



# **Fens Reservoir**

Strategic Environmental Assessment

July 2021

Mott MacDonald  
Floor 3  
1 Whitehall Riverside  
Leeds LS1 4BN  
United Kingdom

T +44 (0)113 394 6700  
mottmac.com

Anglian Water

# Fens Reservoir

## Strategic Environmental Assessment

July 2021

Mott MacDonald Limited. Registered in  
England and Wales no. 1243967.  
Registered office: Mott MacDonald House,  
8-10 Sydenham Road, Croydon CR0 2EE,  
United Kingdom

# Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	May 2021	L Bagshaw	J Fookes	D Ocio	Draft for comments
B	July 2021	H Dodd	J Fookes	D Ocio	Updated

**Document reference:** 100410795-006 | 06-SEA | B

**Information class:** Standard

This document is issued for the party which commissioned it and for specific purposes connected with the above-captioned project only. It should not be relied upon by any other party or used for any other purpose.

We accept no responsibility for the consequences of this document being relied upon by any other party, or being used for any other purpose, or containing any error or omission which is due to an error or omission in data supplied to us by other parties.

This document contains confidential information and proprietary intellectual property. It should not be shown to other parties without consent from us and from the party which commissioned it.

# Contents

Executive summary	1
1 Introduction	2
1.1 Overview	2
1.2 FR Initial Concept Design	2
1.3 Methodology	2
2 Scheme Description	4
3 Stage 1 Strategic Environmental Assessment Findings	5
3.1 Exemplar Option	5
3.1.1 Biodiversity, Flora and Fauna	8
3.1.2 Soil	8
3.1.3 Water	8
3.1.4 Air	9
3.1.5 Climatic Factors	9
3.1.6 Landscape	9
3.1.7 Historic Environment	9
3.1.8 Population and Human Health	10
3.1.9 Material Assets	10
4 Conclusions	11
A. Stage 1 SEA output tables	13
<b>Tables</b>	
Table 3.1: SEA Outputs Pre-Mitigation	6
Table 3.2: SEA Outputs Post-Mitigation	7
Table 4.1: Summary of the Potential Beneficial and Adverse Effects of the Scheme	11

# Executive summary

The Strategic Environmental Assessment (SEA) Annex supports the Environmental Assessment Report (EAR) that accompanies the Gate 1 submission report to Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Fens Reservoir (FR) Scheme. This Annex presents the findings of the SEA applied to the FR exemplar option.

Based on the SEA outputs for residual effects (post mitigation), the exemplar option is predicted to result in moderate positive, neutral, minor negative or moderate negative effects across all the SEA objectives. A summary of the key beneficial and adverse effects is provided below. To note that the Gate 2 concept design will be expanded to include multi-sector features, which could offer significant wider benefits, including opportunities for environmental enhancement, positive social outcomes, improved climate-resilience and realisation of low-carbon targets.

Topic	Beneficial Effects	Adverse Effects
Biodiversity, flora and fauna	No beneficial effects identified	Potential adverse impacts on designated sites and priority habitat during construction and operation.
Soil	No beneficial effects identified	Option is located within Grade 1-2 land, with potential permanent loss of this land. Two authorised landfill sites within 500m with potential to disturb contaminated material.
Water	Option will provide a resilience PWS throughout the year.	Option is located within Flood Zone 2 and 3, although it benefits from flood defences at the 1-in-100 year flood level. The abstraction and release of water has the potential to have an effect on water levels, flows and quality during the operational phase.
Air	No beneficial effects identified.	Option is likely to generate short-term vehicle emissions and dust from construction activities.
Climatic factors	No beneficial effects identified.	Option will have negative carbon impacts due to construction and operation of the reservoir.
Landscape	No beneficial effects identified.	Option is within a national landscape character area and there will be minor negative effects during the construction phase on this area.
Historic environment	No beneficial effects identified.	There are several listed buildings and a scheduled monument within 500m. There is potential for the setting of these historic assets to be affected during the construction phase. There is a potential for unknown archaeology to be discovered during excavation of the reservoir.
Population and human health	No beneficial effects identified.	Option is within proximity to a number of community facilities or recreational areas, with potential to adversely impact during construction.
Material assets	No beneficial effects identified.	Option has potential adverse impacts on minor roads, main roads and a railway during construction.

# 1 Introduction

## 1.1 Overview

This Annex supports the Environmental Assessment Report that accompanies the Gate 1 submission report to the Regulators' Alliance for Progressing Infrastructure Development (RAPID) for the Fens Reservoir (FR). The Annex presents the findings of the Strategic Environmental Assessment (SEA) applied to the one exemplar FR design.

As part of the WRMP19, Anglian Water (AW) and Cambridge Water (CW) have identified an increasing deficit between water supply and demand in several Water Resource Zones over the coming decades. As such, a range of different supply side options have been considered to alleviate this future supply shortfall, including the development of winter storage reservoirs. Fens Reservoir (FR) is one of the reservoirs under consideration.

A site selection process is currently underway to identify the preferred site for the FR, involving a phased approach; an initial coarse screening stage based on technical, social, environmental and planning constraints has been undertaken, which will be followed by a fine screening stage where opportunities will be considered and a preferred site screening. This process is expected to be completed by January 2022. Given that the FR will be a nationally significant infrastructure project it is likely to require a Development Consent Order (DCO) under the Planning Act 2008.

## 1.2 FR Initial Concept Design

The exemplar option described in this report has been selected for concept design for the purposes of establishing indicative costs and benefits for the Gate 1 submission. It consists of the construction of a winter storage reservoir. The reservoir will be fed via four abstraction points along the River Ouse between King's Lynn and Huntingdon; at St German's, Denver, Earith and the Ouse Washes.

## 1.3 Methodology

The group of water companies involved in developing SROs have been working together to increase consistency in approaches to SRO development across the country. To confirm the list of SEA criteria to be used in the SEA assessment for the SROs, a review of the SEA objectives of the water companies was undertaken to determine if a core set of scheme objectives could be developed. The draft WRMP 2019 guidance and its application to the SRO schemes was also considered. The recommended objectives were then reviewed against the Water Resources Planning Guidelines: Working Version for WRMP 2024. Further information on the process undertaken to develop the SEA objectives is available in the *Strategic Environmental Assessment: Core Objective Identification document*<sup>1</sup>.

An option-level assessment has been undertaken to assess the concept design option against the SEA objectives. The SEA assessment was undertaken on 14 SEA objectives based on nine topics (biodiversity, flora and fauna; soil; water; air; climatic factors; landscape; historic environment; population and human health; material assets). An assessment of the potential impact of construction and operation on each SEA criteria was undertaken. The SEA assessment also considered the assessment of residual effects from construction and operation following the identification of potential mitigation.

---

<sup>1</sup> All Companies Working Group: Core Objective Identification. Revision 01C. October 2020.

For the option previously assessed as part of WRMP19, the existing assessment information was used as a basis for the SEA assessment work for the Gate 1 submission.

While FR is a Water Resource East (WRE) scheme, the initial assessments to support the Gate 1 submission were undertaken using the method developed for use on the Water Resources South East (WRSE) regional programme. The WRE environmental assessment approach is currently being finalised following completion of the Integrated Environmental Assessment scoping consultation exercise. It is expected that the WRE methodology will be used to support the work for Gate 2 submission. As the WRSE and WRE methodologies are very similar, this will not invalidate the Gate 1 assessments undertaken for the FR SRO.

## 2 Scheme Description

In the 2019 Water Resources Management Plan (WRMP19), Anglian Water and Cambridge Water estimated an increasing deficit between water supply and demand over the coming decades. The development of the FR as a winter storage reservoir was identified by Anglian Water as a potential supply side option in their extended preferred plan in 2080, mainly due to the reduced water resource benefit of a scheme only supported from Denver. Cambridge Water also explored similar winter storage reservoir options, which were selected beyond the 2040 planning period due to economic comparison. With the aim of increasing the output from the reservoir over the solution adopted in WRMP19, additional sources of water for the reservoir have been introduced, rising the deployable output to over 100MI/d for a 50MCM reservoir. The magnitude of the potential water resource benefit is of a regional scale and would allow a joint use of the scheme by Anglian and Cambridge Water

The FR reservoir will be an earth bunded dam with storage capacity to allow for 50MCM for PWS. The reservoir civil works will allow for transfers into and out of the reservoir including appropriate draw off works. Water quality issues associated with the impounded water will be considered with an aeration system installed within the base of the reservoir, which mixes / circulates the stored volume. As all new reservoirs must have a means to safely remove water from the reservoir in an emergency, rapid drawdown facilities will be considered and are likely to be achieved by means of permanent pipework installed at the site, which then discharge directly into an adjacent watercourse located within the surrounding area. An additional pump station of approximately 10m x 10m footprint shall be co-located at the site to allow conveyance of treated water by buried pipeline from the reservoir to the delivery destination, when required. It is expected that this pump station will be buried or partly-buried, as the conveyance system will be tunnelled underneath the formation of the embankment.

The capacity of the pumping station is assumed to be 100MI/d with water conveyed by pipeline to the delivery point. The design of the treatment works does form part of this assessment as this is currently being undertaken as part of the Anglian to Affinity Transfer (A2AT) scheme. However, the required footprint for the treatment works will be located adjacent to the proposed reservoir and will be incorporated into the overall design provided by the ongoing A2AT workstream, with a maximum footprint of approximately 275 x 108m.

The intakes for this concept design shall consist of four structures in total: Middle Level at St German's (125MI/d), Bedford Ouse at Earith (700MI/d), Ouse Washes (500MI/d) and Denver (500MI/d). Water shall be abstracted from the relevant watercourses through fine screens situated on the riverbank. An abstraction license will need to be agreed with the Environment Agency.

The pump stations will be located within a secure compound located in the most appropriate location depending on the extraction point. It is anticipated that a significant power supply will need to be provided to the pump station site. Raw water will be required to be conveyed from the river intakes to the reservoir. The design of the conveyance system is dependent on the distance and head between the intake and reservoir and as such will comprise pipelines.

A full scheme description can be found in Annex 1 of the Gate 1 submission, the *Concept Design Report*.

## 3 Stage 1 Strategic Environmental Assessment Findings

### 3.1 Exemplar Option

The SEA outputs for the option is summarised in Table 3.1 and Table 3.2 and discussed in the relevant sections below. The colour and score used in these tables to reflect the effects are as follows:

- White, (+): Construction/operation of the option would result in minor positive effects against the SEA objective;
- Yellow, (0): Construction/operation of the option would result in neutral effects against the SEA objective;
- Amber, (-): Construction/operation of the option would result in minor negative effects against the SEA objective;
- Orange, (--): Construction/operation of the option would result in moderate negative effects against the SEA objective; and
- Red, (---): Construction/operation of the option would result in major negative effects against the SEA objective.

For each option, the tables show ratings for construction and operation phases against each of the SEA objectives. Table 3.1 shows the ratings before any mitigation is applied and Table 3.2 shows the ratings after mitigation is applied. The applicable mitigation for each SEA objective is described in sections 3.1.1 to 3.1.9.

**Table 3.1: SEA Outputs Pre-Mitigation**

**Pre mitigation**

SEA Topic	SEA Objective	Construction Effects		Operational Effects	
		+	-	+	-
<b>Biodiversity, flora and fauna</b>	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	0	---	0	---
<b>Soil</b>	Protect and enhance the functionality, quantity and quality of soils	0	--	0	0
<b>Water</b>	Increase resilience and reduce flood risk	0	--	0	--
	Protect and enhance the quality of the water environment and water resources	0	--	0	-
	Deliver reliable and resilient water supplies	0	0	+++	0
<b>Air</b>	Reduce and minimise air emissions	0	-	0	0
<b>Climatic Factors</b>	Reduce embodied and operational carbon emissions	0	--	0	-
	Reduce vulnerability to climate change risks and hazards	0	0	0	0
<b>Landscape</b>	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	--	0	0
<b>Historic Environment</b>	Conserve, protect and enhance the historic environment, including archaeology	0	--	0	0
<b>Population and Human Health</b>	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0
<b>Material Assets</b>	Minimise resource use and waste production	0	--	0	0
	Avoid negative effects on built assets and infrastructure	0	--	0	0

**Table 3.2: SEA Outputs Post-Mitigation**

**Post mitigation**

SEA Topic	SEA Objective	Construction Effects		Operational Effects	
		+	-	+	-
<b>Biodiversity, flora and fauna</b>	Protect and enhance biodiversity, priority species, vulnerable habitats and habitat connectivity (no loss and improve connectivity where possible)	0	--	0	--
<b>Soil</b>	Protect and enhance the functionality, quantity and quality of soils	0	--	0	0
<b>Water</b>	Increase resilience and reduce flood risk	0	-	0	-
	Protect and enhance the quality of the water environment and water resources	0	-	0	-
	Deliver reliable and resilient water supplies	0	0	+++	0
<b>Air</b>	Reduce and minimise air emissions	0	-	0	0
<b>Climatic Factors</b>	Reduce embodied and operational carbon emissions	0	--	0	-
	Reduce vulnerability to climate change risks and hazards	0	0	0	0
<b>Landscape</b>	Conserve, protect and enhance landscape, townscape and seascape character and visual amenity	0	-	0	0
<b>Historic Environment</b>	Conserve, protect and enhance the historic environment, including archaeology	0	-	0	0
<b>Population and Human Health</b>	Maintain and enhance the health and wellbeing of the local community, including economic and social wellbeing	0	-	0	0
	Maintain and enhance tourism and recreation	0	-	0	0
<b>Material Assets</b>	Minimise resource use and waste production	0	-	0	0
	Avoid negative effects on built assets and infrastructure	0	-	0	0

### 3.1.1 Biodiversity, Flora and Fauna

The representative reservoir site is close to a number of statutory designated sites: Ouse Washes Ramsar, SAC, SPA and SSSI (15.7% favourable, 3.5% unfavourable-recovering, 80.7% unfavourable-no change) with potential to result in indirect impacts during construction. The proposed pipeline has potential direct impacts on these designated sites during construction due to the location of the pipeline alignment. During operation, the proposed abstraction from the Ouse Washes has potential to adversely impact these designated sites. The HRA Screening identified likely significant effects during construction and operation to the Ouse Washes SPA, SAC and Ramsar. An Appropriate Assessment will be required to identify the potential effect on habitats and species for which these sites are designated, as well as mitigation measures.

The proposed pipeline has potential direct impacts on one Local Wildlife Site and two County Wildlife Sites.

There is a potential risk of transfer of Invasive Not-Native Species (INNS) associated with the works. However, mitigation could be achieved, if required, through on-site management of INNS.

There are a number of areas of Priority Habitat within 500m from the proposed reservoir, including saltmarsh grazing habitat, deciduous woodland and lowland fens which may be impacted during construction. The pipeline has potential direct impacts on lowland fens and coastal floodplain grazing marsh priority habitat during construction.

Best practice methods are to be implemented to minimise disturbance effects, however the potential for residual effects on designated sites is likely. Reinstatement of habitat should be considered where possible; however, some permanent loss is anticipated. Further ecological surveys will be required to confirm likely impacts.

### 3.1.2 Soil

There are two authorised landfill sites within 500m from the preliminary proposed pipeline, one of them within 115m from the pipeline, with potential to disturb contaminated material during construction.

There are a number of areas of peat soils within the footprint of the proposed reservoir site and the pipeline alignment. These soils have potential to be adversely affected during construction which may result in draining of the soils, and loss of the soil completely.

The option is located within Grade 1 and 2 agricultural land. Construction of the reservoir has the potential to result in a permanent loss of this land, whilst the pipeline may result in temporary impacts. This impact could be minimised by reinstatement of topsoil on completion of the pipeline. Best practice measures are to be implemented during construction to minimise potential disturbance to contaminated land. Ground is to be reinstated where possible to ensure soil is restored to sufficient thresholds for Grade 1 and 2 land. However, permanent loss of agricultural land will remain.

### 3.1.3 Water

There are large areas of FZ2 and FZ3 within and within close proximity of the reservoir boundary. As such there is a potential risk of flooding during the construction and operational phases. It is noted, however, that the reservoir is within an area benefitting from flood defences, and therefore, not anticipated to be affected by flooding from a 1-in-100 year event. However, measures to reduce the impact of flooding during the construction phase are likely to be implemented, with minor residual flood risk is likely to remain.

The construction phase could result in negative effects on waterbodies within or adjacent to the reservoir and pipeline including the Ouse Washes. Embedded mitigation should be included such as agreement with the EA on watercourse diversions to ensure at least that no WFD status deterioration or effects on river environment are caused, appropriate drainage for earthworks are planned, and fully bunded chemical / oil storage is incorporated into construction and operation plans.

The abstraction of water has the potential to have an effect on water levels, flows and quality during the operational phase. To minimise water quality effects, embedded mitigation measures such as regular water testing, treatment of drainage water, discharge permit application, amongst others should be implemented for the operational phase. There may be some minor negative effects during operation although embedded mitigation has been implemented. Best practice construction measures will likely be implemented to mitigate effects.

The proposed option is intended to increase winter storage capacity therefore improving resilience for supply. It is also intended to help reduce abstractions in more vulnerable areas whilst increasing the resilience of water supply during times of low flow.

#### 3.1.4 Air

The option does not fall within an AQMA and there are no impacts within 2000m of the option location. Construction is likely to have minor and temporary impact on air quality. Whilst best practice mitigation measures are likely to be implemented during construction phase, minor and temporary impacts on air quality are likely to still occur.

#### 3.1.5 Climatic Factors

Carbon will be generated from materials used to construct the reservoir (embodied carbon), construction activities and from operation of the reservoir. It will be necessary to investigate the use of renewables during construction and operation for energy supply as well as the use of materials with lower embodied carbon. A carbon footprint study could help identify areas for carbon savings or alternative materials. As the electricity grid is decarbonised, greener energy will be available.

Abstraction may have a negative effect on the environment if not properly monitored and licensed. Monitoring is advised to reduce the risk of negative effects on the environment due to abstraction and should be undertaken at the next stage.

#### 3.1.6 Landscape

The option is not within an AONB, Green Belt or a National Park. The option is, however, located within The Fens National Character Area. There could be minor negative effects during the construction phase on this area associated with the pipeline and reservoir. Embedded mitigation could include tree surveys, tree retention, minimising hedgerow removal, maintain existing views where possible and avoiding disturbance to key landscape features. However, minor effects will likely remain. The new reservoir will result in the significant and permanent change to landscape, and although embedded mitigation such as extensive landscaping around reservoir footprint, limiting embankment heights and slope steepness, may be implemented effects will remain.

#### 3.1.7 Historic Environment

There is one Scheduled Monument within 500m from the preliminary proposed pipeline with potential to be impacted during construction. There are three Grade II\* buildings within 500m of the proposed option, and a further 24 Grade II listed buildings with potential for the setting of these buildings to be impacted during construction.

There is potential for unknown buried archaeology to be present and adversely impacted during construction.

Best practice mitigation measures will likely be implemented to minimise setting effects during construction. A full investigation will be required for planning, as well as an Archaeological Watching Brief. However residual effects are likely to remain if removal is permanent. Further work is required to confirm significance.

### 3.1.8 Population and Human Health

The option is within 500m from an Allotment/Growing Space, play space, playing field, public park/garden, religious buildings and schools. There is likely to be minor and temporary effects to the local community and users of these facilities during the construction phase.

There is potential to disturb recreational activities associated with the Ouse Washes such as walking, bird watching or angling. It is not clear if the reservoir will be accessible to the public once operational. If so, there is potential for additional recreational elements which could be included such as viewing platforms for bird watching or picnic areas, which may contribute towards improved wellbeing and community cohesion.

There are no National Trails or cycle routes shown to be impacted by the proposed reservoir or pipeline alignment.

### 3.1.9 Material Assets

The option has potential direct impacts on two A roads, along with a number of smaller local roads during construction. These roads may require diversion or closure during construction. The proposed pipeline has potential direct impacts on a railway during construction. Best practice mitigation measures will likely be implemented to minimise effects during construction. Embedded mitigation measures could include creating new road diversions and haul roads at the start of the construction, importing main construction materials (drainage stone, rip rap, fuel) by train, and determining access routes and operational hours to minimise traffic through villages avoiding peak road traffic hours. However, minor and temporary effects are likely to still occur.

## 4 Conclusions

A Strategic Environmental Assessment was undertaken using the Water Resources South East methodology on the FR exemplar option. The SEA should be updated with new information gathered at Gate 2.

A summary of the key potential benefits and adverse effects of the Scheme is presented in Table 4.1. The adopted concept design at this stage would only have a moderate positive impact during operation for the delivery of reliable and resilient water supply in line with the intended use. There could be, however, major or moderate positive effects for the local communities and the environment if wider benefit features are implemented for Gate 2, such as wetlands, flood storage areas, visitor centres or enhanced public rights of way/cycle routes.

**Table 4.1: Summary of the Potential Beneficial and Adverse Effects of the Scheme**

Topic	Beneficial Effects	Adverse Effects
Biodiversity, flora and fauna	No beneficial effects identified	Potential adverse impacts on designated sites and priority habitat during construction and operation.
Soil	No beneficial effects identified	Option is located within Grade 1-2 land, with potential permanent loss of this land.  Two authorised landfill sites within 500m with potential to disturb contaminated material.
Water	Option will provide a resilience PWS throughout the year.	Option is located within Flood Zone 2 and 3, although it benefits from flood defences at the 1-in-100 year flood level. The abstraction and release of water has the potential to have an effect on water levels, flows and quality during the operational phase.
Air	No beneficial effects identified.	Option is likely to generate short-term vehicle emissions and dust from construction activities.
Climatic factors	No beneficial effects identified.	Option will have negative carbon impacts due to construction and operation of the reservoir.
Landscape	No beneficial effects identified.	Option is within a national landscape character area and there will be minor negative effects during the construction phase on this area.
Historic environment	No beneficial effects identified.	There are several listed buildings and a scheduled monument within 500m. There is potential for the setting of these historic assets to be affected during the construction phase. There is a potential for unknown archaeology to be discovered during excavation of the reservoir.
Population and human health	No beneficial effects identified.	Option is within proximity to a number of community facilities or recreational areas, with potential to adversely impact during construction.

Topic	Beneficial Effects	Adverse Effects
Material assets	No beneficial effects identified.	Option has potential adverse impacts on minor roads, main roads and a railway during construction.

## **A. Stage 1 SEA output tables**

The outputs can be provided upon request.

