

River Sowy and King's Sedgemoor Drain Enhancements Scheme Environmental Statement Addendum

ENVRESW001353-CH2-XX-400-RP-EN-1127

V1 July 2021

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Quality Assurance

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Date	01/07/2021
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Author	Miriam Olivier

Approvals

Name	Signature	Title	Date	Version
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EIA Quality Mark

This Environmental Statement, and the Environmental Impact Assessment (EIA) carried out to identify the significant environmental effects of the proposed development, was undertaken in line with the EIA Quality Mark Commitments.

The EIA Quality Mark is a voluntary scheme, operated by IEMA, through which EIA activity is independently reviewed, on an annual basis, to ensure it delivers excellence in the following areas:

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Non-Technical Summary

Introduction

Following the significant flood event that affected Somerset in 2013/14, the Somerset Levels and Moors 20-year Flood Action Plan was developed. This plan established the need for the River Sowy and King's Sedgemoor Drain (KSD) Enhancements Scheme. This project (which is referred to as the Proposed Scheme from now on) is Phase 1 of the River Sowy and King's Sedgemoor Drain Enhancements Scheme.

This non-technical summary accompanies an Environmental Statement (ES) addendum prepared in respect of the Proposed Scheme, and should be read in conjunction with the original non-technical summary and ES prepared and consulted on in 2020 which can be found at the following weblink: https://consult.environment-agency.gov.uk/wessex/river-sowy-and-ksd-enhancements/

This ES addendum has been prepared because it was originally planned that the Proposed Scheme would be constructed in autumn 2020, but weather and ground conditions meant that the works are now planned to take place from August to early November 2021, and also the following changes to the design and construction methods are required:

- Material excavated from channel bank features (embayments, two stage channels and backwater) will be used for bank raising where suitable previously it was proposed only to use this material for landscaping.
- Small scale changes to the landscape design of channel bank features, such as the use of translocated plug plants, and use of overplanting on margins to reduce the risk of erosion control - previously it was proposed to use preplanted coir pallets and erosion control matting.
- The proposed borrow area on the left bank of the KSD will no longer be required, with all embankment raising instead using site won material excavated from the right bank or channel bank features where suitable.

Review of environmental assessment

Ecology, water and cumulative effects environmental topic areas were scoped into assessment in the ES addendum as the proposed changes to design and constructability have potential for changed or previously unassessed effects.

No material changes to the assessment provided in the original ES¹ are anticipated for any other environmental topics (noise, population and health, landscape, cultural heritage) due to the limited nature of the changes proposed.

The revised assessment for the environmental topics listed in the first paragraph above concluded that:

 There is a small additional risk of disturbance to breeding birds, including those which are features of nearby designated sites and those which are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), however this additional risk can be mitigated through

¹ Available at: https://consult.environment-agency.gov.uk/wessex/river-sowy-and-ksd-enhancements/

- implementation of measures such as ecological checks in areas where vegetation clearance is proposed, in accordance with best practice.
- There is a small increase in risk to water quality and aquatic species including otter and water vole in the Sowy and KSD now that it is proposed to undertake channel bank construction works during late summer when temperatures may be higher; however this additional risk can be mitigated using monitoring during periods of higher risk and adjusting the working method and/or rate to avoid impacts; and
- No new or additional cumulative effects with other projects or programmes within the local area are anticipated.

Conclusions

The proposed changes to the design and the construction methods for the Proposed Scheme will not result in any changes in the significance of effects on environmental receptors over and above those described in the original ES once a limited number of additional mitigation measures have been implemented.

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1. Introduction

1.1. Introduction to Proposed Scheme

The River Sowy and King's Sedgemoor Drain (KSD) Enhancements Scheme (the Proposed Scheme) has been identified as a priority in the Somerset Levels and Moors 20 Year Flood Action Plan prepared subsequent to the extensive flooding of the Somerset Levels and Moors (SLM) in the winter of 2013-14. The Sowy and KSD corridor is in the Somerset Levels and Moors, part of the coastal plain and wetland area which contains the Parrett catchment. The Sowy and KSD are man-made embanked flood relief channels, which carry excess water from the Parrett. The purpose of the River Sowy and King's Sedgemoor Drain Enhancements Scheme is to increase the capacity of the Sowy and KSD between Parchey Bridge and Monk's Leaze Clyce so a greater volume of water can be stored in the system during heavy rainfall events, helping alleviate flooding on the SLM.

In August/September 2020 an Environmental Statement (ES) for the Phase 1 of the Proposed Scheme was consulted upon, and in September 2020 we determined that in accordance with the Environmental Impact Assessment Land Drainage Improvement Works (Amended) Regulations 1999 (SI 1999/1783) the Proposed Scheme would proceed.

The ES can be found at this weblink: River Sowy & King's Sedgemoor Drain (KSD) Enhancements Scheme Phase 1: Environmental Statement Consultation - Environment Agency - Citizen Space (environment-agency.gov.uk). Chapters 1-4 of the ES provide further information regarding the background to the Proposed Scheme and consultation undertaken between 2016 and 2020.

It was originally planned that the Proposed Scheme would be completed between September and early November 2020, however unavoidable delays to programme due to COVID-19 and poor weather ground conditions on the Somerset Levels meant that it was not safe to undertake the works at this time. Therefore, we now propose to complete the works in late summer and autumn 2021, with some minor changes to the design and construction methodology from the previous proposals outlined in the ES as set out in Section 1.2 and Section 1.3 of this document.

1.2. Review of changes to the design of the Proposed Scheme

The Proposed Scheme involves the reprofiling of existing flood embankments along the Sowy and KSD between Monk's Leaze Clyce and Parchey Bridge, along with small-scale channel widening works through the creation of Water Framework Directive (WFD)² enhancement features (embayments, two-stage channels and a backwater).

Proposed changes to the design of the Proposed Scheme as assessed in the ES¹ include:

² Whilst the Water Framework Directive 2000/60/EC no longer applies within the UK, all measures identified within the Proposed Scheme are relevant to the Environment (Water Framework Directive) (England and Wales) Regulations 2017 and are therefore termed 'WFD enhancement features' for consistency with the ES.

- Material excavated from the channel banks to create the WFD features will be used to raise the existing informal flood banks if suitable, and if not suitable landscaped on the landward side of the KSD and Sowy. Previously it was proposed only landscape material won from channel banks on the landward side of the flood banks.
- All site won material used for bank raising on KSD will be won from either the borrow area on the right bank of the KSD, or where suitable from the WFD enhancement features. The previously proposed borrow area on the left bank of the KSD will no longer be utilised. Material will be transferred from the borrow area on the right bank of the KSD to the left bank of the KSD via tractors with dumper trailers.
- Changes to the landscape design and maintenance period for the WFD features including:
 - Use of plug planting and/or translocation of existing marginal planting rather than pre-established coir pallets;
 - Use of overplanting on margins to reduce the risk of erosion rather than erosion control matting;
 - Reduction of maintenance period to 1 year from 2 years (see Appendix E Landscape and Mitigation Management Plan (LMMP)); and
 - Anti-wildfowl fencing no longer included.

These changes are proposed following a review of the risks and benefits of different approaches to the establishment of aquatic planting within the local environment and will provide a more cost effective approach to achieving the desired WFD benefits than previously proposed.

1.3. Review of changes to the construction methods for the Proposed Scheme

Changes to the construction methodology for the Proposed Scheme are as follows:

- Construction works will now be completed between August and November 2021, with all earthworks completed before the end of October 2021.
 Previously it was proposed to undertake earthworks between September and November 2020. Riparian planting of the backwater island and on the right bank of the KSD and Upper Sowy will require access by 4x4 only and will be completed in early November pending agreement with NE (same seasonal timescales as previously proposed).
- Land within the construction footprint will be fully reinstated with seeding completed in autumn 2021 rather than autumn 2020. Land will be returned to landowners in spring 2023 at earliest (previously spring 2021), as it will be necessary to wait until vegetation cover is well established before allowing livestock to graze.

1.4. Need for this Environmental Statement Addendum

This ES addendum has been prepared to provide a mechanism for the review of the existing ES¹ for the River Sowy/KSD Enhancements Scheme: Phase 1 in light of the

changes to the design and construction methodology set out in Sections 1.2 and 1.3. Table 1.1 identifies those topic areas where the proposed changes would result in material changes to the assessment.

Table 1.1 Scope of the ES addendum

ES topic chapter	Impact of the proposed changes to design and construction methodology	Scoped into assessment in the ES addendum?	
		Construction	Operation
Chapter 6 Water	 Increased risks to water quality associated with in-channel working during August Change in risks to water quality associated with amended WFD landscaping proposals 	Yes – see Section 2.1 for updated assessment	No
Chapter 7 Flora and Fauna	 Increased risks resulting from any changes to water quality associated with in-channel working during August Risk of disturbance to breeding birds due to construction works in August 	Yes – see Section 2.2 for updated assessment	No
Chapter 8 Cultural Heritage	No change	No	No
Chapter 9 Landscape	No material change – increase in construction duration from 8 to 12 weeks and changes to design of WFD features will not alter nature or magnitude of impacts.	No	No
Chapter 10 Population and Health	No material change - increase in construction duration from 8 to 12 weeks and new requirement to transport material between left and right banks of the KSD via approximately 66m of Ward Lane at Parchey Bridge will not alter nature or magnitude of impacts.	No	No
Chapter 11 Noise	No material change – no change in maximum daily frequency or total number of vehicles travelling between the offsite soil storage location and construction footprint. There are no sensitive noise receptors located within 50m of the	No	No

ES topic chapter	Impact of the proposed changes to design and construction methodology	Scoped into assessment in the ES addendum?	
		Construction	Operation
	section of Ward Lane at Parchey Bridge which connects the left and right banks of the KSD.		
Chapter 12 Cumulative Impacts	Change in timing of works from 2020 to 2021 requires assessment of potential for cumulative effects with other developments planned to take place during 2021 which would not previously have been assessed.	Yes – see Section 2.3	Yes – see Section 2.3

An updated assessment for each of these topic areas (water, flora and fauna and cumulative effects) is provided in Chapter 2. These updated assessments 2 have been undertaken in accordance with the methodologies provided in Chapters 5, 6, 7 and 12 of the ES¹ (as relevant).

2. Review of environmental topic assessment outcomes

2.1. Review of water assessment

During construction, there would be increased risks to water quality within the construction footprint for the Proposed Scheme in the absence of mitigation. This is because of changes in the construction works timing to include August which is a warmer month of the year which could result in a greater risk of declines in dissolved oxygen due to suspension of sediments and associated nutrients. Natural England's SSSI Condition Change Briefing Note, Somerset Levels and Moors, May 2021³ notes that all of the SSSI units are now 'unfavourable declining' due to elevated phosphate, emphasising the sensitivity of the water courses to nutrification (e.g. from disturbance of nutrient-rich sediments) and undesirable growth of duckweed and algae. Impacts on water quality would likely be confined specifically to the working area of the KSD and Sowy and would include:

- The use of more natural riparian planting and less engineered erosion protection has a higher potential to increase suspended sediment concentrations and release materials into the water column during and after construction of the backwaters and two stage channel features;
- Increased sedimentation following on from the above;
- Increased risk of poorer water quality linked to the above, particularly in terms
 of nutrients (phosphate) and the effect on duckweed and algal growth and
 dissolved oxygen at the higher water temperatures and light levels that would
 be expected in the summer months.

The WFD enhancements would involve replanting with oxygen-rich plants that would help filter and oxygenate the water. Grazing of the stretch of works will be discontinued until at least 2023, which would give the watercourse time to recover.

Whilst the risks to water quality described above would be increased relative to those described in the ES¹, the magnitude of effect is still assessed as medium in the absence of mitigation as the nature of the impact would still be temporary, and the significance of effect would still be moderate adverse (significant). With mitigation in place as outlined in Table 2.1 the magnitude of change and significance of effect would remain as minor adverse (not significant).

³ Natural England. 2021. SSSI Condition Change Briefing Note. Somerset Levels and Moors.

Table 2.1 Summary of residual effects associated with proposed design and construction methodology changes

Receptor (sensitivity)	Nature of impact (magnitude)	Significance (pre- mitigation)	Mitigation	Residual effect
Construction				
KSD and Sowy (medium)	Increase in suspended sediments within water column; risk of reduced	Moderate adverse	Preparation and implementation of a Surface Water Management Plan (SWMP)	Minor adverse (not significant)
	oxygen levels (medium,	oxygen levels	Compliance with best practice pollution prevention measures	
	temporary)		Use of silt curtains/booms and water quality (including dissolved oxygen) monitoring in summer months, plus contingency for changing the work rate and/or methodology if needed.	
			Toolbox talks regarding water quality risks.	

2.2. Review of flora and fauna assessment

During construction, there is the potential for additional impacts because of changes in works timing. These impacts are likely to include:

- Increased risk of poorer water quality associated with in-channel working during August, when higher water temperature and sunlight levels could lead to reduced dissolved oxygen; and
- Risk of disturbance to breeding birds due to construction works in August.

Birds within Statutory and Non-statutory designated sites (SSSIs and LWSs)

King's Sedgemoor Drain SSSI, Moorlinch SSSI, and West Sedgemoor SSSI, Wet Moor SSSI and West Moor SSSI are all designated for breeding bird features. These features could be impacted through the disturbance of birds within these SSSIs and functionally linked habitat.

The presence of construction plant, vehicles and operatives could result in disturbance and displacement of breeding birds. However, construction works are

proposed to take place between August, which is at the end of the main breeding bird season (which is considered to be March to August, inclusive), and October/November, thus avoiding the most sensitive times for breeding birds and meaning the risk of there being a significant effect is still low.

The magnitude of effects on breeding and non-breeding qualifying bird features of SSSIs (medium / national sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. With mitigation in place (see Table 2.2), there is no change to the significance of effect on breeding bird features associated with the potential risk of disturbance as described in Chapter 7 of the ES¹ given that construction would commence towards the end of the breeding bird season.

Birds outside of Statutory and Non-statutory designated sites

Beyond the statutory designated sites outlined in the previous paragraph, the habitats within the study area are likely to provide functional habitat for qualifying species and assemblages of birds and to offer foraging habitat for birds which are listed under Schedule 1 of the Wildlife and Countryside Act 1981 (as amended), such as barn owl (*Tyto alba*), as well as a range of common species.

Scattered, localised trees and scrub, along with lengths of hedgerow, provide nesting opportunities for common bird species. Lowland wet grassland will also provide suitable habitat for ground nesting birds such as snipe (*Gallinago gallinago*), lapwing (*Vanellus vanellus*) and skylark (*Alauda arvensis*).

The presence of construction plant, vehicles and operatives during August could result in disturbance and displacement of birds. However, this is at the end of the main breeding bird season, and October/November, thus avoiding the most sensitive times for breeding birds. In addition, mitigation has been identified to minimise the risk of disturbance as far as practicable (see Table 2.2).

The magnitude of impacts on birds (low / county sensitivity) is considered to be negligible adverse and the significance of effect, minor adverse. There is no change to the significance of effect on breeding bird features as described in Chapter 7 of the ES¹ associated with the potential risk of disturbance due to works starting towards the end of the breeding bird season.

Otter

Otter (*Lutra lutra*) activity was recorded along the Proposed Scheme and although no holts and/or resting places have been recorded, suitable habitat exists.

Changes in water quality, if they occur as a result of the new proposal for in-channel works in August, could impact ofters directly or indirectly through impacts on its prey species. The sensitivity of any impact on ofter (negligible / local sensitivity) is considered likely to be negligible adverse in terms of the local population based on the limited nature of the works, the temporary nature of construction impacts and the large home ranges of animals. The significance of effect is assessed as negligible in the absence of mitigation. Therefore, there is no change in the significance of effect on otter associated with impacts on water quality from that described in Chapter 7 of the ES1.

2.2.1. Water vole

A low water vole (*Arvicola amphibius*) population size was estimated within the majority of the Proposed Scheme. Changes in water quality during in-water

construction in August could directly impact upon the conservation status of the location water vole population.

In the absence of mitigation, the magnitude of impact on water vole (low / county sensitivity) was considered in Chapter 7 of the original ES Chapter to be high adverse in terms of the local population and the significance of effect, moderate. This was based on the death of animals from channel widening which could lead to local extinctions, and temporary, short-term effects in respect of the loss of burrows, as bank habitat would be available again following construction and establishment of vegetation, as well as potential water quality impacts. With mitigation in place (see Table 2.2) the significance of effect on water vole associated with changes in water quality during construction in August would be less significant than that already described in Chapter 7 of the ES¹.

Table 2.2 provides a summary of potential effects, identified mitigation and residual effects.

Table 2.2 Summary of residual effects associated with proposed construction methodology changes

Receptor (sensitivity)	Nature of impact (magnitude)	Significance (pre- mitigation)	Mitigation	Residual effect
Statutory designated sites	Disturbance of qualifying breeding bird features	Negligible Construction activities planned August to November to avoid most sensitive times for breeding birds.	Where works cannot be conducted outside of the main breeding bird period (i.e. August), an Ecological Clerk of Works should check potential nesting habitat prior to construction works. Where nesting is occurring, appropriate restrictions should be put in place to avoid the nest from being damaged or abandoned. This is to include the use of appropriate avoidance buffers based on disturbance distance for Schedule 1 species.	Negligible
Non-statutory designated sites (LWSs)	Disturbance of qualifying breeding bird features	Negligible Construction activities planned August to November to avoid most sensitive times for breeding birds.		Negligible
Birds (outside of designated sites but including some functionally linked, supporting habitat)	Loss or damage to active nests	Minor adverse But potential for breach of the legislation		Minor adverse (not significant)
Birds (outside of designated sites but including some functionally linked, supporting habitat)	Disturbance of breeding birds	Negligible Construction activities planned August to November to avoid most sensitive times for		Negligible (not significant)

Receptor (sensitivity)	Nature of impact (magnitude)	Significance (pre- mitigation)	Mitigation	Residual effect
		wintering and breeding birds.		
Otter	Changes in water quality as a result of in-channel works in August	Negligible	See Table 2.1 for water quality mitigation measures.	Negligible (not significant)
Water vole	Changes in water quality as a result of in-channel works in August	Moderate adverse	See Table 2.1 for water quality mitigation measures.	Minor adverse (not significant)

2.3. Review of cumulative effects assessment

The following information sources were reviewed in accordance with the methodology set out in Section 12.2 of the ES¹, and no additional schemes or developments were identified within the study area for cumulative effects:

- Sedgemoor District Council planning portal;
- South Somerset District Council planning portal;
- Somerset County Council planning portal;
- Somerset Rivers Authority website (www.somersetriversauthority.org.uk);
- Somerset Drainage Board Consortium website (https://somersetdrainageboards.gov.uk/); and
- Our internal national environmental assessment specialist team.

The 12 schemes with spatial and temporal overlap and/or hydrologically connected with the Proposed Scheme identified in Table 12.2 of the ES¹ have been reviewed with respect to potential cumulative impacts with the Proposed Scheme, and no additional or changed potential cumulative effects have been identified over and above those described in Chapter 12 of the ES¹.

Following review of the information sources described above, one additional scheme has been scoped into assessment:

 21/00311/OUT (South Somerset District Council) - Outline planning application for up to 100 dwellings, associated open space and infrastructure with all matters reserved except access.

As the application is for outline planning permission and has not yet been determined, no overlap in construction period with the Proposed Scheme is considered likely. No cumulative effects during operation are considered likely due to the nature of the scheme and the distance involved (>2km).

In summary, no new or additional cumulative effects are considered likely over and above those discussed in Chapter 12 of the ES¹.

3. Summary of assessment outcomes and monitoring proposals

3.1. Summary of residual effects and conclusions

The proposed changes to the design and construction methods for the Proposed Scheme as outlined in Sections 1.2 and 1.3 have been reviewed and assessed with respect to potential effects on water and flora and fauna and also cumulative effects with other projects in the local area.

The change in timing of construction works to include the month of August increases the risk of a decline in water quality associated with the in-channel works, with subsequent potential impacts on otter and water vole, and also of disturbance to breeding birds (see Sections 2.1-2.3 for further detail). However, with appropriate mitigation in place to control these risks, the identified effects on water quality and ecological receptors would have minor adverse or negligible residual significance (not significant) as described in the ES¹. Mitigation required is set out in the Environmental Action Plan (EAP) provided in Appendix F.

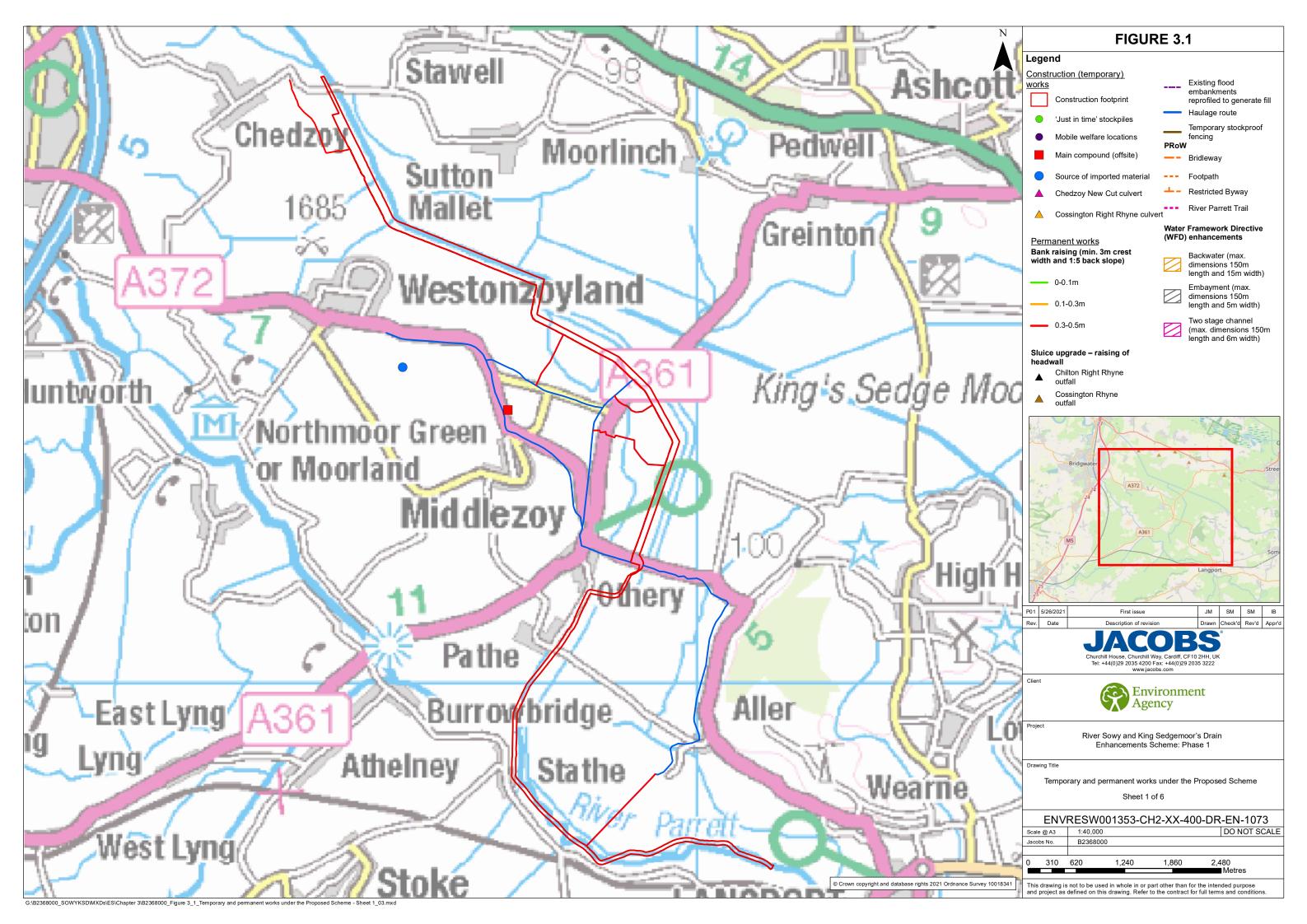
3.2. Updated monitoring proposals

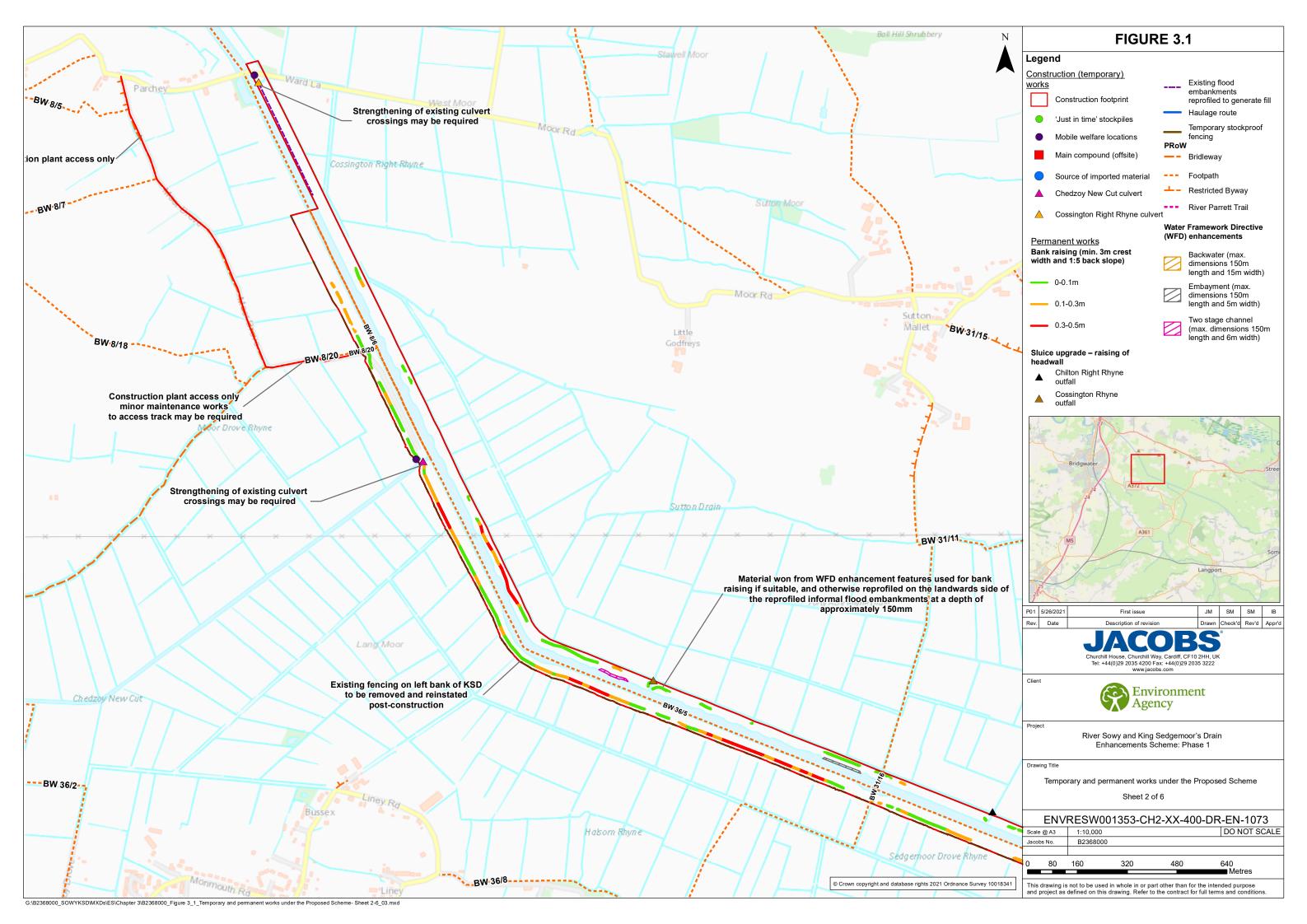
Monitoring is required in order to ensure that the additional or amended mitigation measures identified within Sections 2.1 to 2.3 achieve their objectives. Table 2.3 summarises the proposed monitoring that is over and above those measures already included in Chapter 13 of the ES¹. Monitoring requirements are also specified in the EAP for the Proposed Scheme (see Appendix F).

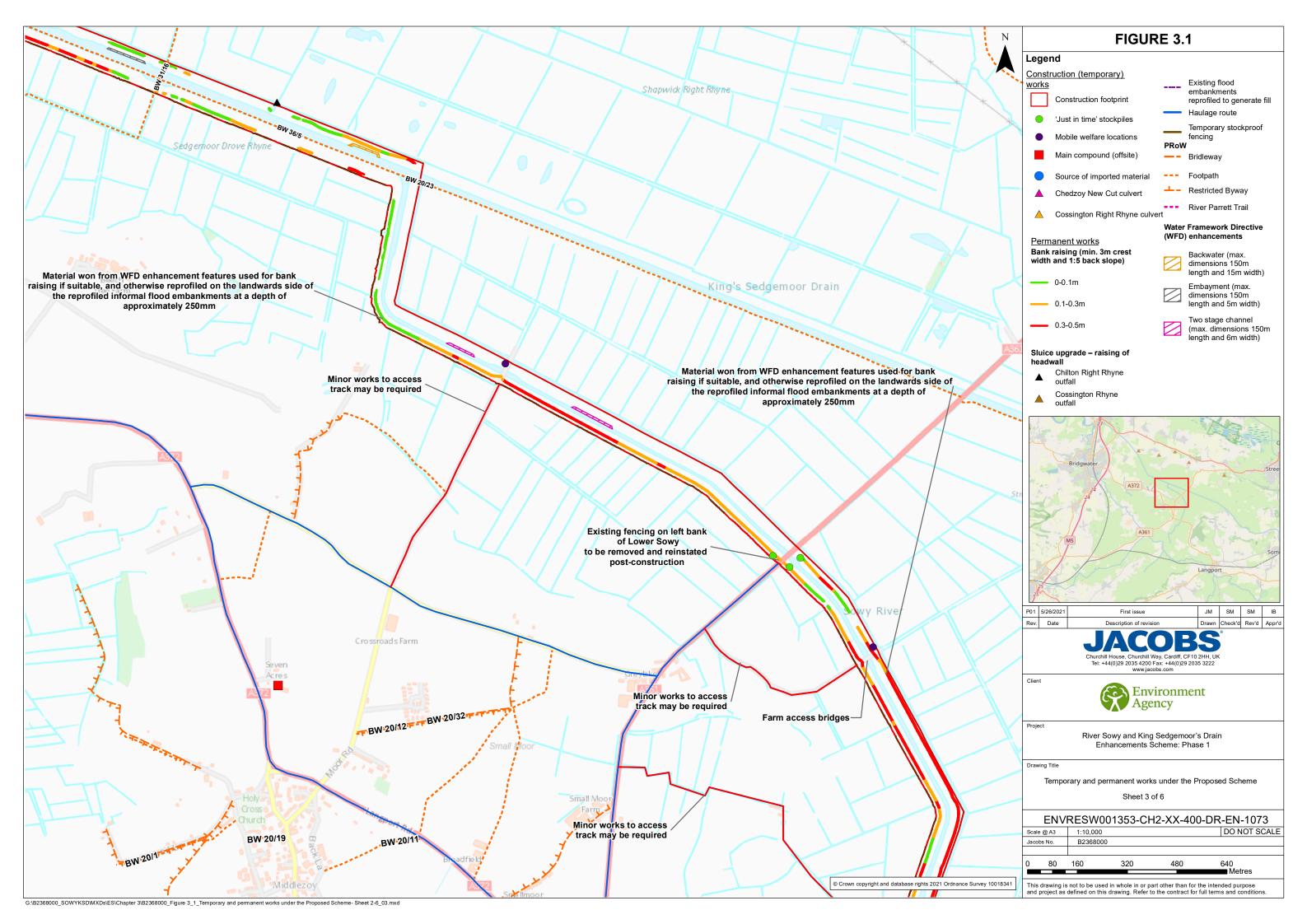
Table 2.3 Additional or amended monitoring requirements

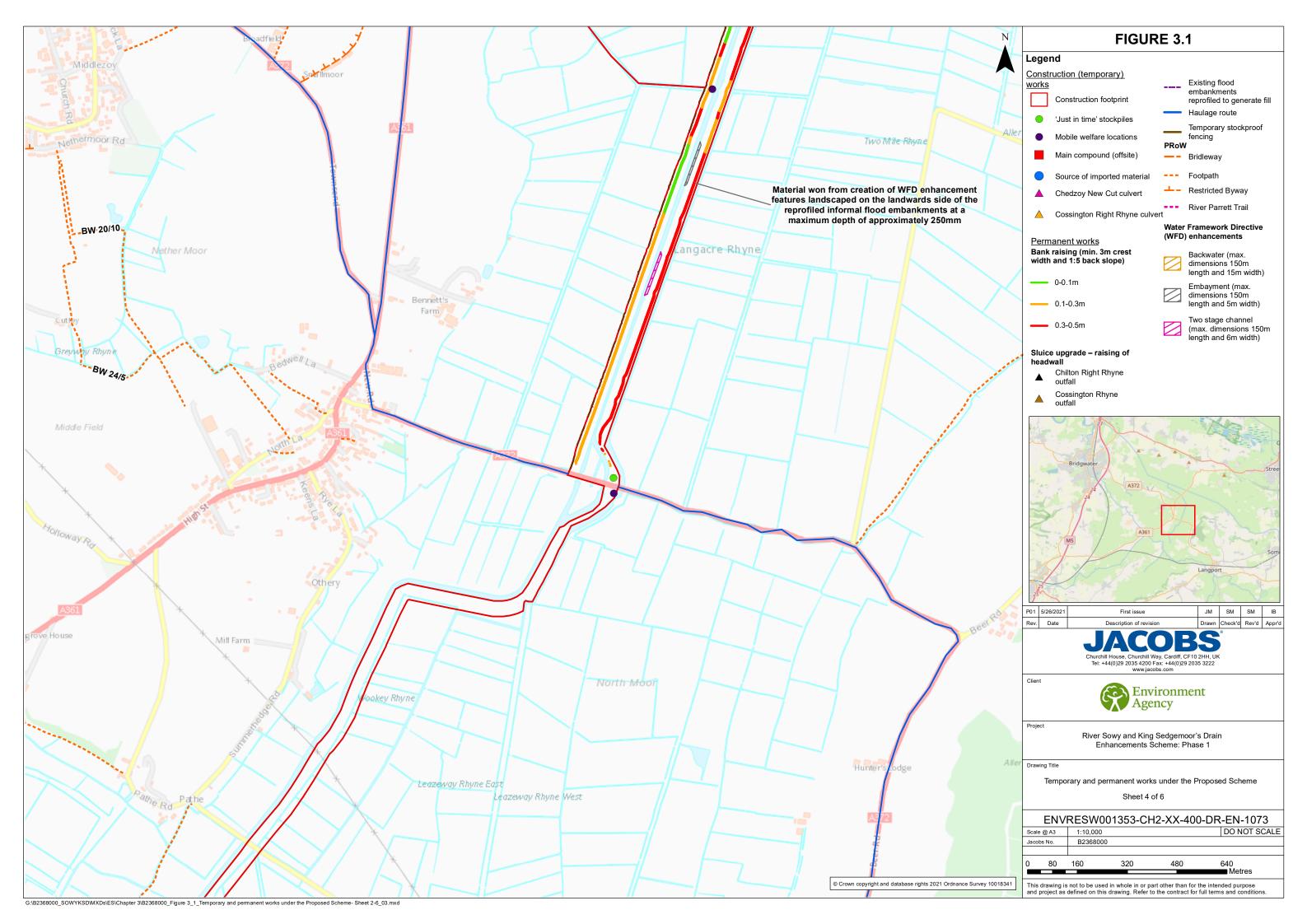
Action	Purpose	Frequency and duration
Water quality monitoring	Ensure no deterioration of water quality during construction period	As defined in the SWMP developed by the contractor and agreed with the relevant National Environmental Assessment and Sustainability (NEAS) Team technical specialists.
Monitoring of aquatic planting for WFD enhancement features	Ensure successful establishment	12 months as set out in the Landscape and Management Mitigation Plan (LMMP) (see Appendix E).

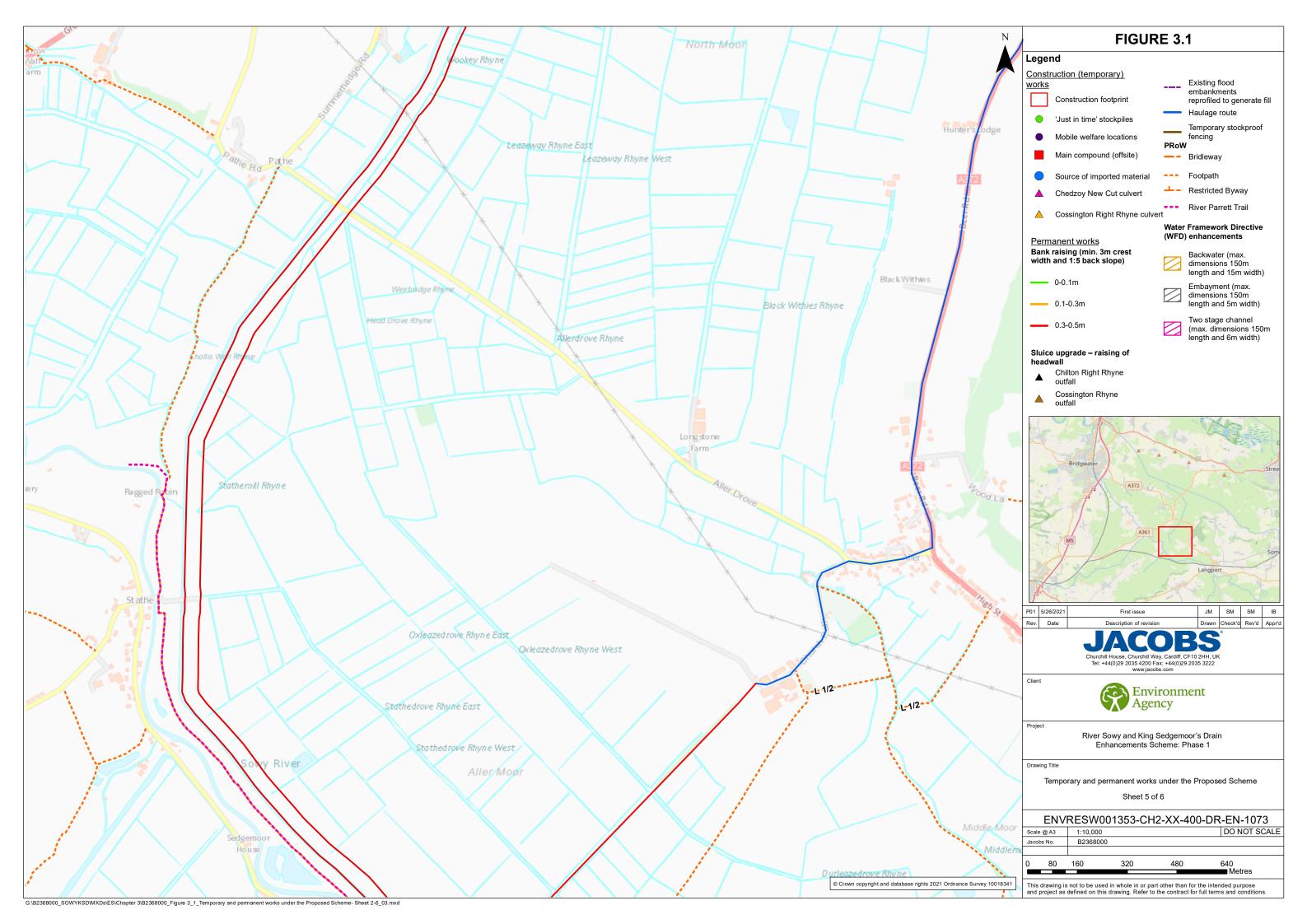
Appendix A Figures

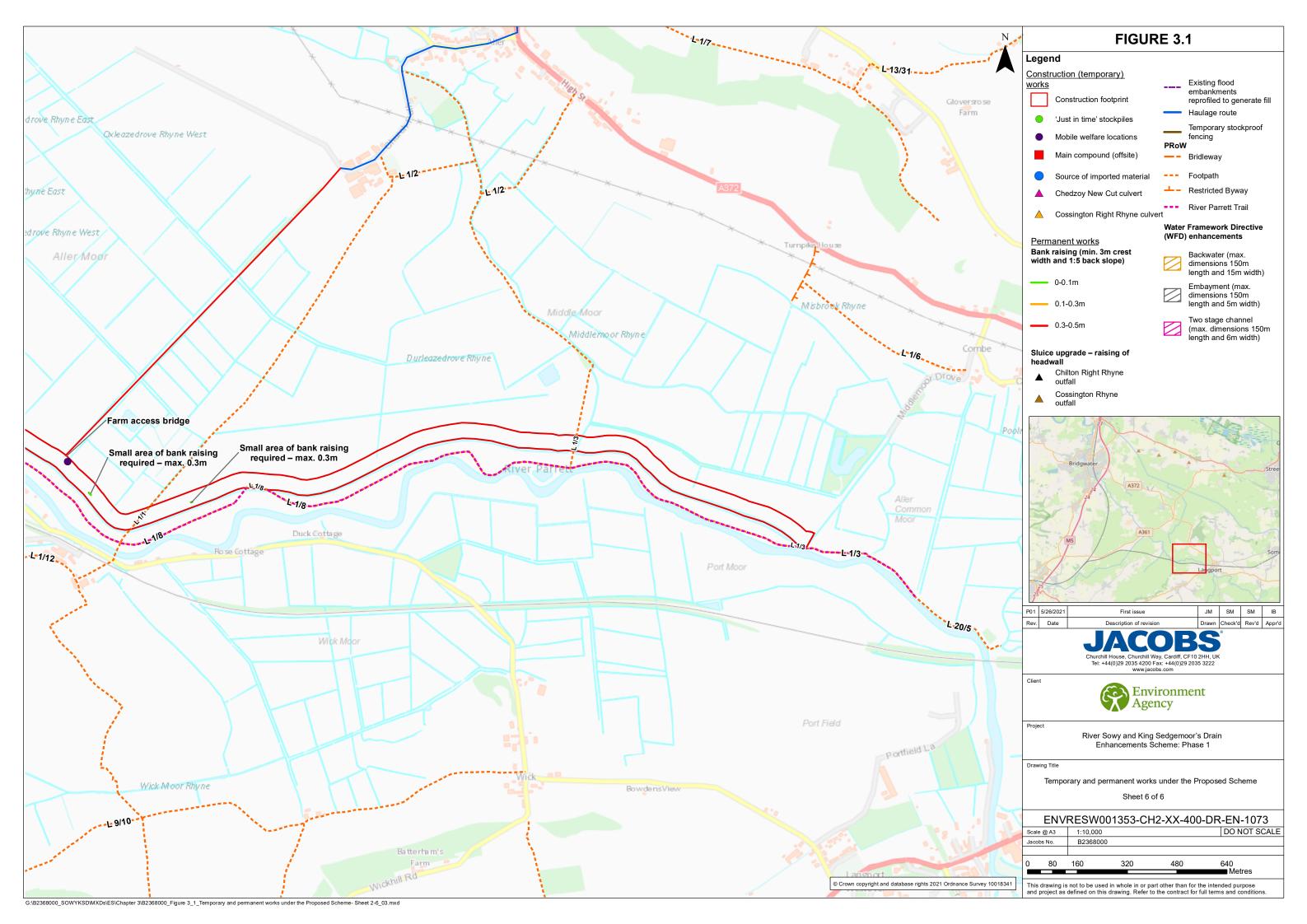












Appendix B Revised project level HRA Stage 2 (AA) Assessment



Stage 2 Habitats Regulations Assessment

Environment Agency record of appropriate assessment

This is a record of the Appropriate Assessment required by Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (as amended), undertaken by the Environment Agency in respect of the River Sowy and King's Sedgemoor Drain Enhancements Scheme. Due to the scale of the scheme it will be necessary to undertake the works in several phases. A strategic level HRA has previously been completed. This document is the project level HRA for Phase 1 of the full River Sowy and King's Sedgemoor Drain Enhancements Scheme and considers likely significant effects covered by the construction of the Phase 1 scheme only. The strategic level HRA considers the operational effects of Phase 1 of the full River Sowy and King's Sedgemoor Drain Enhancements Scheme as well as all further future phases.

Revision	Date	Description	Author	Checked	Reviewed	Approved
P01.1	21/04/20	Review draft	J Halls	M Olivier	L Rudd	I Ball
P0.2	08/07/20	Update post review	R Smedley	M Olivier	J Halls	I Ball
P0.3	21/07/20	Changes to design details etc.	R. Thompson	Cath Walker	Cath Walker	l Ball
P0.4	26/05/21	Changes to design details etc.	A. Davies	Cath Walker	Cath Walker	l Ball

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Permission, plan or project (PPP) details

Type of PPP:	Flood Risk Management Scheme (phased delivery)
Environment Agency reference no:	ENVRESW001353
National grid reference:	ST40932760 (Monk's Leaze Clyce, Sowy River) to ST35173774 (Parchey Bridge, King Sedgemoor Drain)
Site reference:	River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1

Note

This document has been updated to reflect changes in the proposed design and construction methodology of the Scheme following consultation on version 1 of the WFD Assessment in Summer 2020.

Changes in the scheme design and construction methodology, and in the assessment, are highlighted in yellow in the following sections. Text that is no longer relevant has been struck through.

Description of proposal

Introduction

The River Sowy and King's Sedgemoor Drain Enhancements Scheme aims to improve the options available for flood risk management in part of the Somerset Levels. The proposals form part of the 20-year *Somerset Levels and Moors Flood Action Plan*¹, which was published by the Somerset Rivers Authority (SRA) in spring 2014 in response to the extreme and prolonged flooding that the area suffered the previous winter. The primary objective of the completed Scheme is to reduce the risk, depth and duration of such flood events that threaten property and infrastructure. This will be achieved through increasing the capacity of the Sowy River (Sowy) and parts of the King's Sedgemoor Drain (KSD), which operate as a flood relief channel for the River Parrett and its tributaries.

Due to the scale of the full River Sowy and King's Sedgemoor Drain Enhancements Scheme it will be necessary to undertake the works over several phases. This document represents the Stage 2 Habitats Regulations Assessment (HRA) of the first phase of works, termed the River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1 (the Scheme), that are planned to be undertaken in 2020–2021. It follows the completion of strategic level HRA Stage 1 and Stage 2 assessments for the full River Sowy and King's Sedgemoor Drain Enhancements Scheme. to examine the effects of the overall aim of increasing the flow capacity within the flood relief channel of up to $27m^3/s$ (KSD) and $24m^3/s$ (Sowy). The strategic level HRA focussed on the potential operational effects and what mitigation measures would be required to ensure that the full River Sowy and King's Sedgemoor Drain Enhancements Scheme objectives are compliant with the Habitats Regulations.

Each phase of the full River Sowy and King's Sedgemoor Drain Enhancements Scheme will be undertaken under the Environment Agency's permitted development powers, although will still be subject to an appraisal of all environmental effects under the Environmental Impact Assessment (Land Drainage Improvement Works) (Amendment) Regulations 2017. The Environment Agency is therefore both proponent (with the SRA) and determining authority for the Scheme. It is also, therefore, a competent authority with respect to the Habitats

¹ https://www.somersetriversauthority.org.uk/flood-risk-work/somerset-20-year-flood-action-plan/

Regulations. However, because the full River Sowy and King's Sedgemoor Drain Enhancements Scheme is being progressed through permitted development, prior approval must also be sought from the local planning authority where any likely significant effects have been identified (Regulations 75-78).

This Stage 2 project level HRA is required because the Stage 1 assessment concluded there was likely to be some significant effects on the non-breeding bird features of the Somerset Levels and Moors SPA and Ramsar sites, as well as the Severn Estuary SPA and Ramsar sites (Table 1 below). This was partly because it is not possible at Stage 1 to take into account mitigation measures that are specifically required to avoid likely significant effects on European site features (see *Mitigation Measures* and *Incorporated Mitigation* below).

At the time that the Stage 1 HRA was completed there were still some design details to be finalised. Where these differ from the description in the Stage 1 document they have been highlighted below, with a full description available in the Environmental Statement. The final design has not led to any change in the conclusions of the Stage 1 assessment.

Access to the left bank for the Scheme requires vegetation to be cleared at the field boundaries that cross perpendicular to the raised flood bank. A separate HRA (Application reference: 1353/SOWYKSD/VEG/TREE/HRAv2) was submitted to NE by EA for these works on 08/06/2021.

Location

The Scheme focuses on raising the existing embankments situated between Monk's Leaze Clyce on the River Sowy and Parchey Bridge on the KSD to a level such that the capacity of the system is increased in the KSD and Sowy between Beer Wall and the confluence with the KSD is located within the Somerset Levels, to the south-east of Bridgwater, along the whole length of the Sowy corridor and part of the KSD corridor (Appendix 1). The working corridor will run from Monk's Leaze Clyce, along the Sowy through to the KSD and as far downstream as Parchey Bridge. The KSD continues from here for a further 5.5 km before reaching the gravity outfall sluice into the River Parrett at Dunball, downstream of Bridgwater.

Part of the working corridor passes either through or close to several component SSSIs of the Somerset Levels and Moors SPA and Ramsar sites, notably the King's Sedgemoor SSSI (Appendix 1).

Scheme description

Design

In order to achieve the enhanced capacity targets, there is a need to reprofile the existing informal flood banks located along selected lengths of the left and right banks of both the Sowy and KSD, as summarised in Table 1 and shown in the drawings in Appendix 2.

Table 1. Summary of proposed works

Location		Bank raising	Channel widening
Upper Sowy	Sowy between Monk's Leaze Clyce and Beer Wall	Raising of existing informal flood banks on right bank by up to 0.5m to achieve capacity of 17m ³ /s	None
Lower Sowy	Sowy between Beer Wall (A372) and A361	Raising of existing informal flood banks on left and right bank by up to 0.3m to achieve a capacity of 24m ³ /s.	On the right banks: • One embayment

Location		Bank raising	Channel widening
			One section of two-stage channel
	Sowy between A361 and Sowy/KSD confluence	Raising of existing informal flood banks on left bank by up to 0.3m to achieve a capacity of 24m³/s.	On the right bank: One embayment One section of two-stage channel
KSD	KSD between Sowy/KSD confluence and Parchey Bridge	Raising of existing informal flood banks on left and right bank by up to 0.5m to achieve a capacity of up to 27m³/s.	On the right bank: One embayment One backwater One section of two-stage channel

Where existing informal flood embankments are to be raised, the crest width will be designed and maintained at a minimum of 3m, with formed battered embankment sides of 1 in 3 slopes on the channel side and 1 in 5 slopes on the landward side (see Figure 1 below). Material required for raising of the existing informal flood embankments on the KSD will be won through reprofiling of the existing informal flood embankments on both the left and right bank. Material for bank raising along both the Upper and Lower Sowy would be imported under CL:AIRE Code of Practice from a soils processing plant located off the A372 near Westonzoyland. Material won through the channel widening works will be used in bank raising if suitable, and otherwise placed on the landward side of the existing informal flood embankments.

In addition to the embankment reprofiling, the opportunity will also be taken to create habitat enhancements that will help deliver Water Framework Directive (WFD) targets. The type and location of the enhancements are indicated under 'channel widening' in Table 1 and shown on the figures in Appendix 2. Indicative cross-sections are included in Appendix K of the Environmental Statement which is available at the following weblink: https://consult.environment-agency.gov.uk/wessex/river-sowy-and-ksd-enhancements/ and but the approximate dimensions are:

- Two-stage channels: 150m in length, with channel widening of 1.5-2m and a c.5m marginal shelf with shelf level of 300mm below summer pen
- Embayments: 135-150m in length depending on location and 5-6m in width, with shelf level of 300mm below summer pen
- Backwater: back channel 5-6m wide and 100-150m in length, with a "planted island" of 5m width, with access to island via bridge provided for maintenance purposes

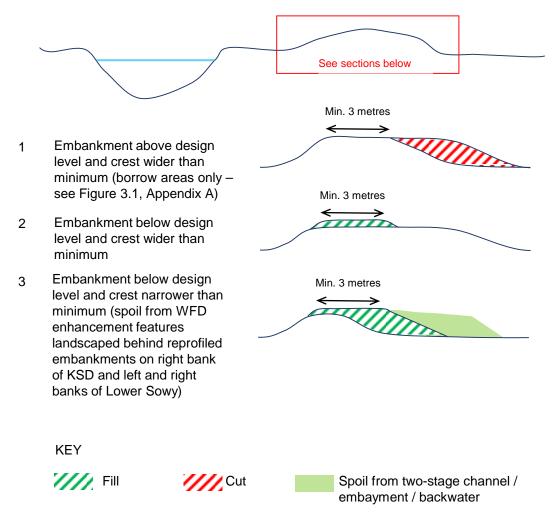


Figure 1. Schematic illustration of bank reprofiling process

In addition to the embankment works it will be necessary to replace the steel sheet-piled wing walls of the Cossington Right and Chilton Right outfalls on the KSD, as well as raise the existing concrete headwalls.

Habitat change

Within the Scheme corridor the main permanent habitat changes will result from the construction of the WFD enhancements:

- Increase in open water through channel widening 0.08ha
- Increase in marginal, emergent vegetation on berms due to embayments and two-stage channel, plus within the new backwaters 0.42ha
- Increase in rough/wet grassland adjacent to marginal vegetation and extending to the reprofiled embankments 0.20ha

As part of the baseline ecological study for the Scheme, a Phase 1 Habitat survey was undertaken between August and September 2019. This covered a 100m wide corridor either side of the Sowy and KSD. The results are presented in Appendix G of the Environmental Statement. With respect to habitats that will be directly affected by the WFD enhancement features and embankment raising and reprofiling, the survey showed that the existing embankments and other terrestrial habitat through to the watercourse margins predominantly comprise species-poor grassland and tall ruderal vegetation. Neutral semi-improved grassland was frequent throughout the study area although always beyond the embankments.

In addition to the permanent habitat changes there will be some temporary changes through the working corridor due to the movement and operation of plant. These areas will be restored through appropriate ground preparation and re-seeding with bespoke neutral wet grassland mix (or alternative appropriate seed mix). The areas will be available again for grazing (where relevant) once the EA is satisfied that they have re-established satisfactorily.

Design uncertainties

It should be noted that it is currently uncertain whether the full programme of works set out in Error! Reference source not found. can be undertaken within the currently available funding and within the programme outlined below.

Should funding or programme constrain delivery of the Proposed Scheme, raising of the existing informal flood embankments on the Lower Sowy (between the confluence of the Sowy and KSD and Beer Wall) and the Upper Sowy (between Monk's Leaze Clyce and Beer Wall) will be prioritised along with the WFD enhancement features along this stretch. The next priority for Phase 1 delivery will then be raising of the existing informal flood embankments on the KSD along with the WFD enhancements along this stretch. Any works not delivered in Phase 1 will be undertaken as part of the Phase 2 proposals.

The HRA is based on the full programme being delivered. There would be no additional risks or increase in existing identified risks to the designated site features if only part of the Scheme was completed in 2021.

Construction programme

Construction would commence at the earliest in August 2021 and finish in early November—(or early November pending agreement with Natural England), taking a maximum of eight 12 weeks for the of earthworks activities, reseeding of the reprofiled embankments and planting of the embayments, two-stage channels and backwater.

There would be up to five gangs working at any one time during the \$12 week construction period, with two gangs starting on each of the left and right bank of the KSD and left and right bank of the Lower Sowy concurrently. Within the Lower Sowy, raising will start at the mid-point between access locations, working backwards towards the access locations. This will prevent the need for construction traffic to cross areas of completed raising work. Once the gang on the KSD have completed their works, they would move onto the right bank of the Upper Sowy to complete the works in this section whilst bank raising on the Lower Sowy is completed. The fifth gang would focus on creation of the WFD enhancement features, starting on the right bank of the KSD working from north to south, and then moving onto the Lower Sowy.

Maintenance

Current reactive maintenance undertaken on the section of the KSD included within the Proposed Scheme may include removal of fallen branches or occasional desilting. Desilting works were undertaken at Parchey Bridge during 2018.

The principal current maintenance activity along the Sowy is routine weed cutting and clearing carried out at least once, and sometimes twice, per year depending on need. In theory, this work is undertaken from alternate banks in order to share the burden of deposited cut weed on the adjacent farm land. However, the majority of the work is undertaken from the right bank as there are fewer access (and therefore safety) constraints.

A longer-term maintenance regime will be developed in conjunction with our internal specialist teams, however the onus will remain on newly created WFD enhancement feature habitats developing naturally following completion of the initial construction aftercare period.

Map showing project location and European sites

See Appendix 1.

Summary of Stage 1 (likely significant effect) conclusion

At Stage 1 it was not possible to rule out the likelihood of significant effects, and those potential effects relating to the construction phase of the Scheme that require appropriate assessment are summarised below in Table 2.

Table 2. Stage 1 likely significant effect risk summary based on EA bird group

EA bird group	Risk	Likely significant effect alone	Likely significant effect in combination#		
Somerset Levels and Moors	SPA and Ramsar				
Severn Estuary SPA and Ramsar					
3.4 Birds of lowland wet grassland	Habitat loss	Uncertain	No		
3.6 Birds of lowland freshwaters and their margins					
3.7 Birds of farmland (for this Scheme any cropped or grassland areas which do not function as wet grassland at any time of year)					

[#] Where a likely significant effect alone is identified at the screening there is no need to consider in combination effects at that stage. If the appropriate assessment concludes no adverse effect alone on site integrity then the potential for in combination effects will be considered.

The relevant species and which EA bird groups they fall into, based on the types of habitat that could be affected, are shown in Table 3 below. EA species and habitat groups are used to consider species with similar habitat requirements and sensitivities as a whole and are particularly useful at the screening stage. As can be seen from Table 3, each species can belong to more than one bird group.

Table 3. Qualifying features and bird groups

Site and qualifying feature	Bird group		
Somerset Levels and Moors SPA	3.4	3.6	3.7
and Ramsar			
Bewick's Swan	Υ	Υ	Υ
Golden Plover	Υ		Υ
Lapwing	Υ		Υ
Teal	Υ	Υ	
Waterfowl assemblage	Υ	Υ	Υ
Severn Estuary SPA and Ramsar			
Bewick's Swan	Υ	Υ	Υ
Dunlin	Υ		
Redshank	Υ	Υ	
Gadwall		Υ	
Shelduck		Υ	
Greater White-fronted Goose	Υ		
Waterfowl assemblage	Υ	Υ	Υ

Table 4 lists the 'main component' species of the waterfowl assemblage of the designated sites i.e. those that fall in one or more of the following categories:

- i) present in nationally important numbers (≥ 1% GB population);
- ii) migratory species present in internationally important numbers (≥ 1% biogeographic population);
- iii) those species comprising \geq 2,000 individuals (i.e. \geq 10% of minimum total to qualify for an internationally-important assemblage);
- iv) 'named components' otherwise listed on the SPA citation.

Other important component species that do not fall in the above categories but need to be considered by the assessment are 'red-listed' Birds of Conservation Concern and/or those included on Section 41 of the Natural Environment and Rural Communities Act 2006.

Table 4. Components of waterfowl assemblage apart from named qualifying features

Site / species	Peak mean	Named	Red	Section
	to 2017/18 ²	component species	List	41
		эрссісэ		
Somerset Levels and Moors SPA				
Mute Swan	1,097	-	-	-
Gadwall	688	-	-	-
Shoveler	1,333	-	-	-
Wigeon	21,835	-	-	-
Pintail	780	-	1	1
Pochard	216	-	Υ	-
Bittern	11	-	-	Υ
Little Egret	117	-	-	-
Whimbrel	0	Y	-	-
Curlew	16	-	Υ	Υ
Black-tailed Godwit	205	-	Υ	Υ
Ruff	8	-	Υ	-
Snipe [#]	829	Υ	-	-
Green Sandpiper	8	-	1	1
Severn Estuary SPA and Ramsar*				
Mute Swan	420	-	-	-
Shoveler	487	-	-	-
Wigeon	7,751	Y	-	-
Teal	5,374	Υ	-	-
Pintail	745	Υ	-	-
Pochard	291	Υ	Υ	-
Tufted duck	812	Υ	-	-
Little Egret	198	-	-	-
Curlew	3,571	Υ	Υ	Υ
Whimbrel	221	Υ	-	-

² Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2017/18 © copyright and database right 2019. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers

Site / species	Peak mean	Named	Red	Section
	to 2017/18 ²	component	List	41
		species		
Black-tailed Godwit	765	-	Υ	Υ
Ruff	35	-	-	-
Peak mean above that of importance at the international (biogeographic) level				
Peak mean above that of importance at the GB level				

[#] Non-breeding snipe are notoriously difficult to census by the count method. Although numbers do not reach the threshold of GB importance this is still the highest peak mean of all WeBS sites.

The only component species of the Severn Estuary SPA and Ramsar that isn't a component of the Somerset Levels and Moors (SLM) SPA is tufted duck. Relatively small numbers occur on the SLM, with a peak mean of 205 birds to 2017/8 compared to the GB threshold of 1,100.

Conservation objectives³

The appropriate assessment will consider the implications of the proposal in view of the site's conservation objectives. The conservation objectives for the sites requiring appropriate assessment are below:

Table 5. Conservation Objectives for the Special Protection Areas

Somerset Levels and Moors SPA (UK9010031) (Natural England 2020a)⁴

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified and subject to natural change:

Ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- the extent and distribution of the habitats of the qualifying features
- the structure and function of the habitats of the qualifying features
- the supporting processes on which the habitats of the qualifying features rely
- the populations of the qualifying features, and
- the distribution of the qualifying features within the site.

Severn Estuary SPA (UK9015022) (Natural England 2020b)⁵

With regard to the SPA and the individual species and/or assemblage of species for which the site has been classified and subject to natural change:

Ensure that the integrity of the site is maintained or restored as appropriate, and to ensure that the site contributes to achieving the aims of the Wild Birds Directive, by maintaining or restoring:

- the extent and distribution of the habitats of the qualifying features
- the structure and function of the habitats of the qualifying features
- the supporting processes on which the habitats of the qualifying features rely
- the populations of the qualifying features, and
- the distribution of the qualifying features within the site.

There are currently no conservation objectives for any Ramsar sites. However, given that it is only the Ramsar non-breeding bird features that are being considered they are adequately covered by the SPA objectives.

^{*} Excludes species that don't utilise the Somerset Levels or are only likely to be found very infrequently and in small numbers, so there is no risk of likely significant effects on the SPA population (e.g. Grey Plover).

³ Generic conservation objectives are based on 'Natural England (2014) Conservation Objectives for European Sites in England Strategic Standard 01/02/2014 V1.0'

⁴ http://publications.naturalengland.org.uk/publication/4598158654963712

⁵ http://publications.naturalengland.org.uk/publication/5601088380076032

The individual species that are qualifying features of the sites are listed in Table 3 above, with additional notable species within the waterfowl assemblage shown in Table 4.

Supplementary Advice

In addition to the generic SPA objectives, Natural England has recently published supplementary advice on the Conservation Objectives for the Somerset Levels and Moors SPA (Natural England, 2019b). These provide site-specific attributes and associated targets for each of the qualifying features, which are primarily used for condition monitoring in relation to maintenance or restoration, but which are also relevant when undertaking a HRA. A summary of the ones relevant to this assessment are shown in Table 6.

Table 6. Summary of attributes and targets for qualifying features of the SLM SPA

Attribute	Target
Population abundance	Bewick's Swan: restore size to a level at or above that at the time of classification (310 birds).
	Golden Plover: maintain at a level above that at the time of classification.
	Teal: maintain at a level above that at the time of classification.
	Lapwing: restore size to a level at or above that at the time of classification.
Assemblage abundance	Maintain the overall abundance of the non-breeding assemblage at a level above 20,000 individual wintering wetland birds. There were 58,093 individuals (5-year peak mean) at the time of classification and the current figure is 93,946.
Diversity of species that	Maintain the species diversity of the waterfowl assemblage.
make up the assemblage	The species composition and numbers of individuals of all species within the assemblage will clearly change over time. However, the focus of the target is maintenance and restoration of populations of the 'main component' assemblage species (Table 2 above).
Extent and distribution of supporting non-breeding habitat	Maintain the extent and distribution of suitable habitat within and outside the SPA boundary, which supports the qualifying features for all necessary stages of the non-breeding/wintering period (moulting, roosting, loafing, feeding).
	Within the SPA boundary maintain 6,394.18ha of habitat, including grazing marsh, fen, reedbeds, neutral grassland, open water, rivers, artificial drainage channels and ditches
	Outside the SPA boundary: an unquantified area of land of functional importance for qualifying features. Such land includes arable, species-poor and species-rich grassland and a variety of high-quality wetland sites as nature reserves such as RSPB Greylake.
Supporting habitat (within and outside the SPA):	Maintain the supply of water to a standard, which provides the necessary conditions to support the qualifying features of the SPA.
water quantity	In winter the flood regime must provide a mixture of splash, shallow and deep flooded areas (target depths and area of flooding is provided in the <i>Supplementary Advice</i>).
	The provision of suitable conditions depends on an integrated approach to water level and flood risk management. The use of Raised Water Level Areas (RWLAs) within the SSSIs contributes to this.
Supporting habitat (within	The SPA qualifying features are relatively insensitive to organic

Attribute	Target
and outside the SPA): water quality	and nutrient pollution. The current water quality of the Somerset Levels and Moors is likely to be adequate to support the SPA qualifying features. However, it should be noted that some of the component SSSIs are currently listed as <i>unfavourable – declining</i> due to elevated phosphorous levels that are having an adverse effect on aquatic plant and invertebrate communities.
Supporting habitat (within and outside the SPA): conservation measures	Maintain management or other measures (whether within and/or outside the site boundary as appropriate) necessary to maintain the structure, function and/or the supporting processes associated with the feature and its supporting habitats. For non-breeding birds the key measures are sward management (grazing and cutting), water level management and maintenance of watercourses and associated structures.
Supporting habitat (within and outside the SPA): air quality	Maintain concentrations and deposition of air pollutants to at or below the site-relevant Critical Load or Level values given for this feature of the site on the Air Pollution Information System (www.apis.ac.uk).
Supporting habitat (within and outside the SPA): minimising disturbance caused by human activity	Reduce the frequency, duration and/or intensity of disturbance within close proximity of affecting roosting, foraging, feeding, moulting and/or loafing birds so that the qualifying features are not significantly disturbed.
Supporting habitat (within and outside the SPA): landscape structure	Maintain open and unobstructed terrain within and around roosting and feeding areas with no overall decrease in field sizes.
Supporting habitat (within and outside the SPA): connectivity with supporting habitats	Maintain the safe passage of birds moving between roosting and feeding areas within and outside the component SSSIs and between the Somerset Levels and Moors and Severn Estuary SPAs. The advice notes that research into the role of the flyway between the estuary and inland moors and the extent and importance of functionally-linked land outside the SPA boundary is required.
Supporting habitat (within and outside the SPA): Food availability within supporting habitat	Bewick's Swan Maintain the availability of cereal grains, rape, potatoes and sugar beet, where these sources are locally important to feeding flocks. Golden Plover and Lapwing Maintain the availability of key invertebrate prey species (e.g. earthworms and beetles) of preferred prey sizes. Teal Maintain the cover/abundance of preferred food plants (e.g. Polygonum, Eleocharis, Rumex, Ranunculus, and Juncus). Assemblage Maintain the cover/abundance of preferred food plants and availability of key invertebrate prey species.

For population abundance it should be noted that where the current 5-year peak mean (see Table 8 below) is in excess of the figure at the time of classification there is a requirement to <u>maintain</u> and avoid deterioration from the current level. For lapwing and Bewick's swan, where

current levels are below that at the time of classification then there is a need to <u>restore</u> the size of the populations to the original baseline.

For the Severn Estuary SPA, advice formerly given under Regulation 33 of the Conservation (Natural Habitats & c.) Regulations was published in 2009 (Natural England and Countryside Council for Wales, 2009). Although this identifies some hazards and vulnerabilities of the SPA features these all relate to saltmarsh and other intertidal habitats within the estuary (despite the fact that the boundary includes some coastal grazing marsh on the landward side of the sea walls), so is not relevant to this assessment.

Site Improvement Plans for the Somerset Levels (Natural England 2015a) and Severn Estuary (Natural England 2015b) provide a high-level overview of the issues (both current and predicted at the time of publication) affecting site condition and outline the priority measures required to improve the condition of the features. They include actions relevant to water level management, including dealing with summer flooding and prolonged, deep winter flooding.

Site condition and conservation status of qualifying features

Somerset Levels and Moors SPA and Ramsar sites

The SPA and Ramsar have 12 component SSSIs, with five located in the Brue valley and seven on the floodplains of the Rivers Parrett and Tone. The Scheme has the potential to affect, directly or indirectly, the seven sites in the Parrett and Tone floodplains so it is those that will be included in this assessment. Table 7 summarises the site condition of each component SSSI based on information published on Natural England's Designated Sites View webpages (Natural England 2019a).

Table 7. Site condition of component SSSI of the Somerset Levels and Moors SPA and Ramsar in the Parrett and Tone floodplains

SSSI	Condition
Curry and Hay Moors	Overall: All but one of the 24 units in Unfavourable - recovering, mainly due to high phosphate levels, the presence of Nuttall's waterweed and a poor range of ditch succession. Non-breeding birds: Relatively few birds noted as using the site due to lack of suitable splash conditions.
King's Sedgemoor	Overall: All 21 units are listed as Unfavourable - Declining following site checks made in 2017. The stated reason is elevated levels of phosphorous in the ditch network, resulting in algal dominance and loss of vascular plant diversity since the previous assessment. Most other site features, including birds, are in favourable condition. Non-breeding birds: The site supports relatively high numbers of waders and wintering waterfowl, the key locations being the RWLAs where they can feed and roost without suffering any significant disturbance.
Moorlinch	Overall: 10 of the units Unfavourable - recovering and the other one (droves) Favourable. Non-breeding birds: No recent figures or condition quoted - favourable based on data up to 2011-12.

Southlake Moor	<u>Overall</u> : All 3 units are listed as <u>Unfavourable</u> - <u>Declining</u> due to elevated levels of phosphorous in the ditch network, resulting in algal dominance and loss of vascular plant diversity since the previous assessment.
	Most other site features, including birds, are in favourable condition.
	Non-breeding birds: The site consistently supports large numbers of birds due to the provision of both shallow and deep-water conditions between December and February. This is partly achieved through taking water directly from the Sowy and the ability to discharge it back when required.
West Moor	<u>Overall</u> : All 10 units <u>Unfavourable</u> - <u>declining</u> due to water quality issues plus lack of full range of ditch succession stages in most units.
	Non-breeding birds: No specific reference though appropriate splash conditions noted in 5 of the 10 units.
West Sedgemoor	<u>Overall</u> : All 7 units are listed as <u>Unfavourable</u> - <u>Declining</u> following site checks in 2016. Elevated levels of phosphorous in the ditch network, resulting in algal dominance, are having a negative effect on plant communities.
	Most other site features, including birds, are in favourable condition.
	<u>Non-breeding birds</u> : West Sedgemoor supports considerable numbers of waterfowl due to the provision of extensive areas of shallow flood where birds can safely roost and feed.
West Moor	Overall: Of the 20 units, 12 are listed as Unfavourable - recovering; 7 as Favourable and 1 (the River Yeo) as Unfavourable - no change. Non-breeding birds: Considered to be favourable in terms of numbers of birds and the presence of suitable splash conditions in those units where these features are mentioned.

Condition

The SSSI condition status gives an indication of the health of each SPA component site, though in the case of non-breeding birds it should be noted that some sites are more important to these features than others. Raised Water Level Areas (RWLA) within some of the sites are managed between December and February to provide suitable conditions for waterbirds, ranging from 'splash' to shallow water through to deeper water.

Furthermore, many of the qualifying species will also utilise areas of functional / supporting habitat outside of the SSSIs. Unless specifically managed as part of an agri-environment scheme, functional habitat tends to only be of value when there is standing water present and that is often the result of pluvial and/or fluvial flooding. The exception is for species such as lapwing, golden plover, Bewick's swan and mute swan that regularly utilise cropped fields and non-flooded grassland for feeding.

Wetland Bird Survey

SSSI

Wetland Bird Survey (WeBS) data provides useful figures and information about non-breeding bird populations at the SPA level as well as the ability to query and compare individual species data across sites. The WeBS Report Online (Frost et al 2019) details the latest published peak mean counts together with 'Alerts'. The latter analyses trends in abundance of waterbird features on designated sites and highlights those where there is a >25% decline (Amber Alert) or more than 50% decline (Red Alert) over the short (5 years), medium (10 years) and long-term

(up to 25 years) periods. The latest WeBS Alerts were published in 2019 utilising data up to 2017/18 (Woodward *et al* 2019).

Table 8. Somerset Levels and Moors SPA and Ramsar features, 5-year peak mean numbers⁶

Feature	Peak mean	Peak	Peak	Peak	Peak	Peak
	at	mean to				
	classification	2017/18	2016/17	2015/16	2014/15	2013/14
Bewick's swan	310	4	5	4	16	22
Golden Plover	3,110	12,881	12,578	12,778	10,370	9,638
Teal	7,476	17,906	21,908	21,816	25,707	23,328
Lapwing	36,565	33,779	32,662	31,651	39,783	37,041
Waterfowl assemblage	58,093	93,946	90,183	94,737	107,391	101,751

Annex 1 species (Article 4.1)

The large drop in numbers of Bewick's swan is reflected in both national and regional (southwest) trends since the mid-1990s. However, reductions on the Somerset Levels pre-dated the national declines so there are likely to be some site-specific drivers of decline.

The increase in golden plover numbers is reflected in national and international trends. They are far less dependent upon areas of shallow flood and spend most of their time feeding (daytime, but more particularly at night) on permanent pasture and ploughed fields. They will roost on the latter but may also move to coastal areas (Brown and Grice 2005).

Migratory / non-breeding species (Article 4.2)

Increases in teal are also a reflection of national and regional trends over the last 30 years. The current lapwing peak is lower than at the time of classification, but they still represent the most numerous single species and SLM is the most important site for them in the whole of Britain.

Waterfowl assemblage (Article 4.2)

At the time of classification, in addition to the Annex 1 and migratory species referenced above, the following assemblage species occurred in nationally important numbers: gadwall, wigeon, shoveler, pintail, snipe and curlew. The current status of these and additional species which now occur in nationally or internationally important numbers are shown in Table 4 above.

Severn Estuary SPA and Ramsar sites

The site comprises 12 component SSSIs extending to 24,488 ha, of which approximately 10% is grazing marsh and other habitats landward of the sea defences. For the purpose of this assessment, the Bridgwater Bay SSSI has been considered as the site from where there is most likely to be an interchange of birds within the Somerset Levels.

Bridgwater Bay SSSI is divided into 30 units of which 14 are listed as 'neutral grassland (lowland)', so are assumed to be grazing marsh or similar. The condition of 12 of the neutral grassland units is Unfavourable - recovering and the other two as Favourable. Two of the units have RWLAs.

Qualifying species

Data on the qualifying species has been obtained from WeBS online⁷ and the SPA and Ramsar citations.

⁶ Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2017/18 © copyright and database right 2019. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers

⁷ Frost et al 2019 https://app.bto.org/webs-reporting/

Table 9. Severn Estuary SPA features that may use the Somerset Levels and Moors

Feature	Peak mean at classification	Peak mean to 2017/18	Peak mean on SLM 2017/18
Article 4.1			
Bewick's swan	289	150	4
Article 4.2			
Shelduck	2,892	4,450	68
Gadwall	330	190	688
Redshank	2,013	5,720	6
Dunlin	41,683	29,189	777
Greater white-fronted goose	3,002	125	0
Waterfowl assemblage	68,026	88,178	93,946
Mute swan	n/a	420	1,097
Shoveler	n/a	487	1,333
Wigeon	3,977	7,751	21,835
Teal	1,998	5,374	17,906
Pintail	523	745	780
Pochard	1,686	291	216
Tufted duck	913	812	475
Little egret	n/a	198	117
Curlew	3,096	3,571	16
Whimbrel	246	221	0
Spotted redshank	3	8	0

Bewick's swan: This is the only Annex 1 qualifying feature. As with the Somerset Levels and Moors SPA, numbers of this species have declined since the site was classified in 1993, with a peak mean of 289 birds (1988/89-1992/93), to 122 for the period 2017/18. These birds are all probably concentrated around the Slimbridge Wetland Centre and unlikely to use the Somerset Levels over the wintering period or on migration.

Shelduck: Primarily associated with estuaries and other coastal habitats throughout the year although some birds will use freshwater wetlands, though typically never that far inland. The large numbers that use the Severn Estuary are partly a reflection of the post-breeding moult gathering in Bridgwater Bay.

Gadwall: Most birds will be associated with coastal grazing marsh, but the overall numbers are much lower than within the SLM, though there is likely to be a movement of birds from the estuary inland at the time of harsh winter weather conditions on the coast.

Redshank: Primarily an estuarine species, but birds will nest inland in freshwater environments, as they do in the SLM. Very few birds are recorded in the SLM during WeBS counts and the peak numbers are often recorded in March, which is likely to represent bird returning from elsewhere to breed.

Dunlin: Primarily a coastal species but birds will use inland sites whilst on migration and during harsh weather. The SLM peak mean is currently 777 birds and it is highly likely that some of

these will be using Bridgwater Bay and/or the wider Severn estuary. They will feed on bare, muddy margins.

Greater white-fronted goose: The number of geese has declined markedly since classification, in line with national trends. Most of the birds that currently use the Severn estuary will be in and around Slimbridge. The current peak mean for SLM is 0 although there is suitable habitat present and they used to occur regularly.

Appropriate assessment: assessing the impacts alone

Scoping of qualifying features

Rather than undertake the assessment based on 'bird groups' (see Table 2 above), each of the qualifying species of the designated sites that are listed in Tables 3 and 4 have been considered. Initially this has involved scoping out species where there is either considered to be no likelihood of any effect whatsoever (in the absence of the incorporated mitigation measures), or that if there was the prospect of any effects then they would be so small or inconsequential that they would neither be significant alone, nor could they combine with other plans and projects to result in a significant effect.

Table 10. Bird features that have been scoped out of the assessment

Feature	SLM	Severn Estuary	Reason for scoping out
Bewick's swan Annex 1	Y	Y	A reduction in the extent, frequency and duration of shallow flood events would not have any effects on the few birds that currently occur, nor would it compromise the ability to restore the relatively small numbers of birds that there were at the time of the SLM classification (310). The birds favour permanent bodies of deeper water for roosting and a variety of agricultural land for feeding and daytime loafing. Suitable deep-water roost sites exist at Southlake and West Sedgemoor in the Parrett valley as well as at the complex of flooded peat workings in the Brue valley. Although Bewick's swan will utilise areas of shallow flood in cultivated fields and pasture they are not dependent upon it and will feed on sites with no standing water whatsoever. Sufficient habitat would therefore remain throughout the SPA even if there were a reduction in the extent of shallow water.
Golden plover Annex 1	Y	-	This species tends to roost on coastal flats and feed (daytime and night-time) on ploughed fields and permanent pasture. The presence of areas of shallow flood within the SLM is not critical to either feeding or roosting. Furthermore, the current peak mean is four times that at the time of classification (and rising), suggesting that overall environmental conditions are favourable.

Feature	SLM	Severn Estuary	Reason for scoping out
Shelduck	-	Υ	Numbers of birds on the Severn Estuary SPA have remained stable long-term, and there are no Alerts over any of the three time periods. The figures include the long-established post-breeding moult gathering in Bridgwater Bay. The peak mean count for the SLM is just 68 (cf 4,450 for the Severn) and birds are more likely to be found on permanent deeper waterbodies where they do occur inland. Suitable deep waterbodies can be found during the winter months at Southlake and West Sedgemoor in the Parrett valley as well as at the complex of flooded peat workings in the Brue valley.
Greater white- fronted goose	-	Υ	Numbers have been declining in the Severn Estuary SPA and nationally for many years. The majority of birds use Slimbridge, and whilst the SLM has plenty of suitable habitat they are rarely recorded here and would be unlikely to be dependent upon this area even if numbers in the Severn recovered to the peak at the time of classification (3,002).
Bittern	Y	-	This species is not dependent upon areas of splash or shallow flood.
Gadwall	Y	Υ	The current peak mean for SLM is 688 and the Severn Estuary 190. Although the former exceeds the threshold for a site of international importance, the vast majority of birds using the larger, permanent waterbodies in the Brue valley with very few recorded in the Parrett and Sowy/KSD corridors (including the RSPB reserves of West Sedgemoor and Greylake which are used by large numbers of other duck such as teal and shoveler).
Pochard	Y	Υ	A diving duck that tends to be found on permanent, deeper waterbodies and will not be reliant on RWLAs or other areas of shallow flood.
Tufted duck	-	Υ	As pochard.
Curlew	Y	Υ	The current peak mean is 16, which is highest that it has been since 1991/92 when it was 33. Whilst a Red List and section 41 species, there is no prospect of there being any significant adverse effect. The ability to reduce the extent and duration of flooding in late spring and summer represents a small beneficial effect on the breeding population.

Feature	SLM	Severn Estuary	Reason for scoping out
Whimbrel	Y	Y	Although a component of the waterfowl assemblage on the SLM classification, the current peak mean is 0 so there is no prospect of any significant effect.
Redshank	-	Υ	The current peak mean is eight and the highest that it has been historically back to 1991/92 is 52 so, there is no prospect of there being any significant adverse effect. The ability to reduce the extent and duration of flooding in late spring and summer represents a small beneficial effect on the breeding population.
Spotted redshank	-	Υ	There are no recent records from the WeBS counts for SLM and the current peak mean for the Severn is only eight birds.
Green sandpiper	Y	-	Although numbers exceed those of importance at the GB level, the peak mean is just eight birds so there is no prospect of any significant effect.
Ruff	Y	-	Although numbers exceed those of importance at the GB level, the peak mean is just eight birds so there is no prospect of any significant effect.

This leaves the following species that are considered to be highly dependent upon the existence of temporary areas of splash and shallow flood in the SLM during the core winter period (December to February inclusive):

- Mute swan
- Dabbling ducks shoveler, teal, pintail, wigeon (mostly grazing but always in close proximity to water)
- Little egret
- Waders lapwing, dunlin, snipe and black-tailed godwit

The waterfowl assemblage calculation for the SLM incorporates all species, however the majority of the peak mean total (currently 93,946) is accounted for by lapwing, wigeon, teal, golden plover, shoveler and mute swan (total 87,831 for species contributing at least 1,000 birds). Of these species, golden plover (12,881) is the only one that has been scoped out of the assessment.

Change in flow or velocity regime during operation

The Scheme will not result in any changes in flow or velocity regime that would compromise the Conservation Objectives and therefore there will be no adverse effect on the integrity of the designated sites. No mitigation measures are required to reach this conclusion. These impacts are assessed for the full River Sowy and King's Sedgemoor Drain Enhancements Scheme in the strategic level HRA Stage 2 Assessment report.

<u>Changed water chemistry during operation and maintenance</u>

The Scheme will not result in any changes in water chemistry that would compromise the Conservation Objectives and therefore there will be no adverse effect on the integrity of the

designated sites. Standard environmental protection measures will be used to minimise impacts, but nothing is required specifically for any risk to the designated site features. These impacts are assessed for the full scheme in the strategic level HRA Stage 2 Assessment report.

Changes in physical regime within the flood relief channels

The Scheme will not result in any changes in physical regime within the Sowy/KSD that would compromise the Conservation Objectives. Consequently, there will be no adverse effect on the integrity of the designated sites from this risk. No mitigation measures are required to reach this conclusion. These impacts are assessed for the full scheme in the strategic level HRA Stage 2 Assessment report.

Changes in surface water flooding

The increase in capacity to accommodate flows of 27m3/s in the KSD, 24m3/s in the Lower Sowy and 17m3/s in the Upper Sowy, subject to the implementation of the incorporated mitigation measures, will not have an adverse effect the integrity of the designated sites. These impacts are assessed for the full scheme in the strategic level HRA Stage 2 Assessment report.

Habitat loss

The Scheme works will result in a net loss of terrestrial habitat (species-poor grassland and ruderal) and an increase in open water and marginal habitats. The latter changes are a consequence of the WFD enhancements. Material for reprofiling and raising the embankments will be sourced from re-use of existing material of site (KSD) and through material import under CL:AIRE (Upper and Lower Sowy).

The net increase in open water and marginal habitats comprise

- Increase in open water through channel widening 0.08ha
- Increase in marginal, emergent vegetation on berms due to embayments and two-stage channel, plus within the new backwaters 0.69ha
- Increase in rough/wet grassland adjacent to marginal vegetation and extending to the reprofiled embankments 0.35ha

The main value of habitats within the scheme corridor are the watercourses (Sowy, Langacre Rhyne and KSD), which are used by the wildfowl species. They become particularly important during severe cold weather as they provide an open water refuge when the moors are frozen (S. Parker, Natural England, *pers. comm.*). The grassland alongside these channels is unlikely to be used by large numbers of over-wintering birds during daylight because it provides sub-optimal feeding compared to the moors proper and is also constrained by poor sight lines and disturbance in places viz. low embankments, undulating ground; presence of trees and hedge lines; proximity to roads, footbridges and buildings in places. However, there is no specific survey data to confirm this and it is also possible that some species could use the corridor at night-time. There is evidence that the corridor is used for feeding in the early spring by breeding waders, in particular redshanks and curlews (John Leece *pers. comm.*).

The Supplementary Advice on conserving site features (Natural England, 2019b) notes that maintaining the extent and distribution of supporting non-breeding habitat is a key attribute and measure for site integrity. In this case the loss of grassland is from within a corridor that is not important to non-breeding birds, irrespective of the fact that the main change is to open water and marginal habitats that are of greater value in this context.

The small net loss of grassland habitat within the working corridor will not compromise the Conservation Objectives; indeed there may be a minor beneficial effect for non-breeding

waterbirds as a result of the increase in open water and marginal habitat. Consequently, there will be no adverse effect on the integrity of the designated sites. No mitigation measures are required to reach this conclusion.

Habitat /community simplification

There will be no operational changes following implementation of the Scheme. Although there may be a reduction in out of bank flooding this would not lead to any changes in the type or extent of wet grassland features (vegetation type and structure) that non-breeding waterbirds depend upon. Consequently, there will be no adverse effects on the integrity of the designated sites. No mitigation measures are required to reach this conclusion. These impacts are assessed for the full River Sowy and King's Sedgemoor Drain Enhancements Scheme in the strategic level HRA Stage 2 Assessment report.

Appropriate assessment: conclusion alone

The permanent habitat changes from the Scheme works, specifically the increase in open water and marginal vegetation at the expense of grassland and ruderal vegetation due to the WFD enhancements, are small-scale and may be beneficial for non-breeding waterbirds.

The other risks considered will not result in any adverse effect on designated site integrity.

Appropriate assessment: assessing the impacts in combination

The assessment of impacts alone has concluded that there will be no adverse effects on the integrity of the designated sites. The strategic mitigation package has been designed and agreed with Natural England to take account of the combined effects (which would be additive) of the full Scheme (including future phases of work) with recently completed and planned dredging on the River Parrett.

Other routine maintenance works along the Sowy and KSD, including small-scale dredging around bridges and other structures, would not result in additional effects that in combination could result in an adverse effect on site integrity.

Appropriate assessment: conclusion in combination

The Scheme, when incorporating of the proposed mitigation measures for the full River Sowy and King's Sedgemoor Drain Enhancement Scheme, will not result in any adverse effects to the integrity of the designated sites, either alone or in-combination with other plans or projects, or impede the ability of the sites to achieve their conservation objectives.

Stage 2 Habitats Regulations Assessment conclusion

Qualifying Feature	Predicted Risk	Potential Impact on Conservation Objective	Will scale of impact lead to adverse effect on integrity of the site alone?	Will scale of impact lead to adverse effect on integrity of the site in combination?	Can adverse effects be avoided or mitigated?
All species from the SLM and Severn Estuary SPA and Ramsar sites scoped into the assessment: Mute swan Shoveler, Teal, Pintail, Wigeon Little egret Lapwing Snipe Dunlin Black-tailed godwit	Habitat loss	There will be some small-scale changes in the relative amounts of grassland and open water along the Sowy-KSD channel. Any reduction in important habitat could compromise Conservation Objectives.	No. The nature and extent of habitat changes is considered to be insignificant given the location and scale of impact on terrestrial habitat that are of low value for the bird features.	No.	N/A

Stage 2 Habitats Regulations Assessment summary

Somerset Levels and Moors SPA

Somerset Levels and Moor Ramsar

Severn Estuary SPA

Severn Estuary Ramsar

The Scheme (Phase 1 of the full River Sowy and King's Sedgemoor Drain Enhancement Scheme), as proposed, has no adverse effect on the integrity of any of these sites. The mitigation measures proposed for future phases of the full River Sowy and King's Sedgemoor Drain Enhancement Scheme will cancel the effects of a reduction in the frequency and volume of uncontrolled over-topping that contributes to the maintenance of suitable splash and shallow flood conditions along the Sowy/KSD corridor. The Scheme will not result in any significant construction related effects, either through disturbance or changes in habitat (temporary and permanent).

No additional conditions or restrictions on the way that the plan is implemented are required.

Advice

Natural England advice

Natural England officers have been involved in discussions throughout Scheme development, including providing advice on potential impacts and the formulation of suitable mitigation measures. Natural England will be the owners of the Mitigation Implementation Plan (MIP), which will be accepted and delivered by all partner organisations involved in water level management, to ensure mitigation for the full Scheme is in place prior to future phases commencing.

A separate HRA (Application reference: 1353/SOWYKSD/VEG/TREE/HRAv2)was submitted to NE by EA on 08/06/2021 for vegetation clearance and tree removals works within King's Sedgemoor SSSI which requires vegetation to be cleared at the field boundaries that cross perpendicular to the raised flood bank.

Third party advice

None specifically on the HRA.

Somerset Drainage Board Consortium (incorporating the Parrett IDB) have been involved in discussions on the potential in-combination effects of dredging in the River Parrett and the mitigation measures required to counter these both in the short term and with respect to completion of the full Sowy-KSD enhancements. They undertook the hydraulic modelling analysis to identify the potential changes in extent and duration of flooding following an increase in the capacity of the River Parrett and the Sowy-KSD.

The RSPB have also contributed local land management experience and advice on the mitigation measures.

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⁸ Contains Wetland Bird Survey (WeBS) data from Waterbirds in the UK 2017/18 © copyright and database right 2019. WeBS is a partnership jointly funded by the BTO, RSPB and JNCC, in association with WWT, with fieldwork conducted by volunteers

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Decision

The Environment Agency has completed the appropriate assessment and the draft conclusion is that the plan would not have an adverse effect on the integrity of the following sites, either alone or in combination with other plans and projects:

- Somerset levels and Moors SPA
- Somerset Levels and Moors Ramsar
- Severn Estuary SPA
- Severn Estuary Ramsar

Name of Environment Agency officer:	Will Maclennan
Job title:	Senior Environmental Project Manager, NEAS
Date:	30 th June 2021

This appropriate assessment has been sent to Natural England for consultation

Date sent to Natural England:	30 th June 2021
Date response received from Natural England:	

Natural England comments:

Natural England advise:

Delete as appropriate

- that the operation can go ahead
- against the issuing of the PPP

Please ensure that Natural England's response is attached to this Formal Notice.

Name of Natural England officer:	
Job title:	
Date:	

Final appropriate assessment record

This is a record of the appropriate assessment required by Regulation 63 of the Conservation of Habitats and Species Regulations 2017 (SI 2017/1012), undertaken by the Environment Agency.

The Stage 1 assessment concluded that the Scheme (River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1) would be likely to have a significant effect on the following site(s):

- Somerset levels and Moors SPA
- Somerset Levels and Moors Ramsar
- Severn Estuary SPA
- Severn Estuary Ramsar

An appropriate assessment has been undertaken of the implications of the proposal in view of the relevant site conservation objectives.

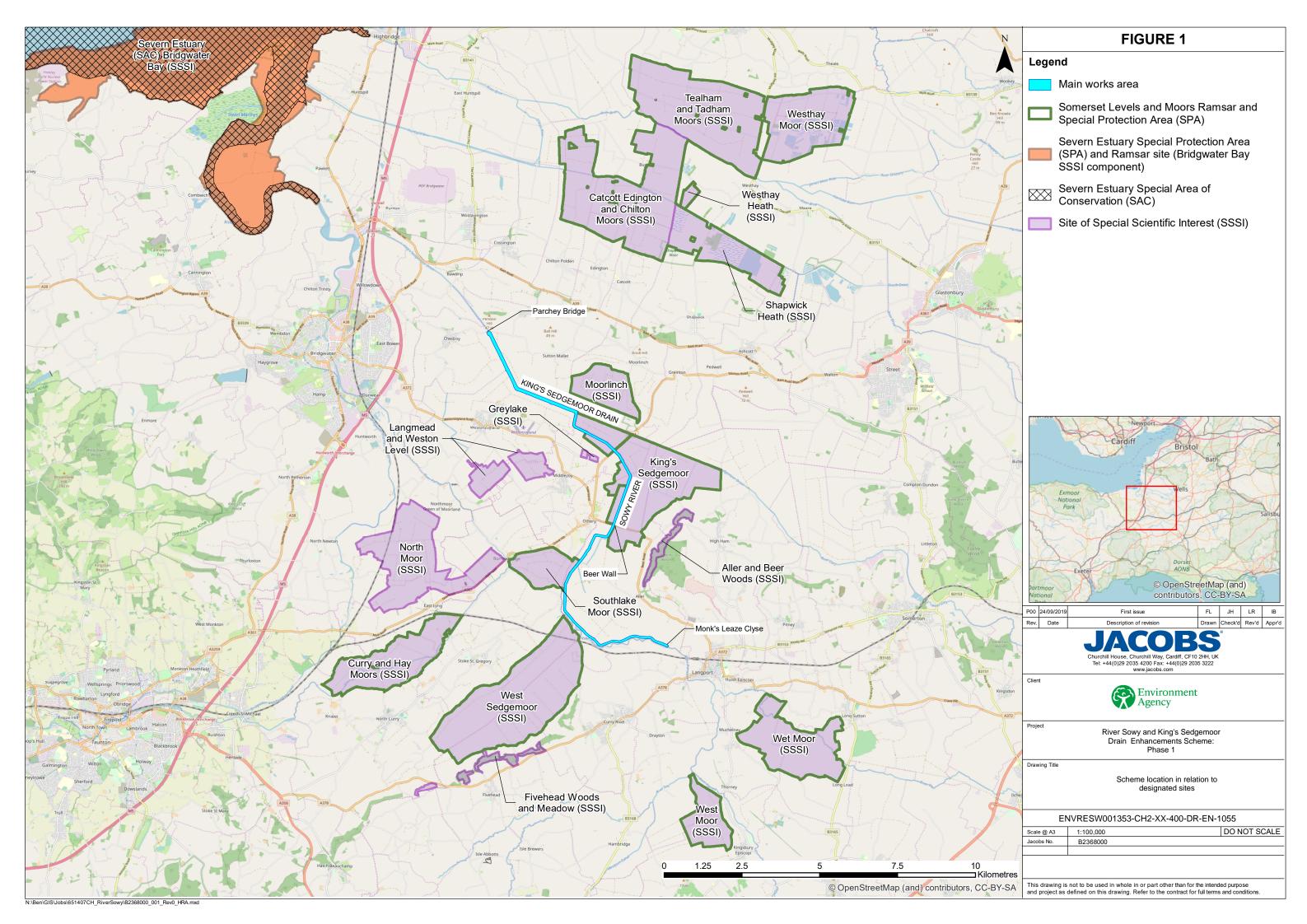
The Environment Agency has concluded that the plan would not have an adverse effect on the integrity of the following sites, either alone or in combination with other plans and projects:

- Somerset levels and Moors SPA
- Somerset Levels and Moors Ramsar
- Severn Estuary SPA
- Severn Estuary Ramsar

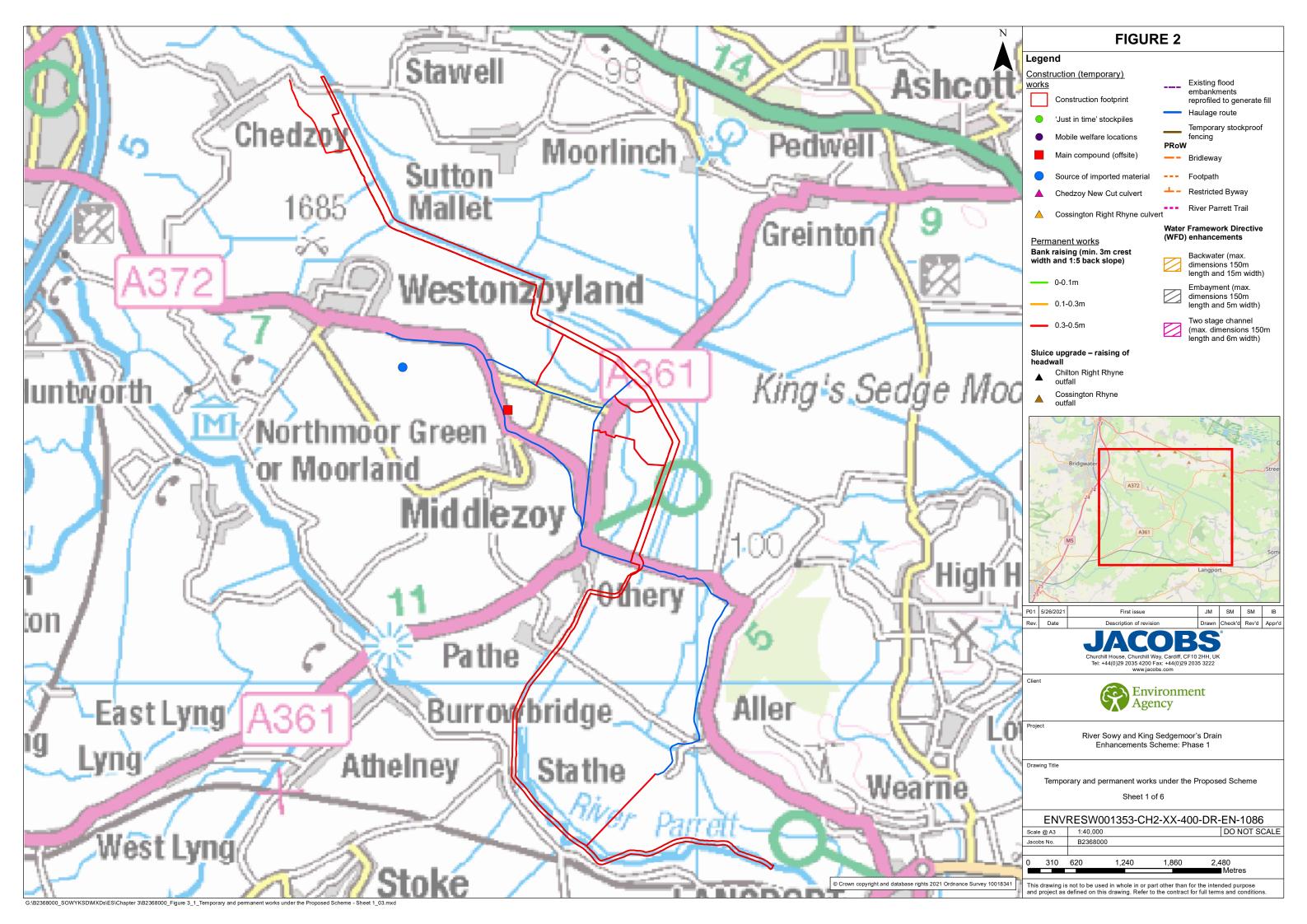
Natural England were consulted on the appropriate assessment and the Environment Agency's conclusions on [date] and their representations, to which the Environment Agency has had regard, are attached in Annex 1. The conclusions of this appropriate assessment are in accordance with the advice and recommendations of Natural England.

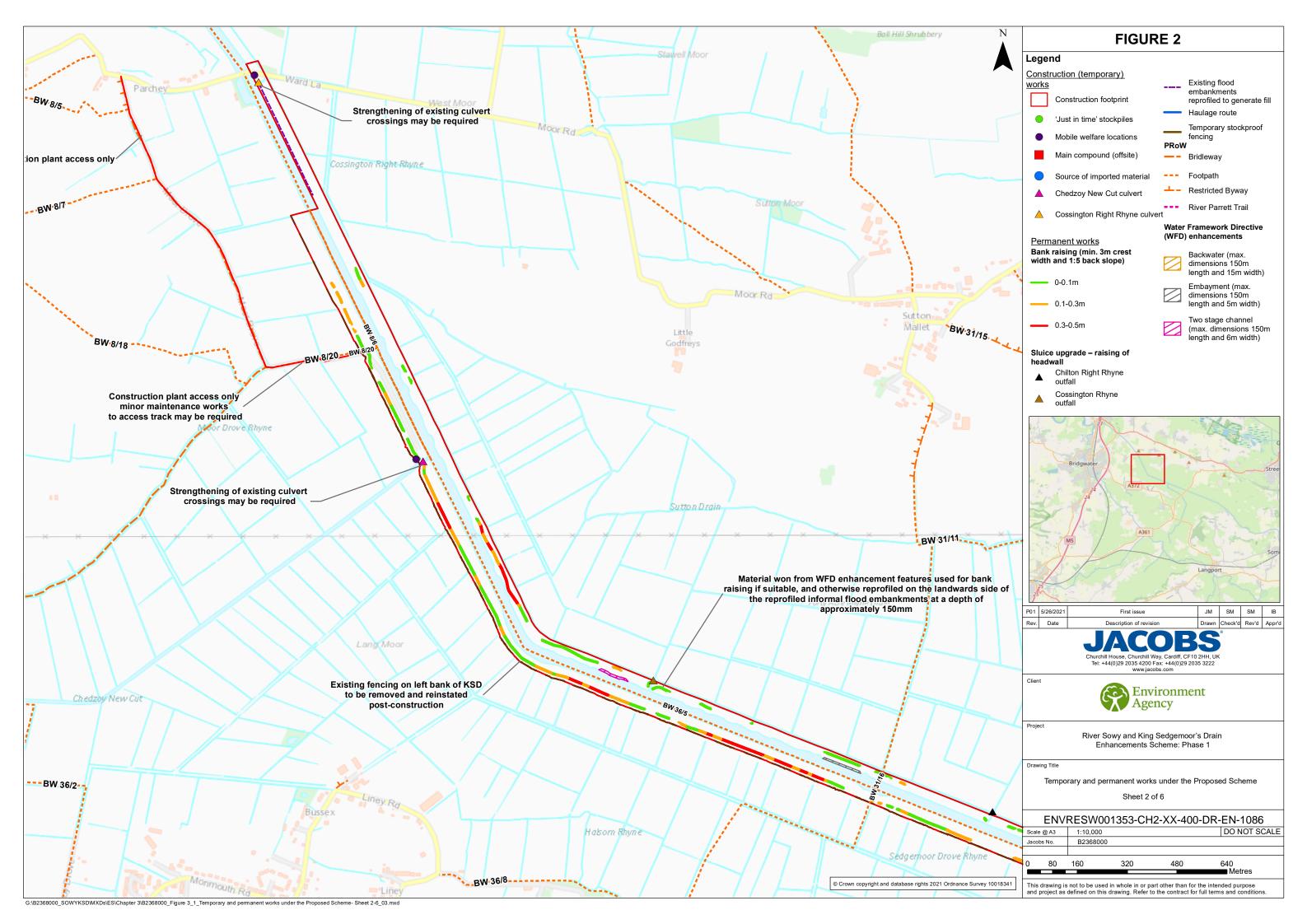
Name of Environment Agency officer:	Will Maclennan
Job title:	Senior Environmental Project Manager, NEAS
Date:	TBC

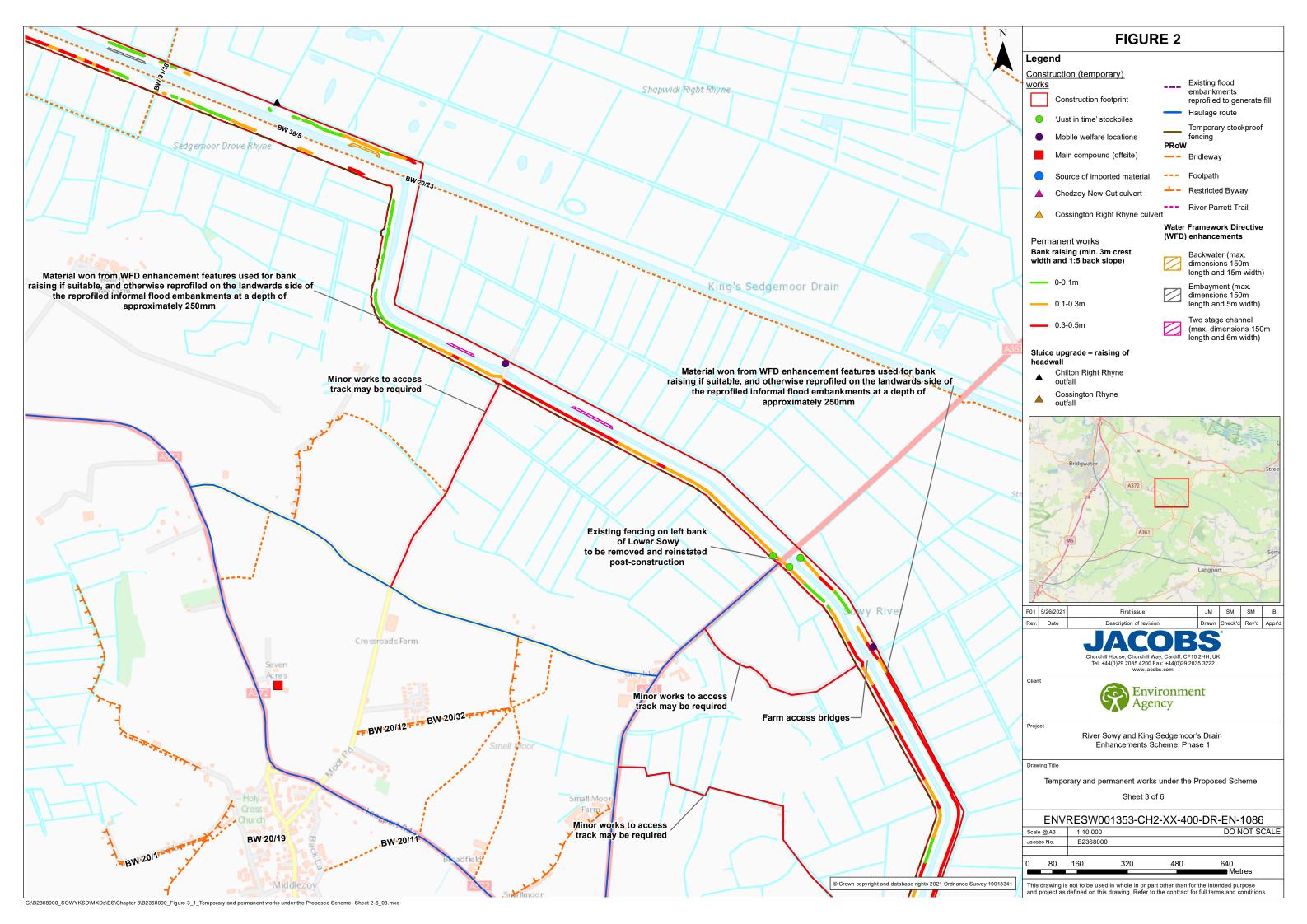
Appendix 1 – Figure showing scheme location in relation to designated sites

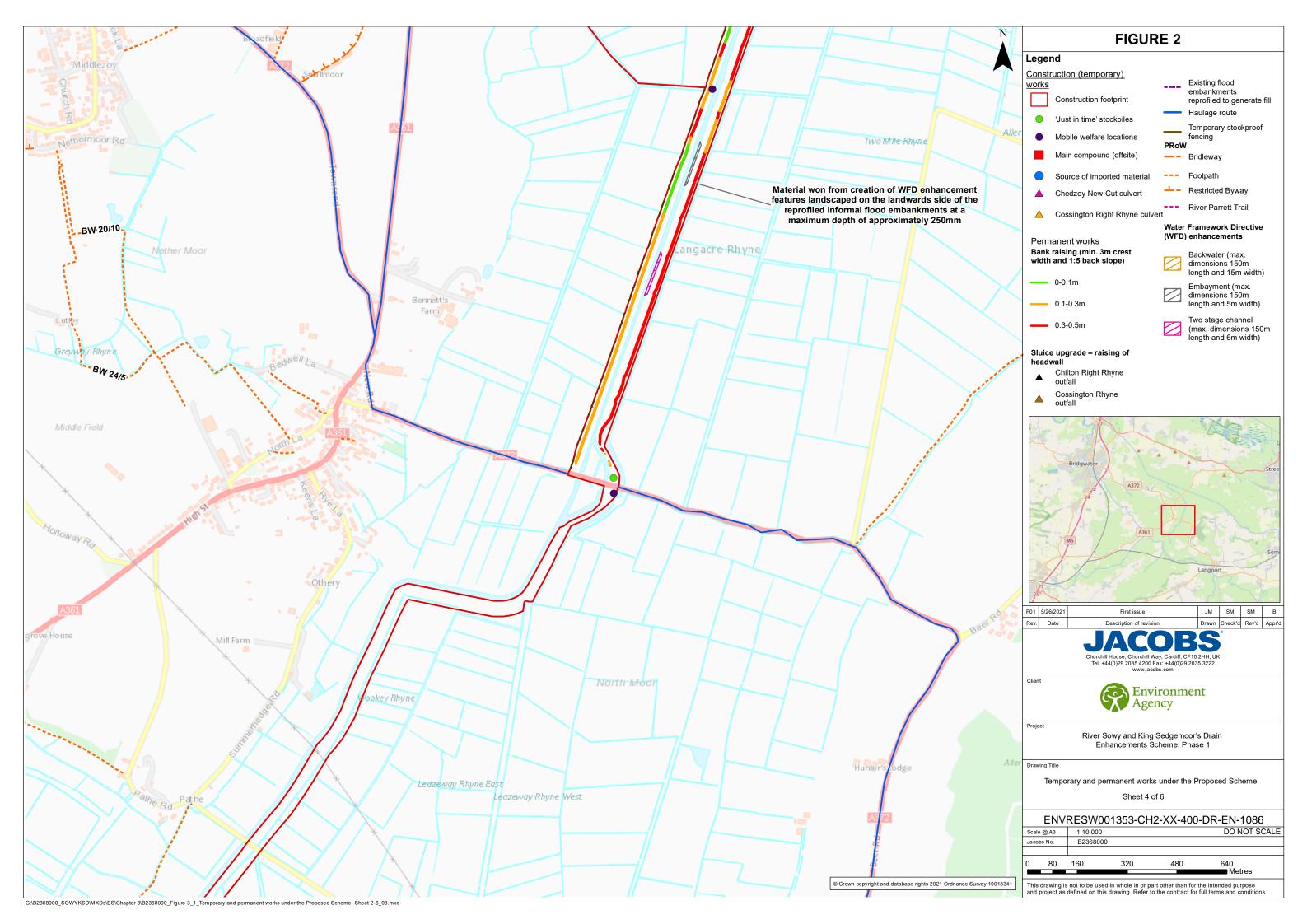


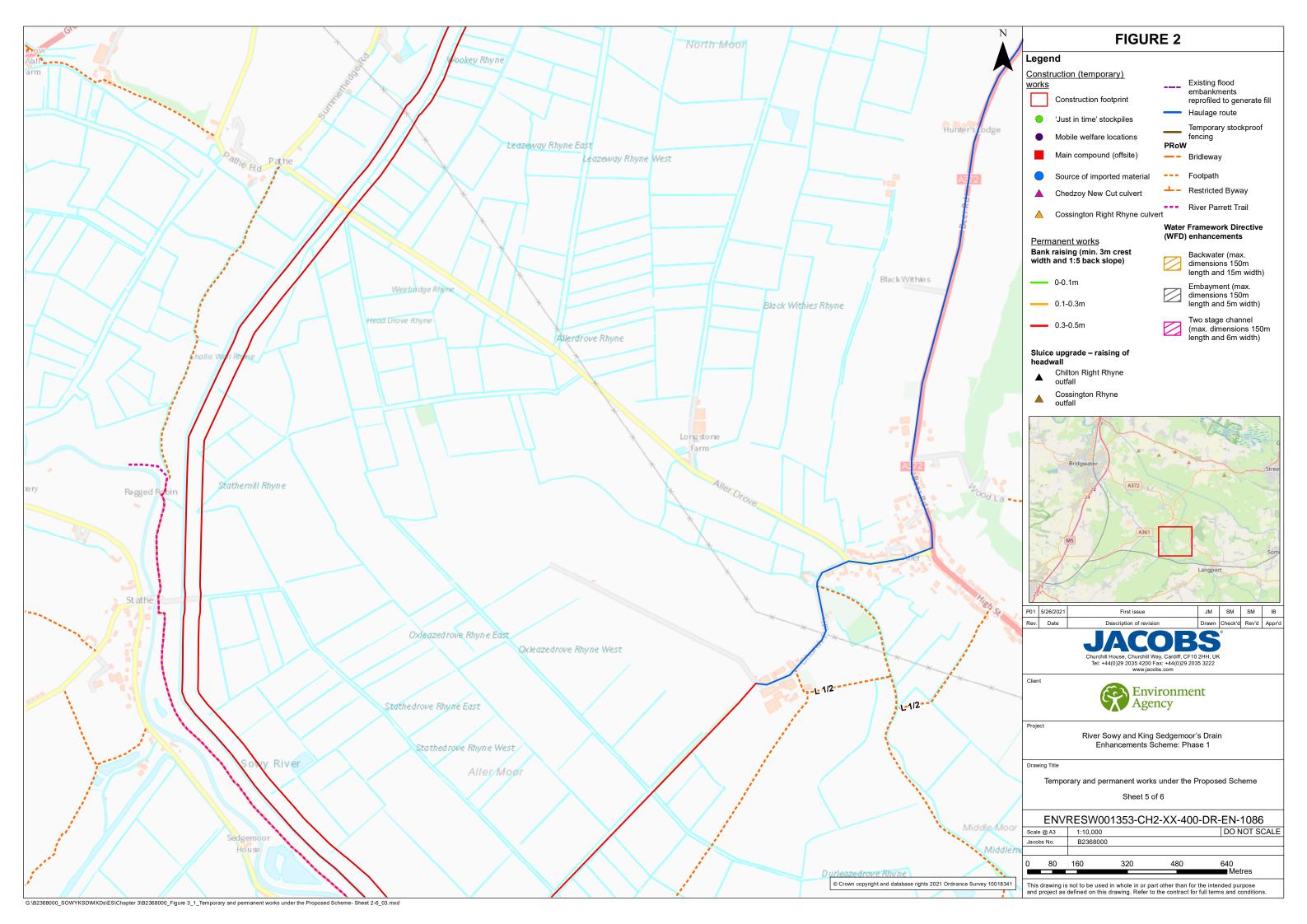
Appendix 2 - Temporary and permanent works proposed under the Scheme

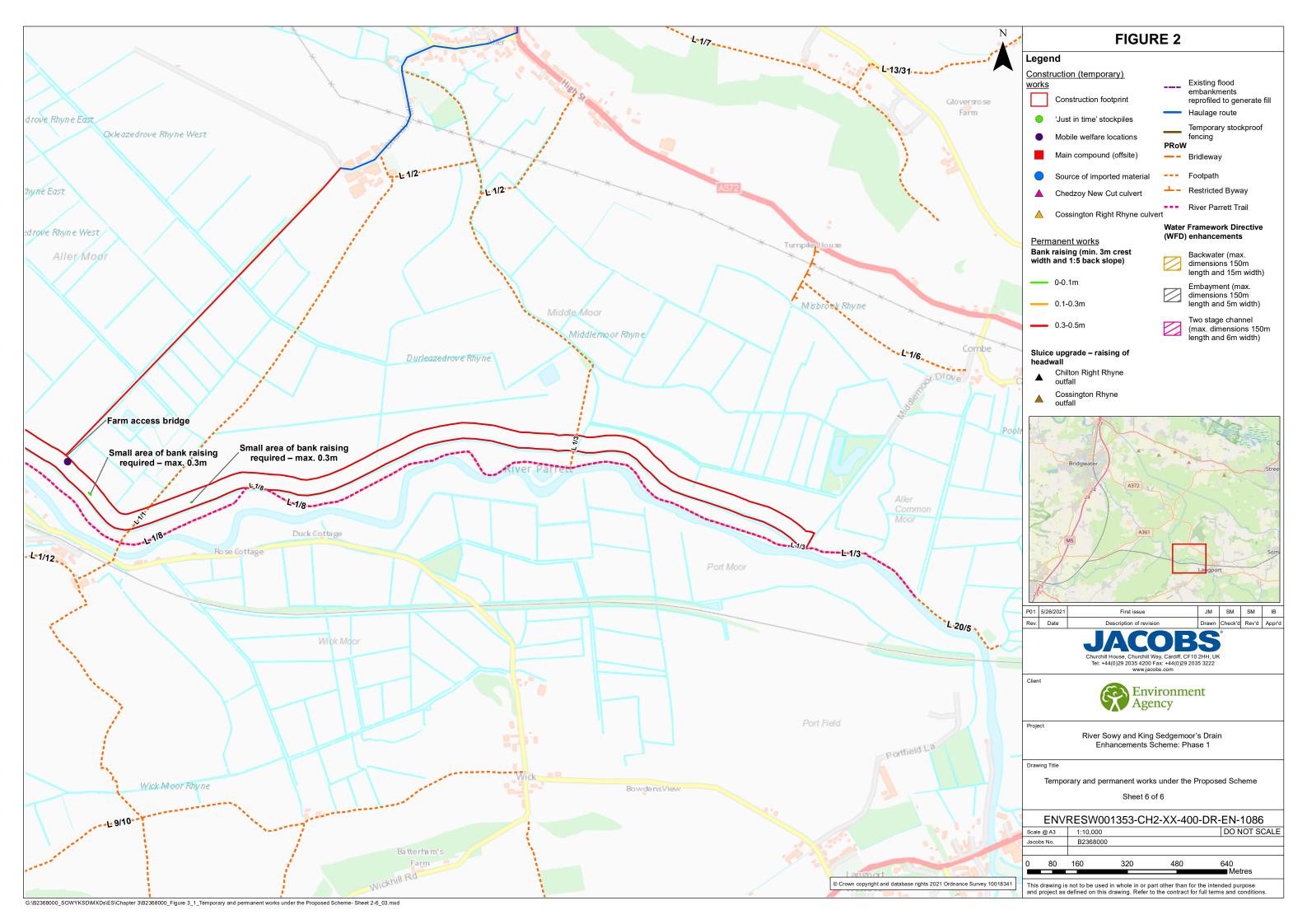












Appendix C Revised WFD Compliance Assessment



River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1 Full Water Framework Directive Assessment

ENVRESW001353-CH2-XX-400-RP-EN-1062

V2 May 2021

We are the Environment Agency. We protect and improve the environment and make it a better place for people and wildlife.

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03708 506506

Quality Assurance

Project name	River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1
Project SOP Code	ENVRESW001353
Date	01/06/2021
Version number	2
Author	Rebecca Westlake

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Note

This document has been updated to reflect changes in the proposed design and construction methodology of the Scheme following consultation on version 1 of the WFD Assessment in Summer 2020.

Changes in the scheme design and construction methodology, and in the assessment, are highlighted in yellow in the following sections. Text that is no longer relevant has been struck through.

This document should be read in conjunction with the following documents which are referenced herein:

- River Sowy and KSD Enhancements Scheme: Phase 1 Environmental Statement (available at the following weblink: https://consult.environmentagency.gov.uk/wessex/river-sowy-and-ksd-enhancements/)
- River Sowy and KSD Enhancements Scheme: Phase 1 Environmental Statement Addendum

It should be noted that between Summer 2020 and May 2021 the Water Framework Directive ceased to have any regulatory standing in the UK, being replaced by the Water Environment Regulations. This assessment was originally undertaken before the UK left the European Union and therefore still refers to the Directive.

1. Introduction

This assessment report has been prepared for the River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1 (the Scheme).

A preliminary compliance assessment in respect of the Water Framework Directive (WFD) was undertaken for this Scheme in October 2019. It concluded that the compliance assessment had demonstrated that there are no identified adverse impacts to the water quality elements measured under the WFD assessment for the water bodies associated with the River Cary. However, for those associated with the King's Sedgemoor Drain (KSD), the assessment demonstrated potentially adverse impacts due to the nature of the works and the length of the works. Environment Agency guidance (Operating Instruction 488-10) for screening thresholds under the traffic light system states that:

- Channel widening, deepening, straightening or realigning is a high-risk activity to WFD objectives whatever the length or extent
- Embankment works are high risk where the length of channel affected is greater than 100m; lower risk for between 10 and 100m; and low risk for less than or equal to 10m
- Reprofiling works are high risk where the length of channel affected is greater than 100m; lower risk for between 10 and 100m; and low risk for less than or equal to 10m

It was concluded that the Scheme options could cause deterioration in the status of the water bodies and may cause failure to meet surface water Good Ecological Status (GES) or Potential (GEP) or result in a deterioration of surface water Ecological Status or Potential. This assessment has been undertaken to better understand these risks and to identify if these can be mitigated to ensure compliance with the environmental objectives of the Directive.

1.1. Purpose of Report

The WFD needs to be taken into account in the planning of all new activities in the water environment. The Environment Agency (EA), as competent authority in England and Wales are responsible for delivering the Directive through the Environment (Water Framework Directive) (England and Wales) Regulations 2017¹.

The generic environmental objectives set out below (based on Article 4.1 of the Directive and as described in Table 1) are used for the assessment of the Scheme in relation to the Directive:

- No changes affecting high status sites
- No changes that will cause failure to meet surface water good ecological status or potential or result in a deterioration of surface water ecological status or potential

¹ 2017 SI No. 407 WATER RESOURCES, ENGLAND AND WALES. The Water Environment (Water Framework Directive) (England and Wales) Regulations 2017

- No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies
- No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status

Table 1 Environmental Objectives of the Water Framework Directive

Objectives

Member States shall implement the necessary measures to prevent deterioration of the status of all bodies of surface water.

Member States shall protect, enhance and restore all bodies of surface water, subject to the application of subparagraph (iii) for artificial and heavily modified bodies of water, with the aim of achieving good surface water status by 2015.

Member States shall protect and enhance all artificial and heavily modified bodies of water, with the aim of achieving good ecological potential and good surface water chemical status by 2015. Where this is not possible and subject to the criteria set out in the Directive, aim to achieve good status by 2021 or 2027.

Progressively reduce pollution from priority substances and cease or phase out emissions, discharges and losses of priority hazardous substances.

Prevent Deterioration in Status and prevent or limit input of pollutants to groundwater.

Member states must meet the conditions of the WFD unless they meet the criteria laid out in Article 4.7. To be compliant, the following condition must be met: "the beneficial objectives served by the modifications or alterations of the water body cannot, for reasons of technical feasibility or disproportionate cost be achieved by other means, which are a significantly better environmental option."

Additionally, the Somerset Levels Special Protection Area (SPA) needs to be considered in terms of integrity to the site as a result of the Scheme, in order to comply with Article 4.9.

2. Outline of scheme

2.1. River Sowy and King's Sedgemoor Drain Enhanced Capacity Scheme: Phase 1 (the Scheme) Overview

2.1.1. Overview

The Scheme focusses on capacity enhancements between Monk's Leaze Clyce on the Sowy and Parchey Bridge on the KSD as shown on Figure 1.1 of the Environmental Statement (ES) Addendum (see Appendix A of the ES Addendum) and set out in Table 2 below.

Table 2 Capacity enhancements

Location	Bank raising		Channel widening
Upper Sowy	Sowy between Monk's Leaze Clyce and A372 Beer Wall	Raising of existing informal flood banks on right bank by up to 0.5m to achieve capacity of 17m ³ /s	None
Lower Sowy	Sowy between A372 Beer Wall and A361	Raising of existing informal flood banks on left and right bank by up to 0.3m to achieve a capacity of 24m ³ /s.	On the right bank:One embaymentOne section of two-stage channel
	Sowy between A361 and Sowy/KSD confluence	Raising of existing informal flood banks on left bank by up to 0.3m to achieve a capacity of 24m³/s. No bank raising on the right bank.	On the right bank:One embaymentOne section of two-stage channel
KSD	KSD between Sowy/KSD confluence and Parchey Bridge	Raising of existing informal flood banks on left and right bank by up to 0.5m to achieve a capacity of up to 27m ³ /s	On the right bank: One embayment One backwater One section of two-stage channel

2.1.2. Raising and re-profiling of existing informal flood embankments

Where existing informal flood embankments are to be reprofiled or raised, the crest width will be maintained at a minimum of 3m or increased to 3m, with formed battered

embankment sides of 1 in 3 slopes on the channel side and 1 in 5 slopes on the landward side.

Material required for raising of the existing informal flood embankments on the KSD would be won through reprofiling of the existing informal flood embankments on the right bank and left banks and generated from the creation of channel bank features along the right bank, should the excavated material be suitable (see section 2.1.3).

Material required for raising of the existing informal flood embankments on the Sowy would be:

- won through reprofiling of the existing informal flood embankments on the right bank and left bank
- imported under CL:AIRE Code of Practice (COP) from a soils processing plant located off the A372 near Westonzoyland; and
- generated from the creation of channel bank features along the right bank, should the excavated material be suitable. If material won through creation of channel widening structures is not suitable for use in bank raising, it would be placed on the landward side of the existing informal flood embankments.

2.1.3. Channel widening: embayments, two-stage channel and back waters (WFD enhancement features)

The Scheme includes creation of channel bank features on the right bank of the KSD and Lower Sowy at the locations indicated on Figure 1.1 of the ES Addendum (see Appendix A of the ES Addendum) which both provide a small degree of additional channel capacity within the Sowy and KSD corridor and help to increase the diversity of aquatic and riparian habitats available within these man-made artificial waterbodies.

- Two-stage channels: up to 150m in length, with channel widening of 2m and a 5m marginal shelf with shelf level of 300mm below summer pen
- Embayments: 135-150m in length depending on location and 6m in width, with shelf level of 300m below summer pen
- Backwater: back channel 9m wide and 100m in length, with a "planted island" of 6m width, with access to island via a bridge provided for maintenance purposes

Proposed locations for the WFD enhancement feature locations, along with a typical plan view layouts and cross sections for each type of enhancement (e.g. embayment, two-stage channel and backwater), are shown in Figure 1.1 of the ES Addendum (see Appendix A of the ES Addendum). Their placement and dimension have been designed to improve channel form and diversity, maximise benefit to water vole through providing good quality habitat within areas currently identified as sub-optimal and minimise loss of trees.

2.2. Outfall improvements

The Cossington Right and Chilton Right outfalls both include concrete headwalls and steel sheet-piled wing walls. Crest levels of both structures are below the required design level and will be modified to provide a continuous defence level when combined with the bank raising works.

2.3. Operation

Current reactive maintenance undertaken on the section of the KSD included within the Proposed Scheme may include removal of fallen branches or occasional desilting. Desilting works were undertaken at Parchey Bridge during 2018.

The principal current maintenance activity along the Sowy is routine weed cutting and clearing, carried out at least once, and sometimes twice, per year depending on need. In theory, this work is undertaken from alternate banks in order to share the burden of deposited cut weed on the adjacent farmland. However, the majority of the work is undertaken from the right bank as there are fewer access (and therefore safety) constraints. A new maintenance regime will be developed in conjunction with our internal specialist teams; however, the onus will remain on newly created WFD enhancement feature habitats developing naturally following completion of the initial construction aftercare period.

The 'enhanced operation' proposals outlined in section 3.1 of the ES for the Proposed Scheme which is available at the following weblink: https://consult.environment-agency.gov.uk/wessex/river-sowy-and-ksd-enhancements/ would not be implemented following completion of the Proposed Scheme, however the measures identified under Mitigation Action Plan (MAP) developed by the EA, IDB and Natural England to counteract potential adverse effects on the Somerset Levels and Moors Special Protection Area (SPA) would be implemented as required. Further detail is provided in section 3.2 of the ES for the Proposed Scheme⁴.

2.3.1. Material Management

A Materials Management Plan (MMP) would be prepared by the contractor and agreed with the relevant authorities in advance of the start of construction to ensure that any excess imported material, or material won on site and found to be unsuitable for use in bank raising, is appropriately managed (e.g. by using to landscape the landward side of existing embankments) or disposed of, so excess materials will not present any risk of washing into the water body after any future flood events

2.3.2. Reprofiling of existing informal flood embankments

Light weight bulldozers would be used to reprofile the existing informal flood embankments. Topsoil will be stripped as and when required for construction (rather than in advance) to minimise the duration of weather exposure and associated risk of runoff into the water body.

2.3.3. Outfall improvements

The existing steel sheet piled wing walls at Cossington Right Rhyne and Chilton Right Rhyne will be replaced with new steel sheet piled walls which will extend further into the adjacent informal flood embankments that to tie in with existing areas of high ground. The existing steel will be removed from site. The crest level of the headwall will be raised with the addition of new coping. The new steel sheet piles will be driven to the design level, using a vibro-driven method to reduce noise during installation. WFD enhancement features

Long reach excavators would be used for the creation of the WFD enhancement features, which is programmed towards the end of the earthworks phase in order to

minimise the risk of adverse impacts of water quality (dissolved oxygen). In addition, a Surface Water Management Plan (SWMP) would be developed and agreed with the relevant authorities in advance of the start of construction. This would include measures such as the use of silt curtains, provision for dissolved oxygen monitoring where necessary, and other measures to protect water quality during earthworks. WFD enhancement features would be planted immediately following creation, with riparian tree planting taking place in November 2021 pending agreement with Natural England.

2.3.4. Site reinstatement

All land within the construction footprint would be fully reinstated with reseeding taking place as soon as construction works are complete within a given area. Livestock would be excluded as needed, at least until Spring 2023, to allow vegetation to establish.

3. Methodology

The existing preliminary WFD assessment (Jacobs, 2019 – see Appendix E1) concluded that a detailed assessment was needed for the extensive channel modification works on the 'King's Sedgemoor Drain – Henley Sluice to mouth' water body (hereafter referred to as the 'KSD water body'), and these are therefore screened in to this detailed assessment, whilst all the other elements of the Scheme have been screened out.

The following chapter provides a baseline assessment for the KSD water body and those immediately upstream and downstream (section 4.1), and a scoping of the water body quality elements potentially affected by the works (section 4.2). Inclusion of the up and downstream waterbodies was included in the preliminary assessment, and it was concluded that they should be scoped out of any further assessment, and so are not included here. This is followed by the impact assessment (section 4.3), which considers the potential impacts of an activity, identifies ways to avoid or minimise impacts, and indicates if an activity may cause deterioration or jeopardise the water body achieving good ecological potential (GEP). This is followed by assessment of the Scheme against mitigation measures (section 5); and a cumulative assessment against other proposed schemes (section 6).

4. Assessment

4.1. Baseline data collection

The Scheme is located within the South West River Basin which is managed by the South and West Somerset River Basin Management Plan².

The EA's Catchment Data Explorer³ was used to assess water bodies present within the Scheme's study area. The WFD compliance mapping for groundwater risk and status assessment was also reviewed.

The relevant river bodies were assessed in the preliminary compliance assessment, and it was concluded that further assessment would only be needed for the KSD water body:

 King's Sedgemoor Drain – Henley Sluice to mouth (water body ID GB108052021150) (Table 3).

Table 3 Water body WFD parameters – King's Sedgemoor Drain – Henley sluice to mouth (https://environment.data.gov.uk)

Water body ID	GB108052021150
Water body name	King's Sedgemoor Drain – Henley Sluice to mouth
NGR	ST4081234025
Catchment area	11560.058 ha
Length	27.917 km
Hydromorphological designation	Artificial
Current overall potential (2016 data)	Moderate
Status objective (overall)	Good (2027)
Reasons for not achieving good potential	Mitigation measures assessment: physical modification (Urbanisation, land drainage, flood protection)
	Phosphates – Diffuse source (livestock); point source (sewage discharge)
	Dissolved oxygen – Physical modification (land drainage structures; flood protection); Point source (sewage discharge); Diffuse source (livestock)
	Fish – suspect data
Protected area designation	Conservation of Wild Birds Directive – Somerset Levels and Moors

² South and West Somerset RBMP (2015)

³ Catchment Data Explorer, http://environment.data.gov.uk/catchment-planning/

Hydromorphological supporting elements	Supports Good
Current ecological potential (and status objective)	Moderate (Good 2027)
Biological quality elements	Fish – Moderate
	Invertebrates – Good
	Macrophytes and Phytobenthos combined - High
Physico-chemical quality elements	Moderate
Chemical quality elements	Good

4.2. Scoping

Table 4 provides a list of elements that are scoped in and out for the purposes of this assessment.

Table 4 Quality elements scoped in/out of assessment for each scheme element

Quality element	Raising of existing informal embankments	Channel widening works (WFD enhancements)	Outfall improvements
Fish	In	In	In
Benthic invertebrates	Out due to works being above the channel and unlikely to affect invertebrates in the water body itself.	In	In
Macrophytes and phytobenthos combined	In	In	In
Thermal conditions	Out due to works being above the channel and unlikely to affect thermal conditions in the water body itself.	In	Out due to minimal works within the channel, and unlikely to affect thermal conditions.

Quality element	Raising of existing informal embankments	Channel widening works (WFD enhancements)	Outfall improvements
Oxygenation conditions	Out due to works being above the channel and unlikely to affect oxygenation in the water body itself. The embankments are setback.	In	Out. Works are unlikely to have an impact at a water body scale due to their nature, and not likely to cause deterioration /change in oxygenation.
Nutrient conditions	In	In	In
Connection to groundwater	Out	In	Out
Quantity and dynamics of flow	Out due to topping up of existing informal embankments and being away from the main channel; there will be no interruption to channel flow.	In	Out
River Continuity	Out	In	Out
River depth and width variation	Out	In	In
Structure and substrate of the river bed	Out	In	In
Riparian zone	In	In	In
Chemical elements and	In. Existing pressure related to	In	In

Quality element	Raising of existing informal embankments	Channel widening works (WFD enhancements)	Outfall improvements
Specific pollutants	phosphate release due to agricultural run-off and sewage treatment discharge (already covered by nutrient conditions).		
	Out. No implications in relation to the release, dispersal or persistence of chemical contaminants or wastewater and influence on the existing pressures related to pesticides or other pollutants.		
INNS	In	In	In

4.3. Assessment against quality elements

Table 5 details a site-specific assessment of the Scheme against quality elements for the scoped in biology, physico-chemical and hydromorphological elements.

Table 5. Screening of the Scheme's Options against Status Objectives and Elements for water quality elements

Key to Im	pact				
Negative		Negligible	Positive	No change	
				onango	

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
KSD between Sow	y/KSD confluence a	nd Parchey Bridge	
Bank raising and reprofiling on left and right banks.	Macrophytes and phytobenthos	During construction: Potential sediment remobilisation during works resulting in potential deterioration in quantity and quality of species alongside river channel. Temporary localised potential impacts. Riparian tree planting and retention of existing vegetation. During operation, there should be an increased species diversity and abundance and potential for planting between flood bank and channel. Creation of additional habitats on area adjacent to channel could be utilised by benthic invertebrates, and/or other species to improve overall species diversity and abundance.	Potential indirect impacts from construction stage of the development would be managed and no likely significant effects are anticipated on the water environment. This will be managed through implementation of a SWMP and application of other best practice. The SWMP was developed in agreement with our internal technical specialists and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. It would also contain information on how vegetation on floodplain will be reinstated following construction, which includes removal of the turf, re-seeding and careful

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			placement of landscape features as supported by landscape planning.
	Fish fauna	During construction: Potential disturbance to species due to noise and to runoff from the working area, which could include temporary interruption to any migration (if occurring); potential for disturbance or loss of species over a localised and temporary event. This is most likely where works are occurring with bank raising and embayment construction, i.e. immediately adjacent to the channel. During operation: No change as a result of bank raising alone.	Potential indirect impacts from construction stage of the development would be managed through sensitive timing and avoiding working in the channel. Timing of works is important and should avoid migration and spawning periods. August to October has been scheduled for works to be undertaken to avoid spawning. Increased sediment availability also needs to be managed as an indirect impact for fish due to timing of works. This will be managed through SWMP and application of other best practice. The SWMP should be agreed with our internal technical specialists and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. This would also contain information on how vegetation on floodplain will be reinstated following construction., which includes removal of the turf, reseeding and careful placement of

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			landscape features as supported by landscape planning.
			All pollution to be controlled under current legislation and best practice.
	Structure of the riparian zone	During construction: The topping up of embankments may will require plant tracking/movement along the floodplain corridor, potentially damaging habitat within the riparian channel. Vegetation/turfs will have to be removed during construction, or will at least be removed during construction, and subsequently reinstated, replanted or reseeded. During operation: Embankments will not change structure of riparian zone as already present.	No plant will track within 5m of the watercourses (except where improvement works to sluices required as discussed above, and where strengthening of culverts on left bank of Sowy and KSD is needed). The SWMP would be developed in agreement with our internal technical specialists and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. Overplanting to be included as part of erosion control. The SWMP would also contain information on how vegetation on floodplain will be reinstated following construction., which includes removal of the turf, re-seeding and careful placement of landscape features as supported by landscape planning. This also needs to contain information on how vegetation on floodplain will be reinstated

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			following the construction. No likely significant effects are anticipated on the water environment.
			Geomorphologist and ECoW to be deployed to provide technical guidance on site
	Floodplain connectivity and	During construction: there will be no overall change during this time.	Timing of the works is important. They will be undertaken between August and
	continuity	During operation: there will be no overall change. The hydromorphic processes will be more variable due to better heterogeneity but overall there will be no change to continuity. this scheme is going to change the degree of floodplain connectivity though embankment raining and increased conveyance but not sufficiently to alter water body status.	October when the water levels are lower therefore minimising the need to put in measures to prevent flooding out of works during construction. Overall, potential indirect impacts from construction stage of the development will be managed and no likely significant effects are anticipated on the water environment.
	Nutrient conditions	During construction: Sediment remobilisation during works could result in potential deterioration of nutrient conditions within the water course if there was a direct pathway for transport to the river channel. There is evidence of the potential for algal blooms within the water course. There needs to be assurance that these cannot flare up during the works through disturbance of sediment in the channel during works, or	Potential indirect impacts from construction stage of the development would be managed through sensitive timing and avoiding working in the channel. Timing of works is important and is scheduled between August and October, outside of higher river discharges and wet weather. Therefore, runoff into the KSD from areas stripped of vegetation is less likely than at wetter times of year. The SWMP (as outlined above) will also reduce runoff. As a

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		by a temporary pathway from the adjacent land to the channel.	result, potential indirect impacts from construction of the embankments would be managed and no likely significant effects are anticipated on the water environment.
			The SWMP will establish site-specific measures to ensure nutrient-rich materials do not pollute substrate or water body during the embankment works.
			All pollution to be controlled under current legislation and best practice.
		Localised bank raising may aid in the reduction of phosphate/algal blooms in the channel because of potential interception of contaminants in agricultural land runoff. There will be no change to water levels on the moors as a result of the lowering of the Sowy levels as these are determined and controlled by the penning structures. There will also be no change in the risk of discharge of farm phosphates. The bank construction will intercept the pathway however where phosphate is not already in the channel.	Mitigation will include application of the SWMP, monitoring of flood levels and flood warnings need to be issued should there be a requirement. There will need to be top soil strip in all areas where raising proposed and also where banks are being reprofiled to win material.
	Connection to designations	Somerset Level and Moors SPA – no anticipated impact to SPA.	A Habitats Regulation Assessment (HRA) has been undertaken which considers potential effects on the Somerset Levels

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			and Moors SPA (see Appendix E of the ES4 and Appendix B of the ES Addendum). The HRA concludes that, with the identified mitigation in place, no significant effects on the integrity of any European designated sites would occur.
Channel widening including two stage channel	Macrophytes and phytobenthos	During construction: Works will require plant tracking/movement along the floodplain corridor, potentially damaging habitat within the riparian channel. Vegetation/turfs will have to be removed during construction, or will at least be removed during construction, and subsequently reinstated, replanted or reseeded. Potential sediment remobilisation during works resulting in potential deterioration in quantity and quality. Temporary localised potential impact. During operation, there should be an increased in-stream vegetation habitat due to diverse flow conditions and creation of marginal berms or widening existing marginal berms. The backwaters/embayments are circa 10 metres long at regular intervals so will	Potential indirect impacts from construction stage of the development would be managed and no likely significant effects are anticipated on the water environment. This will be managed through SWMP and application of other best practice. The SWMP should be agreed with the technical specialists and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. This also needs to contain information on how vegetation on floodplain will be reinstated following construction., which includes removal of the turf, reseeding and careful placement of

⁴ Available at the following weblink: https://consult.environment-agency.gov.uk/wessex/river-sowy-and-ksd-enhancements/.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		improve overall habitat diversity and abundance and will ensure a suitable corridor for habitat is put in place without homogenising plant communities. Low/backwater flows will allow diverse habitat during operation. Planting of rhizomes and wet woodland species, including willows will also improve habitat diversity and abundance.	landscape features as supported by landscape planning. Continuous lengths of pre-vegetated coir rolls would protect the river edge of the berm from erosion—and pre-vegetated coir pallets would seed the bank side of the berm with marginal species. Plug planting and/or translocation of existing marginal planting will be used to promote benefits to macrophytes and wider habitat. Backwater channels would be planted with either/both pre-vegetated coir rolls and
	Benthic invertebrate fauna	During construction: Potential sediment remobilisation during works with potential for smothering downstream channel bed features (localised and temporary sediment remobilisation so impact limited). During operation: Decreased sediment load to channel following a major flood event due to more storage in two-stage channel leading to decreased nutrient enrichment. Habitat niches improve abundance and richness. Creation of additional habitats which can be utilised by benthic invertebrates.	Potential indirect impacts from construction stage of the development would be managed and no likely significant effects are anticipated on the water environment. This will be managed through SWMP and application of other best practice. The SWMP should be agreed with the technical specialists and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. This also needs to contain information on how vegetation on floodplain

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			will be reinstated following construction, which includes removal of the turf, reseeding and careful placement of landscape features as supported by landscape planning. This also needs to contain information on how vegetation on floodplain will be reinstated following construction.
			In addition, continuous lengths of pevegetated coir rolls would protect the river edge of the berm from erosion-and prevegetated coir pallets would seed the bank side of the berm with marginal species. Backwater channels would be planted with either/both pre-vegetated coir rolls and pallets. Plug planting and/or translocation of existing marginal planting will be used to promote benefits and habitat for various species.
	Fish Fauna	During construction: Potential disturbance to species within the river at this point, due to close proximity of works, which could include temporary interruption to any migration (if occurring); potential for disturbance or loss of species over a localised and temporary event.	Potential indirect impacts from construction stage of the development would be managed through sensitive timing and avoiding working in the channel. Timing of works is important and should avoid migration and spawning periods. August to October has been scheduled for works to be undertaken to avoid spawning.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		During operation: provision of better habitat to improve conditions for fish during spawning and migration. Embayments/backwaters potentially provide nursery areas. The backwater design allows for sufficient width, in conjunction with the associated island to improve the sustainable function of backwater without it quickly and efficiently silting up or becoming choked by vegetation.	Increased sediment availability also needs to be managed as an indirect impact for fish. This will be managed through SWMP and application of other best practice. The SWMP has not been produced yet but should include details of managing spoil, managing sediment pathways within the channel and on the floodplain. Construction of the backwaters would offer a direct pathway to the channel. This needs to be controlled by silt traps or other suitable mitigation. ECoW to be used on site.
			All pollution to be controlled under current legislation and best practice.
	Quantity and dynamics of water flow	During construction: Anticipate that the working method to allow formation of new channel features will require some localised coffer-damming and dewatering and/or over-pumping. Any consequences for the dynamics of flow would be temporary and reversible. During operation: Improvement to conveyance and decreasing flood risk. The creation of embayments and/or two-stage channel will lead to more diverse flow variability and habitat niches. The backwater design allows for sufficient	Timing of the works is important. They will be undertaken between August to October when the water levels are lower therefore minimising the need to put in measures to prevent flooding out of works during construction. As water levels will be lower, the need for pumps and cofferdams will be minimised. Silt traps or silt curtains also need to be put in place during construction to further mitigate any potential entrainment into the channel. Geomorphologist to attend on site during works to provide detailed guidance.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		width, in conjunction with the associated island, to improve the sustainable function of backwater without it quickly silting up or becoming choked by vegetation.	
	River depth and	No change during construction.	Potential indirect impacts from construction
	width variation:	During operation: Improvement to river channel cross-Section, from current trapezoidal cross-Section to diverse channel profiles, will increase river width and provide flow and habitat diversity.	stage of the development would be managed and no likely significant effects are anticipated on the water environment.
	Structure and substrate of the river bed	During construction: Potential change to structure of substrate due to construction. Sediment remobilisation during works could result in potential deterioration in water quality, and potential for greater concentrations of fines downstream. Temporary localised potential impact. During operation: Potential improved	Sediment mobilisation into the water column will need to be minimised. The SWMP (as outlined above) will include specific measures for in-channel works to minimise the risk of resuspending sediment and of releasing any plumes beyond the working area. Thus, the potential indirect impacts from construction stage of the development would be managed and no likely significant effects are anticipated on
		sediment variability. Aggregation of fines (potential for) in slacker areas of water	the water environment.
	Structure of the riparian zone	During construction: The creation of WFD enhancements will require the removal of existing riparian vegetation. Sediment remobilisation during works could result in the potential deterioration	Potential indirect impacts from construction stage of the development would be managed. An EAP (see Appendix F of the ES Addendum) will refer to site-specific measures to mitigate for effects on the

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		of the riparian zone, and risk of materials entering the water course.	riparian zone, such as translocating areas of vegetation. No likely significant effects
		During operation: Improvement to overall riparian morphological diversity and species diversity. Morphological diversity improves habitat by creating a variety of habitat niches for various aquatic species. Planting of rhizomes and wet woodland species, including willows will improve habitat diversity and abundance.	are anticipated on the water environment.
	River continuity	During construction: There will be no overall change during this time.	Timing of the works is important. They will be undertaken between August and
		During operation: there will be no overall change in longitudinal continuity. The hydromorphic processes will be more variable due to better heterogeneity but overall there will be no change to continuity. However, the scheme is going to slightly reduce the degree of floodplain connectivity though embankment raising and increased conveyance but not sufficiently to alter water body status.	October when the water levels are lower therefore minimising the need to put in measures to prevent flooding out of works during construction. Potential indirect impacts from construction stage of the development will be managed and no likely significant effects are anticipated on the water environment.
	Nutrient conditions	During construction: Sediment remobilisation during works could result in potential deterioration of nutrient conditions within the water course.	Any phosphates occurring in the existing riparian sediments are due to agricultural/discharge issues outside of the Scheme and cannot be mitigated for within

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		During operation: Habitat diversity improves oxygenation, clarity (reduced silt within the water column) and sediment transport, and therefore overall water quality. However, decreased uncontrolled flooding of agricultural land due to more water being stored within the two-stage	this Scheme. Potential indirect impacts from construction stage of the modified channel will need to be carefully managed to ensure that sediment mobilisation into the water column is minimised, especially under conditions of high light and temperature that could encourage algal blooming.
		channel leading to potential decreased diffuse pollution into the water body. Also potential interception of contaminants in the widened riparian zone reducing the load reaching the channel.	Since the work is scheduled for August to October in order to be outside of higher river discharges and wet weather there is the potential to coincide with sunny and warm spells of weather. The SWMP (as outlined above) will include specific measures for in-channel works to minimise the risk of resuspending sediment and of releasing any plumes beyond the working area.
			The SWMP would be developed in agreement with our internal technical specialists, and would consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment. It would also contain

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			information on how vegetation on floodplain will be reinstated following construction., which includes removal of the turf, reseeding and careful placement of landscape features as supported by landscape planning.
			All pollution to be controlled under current legislation and best practice.
	Oxygenation	During construction: See 'Nutrient	See 'Nutrient conditions' above.
	conditions	months when water temperature is likely to be elevated could result in localised sediment motors.	Potential indirect impacts from construction stage of the modified channel will need to be carefully managed to ensure that sediment mobilisation into the water column is minimised, especially under conditions of
		During operation: Habitat diversity improves oxygenation, clarity (reduced	high light and temperature that could encourage algal blooming.
		silt within the water column) and sediment transport, and therefore overall water quality. Water held in the two-stage channel/embayments is likely to have a negligible impact on dissolved oxygen levels of the overall water body. The widened channel can be operated at higher flows with similar velocities and water depths to pre-scheme as a result of summer penning.	Since the work is scheduled for August to October in order to be outside of higher river discharges and wet weather there is the potential to coincide with sunny and warm spells of weather. The SWMP (as outlined above) will include specific measures for in-channel works to minimise the risk of resuspending sediment and of releasing any plumes beyond the working area.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
	Invasive Non- Native Species (INNS)	 During construction: Risk of spread of invasive species if present. Himalayan Balsam (Impatiens glandulifera) was recorded in the study area on the Parrett. Curly water thyme (Lagarosiphon major) Further information on non-native, invasive plant species was also provided by the Somerset Drainage Board Consortium stating that parrots feather (Myriophyllum aquaticum) is widespread on Aller Moor and known to be present in the Langacre Rhyne. The RSPB have also recorded on Othery Rhyne. The extent of Parrots feather is increasing as no control measures have been implemented. Also, water lettuce (Pistia stratiotes), water hyacinth (Eichhornia crassipes), Water fern (Azolla filiculoides) have been found on the KSD in recent years, but these are not thought to be currently present in the study area. Nuttall's waterweed (Elodea nuttallii) has been recorded on the Sowy but is not thought to be currently present in thestudy area. There are also records of floating pennywort (Hydrocotyle 	With appropriate mitigation these will be managed to ensure no significant effects. Invasive Species Management Plan to be put in place. Ensure no spread within the water channel. Given the recorded presence of, and potential for, a number of non-native invasive plant species, an Invasive Species Management Plan would be required. This would highlight the species likely/with potential to be present in the construction area and the biosecurity measures needed to prevent the spread of these species and thus to ensure compliance with Wildlife and Countryside Act 1981 (as amended) where species are listed on Schedule 9 of the Act. These biosecurity measures would include; • Pre-construction survey for nonnative invasive plant species. • Environmental Clerk of Works to undertake toolbox talk for all site workers (and visitors when appropriate) to aid identification and appropriate responses to encountering invasive species. • Areas of possible contamination should be identified in the site management plan.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		ranunculoides) and Canadian pond weed (Elodea canadensis) and in drainage systems connected to the Sowy corridor and there is therefore a significant likelihood that floating pennywort may already be in, or close to the Sowy, or may become present during the implementation period of the scheme.	 Where contaminated soil, materials or water are located, signage should be erected to indicate them. Only accepting machinery to site that is clean. Pressure washing in a designated area for all vehicles before entering and after leaving site to avoid accidental transfer of invasive plant material. Personnel working on or between sites should ensure their clothing and footwear are cleaned where appropriate to prevent spread All wash facilities including waste water from washing vehicles, equipment or personnel should be managed in a responsible way so as not to not cause harm to the environment. If present, report to competent authority.
	Connection to designations	Somerset Level and Moors SPA – no anticipated impact to SPA.	A Habitats Regulation Assessment (HRA) has been undertaken which considers potential effects on the Somerset Levels and Moors SPA (see Appendix C of the ES ⁴ and Appendix B of the ES Addendum). The HRA concludes that, with the identified mitigation in place, no significant effects on

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			the integrity of any European designated sites would occur.
Raising of the existing concrete headwalls by 300-400mm.	Macrophytes and phytobenthos	During works potential deterioration in quantity and quality of vegetation through direct impacts of groundworks. Temporary localised potential impact. During operation: no change.	Potential indirect impacts from construction stage of the development will be managed and no likely significant effects are anticipated on the water environment. The SWMP should be agreed with the technical specialists, and will consider measures to manage spoil heap with reference to up to date and applicable guidance. It will include details of managing spoil, managing sediment pathways on the floodplain, in some areas, no works within 10m of the water course because of the potentially large amount of soil potentially available for entrainment.
	Benthic invertebrate fauna	Sediment could be remobilised during works with potential for smothering downstream channel bed features (localised and temporary sediment remobilisation so impact limited. During operation: no change.	Potential indirect impacts from construction stage of the development will be managed through sensitive working method and no likely significant effects are anticipated on the water environment. All pollution to be controlled under current legislation and beat practice.
	Fish fauna	During construction: disturbance to species within the river at this point, which could include temporary interruption to any migration (if occurring) between KSD and	legislation and best practice. Potential indirect impacts from construction stage of the development will be managed through sensitive timing (to avoid fish migration) and working method and no

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		Cossington Right or Chilton Right rhynes; potential for disturbance of species over a localised and temporary event.	likely significant effects are anticipated on the water environment.
		No change during operation from current conditions.	
	INNS	 Risk of spread of invasive species if present. Water fern (<i>Azolla filiculoides</i>) was recorded on a ditch in a field adjacent to the KSD near Westonzoyland. Himalayan Balsam (<i>Impatiens glandulifera</i>) was recorded in the study area on the Parrett. Canadian pond weed (<i>Elodea canadensis</i>) was recorded in an agricultural drainage ditch. Nuttall's waterweed (<i>Elodea nuttallii</i>) was recorded at two 	Invasive Species Management Plan to be put in place. Ensure no spread within the water channel. See above for details.
		Iocations in the Sowy. Further information on non-native, invasive plant species was also provided by the Somerset Drainage Board Consortium stating that parrots feather (<i>Myriophyllum aquaticum</i>) is widespread on Aller Moor and known to	

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		be present in the Langacre Rhyne. The extent of Parrots feather is increasing as no control measures have been implemented. Also, water lettuce (<i>Pistia stratiotes</i>) and water hyacinth (<i>Eichhornia crassipes</i>) have been found on the KSD in recent years, but these are not thought to be currently present in the study area. There are also records of floating pennywort (<i>Hydrocotyle ranunculoides</i>) in drainage systems connected to the Sowy corridor and there is therefore a significant likelihood that floating pennywort may already be in, or close to the Sowy, or may become present during the implementation period of the scheme.	
	Connection to designations	Somerset Level and Moors SPA – no anticipated impact to SPA.	A Habitats Regulation Assessment (HRA) has been undertaken which considers potential effects on the Somerset Levels and Moors SPA (see Appendix C of the ES ⁴ and Appendix B of the ES Addendum). The HRA concludes that, with the identified mitigation in place, no significant effects on the integrity of any European designated sites would occur.
Installation of sheet piles	Macrophytes and phytobenthos	During construction: Potential sediment remobilisation during works resulting in potential deterioration in quantity and	Potential indirect impacts from construction stage of the development will be managed and no likely significant effects are

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		quality, and potential loss in places. Temporary localised potential impact.	anticipated on the water environment. This will be managed through SWMP and
		During operation, there should be no change from current conditions once the river has returned to normal conditions.	application of other best practice.
	Benthic invertebrate fauna	During construction: Potential sediment remobilisation during works with potential for smothering downstream channel bed features (localised and temporary sediment remobilisation so impact limited).	Potential indirect impacts from construction stage of the development will be managed through sensitive working method and no likely significant effects are anticipated on the water environment. Use of ECoW on site.
		During operation, there should be no change	
	Fish fauna	During construction: Potential disturbance to species within the river at this point, due to close proximity of works, which could include temporary interruption to any migration (if occurring) between KSD and Cossington Right or Chilton Right rhynes; potential for disturbance or loss of species over a localised and	Potential indirect impacts from construction stage of the development will be managed through sensitive timing (to avoid fish migration) and working method and no likely significant effects are anticipated on the water environment. Compile and adhere to an EAP and ensure materials do not pollute substrate or water body.
		During operation: no change.	Consider ECoW on site during construction. All pollution to be controlled under current
		During operation: No change and no potential for channel width diversity	legislation and best practice.

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		apart from where sheet piling is absent, and then potential for outflanking.	
	Structure and substrate of the river bed	During construction: Potential change to structure of substrate due to construction. Sediment remobilisation during works could result in potential for greater concentrations of fines downstream. Temporary localised potential impact.	Potential indirect impacts from construction stage of the development will be managed through the SWMP and no likely significant effects are anticipated on the water environment
		During operation: No change. From current conditions.	
	Nutrient conditions	During construction: Sediment remobilisation during works could result in potential deterioration of nutrient conditions within the water course. During operation: No change	Any phosphates occurring in the existing sediment are due to agricultural/discharge issues outside of the Scheme and cannot be mitigated for within this Scheme. Potential indirect impacts from construction of the outfalls will need to be carefully managed to ensure that sediment mobilisation into the water column is minimised, especially under conditions of high light and temperature that could encourage algal blooming.
			Since the work is scheduled for August to October in order to be outside of higher river discharges and wet weather there is the potential to coincide with sunny and warm spells of weather. The SWMP (as outlined above) will include specific

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			measures for in-channel works to minimise the risk of resuspending sediment and of releasing any plumes beyond the working area.
			The SWMP will establish site-specific measures to ensure nutrient-rich materials are properly managed. This might include specific weather-dependent limits on working activities.
			All pollution to be controlled under current legislation and best practice
	INNS	 During construction: Risk of spread of invasive species if present. Water fern (<i>Azolla filiculoides</i>) was recorded on a ditch in a field adjacent to the KSD near Westonzoyland. Himalayan Balsam (<i>Impatiens glandulifera</i>) was recorded in the study area on the Parrett. Canadian pond weed (<i>Elodea canadensis</i>) was recorded in an agricultural drainage ditch. Nuttall's waterweed (<i>Elodea nuttallii</i>) was recorded at two locations in the Sowy. 	With appropriate mitigation these will be managed to ensure no significant effects. Invasive Species Management Plan to be put in place. Invasive species are 'reportable' but the operatives need to be provided with this guidance. If present, report to competent authority. Given the recorded presence of, and potential for, a number of non-native invasive plant species, an Invasive Species Management Plan would be required. This would highlight the species likely/with potential to be present in the construction area and the biosecurity measures needed to prevent the spread of these species and thus to ensure compliance with Wildlife and Countryside Act 1981 (as amended) where

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
		Further information on non-native, invasive plant species was also provided by the Somerset Drainage Board Consortium stating that parrots feather (<i>Myriophyllum aquaticum</i>) is widespread on Aller Moor and known to be present in the Langacre Rhyne. The extent of Parrots feather is increasing as no control measures have been implemented. Also, water lettuce (<i>Pistia stratiotes</i>) and water hyacinth (<i>Eichhornia crassipes</i>) have been found on the KSD in recent years, but these are not thought to be currently present in the study area. There are also records of floating pennywort (<i>Hydrocotyle ranunculoides</i>) in drainage systems connected to the Sowy corridor and there is therefore a significant likelihood that floating pennywort may already be in, or close to the Sowy, or may become present during the implementation period of the scheme.	 species are listed on Schedule 9 of the Act. These biosecurity measures would include; Pre-construction survey for nonnative invasive plant species. Environmental Clerk of Works to undertake toolbox talk for all site workers (and visitors when appropriate) to aid identification and appropriate responses to encountering invasive species. Areas of possible contamination should be identified in the site management plan. Where contaminated soil, materials or water are located, signage should be erected to indicate them. Only accepting machinery to site that is clean. Pressure washing in a designated area for all vehicles before entering and after leaving site to avoid accidental transfer of invasive plant material. Personnel working on or between sites should ensure their clothing and footwear are cleaned where appropriate to prevent spread

Scheme element	WFD element likely to be impacted	Description of impact	Mitigation proposed
			 All wash facilities including waste water from washing vehicles, equipment or personnel should be managed in a responsible way so as not to not cause harm to the environment.
	Connection to designations	Somerset Level and Moors SPA – no anticipated impact to SPA.	A Habitats Regulation Assessment (HRA) has been undertaken which considers potential effects on the Somerset Levels and Moors SPA (see Appendix C of the ES4 and Appendix C of the ES Addendum). The HRAs conclude that, with the identified mitigation in place, no significant effects on the integrity of any European designated sites would occur.

5. Assessment of the scheme against mitigation measures

Within each RBMP, there is a list of mitigation measures, or environmental improvements, which need to be implemented in order to improve the ecology of water bodies by a specified date in order for the UK to meet the target date set by the WFD. Part of the a WFD compliance assessment is to consider relevant mitigation measures and assess whether a proposed scheme can contribute to them or might obstruct any of them from being delivered.

Table 6 provides a list of all mitigation measures applicable to the Scheme and the KSD water body specifically. There were not any mitigation measures data to contribute to this assessment as they were not readily available, so these are proposed based on experience/knowledge of other mitigation measures for other similar schemes.

Table 6 Mitigation measures put forward to support the RBMP and the Scheme

Mitigation Measure		Will the Scheme help to achieve or contribute to mitigation measure?
Flood protection	Align and attenuate flow to minimise impact on ecology	Yes, through creation of enhancements
	Create habitat	Yes, including backwaters, two stage channels, WFD enhancements, embayments, and improvement to riparian habitat
	Educate landowners impacts to Hydromorphology and Hydromorphological harm	Partially – indirectly through design
	Enhance existing structures to improve ecology	Yes, including backwaters, two stage channels, embayments, WFD enhancements improvement to riparian habitat
	Ensure maintenance minimises habitat impact	Partially – indirectly through design, although maintenance not part of the Scheme objective
	Manage in-channel and riparian vegetation	Yes, through design of enhancements
	Manage realignment of flood defences	Yes
	Preserve or restore habitats	Yes, through design of enhancements
	Remove and prevent further dispersal of invasive non-native species	Partially

Mitigation Measure		Will the Scheme help to achieve or contribute to mitigation measure?
	Remove obsolete structure(s)	No
	Remove or enhance set- back embankments	Yes, including backwaters, two stage channels, improvement to riparian habitat
	Remove or soften hard bank engineering	Yes, partially, including backwaters, two stage channels, improvement to riparian habitat
	Restore or increase floodplain (lateral) connectivity	No
	Restore or Increase In- channel morphological diversity	Yes, including backwaters, two stage channels, improvement to riparian habitat
	Retain habitats	Yes, including backwaters, two stage channels, improvement to riparian habitat
Land drainage	Align and attenuate flow to minimise impact on ecology	Partially through design and improvement of riparian zone
	Create habitat	Yes, including backwaters, two stage channels, improvement to riparian habitat
	Educate landowners impacts to Hydromorphology and Hydromorphological harm	Partially – indirectly through design and tacit understanding of Scheme
	Enhance existing structures to improve ecology	Yes, including backwaters, two stage channels, improvement to riparian habitat
	Ensure maintenance minimises habitat impact	Partially – indirectly through design, although maintenance not part of the Scheme objective
	Preserve or restore habitats	Yes, through design of enhancements
	Remove and prevent further dispersal of invasive non-native species	No
	Restore or increase floodplain (lateral) connectivity	Yes, through design of enhancements

Mitigation Measure	Will the Scheme help to achieve or contribute to mitigation measure?
Restore or Increase Inchannel morphological diversity	Yes, through enhancements
Retain habitats	Yes, through design

In summary, it is unlikely that the nature of the works would impede any mitigation measures that might be put forward as part of the RBMP or water body specific measures. Further, the nature of the works are unlikely to impede achievement of GEP.

6. Cumulative assessment

None of the other proposed schemes scoped into the cumulative assessment within Chapter 2.3 of the ES Addendum are considered to offer the potential for cumulative effects on the KSD water body, predominantly due to their distance, and scale of development.

7. Compliance conclusions

Referring back to the points raised in Chapter 1, and the assessment in Chapters 4 to 6, the reasoning put forward for the need for a detailed assessment can be put aside for the following reasons:

- Channel widening, deepening, straightening or realigning is a high-risk activity to WFD objectives whatever the length or extent. Reprofiling works are high risk where the length of channel affected is greater than 100 metres. The risks to a number of quality elements have been identified but these can each be mitigated through appropriate working methods and precautionary measures that will be incorporated into a SWMP which will specifically consider risks around sediment control and associated water quality, and an EAP. Once completed, the Scheme will provide a much more tangible benefit in that it will improve the physical condition of the artificial water body, which is currently an oversized trapezoidal drainage channel. The WFD benefits put forward as part of the Scheme, in conjunction with improved hydromorphological condition (for example, improved heterogeneity, improved abundance and variability in species within the channel and riparian corridor) far exceed the implications of channel widening being a high-risk activity.
- Embankment works are high-risk where the length of channel affected is greater than 100 metres. However, the works, including incorporation of enhancements, should benefit the water body. During operation the works will prevent or reduce adverse water quality side-effects from flooding (sewer overflow, arable soil loss). Additionally, they are already on areas of relatively low floodplain value and are being widened on the dry side in all cases, and therefore their adverse consequences are limited.

The overall improvement to the waterbody as a result of this Scheme would suggest that all WFD quality elements will be improved or unaffected.

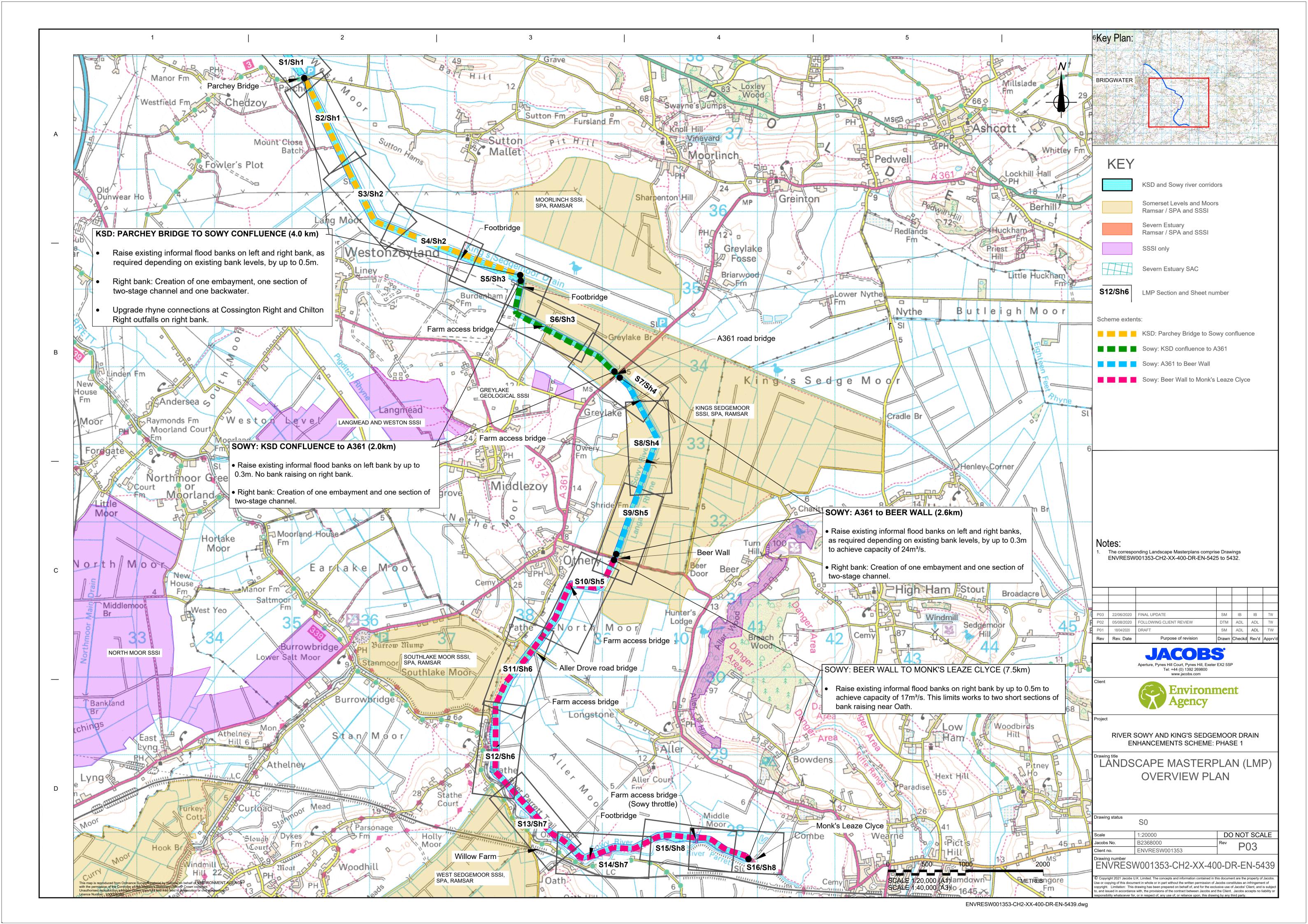
Taking into consideration the above points, and the anticipated impacts of the Scheme on the biological, physico-chemical and hydromorphological quality elements, the Scheme not only is unlikely to compromise progress towards achieving GEP or cause a deterioration of the overall ecological potential of the King's Sedgemoor Drain – Henley Sluice to mouth water body, it is also likely to actively support progress towards GEP. The aim of the Scheme is largely to improve the physical condition of an artificial system. This is dependent on the implementation of the design and construction of mitigation measures that are identified in this assessment. The overall design will improve overall WFD elements, and is being designed to specifically includes WFD benefits, such as variable channel widths and depths, two-stage channels and embayments for improved marginal habitat.

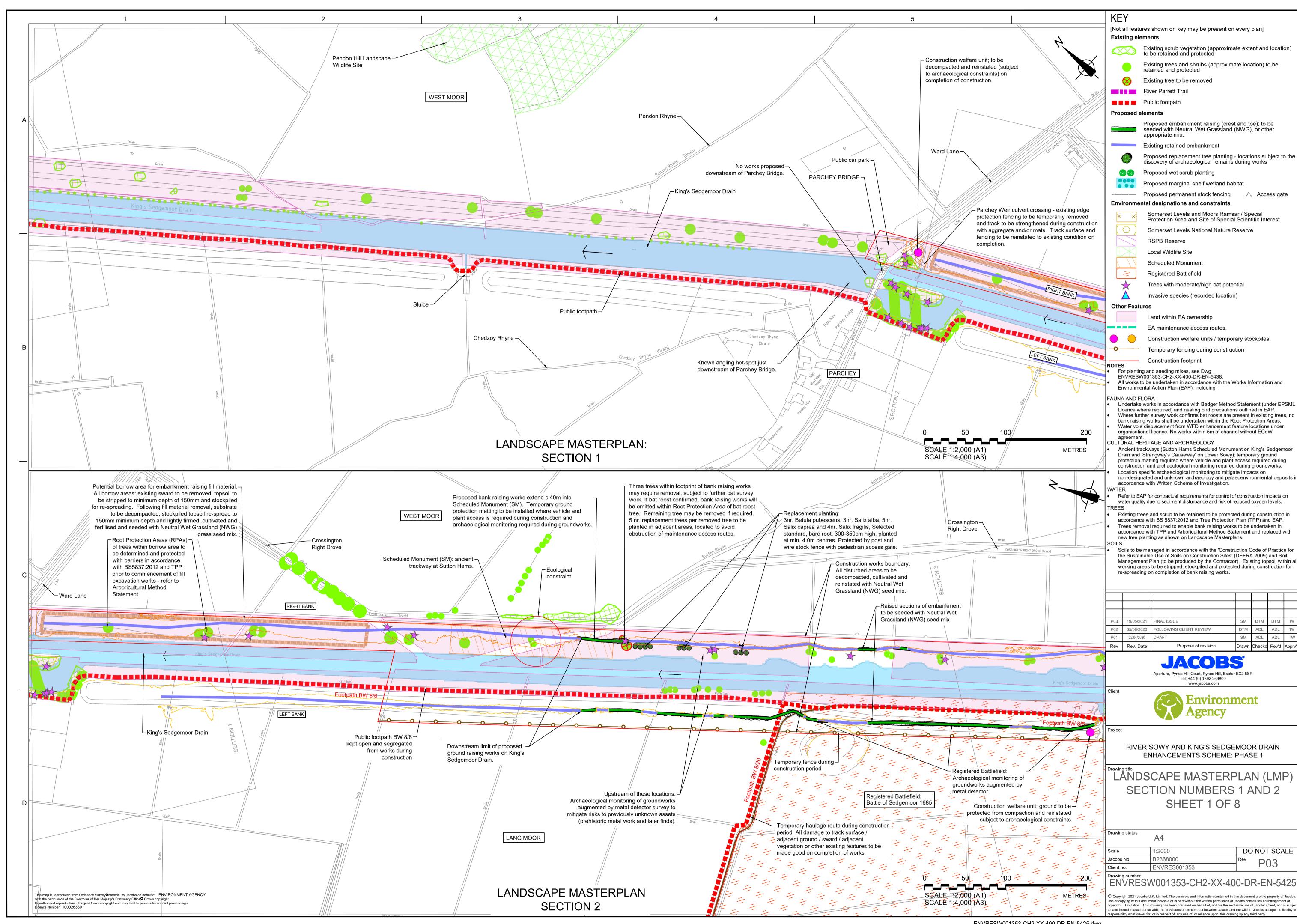
Table 8 Compliance of the scheme with the environmental objectives of the WFD

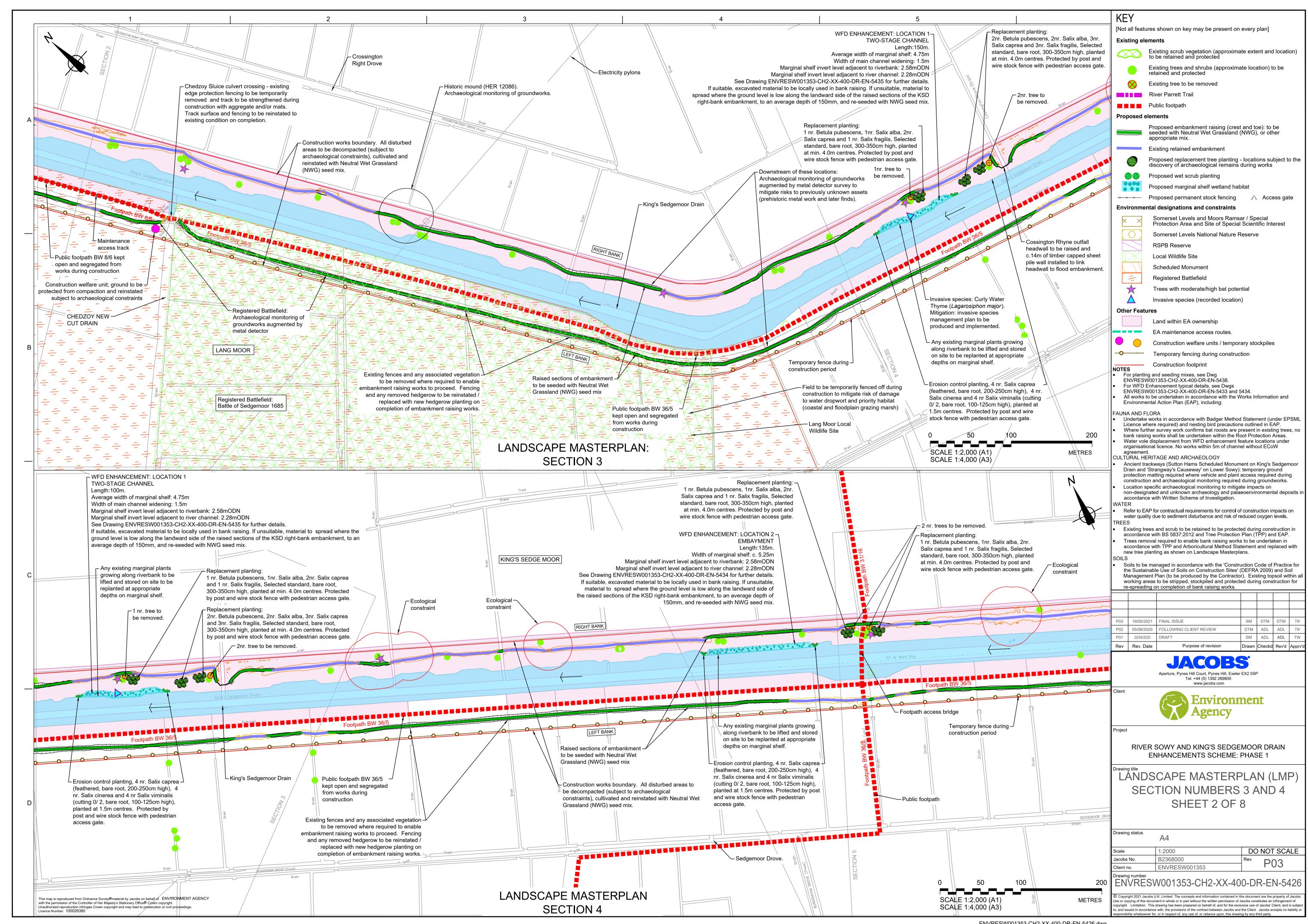
Environmental Objective	Scheme	Compliance with the WFD Directive
No changes affecting high status sites	part of the detailed	Yes. A HRA has been undertaken in support of
	compliance assessment,	the full Scheme. It

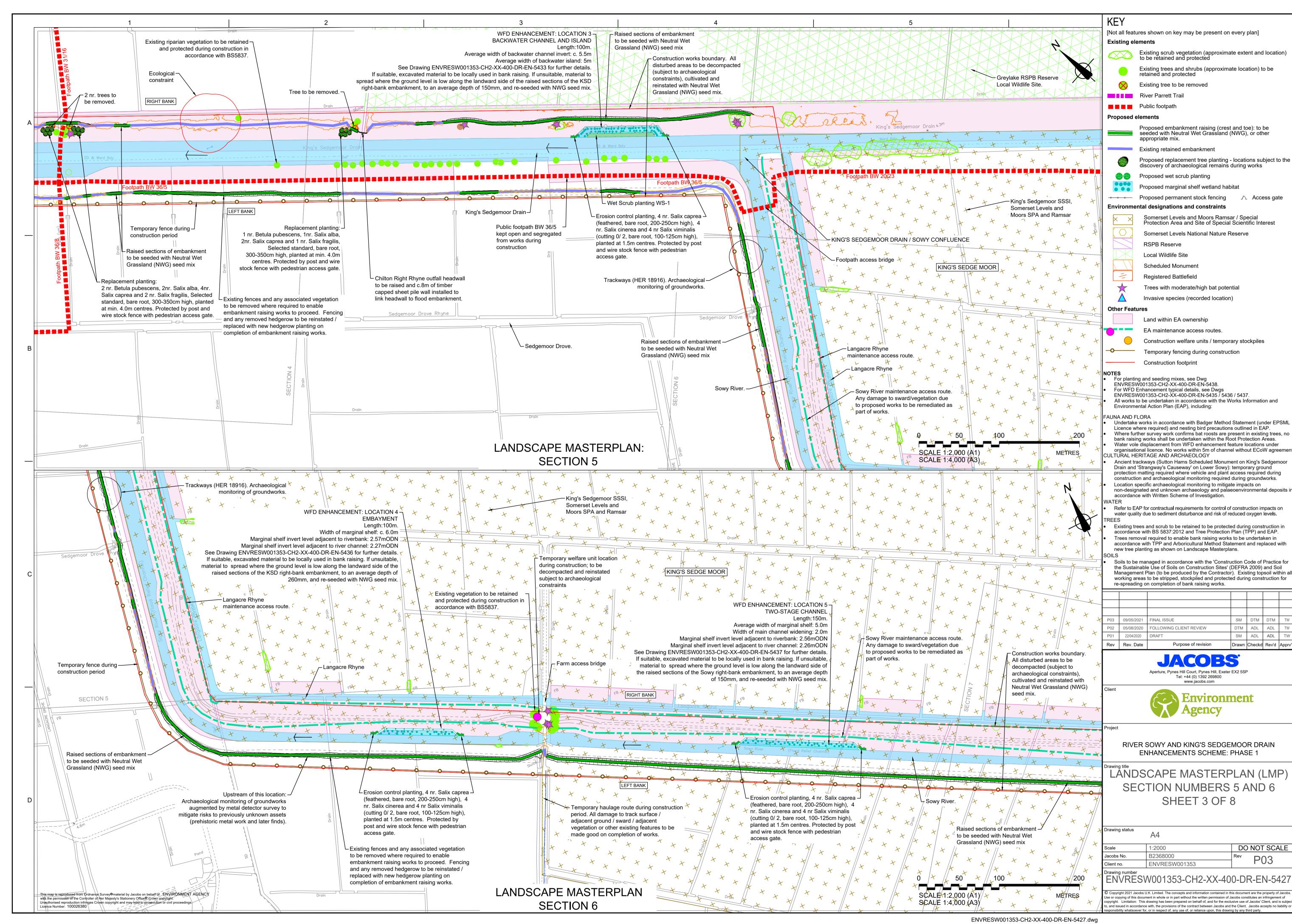
Environmental Objective	Scheme	Compliance with the WFD Directive
	none of the options considered will cause a change to the high-status sites in the study area if mitigation is put in place.	concludes that no adverse effects on the integrity of European sites would occur with the identified mitigation in place.
No changes that will cause failure to meet surface water good ecological status or potential or result in a deterioration of surface water ecological status or potential	After consideration as part of the detailed compliance assessment, the Scheme options will not cause deterioration in the status of the water bodies if mitigation is put in place.	Yes
No changes which will permanently prevent or compromise the Environmental Objectives being met in other water bodies	The Scheme options will not cause a permanent exclusion or compromise achieving the WFD objectives in any other bodies of water within the River Basin District.	Yes
No changes that will cause failure to meet good groundwater status or result in a deterioration groundwater status.	The Scheme options will not cause deterioration in the status of the of the groundwater bodies.	Yes

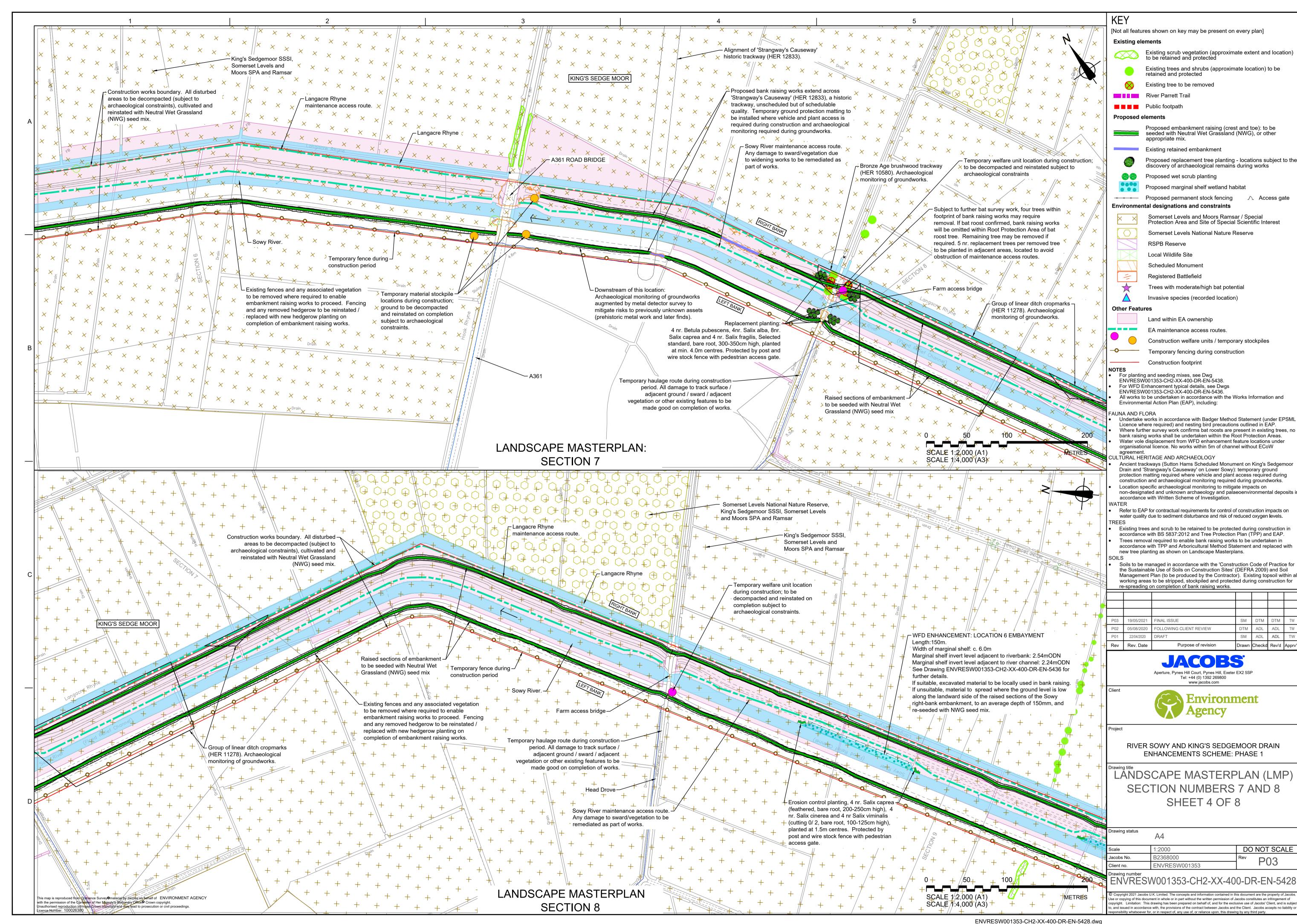
Appendix D Revised Landscape Masterplan (LMP)

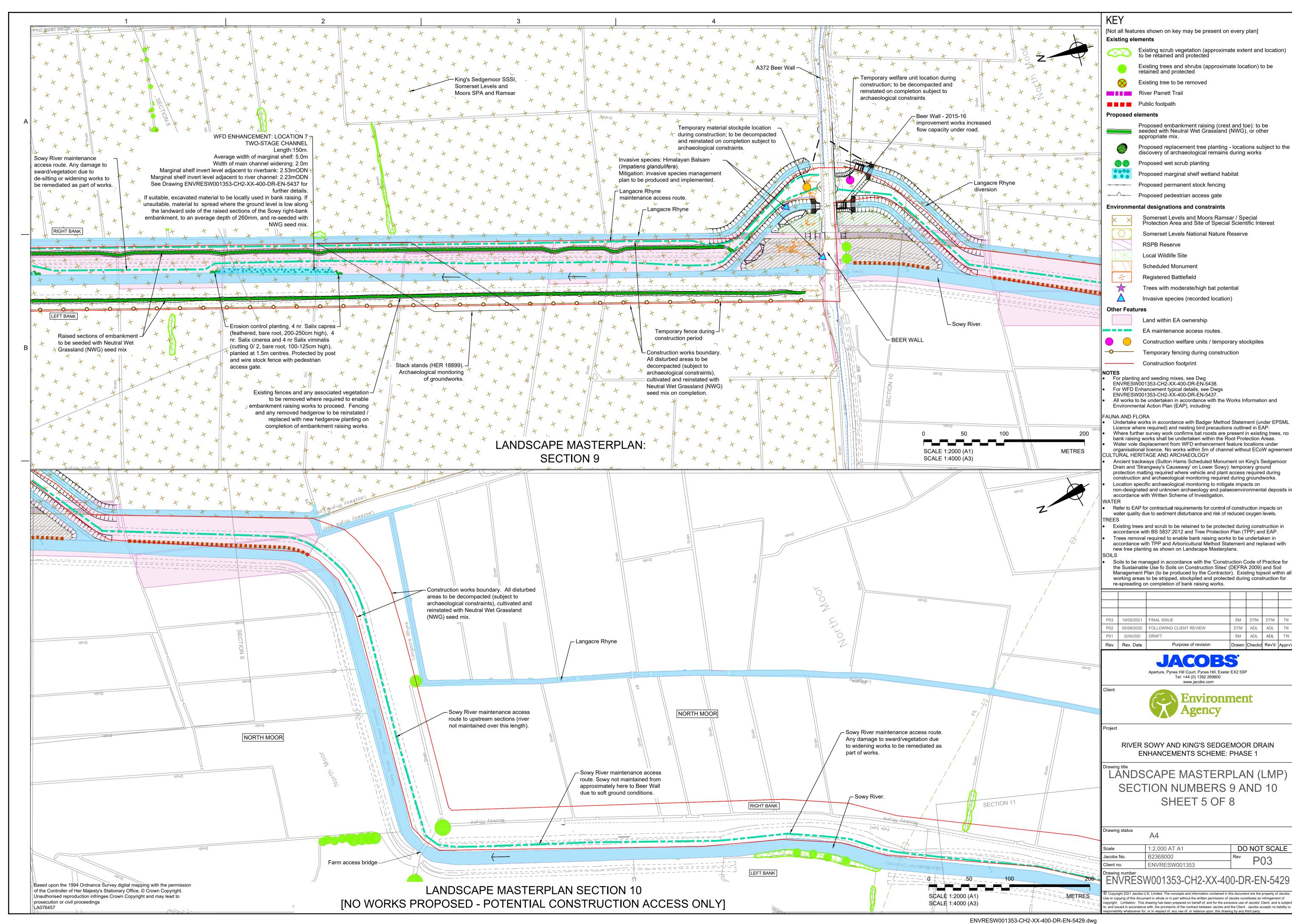


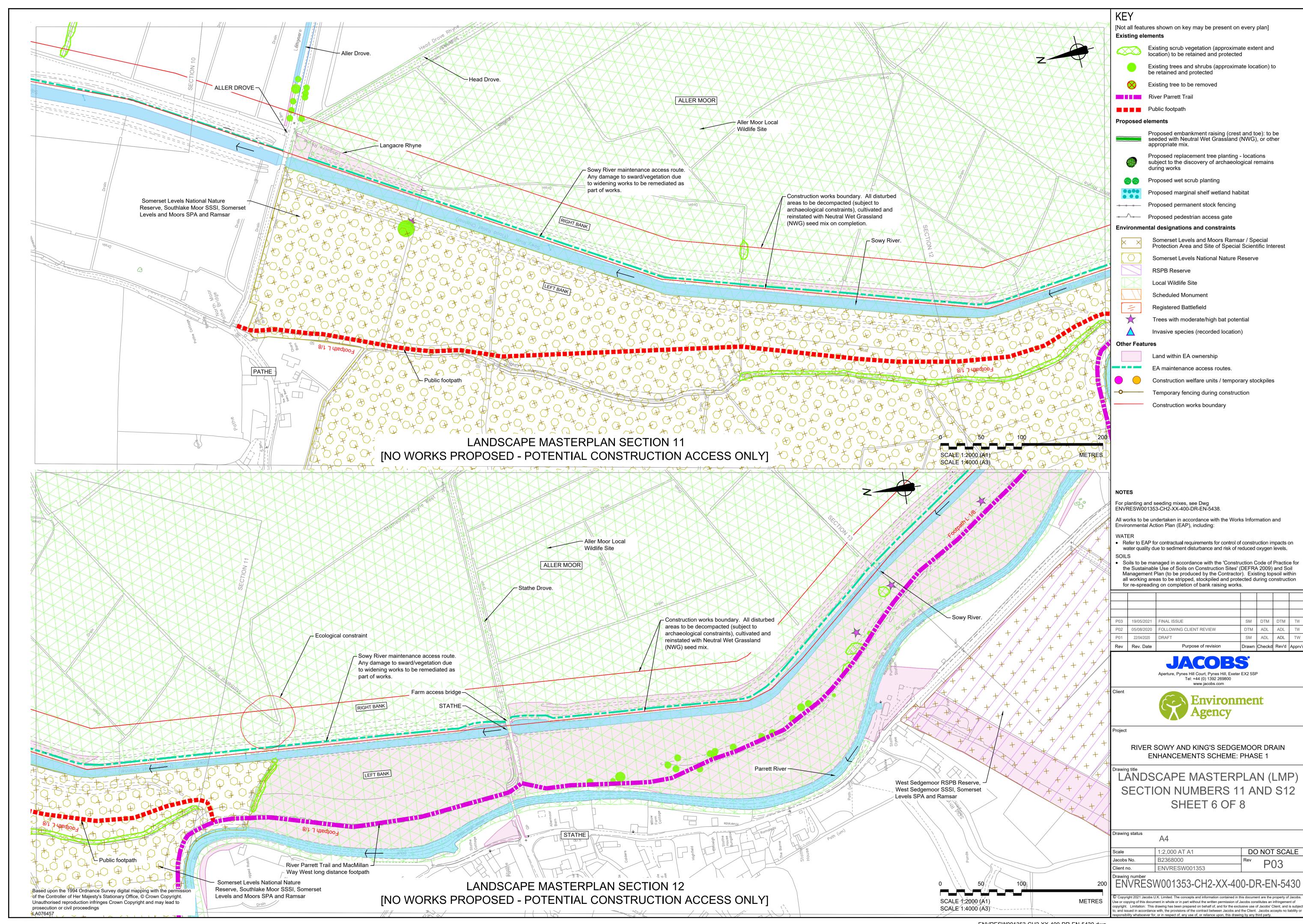


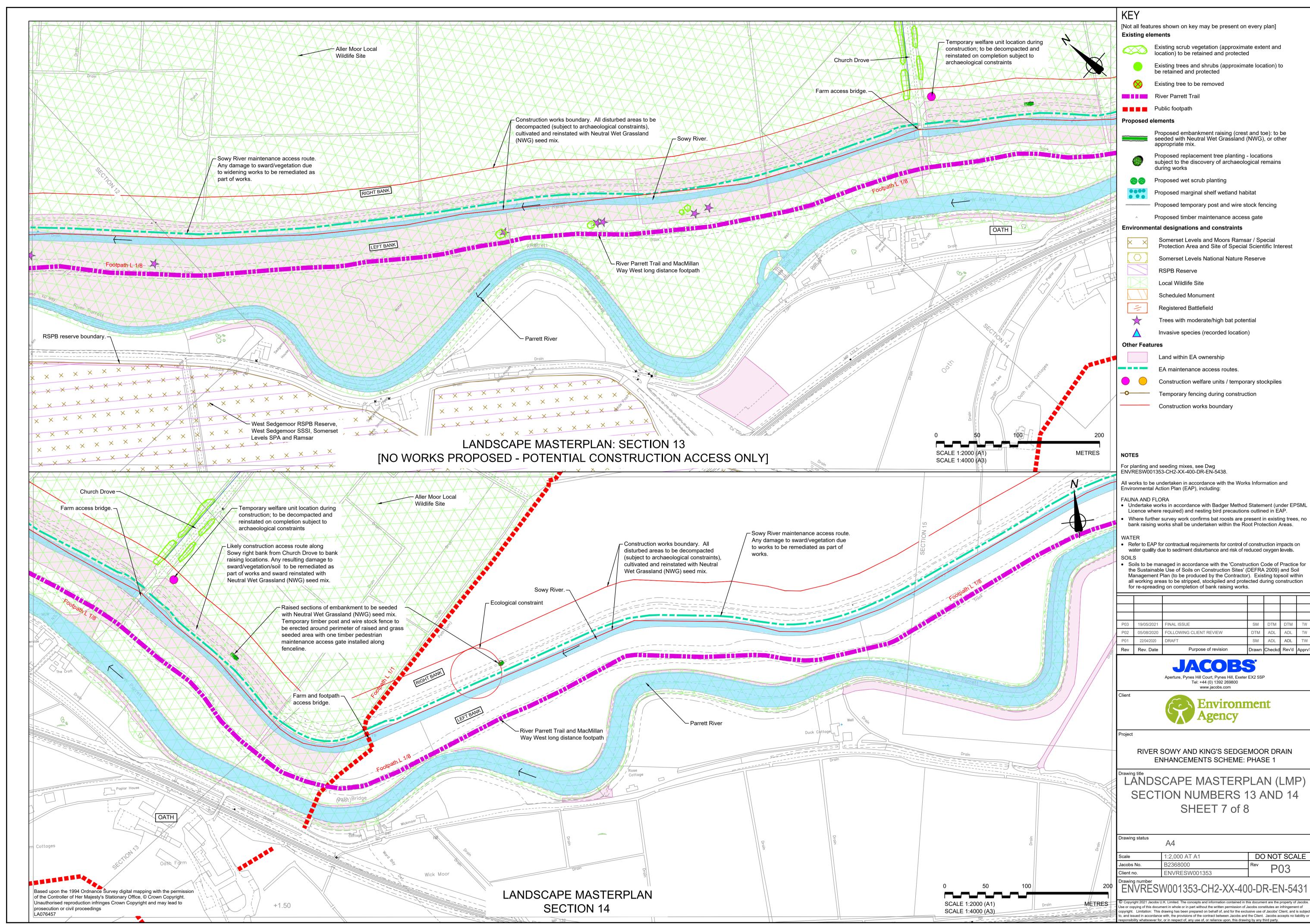






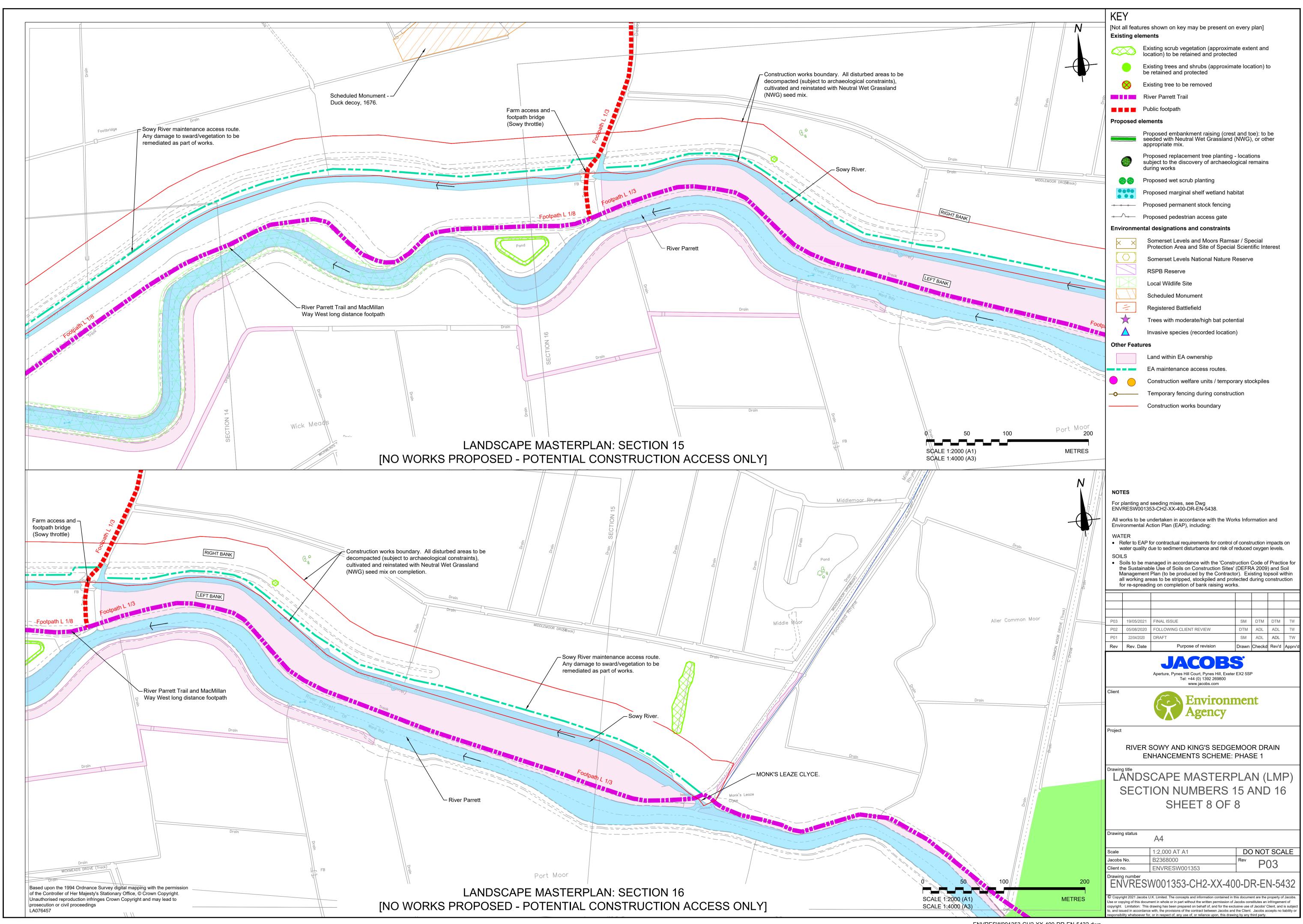


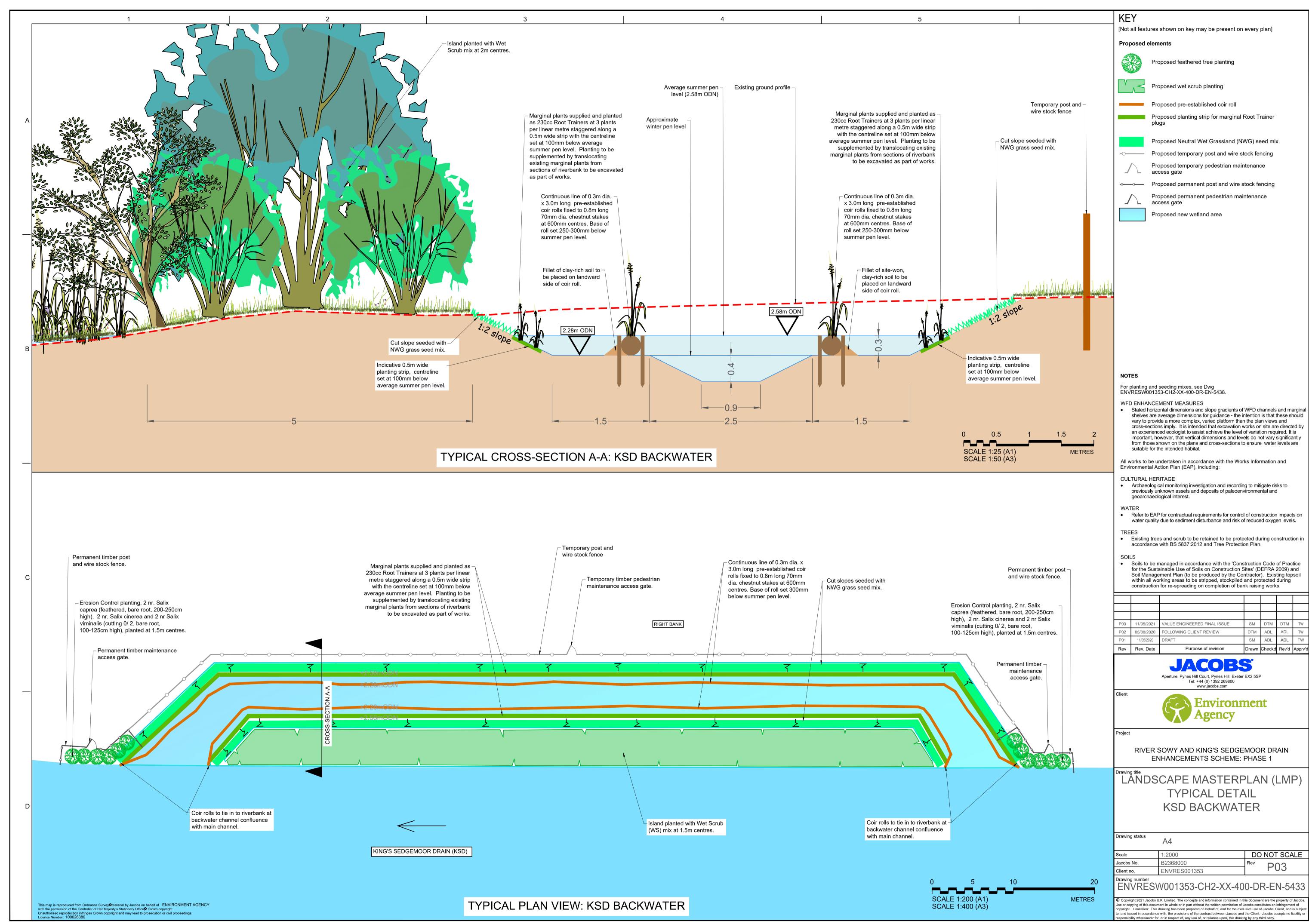


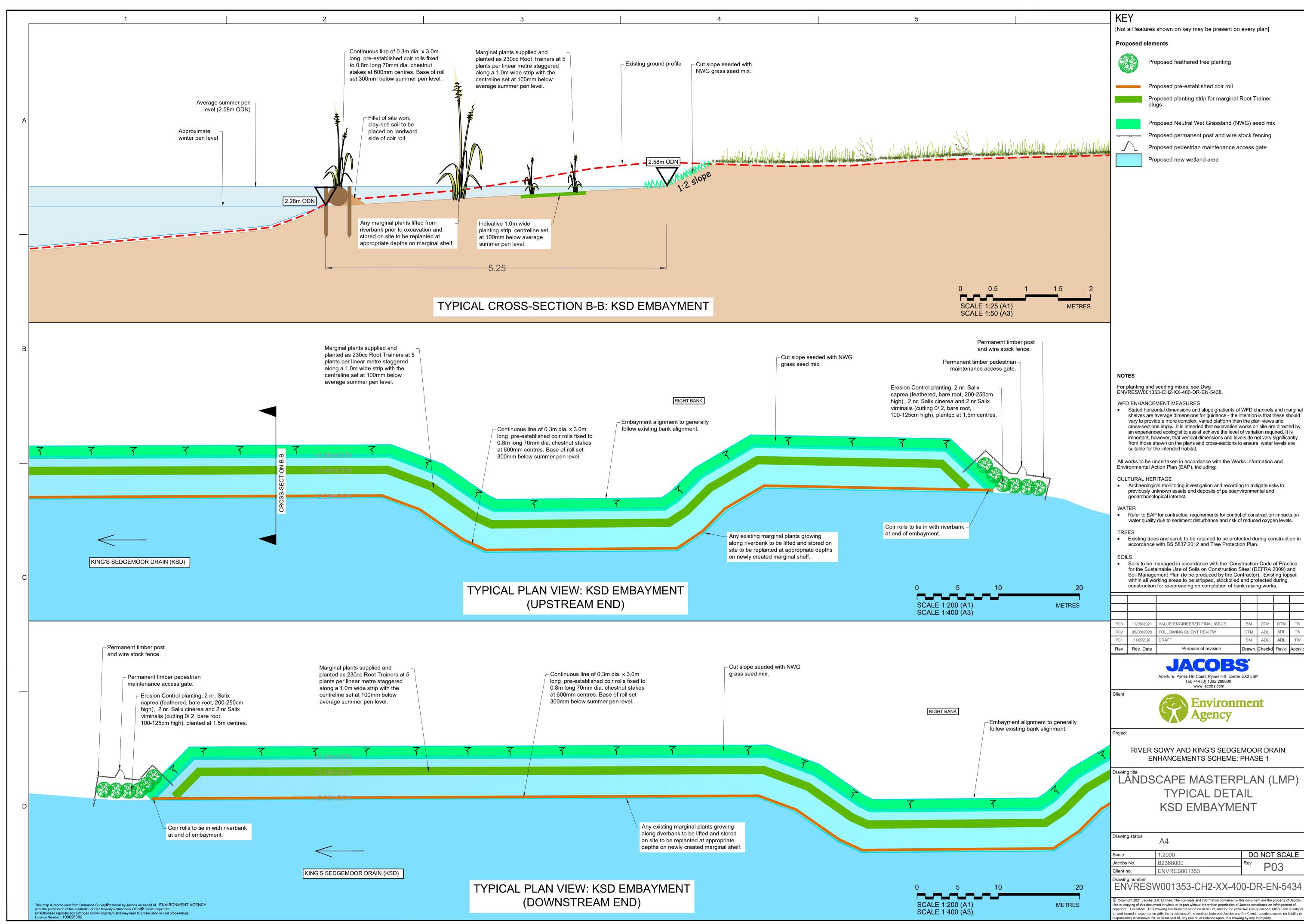


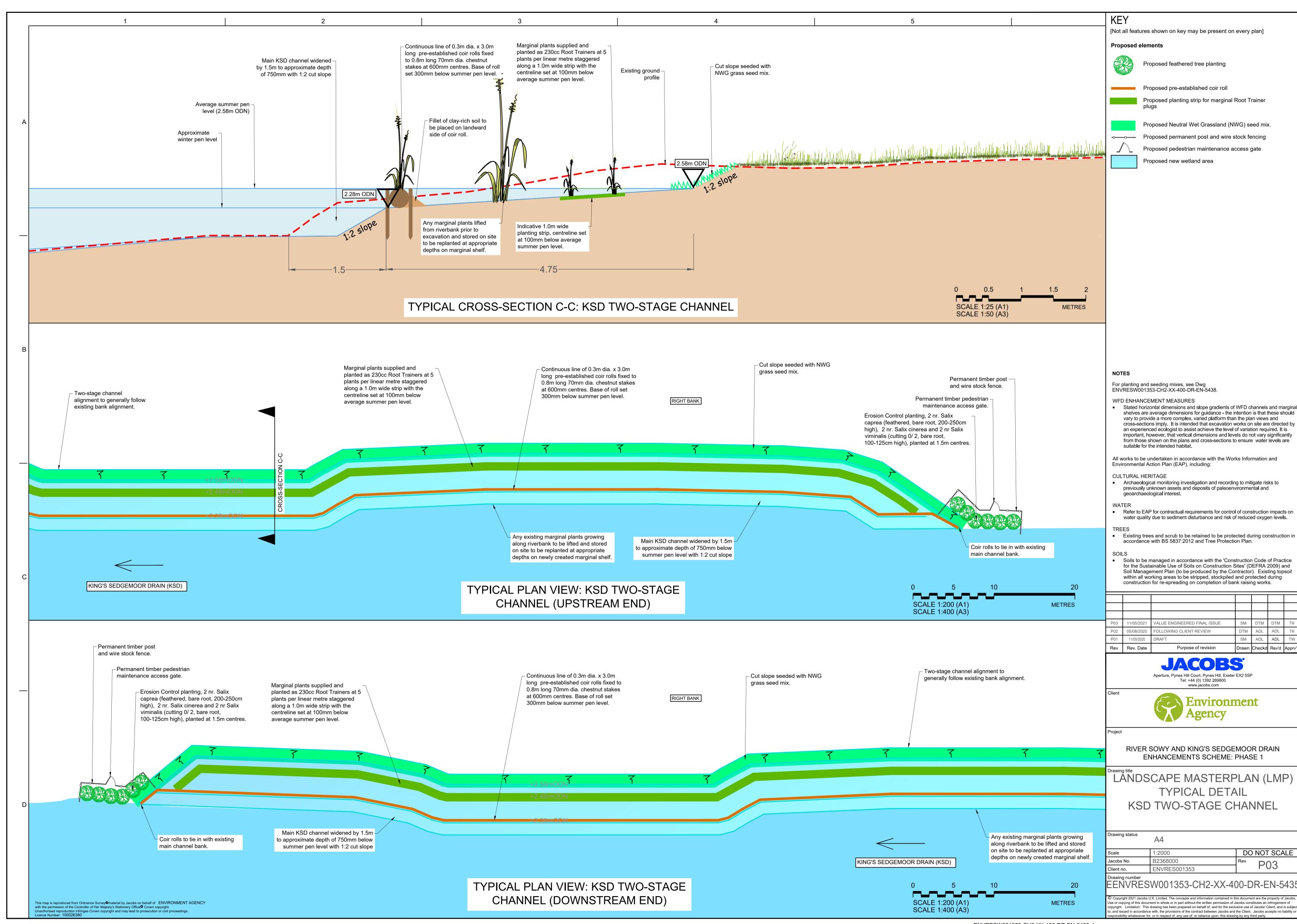
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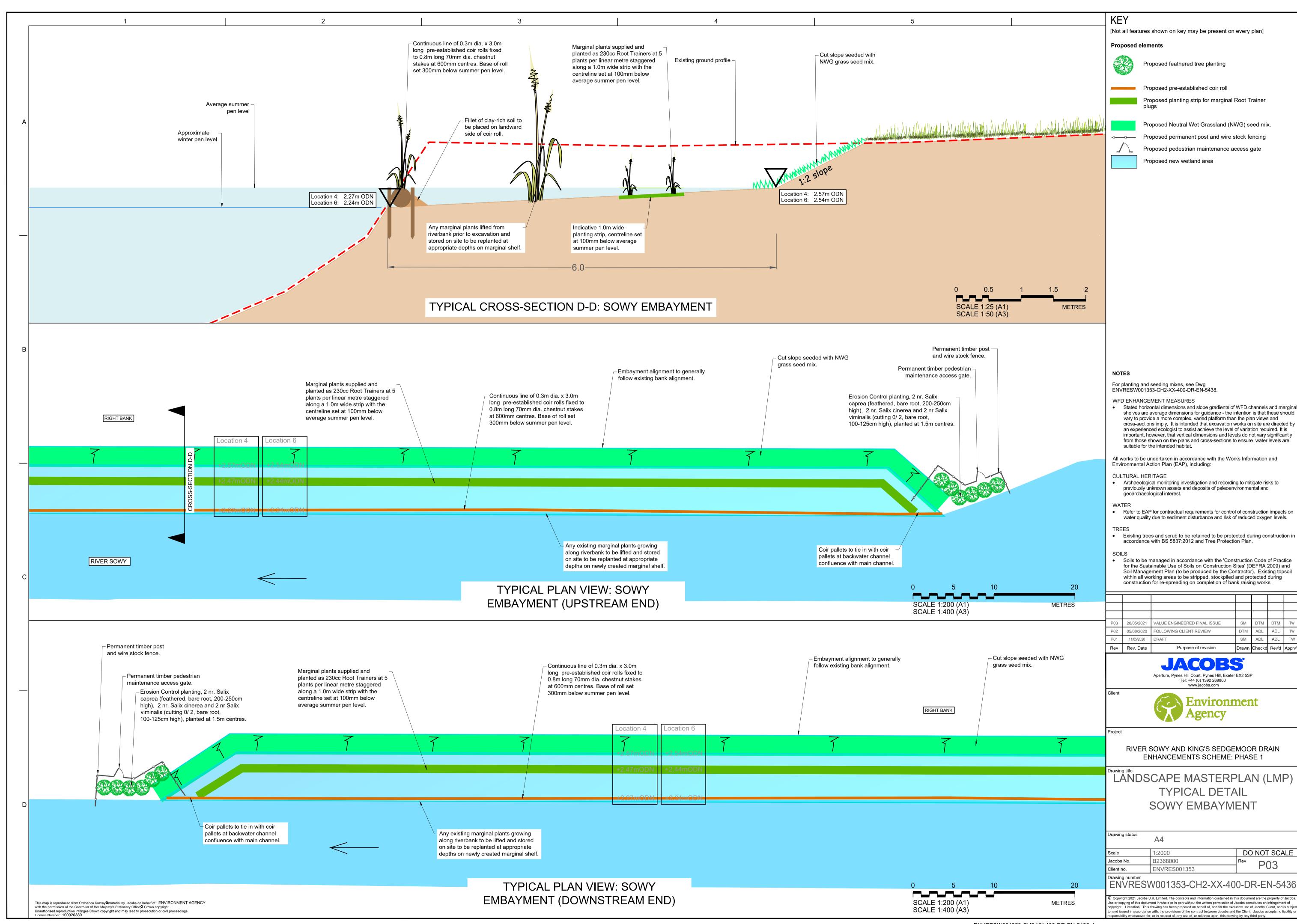
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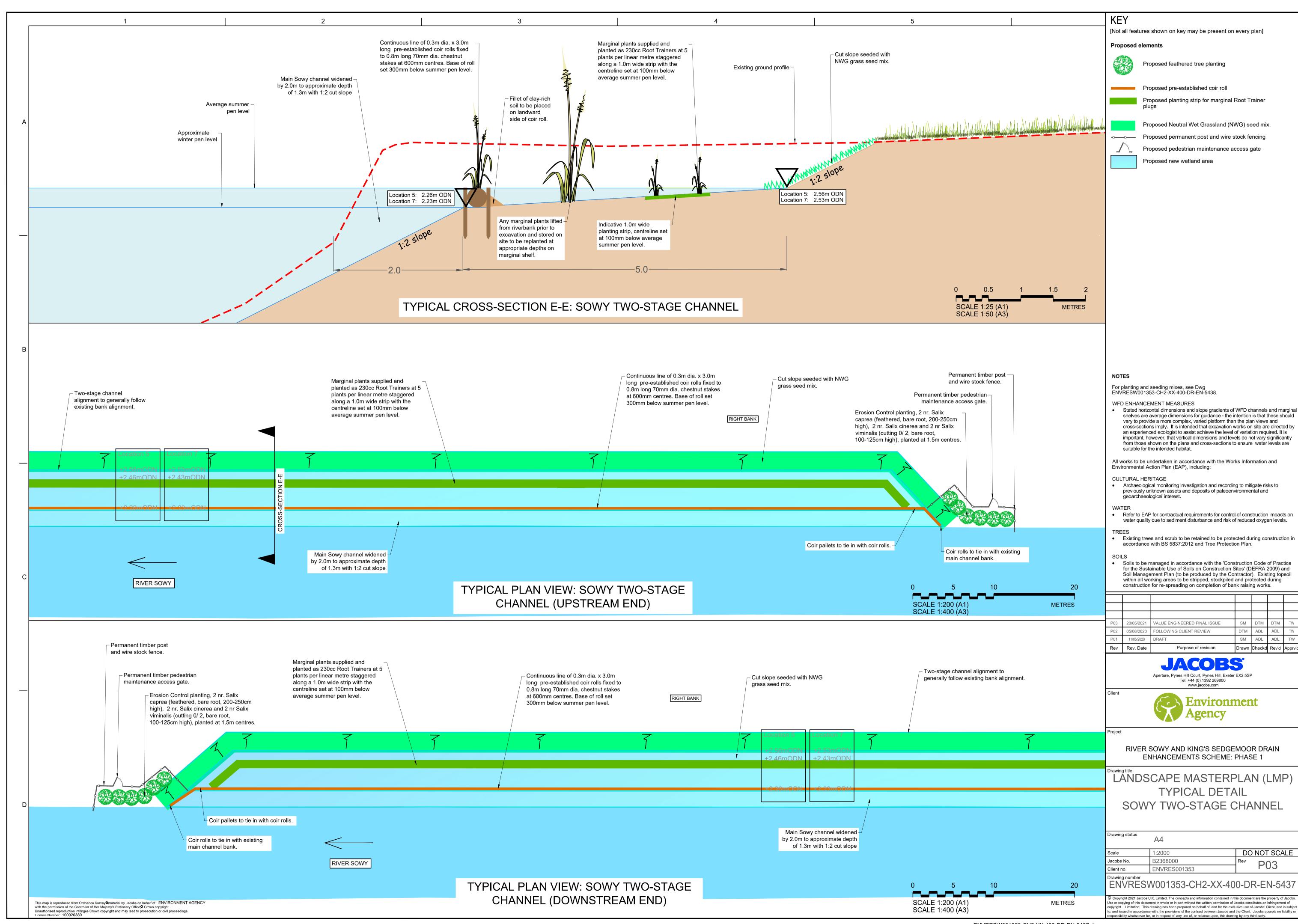












Wet Scrub Mix (WS) - erosion control and habitat creation on KSD backwater islands TOTAL AGE/CONDITION SPECIES SIZE GROUP % of WS-1 (cm) SIZE mix Betula pubescens 1+1 bare root transplant 40-60 5 to 15 20% 33 Crataegus monogyna 1+1 bare root transplant 40-60 3 to 10 15% Rosa canina 1+1 bare root transplant 40-60 1 to 5 5% Rubus fruticosus 0/1 bare root cutting 40-60D 1 to 2 5% Salix caprea 1+1 bare root cutting 40-60 5 to 15 20% 33 Salix cinerea 0/1 bare root cutting 60-80 5 to 15 15% Salix viminalis 0/1 bare root cutting 60-80 5 to 15 10% Sambucus nigra 1+1 bare root transplant 40-60 5 to 15 10% Total transplant numbers 167

Area of planting plots (square metres).

2

167

370

370

SPECIES	FORM	No. of times trans plante d	GIRTH SIZE (cm)	OVERALL HEIGHT (cm)	Clear Stem	Root Condition	Rootball/ Container Size (litres)	Min. no. of breaks	Total Nos.
Betula pubescens	Selected standard	2x	10 to 12	300-350	175-200	BR	113	4	13
Salix alba	Selected standard	2x	10 to 12	300-350	175-200	BR	₩.	4	13
Salix caprea	Selected standard	2x	10 to 12	300-350	175-200	BR	H 2	4	24
Salix fraglis	Selected standard	2x	10 to 12	300-350	175-200	BR	<u></u>	4	15
Total numbers	- 1.75		15	Ži	ů.		n.9	T:	65

Erosion control p 12 nr plants per W			y WFD E	nhancement	s				
SPECIES	FORM	times	GIRTH SIZE (cm)	OVERALL HEIGHT (cm)	Clear Stem	Root Condition	Rootball/ Container Size (litres)	Min. no. of breaks	Total Nos.
Salix caprea	Feathered	2x	_	200-250	-	BR		4	84
Salix cinerea	Cutting 0/2	2x	+	100-125	÷	BR	-	4	84
Salix viminalis	Cutting 0/2	2x	-	100-125	(A)	BR	-	3	84
Total numbers	(11)	.,		*		1	*	Tr.	252

Neutral Wet Grassland mix (Type 'NWG') - grass seed mix for for raised floodbanks, banks of new channels and reinstatement of working areas and haulage routes. Species listed as present within King's Sedgemoor SSSI Citation Numbers Species Composition Grams of seed Scientific Common (% by weight) per m2 7 Agrostis capillaris 5.0 0.4 Common bent Agrostis stolonifera 0.3 Creeping Bent 4.0 Crested Dogstail Cynosurus cristatus 20.0 1.4 Tufted hair-grass Deschampsia cespitosa 3.0 0.2 Meadow Fescue Festuca pratensis 0.6 8.0 Tall fescue Festuca arundinacea 0.3 4.0 Slender Creeping Red Fescue Festuca rubra spp. litoralis 16.0 1.1 Lolium perenne Perenial rye grass (low growing 12.0 0.8 non-agricultural var.) Westerwolds ryegrass Lolium multiflorum 28.0 2.0 100.00 Total 7.00

Scientific	Common	SIZE	% of	WFD	TOTAL						
		(cm)	mix	Location							
				1	2	3	4	5	6	7	
Carex acutiformis	Lesser pond sedge	_	20.0%	208	264	438	200	302	300	302	2014
Glyceria maxima	Sweet Reed Grass		20.0%	208	264	438	200	302	300	302	2014
Iris pseudocorus	Yellow flag iris	_	20.0%	208	264	438	200	302	300	302	2014
Lythrum salicaria	Purple Loosestrife	-	20.0%	208	264	438	200	302	300	302	2014
Phalaris arundinacea	Reed canary grass	-	20.0%	208	264	438	200	302	300	302	2014
			100.0%								
Total plant numbers				1040	1320	2190	1000	1510	1500	1510	10070
Length of coir roll				104	132	219	100	151	150	151	1007
No. of coir rolls				35	44	73	33	50	50	50	336

Scientific	Common	SIZE (cc)	% of mix	WFD Location 1	WFD Location 2	WFD Location 3	WFD Location 4	WFD Location 5	WFD Location 6	WFD Location 7	TOTAL
Alisma plantago-aquatica	Water plantain	230	10%	48	65	64	48	72	73	70	440
Caltha palustris	Marsh Marigold	230	10%	48	65	64	48	72	73	70	440
Carex acutiformis	Lesser Pond Sedge	230	10%	48	65	64	48	72	73	70	440
Iris pseudocorus	Yellow Flag Iris	230	10%	48	65	64	48	72	73	70	440
Juncus effusus	Soft Rush	230	10%	48	65	64	48	72	73	70	440
Lythrum salicaria	Purple Loosestrife	230	10%	48	65	64	48	72	73	70	440
Myosotis scorpiodes	Water Forget Me Not	230	10%	48	65	64	48	72	73	70	440
Phalaris arundinacea	Reed Canary Grass	230	10%	48	65	64	48	72	73	70	440
Ranunculus flammula	Lesser Spearwort	230	10%	48	65	64	48	72	73	70	440
Schoenoplectus lacustris	Common Club Rush	230	10%	48	65	64	48	72	73	70	440
-			100%								
Total plant numbers				480	650	640	480	720	730	700	4400
Plants per m2				5	5	6	5	5	5	5	
Planting area (m2)				96	130	106	96	143	145	143	859

HEDGEROW REINSTATEMENT Areas of hedgerow reinstatement to planted with matching species to those lost during the works, in agreement with the Contract Administrator. Hedgerow reinstatement to be planted as a staggered double row of 6 plants per linear metre; plants to be 40-60/60-80cm bare root transplants.

Rev	Rev. Date	Purpose of revision	Drawn	Checkd	Rev'd	Apprv'd
P01	11/05/2020	DRAFT	SM	ADL	ADL	TW
P02	05/08/2020	FOLLOWING CLIENT REVIEW	DTM	ADL	ADL	TW
P03	21/05/2021	VALUE ENGINEERED FINAL ISSUE	SM	DTM	DTM	TW

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RIVER SOWY AND KING'S SEDGEMOOR DRAIN **ENHANCEMENTS SCHEME: PHASE 1**

LANDSCAPE MASTERPLAN (LMP) PLANTING AND SEEDING SCHEDULES

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Appendix E Revised Landscape and Mitigation Management Plan (LMMP)

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River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1

Landscape Maintenance and Management Plan

ENVRES1001353-CH2-ZZ-400-PL-EN-1096 24th May 2021

Environment Agency





River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1

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Appendix A. Landscape Masterplans



Executive Summary

This Landscape Maintenance and Management Plan (LMMP) sets out the work requirements to enable successful establishment, future monitoring and efficient and effective maintenance works of the landscape works implemented as part of the River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1. It covers both the initial establishment aftercare and rectification period following implementation (to be undertaken by the Contractor), and subsequent longer-term management (to be undertaken by the Environment Agency Area operational team).



1. Introduction

This document covers the landscape maintenance and management operations required for the soft landscape elements associated with the River Sowy and King's Sedgemoor Drain Enhancements Scheme: Phase 1 engineering works over a 5-year establishment aftercare period following implementation, and subsequent long-term management. It should be read in conjunction with the Landscape Masterplan which comprises ten drawings that are included in Appendix A.

The LMMP incorporates all the elements of the planting and grass seeding works included in the Scheme and indicates the type of operation required and frequency of maintenance visits. Each element has a corresponding specification clause summarising the maintenance and management works as set out in Section 6 of this LMMP. Further reference should be made to the Landscape Specification for Landscape Works Implementation and Establishment Aftercare Works which provides detailed and full specification clauses for landscape maintenance works during the establishment aftercare period.

Sections 2 and 3 of the LMMP include a brief scheme overview and outline of the design and management philosophy of the various planting zones in the Scheme for those involved in the future management of the site that have not been involved during the design and construction phases.

Management responsibilities are set out in Section 4 to record the agreed transfer of responsibility from the Contractor following initial establishment maintenance to the Environment Agency. Any areas of management responsibility still to be agreed at the time of issue are highlighted and management plan will be updated as appropriate as and when notable changes occur.

Details of plant and grass species and nursery stock specifications are included on the Landscape Masterplan drawing number ENVRESW001353-CH2-XX-400-DR-EN-5438 included in Appendix A.



2. Scheme overview

2.1 The existing site and context

The Sowy and King's Sedgemoor Drain (KSD) corridor is in the Somerset Levels and Moors, part of the coastal plain and wetland area which contains the Parrett catchment. The Sowy and KSD are man-made embanked flood relief channels, which carry excess water from the Parrett.

The Levels and Moors are the largest area of lowland wet grassland and associated wetland habitat remaining in Britain, covering about 60,000 hectares in the floodplains of the rivers Axe, Brue, Parrett, Tone and their tributaries. As such, the area has several international ecological designations such as the Somerset Levels and Moors Special Area of Conservation (SAC), Somerset Levels and Moors Special Protection Area (SPA) and Somerset Levels and Moors Ramsar site. The majority of the area is only a few metres above mean sea level. This is a landscape of rivers and wetlands, artificially drained, irrigated and modified to allow productive farming.

The Sowy/KSD corridor is approximately 21km long, mostly comprising agricultural land with a relatively low density of residential properties, and several access roads across the associated river corridor. Land towards the western (downstream) end of the Sowy system and its confluence with the KSD has a number of international nature conservation designations, principally due to wetland habitat value and overwintering birds.

Originally built in the 1960s, the Sowy acts as a flood water relief channel for the Parrett, joining it to the KSD. The Sowy and KSD take diverted water from the Parrett downstream from Langport, discharging into the tidal section of the Parrett at Dunball downstream of Bridgwater. This creates capacity in the channel of the Parrett so that more flood water can be pumped from the moors, reducing the extent and duration of flooding across a wide area.

When the Parrett reaches a pre-determined operational level, water flows over spillways near Langport (Aller Moor and Beazley's Spillways) and into the Sowy which conveys it to the KSD. Water can also be actively diverted from the Parrett into the Sowy via the Monk's Leaze Clyce – a sluice near Aller and Langport.

There are no statutory landscape designations within 1km of the study area.

2.2 The proposed scheme

The Proposed Scheme aims to reduce the flood risk from the Parrett to people and properties in the Somerset Levels and Moors downstream of Langport, via increased high flow conveyance down the River Sowy and the KSD

Phase 1 of the River Sowy and King Sedgemoor's Drain Enhancements Scheme (referred to as the Scheme) focusses on capacity enhancements between Monk's Leaze Clyce on the Sowy and Parchey Bridge on the KSD. These include:

- (i) raising existing flood embankments adjacent to the Sowy and KSD where these are low;
- (ii) channel 'widening' through the creation of seven Water Framework Directive (WFD) enhancement features (three embayments, three lengths of two-stage channel and one back water); and
- (iii) raising the headwall of two existing water control structures on the KSD (Cossington Right Outfall and Chilton Right Outfall) and replacement of the existing sheet piled wing walls.



3. Landscape design and management

3.1 Landscape works proposals

The planting design aims to assist to integrate the proposed works into the existing landscape and provide long-term, low-maintenance native tree and scrub cover on the backwater island, tree planting on the banks of the KSD and Sowy at appropriate locations, marginal wetland habitat within the WFD enhancement features and grassland on the raised flood embankments which reflect the existing vegetation and habitat types.

The combined planting and seeding works are required to mitigate vegetation losses likely to occur during the construction of the required flood defence improvement works. They include replacement tree planting and the restoration of a grass sward with an erosion control function on the raised flood embankments. The provision of new marginal wetland and wet scrub habitat associated with the WFD enhancement features will provide additional environmental improvements.

All the combined landscape elements will contribute to improving biodiversity and enriching landscape character and visual amenity.

The implementation of the proposed landscape works shall be undertaken by the Contractor via the appointment of a landscape sub-contractor registered with the British Association of Landscape Industries (BALI).

3.2 Landscape management and maintenance proposals

Following completion of the landscape implementation works, the landscape works shall be maintained and managed by the Contractor via the appointed landscape sub-contractor who undertook the implementation works, for the duration of an establishment aftercare / maintenance period which will coincide with the rectification or defects period. The length of the establishment aftercare / maintenance / rectification period is as follows:

- 1. All grass seeding works: 18 to 24 months following Practical Completion of seeding depending on how long the seeded sward takes to establish sufficiently to enable the grassland to be returned to full grazing.
- 2. Marginal planting works associated with the WFD enhancement features: 12 months following Practical Completion of marginal planting.
- 3. Tree planting works: 60 months following Practical Completion of planting.
- 4. Wet Scrub planting works on backwater islands: 0 months. Wet Scrub planting will not be maintained following the implementation works in order to minimise disturbance of these wildlife refuges.

Practical Completion for grass seeding works shall be defined as when all seeding works are fully completed, seed germination is complete and satisfactory, the sward is free of all weeds and the sward has been subject to two initial grass cuts (see specification for details).

Practical Completion for planting works shall be defined as when all planting works are fully completed, all planting stock is healthy and correctly located and all planting areas shall be weed free and in a clean and tidy condition.

These seeding and planting implementation and management / maintenance works shall be undertaken as set out below.



3.3 Grass seeding

Upon completion of the flood embankment re-profiling and raising works and WFD enhancement features excavation works, the following areas will be seeded with the following seed mixes after pre-seeding preparatory works (including weed control and cultivation):

- a) Along the KSD, the raised flood embankments, (totalling approximately 2.82ha), will be seeded with a bespoke neutral wet grassland (NWG) mix containing 100% grass species with a soil-stabilising function.
- b) Along the Lower Sowy, the raised flood embankments (totalling approximately. 3.83ha), will be seeded with the NWG mix containing 100% grass species with a soil-stabilising function.
- c) Newly created channel banks associated with the WFD enhancement features and any maintenance access routes which require creation or reinstatement will be subject to pre-seeding preparatory works and seeded with the NWG mix, as above.
- d) All working areas, haul routes and other areas disturbed during construction which comprised grassland prior to the commencement of the works will be subject to pre-seeding preparatory works and seeded with the NWG mix, as above.

3.3.1 Maintenance of grassland during the grassland establishment aftercare / maintenance period

The duration of the proposed establishment aftercare / maintenance period for grassland shall comprise a period of **eighteen to twenty-four months** following Practical Completion of seeding, depending on how long the seeded sward takes to establish sufficiently to enable the grassland to be returned to full grazing. If, after the first 18 months, the sward is sufficiently established to enable a return to full grazing and is a condition acceptable to the Environment Agency and other respective landowners, a shorter establishment aftercare / maintenance period may be agreed with the Environment Agency. Otherwise, the period shall extend to cover twenty-four months. During establishment aftercare / maintenance period, however long it is, all grass seeded areas and any existing grassland areas within the temporary protective fencing erected to protect newly seeded areas shall be maintained by the Contractor as follows:

Grass cutting

Newly seeded areas

In the first year after sowing, following two initial establishment cuts to be undertaken after seeding and germination, the newly seeded grassland areas (comprising the raised flood embankments and reinstated working areas and haul routes) shall be subject to 5 cuts evenly spread out through the growing season (e.g. cuts in April, May/June, July, August and October, assuming an autumn sowing in the previous year). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.

In the second year after sowing, the newly seeded grassland areas (comprising the raised flood embankments and reinstated working areas and haul routes) shall be subject to 3 cuts evenly spread out through the growing season (e.g. a spring cut in April, a main hay cut in late July/ early August and an autumn cut in October). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed. Should the grassland be sufficiently established to enable a return to grazing after 18 months or more, the second year cuts should be omitted as appropriate.

In subsequent years (year 3 onwards), it is expected that the grassland areas will be managed by grazing, but should this not happen, then the grassland areas should be cut as per the second year.



Areas of existing grassland

Grassland areas on the:

- Left banks of the KSD and Sowy between the temporary protective fencing and the river channels;
- Right bank of the KSD between the river channel and the drain which runs parallel to the KSD some 30m away;
- Grassland areas on the right bank of the Sowy between the river channel and the Langacre Rhyne

shall be subject to 3 cuts evenly spread out through the growing season (e.g. a spring cut in early April, a main hay cut in late July/ early August and an autumn cut in October) throughout the one to two-year establishment aftercare / maintenance period. The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.

In subsequent years (year 3 onwards), it is expected that the grassland areas will be managed by grazing, but should this not happen, then the grassland areas should be mown as per the second year.

All grassland areas

Mown clippings shall be boxed or raked up and disposed of a suitable composting facility or, where suitable, may be dried and baled as hay. Prior to cutting, areas to be cut shall be checked for ground nesting birds by an experienced ecologist and cutting delayed in areas where nesting birds are present, until the end of the nesting season (March to August inclusive).

Weed control

Grassland shall be maintained substantially free of broad leaved, injurious and invasive weeds by the application of a suitable herbicide by spot treatment or weed wiping or removal by hand. Injurious weeds are those listed in the Weeds Act 1959 and Wildlife and Countryside Act 1981 and include the following: spear thistle, creeping or field thistle, curled dock, broadleaved dock and common ragwort. Invasive weeds include giant hogweed, Himalayan balsam and Japanese knotweed. However other weeds which threaten infestation and / or disfigure the sites appearance may also be targeted including, but not necessarily restricted to; stinging nettle, fat hen, redshank, volunteer oil seed rape, gorse, rush and bramble.

Other operations

Stone picking, rolling, scarifying, harrowing, hollow tining, levelling, surface decompaction, fertiliser application and pest control to be undertaken if required and as directed by the Site Supervisor to maintain the health and growth of the sward.

Protection fencing of newly seeded areas

Newly seeded areas on the left bank of the KSD and Lower Sowy will be protected from grazing stock by the retention of temporary stock proof fencing installed at the commencement of construction. In addition, the two small areas of bank raising on the Upper Sowy near Oath will be protected from grazing stock by the erection of temporary stock proof fencing installed on completion of the bank raising works. Temporary stock proof fencing shall be retained and maintained until such time as the sward is considered sufficiently established to withstand a return to grazing. This may be up to two years after seeding. During this period, the temporary protective fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times. Temporary protective fencing will not be required on the right banks of the KSD and Lower Sowy because grazing will cease on the right bank from the commencement of construction until such time as the sward is considered sufficiently established to withstand a return to grazing. This may be up to two years after seeding to protect newly seeded areas from stock shall be maintained throughout the maintenance period.



At the end of the proposed two-year establishment aftercare / maintenance period (or earlier if it is agreed that the sward is sufficiently well established to resume grazing), it is intended that the seeded grass areas will be handed over to the respective landowners (private landowners and the Environment Agency) for on-going management, which is most likely to be by grazing. At this point, the temporary stock proof fencing along the left banks of the KSD and Sowy and around the two areas of bank raising on the Upper Sowy shall be removed by the Contractor.

3.4 Marginal wetland habitat

Upon completion of WFD enhancement features excavation works, all newly created marginal shelves on the embayments, two-stage channels and the backwater channel will be planted with appropriate marginal wetland species introduced by:

- a) Installing pre-vegetated coir rolls along the riverside edge of the marginal shelves in the embayments and two-stage channels and along the new channel edge of the marginal shelves in the backwater channel:
- b) Planting marginal wetland plug plants (230cc root trainers) in a one metre wide strip closer to the landward edge of the marginal shelves in the embayments and two-stage channels and in a 0.5m wide strip along the marginal shelves in the backwater channel;
- c) Re-planting any existing marginal plants (lifted from the channel edges at WFD enhancement locations prior to excavation and stored on site in suitable locations) on the newly created marginal shelves.

The planted wetland plants shall not be protected from bird predation by the installation of temporary protective post and wire mesh fencing for the duration of the establishment aftercare period. Protective fencing was initially proposed but has since been omitted from the works in order to save costs.

Planting will be also undertaken at WFD enhancement feature locations, comprising erosion control willow planting at both ends of all backwaters, embayments and sections of two-stage channels and wet scrub planting on the two backwater islands. These are covered in more detail in Sections 3.5 and 3.6 below.

3.4.1 Maintenance of marginal wetland and associated planting during the marginal planting establishment aftercare / maintenance period

Wetland habitat established by means of the installation of pre-vegetated coir rolls, the planting of wetland marginal plug plants, the translocation of existing vegetation from within the construction area and natural regeneration will rely on establishment maintenance initially with monitoring and management to ensure preferred habitat develops throughout these areas. By simple management during the establishment of vegetation cover, species prevalent within the existing site will be encouraged to develop, providing ecological benefit by reducing the number of undesirable species brought into the site.

For the duration of the proposed establishment aftercare / maintenance period for marginal planting, which shall comprise a period of **one year** following Practical Completion of planting all marginal planting areas shall be maintained by the Contractor as follows. All maintenance works in wetland areas shall comply with the required biosecurity measures as specified in Specification clause Q35/875.

3.4.1.1 Weed control

Wetland areas, including the pre-vegetated coir rolls and pallets, shall be regularly inspected for and maintained free of injurious and invasive weeds by hand pulling, digging out of roots or by herbicide application¹, depending on the species. Injurious weeds are those listed in the Weeds Act 1959 and Wildlife and Countryside Act 1981 and include the following: Parrots feather, Himalayan balsam, Japanese knotweed, *Crassula helmsii*, Floating pennywort and Water fern. However other plant species which threaten infestation and / or disfigure the sites appearance may also be targeted including, but not necessarily restricted to; *Typha latifolia*, docks, creeping and



spear thistle. Physical techniques are often inadvisable for non-native invasive species and the control method should be selected in accordance with the Environment Agency document "Managing invasive non-native plants" (April 2010 https://www.gov.im/media/62585/ea_invasive_plants.pdf).

All plant debris must be removed from the water or surface of the marginal area after any cutting operations. Advice should be sought from the Environment Agency on the disposal of non-native invasive plant arisings as these may be considered 'controlled waste'.

3.4.1.2 **Pruning**

Wetland plants shall be pruned as required to remove dead, damaged or diseased material to promote healthy growth and natural shape. Cut ends exceeding 25mm diameter shall be dressed with fungicidal sealant.

3.4.1.3 Other operations

Wetland areas shall be kept clear of litter and artificial debris. Coir roll stakes shall be checked for integrity and firmness. Any tree or shrub species that start to grow in the marginal wetland areas shall be removed by hand-pulling, digging up or by suitable herbicide application¹ (ensuring that the work is undertaken by competent operatives from a safe and secure access point), and in accordance with clause Q35/125 of the *Landscape Specification for EA Landscape Works Implementation and Maintenance Works*.

3.4.1.4 Bird protection fencing

As stated above, no fencing to protect marginal planting from bird predation is proposed. However, should levels of bird predation prove to be such that temporary protective fencing is required to be installed at a later stage, any installed fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

At the end of the proposed one-year establishment aftercare / maintenance period when it is intended that the wetland areas will be handed over to the Environment Agency for on-going management, a decision will be made to either remove any installed fencing or delay its removal until such time as the marginal planting has established sufficiently to be able to withstand bird predation.

3.5 Wet scrub

The backwater islands will be planted with appropriate wet scrub species to provide biodiversity habitat value for a range of species and to assist with long-term stabilisation of the banks. The wet scrub species (**WS** mix) will comprise Betula pubescens, Crataegus monogyna, Rosa canina, Rubus fruticosus, Salix alba, Salix caprea, Salix cinereal and Sambucus nigra.

3.5.1 Maintenance of wet scrub planting during the planting establishment aftercare / maintenance period

To prevent disturbance of these wildlife refuge areas and to avoid the safety risks involved in accessing the islands, the wet scrub planting will not be subject to maintenance works following planting. All wet scrub plants will be fitted with a fully biodegradable mulch mat on planting which will provide weed control benefits for a period of up to 36 months. No rabbit guards or shelters will be fitted unless the islands are planted in advance of the excavation of the backwater channels, in which case spiral rabbit guards will be temporarily fitted until the completion of the backwater channel excavation works.

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¹ Use of herbicide in or near water will require prior agreement from the Environment Agency and must be carried out by a suitably skilled, qualified and knowledgeable person. https://www.gov.uk/government/publications/application-to-use-herbicides-in-or-near-water



3.5.2 Scrub planting protection fencing

Wet scrub planting shall be protected from damage from grazing stock by temporary post and wire stock proof fencing erected on the landward side of the backwater channel. The fencing and the associated pedestrian maintenance access gate shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times. The fencing shall be retained in place until the scrub planting is considered sufficiently mature to withstand damage from grazing stock, at which time it should be removed. Unless otherwise agreed with the Environment Agency, the temporary fencing and associated pedestrian access gate should be removed 5 years after the completion of the works and taken to suitable recycling facility.

3.6 Tree planting

Tree planting will be undertaken as follows:

- a) Replacement tree planting for trees removed to accommodate the proposed flood embankment raising works. This comprises the planting of 65 nr. bare-root Selected standard trees, 10 to 12 girth size, in a number of locations adjacent to the KSD and Lower Sowy. Species comprise *Betula pubescens*, *Salix alba*, *Salix caprea* and *Salix fragilis*.
- b) A variety of willow species will be planted as bare-root feathered stock or cuttings on the riverbank at both ends of every backwater, embayment and section of two-stage channel where the new wetland bank re-joins the existing riverbank to provide erosion control at the juncture. Species comprise *Salix cinerea*, *Salix caprea* and *Salix viminalis*.

Tree planting shall be protected from damage from grazing stock by permanent stock proof fencing.

3.6.1 Maintenance of tree planting during the planting establishment aftercare / maintenance period

For the duration of the proposed establishment aftercare / rectification period for tree planting, which shall comprise a period of **five years** following Practical Completion of planting, all tree planting areas shall be maintained by the Contractor as follows.

3.6.1.1 Weed control

An area of one metre diameter around each tree shall be maintained free of weeds and vegetation for the duration of the aftercare period. Weed control shall be undertaken either by hand weeding or with a non-residual glyphosate-based herbicide up to twice per month between March and October as required. Remove all weeds from site. Pernicious weeds (e.g. thistle, nettle, dock, bindweed) may require additional spot treatment. Strimming of vegetation should be avoided unless agreed with the site supervisor as this can lead to damage of plants and does not reduce the uptake of water and nutrients by weeds. Mulch mats shall be re-pegged or replaced as required to ensure that the mulch mats remain effective for a minimum of 36 months after planting.

3.6.1.2 Watering

Water trees during the establishment period as required sufficiently to maintain healthy growth.

3.6.1.3 Fertiliser application and pruning

Apply slow release fertiliser to all trees in March or April in accordance with the manufacturer's recommendations. Prune trees in accordance with good horticultural and arboricultural practice to remove dead, damaged or diseased material and promote well balanced form and growth pattern.



3.6.1.4 Replacement of dead trees

For the 5-year duration of the establishment aftercare / maintenance / rectification period, any trees which are dead, dying or otherwise defective must be replaced by approved equivalent trees during the next suitable planting season unless otherwise instructed. The numbers of trees that require replacement will be agreed in September/October before leaves drop, with the site supervisor. Dead trees will be removed from the site and replaced with new in accordance with the Landscape Specification before the end of the following March, ideally in November or December to ensure the highest success rates. The size and species of plants to be in accordance with the planting schedules unless otherwise agreed with the site supervisor.

3.6.1.5 Staking and plant protection

Guards, stakes and ties should not rub against the tree as this can damage the bark and lead to infection. Check condition of stakes, ties, guys and guards to ensure healthy establishment of the trees at each maintenance visit.

Broken or missing items to be replaced, ties adjusted to accommodate growth, loosened soil around trees/shrubs to be gently firmed, leaning trees to be straightened and any damaged bark to be cut back neatly with sharp knife to prevent further damage. Guards and stakes should be removed 5 years after the completion of the works and taken to suitable deposal facility.

3.6.1.6 Stock protection fencing around trees

Newly planted trees will be protected from grazing stock by permanent stock proof fencing. The fencing and associated pedestrian maintenance access gates shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

3.6.1.7 Coppicing of erosion control planting

When sufficiently well established, erosion control willow plants shall be coppiced to maintain vigour, form and function of plants to provide long-term erosion control. Arisings shall be removed from site. Allowance should be made for coppicing in Year 5 following planting and thenceforth every 5 years, subject to review of growth and need.



4. Management responsibilities

4.1 Responsibility for works

The Contractor (via their appointed landscape sub-contractor) will be responsible for:

- 1. All grass seeding works: **18 to 24** months post construction establishment maintenance and rectification following Practical Completion of seeding.
- 2. Marginal planting works associated with the WFD enhancement features: **12 months** post construction establishment maintenance and rectification following Practical Completion of marginal planting.
- 3. Tree planting works (excluding WS plots on backwater islands): **60 months** post construction establishment maintenance and rectification following Practical Completion of planting.
- 4. Post and wire planting protection fencing and access gates: **60 months** post construction maintenance following Practical Completion of planting.

At the end of these periods, the responsibility for the management and maintenance will revert to the Environment Agency and private landowners as follows. Replacement for any plant failures will be the responsibility of whoever has the management responsibility during that time period.

- 1. All grass seeding works: The Environment Agency on areas within EA ownership, private landowners on all other areas.
- 2. Marginal planting works associated with the WFD enhancement features: the Environment Agency.
- 3. Tree planting works: the Environment Agency.
- 4. Post and wire stock protection fencing and access gates: the Environment Agency.

The Environment Agency Area team responsible for River Sowy and KSD will review the long-term requirements for regenerative treatment of planting and seeding as and when necessary. However, on the basis that adequate establishment maintenance is undertaken and planting is allowed to fully establish and develop, the proposed planting should provide long-term functionality and wildlife cover with limited regular management works and without the need for supplementary planting.

4.2 Health and safety

Prior to any landscape maintenance and management activities being carried out, the parties involved will have an obligation to ensure that all health and safety implications have been identified, all necessary risk assessments have been made, a safe system of work is in place and that operatives are properly trained and provided with appropriate personal protective equipment (PPE). Risks and proposed mitigation measures are provided in the Designer's Risk Assessment for the Proposed Scheme (document number: ENVRESW001353-CH2-DL-400-RA-C-1023).



5. Landscape management operations

Table 1. Schedule of Landscape Management Operations NOTE: Locations are given as Section numbers as set out on the Landscape Masterplans.

CLAUSE No	CLAUSE TITLE	No OF VISITS (MINIMUM)
	TREE AND SHRUB PLANTING (excluding Wet	Scrub plots on backwater islands):
	Locations: Sections 2, 3, 4, 5, 6, 7, 8 and 9.	
1.	Check/adjust stakes, ties and guards	4 per year (years 1-5 unless removed earlier)
2.	Weed control	4 per year (years 1-5 subject to establishment)
3.	Water to field capacity	as required to ensure healthy growth (years 1-5)
4.	Slow release fertilizer application	1 per year (years 1-5 subject to establishment)
5.	Cleaning out and dead wooding	1 per year
6.	General pruning operations	1 per year (years 1-5)
7.	Replacement planting	1 per year if necessary (first 5 years only)
8.	Hand weeding of tree and shrub guards	4 per year (first 3 years only)
9.	Straighten plants and re-firm around roots	4 per year (first 5 years only)
10.	Remove stakes, ties and guards	1 no. visit (before or at end year 5 subject to establishment)
11.	Inspect and maintain temporary stock fencing and gate along KSD back water.	4 per year (years 1-5).
12.	Inspect and maintain permanent stock fencing and gates around tree planting	4 per year (years 1-5, thenceforth 2 per year).
13.	Thin / coppice tree and shrub planting	1 no. visit (at end year 5 subject to establishment, thenceforth every 5 years subject to review)
	GRASSLAND – NEWLY SEEDED AREAS	
	Locations: Sections 2 ,3, 4, 5, 6, 7, 8, 9 and 14	k.
14.	Mowing of newly sown grassland areas	5 cuts in Year 1, 3 cuts in Year 2 unless grazed. Thenceforth 3 cuts per year if not grazed.
15.	Spot herbicide weed treatment.	As necessary within grassed areas as per spec
16.	Other operations (stone pick, roll etc)	As necessary within grassed areas as per spec
17.	Temporary stock proof fence – inspect/maintain	4 per year (year 1 and year 2 if not grazed)
18.	Temporary stock proof fence – remove	1 per year (year 1 or year 2 if not grazed)
19.	Scrub removal in grassland areas	5-year cycle long term
	GRASSLAND – EXISTING AREAS TO BE MAINT	TAINED
	Locations: Sections 1, 2 ,3, 4, 5, 6, 7, 8, and 9.	
20.	Mowing of existing grassland areas	3 cuts per year (year 1 and year 2 if not grazed) thenceforth 3 cuts per year if not grazed.
21.	Spot herbicide weed treatment.	As necessary within grassed areas as per spec
22.	Other operations (stone pick, roll etc)	As necessary within grassed areas as per spec
	MARGINAL WETLAND HABITAT	
	Locations: Sections 3, 4,5, 6, 8, and 9.	
23.	Algae and noxious weed control	As necessary within grassed areas as per spec



24. 25	Spot herbicide weed treatment Scrub removal and control	As necessary within grassed areas as per spec
26.	Removal of litter and checking of stakes	4 per year (years 1-2) (removal of litter - annual cycle long term)
27.	Inspect and maintain bird protection fencing	4 per year (years 1-2)
28.	Remove bird protection fencing	End of year 2 unless extension required
	ALL AREAS	
29.	Litter collection	At every maintenance visit
30.	Cleanliness	At every maintenance visit

NOTES:

- 1. The operations above will be carried out for the full 1 year (marginal wetland habitat), 1.5-2 year (newly seeded and reinstated grassland) or 5- year (planting) period as specified. Some will be pertinent to the longer-term management of the site (extended in 5 year cycles from year 5 onwards for thinning and coppicing cycles for example). Some operations such as vegetation control, litter picking, and site cleanliness will be subject to resource availability and revenue costs in the long term and may vary depending on the future operational requirements of the Environment Agency or use of the site. Future variations should be recorded in the LMMP to register changes in management operations.
- 2. The number of visits indicated for the establishment period maintenance (years 1 to 5) is to be taken as a minimum, the contractor is to ensure enough additional visits or combine operations to ensure compliance with the clauses in Appendix A. The frequency of visits may also be adjusted as a result of subsequent agreement between the Contractor/landscape contractor and the Environment Agency (and its agents in determining maintenance responsibilities and approach over the first 5-year period. No adjustment to the frequency of visits should result in less than 4no. visits per year in total, for the maintenance years 1-5.
- 3. Changes in management operations arising from change in construction approach or resulting from changes as vegetation establishes in particular areas of the site should be recorded in the LMMP in order to inform ongoing and future management operations and requirements.
- 4. Due to the nature and characteristics of the site, maintenance and management approaches need to be flexible with due consideration for overlap in vegetation/habitat types within the respective planting zones illustrated on the masterplans. The landscape management operations set out in Table 1 provide a guide for overall requirements, but maintenance work should be programmed appropriately by those responsible for undertaking the work at any stage in the site's development.
- 5. Changes on site should be monitored and recorded in order that the LMMP can be adapted to respond to changes in habitat establishment or development.



6. Landscape management clauses

Landscape management and maintenance operations during the 2 /5 year aftercare establishment periods shall be undertaken in accordance with the Landscape Specification for Landscape Works Implementation and Establishment Aftercare Works. These specification requirements are summarised below for reference but should not be considered exhaustive and further reference should be made to the full specification in undertaking the works. To be read in conjunction with the Landscape Management Operations table on the previous page.

NATIVE STANDARD AND FEATHERED TREES AND SHRUBS (EXCLUDING WET SCRUB PLANTING)

1. TREE STAKES AND TIES; TREE SHELTERS

Inspect and carry out the following:

Check stakes for looseness, breaks and decay and replace as necessary to original specification. If a tree with a defective stake has grown sufficiently to become self-supporting, inform the Contract Administrator (henceforth referred to as CA) and, if instructed, remove stake(s) and fill the hole(s) with lightly compacted soil.

Adjust, re-fix or replace loose or defective ties as necessary.

Remove redundant tapes, tags, ties, labels and other encumbrances.

Check all tree and shrub guards at regular intervals to ensure that they are secure. Notify CA of number of missing or damaged guards and obtain instructions for replacement. Replacement guards to comprise:

- Feathered trees (erosion control planting): Tubex Mesh Shrub Shelterguard, 0.6m high x 144-200mm dia, Olive Green colour, oxo-biodegradable polypropylene.
- Standard trees: Green-tech Rainbow Treebio Biodegradable Spiral rabbit guards, 0.6m high x 68mm dia, Polylactic Acid with UV stabilisation system.

WEED CONTROL

Use a suitable herbicide to maintain a weed free zone 0.5m radius around the base of each tree. One of the applications per year to be winter applied residual herbicide to provide residual cover for early spring growth.

Herbicide to be applied by a certified user in accordance with the manufacturer's instructions. Where work is near water, drainage ditches or land drains, comply with the DEFRA guidelines for the use of herbicides on weeds in or near watercourses and lakes. No herbicide may be applied on or near water without a valid herbicide application licence issued by the Environment Agency, allow sufficient time to obtain approval for this application. Proof of consent for each licence application must be provided to the CA prior to each herbicide application. Take special care to prevent spray drift into water bodies and adjoining land.

Mulch mats shall be re-pegged or replaced as required to ensure that the mulch mats remain effective for a minimum of 36 months after planting.

3. WATER TO FIELD CAPACITY

Water as necessary to field capacity to ensure the continued thriving of all planting.

4. SLOW RELEASE FERTILIZER APPLICATION

In March or April, evenly spread and incorporate 15:15:15, N:P:K granular slow release fertilizer at a rate to suit manufacturer's instructions within native scrub planting stations only. No fertilizer to be applied in sensitive habitat areas including field layer planting, species rich grassland or marginal / aquatics.

5. CLEANING OUT AND DEADWOODING

Remove:



- Dead, dying, or diseased wood, broken branches and stubs.
- Fungal growths and fruiting bodies.
- Wind-blown or accumulated rubbish in branch forks.

6. GENERAL PRUNING OPERATIONS

Do not prune natural form of feathered trees unless damaged, diseased or deadwood present.

Do not prune during the late winter/early spring sap flow period, unless specified otherwise.

Prune in accordance with good horticultural practice.

Thin, trim and shape appropriately to each species, location, season, and stage of growth, leaving a well-balanced natural appearance.

Use clean sharp secateurs, hand saws or other tools approved by the CA.

Trim off ragged edges of bark or wood with a sharp knife.

Remove branches without damaging or tearing the stem.

Keep wounds as small as possible and cut cleanly back to sound wood. Make cuts above and sloping away from an outward facing healthy bud, angled so that water will not collect on cut area.

Prune larger branches neither flush nor leaving a stub but using the branch bark ridge or branch collar as a pruning guide.

Notify the CA of any disease or fungus. Do not apply growth retardants, fungicide or sealant unless instructed by the CA.

Inform CA if any growth is encroaching onto paths, tracks, structures etc.

7. REPLACEMENT PLANTING

Inform CA of any trees which are dead or dying and obtain instructions for replacement. Replacement trees to be the same species and of a comparable size with the surrounding trees (where practical to do so) or default to original specification (if site constraints reduce viability of planting larger nursery stock). Additional watering and fertilizer applications are to be undertaken, sufficient to ensure the successful establishment of the tree. Do not undertake replacement planting in periods of drought or out of season.

8. HAND WEEDING OF TREE AND SHRUB GUARDS

Keep the base of all tree and shrub guards/shelters clear of weeds and grass, by hand weeding to ensure there is no weed or grass growth within the ring spray area (where herbicide ring spraying misses weeds growing close to each tree/shrub). Remove all weeds, including roots, by hand using hoes, trowels or forks, taking care to remove not more than a minimum quantity of soil, causing minimum disturbance to trees and leaving the area in a neat, clean condition.

9. STRAIGHTEN PLANTS AND REFIRM AROUND ROOTS

Re-firm soil around any loose plants, without compacting and ensure that all plants are upright after each visit. Ensure any recently replaced planting in remote areas of the site are re-visited to re-firm and straighten as necessary.

10. REMOVE STAKES, TIES AND GUARDS

Once the tree/shrub has successfully established with firm root support and no indications of movement around the root ball, remove the stake, tie and guard from the tree. Bear in mind individual trees may not develop at the



same rate and each tree should be checked independently before removing support. All ties and guards to be removed off suite and recycled in appropriate recycling facilities upon removal.

11. INSPECTION AND MAINTENANCE OF STOCK FENCING AND ACCESS GATES

Newly planted trees and shrubs will be protected from grazing stock by temporary and permanent stock proof fencing. The fencing and associated maintenance access gates shall be inspected at regular intervals and repaired or reinstated as required to maintain these elements in a fully functional condition at all times.

12. THINNING/COPPICING

Thinning and coppicing operations to be undertaken at year 5 and subsequently on 5 yearly cycles subject to development of the planting and following a review by the CA or suitably qualified personnel. Thinning and coppicing only to be undertaken to promote healthy vegetation cover, structural/age diversity and to retain preferred species content of the original planting. Where thinning is required treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Arisings from thinning or coppicing operations should be either removed from site or either chipped and spread or windrowed (subject to location and sensitivity of ground flora).

GRASSLAND AREAS

13. MOWING NEWLY SOWN NWG GRASSLAND

Preparation: Before each cut remove all litter and debris.

Cutting:

- First year after sowing: Following the two initial establishment cuts to be undertaken after seeding and germination, NWG grassland shall be subject to five cuts evenly spread out through the growing season (e.g. cuts in April, May/June, July, August and October, assuming an autumn sowing in the previous year). Clippings shall be removed by boxing or raking up and disposed of a suitable composting facility, unless growth and arisings are light enough to allow dispersal over the seeded areas but if this creates a mulch, arisings shall be removed from site.
- Second year after sowing: NWG grassland shall be subject to three cuts evenly spread out through the growing season (e.g. a spring cut in April, a main hay cut in late July/ early August and an autumn cut in October). Clippings shall be removed by boxing or raking up and disposed of a suitable composting facility, unless growth and arisings are light enough to allow dispersal over the seeded areas but if this creates a mulch, arisings shall be removed from site.

Minimum height of cut: 75 mm.

MOWING EXISTING GRASSLAND

Preparation: Before each cut remove all litter and debris.

Locations:

- left banks of the KSD and Sowy between the temporary protective fencing and the river channels.
- right bank of the KSD between the river channel and the drain which runs parallel to the KSD some 30m away.
- grassland areas on the right bank of the Sowy between the river channel and the Langacre Rhyne.

Cutting: 3 cuts evenly spread out through the growing season (e.g. a spring cut in early April, a main hay cut in late July/ early August and an autumn cut in October). The minimum height of each cut shall be 75mm. Heavy arisings should be removed by boxing or raking up and disposed of a suitable composting facility. If growth and arisings are light, clippings may be dispersed over the seeded areas but if this creates a mulch, arisings shall be removed.



Minimum height of cut: 75 mm.

15. SPOT HERBICIDE WEED TREATMENT

Use a suitable herbicide and appropriate method of application to maintain all newly seeded and existing grassed areas predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that existing grass cover and planting are not detrimentally affected by any such herbicide application. Spot application methods to be utilised to prevent spray drift or kill of required ground cover and vegetation. Herbicide to be applied only by a certified user in accordance with manufacturer's instructions. Reapply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site.

16. OTHER OPERATIONS

Undertake stone picking, rolling, scarifying, harrowing, hollow tining, levelling, surface decompaction, fertiliser application and pest control to be undertaken if required and as directed by the Site Supervisor to maintain the health and growth of the sward.

17. INSPECTION AND MAINTENANCE OF TEMPORARY STOCK FENCE

Temporary protective fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

18. REMOVAL OF TEMPORARY STOCK FENCE

At the end of the proposed two-year establishment aftercare / maintenance period (or earlier if it is agreed that the sward is sufficiently well established to resume grazing), the temporary stock proof fencing along the left banks of the KSD and Sowy shall be removed of-site by the Contractor for recycling/re-use and post holes infilled with soil or posts cut off at ground level to prevent fall or trip hazards to livestock or people.

19. SCRUB REMOVAL IN GRASSLAND AREAS

Subject to ongoing grassland maintenance beyond year 2 by grazing or cutting, if grassland within Environment Agency ownership is left uncut or ungrazed for any reason, scrub removal may be desirable to maintain the open grassland character and prevent loss of habitat to self-seeded scrub and woodland species, particularly on the flood embankments. If this is desirable in terms of long-term management of the site, scrub removal should be undertaken on a 5 yearly cycle starting in year 5. Where thinning is undertaken treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Remove any arisings from thinning operations from site.

MARGINAL WETLAND VEGETATION

20. ALGAE AND NOXIOUS WEED CONTROL

Control algal blooms and aquatic weeds developing in the water body as necessary to maintain a balanced mix of preferred/desirable species. Control measures and method statement to be agreed prior to treatment.

21. SPOT HERBICIDE WEED TREATMENT

Use a suitable herbicide and appropriate method of application to maintain all-natural regeneration marginal areas predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that existing grass cover and vegetation are not detrimentally affected by any such herbicide application. Spot application methods to be utilised to prevent spray drift or kill of required ground cover and vegetation. Use of herbicide in or near water will require prior agreement from the Environment Agency and must be carried out by a suitably skilled, qualified and knowledgeable person in accordance with manufacturer's instructions. Re-apply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site.



22. SCRUB REMOVAL AND CONTROL IN AND AROUND MARGINAL WETLAND

Remove self-sown tree and shrub species (e.g. willow, alder, birch and hazel) from within marginal wetland areas by hand pulling, digging up or by suitable herbicide application.

Control self-sown tree and shrub species establishing on the banks around marginal wetland areas by thinning or coppicing as required. Thinning and/or coppicing operations to be potentially undertaken at year 5 and subsequently on 5 yearly cycles subject to development of scrub around the margins of the water body and following a review by the CA or suitably qualified personnel. Thinning and coppicing only to be undertaken to promote healthy vegetation cover around the margins of the water body and discourage scrubbing over of the water body to retain preferred species. Where thinning is required treat the cut stump immediately after felling with a suitable herbicide to prevent re-growth. Remove any arisings from thinning operations from site.

23. INSPECTION AND MAINTENANCE OF TEMPORARY BIRD PROTECTION FENCE

Not currently required. If it subsequently becomes required and is installed, temporary bird protection fencing shall be inspected at regular intervals and repaired or reinstated as required to maintain it in a fully functional condition at all times.

REMOVAL OF TEMPORARY BIRD PROTECTION FENCE

Not currently required. If it subsequently becomes required and is installed, at the end of the proposed one-year establishment aftercare / maintenance period (or earlier if agreed with the Environment Agency) the temporary bird protection fencing used to protect newly planted marginal vegetation within the KSD and Sowy shall be removed of-site by the Contractor for recycling/re-use.

LITTER PICKING

25. LITTER COLLECTION

Collect and remove all extraneous rubbish detrimental to the appearance of the site, including paper, packaging materials, bottles, cans, and similar debris from all planted and grassed areas, particularly immediately prior to mowing and/or strimming grass.

26. CLEANLINESS

Remove extraneous soil, grass cuttings and other arisings from all surfaces and leave the works in a clean, tidy condition after all maintenance operations.

VEGETATION CONTROL

27. SPOT HERBICIDE WEED TREATMENT

Over and above any specific weed treatment specified in previous clauses, use a suitable herbicide and appropriate method of application to maintain the site predominantly free of noxious and notifiable weeds or other undesirable species. Treatments should ensure that general grass cover and vegetation established is retained and adjacent grass cover and planting are not detrimentally affected by any such herbicide application. Spot application methods to be utilised as necessary to prevent spray drift or kill of adjacent areas of vegetation. Herbicide to be applied only by a certified user in accordance with manufacturer's instructions and all current guidelines and codes of practice as relevant to the species to be treated. Re-apply herbicide as necessary to maintain the level of weed control described above. Allow the recommended period before clearing arisings and removing from site. Where appropriate a wider scale, more intensive vegetation control programme or management strategy may be required to address specific weed issues within the site. Where work is near water, drainage ditches or land drains, comply with the Defra guidelines for the use of herbicides on weeds in or near watercourses and lakes. No herbicide may be applied on or near water without a valid herbicide application licence issued by the Environment Agency, allow sufficient time to obtain approval for this application. Proof of



consent for each licence application must be provided to the CA prior to each herbicide application. Take special care to prevent spray drift into water bodies and adjoining land.



Appendix A. Landscape Masterplans

See Appendix D of the ES Addendum

Appendix F Revised Environmental Action Plan (EAP)



National Environmental Assessment Service

Environmental Action Pan

Poject name	River Sowy and King Sedgemoor's Drain Enhancements Scheme: Phase 1
Poject B reference	ENVRESW001353
Area	South West
D te	15/06/2021
∀ rsion nmbr	11
Atbr	Megan David/Miriam Olivier

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23/07/20	Update to reflect scheme design changes and internal review comments	Miriam Olivier	3
03/09/20	Update to reflect outcome of pre-construction ecology surveys	Miriam Olivier	4
17/09/20	SSSI Assent Measures Added	Gary Cutts	5
26/09/20	Split into Phase 1a and Phase 1b works	Miriam Olivier	6
09/10/20	Amended to reflect revised scope of works for Phase 1a	Miriam Olivier	7
22/10/20	Updated to include FBG review and revised scope of works for Phase 1a	Miriam Olivier	8
08/03/21	Phases 1a and 1b dates updated	Steve Maddison	9
24/03/21	Updated to reflect Phase 1a March 21 scope	Miriam Olivier	10
15/06/21	Updated to reflect additional measures identified through ES addendum preparation and revisions to SSSI Assent, Project level HRA Stage 2 Report and Detailed WFD Compliance Report	Miriam Olivier	11

EAP Apovals

Name	Sigatre	Tele	D te	V rsion

Distribution

Name	Title	Date	Version

Purpose

This Environmental Action Plan (EAP) summarises the actions required to implement the environmental mitigation and outcomes contained within the Environmental Statement (ES) that will be prepared following the Environment Agency's Minimum Technical Requirements. It sets out specific objectives and targets defining the way in which we wish the ES and its relevant findings to be addressed during the implementation phase of the project (detailed design, construction and post-construction phases). It also details roles and responsibilities of those involved in the proposal and refers to all **temporary** and **permanent** works.

These actions form part of the contract documentation and must be adhered to.

Roles

Each action in the table below has <u>one</u> named person or organisation who is responsible for ensuring that the action is implemented. It is ultimately the contractor's responsibility for ensuring the EAP commitments, which may include planning conditions, are delivered.

The EA National Environmental Assessment and Sustainability (NEAS) team are responsible for agreeing any changes to the EAP and for signing off, or agreeing to the signing off of, the actions.

The contractor and Project Manager are responsible for advising NEAS on any changes to method statements or the planned construction work as these may result in changes to the EAP or additional consultation with statutory consultees. NEAS will assess the significance of these changes and determine the appropriate course of action.

The contractor is also responsible for implementing good environmental practice on site, in line with their own environmental management systems (EMS). The environmental clerk of works (ECoW) will monitor adherence to the EMS and EAP. Typical issues include:

- Any working hour restrictions
- Dust suppression measures
- Traffic management
- Site waste management
- Materials management
- Maintenance of the carbon calculator
- Vehicle maintenance and management
- Pollution prevention and control (including storage, refuelling and incident response)
- Response procedures e.g. services strike, contaminated land
- Hazardous materials handling and storage
- Noise management
- Securing and delineation of working areas including signage
- Vegetation protection measures

Environmental Audits

The appended template should be used when undertaking any site audits during construction. Such audits can be undertaken by NEAS Environmental Project Managers (EPM) or delegated by NEAS to the ECoW or other individuals. Technical assistance can be obtained from functional staff as appropriate. Site audits can potentially highlight good practice and can be separate to the

review of EAP actions as undertaken in progress meetings. They do not replace the regular checks undertaken by the ECoW during the works; no set template has been provided for this.

Environmental Incident Reporting system

All environmental incidents must be reported to the Environment Agency Incident Hotline 0800 80 70 60 as per the Environmental Incident Reporting Poster at the earliest opportunity and then to the ECC Project Manager, Site Supervisor, Environment Agency Project Manager and Environment Agency NEAS Environmental Project Manager. In addition, near misses must be reported via the hotline where there was/is the potential for a significant impact and where lessons can be learned.

Initial reports for such incidents and near misses must be followed by a written report using the contractor's in-house forms. This must include the following information (project/location, date, contractor, NIRS reference number, details of what happened, cause of incident, lessons learned). This final and comprehensive investigation report is to be provided by the Contractor to the ECC Project Manager, Environment Agency Project Manager and Safety, Health and Environment Manager within 14 days.

Summary of scope of works

Phase 1 of the River Sowy and King's Sedgemoor Drain Enhancements Scheme (referred to as the Scheme) focusses on capacity enhancements between Monk's Leaze Clyce on the Sowy and Parchey Bridge on the KSD as shown in Figure 1. These include (i) raising existing informal flood embankments and (ii) channel widening through creation of seven Water Framework Directive (WFD) enhancement features (embayments, lengths of two-stage channel and back waters) and (iii) raising the headwall of two existing water control structures on the KSD (Cossington Right Rhyne outfall and Chilton Right Rhyne outfall). Strengthening works to two culvert crossings of Chedzoy New Cut and Cossington Right Rhyne are also required to facilitate plant access.

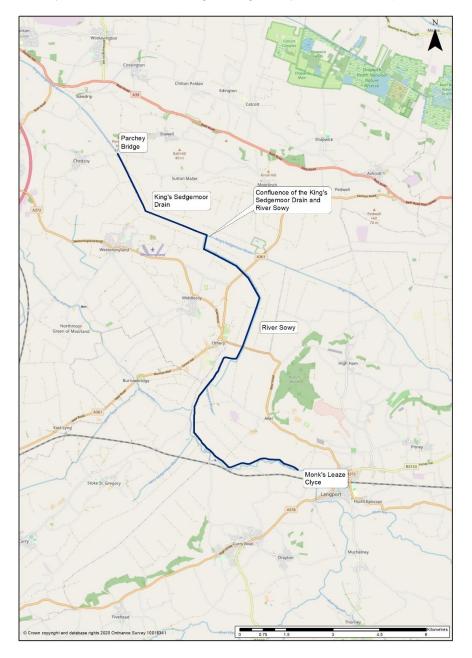


Figure 1 Scheme location

The works will be undertaken in two phases: Phase 1a (March 2021, with vegetation clearance for water vole displacement ongoing until Phase 1b commences) and Phase 1b (August 2021 – October 2021, with vegetation clearance for access during July 2021).

Phase 1a

Works to be undertaken under Phase 1a include the following:

- Scrub and field boundary vegetation clearance for access on the left bank of the KSD and left bank of the Lower Sowy (July 2021)
- Raising of existing informal flood embankments on the Upper Sowy using material won under CL:AIRE from an offsite source (June or July 2021)
- Vegetation clearance for water vole displacement under the EAs organisational licence (WML OR 23) on the right bank of the KSD and Lower Sowy (March 2021 until commencement of Phase 1b)
- Tree removals on the right bank of the KSD and Lower Sowy (June or July 2021)

No access to the right bank of the KSD will be required under Phase 1a except for tree removals and ongoing vegetation maintenance required under WML OR23 organisational licence at the Water Framework Directive (WFD) enhancement features (embayments, two-stage channels and back water) locations and at Chilton Right Rhyne and Cossington Right Rhyne outfalls.

As Phase 1a does not require tracking along the KSD at a frequency above the baseline usage which includes sporadic use by excavators, the conditions of the SMC do not apply to Phase 1a.

Phase 1b

Further works to be completed in 2021 as part of Phase 1b will include raising of the existing informal flood embankments on the KSD and Lower Sowy, excavation and planting of the Water Framework Directive (WFD) enhancement features (embayments, two-stage channels and back water) and upgrading of the Chilton Right Rhyne and Cossington Right Rhyne outfalls. Material required for raising of the existing informal embankments on the KSD will be won through reprofiling of existing embankments towards the north of the site. Material required for raising of the existing informal embankments on the Lower Sowy will be obtained under CL:AIRE from an offsite location, with material won from creation of WFD enhancement features also used for bank raising where suitable..

Please note that the numbering of measures within the EAP follows that set out within the Environmental Statement for the Scheme (document reference: ENVRESW001353-CH2-XX-400-RP-EN-1042), with additional measures added following completion of pre-construction surveys and consenting conditions are completed. The numbering of measures is therefore not contiguous throughout the document.

Relevant contact details

Project Sponsor	Rachel Burden	020 302 50283/07771 674639
Project Executive	Graham Quarrier	0203 0252248/07909 534620
Project Manager	Gary Cutts	020771 40686/07976 861 553
NEAS	Will Maclennan	020 8474 5492/ 07385 426998
ECoW	To be confirmed by the Environment Agency	To be confirmed
Project geomorphologist	To be confirmed by the Environment Agency	To be confirmed
LCoW	To be confirmed by the Environment Agency	To be confirmed
Contractor	Matt Phillips (Kiers)	To be confirmed

Site Supervisor	To be confirmed	To be confirmed
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Environmental Action Plan

Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date			
	A. Pre-construction General									
A1	Compliance with environmental legislation and/or conditions of consent for the Scheme under EIA legislation	 Comply with all measures identified in: this EAP the Environmental Statement (ES) and ES Addendum for Scheme (including any conditions imposed by the determining authority at consenting stage) the Landscape Masterplan (LMP) for the Scheme, including provision of between seven WFD enhancement features as identified in this document the Landscape Maintenance and Management Plan (LMMP) any Protected Species (PS) licences found to be required following further ecological survey effort as detailed in the ES and EAP Scheduled Monument Consents (SMCs), including any conditions imposed by Historic England (HE) on determination 	Phase 1a (measures 1, 2, 5) Phase 1b (all measures)	EA (where identified in the following measures) Contractor (where identified in the following measures)	ES (document reference: ENVRESW001353- CH2-XX-400-RP-EN- 1042) ES Addendum (document reference: ENVRESW001353- CH2-XX-400-RP-EN- 1127) LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439) LMMP (Document reference: ENVRESW001353- CH2-ZZ-400-PL-EN- 1096)					

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
Wate	er						
A2	Reduce the risk of pollution of the water environment.	Produce an Emergency Pollution Response Plan (EPRP)	Phase 1a Phase 1b	Contractor			
A3	Reduce the risk of pollution of the water environment.	Produce a Surface Water Management Plan (including measures to minimise site runoff) (SWMP) in agreement with our internal technical specialists	Phase 1a Phase 1b	Contractor			
A4	Reduce the risk of pollution of the water environment.	Register for flood warnings	Phase 1a Phase 1b	Contractor			
A5	Prevent the spread of invasive species	Carry out pre-construction survey for non-native invasive plant species.	Phase 1a	EA	Pre-construction INNS survey report (Phase 1a only): ENVRESW001353- CH2-XX-400-RP-EN- 1117	Pre-construction INNS survey and reporting complete for Phase 1a. Note: Parrot's Feather was identified at Othery Rhyne near Egypt's Clyse subsequent to preparation of the Pre-construction INNS Survey Report	
A6	Prevent the spread of invasive species	Develop Invasive Species Management Plan in accordance with the recommendations provided in the INNS survey report and to include as a minimum: site briefings, cleaning of plant between moving locations, and checking for	Phase 1a Phase 1b	Contractor		Note: Parrot's Feather was identified at Othery Rhyne near Egypt's Clyse subsequent to preparation of the	

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
		presence of INNS in excavated soils. Update EAP in accordance with MS requirements, ensuring responsibility and frequency of monitoring or treatment actions is made clear.				Pre-construction INNS Survey Report	
A7	Reduce the risk of pollution of the water environment.	Identify areas of possible contamination on the Site Management Plan and erect signage to indicate them on site.	Phase 1a Phase 1b	Contractor			
A25	Minimise risks to bivalves	Prepare Method Statement for recovery of bivalves from material excavated during construction of WFD enhancement works, to be agreed with EA technical specialists.	Phase 1b	Contractor		Not relevant to Phase 1a	N/A
Flora	and Fauna						
A8		 Carry out pre-construction check for otter holts should be conducted prior to works commencing. If otter holts present an European Protected Species (EPS) licence 	Phase 1a Phase 1b	Contractor	Pre-construction otter survey report: ENVRESW001353- CH2-XX-400-RP-EN- 1116	Pre-construction survey check for Phase 1a complete. Camera trap monitoring of	
	Countryside Act 1981 (as amended) and the Species and Habitats Regulations 2017.	may be required to permit activities that would otherwise be unlawful				potential holt complete (08/09/20). No further mitigation recommendations made with respect to Phase 1a.	
A9	Minimise risk of loss/injury of badgers ensure compliance with the Protection of	 A pre-construction survey should be undertaken to determine if any new badger setts are present on site. Where active badger setts would lost/disturbed by the works a licence 	Phase 1a Phase 1b	Contractor	Pre-construction badger survey report: ENVRESW001353- CH2-XX-400-RP-EN-	Phase 1 pre- construction survey completed.	

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	Badgers Act 1992	may be required to permit activities that would otherwise be unlawful.			Method Statement (all setts Phase 1a, and setts 1,3, 9 and 10 for Phase 1b): ENVRESW001353- CH2-XX-400-MS-EN- 1122		
A10	Avoid loss of trees with potential bat roost features.	 Trees with bat roost potential that are proposed for removal would be subject to appropriate survey effort to determine likely presence/absence of a roost. Trees found to be roosts would be retained. Pre-construction check of trees with bat roost potential proposed for removal would also be carried out immediately prior to felling. 	Phase 1a	Contractor	Pre-construction bat survey report: ENVRESW001353- CH2-XX-400-TN-EN- 1112	Pre-construction bat survey completed in 2020– no roosts found. Pre-construction survey and check to be carried out prior to tree removal in Phase 1a.	
A24	To minimise the risk of loss/injury of otters and ensure compliance with the Wildlife and Countryside Act 1981 (as amended) and the Species and Habitats Regulations 2017.	Camera trap monitoring survey for potential otter holt on the right bank of the KSD identified during pre-construction survey. Implement any further mitigation measures identified following completion of the camera trap monitoring survey.	Phase 1a	EA	Pre-construction otter survey report: ENVRESW001353- CH2-XX-400-RP-EN- 1116	Camera trap survey complete: 08/09/2020 No further mitigation requirements identified for Phase 1a as potential holt identified during preconstruction survey no longer present.	
A25	To minimise direct	Displacement of water vole from working	Phase 1a	EA under advice	Pre-construction water		

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	loss or injury of water voles and the loss of burrows.	areas at seven WFD enhancement areas and Cossington Right Rhyne outfall and Chilton Right Rhyne outfalls in accordance with EA organisational licence (WML OR23) in advance of construction activities commencing.		from accredited ecologist on WML OR23 licence)	vole survey report: ENVRESW001353- CH2-XX-400-TN-EN- 1111		
A26	Minimise risk of loss/injury of badgers ensure compliance with the Protection of Badgers Act 1992	Contractor to erect weighted traffic cones and blue rope prior to works as indicated by post markers already on site, located at badger setts 2, 2a and 7. The fencing shall act as a guide and boundary for tracking plant to avoid damage to setts. Modification of sett entrances at sett 7 Any additional mitigation measures as recommended by the client's ecologist following completion of the Phase 1b preconstruction badger survey (see measure A9)	Phase 1b	Contractor (erection of traffic cones and blue rope fencing) EA (modification of sett entrances at sett 7)	EA Pre-construction survey report: 'Sowey River and King's Sedgmoor Drain Up- Date Survey for Badger Setts' (February 2021) – N.B blue cones and rope to replace Heras fencing, as agreed between NEAS and Country Contracts		
Cultu	ıral Heritage						
A11	Mitigate impact on archaeological remains and deposits of paleoenvironmental and geoarchaeological interest	Produce Written Scheme of Investigation (WSI) in agreement with internal technical specialists, South West Heritage Trust (SWHT) and Historic England (HE).	Phase 1b	EA	Draft WSI: ENVRESW001353- CH2-XX-400-RP-EN- 1095	Draft WSI to be updated by Cotswold Archaeology prior to commencement of Phase 1b	
A12	Compliance with Ancient Monuments	Obtain SMCs for (i) tracking across SM and (ii) bank raising works within scheduled	Phase 1b	EA	SMC submission documents:	SMC S00240209 (plant tracking)	

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	and Archaeological Areas Act (1979)	area			ENVRESW001353- CH2-XX-400-RP-EN- 1103 (plant tracking – ref S00240209) and ENVRESW001353- CH2-XX-400-RP-EN- 1128 (bank raising – ref S00241479) SMC S00240209	conditionshave been added to the EAP SMC S00241479 (bank raising) application submitted 09/06/21 and acknowledged 10/06/21.	
					(plant tracking) and associated documents (see Appendix 11 of the ECC Scope: document reference ENVRESW001353-CH2-XX-400-SO-Z-1084)		
A25	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	Implement any mitigation identified as being required pre-construction, construction or post-construction as part of the SMC application process.	Phase 1b	Contractor	See measures A27-A29, and B42-B45	Not relevant to Phase 1a	N/A
A27	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	At least 48 hours' notice (or such shorter period as may be mutually agreed) in writing of the commencement of each phase of work shall be given to Dr Helen Woodhouse (helen.woodhouse@HistoricEngland.org.uk) in order that a Historic England representative can inspect and advise on the works and their effect in compliance	Phase 1b	Contractor		Not relevant to Phase 1a	N/A

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
		with this consent.					
A28	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	All those involved in the implementation of the works granted by this consent must be informed by the Environment Agency that the land is designated as a scheduled monument under the Ancient Monuments and Archaeological Areas Act 1979 (as amended); the extent of the scheduled monument as set out in both the scheduled monument description and map; and that the implications of this designation include the requirement to obtain Scheduled Monument Consent for any works to a scheduled monument from the Secretary of State prior to them being undertaken	Phase 1b	EA		Not relevant to Phase 1a	N/A
A29	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	No works shall take place until the applicant has confirmed in writing that the ground protection measures will be installed in accordance with a method statement in the interests of avoiding damage to the archaeological remains of the scheduled monument which has been submitted to and approved by the Secretary of State advised by Historic England	Phase 1b	EA		Not relevant to Phase 1a	N/A
Reso	urce and Waste Mana	gement					•
A14	To minimise the amount of waste produced.	Develop a Materials Management Plan (MMP) to be followed throughout the scheme.	Phase 1a Phase 1b	Contractor			
A15	Ensure any waste is	Develop a Site Waste Management Plan	Phase 1a	Contractor			

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Ref.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	disposed of appropriately	(SWMP) to be followed throughout the scheme.	Phase 1b				
Popu	lation and Human He	alth	1	,			·
A16	To minimise disruption to agricultural businesses	Liaise with agricultural businesses to understand access needs and timings of key agricultural practices and plan construction access and works accordingly	Phase 1a Phase 1b	EA			
A17	To minimise disruption to agricultural businesses	Liaise with agricultural businesses regarding temporary and permanent land take requirements, including any financial compensation for landowners Provide clear accessible public information regarding proposed works for agricultural landowners	Phase 1a Phase 1b	EA		Somms letters and 2 notices of access to landowners Vegetation removal schedule sent to all affected landowners Individual meetings held with all landowners. Publicity banners to be displayed on site throughout Phase 1a works	

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
A18	Minimise disruption to recreational users of Public Rights of Way (PRoW) and bird watchers	Inform the local community of the nature and duration of works and alternative provisions of access through signage and webpage updates Inform local communities within the study area about the proposed haulage routes through signage and webpage updates. In addition, notices should also be placed on PRoW immediately adjacent to the proposed haulage routes prior and during the construction period to notify users of these PRoW.	Phase 1a Phase 1b	Contractor			
Land	scape		•				
A19	Minimise adverse effects on landscape and visual amenity receptors	Confirm material excavated from WFD enhancement features to ensure material is suitable for reseeding and can be utilised in reprofiling of embankments without generating adverse impacts on landscape and visual amenity.	Phase 1b	Landscape Clerk of Works (LCoW) (client provided)		Not relevant to Phase 1a	N/A
A20	Minimise adverse effects on landscape and visual amenity receptors	Implement any design mitigation measures identified through the Tree Survey and Arboricultural Impact Assessment (AIA) (including 'Heads of Terms' Arboricultural Method Statement (AMS)) to ensure tree retention is prioritised	Phase 1b	Contractor	AIA and TCP: ENVRESW001353- CH2-XX-400-RP-EN- 1118 AMS: ENVRESW001353- CH2-XX-400-MS-EN- 1120	AIA, TCP and AMS complete (18/09/20)	
A21	Minimise adverse effects on landscape	Develop site specific AMS based on 'Heads of Terms' AMS and final scheme design (if	Phase 1b	Contractor	AMS: ENVRESW001353-	AMS complete (18/09/20). No	

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D - (Delever		1		0:
Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	and visual amenity receptors	required)			CH2-XX-400-MS-EN- 1120	update needed as no change to scheme design required.	
Air Q	luality						
A22	To minimise the impact of dust emissions on human and ecological receptors.	Implement appropriate mitigation measures as recommended in Institute of Air Quality Management (IAQM) guidance Assessment of Dust from Demolition and Construction (IAQM, 2016).	Phase 1b	Contractor	IAQM guidance Assessment of Dust from Demolition and Construction (IAQM, 2016)		
A23	To minimise the impact of dust during construction.	Develop and implement a Dust Management Plan (DMP) in agreement with the EA.	Phase 1b	Contractor	IAQM guidance Assessment of Dust from Demolition and Construction (IAQM, 2016		
Clim	ate	1		1		1	
None	dentified						
Traff	ic						
A24	To minimise the impact from construction vehicles.	Prepare a Construction Traffic Management Plan (CTMP), which will set out measures to mitigate risks and minimise their impact of construction vehicles.	Phase 1a Phase 1b	Contractor			
B. Du	uring construction	,	I	•		1	
Wate							
B1	To minimise risks to water quality and of harm to fish and aquatic ecology	During summer months take dissolved oxygen (DO) readings whilst undertaking channel works to ensure water quality does not deteriorate	Phase 1b	Contractor, as advised by ECoW		Not relevant to Phase 1a	N/A

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		 rapidly. If DO levels drop below 20%, all operations stop immediately, and inform client of the need to cease the operation of pumping stations Stop works if the works combined with higher temperatures threaten to deplete dissolved oxygen as advised by the ECoW. Construction programming to include contingency for changing the work rate and/or methodology if needed. 					
B2	To minimise risk of water pollution	Toolbox talks regarding water quality risks	Phase 1a Phase 1b	ECoW (client provided)			
В3	To minimise risk of water pollution and to ensure best ecological value obtained by guiding design of features to suit individual sites	Suitably experienced ECoW and project geomorphologist to advise the contractor on the creation of WFD enhancement features	Phase 1b	EA ECoW (client provided) Project geomorphologist (client provided)		Not relevant to Phase 1a	N/A
B4	To minimise risk of water pollution	Use of silt curtains/booms for in channel works	Phase 1b	Contractor		Not relevant to Phase 1a	N/A
B5	To minimise risk of water pollution	Use impermeable bases, flood bunds, and temporary covering of exposed material to minimise risks of leachate from material stockpiles	Phase 1b (Note: assumes no stockpiling required for Phase 1a)	Contractor		Not relevant to Phase 1a	N/A
B6	To minimise risk of water pollution	Use of drip trays, which will be of adequate capacity and regularly maintained	Phase 1a Phase 1b	Contractor			

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D-6			Delevent				C:
Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
B7	To minimise risk of water pollution	Store fuels in appropriately bunded areas, with refuelling activities will take place in designated areas away from the river	Phase 1a Phase 1b	Contractor			
B8	To minimise risk of water pollution	Compliance with best practice pollution prevention measures	Phase 1a Phase 1b	Contractor			
Flora	a and Fauna						
B9	To minimise the disturbance of qualifying wintering bird features.	Ensure that there are working restrictions in the event of any severe, cold weather that would make bird displacement due to disturbance an issue.	Phase 1a Phase 1b	ECoW (client provided)			
B10	To minimise the disturbance of qualifying wintering bird features.	Suitably experienced ECoW to monitor and record presence of any significant numbers of birds (>1% of the current 5-year peak mean for any species) within the disturbance zone of influence (up to 250m), identify any potentially unforeseen impacts and alert EA PM accordingly.	Phase 1a Phase 1b	ECoW (client provided)			
B11	To reduce the loss of suitable foraging and roosting habitat for wintering bird features of designated sites	Implement measures identified in River Sowy and King's Sedgemoor Drain Enhancement Scheme Mitigation Action Plan (MAP) Version 5 as provided in Appendix J of the ES for the Scheme and Appendix A of this document.	Phase 1a Phase 1b	EA NE SDBC (individual measures as indicated with MAP, Appendix A)	ES (document reference: ENVRESW001353- CH2-XX-400-RP-EN- 1042)		
B12	To minimise risk of loss or damage to notable habitats (coastal grazing marsh) and notable plant species (water	Install protective fencing and define working areas to exclude construction areas from surrounding habitats of value to be retained.	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439) Note: LMP and LMMP	Not relevant to Phase 1a	N/A

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Ref.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	dropwort and frogbit)				to be updated during consenting process for Phase 1b works		
B13	To minimise risk of loss or damage to notable habitats (coastal grazing marsh)	 Reseeding of grassland areas with an appropriate seed mix (to be agreed with NE). Riparian planting to one backwater WFD enhancement feature, planting of WFD enhancement features with pre-vegetated coir rolls/pallets and reseeding of disturbed channel bank areas with appropriate seed mix (to be agreed with NE) 	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439) Note: LMP and LMMP to be updated during consenting process for Phase 1b works	Not relevant to Phase 1a	N/A
B14	To minimise risk of loss/mortality or damage/disturbance to priority habitat, notable plant species, eel, water vole and aquatic invertebrates	Implementation of standard good practice measures to control risk of water pollution through run-off/drainage management as detailed in the EPRP and SWMP Minimising the temporary working area required for tracking across the embankment and/or embankment (SSSI and non-SSSI). Temporary working area shown in general arrangement plans.	Phase 1a Phase 1b	Contractor	General arrangement plans: ENVRESW001353- CH2-ZZ-4KS-DR-C- 2011-2013		
B15	To minimise disturbance of qualifying wintering bird features within statutory designated and non-designated sites	No working or lighting after dark close to any areas known to be favoured by birds (to be identified and agreed with NE) All works on site, including commuting to and from the working area, to commence during daylight hours only and cease at least two hours before	Phase 1a Phase 1b	Contractor (following advice of ECoW)			

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
		 sunset. If works undertaken in autumn, minimise unnecessary, sudden noise generated by plant e.g. sudden revving of engines, loud music/radio or shouting. Ensure use of a modern plant fitted with appropriate noise silencers. 					
		If works undertaken in autumn, undertake as much preparatory work as possible before arriving on site (from within the site compound).					
		Stop works to the SSSI during periods of severe weather and minimising time that plant or personal are in the working area to minimise disturbance to breeding and roosting birds.					
		All works will stop if the temperature during any 24-hour period falls below 0°C for 7 consecutive days. Works will restart when 48 hours have passed that do not fulfil the criteria for freeing conditions (the temperature does not remain below 0°C for eighteen consecutive hours). Daily temperature readings to be logged throughout the works, using a maximum and minimum thermometer located within the site compound.					
B42	To minimise	If works undertaken in November, an	Phase 1b	EA		Not relevant to Phase	N/A

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	disturbance of qualifying wintering bird features within statutory designed and non-designated sites	 ornithological watching brief is required to monitor for birds within the area of works of the SSSI Weekly calls with NE shall be set up to provide regular communications, update on conditions and results of ornithological watching brief. 		ECoW (client provided)		1a	
B16	To reduce the risk of direct loss of aquatic invertebrates	Pull back excavated material by a short distance from the margin of the existing river and allow to rest for a short time to allow animals that can escape back in to the water.	Phase 1b	Contractor		Not relevant to Phase 1a	N/A
B17	To reduce the risk of death or injury to great crested newt (GCN) and grass snakes.	Carry out vegetation works under a method statement (to include two-stage clearance) and supervision by an ECoW	Phase 1a Phase 1b	Contractor	Reptile MS: ENVRESW001353- CH2-XX-400-MS-EN- 1110		
B18	To reduce the risk of disturbance of breeding birds (both those which are qualifying features or designated sites and those which are not)	Works shall be conducted outside of the main breeding bird period (March to August inclusive) where practicable, and ECoW should check potential nesting habitat prior to construction works. Vegetation clearance will be undertaken in a phased and directional manner. Where nesting is occurring, appropriate restrictions for the species shall be put in place to avoid the nest from being damaged or abandoned	Phase 1a Phase 1b	Contractor (as advised by ECoW)	SSSI Assent V3 02/06/2021HRA1 (Record of screening for significant effects) ref: 1353/SOWYKSD/VEG/ TREE/HRAv2		
B19	Minimise risk of disturbance/mortality	Carry out works under a Badger Method Statement.	Phase 1a Phase 1b	Contractor (as advised by	Badger Method Statement:		

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	of badgers ensure compliance with the Protection of Badgers Act 1992		(Note: Badger Method Statement may require update pending outcome of Phase 1b pre- construction surveys)	ECoW)	ENVRESW001353- CH2-XX-400-MS-EN- 1122		
B20	To minimise direct loss or injury of water voles and the loss of burrows.	 Maintain 5m buffer from all watercourses except in areas where displacement has been completed under EA organisational licence WML OR23 Pre-construction checks for burrows at any locations where a 5m standoff from watercourses cannot be maintained. 	Phase 1a Phase 1b	EA (displacement and vegetation maintenance until commencement of construction, and ecological supervision throughout construction) Contractor (post- commencement of construction, including	Pre-construction water vole survey report: ENVRESW001353- CH2-XX-400-TN-EN- 1111 EA organisational licence: WML OR23	Pre-construction check complete. Displacement required for works near outfalls.	

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
				searches)			
B46	Minimise risks to bivalves	Implement Bivalve Method Statement during construction and management of WFD enhancement features	Phase 1b	Contractor		Not relevant to Phase 1a	N/A
B47	Minimise risks to habitats and features of King's Sedgemoor SSSI	Phase 1a works to be carried out outside 1st-31st March 2021	Phase 1a	Contractor	SSSI Assent V3 02/06/2021		
B48	Minimise risks to habitats and features of King's Sedgemoor SSSI	Access to King's Sedgemoor SSSI for Phase 1a vegetation clearance works would be via the raised flood bank on the left bank of the River Sowy.	Phase 1a	Contractor	SSSI Assent V3 02/06/2021		
B49	Minimise risks to habitats and features of King's Sedgemoor SSSI - invertebrate assemblages	All access routes and working areas subject to ecological check prior to Phase 1a vegetation clearance works commencing.	Phase 1a	ECoW (client provided)	SSSI Assent V3 02/06/2021		
B50	Minimise risks to habitats and features of King's Sedgemoor SSSI – M22, MG13, MG5 and MG8 grassland	All vegetation cleared using tractor and flail,	Phase 1a	Contractor	SSSI Assent V3 02/06/2021		
B51	Minimise risks to habitats and features of King's Sedgemoor SSSI –	Vegetation to be inspected for evidence of otter prior to clearance. Vegetation clearance undertaken in phased manner and under ecological supervision.	Phase 1a	EcoW (client provided)	SSSI Assent V3 02/06/2021		

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	otter						
B52	Avoid risk of disturbance to Schedule 1 breeding birds	All access routes and working areas plus any areas of potentially suitable habitat within a 50m buffer will be subject to an ecological check prior to any works starting. If the ECoW identifies any nests during this walkover the nest will be cordoned off as per normal ecological best practice.	Phase 1a	ECoW (client provided)	SSSI Assent V3 02/06/2021HRA1 (Record of screening for significant effects) ref: 1353/SOWYKSD/VEG/ TREE/HRAv2		
Cultu	ıral Heritage	1		1	1		
B21	Minimise risks to Prehistoric wooden trackway located approximately 670m to the south-east of Parchey Bridge (NHLE 1014430)	Install temporary matting where vehicle access required, and implement any other measures identified as required within SMCs tracking over SM and bank raising within SM) and conditions. Archaeological monitoring of groundworks in accordance with archaeological WSI (as per A11)	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B22	Minimise risks to non-designated heritage assets as identified on the LMPs LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR- EN-5425 to 5439)	Archaeological monitoring of groundworks during topsoil stripping in accordance with archaeological WSI (as per A11)	Phase 1a Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B23	Minimise risks to unstratified finds	Archaeological monitoring of groundworks augmented by metal detector survey in	Phase 1b	Contractor	LMP (drawing numbers:	Not relevant to Phase 1a	N/A

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Ref.			Relevant		Deference to further	Drogress and	Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	within the Battle of Sedgemoor Registered Battlefield (NHLE 1000032)	accordance with archaeological WSI (as per A11)			ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)		
B24	Minimise risks to previously unknown archaeological assets and deposits of paleoenvironmental and geoarchaeological interest	Archaeological investigation and recording (excavation and recording if preservation insitu not achievable) in accordance with archaeological WSI (as per A11) during creation of WFD enhancement features (embayments, two stage channels and backwater)	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B25	Minimise risks to previously unknown archaeological assets (prehistoric metalwork and later finds) in the Greylake area	Archaeological monitoring of groundworks augmented by metal detector survey in accordance with archaeological WSI (as per A11)	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B42	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	Photographs to a scale and quality to be agreed in writing shall be prepared of the monument before the start and after completion of each episode of the works and a set of the prints in digital formats shall be sent to Historic England (Dr Helen Woodhouse) within 1 month of the completion of the works (or such other period as may be mutually agreed	Phase 1b	Contractor	SMC S00240209 (plant tracking) and associated documents (see Appendix 11 of the ECC Scope: document reference ENVRESW001353- CH2-XX-400-SO-Z- 1084)	Not relevant to Phase 1a	N/A

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
B43	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	Equipment and machinery shall not be used or operated in the scheduled area in conditions or in a manner likely to result in damage to the monument or any ground disturbance.	Phase 1b	Contractor	SMC S00240209 (plant tracking) and associated documents (see Appendix 11 of the ECC Scope: document reference ENVRESW001353-CH2-XX-400-SO-Z-1084)	Not relevant to Phase 1a	N/A
B44	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	All ground protection measures shall be removed from within the scheduled area within 2 weeks of the conclusion of each phase of works	Phase 1b	Contractor	SMC S00240209 (plant tracking) and associated documents (see Appendix 11 of the ECC Scope: document reference ENVRESW001353- CH2-XX-400-SO-Z- 1084)	Not relevant to Phase 1a	N/A
B45	Compliance with Ancient Monuments and Archaeological Areas Act (1979)	Following removal of the ground protection measures from site the Environment Agency shall consult with Historic England in advance of taking any restorative steps for the grassland within the scheduled monument in accordance with the Landscape Management and Maintenance Plan submitted in support of the Environment Agency's Environmental Statement for the River Sowy & King's Sedgemoor Drain (KSD) Enhancements Scheme Phase 1.	Phase 1b	EA	SMC S00240209 (plant tracking) and associated documents (see Appendix 11 of the ECC Scope: document reference ENVRESW001353- CH2-XX-400-SO-Z- 1084)	Not relevant to Phase 1a	N/A

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Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further	Progress and	Sign off
				,	information	Further Action	and date
Resc	ource and Waste Mana	agement	<u> </u>	1		1	
No m	nitigation measures duri	ng construction have been identified for Resou	rce and Waste	e Management.			
Popu	ulation and Human He	alth					
B26	To minimise	Inform local communities of the nature and	Phase 1a	Contractor			
	disruption to users of Public Rights of	duration of the works through signage and webpage updates.	Phase 1b				
	Way (PRoW)	Ensuring local communities within the study area are kept informed about the proposed haulage routes through signage and webpage updates. Notices will also be required on PRoW immediately adjacent to the proposed haulage during the construction period to notify users of these PRoW.					
B27	To minimise	Sign post any diversions to farm access	Phase 1a	Contractor			
	disruption to agricultural	routes required	Phase 1b				
	businesses	Provide access to drinking water for stock or implement alternative provisions					
Land	Iscape and Visual Am	enity	L	1			
B28	To reduce the risk of damage to the wetland vegetation.	Temporarily re-locate and store marginal wetland vegetation which cannot be retained in appropriate conditions conducive to its continuing survival for re-placement once the WFD enhancement features have been completed.	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B29	To minimise any damage to the	Any damage to sward/vegetation at Sowy maintenance access route shall be	Phase 1b	Contractor	LMP (drawing numbers:	Not relevant to Phase	N/A

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
	access route.	remediated as part of works			ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	1a	
B30	Minimise adverse impacts on landscape and visual amenity receptors	Reseeding of areas of bare ground created by vehicle access, bank raising and reprofiling works on the KSD using a bespoke neutral wet grassland (NWG) mix or other appropriate seed mix following preseeding preparatory works (weed control and cultivation).	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B31	Minimise adverse impacts on landscape and visual amenity receptors	Reseeding of areas of bare ground created by vehicle access, bank raising and reprofiling works on the Sowy using a bespoke NWG mix or other appropriate seed mix following pre-seeding preparatory works (weed control and cultivation).	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B32	Minimise adverse impacts on landscape and visual amenity receptors	Reseeding of any newly created channel bank (through creation of embayments, two-stage channels and backwater) and any maintenance access routes with a bespoke NWG mix or other appropriate seed mix agreed with NE following pre-seeding preparatory works (weed control and cultivation).	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
B33	Minimise adverse impacts on landscape and visual amenity	Newly created marginal shelves on the embayments and two-stage channels and the backwater channel will be planted with appropriate marginal wetland species	Phase 1b	Contractor	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN-	Not relevant to Phase 1a	N/A

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Ref.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
	receptors	 Pre-vegetated coir rolls along the riverside edge of the marginal shelves or edges of the backwater channel Pre-vegetated coir pallets closer to the landward edge of the marginal shelves Pre-planting any marginal plants lifted from the channel edges at WFD enhancement locations prior to excavation and stored on site in suitable locations Backwater islands will be planted with appropriate wet scrub species (grey willow, goat willow, osier, downy birch, dog rose, elder, hawthorn and bramble) to provide biodiversity habitat value for a range of species and to assist provide long-term stabilisation of the banks. 			5425 to 5439)		
B34	Minimise adverse impacts on landscape and visual amenity receptors	Implement measures under site specific Arboricultural Method Statement (SS AMS) as relevant to the working area for each Phase	Phase 1a Phase 1b	Contractor	AMS: ENVRESW001353- CH2-XX-400-MS-EN- 1120		
B35	Minimise adverse impacts on landscape and visual amenity receptors	Mark up Root Protection Areas (RPAs) in working areas and areas where heavy plant tracking in excess of baseline frequency for any trees not included within the SS AMS and install tree protection barriers as	Phase 1a Phase 1b	Contractor			

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Ref. No.	Objective	Action advised by the ECoW. Avoid tracking within these areas where practicable. Where not practicable, install appropriate	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
Noise	<u> </u>	ground protective measures as advised by a suitably qualified arboriculturalist.					
B36	To minimise the potential for disturbance.	Ensure Best Practical Means (BPM), including noise shrouding and plant specification and maintenance, will be applied throughout the construction period.	Phase 1a Phase 1b	Contractor			
B37	To minimise the potential for noise disturbance to sensitive receptors located near haulage routes and access points	 Implement measures including: Minimise the use of rapid breaking or accelerating Avoid the use of horns, unless required for safety reasons on narrow tracks Brief drivers on the existing quiet nature of the areas surrounding haul routes and the need to minimise noise generated through haulage Inform residents of Church Path, Church Drove, Aller Drove and Coombe Lane regarding the nature of vehicles passing, timescales and durations of the works 	Phase 1a (measures 1-3) Phase 1b (all measures)	Contractor			
Clima			T		T	1	
B38	Minimise impact on CO ₂ emissions	Maintain carbon calculator for the Scheme	Phase 1a	Contractor			

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Ref. No.	Objective	Action	Relevant	Responsibility	Reference to further information	Progress and Further Action	Sign off and date
B39	during construction Minimise impact on CO ₂ emissions during construction	Implementing the following targets as part of the works: • Avoiding the use of inefficient or oversize machinery to complete the works • No idling of vehicles • Use of new plant where necessary • Reduction of the overordering of material to reduce waste onsite	Phase 1b Phase 1a Phase 1b	Contractor			
B41	To minimise the impact from construction vehicles on traffic and minimise risks to archaeological remains and deposits	Store construction plant in a site compound or on site overnight to reduce the movements to and from site and within the site boundary	Phase 1a Phase 1b	Contractor			
Wate	. Post construction						
C1	To reduce the risk of adverse water quality from maintenance activities	Monitor the oxygen levels using a dissolved oxygen monitor and stop maintenance works should they approach trigger levels.	Phase 1b	Contractor		Not relevant to Phase 1a	N/A
C2	To minimise risks to	Carry out erosion control planting as per	Phase 1b	Contractor	LMP (drawing numbers:	Not relevant to Phase	N/A

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Sowy and King's Sedgemoor Drain (KSD) Enhancements Scheme: Phase 1

Ref.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and
					Illormation	Further Action	date
	water quality.	landscape drawings.			ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	1a	
C3	To ensure successful establishment of landscaping planting proposals	Post-construction monitoring and maintenance, supervised by LCoW	Phase 1b	Contractor, following advice from LCoW (client provided)	LMP (drawing numbers: ENVRESW001353- CH2-XX-400-DR-EN- 5425 to 5439)	Not relevant to Phase 1a	N/A
Flora	l and Fauna						
C4	Comply with requirements of EA organisational licence for water vole displacement	Post-construction monitoring as required under organisational licence	Phase 1b	EA		Not relevant to Phase 1a	N/A
C5	To reduce the loss of suitable foraging and roosting habitat wintering bird features of designated sites and minimise adverse effects on agricultural land holdings	Implement measures identified in River Sowy and King's Sedgemoor Drain Enhancement Scheme Mitigation Action Plan (MAP) Version 5 as provided in Appendix J of the ES for the Scheme and Appendix A of this document.	Phase 1b	EA NE SDBC (individual measures as indicated with MAP, Appendix A)	ES (document reference: ENVRESW001353- CH2-XX-400-RP-EN- 1042)	Not relevant to Phase 1a	N/A
Cultu	ıral Heritage	<u> </u>	<u> </u>	1	<u> </u>		

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Ref.			Relevant				Sign
No.	Objective	Action	phase	Responsibility	Reference to further information	Progress and Further Action	off and date
None	identified		•	1		-	
Resc	ource and Waste Mana	ngement					
None	dentified						
Рори	ılation and Human He	alth					
C6	To minimise adverse effects on agricultural land holdings	Ensure effective liaison with agricultural businesses to discuss mitigation measures agreed with NE regarding environmental stewardship agreements and any potential financial compensation for landowners	Phase 1a Phase 1b	EA			
Land	scape and Visual Am	enity	1	1			
C7	To minimise effects on the landscape and visual amenity	Monitoring and maintenance of landscape planting in accordance with the LMMP	Phase 1b	EA (following completion of initial maintenance period as identified in LMMP) Contractor (for initial maintenance period as identified in LMMP)	LMMP (Document reference: ENVRESW001353-CH2-ZZ-400-PL-EN-1096)	Not relevant to Phase 1a	N/A
				LCoW (client provided) (for initial maintenance period as			

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Sowy and King's Sedgemoor Drain (KSD) Enhancements Scheme: Phase 1

Ref. No.	Objective	Action	Relevant phase	Responsibility	Reference to further information	Progress and Further Action	Sign off and date	
				identified in LMMP)				
Noise	•		•	,	,		•	
None	identified							
Air Q	uality							
None	identified							
Clima	ate							
None	None identified							
Traff	ic							
None	identified							

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Environmental audit record

Project	Project ref.:	
Project Manager:	NEAS EPM:	
Location	Grid reference	

Site Visit Audit Details

Visit During/Post Construction:	Date of Visit:	Time of Visit:	
Audit Officer:	Photos taken (y/n):	Referenced to Pre- Photos(y/n):	

Does the Site Supervisor have an up to date copy of the EAP? Yes / No

General comments

Appendix A

River Sowy and King's Sedgemoor Drain Enhancements Scheme

Parrett Dredging and River Sowy and King's Sedgemoor Drain Enhancements Scheme Mitigation Plan

Version 5: update to IDB Mitigation Plan for Parrett Dredge (Version 3: published in IDB Environmental Statement) to also include River Sowy and King's Sedgemoor Drain Enhancements Scheme (hereon referred to as Sowy projects for ease) effects (Table B & Maps 3 & 4) and incorporate an Implementation plan (Table 3) for mitigation actions for both projects. Version 4 used for comment to update in version 3

Tables 3 & 4 and Maps 3 & 4 are included in Annex 1.

Version 1- 4	Version 5
10/6/2020	22/06/2020
Philip Brewin	John Rowlands
Parrett IDB	Environment Agency

1. Introduction

The Somerset Levels and Moors provides exceptional wetland habitat for 10,000s of over-wintering wildfowl and waders (waterbirds). The availability and quality of this habitat depends on effective water level management. The conservation requirements for water level management include maintenance of extensive wet grasslands with wet ditches and large areas of splash flooding in the winter months of December, January and February. For the Parrett Dredging and Sowy projects to be legally compliant, the work must not cause a deterioration in these conditions.

The primary purpose of this mitigation plan is to ensure no deterioration in SPA habitat availability or quality, as a consequence of the Dredging and Sowy projects. It is important to highlight that this plan covers the effects of a full River Sowy and KSD Enhancements scheme (increasing capacity up to 24 cubic metres of water - cumecs) and an IDB dredge project which was planned to increase conveyance by 8 cumecs. The impact of both these projects will initially be less than shown by the modelling outputs within this plan. The Phase 1 Sowy projects will deliver a 17 cumec capacity and the dredge a 3- 4 cumec increase. This plan will allow any future phases of work to have agreed mitigation in place and therefore be legally compliant. It was agreed by all partners that this strategic and phased plan would be the best approach to take in delivering such a large project.

This change will be most apparent for the Langport Moors and the Sowy/KSD corridor. Small winter floods, resulting from minor overtopping of spillways or simply from rainfall and runoff overwhelming watercourses on the Moors, are beneficial to waterbirds. Especially important is their dynamic nature and the consequential fluctuations in water levels that result in the short-term wetting up of low-lying meadows. Another important

aspect is how the projects affect areas of suitable habitat beyond the boundaries of the protected sites. These areas provide supporting habitat (functionally linked land) and are typically wet grassland meadows with few trees that provide feeding opportunities (areas of splash flooding) in wet conditions and are important refuges during larger floods, when waterbirds are displaced from the lower, wetter, sites by deep floods. Hydraulic modelling indicates the projects will, in effect, reduce the magnitude, and therefore the frequency, of small winter floods.

2. Mitigation Objectives

Over the last 30 years, an extensive network of Raised Water Level Areas (RWLA) has been developed and operated across many of the moors. Water levels are maintained close to ground level in these wetland schemes to create surface water conditions in winter months, which are used by waterbirds as night-time feeding sites or daytime safe roost sites. RWLAs are the primary mechanism for achieving the conservation objectives of the SPA. The total area of land under RWLA management in the Parrett catchment is 2,000ha. These areas help mitigate the effects of flood and water management, which generally reduce the wetness of the low-lying meadows in winter and therefore prevent the habitat requirements of the SPA from being met. RWLAs will also act to protect the SPA from the potential impacts of the Dredging and Sowy projects on small winter floods. It is essential that this mitigation plan supports the ongoing maintenance and operation of the existing RWLA network.

This mitigation plan proposes to sustain the existing area of RWLA, recognising that investment will be required for renewal, operation and maintenance of these schemes. If the total area was to fall below current levels, then the mitigation plan will seek to replace the lost area with an equivalent area elsewhere. This is a basic requirement for ensuring that there is no deterioration in SPA habitat availability or quality, and that the SPA retains its favourable status.

The existing Water Level Management Plans (WLMPs) will be complied with and the WLMPs will be reviewed and updated to take account of infrastructure improvements and operational changes and ensure favourable conditions are sustained.

This mitigation plan also includes actions for each Moor to ensure no change to the impact of the Dredging and Sowy projects on the extent, duration and frequency of small winter floods outside of RLWAs. As hydraulic modelling indicates the majority of change will occur outside of protected areas, these actions should focus on the functionally linked land (outside designated areas). Mitigation actions include changing target water levels in winter, to ensure ditches remain wet and surface water features are created during wet conditions.

Alternative options for mitigation have also been identified, including the potential to develop new RWLAs, on functionally linked land. Similar mitigation actions can also be undertaken within designated sites, where there is potential to

extend/consolidate existing wetland schemes or generally improve water level management. Mitigation actions will take into account the broader conservation objectives for each area, including condition status and any remedial actions required to achieve favourable condition.

3. Impacts

The impacts of the Dredging and Sowy projects on the duration and extent of small, environmentally beneficial, winter floods have been identified through hydraulic modelling and mapping. This is summarised in Figures D3.1 and D3.2, which were included in the HRA Appropriate Assessments (see text box below). Table D3.1 further summarises the model output for each area.

Extract from HRA Appropriate Assessment: Summary of hydraulic modelling of the potential impact of the Dredging and Sowy projects on the duration and extent of small, environmentally beneficial, winter floods.

A hydrological modelling study compiled by SDBC has been used to inform this HRA (Appendix 1). The EA hydraulic flood model for the lower Parrett and Tone was used to assess the potential effects of conveyance improvements. Light Detecting and Ranging (LiDAR) land level data were used to calculate the area of land which the model indicated would have at least 50 mm depth of water (splash conditions) at the peak flood level of model runs for the 2012 summer floods. The 2012 summer floods are considered to be a suitable reference event for winter floods that have an estimated probability in occurrence (i.e. a 1 in 3 year to a 1 in 5 year flood event).

The modeling includes the following caveats and assumptions:

The model is calibrated to analyse large flood flows and not changes in more frequent small flood events which are the focus of the study to inform the HRA;

The model uses reference flow events, rather than flows of known probability;

The model does not include the ditch networks or water level management infrastructure; and

Modelling includes the length of the River Parrett from Oath to Burrowbridge which is approximately 50% more than the actual length of proposed dredging from Stathe to Burrowbridge, therefore the actual increase in conveyance will be less.

The model has used the full Sowy scheme outputs (24 cumecs) but with a phase 1 scheme (17 cumecs) being promoted, the impacts will be less than modelled and shown here.

The model has predicted changes to the level and duration of winter surface splash flooding in the following areas outlined in Table D3.1 as a result of the dredging of the River Parrett. The results of the hydrological modelling are also presented in Figures D3.1 and D3.2.

Using the 2012 summer floods as a proxy for a small winter flood, hydraulic modelling of current baseline conditions indicates a total flood area across all Parrett Moors of nearly 3,500 ha. This reduces by nearly 300 ha as a result of the Parrett dredging in the model. Across all moors there is an approximate 7% reduction in flood area. Changes in flood extent are greatest (70%) outside the areas of SSSI (200 ha) and 80% is outside of Raised Water Level Areas (RWLAs) (230 ha). It must be noted that the reductions will in fact be smaller initially for the proposed project dredging and Sowy projects, as the dredging is approximately 50% of the modelled scheme and the improved conveyance for the Phase 1 Sowy projects is less than the full scheme improvements.

Langport Moors, West Sedgemoor, Aller Moor, King's Sedgemoor and Chedzoy experience the greatest change in flood extent and have a predicted minimum 10% reduction in flooding. Reductions in flood duration are relatively small: typically, a 12-hour to a 2-day reduction in flooding due to increased flood flow conveyance of the River Parrett.

RWLAs considerably contribute to achieving and sustaining wetland condition of the SPA and maintain the required conditions during December to February. It is possible to compare RWLA to the effect of dredging in terms of area and duration: ha/days (the length time flooded multiplied by area). Assuming 50% the area within RWLAs achieves the required winter conditions, RWLAs contribute 167,300 ha/days, which compares with a reduction of 1500 ha/days for a typical winter flood as a consequence of the proposed Parrett Dredge. This represents a 1% reduction in SPA winter flood conditions due to dredging, when compared to the combined contribution of RWLAs. The potential effect associated with water level management upon the Somerset Levels and Moors SPA and Ramsar site is predicted to be minor adverse.

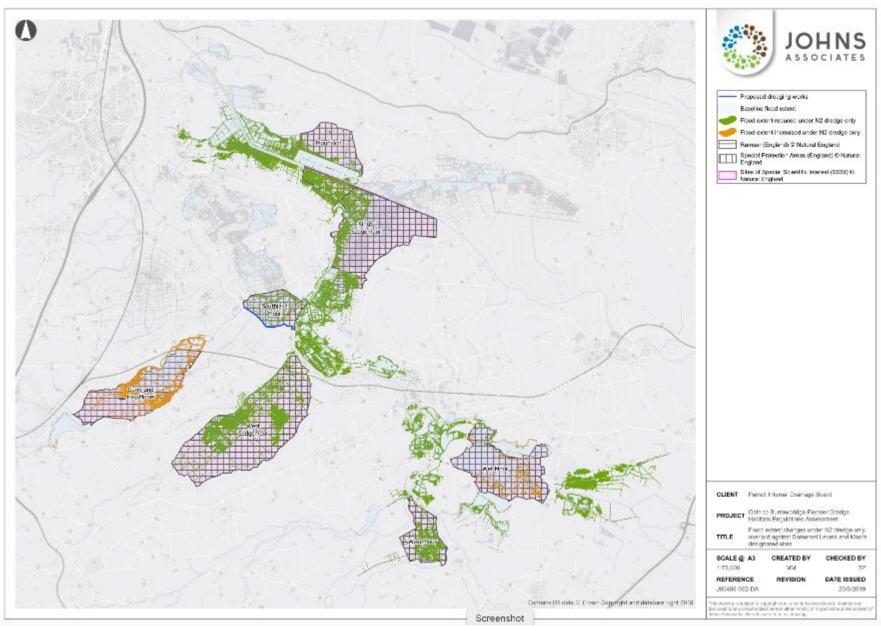


Figure D3.1 (from HRA and Appropriate Assessment): Analysis of Indicative Changes in Flood Extent for the Parrett Dredge

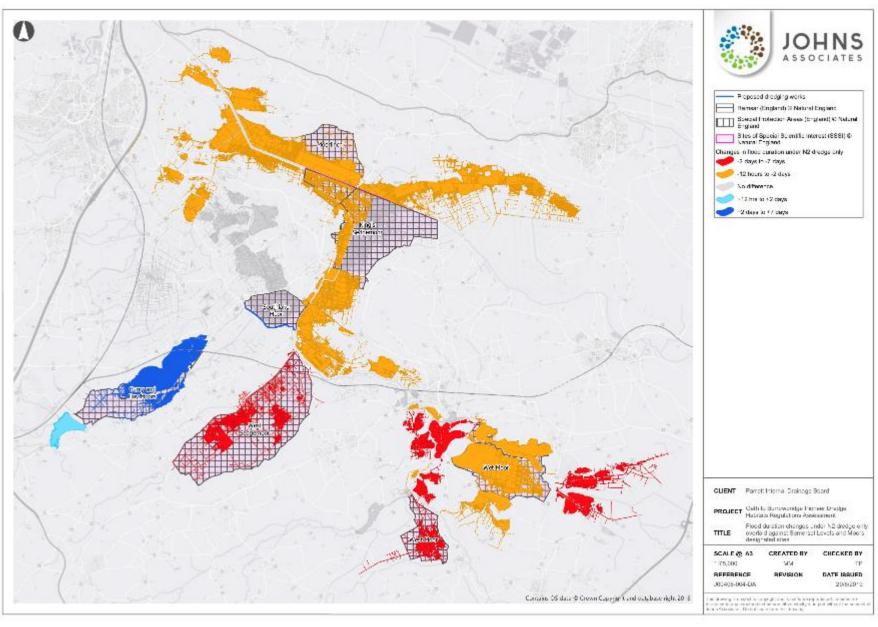


Figure D3.2 (from HRA and Appropriate Assessment): Analysis of Indicative Changes in Flood Duration for the Parrett Dredge

Table D3.1 - Indicative change in flood extent and duration for the Parrett Dredge

Hydraulic modelling was used to identify potential changes in the level and duration of flooding, for a small winter flood, as a consequence of the Parrett Dredge. Table D3.1.

	or a ornan wirte	· · · · · · · · · · · · · · · · · · ·				
Area	Change (ha)	Change within SSSI	Change outside SSSI	Change within RWLAs	Change outside RWLAs	Change in flood duration
Long Load	-69.4	0	-69.4	0	-69.4	-2 days to -7 days
Wet Moor	-29.7	0.3		1.21	-31.09	6 Areas: - 12 hrs to - 2 days
Wet Mooi	-29.7	0.3	-30	1.21	-31.09	4 Areas: - 2 days to -7 days
West Moor	-22	-21.8	-0.2	-12.78	-9.22	-2 days to -7 days
						1 Area -2 days to -7 days
South Moor	-2.2	0	-2.2	0	-2.2	1 Area: - 12 hrs to - 2 days
						3 Areas: No difference
Huish Level	-4.9	0	-4.9	0	-4.9	-2 days to -7 days
Langport	0.0	•	0.0			1 Area: - 12 hrs to - 2 days
Moors	-0.9	0	-0.9	0	-0.9	1 Area: No difference
West	50.5			00.40		2 Areas: No difference
Sedgemoor	-58.5	-57.7	-0.8	-36.42	-22.08	1 Area: -2 days to -7 days
Stanmoor	0	0	0	0	0	No difference
Currymoor	59	43.5	15.5	2.41	56.59	1 Area +12 hrs to +2 days
Currymoor	39	40.0	13.5	2.41	30.38	2 Areas: +2 daysto +7 days

Area	Change (ha)	Change within SSSI	Change outside SSSI	Change within RWLAs	Change outside RWLAs	Change in flood duration
Northmoor	0	0	0	0	0	No difference
AllerMen	05.0	0.4		0.04	F0 00	7 Areas: - 12 hrs to - 2 days
Aller Moor	-65.2	-6.1	-59.1	-6.24	-58.96	1 Area: No difference
King's	20.2	25.0	2.4	-1.05	20 25	4 Areas: - 12 hrs to - 2 days
Sedgemoor (SSSI)	r -39.3	-35.9	-3.4	-1.05	-38.25	1 Area: No difference
King's Sedgemoor (Butleigh & Walton)	0	0	0	0	0	No difference
Moorlinch	-7	-2	-5	-3.65	-3.35	-12 hrs to -2 days
Southlake	-1.8	-1.7	-0.1	-1.78	-0.02	No difference
Earlake	0	0	0	0	0	No difference
Langmead & Weston	0	0	0	0	0	No difference
Chedzoy	-47.2	0	-47.2	0	-47.2	-12 hrs to -2 days
Bawdrip & Bradney	0	0	0	0	0	No difference
TOTAL	-289	-81	-208	-58	-231	

4. Mitigation Action Plan

Based on the impacts identified from the modelling, mitigation options have been attributed to each area and developed into actions, through consultation with EA, NE and PIDB.

The following Table 1 "General Water Management Mitigation Measures" identifies mitigation actions that are applicable to all areas. Site specific and detailed actions are included in section 5 and Table 2 "Site Specific Water Management Mitigation Measures"

Following implementation of the mitigation measures identified in Table 2, the proposed Dredging and Sowy projects are unlikely to have a significant effect on the Somerset Levels and Moors SPA.

Table 1. General Water Level Management Mitigation Measures: These actions apply to all areas. Site specific actions are identified in Table 2 below.

General actions	Description	Туре	Responsible Body	When	Actions
All areas	Ensure water level management (especially in winter) meets the operational requirements (target water levels) of the agreed WLMPs. Report annually on status of WLMP implementation.	WLMP compliance	IDB/EA	ongoing	All WLMPs for the Parrett area are nearly 10 years old and need updating to take account of investments and operational changes since the plans were last produced. WLMPs will be the primary documents for ensuring protected sites achieve and sustain favourable condition status and to implement mitigation actions for Parrett Dredging and the Sowy.
All areas	Maintain and update WLMPs, extend WLMPs to include Functionally Linked Land (FLL) here necessary. Report annually on status of WLMP development outside of SSSIs.	WLMP update	IDB	Autumn 2020	Areas impacted by Dredging and Sowy projects, where current WLMPs do not include winter penning levels for nature conservation including: Aller Moor, Chedzoy and Kings Sedgemoor.
All areas	Sustain existing RWLA network. Maintain existing schemes, seek opportunities to improve the operation, or extend existing schemes. Implement new areas if existing schemes fall out of operation. Report annually on status of RWLA network.	RWLAs	IDB/EA	Ongoing	Significant investment has been made in recent years to improve RWLA management. Existing RWLAs that are currently failing to meet this requirement include West Moor and Moorlinch.
All areas	Maintain and improve existing water management infrastructure required to achieve the conservation objectives of the protected sites and the wider area (FLL). Report annually on status of water management infrastructure.	Water management infrastructure	IDB/EA	Ongoing	Significant investment has been made in recent years to improve water management infrastructure. Notable areas, where further investment is required, include: King's Sedgemoor and West Moor.
All areas	Channel maintenance. Ensure channel maintenance is sympathetic to nature conservation. In particular, ensure maintenance is undertaken at the most appropriate time of year and in accordance with agreed specifications. Report annually on maintenance programme.	Operations (channel maintenance)	IDB/EA/farmer s (supported by agri- environment funding)	Spring 2020	Parrett IDB will review maintenance programmes before the end of 2019 and will agree maintenance specifications and timings with NE.

General actions	Description	Туре	Responsible Body	When	Actions
Within SSSIs See Table 2 (below) for details	Mitigate for the predicted changes in small winter floods as a consequence of Dredging and the Sowy projects. Modelling indicates that the combined impact of these schemes across all Parrett wetland SSSIs is 100ha less of splash flooding, with duration of flooding typically reduced, by 2 days, to one week for a flood of the same magnitude as the summer 2012 flood. No assessment of the impacts on flood frequency could be made, but it can be assumed that Dredging and the Sowy projects will reduce the frequency of small floods in winter. Report annually on this requirement.	Strategic planning and operational delivery. Structures and operations (water levels).	IDB/EA	Spring 2020	See site specific actions (Table 2) for a list of potential measures that can, in combination, meet this requirement. Not all actions identified in Table 2 will be practical and achievable. Given potential uncertainties over the achievability of some actions, more actions have been identified than will be required for mitigation. The minimum requirement is to mitigate for reduced winter flooding on 100ha SSSI land.
Outside SSSIs See Table 2 (below) for details	Mitigate for the predicted changes in small winter floods as a consequence of Dredging and the Sowy projects. Modelling indicates that the combined impact of these schemes across all non-designated areas of the Parrett is 500ha less of splash flooding, with duration of flooding typically reduced, by 2 days, to one week for a flood of the same magnitude as the summer 2012 flood. No assessment of the impacts on flood frequency could be made, but it can be assumed that Dredging and the Sowy projects will reduce the frequency of small floods in winter. Report annually on this requirement.	Structures and	IDB/EA	Spring 2020	See site specific actions (Table 2) for a list of potential measures that can, in combination, meet this requirement. Not all actions identified in Table 2 will be practical and achievable. Given potential uncertainties over the achievability of some actions, more actions have been identified than will be required for mitigation. The minimum requirement is to mitigate for reduced winter flooding on 500ha of non-designated land.

5. Site Specific Mitigation Actions

5.1. Monitoring of effects

- **5.1.1.** Ecological monitoring The primary source of ecological data, relating to the SPA, is bird count data from the British Trust for Ornithology (BTO). BTO data will be collected by Natural England and analysed once a year to identify any changes in the number of birds using the SPA. This data will help identify ecological change that may require mitigation.
- 5.1.2. Water level monitoring Where detrimental change is likely as a consequence of the Dredging or Sowy projects, continuous water level data will be collected by the Environment Agency at key locations for each moor and analysed once a year for any discernible trends that might be attributed to the Dredging or Sowy projects. Historical water level records will be used to identify trends in data collected after the Dredging and Sowy projects have been implemented. If necessary, new telemetry will be installed to monitor conditions in specific locations. Data analysis will focus on identifying changes in the frequency and duration of small winter floods. If detrimental trends in water levels are detected, further meteorological and climate data such as rainfall and temperature will be analysed in order to better understand the causes of those trends.

5.2. Mitigation measures including Water Level Management Mitigation Measures

Where detrimental change, as a consequence of the Dredging or Sowy projects, has been identified and confirmed by monitoring, appropriate mitigation measures will be deployed. Mitigation measures will be agreed with the partners (Natural England, IDB and EA) prior to implementation.

- 5.2.1. Replacement or new water control structures Replace failing structures, or build new structures, that are necessary to effect 'no change' to existing surface water conditions during winter months (December to February) and ensure no detrimental change in SPA condition as a consequence of the Dredging and Sowy projects.
- 5.2.2. Operational protocols Where monitoring indicates it is necessary, and it is agreed that other measures are less suitable, existing water level control structures such as pumping stations and sluices can be operated to effect 'no change' to existing conditions during winter months (December to February) and ensure no detrimental change as a consequence of the Dredging and Sowy projects. This could be achieved by evacuating excess flood water in accordance with existing protocols but suspending evacuation for a short period of time once an agreed level is achieved to safeguard the 'splash conditions' that would

otherwise be lost. If required, these changes will only be implemented during small winter floods that pose no increased flood risk to homes, businesses and infrastructure (e.g. local roads). And the operational risk for each location will need to be carefully considered and the agreed protocols incorporated into the Water Level Management Plan for each area.

- **5.2.3.** Water Level Management Plan (WLMP) Water Level Management Plans will be reviewed with partner organisations by 2022. Changes to water control structures and water levels, agreed in the intervening period, will be incorporated in WLMPs.
- **5.2.4.** Maintain a depth of water (minimum of 300mm) in ditches through the winter period This will include the ditch network within and outside the designated sites where ditches have sufficient depth to achieve this without increasing flood risk.
- **5.2.5. Creation of in-field wet features –** To maintain surface water conditions for waterbirds in winter, such as creation of shallow water scrapes and wet field gutters.

Table 2. Site specific Water Level Management Mitigation Measures: the current condition status of Parrett SSSIs, and existing remedial actions required for each site to achieve favourable condition status, have been used to inform selection of mitigation measures required to effect 'no change' to existing surface water conditions during winter months (December to February) and ensure no detrimental change in SPA condition as a consequence of the Dredging and Sowy projects. Refer to Table D3.1 (above): for potential size and probably location of effect.

Area	Description	Mitigation type	Responsible Body	When	Actions
Aller Moor	Monitor surface water conditions in winter, new telemetry required for Aller Moor, upstream of Aller Drove.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Remedial Work at Beer Wall to prevent water bypassing structure during high flows.	Rebuild structures	EA	Completed 2019	Part of Sowy project, but not mitigation, due to defect causing unanticipated changes in surface water conditions on Aller Moor in winter.
	Implement changes in the operation of Langacre and Beer Wall or IDB structures on Aller Moor	Operational Protocols	EA/IDB	Winter 2020/21	Implement operational changes to effect 'no change' in winter months. Informed by monitoring. Use EA structures Church Drove, Oxleaze Drove and IDB structure Stathe Drove to pen winter level. Operate IDB weirs Lucas Rhyne, Black Withies and Leazeway to maintain water levels in winter.
King Sedgemoor (Non SSSI) Butleigh and	Monitor surface water conditions in winter, new telemetry required for Butleigh and Walton Moor, 18 ft rhyne.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
Walton Moor, 18 ft rhyne	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
	Land purchase to create new RWLA.	New structures	IDB/NE	2025	Potential to mitigate changes in surface water conditions in winter.

Area	Description	Mitigation type	Responsible Body	When	Actions
	Monitor water levels using telemetry at Greylake and Nythe structure.	Monitoring	IDB	2020 – 2022	Operate to effect 'no change' in winter months. Informed by monitoring.
	Implement changes in the operation of Greylake sluice, or other alternative.	Operating protocols	IDB	2022	If required and feasible, as informed by monitoring.
West Sedgemoor	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
Long Load	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Area has low SPA potential due to disturbance and flood risk management constraints.
	Implement changes in the operation of Long Load pumping station and syphon.	Operational protocols	EA	2021	Operate to effect 'no change' in winter months. Only if effect seen through monitoring?
	Prepare WLMP (no existing WLMP for this area).	WLMP	IDB	2025	To agree and formalise target water levels and operational protocols. Area has low SPA potential due to land use and disturbance constraints.
Wet Moor SSSI	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Implement changes in the operation of North barrier Sluice to sustain surface water conditions in winter.	Operational protocols	EA	2021	Operate to effect 'no change' in winter months. Informed by monitoring.
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.

Area	Description	Mitigation type	Responsible Body	When	Actions
West Moor	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Rebuild and maintain existing RWLA including syphons, bunds and flap valves.	Refurbishment / Rebuild structures	EA construction IDB maintenance and operation	2020/21	Refurbish 68 structures in total (works varying from replacing fences to replacement of trench sheet dams) Possibility to extend the RWLA, re resilient wet grassland project.
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
Huish Level	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Area has low SPA potential due to disturbance and flood risk management constraints.
	Prepare WLMP (no existing WLMP for this area).	WLMP	IDB	2025	To agree and formalise target water levels and operational protocols. Area has low SPA potential due to disturbance and flood risk management constraints.
Moorlinch	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Rebuild and maintain existing RWLA, including bunds and flap valves, and consider extension to the east.	Refurbishment / Rebuild structures and operational changes	EA construction IDB maintenance and operation	2020/21	Refurbish 28 structures in total (works varying from replacing fences to refurbishment of existing structures) Restoration of neglected ditch habitats (low water depth and very poor water circulation through SSSI ditches) is impacting habitat quality and water level management.
	Implement changes in the operation of IDB weirs to extend existing RWLA to the east.	Operational changes	IDB	2021	Operate to effect 'no change' in winter months. Informed by monitoring.

Area	Description	Mitigation type	Responsible Body	When	Actions
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
King Sedgemoor (SSSI)	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Rebuild Egypt Clyse.	Rebuild structures	Rebuild structures	2020/21	Refurbishment of upstream headwall and discharge culvert.
					Maintain current operational practices (closed in winter).
	Maintain existing RWLA.	Rebuild structures	IDB	2020	Extreme high silt levels in SSSI ditches and rhynes have compromised the summer feed to KSM and is impacting SSSI condition. Bunds and fencing need repair and maintenance.
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
Currymoor	Monitor surface water conditions in winter.	Monitoring	EA	Continuation of existing EA mitigation programme	Monitor surface water conditions in winter
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
Southlake Moor	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.
	Update WLMP.	WLMP	IDB	2022	To agree and formalise target water levels and operational protocols.
Chedzoy	Monitor surface water conditions in winter.	Monitoring	IDB/EA	Report annually	Implement operational changes to effect 'no change' in winter months. Informed by monitoring.

Area	Description	Mitigation type	Responsible Body	When	Actions
	Update WLMP.	WLMP	IDB		To agree and formalise target water levels and operational protocols.

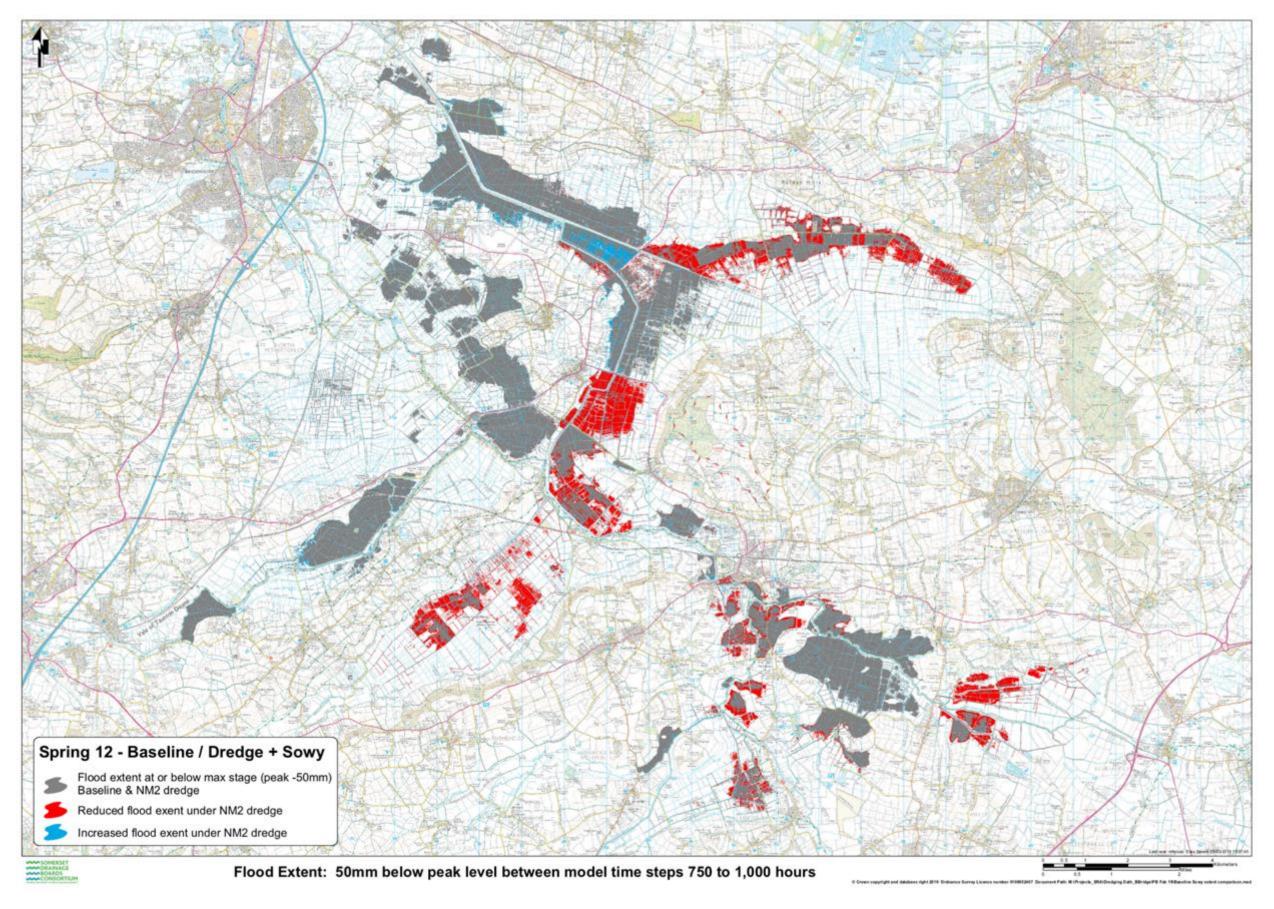
ANNEX 1

Table 3: Indicative change in flood extent and duration for the Parrett Dredge and Sowy Project combined

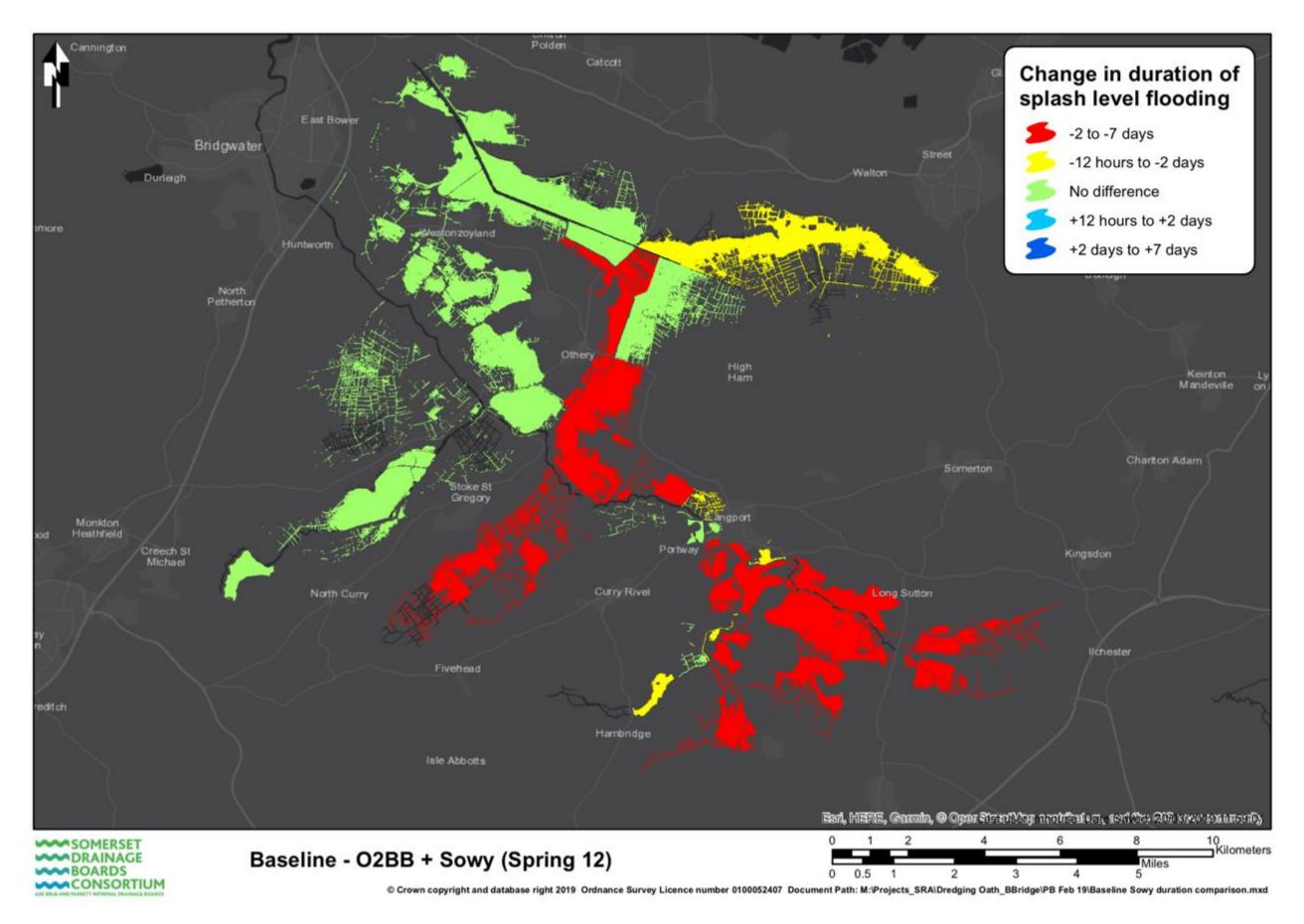
Hydraulic modelling was used to identify potential changes in the level and duration of flooding, for a small winter flood, as a consequence of the combined Parrett Dredge and River Sowy and King's Sedgemoor Drain Enhancement Scheme.

Area	Change (ha)	Chan ge within SSSI	Change outside SSSI	Change within RWLAs	Change outside RWLAs	Change in flood duration
Long Load	-84.1	0	-84.1	0	-84.1	-2 days to -7 days
Wet Moor	-63.4	-1.3	-62.1	0.94	-64.48	-2 days to -7 days
West Moor	-26.1	-25.8	-0.3	-15.26	-10.84	-2 days to -7 days
						1 Area -2 days to -7 days
South Moor	-3.9	0	-3.9	0	-3.9	2 Areas: - 12 hrs to - 2 days
						2 Areas: No difference
Huish Level	-21.7	0	-21.7	0	-21.7	-2 days to -7 days
Langport						1 Area -2 days to -7 days
Moors	-5.8	0	-5.8	0	-5.8	1 Area: - 12 hrs to - 2 days
West	00.0		4.0	51.10	04.44	2 Areas: No difference
Sedgemoor	-88.9	-87.7	-1.2	-54.49	-34.41	1 Area: -2 days to -7 days
Stanmoor	0	0	0	0	0	No difference
Currymoor	11.8	8.5	3.3	0.8	11	No difference
Northmoor	0	0	0	0	0	No difference

Area	Change (ha)	Chan ge within SSSI	Change outside SSSI	Change within RWLAs	Change outside RWLAs	Change in flood duration
						6 Areas: - 2 days to -7 days
Aller Moor	-205.4	-33.7	-171.7	-15.61	-189.79	1 Area: - 12 hrs to - 2 days
						1 Area: No difference
King's	47.0	45.4	1.9	-1.1	48.4	3 Areas: - 2 days to -7 days
Sedgemoor (SSSI)	47.3			-1.1	40.4	2 Areas: No difference
King's Sedgemoor (Butleigh & Walton)	-188.8	0	-188.8	-5.81	-182.99	No flood duration model output available
Moorlinch	7.4	-0.5	7.9	-0.84	8.24	No difference
Southlake	-3.8	-3.8	0	-3.8	0	No difference
Earlake	0	0	0	0	0	No difference
Langmead & Weston	0	0	0	0	0	No difference
Chedzoy	21.7	0	21.7	0	21.7	No difference
Bawdrip & Bradney	0	0	0	0	0	No difference
TOTAL	-604	-99	-505	-95	-509	



Map 3. Indicative change in flood extent for a typical annual winter flood determined from hydraulic modelling of the Parrett Dredging and Sowy projects



Map 4. Indicative change in flood duration for a typical annual winter flood determined from hydraulic modelling of the Parrett Dredging and Sowy projects.

Table 4. Implementation of operational protocols: the current condition status of Parrett SSSIs, and existing remedial actions required for each site to achieve favourable condition status, has been used to inform the selection of mitigation measures. These are required to effect 'no change' to existing surface water conditions during winter months (December to February) and ensure no detrimental change in SPA condition as a consequence of the Parrett Dredging and Sowy projects. Indicative change in flood extent and duration for a typical annual winter flood determined from hydraulic modelling (see Table 3 and maps 3 and 4). Abbreviations: WLMP – Water Level Management Plan, RWLA – Raised Water Level Area.

Early warning monitoring – Where there is a high degree of certainty that there will be no adverse effect. Monitoring could provide early warning of any adverse effects. Validation monitoring – A monitoring plan put in place to validate predicted effects after implantation of required mitigation.

Area	Projected indicative change extent and duration for a typical annual winter flood	Potential mechanism off change (typical winter flood)	Mitigation type	Mitigation objective	Short-term infrastructure improvements	Required mitigation operational protocols	Responsible Body	WLMP update (to incorporate mitigation protocols)	Strategic mitigation options
Long Load	Reduced flood duration (2 to 7 days) and reduced extent (25-100ha).	Increased conveyance in Sowy and Parrett.	Validation monitoring and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	None proposed.	Adjust winter operation of Long Load pumps and syphon to maintain a minimum water level in ditches and mitigate reduced flood conditions.	EA develop and implement operational protocols (winter 2020/21 - Dec 20 to Feb 21)	No WLMP (prepare 2025)	Operate pumps to sustain wetland conditions in winter.
Wet Moor	Reduced flood duration (2 to 7 days) and reduced extent (25-100ha).	Increased conveyance in Sowy and Parrett.	Validation monitoring and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	None proposed.	Adjust winter operation of HEPS pumps and North Barrier Sluice to mitigate reduced flood conditions.	EA develop and implement operational protocols (winter 2020/21- Dec 20 to Feb 21)	2022	None proposed.
West Moor	Reduced flood duration (2 to 7 days) and reduced extent (25-100ha).	Increased conveyance in Sowy and Parrett.	Validation monitoring, infrastructure improvements and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	Refurbish and maintain existing RWLA including refurbishment works on 68 structures.	Adjust winter operation of Midelney pumps to mitigate reduced flood conditions.	EA infrastructure (2020) EA develop and implement operational protocols (2020)	2022	Remove RWLA structures to restore connectivity and operate pumps to sustain wetland conditions in winter.
South Moor	Reduced flood duration (2 to 7 days) and reduced extent (<25ha).	Increased conveyance in Sowy and Parrett.	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed.		No WLMP	None proposed.
Huish Level	Reduced flood duration (2 to 7 days) and reduced extent (<25ha).	Increased conveyance in Sowy and Parrett.	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed.		No WLMP	None proposed.
Langport Moors	Reduced flood duration (2 to 7 days) and reduced extent (<25ha).	Increased conveyance in Sowy and Parrett.	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed.		No WLMP	None proposed.
West Sedgemoor	Reduced flood duration (2 to 7 days) and reduced extent (25-100ha).	Increased conveyance in Sowy and Parrett.	Validation monitoring and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	None proposed.	Adjust winter operation of IDB weirs (North East Block) to maintain a minimum water level in ditches. Adjust winter operation of pumps and Black Smock Sluice to mitigate reduced flood conditions.	EA/IDB develop and implement operational protocols (2020)	2022	Consolidation of Northside RWLA and operational protocols for enhance floodplain connectivity and floodwater storage in Southside Black Smock system.

Area	Projected indicative change extent and duration for a typical annual winter flood	Potential mechanism off change (typical winter flood)	Mitigation type	Mitigation objective	Short-term infrastructure improvements	Required mitigation operational protocols	Responsible Body	WLMP update (to incorporate mitigation protocols)	Strategic mitigation options
Stanmoor	No change in flood duration(<12hrs) or extent (<25ha).	None. Small pump system unconstrained by river flows and no bank overtopping.	Early warning monitoring.	Provide evidence of adverse effects.	Monitoring: telemetry required for Saltmoor (remote from pumps).	None proposed.		No WLMP	
Currymoor	No change in flood duration(<12hrs) or extent (<25ha).	Pump system influenced by level at Parrett Tone confluence. Interaction between increased conveyance in Parrett and Sowy.	Early warning monitoring and operational protocols.	Provide evidence of adverse effects.	None proposed.	None proposed.		2022	Operate pumps to sustain wetland conditions in winter by either increasing winter pen level or the retention of splash conditions.
Northmoor	No change in flood duration(<12hrs) or extent (<25ha).	None. Pump system unconstrained by river flows and no spillway flow.	Early warning monitoring and operational protocols.	Provide evidence of adverse effects.	None proposed.	Adjust winter operation of Banklands Bridge Weir to maintain a minimum water level in ditches.	IDB develop and implement operational protocols (2020)	2022	
Aller Moor	Reduced duration (2 days) and reduced max extent (100-250ha) of surface water.	Increased conveyance in Sowy and reduced spillway flow after dredge.	Validation monitoring, infrastructure improvements and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	Monitoring: telemetry required for Church Drove and Aller Drove.	Adjust winter operations of IDB and EA weirs to maintaining a minimum water level in ditches (IDB: Lucas Rhyne, Black Withies and Leazeway - EA: Beer Wall, Church Drove, Oxleaze Drove and IDB structure Stathe Drove). Adjust winter operation of Langacre	EA/IDB develop and implement operational protocols (winter 2020/21 – Dec 20 to Feb 21)	2022	Increase floodplain connectivity of Langacre system.
						Rhyne at Beer Wall, or IDB structures on Lucus, Leazeway and Black Withies Rhyne to mitigate reduced flood conditions.			
King Sedgemoor SSSI	Reduced flood duration (2 to 7 days) and reduced extent (25-100ha).	Increased conveyance in Sowy and reduced spillway flow after dredge.	Validation monitoring, infrastructure improvements and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	Rebuild Egypt Clyse (EA 2020). Maintain existing RWLA (IDB). Monitoring: telemetry required for Middlezoy Moor, Othery Rhyne and RWLA Block 3.	Recent operational changes for Langacre and Othery Rhyne system already provide adequate mitigation.	EA construction (2020) No operational changes required IDB provision of telemetry	2022	Further enhance floodplain connectivity of Langacre system.
Butleigh & Walton KSM	Reduced max extent (100-250ha). No flood duration model output available.	Interaction between increased volume in KSD and reduced spillway flow from Parrett.	Validation monitoring, infrastructure improvements and operational protocols.	Manage water levels to effect 'no change' in winter months. Confirm with monitoring.	Monitoring: telemetry required for 18ft Rhyne and Butleigh Drove.	Adjust operation of Greylake sluice to mitigate reduced flood conditions or seek suitable alternative. For example, adjust winter operation in adjacent areas, Sutton Moor, Pitney, Somerton Moor, Low Ham Moor to maintain a minimum water level in ditches.	EA/IDB develop and implement operational protocols (2020)	2022	Potential for RWLA type schemes.

Area	Projected indicative change extent and duration for a typical annual winter flood	Potential mechanism off change (typical winter flood)	Mitigation type	Mitigation objective	Short-term infrastructure improvements	Required mitigation operational protocols	Responsible Body		Strategic mitigation options
Moorlinch	No change in flood duration(<12hrs) or extent (<25ha).	Interaction between increased volume in KSD and reduced spillway flow from Parrett.	Early warning, infrastructure improvements and operational protocols.	Provide evidence of adverse effects.	Rebuild and maintain existing RWLA, including bunds and flap valves. Rebuild Parchey tilting weir.	Restore operation of micro-roost (NE). Adjust winter operation of Shapwick Right Rhyne (IDB) to buffer RWLA and sustain ditch levels and splash conditions across SSSI.	EA construction (2020) IDB develop and implement operational protocols (winter 2020/21 – Dec 20 to Feb 21)		Remove RWLA structures to restore connectivity and operate IDB structures to sustain wetland conditions in winter. Potential to extend winter splash conditions to include Sutton Hams.
Southlake	No change in flood duration(<12hrs) or extent (<25ha).	None	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed		2022	Permit warping in February
Earlake	No change in flood duration(<12hrs) or extent (<25ha).	None	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed		2022	None proposed.
Langmead & Weston	No change in flood duration(<12hrs) or extent (<25ha).	None	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed		2022	None proposed.
Chedzoy	No change in flood duration(<12hrs) or extent (<25ha).	Interaction between increased volume in KSD and reduced spillway flow from Parrett.	Early warning monitoring and operational protocols.	Provide evidence of adverse effects.	None proposed.	Adjust winter operation of Chedzoy Sluice to maintain a minimum depth of water in ditches.	EA develop and implement operational protocols (2020)	2022	Potential for RWLA type scheme, Sedgemoor Drove.
Bawdrip & Bradney	No change in flood duration(<12hrs) or extent (<25ha).	Interaction between increased volume in KSD and reduced spillway flow from Parrett.	Early warning monitoring.	Provide evidence of adverse effects.	None proposed.	None proposed		2022	None proposed.