from the wind will be key to ensure that the perimeter route is attractive to visitors.

Would like to see how local sports and leisure clubs may benefit or become involved with the delivery of the recreational offer, ensuring that the offer serves a local need.



Photo taken during the IDRP (December 2023)

8.8 Outcomes & Insight Taken Forward to Emerging Design Stage

The feedback from stakeholders and the IDRPs has informed how the elements of the optioneering phase were taken forward into an emerging design for wider consultation. This included consideration of the preferred arrangement of key engineering components; preferences regarding the arrangement of the recreational elements; and arrangement of the mix of land uses including the overall balance between active and passive areas.

Outcomes taken into the next stage of design development:

Reservoir form/ shape

Continue to refine the shape of the embankments to bring efficiencies in earthworks; visual and landscape impacts and mitigation to be assessed through the EIA process.

Recreation/ Visitor Hub

- Proposal for the principle of the south-east zone becoming the main recreation hub on the basis that it has better access (from A52); limits spread of built elements around the reservoir (noting that the WTW and the water inlet and supply infrastructure are proposed to be located to the south of the reservoir).
- Peninsula to be progressed as a component of the recreational experience but not as the primary hub.
- Additional local facilities at Helpringham to remain as an option at next stage.

Renewable Energy

- Land based and floating solar panels should be explored further. Areas required to be guided by the overall renewable energy approach underpinned by technical assessment and EIA process.

Water Treatment Works

- Land to the west was discounted through the associated water infrastructure options appraisal process; next stage of design development to focus on further assessment of the location of the WTW within the southern land parcel.

Lagoons

- Principle and location of three lagoons supported and encouraged to be developed further in next stage of design.

Access

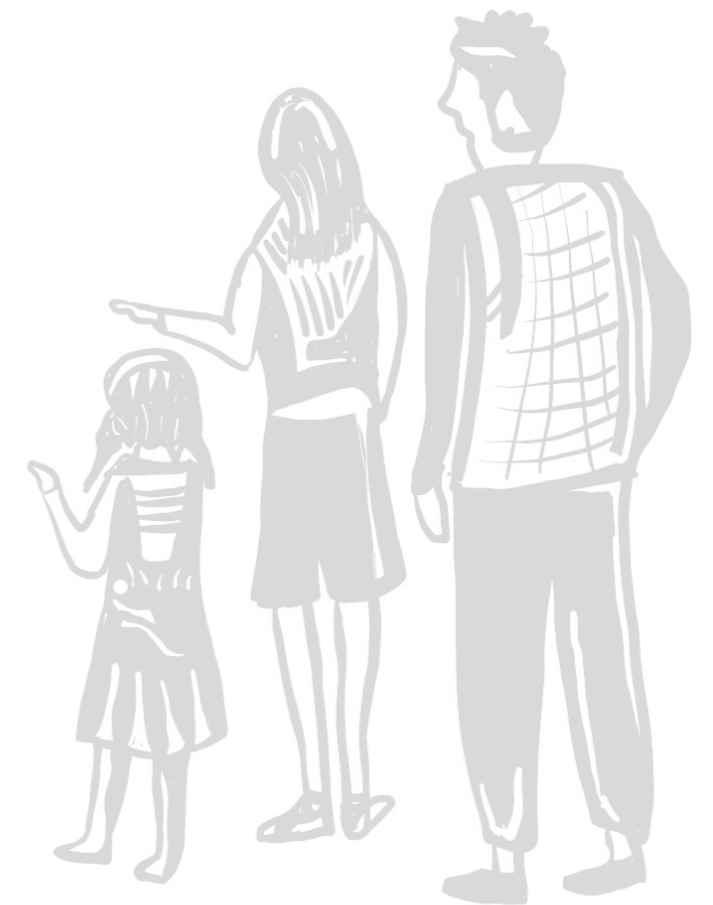
- Proposal for primary access from A52 with new junction arrangements, servicing the main visitor hub.
- Other site access routes to be subject to further technical and environmental assessment and public consultation; maintaining access to secondary hub on the peninsula generally supported, though nature of upgrades to be assessed in more detail.

Ecological mitigation

- General principles supported but proposals over the type and quantity of mitigation cannot be finalised until technical and environmental assessment work is further progressed.

Flood mitigation

- General principles supported but proposals for the type and quantity of mitigation cannot be finalised until technical and environmental assessment work is sufficiently complete.



8.9 Additional Design Studies

Following the completion of the above design phases, two focused design studies were undertaken looking at components of the potential lagoon design and alternative solutions for discharging of raw water into the reservoir.



Southern Recreational Lagoons

This study considered further the form and function of the southern recreational lagoons, exploring recommendations from stakeholders to revisit the balance between habitat creation and recreational areas; and to look at aspects of connectivity and visitor experience.

Rebalancing nature and recreation

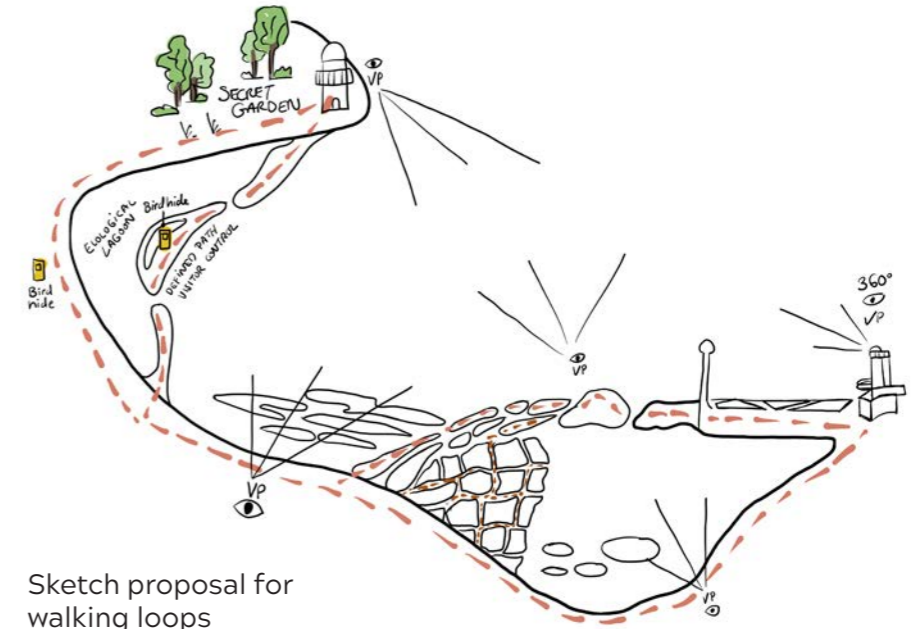
A re-purposing of the southern lagoon looked at ways to incorporate wetland habitats alongside the more active open water areas. This led to the introduction of connected pools, located to the west of the lagoon supporting limited public access. The arrangement of pools took inspiration from the pattern of light reflected off water, creating a complex series of interwoven organic shapes stitched together by meandering pathways and planting.

Connectivity and visitor experience

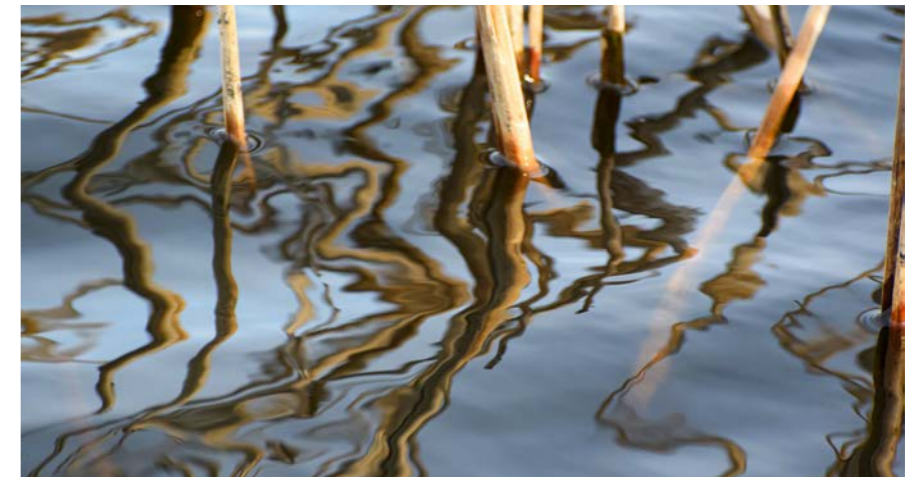
This looked in greater detail at the connections and visual relationship between the reservoir peninsula and the main visitor hub.

The concept of a 'figure of 8' recreational loop was introduced, which could serve as a shorter and more inclusive 'there and back' route compared to the full reservoir circuit. This gave purpose and validity to developing the peninsula as a destination for visitors, accessible largely by walking and cycling.

This work also looked further at how the figure of 8 loop could embody the transitional nature of the landscape through visual references (such as views to landmarks), and through changes in planting character and landform.



Sketch proposal for walking loops



Exploring water patterns

Raw Water Connection into Reservoir

Alternative routing options were considered for the raw water connection into the reservoir from the point of arrival at the western end of the repurposed Helpringham South Beck.

Preliminary designs which were presented at the permutation and option testing stages considered routing the water supply along the eastern and northern perimeters of the reservoir via a mix of high pressure pipes and open water channels, with a discharge into the reservoir along the northern shoreline and on the western peninsula (as illustrated, top right). This had some potential benefits for creating additional wetland habitats associated with the open water elements, including relatively substantial water bodies identified along the toe of the northern embankment. In terms of disbenefits, this solution would require a significant amount of pumping to move water from low ground in the east to higher ground in the west, requiring long pipe runs to the discharge points into the reservoir.

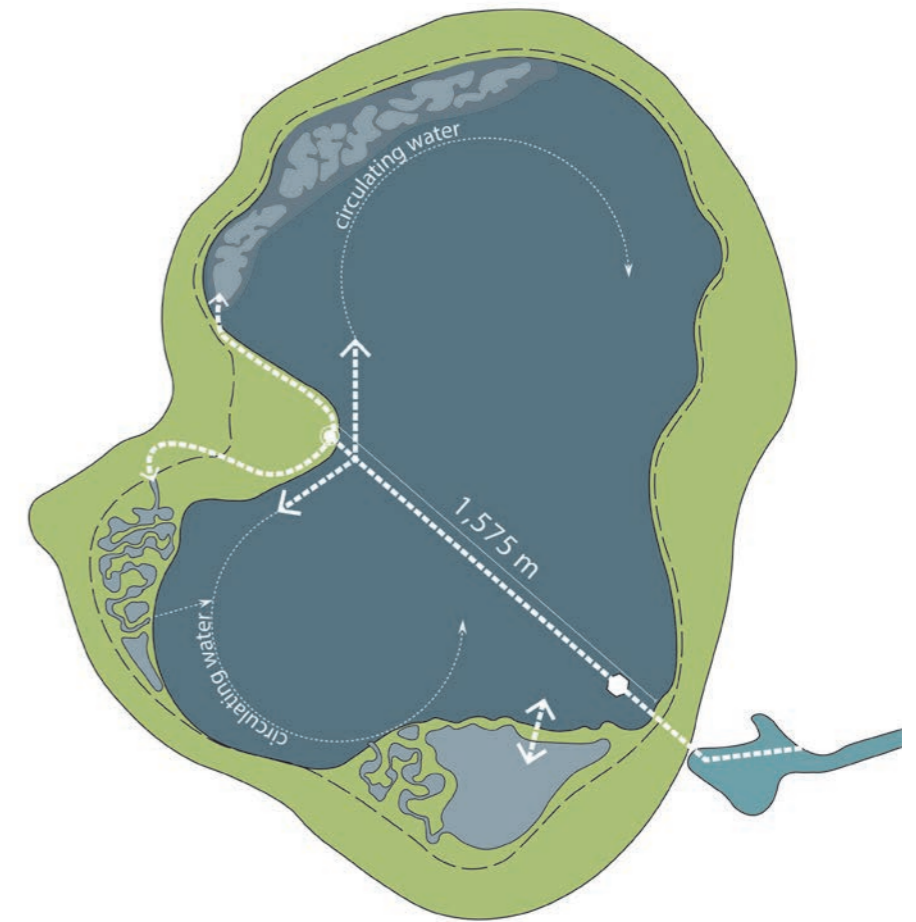
An alternative solution was subsequently considered (as illustrated, bottom right). This considered routing the raw water through the embankment at the south east corner, taking it across the reservoir towards the peninsula, via a submerged pipe, before discharging.

The alternative solution has several benefits compared with the route around the perimeter, including:

- reduced length of pipework and pumping, with potential for cost and carbon savings during construction and operation.
- opportunity for more comprehensive landscape treatment and mitigation options compared with restrictive conditions which would apply within a pipe easement corridor. This is most pertinent along the eastern edge which has particular environmental sensitivities including setting of heritage assets



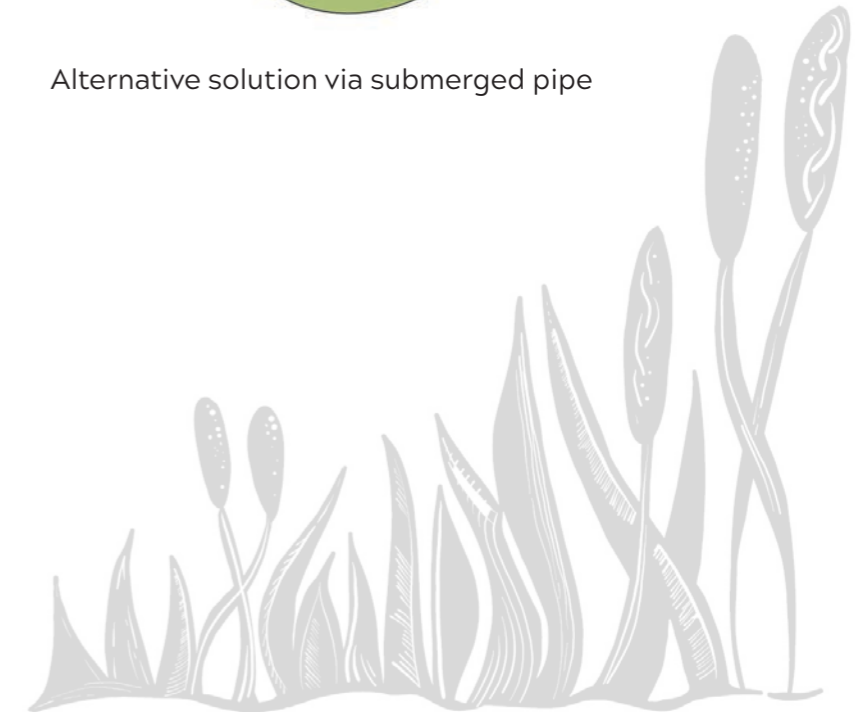
Preliminary design for water transfer via pipes along eastern and northern perimeter



Alternative solution via submerged pipe

- utilisation of the same tunnels through the embankment needed for the water discharge pipes in the south east corner, reducing the number of penetration points and lowering construction cost and carbon impact.

When considering the two options, the alternative solution through the reservoir offers greater potential for benefits and will be developed further in the next stage of the design.



9 Description of Emerging Design

This chapter describes the emerging design proposals for the Lincolnshire Reservoir, focussing on the permanent works to the main reservoir site. It does not represent a fixed solution but gives a sense of the types of facilities and features which could be included alongside the core engineering elements which are needed to operate the reservoir.

As explained in section 1 of this report, it might not be possible to include all the facilities and features in the DCO application, given the legal and policy tests that have to be met. If it is desired to take forward aspects that cannot be included in the DCO, they would need to be brought forward by other means (potentially by third parties). In addition, the EIA process for the project is still at an early stage and its outcomes will determine the feasibility or otherwise of some of the identified opportunities.

Find out more and have your say

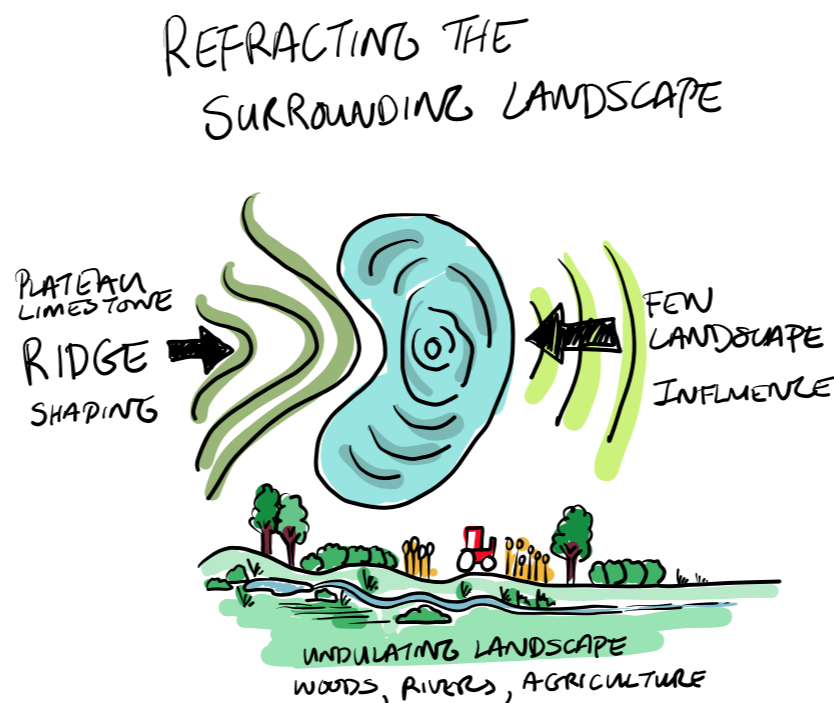
We would like to get your comments on our emerging design for the reservoir. Please see a guide to our proposals and Phase Two Consultation brochure for ways to provide your feedback:

www.lincsreservoir.co.uk/documents

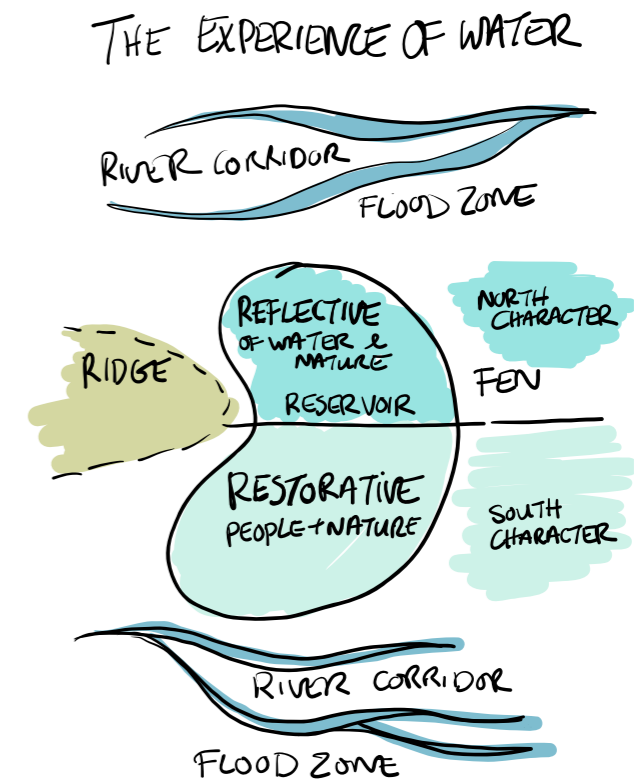
9.1 Overview

The design process described in Chapter 8 has led to the development of an emerging design for the Lincolnshire Reservoir. The ideas presented in this chapter illustrate how the reservoir could be configured, incorporating the core engineering components alongside non-operational elements such as recreational facilities, areas for habitat creation and landscape integration.

The proposals have been considered in the context of the design vision and indicative design principles (Chapter 4) which set out broader ambitions for the Project, the conceptual thinking set out in section 8.1 and the outcomes and insights taken forward set out in section 8.8.



Concept sketches illustrating the inspiration behind the emerging masterplan and development of character areas



WATER GARDENS

- STREAMS
- WETLANDS
- WET GRASSLAND
- LAGOON
- CHANNELS (WATER TRANSFER)



Artist's impression of what the Lincolnshire Reservoir could look like looking from the south east showing indicative connecting infrastructure locations

9.2 Lincolnshire Waterside Park

Overall Approach

The emerging design concept seeks to create a variety of experiences and opportunities which are connected in different ways to the water itself and to the landscape in which the reservoir will sit.

The design uses a combination of indicative landform and lagoons within the reservoir as organising elements which activate different parts of the site and their associated uses.

This establishes zoning of the most active areas - the visitor centre and recreation hubs to the south, with more passive areas where the focus is on nature and tranquility to the north. The peninsula acting as the divide between these two areas.

Beyond the crest of the embankments 'green' and 'blue' infrastructure corridors form a connecting thread through the different character areas.

These corridors could support a range of activities and uses which individually and collectively could be a catalyst for social, economic and environmental benefits. Ideas which form part of the emerging design include:

- a comprehensive network of footpaths, cyclepaths and horse riding routes which could connect into the wider rights of way network and provide better connectivity between settlements;
- opportunities to enhance the existing watercourses incorporating habitat creation, nature based solutions to provide better flood management and opportunities for recreation and connecting people to nature.

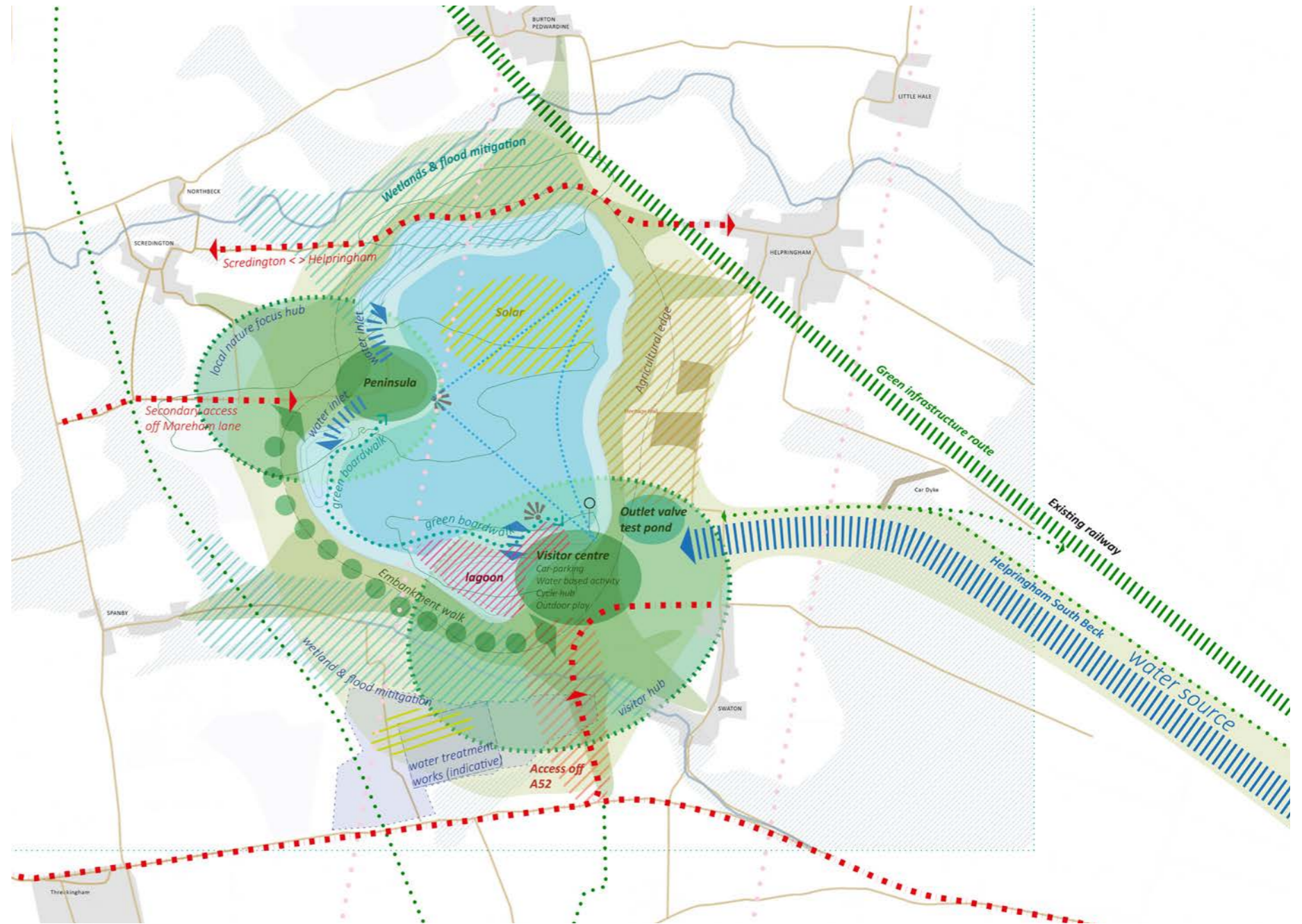


Illustration showing the emerging spatial concept

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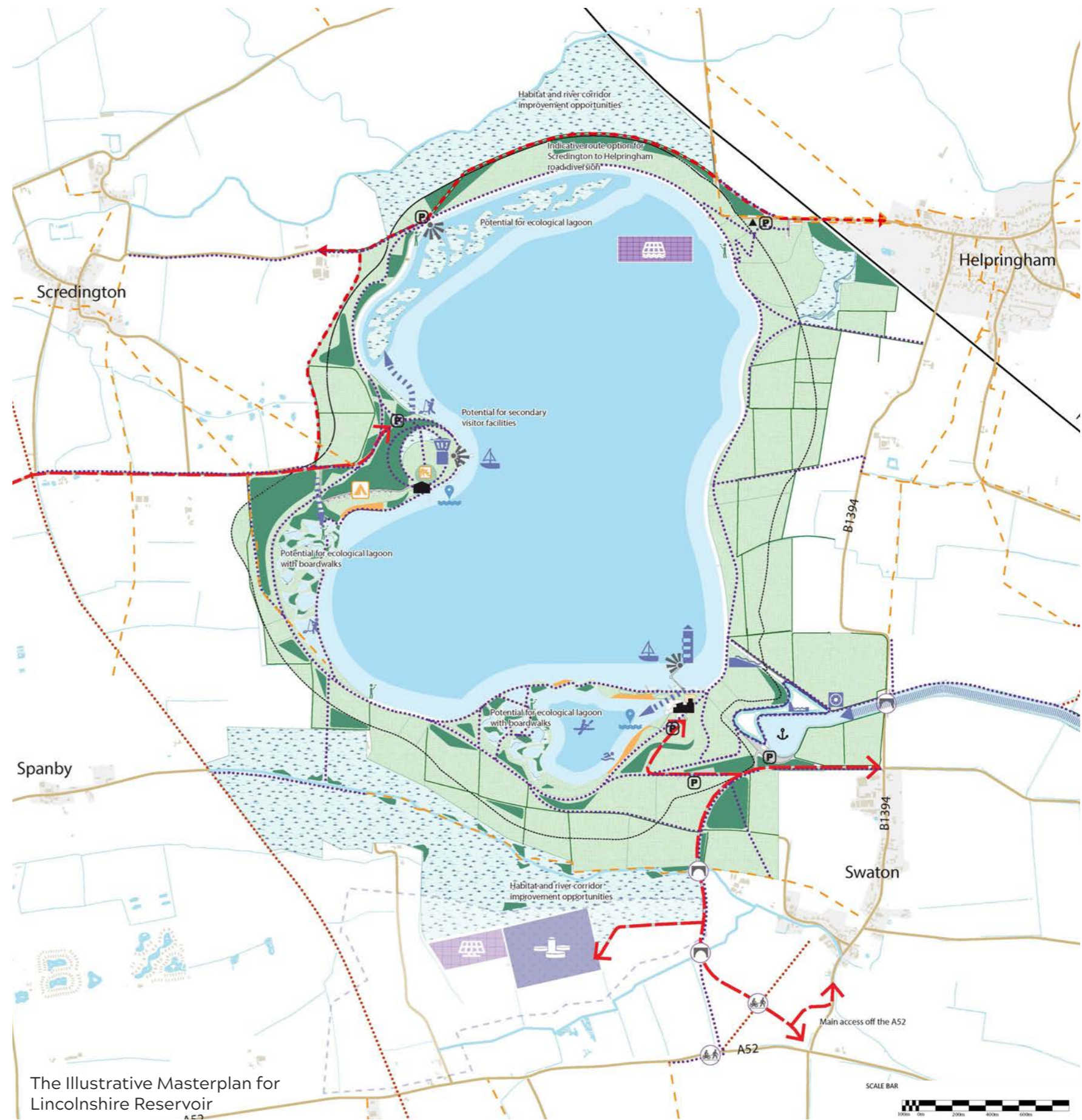


An indicative artist's impression of the view east across the southern lagoon towards the illustrative visitor centre

9.3 Illustrative Masterplan

The concept described in section 9.2 has led to the creation of the illustrative masterplan which is shown here (right).

The following sections in this chapter cover, in more detail, specific elements of this emerging design, including an explanation of how the reservoir is likely to operate; studies to convey the scale of the development and embankments, including consideration of their visual impact; and finally examples of component areas which could be created to enhance the sense of place.





The Illustrative Masterplan for Lincolnshire Reservoir



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Key





Indicative Locations for Primary Infrastructure (Operational Reservoir)

-  Upstream transfer (open channel)
-  Water discharge points into reservoir
-  Outlet valve test pond
-  Pumping station
-  Spillway
-  Water treatment works
-  Preferred water treatment works site selection area
-  Outlet tower
-  Proposed toe of outer embankment
















Renewable Energy:

-  Indicative location and extent of floating solar
 -  Indicative location and extent of land based solar and battery storage
- Other renewable energy technologies are being considered, including wind turbines. Further work will be undertaken to identify preferred technologies, scale and locations

Indicative Landscape Elements

-  Woodland
-  Grassland
-  Wetland
-  Hedgerow

Indicative Opportunities for Recreation

-  Visitor centre
-  Tertiary recreational facility
-  Secondary recreational facility
-  Potential location for marina and associated facilities
-  Viewing tower
-  Beach
-  Camping
-  Swim
-  Play
-  Fish
-  Bird Watch
-  Paddle Sport
-  Viewpoint
-  Point of access to the water
-  Sailing

Indicative Access Elements

-  Potential shared path
-  Proposed road crossing for walking, cycling and horse riding
-  Existing Public Right of Way
-  Proposed all user bridge
-  Potential vehicular access route
-  Proposed parking
-  Potential route for road diversion
-  Potential route for offsite active travel connectivity (by others)

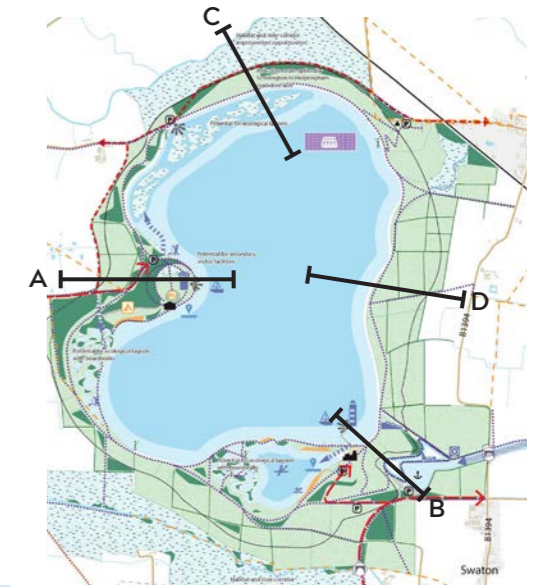
The location and alignment of routes shown on the masterplan are also indicative at this stage and further work will be undertaken to define and refine these

9.4 Embankment Integration - Cross Sections

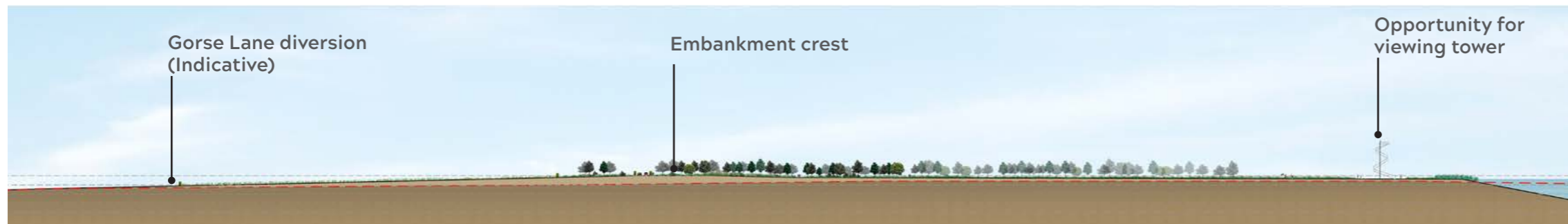
As discussed previously, the height of the embankment relative to the existing ground and the landscape treatment of the embankment slopes varies around the perimeter of the reservoir. This is in response to the surrounding landscape context as well as the technical requirements of the reservoir.

Shown below and opposite are a series of illustrative cross sections through the emerging design to show how the height, slope and landscape treatment of the embankments could vary around the reservoir.

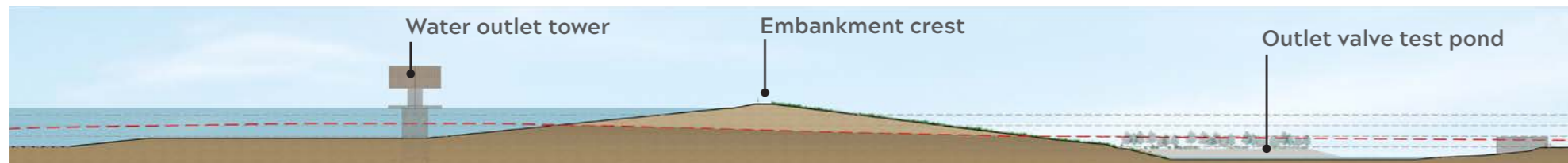
The current designs for the reservoir embankments show them at a crest height of approximately 25m AOD. This overall height is not fixed and will be subject to ongoing assessment, design and refinement.



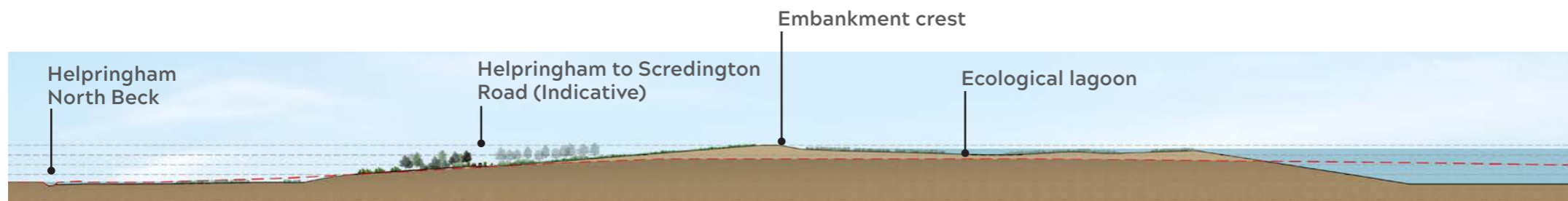
Section location plan



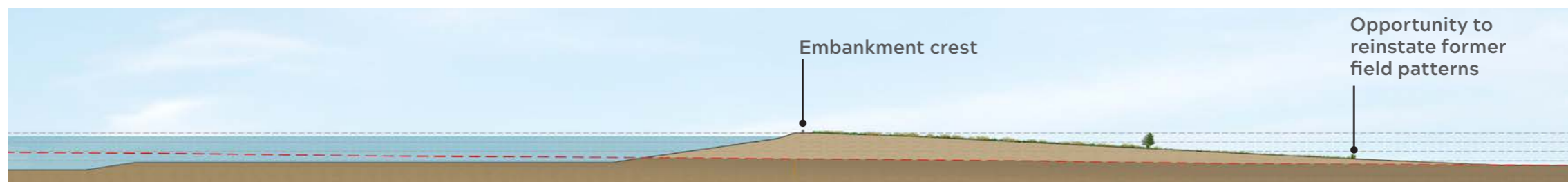
Cross Section A - Through peninsula






Cross Section B - through southern lagoon and water outlet tower

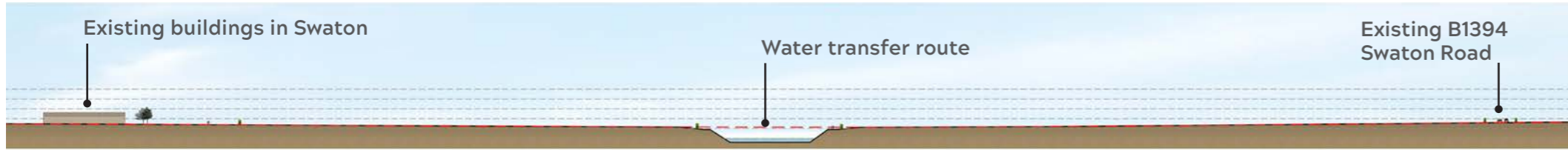


Cross Section C - Through northern wetlands and ecological lagoon

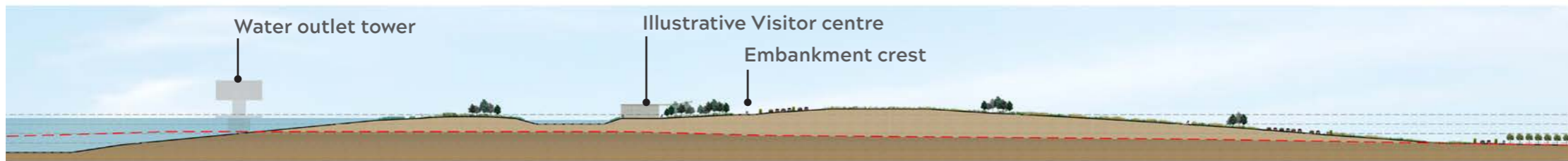


Cross Section D - Through eastern embankment

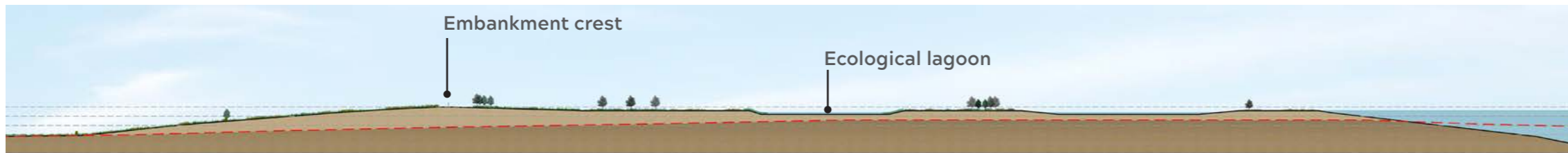
-  Existing Ground Line
-  Proposed Ground
-  Existing Ground



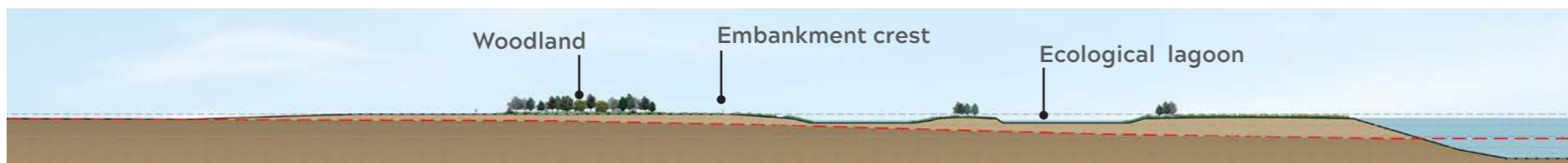
Cross Section E - Through water transfer channel



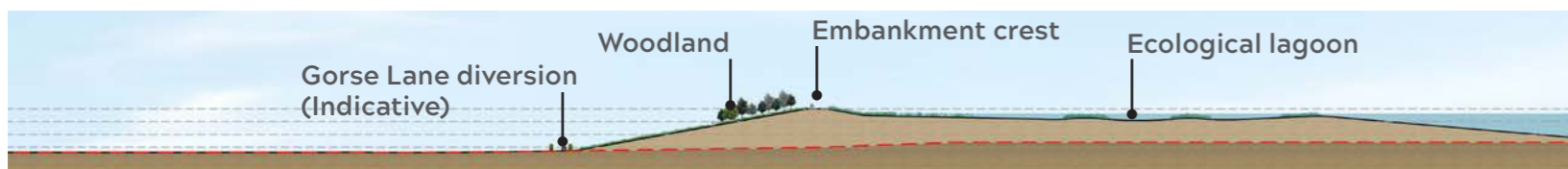
Cross Section F - Through visitor centre



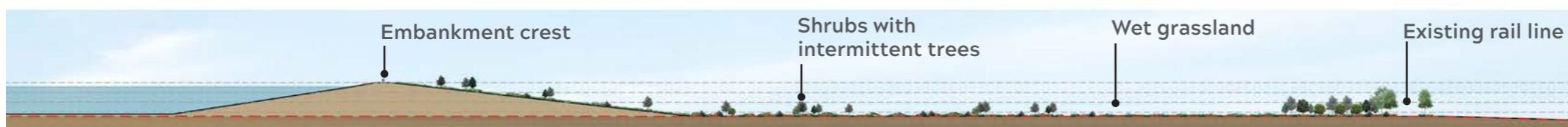
Cross Section G - Through southern embankment and ecological lagoon



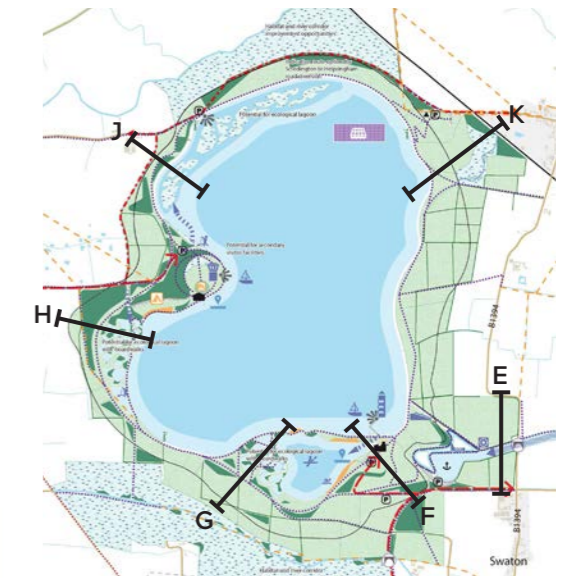
Cross Section H - Through western lagoon Lagoon



Cross Section J - Through western embankment



Cross Section K - Through north-east corner



Section location plan

- - - Existing Ground Line
- Proposed Ground
- Existing Ground

9.5 Embankment Height and Integration - Eye Level Views

The current designs for the reservoir embankments show them at a crest height of approximately 25m AOD. The apparent height is relative to the local terrain and the build up above existing ground levels varies between approximately +2m around the western peninsula to approximately +15m in the south east corner.

This overall height is not fixed and will be subject to ongoing assessment, design and refinement. This is dependent in part on the volumes of materials excavated and reused in the embankments and the need to maintain sufficient storage capacity in the reservoir to meet supply demands.

As explained in Chapter 7, the outer embankments can be designed to different slope angles and to incorporate planting to help break up their scale and provide better integration.

The emerging design for the Lincolnshire Reservoir includes a range of slope profiles, with the shallowest (least steep) slopes located along the eastern edge to create a more gentle transition towards the flat fen landscape to the east. All areas show planting in various forms including proposed hedgerows and small copses.

Illustrative photorealistic eye-level views have been prepared from three locations around the reservoir to give a sense of the embankment scale and indicate how landscape elements, such as planting could be used to soften their appearance. The embankments are shown with a crest height of 25m AOD and the planting illustrated within the views is shown at 15 years maturity.

A formal assessment of landscape and visual impacts will be undertaken as part of the EIA and will inform the embankment profiling and planting proposals, taking on board consultation feedback.



Inset - Artist's impression of view towards the eastern embankment

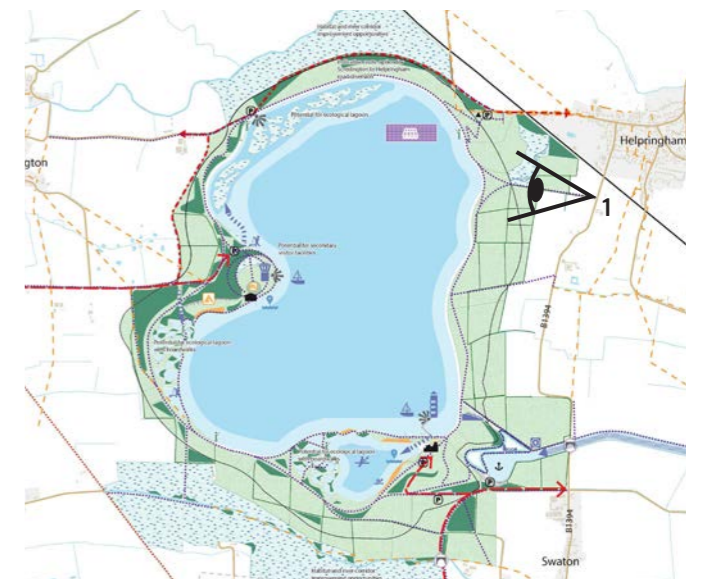
Viewpoint 1



Existing view at viewpoint 1 (south of Helpringham)



Artist's impression of proposed view at viewpoint 1



Viewpoint location plan

Viewpoint 2



Existing view at viewpoint 2 (east of Scredington)



Artist's impression of proposed view at viewpoint 2



Viewpoint location plan



Inset - Artist's impression of proposed view of western embankment

Viewpoint 3



Existing view at viewpoint 3 (west of Swaton)



Artist's impression of proposed view at viewpoint 3



Viewpoint location plan



Inset - Artist's impression of view towards visitor centre

9.6 Component Areas

The emerging design for the Lincolnshire Reservoir presents opportunities to provide a rich and varied experience for visitors. This could be achieved in different ways in different parts of the reservoir, creating variations and contrasts in character and activities between one area and another.

To illustrate how this might be done, potential design ideas for two areas of the reservoir are shown on the following pages.

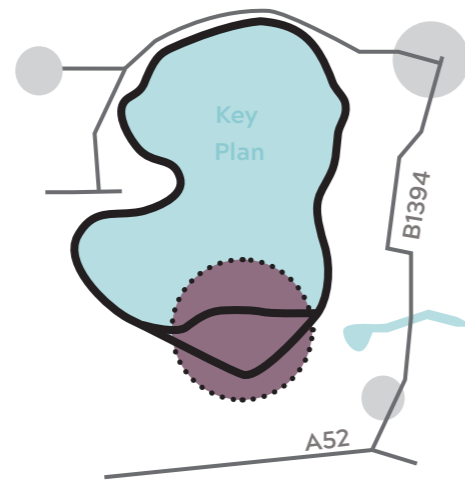
Following this, a summary is provided of the considerations and opportunities that could shape the design in the remaining component areas of the reservoir.





Approximate locations of component areas indicated on artist's impression of the reservoir seen from the south east

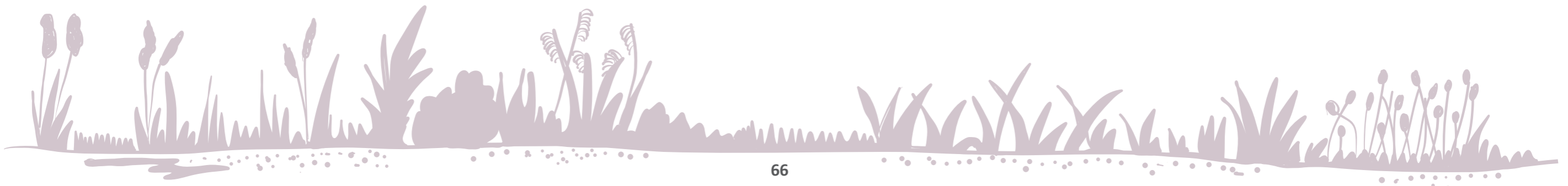
Southern Lagoon



This part of the reservoir could have the potential to be both the main visitor hub and main point of access to the reservoir for visitors. It is well positioned close to the A52 and it would be the expectation that this will serve as a key strategic route for visitors to the reservoir.

With appropriate landscape treatment, the land between the visitor hub and Swaton could be designed to maintain a sense of separation between the reservoir and the settlement, whilst also presenting an opportunity to provide walking, cycling and horse riding routes, with habitat creation and natural flood mitigation integrated into the Swaton Eau corridor.

This area is also where key infrastructure will be located including the Water Treatment Works, spillway and raw water inlet channel.





...What a view! Sitting having a coffee looking over the tranquil water of the reservoir. It's a bustling place with activity at the harbour front...

Potential features of the emerging design:

- A visitor centre building, located on the reservoir embankment with associated parking, access and outdoor spaces.
- A lagoon (separated from the main reservoir by an accessible causeway and weir) which could have maintained water levels, allowing access to the water from the embankment.
- The start/end point for walking, cycling and horse riding routes.
- Possible visitor facilities such as a beach, areas for water based activities, etc.
- Wetland habitat areas located further to the west which might incorporate features such as boardwalks, pond dipping platforms, etc.
- An outlet tower within the reservoir (as part of the water supply to the Water Treatment Works) which could potentially be partly accessible to the public.
- The outer face of the embankment designed to respond to the local landscape context, including views to the church spire, and help integrate the main reservoir features into the landscape. This could include planting to screen views from Swaton.

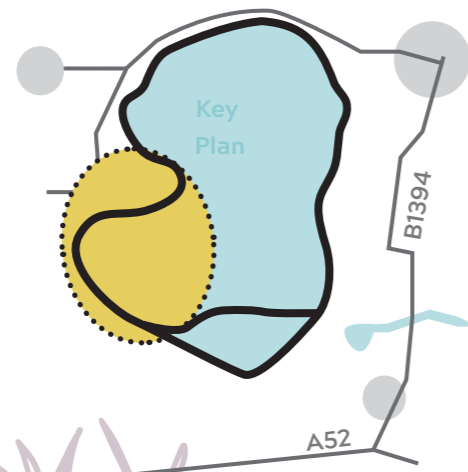


Peninsula

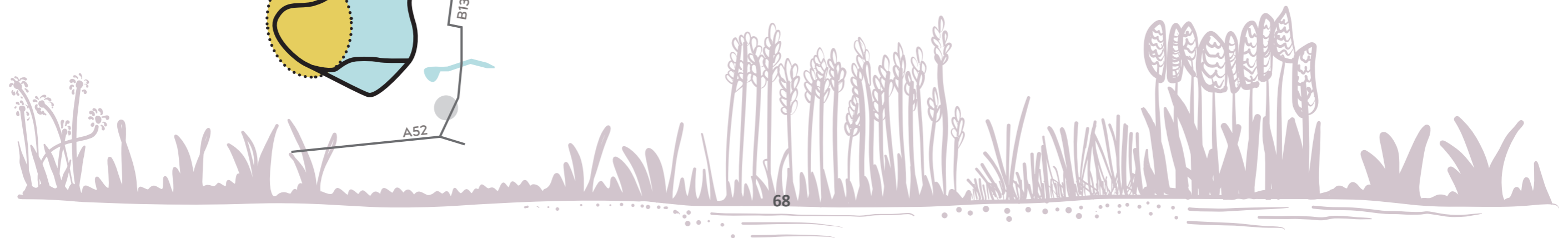


The Peninsula could be conceived as a place of discovery and contemplation, using the existing landform and areas of woodland to create a space hidden from view from the surrounding countryside. This area could be a destination, though not the main area of activity; its prominent position on the central peninsula would draw people away from the main hub into a quieter space which commands views across the reservoir and beyond.

A lagoon immediately south of the Peninsula could be designed as a place where people and nature meet, offering opportunities for visitors to walk through a wetland habitat in a restorative rural and quiet setting. Birdsong and sounds of flowing water could replace the more active recreational sounds found at the main visitor hub.



...Nestled on the reservoir edge, the hidden gem reveals itself as children's laughter mingles with the gentle lapping of water...





Potential features of the emerging design:

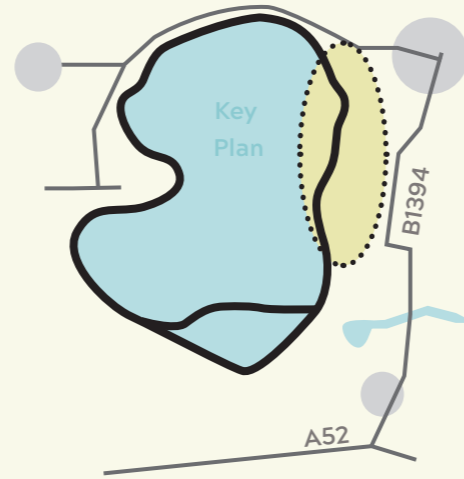
- The existing ridgeline would be retained to create an elevated landform which extends into the waterspace. The ridgeline is of a height comparable to the maximum crest height required by the reservoir to retain water levels.
- Access to the water could be provided, making best use of the landform with no embankments to navigate.
- This may offer an opportunity for installation of a landmark feature - a structure or land art sculpture - potentially reflective of the vertical spires which are local landmarks.
- The design could take advantage of elevated land in this area to create a lagoon - a body of water which can maintain raised water levels independent of levels in the main body of the reservoir.
- A series of pools and waterbodies of varying shapes and sizes could be designed to create a diverse wetland habitat. There would be a flow of water through the lagoon before it enters the main body of the reservoir.
- Footpaths and trails could form part of the loop around the embankment crest but with connections to routes into Scredington and Spanby. The lagoon could include a raised timber boardwalk providing controlled public access through the waterbodies, whilst retaining a more natural character to the space.
- Limited parking would dissuade large numbers of people coming here by vehicle.



...The boardwalk meanders through a mixture of ponds and pools against a backdrop of reeds rustling in the wind...



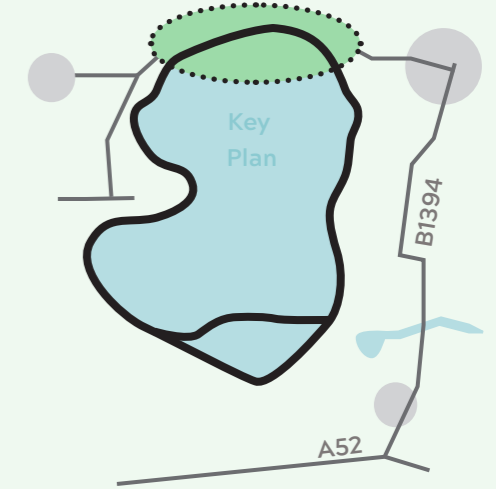
Eastern Embankment



Considerations and opportunities:

- Potential for shallow embankment slopes set back from Helpringham and Swaton, allowing a gradual transition to the fen edge. In combination with the strong field patterns the shallow slopes are intended to create a positive and appropriate setting of the historic assets.
- Planting of hedgerows on the embankments, reinstating historic field patterns, could reduce the apparent scale of the embankments and help integrate them into the landscape. Together with shallow slopes, this could help create an appropriate setting for Thorpe Latimer (Scheduled Monument) and retained ridge and furrow fields.
- Opportunities to create a green buffer between Helpringham and the reservoir at the north-east corner, where the embankment extent is restricted by the Lincoln to Peterborough railway line, through grassland, woodland planting and potential river corridor improvements along the existing watercourse.
- Potential for a local visitor facility in close proximity to Helpringham, incorporating low key features such as limited parking and play features to serve local users rather than visitors to the reservoir.
- Potential for new/improved rights of way connecting the route along the embankment crest to local settlements, the B1394 and existing PRow network.

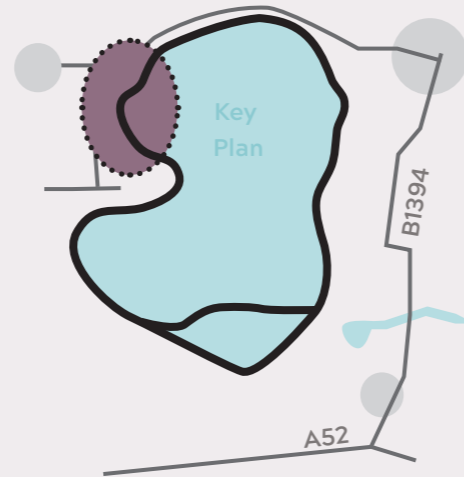
Northern Wetlands



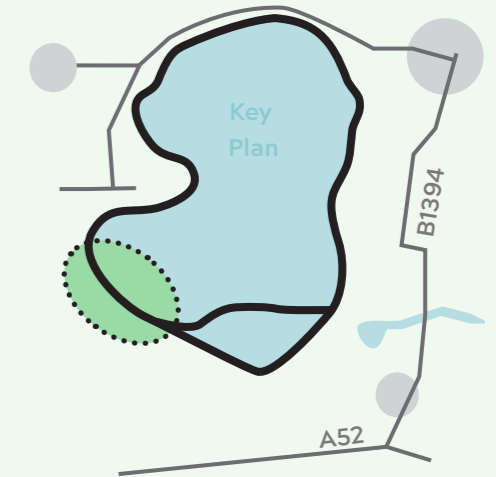
Considerations and opportunities:

- The crest of the embankment would be aligned with the existing ridgeline, maintaining the elevated character in this location, with the embankment slope reflecting the natural slope of the land towards the flood plain.
- Opportunity for an ecological lagoon within the reservoir, utilising the existing elevated terrain to create permanent wetland areas with varying depths, even during low reservoir water levels. Islands within the lagoon could provide refuge for wildlife with no access for the public.
- Localised modifications to Helpringham North Beck could provide beneficial wetland habitat and incorporate potential river corridor improvements.
- Planting on parts of the embankment slope and within the river corridor could integrate the reservoir into the landscape and reinforce the riverine character.
- The realignment of the Helpringham to Screddington road could be accommodated within this area. The illustrative masterplan shows one of the early indicative options under consideration, which would take the realigned road along the toe of the embankment with a short section rising to the embankment crest to provide a glimpsed view of the reservoir. However further work is required on the feasibility of the diversion options, including thorough engagement with the local highway authority.
- To meet the energy needs of the Project, there may be an opportunity to locate areas of floating solar panels within the northern part of the reservoir.

Western Embankment



Southern Embankment



Considerations and opportunities:

- Embankments could be shaped to reflect subtle variations in landform with access to the water's edge for activities such as angling.
- Gorse Lane could be retained as an access road, diverted to the west.
- Blocks of woodland planting on the embankment slopes and extending beyond the toe, could draw inspiration from the more wooded character to the south-east of Scredington, helping to break up views towards the embankment crest from Scredington and for users of the local PRoWs.
- Woodland planting and grassland could provide opportunities for sheltered routes around the reservoir and
- Woodland trails linking into the existing footpath networks, retaining and improving connection to local communities.

Considerations and opportunities:

- This area could connect the main visitor hub at the Southern Lagoon with secondary visitor facilities at the Peninsula. A series of recreational loops for visitors could be created, including a footpath link along the crest of the embankment and other routes on the outer face of the embankment and along the river corridor to the south.
- There is an opportunity for reinstatement of existing and historic field patterns and hedgerows, alongside woodland and grassland planting to help break up views towards the embankment crest, including from south of the A52.
- Subject to the energy requirements of the Project, the area to the south could potentially host a solar array, optimising the south facing slopes. This area is also the provisional proposed location for the Water Treatment Works.

A52 Access



Considerations and opportunities:

- Potential for a new access from the A52, possibly at the Swaton Lane junction.
- Potential gateway or landmark features at the junction to draw visitors off the A52 or to signify the entrance to the reservoir.
- Opportunity for a link from the main reservoir access road connecting back to the B1394 north of Swaton .
- Possibility to provide new footpath links to connect Horbling and Swaton, and further opportunities to provide new active travel routes from Swaton and the existing PRoW network to the reservoir and main visitor hub, creating easy access for local users.
- Opportunity to reinforce landscape character through planting and potential reinstatement of historic field patterns.
- Potential for additional natural flood alleviation measures along Swaton Eau, creating green links to the village.



Indicative artist's impression
of the view across the southern
lagoon towards the illustrative
visitor centre and water outlet
tower

...The last rays of the sun unfurl like a silken ribbon
across the sky, a final flourish on the masterpiece of
this summer's day.



10 Glossary

Above Ordnance Datum (AOD)

Above ordnance datum is a vertical height above sea level.

Arable

Land used or suitable for growing crops.

Capital carbon

Emissions associated with the creation of an asset.

Crest/ crest level

The level of the top of the dam.

Dam

A dam is a man-made barrier built to hold water.

Development Consent Order (DCO)

Means of obtaining permission for developments categorised as Nationally Significant Infrastructure Projects (NSIP). This includes energy, transport, water and waste projects. This is in place of other consents such as planning permission and compulsory purchase orders. Introduced in 2008 to speed up the planning process for NSIP projects.

Downstream

Associated water infrastructure located between the raw water reservoir and the point of supply

Drain

Engineered drainage channel.

Embankment core

Central section of an embankment dam made from an impermeable material to stop water passing through the dam.

Embankment dam

A dam made mainly from natural materials.

Fenland / the Fens

An area of low-lying land in eastern England.

Freeboard

The height differential between the top water level and the crest of the reservoir embankment.

Impounding reservoir

A type of reservoir that is created by blocking natural flow of water with a dam or embankment. The flow may be from a stream or river. They may also be fed by groundwater springs.

Independent Design Review Panel (IDRP)

Design Review is an independent and impartial evaluation process in which a relevant panel of experts assess the design of a proposal. The projects that Design Review deals with are usually of public significance, and the process is designed to improve the quality of places for the benefit of the public

Inlet /inlet pumping

The point at which water enters the reservoir.

Lagoon

A body of water hydraulically connected to the main reservoir but separated by a dividing weir. The water level can be controlled to be more consistent than the main reservoir and facilitate a greater recreational use.

Landform

A natural or manmade land feature

National Cycle Routes

The National Cycle Network is a UK-wide network of signed paths and routes for walking, wheeling, cycling and exploring outdoors.

The National Cycle Network - [Sustrans.org.uk](https://www.sustrans.org.uk)

National Policy Statement (NPS)

National Policy Statements are produced by the government and comprise the government's objectives for the development of nationally significant infrastructure in a particular sector and state. They provide the framework within which Examining Authorities make their recommendations to the Secretary of State.

Nationally Significant Infrastructure Project (NSIP)

In the water industry this includes the construction of new dams/ reservoirs where the volume of water to be held back by the dam or stored in the reservoir is expected to exceed 30Mm³ and water transfer schemes where the deployable output of the facility to be constructed as a result of the development will exceed 80 million litres per day.

Non-impounding reservoir

A type of reservoir that does not obstruct the flow of a river and is normally filled by pumping water into it.

Open water

A large body of water.

Operational water level

The maximum level at which water is held within the reservoir.

Outlet tower

The outlet tower draws-off water at different levels in the reservoir and transfers the water out of the reservoir. The supply pipe passes from the outlet tower to the WTW.

Phase One Consultation

10 week consultation that took place between 12 October and 21 December 2022. Feedback was sought on two key parts of the proposals - the areas identified for the reservoir and an early concept design.

Public Rights of Way (PRoW) Network

A network of routes which the public have a legal right to pass along, the land may be owned by a private individual.

Rights of way and accessing land: [Use public rights of way - GOV.UK \(www.gov.uk\)](https://www.gov.uk/guidance/use-public-rights-of-way)

Pumping station

A utility building that pumps water from one place to another.

Reservoir

A natural or artificial lake used as a source of water supply.

Spillway

A spillway is used to prevent uncontrolled overtopping of the embankment. The spillway crest is proposed to be above the operational water level to reduce water loss from spills over the spillway at normal operational levels.

The Reservoirs Act 1975

Reservoir safety is regulated through the Reservoirs Act 1975. The Act applies to “large raised reservoirs” - reservoirs which store more than 25,000m³ above ground level.

Upstream

Associated water infrastructure located between the point of raw water abstraction and the raw water reservoir.

Water treatment works (WTW)

Compound that contains the water treatment processes. The process of removing contaminants and bacteria from water abstracted from water sources such as reservoirs and aquifers before delivering clean and safe water to customers for consumption.

Watercourse

A brook, stream, or artificially constructed water channel.

Weir

A low dam that is built across water to raise the water level, divert water or control its flow.

Wetland

An area of land that is either covered by water or saturated with water.

Woodland

A woodland must meet all the following, as defined in the government publication in the link below:

- a minimum area of 0.5ha
- a minimum width of 20m
- a potential tree canopy cover of at least 20%
- a canopy consisting of specimens that meet the definition of trees

[Guidance Definition of trees and woodland. Government website](#)



Get in touch

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