



Southern Water's Water for Life: Hampshire

Technical Report 2: Biodiversity Net Gain and Natural Capital Assessments

Report for Southern Water

FINAL

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1 Introduction

1.1 Background

Water companies in England and Wales are required to produce a Water Resources Management Plan (WRMP) every five years. The Plan sets out how the company intends to maintain the balance between supply and demand for water over the selected planning horizon (minimum 25 years) in order to ensure security of supply in each of the water resource zones making up its supply area.

Following submission of WRMPs in 2019, Ofwat through the Price Review 2019 (PR19) Final Determination, has identified the potential for companies to jointly deliver strategic regional water resources solutions to secure long-term resilience on behalf of customers while protecting the environment and benefiting wider society. As part of the assessment of companies' PR19 business plans, Ofwat introduced proposals to support the delivery of Strategic Regional Water Resource Options (SROs) over the next 5 to 15 years with solutions considered to be 'construction ready' for the 2025-2030 period. Ofwat's Final Determination in December 2019 set out a gated process for the co-ordination and development of a consistent set of SROs.

This gated process provides a mechanism for the industry, regulators, stakeholders and customers to input into the development and scheduling of these strategic solutions, through a combined set of statutory and regulatory processes. These include the National Framework, Drinking Water Safety Plans, Business Plans and WRMPs.

1.2 Southern Water's Strategic Challenge and SROs

The River Itchen, the River Test, and the Candover Stream are the three primary surface water resources utilised in Southern Water's Western Operating Area. In March 2019, the Environment Agency (EA) enacted sustainability reductions on all three sources, imposing new abstraction limitations to protect biodiversity in periods of drought. These reductions have fundamentally changed the water resources position in Hampshire and Isle of Wight (IOW) water resource zones (WRZs), and there is uncertainty regarding the potential for further changes in the future. The scale of the sustainability reductions is expected to generate sizeable supply-deficits during periods of severe drought.

Water supply modelling completed in development of Southern Water's WRMP, published in 2019, identified a 167 MI/d supply-demand deficit across Southern Water's Western Operating Area during a 1-in-200-year drought scenario, accounting for the sustainability reductions referenced above. The WRMP19 preferred strategy included a 75MI/d desalination plant in the Hampshire Southampton West (HSW) Water Resource Zone (WRZ). This was confirmed as the Base Case for the Gate 1 submission.

As part of the RAPID Gated process, Southern Water have been investigating a number of alternative Strategic Resource Options (SROs) to the Base Case including water recycling and water transfer from Portsmouth Water's Havant Thicket Reservoir.

A high-level natural capital assessment and an initial look at potential net gain opportunities were completed for Gate 1, as the methodologies for more detailed assessments for SROs related to both Natural Capital and Biodiversity Net Gain, were still (at the stage of the accelerated gate-1 pathway) in developed. The latest Water Resource Planning Guidelines (WRPG)¹ states that water companies should review the natural capital impacts of their future solutions and their contribution to Biodiversity Net Gain in order to ensure that benefits of the environment to human society, wider environmental and societal objectives, and biodiversity, are taken into account within decision-making. Water companies are expected to make decisions that do not devalue, and look to enhance, the value of the natural world for the benefit of society.

¹ Environment Agency, Natural Resources Wales, Office for Water Services (2021). Water resources planning guideline. Updated 17 March 2021

1.3 Purpose of this Report

As such the purpose of this report is to provide firstly a Biodiversity Net Gain (BNG) and Natural Capital (NC) assessment of the solution components, to inform the site selection work and secondly a preliminary assessment of BNG and NC losses and benefits for the chosen solution configurations, for reporting as part of the Gate 2 submission and to enable a comparison of the SROs for the purposes of options appraisal.

This report applies the latest methodologies for biodiversity net gain and natural capital assessment as set out in the All Company Working Group's (ACWG) current guidance to SRO Environmental Assessment.

This report sets out the environmental evidence and data used to inform the natural asset baseline and the results of the BNG and NC assessments. The report also identifies the remaining evidence and data gaps for further consideration in the next stage of development of the selected SRO.

The report (as per the structure set out in Section 1.4) firstly focusses on BNG and associated NC for key identified metrics for the range of components associated with Southern Water's key strategic best endeavours Water for Life-Hampshire (WfLH) programme as outlined in **Table 2.1**. The individual components for each SRO (e.g., pipe line, water treatment work etc etc) were then used within the site selection work (see relevant Level 3 document) to confirm the solution configuration to be taken forward to options appraisal. A second stage was then completed to develop a BNG and NC assessment for key configurations (options). This data was required for the multi-decision criteria assessment (MCDA) undertaken by [REDACTED]. Completing the individual component analysis was critical to enable final refinement for agreed configurations for the MCDA (i.e., refinement of agreed component summation to avoid double counting related to land cover for individual components).

This report includes an assessment of habitat loss (both temporary and permanent loss), a high level assessment of habitat reinstatement required on-site and where necessary consider additional offsite mitigation to offset any habitat loss. An assessment of 'uplift' necessary to achieve a minimum of 10% net gain is also included. An associated NC assessment is included that account for temporary and permanent losses and additional benefits related to net gain. It should be noted however, that at this stage the assessment of both BNG and NC is based on open source data and that there are uncertainties associated with limited construction detail. To ensure however, that this approach is robust for the assessment across the options at Gate-2 we have taken a precautionary approach and applied the analysis of the data in the same way across the assessment. More detail of the approach and applied assumption to ensure robustness of the methodology are outlined in more detail in section 3.

1.4 Structure of this Report

This report includes the following sections:

Section 1: Introduction

Section 2: Description of the Southern Water SROs²

Section 3: Approach

Section 4: Site Selection: Component Level Assessment

Section 5: Options Appraisal: Configuration Level Assessment

Section 6: Summary of Configurations

Section 7: Monitoring and Assessment for Solution Development

² Individual company solutions only. Southern Water are working with other water companies on a range of joint SRO solutions.

2 Description of the Southern Water Strategic Resource Options

2.1 Summary

As part of the RAPID Gate 2 submission, Southern Water is progressing the ‘base case’ (Fawley desalination) as well as eight potential alternatives, which are being considered in case the Base Case is not deliverable. These can be broken down into the following options:

- Desalination alternatives
- Water recycling
- Water transfer

Those configurations relevant to this report are provided in **Table 2.1**.

Table 2.1 Water for Life-Hampshire Strategic Solution Review

Solution	Configuration	Description
Desalination	Base Case	75MI/d of drinking water produced by desalination plant in Fawley area supplying Hampshire Southampton West (HSW) Water Resources Zone with the interface between the new and existing distribution system located at Testwood WSW.
	A.2	61MI/d of drinking water produced by desalination plant in vicinity of Fawley supplying HSW WRZ (as in Strategy A.1).
	A.3	75MI/d or 61MI/d of drinking water produced by desalination plant at land parcel D55 supplying HSW WRZ with interface between the new and existing distribution system located at Otterbourne WSW.
Water Recycling	B.2	61 MI/d recycled water from Water Recycling Plant (fed from [REDACTED]) transferred to Lake Otterbourne environmental buffer and treated at Otterbourne WSW
	B.4	15 MI/d recycled water from Water Recycling Plant (fed from [REDACTED]) transferred to Havant Thicket Reservoir environmental buffer, with bulk supply to 61MI/d, treated at Otterbourne WSW
	B.5	75 MI/d recycled water from Water Recycling Plant (fed from [REDACTED]) transferred to Lake Otterbourne environmental buffer and treated at Otterbourne WSW
Water Transfer Alternatives	D.2	75 MI/d Alternative direct raw water transfer from Havant Thicket Impounding Reservoir to Otterbourne WSW

The following sections describe the components of each configuration. For both the Biodiversity Net Gain and Natural Capital, the assessment initially provides outputs per component and subsequent to the completion of the site selection work, assessments of the key SRO configurations were completed to inform both the MCDA assessment undertaken by KPMG. The latter is detailed in Section 5 but comprises a selection of those components detailed below.

2.2 Desalination

The key components of the desalination solution considered in this environmental assessment include:

- Sea water intake and outfall with brine waste-stream.
- Pumping station (PS) and brine tank.
- Pipeline from intake to the desalination plant.
- Pipeline from desalination plant to outfall (assumed to be within same corridor as intake pipeline).
- The desalination plant itself.

- A transfer pipeline to a water supply works.
- Receiving tank at water supply works.

As indicated above, two sizes for the desalination plant are being considered; 75MI/d and 61MI/d.. The engineering information used within this assessment is based on the conceptual design produced for a 75MI/d solution for costing purposes only. The full 75MI/d will only be required to supply potable water in a 1 in 200 year drought event, and therefore the output at this level is periodic (one in every 20 years) a considered very much the worst-case scenario. However, the plant will need to be run with a sweetening flow of 15MI/d to main operational processes, ready for output to be increased when required. This would therefore be the likely, and more frequent, mode of operation.

For a 75MI/d Deployable Output desalination solution, 189MI/d of seawater is required which gives rise to 87m³/d solid waste and 114MI/d brine waste stream. When operating at a baseline level to provide 15MI/d, 38MI/d seawater is required resulting in 17m³/d solid waste and 23MI/d brine waste stream. The solid waste would need to be taken from site to landfill, requiring c. 1-2 movements per day when operating at 15MI/d and c.6-7 movements when operating at 75MI/d.

Two alternatives to the Base Case were worked up in additional detail by the WfLH Engineering team, as to a potential alternative to the Base Case. These considered an alternative site for the intake and outfall at Lepe, but with the desalination plant remaining at [REDACTED] and transferring water to Testwood WSW. The latter alternative (A.3) was to locate the desalination plant on Southampton Water, in an area close to Meon, with the transfer of water to Otterbourne WSW.

Table 2.2 provides a summary of the components required for each configuration, and these are shown in **Figure 2.1**. Sections 2.21 to 2.2.3 describe the configurations in more detail.

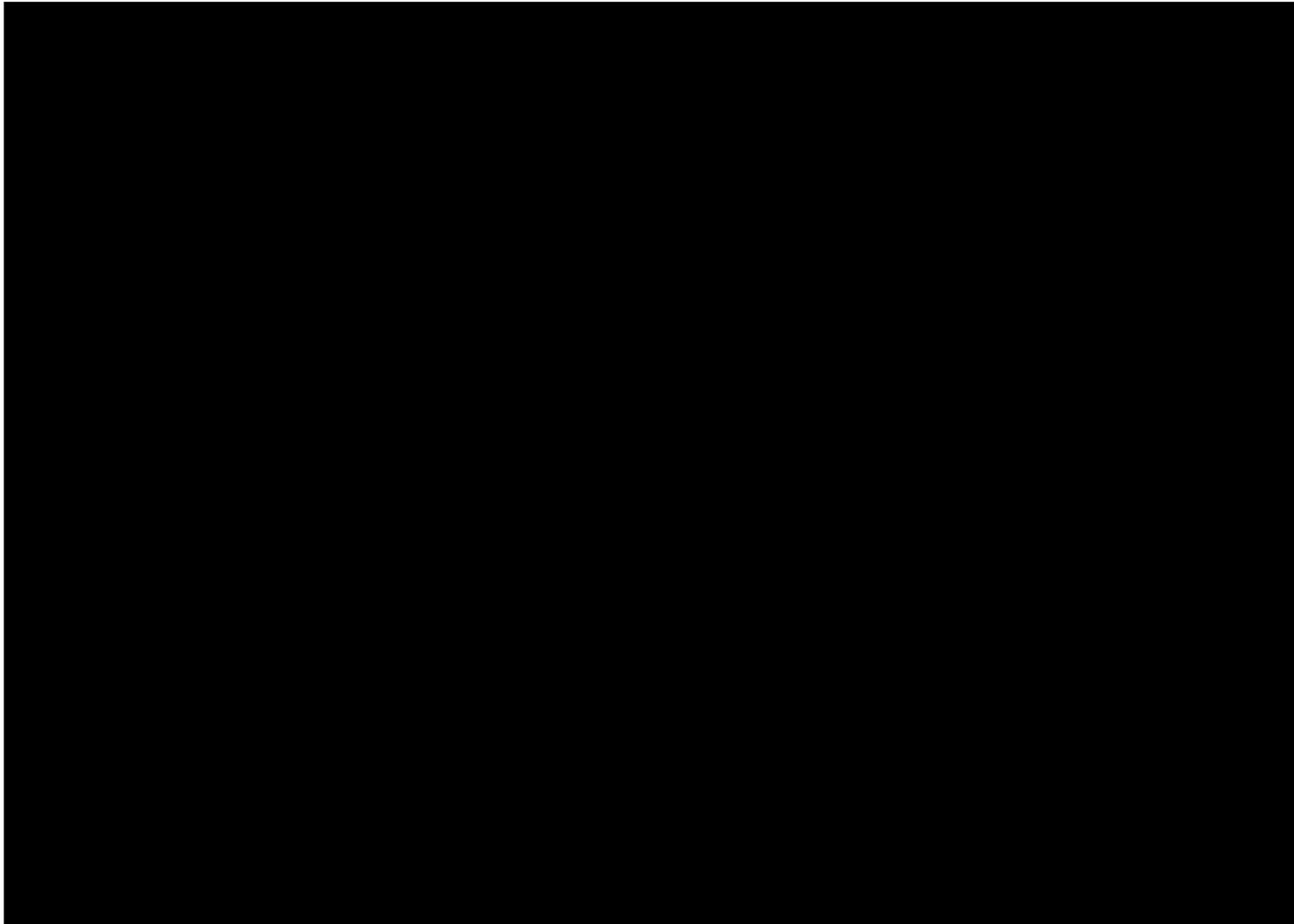
Table 2.2 Desalination solution components³

Component	Locations	A1/A2 Base Case desalination (Calshot)	A1/A2 Base Case desalination (Lepe)	A3 desalination
Intake within Southampton Water or Solent	[REDACTED]	Calshot intake/outfall	Lepe	Meon
[REDACTED]	[REDACTED]	x		
Pumping station at Fawley (x1 site)	[REDACTED]	x		
Pumping station at Lepe (x3 site locations)	[REDACTED]		x	
Pumping station at Meon	[REDACTED]			x
Transfer from intake/to outfall via Fawley PS to desalination plant (x1 route)	[REDACTED]	x		
Transfer from intake/to outfall via Lepe PS to desalination plant	[REDACTED]		x	
Transfer from intake/to outfall via Meon PS to desalination plant	[REDACTED]			x
Desalination plant at [REDACTED]	[REDACTED]	x	x	
Desalination plant at Meon	[REDACTED]			x
Brine discharge * outfall from desalination plant to Solent	[REDACTED]	x	x	x
Transfer from desalination plant at [REDACTED] to Testwood WSW (x5 routes)	[REDACTED]	x	x	
Transfer from desalination plant at Meon to Otterbourne WSW (x2 routes)	[REDACTED]			x
Receiving tanks at Testwood WSW	[REDACTED]	x	x	
Receiving tanks at Otterbourne WSW	[REDACTED]			x

* In report referred to as abstraction and discharge structures

³ The 'x' denotes where a component is included in the solution.

Figure 2.1 Desalination components: Fawley, Calshot, Lepe and Meon⁴



⁴ Note: the site selection clusters were not included in the BNG and NC assessments.

2.2.1 A1 - 75MI/d or A2 61MI/d - Base Case: Fawley and Calshot

The components of the desalination solution at Fawley are as follows:

- Sea water intake:
 - [REDACTED]
 - Offshore at Calshot
- Brine waste-stream and diffuser:
 - [REDACTED]
 - Offshore at Calshot but with completely new pipeline
- [REDACTED] (permanent land take c. 6,070m², additional temporary land take for construction compound c. 4,070m²)
- Pipeline to/from intake and outfall and desalination plant along western boundary of Fawley site.
- Desalination plant at [REDACTED] (including brine Contact Tank, Clear Water Tanks, Reject Water Tank and site drain) (c. 96,000m² for 75MI/d (permanent land take, 4,047m² temporary construction compound).
- Transfer pipeline to Testwood WSW (no water booster stations or break pressure tanks are required):
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
 - [REDACTED] joins Route 1 and 2 corridor at Hounsdawn.
 - [REDACTED]
 - [REDACTED]
 - [REDACTED]
- Receiving tank at Testwood WSW.

2.2.2 A1 - 75MI/d or A2 61MI/d – Alternative: Lepe

The components of the desalination solution at Lepe are as follows:

- Sea water intake off Lepe coast (all new infrastructure).
- Brine waste-stream and diffuser off Lepe coast (completely new infrastructure).
- Pumping station and brine reception to be located close to offshore components at Lepe (permanent land take c. 6,070m², additional temporary land take for construction compound c. 4,070m²):
 - Land parcel FAWPS 19 (north of Lepe Country Park car park).
 - Land parcel FAWPS 21 (west of Pits Copse).
 - Land parcel FAWPS 23 (west of Allwoods Copse).
- Pipeline to/from intake and outfall and desalination plant:
 - [REDACTED] along [REDACTED] to [REDACTED].
 - [REDACTED]

- Desalination plant at [REDACTED] (including Tanks) (c. 96,000m² for 75MI/d (permanent land take, 4,047m² temporary construction compound).
- Transfer pipeline to Testwood WSW – five route options as described in Section 2.2.1 Fawley.
- Receiving tank at Testwood WSW.

2.2.3 A3 - 75MI/d or A2 61MI/d – Alternative: Meon

The components of a desalination solution at in land parcel D55 (in Meon) are as follows:

- Sea water intake offshore into Southampton Water/Solent (completely new infrastructure).
- Brine waste-stream and diffuser offshore (completely new infrastructure).
- [REDACTED] 6,070m², additional temporary land take for construction compound c. 4,070m²).
- Pipeline from pumping station to desalination plant.
- [REDACTED] (c. 96,000m² for 75MI/d (permanent land take, 4,047m² temporary construction compound).
- Transfer pipeline to Otterbourne WSW:
 - Route 1
 - Route 2

2.3 Water Recycling

Table 2.23 provides a summary of the components required for each configuration, and Sections 2.3.1 to 2.3.3 describe the configurations in more detail.

Table 2.3 Water recycling and water transfer scheme components⁵

Component	Location	B2 Water Recycling to Lake Otterbourne	B4 Water Recycling to Havant Thicket Reservoir	B5 Water Recycling ([REDACTED] to Lake Otterbourne)	D2 Havant Thicket Transfer
Effluent transfer from [REDACTED] to WRP (x1 route)	[REDACTED]	x	x	x	
Effluent transfer from [REDACTED] to WRP (x1 route)	[REDACTED]			x	
WRP sites (x7 sites)	[REDACTED]	x	x	x	
Waste-stream to [REDACTED] and out [REDACTED] LSO	[REDACTED]	x	x	x	
Transfer pipeline WRP to Lake Otterbourne environmental buffer (x3 routes)	[REDACTED]	x		x	
Water booster stations (WBS) and break pressure tanks (BPT) (along pipeline routes)	[REDACTED]	x	x	x	x
Lake Otterbourne environmental buffer with emergency discharge pipeline to Otter Bourne watercourse <u>OR</u> to overland discharge area	[REDACTED]	x		x	
Transfer pipeline WRP to Havant Thicket Reservoir (x2 routes)	[REDACTED]		x		
Havant Thicket Reservoir high lift pumping station (x4 land parcels)	[REDACTED]		x		x

⁵ The 'x' denotes where a component is included in the solution.

Component	Location	B2 Water Recycling to Lake Otterbourne	B4 Water Recycling to Havant Thicket Reservoir	B5 Water Recycling (Budds and Peel) to Lake Otterbourne	D2 Havant Thicket Transfer
Transfer pipeline HTR to Otterbourne WTW (x4 routes)	Routes 1, 2, 3, 4		x		x
Pre-disinfection ceramic membrane plant at Otterbourne WSW		x	x	x	
Overflow and drawdown to Overland flow		x		x	

2.3.1 B2 - 61 Ml/d Recycled Water from new Water Recycling Plant (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant
 - Seven separate sites are currently being considered in the vicinity of [REDACTED] (land parcels 68, 70, 71, 72, 73, 74, 75), see **Figure 2.2** (permanent land take c. 45,000m², 4,047m² for temporary construction compound).
- Pipeline connection between [REDACTED] and water recycling plant site (assumed tunnelled under watercourse)
- Transfer pipeline from water recycling plant to Lake Otterbourne environmental buffer
 - Route 1
 - Route 2
 - Route SIA
- 2nd Stage Pumping stations and break pressure tanks along routes – indicative locations (see **Figure 2.3** and **Figure 2.4**).
- Lake Otterbourne environmental buffer with emergency discharge pipeline to Otter Bourne watercourse⁶ **OR** overland discharge area (see **Figure 2.5** and **Table 2.4**)
 - The infrastructure on the Otterbourne/ River Itchen has not been assessed as the data is not available. Gate 3 will include assessment of this infrastructure if the information is available at the time.
- Pre-disinfection ceramic membrane plant at Otterbourne WSW (see **Figure 2.6**).

⁶ A discharge structure will be required at the Otter Bourne watercourse, however this has currently not been sized (re: requirements to reduce scour etc) and therefore has not been included in the assessment.

Figure 2.2 Water Recycling Plant land parcels from site selection process

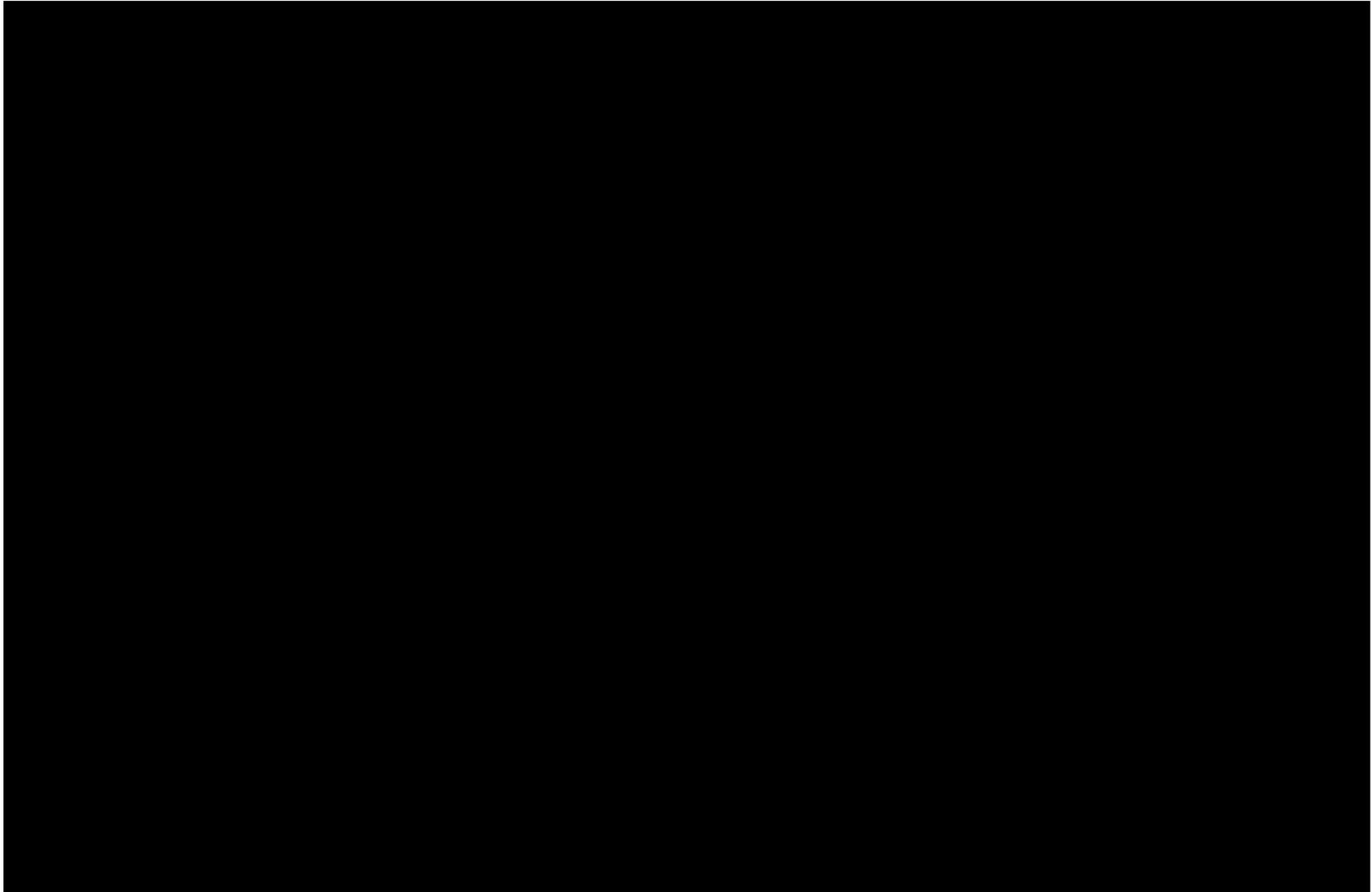


Figure 2.3 Indicative locations of water booster stations and break pressure tanks: Route 1 and Route 2

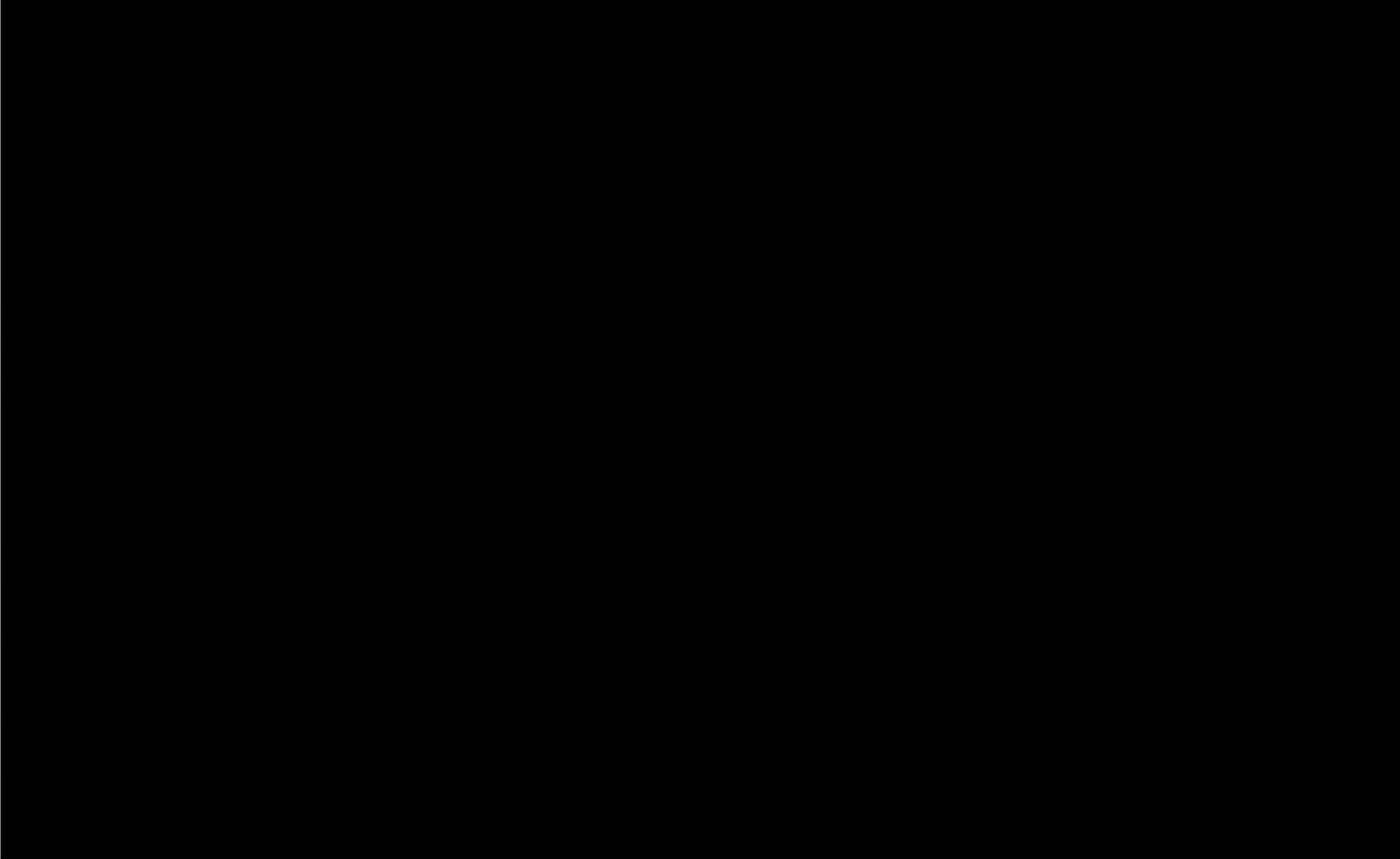


Figure 2.4 Indicative locations of water booster stations and break pressure tanks: Route SIA

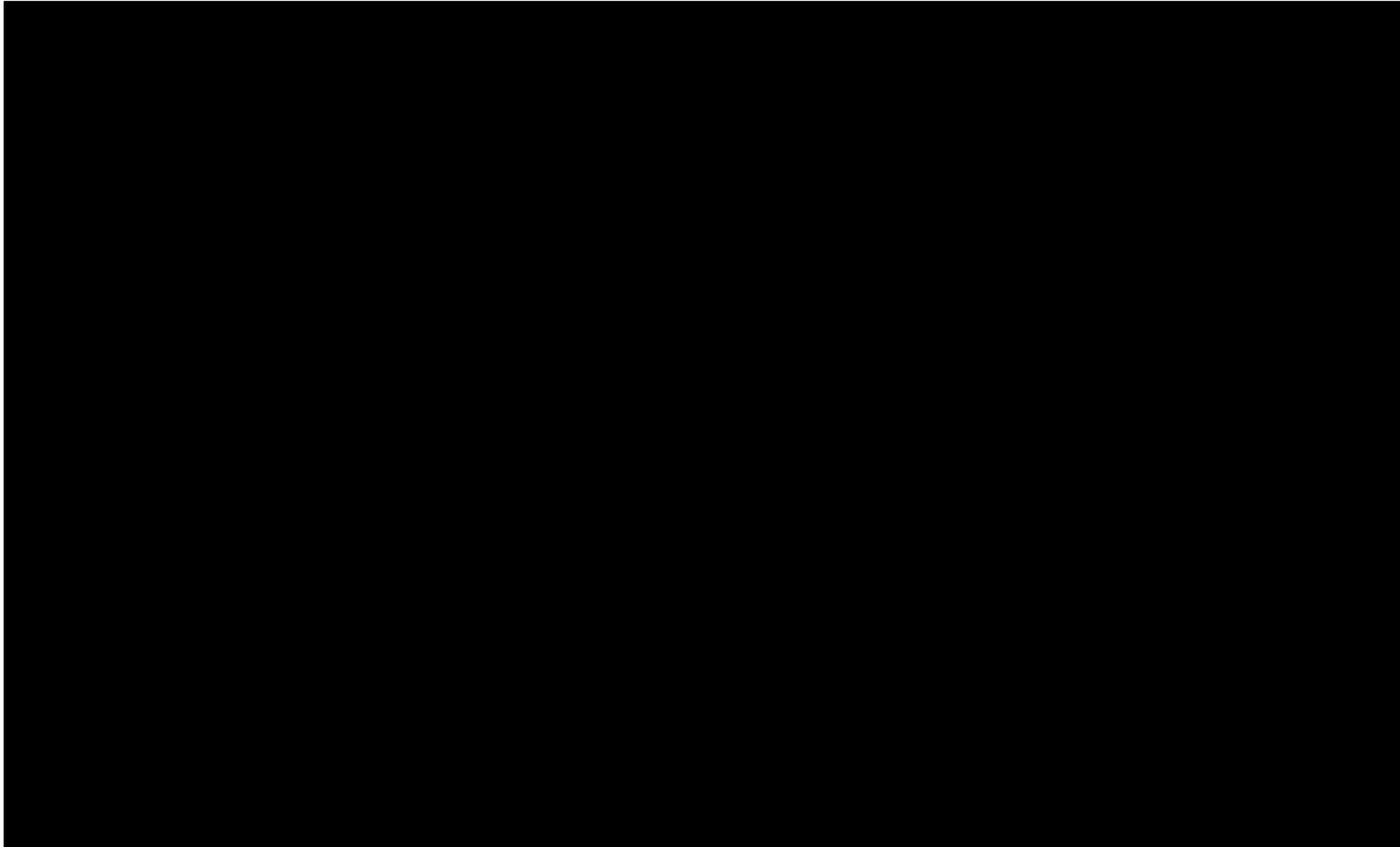


Figure 2.5 Lake Otterbourne conceptual design

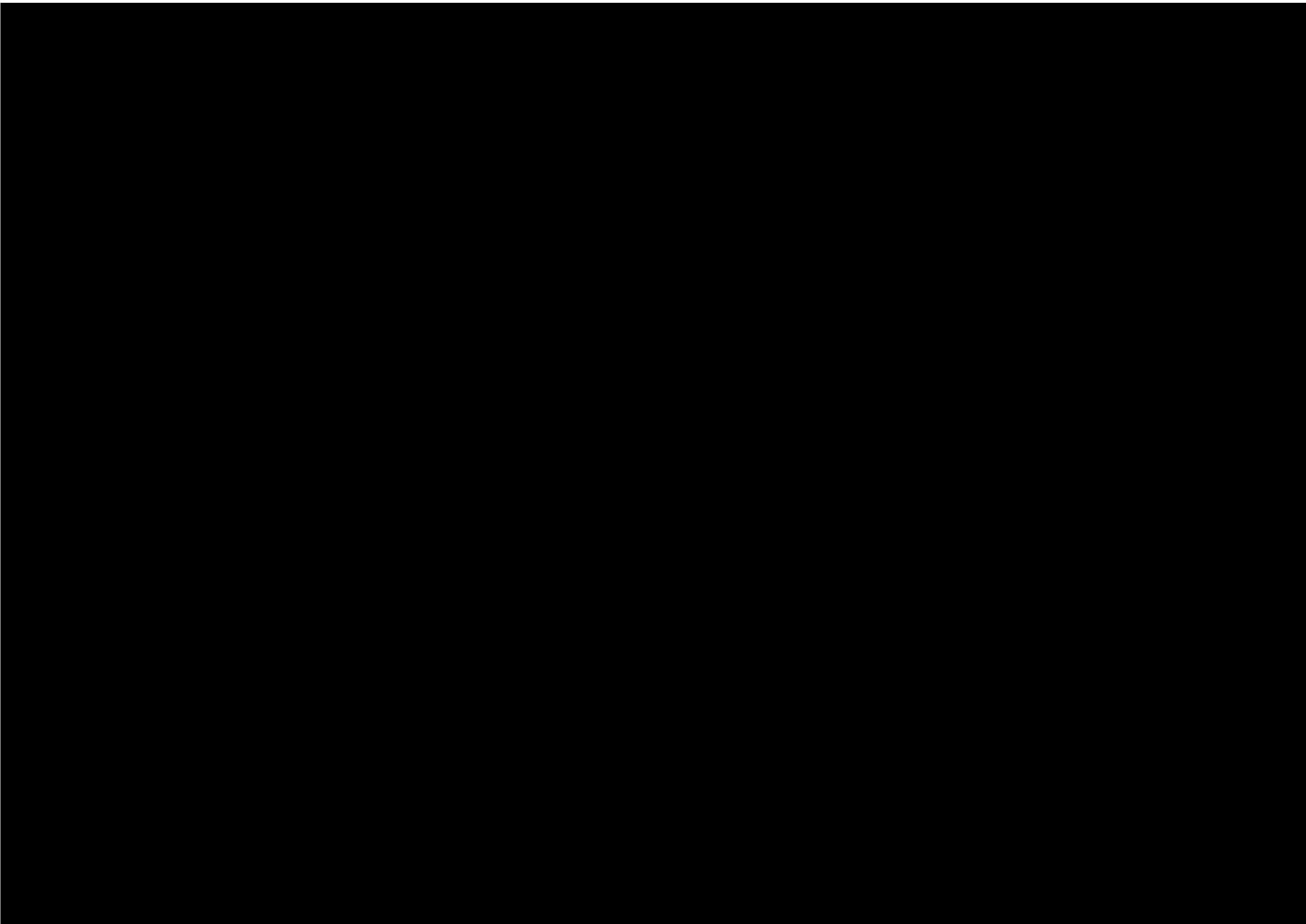
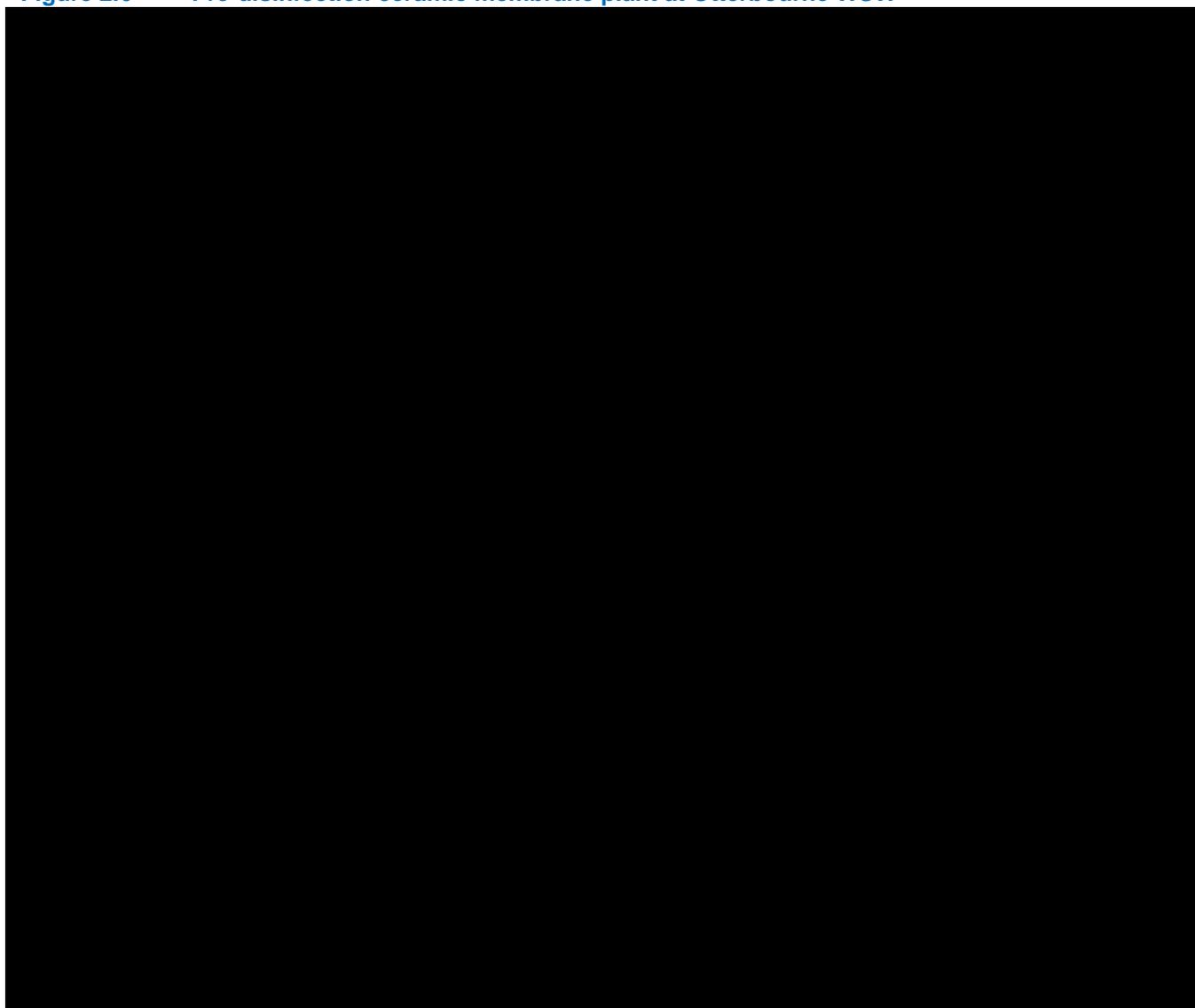


Table 2.4 Lake Otterbourne land area assumptions

Land use	Area m ²
SW Land Parcel (solar panels)	41,631
Southern Land Parcel (to be purchased)	13,875
EBL Surface Area (based on TWL)	19,860
Channel Surface Area	656
Small Pond Area	956
Access road (as shown on plus additional 140m long 3.5m wide access to pumping station)	3,946
Planting/screening (assumed)	3,806
Embankments/grassland	26,282
Structures	60
Temporary lay down and working areas (assumed that existing lay down areas within the WSW are used)	0

Figure 2.6 Pre-disinfection ceramic membrane plant at Otterbourne WSW



2.3.2 B4 - 15 MI/d Recycling Water from new Water Recycling Plant (fed from [REDACTED] to Otterbourne WSW via Havant Thicket Reservoir environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant:
 - Seven separate sites are currently being considered in the vicinity of [REDACTED] [REDACTED]⁷.
- Pipeline connection between [REDACTED] and water recycling plant site (assumed tunnelled under watercourse)
- Transfer pipeline from water recycling plant to Havant Thicket Reservoir
 - Route 1
 - Route 2
- Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW:
 - Route 1
 - Route 2
 - Route 3
 - Route 4
- Initial high lift pumping station close to Havant Thicket Reservoir (permanent land take c. 1,500m², temporary construction compound c.1,000m²) – indicative location.
- 2nd Stage Pumping stations and break pressure tanks along routes – indicative locations (see **Figure 2.7** to **Figure 2.9**).
- Pre-disinfection ceramic membrane plant at Otterbourne WSW.

⁷ The total footprint for the WRP will be smaller than the 45,000m² required for the 75MI/d option: c.25,000m². However, as a worst case, the larger footprint has been used for all water recycling solutions as the exact location within the site boundary is unknown. This therefore assumes removal of the same habitats until design refinement at Gate 3.

Figure 2.7 Indicative locations of water booster stations and break pressure tanks: Route 1 and Route 2

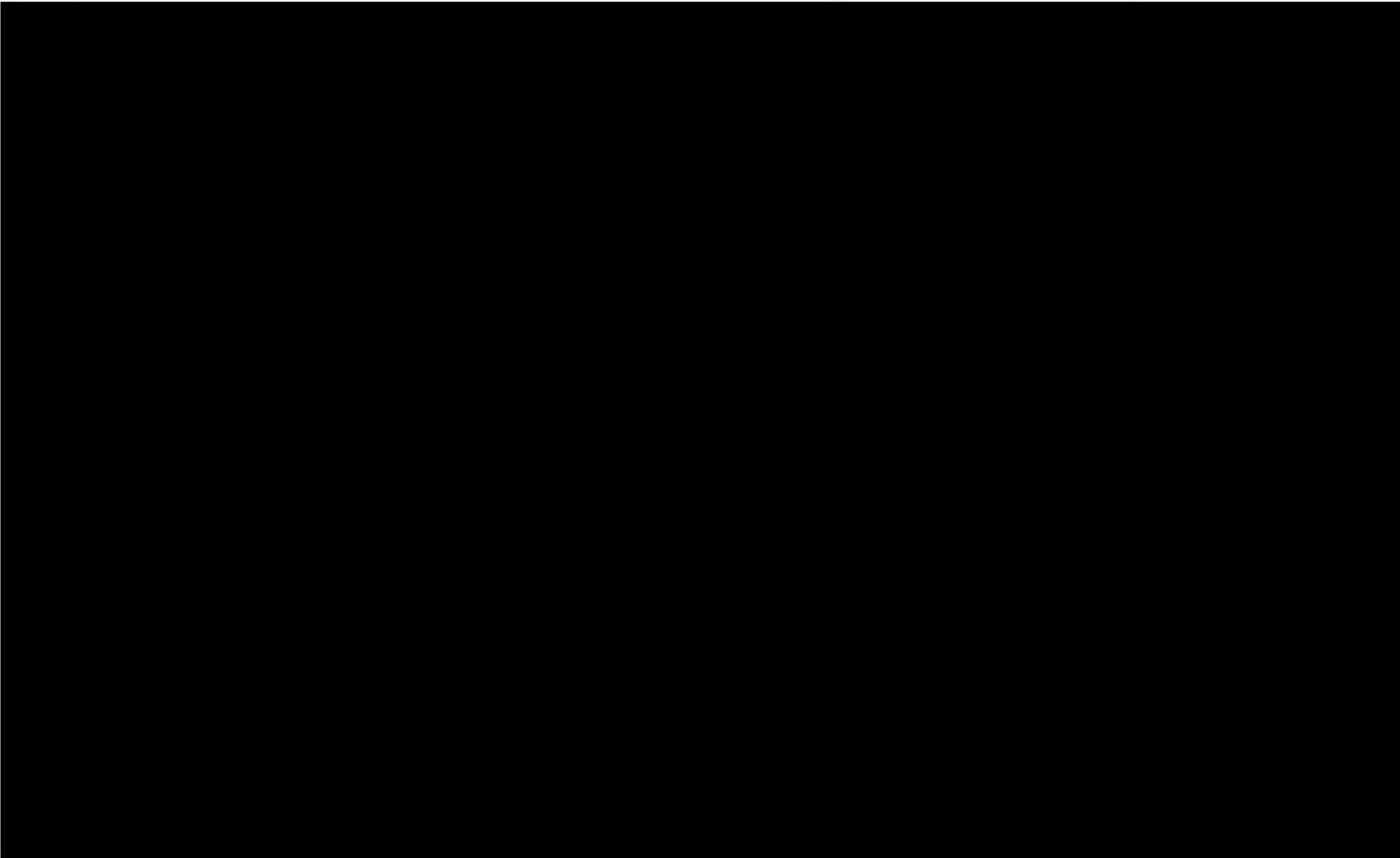
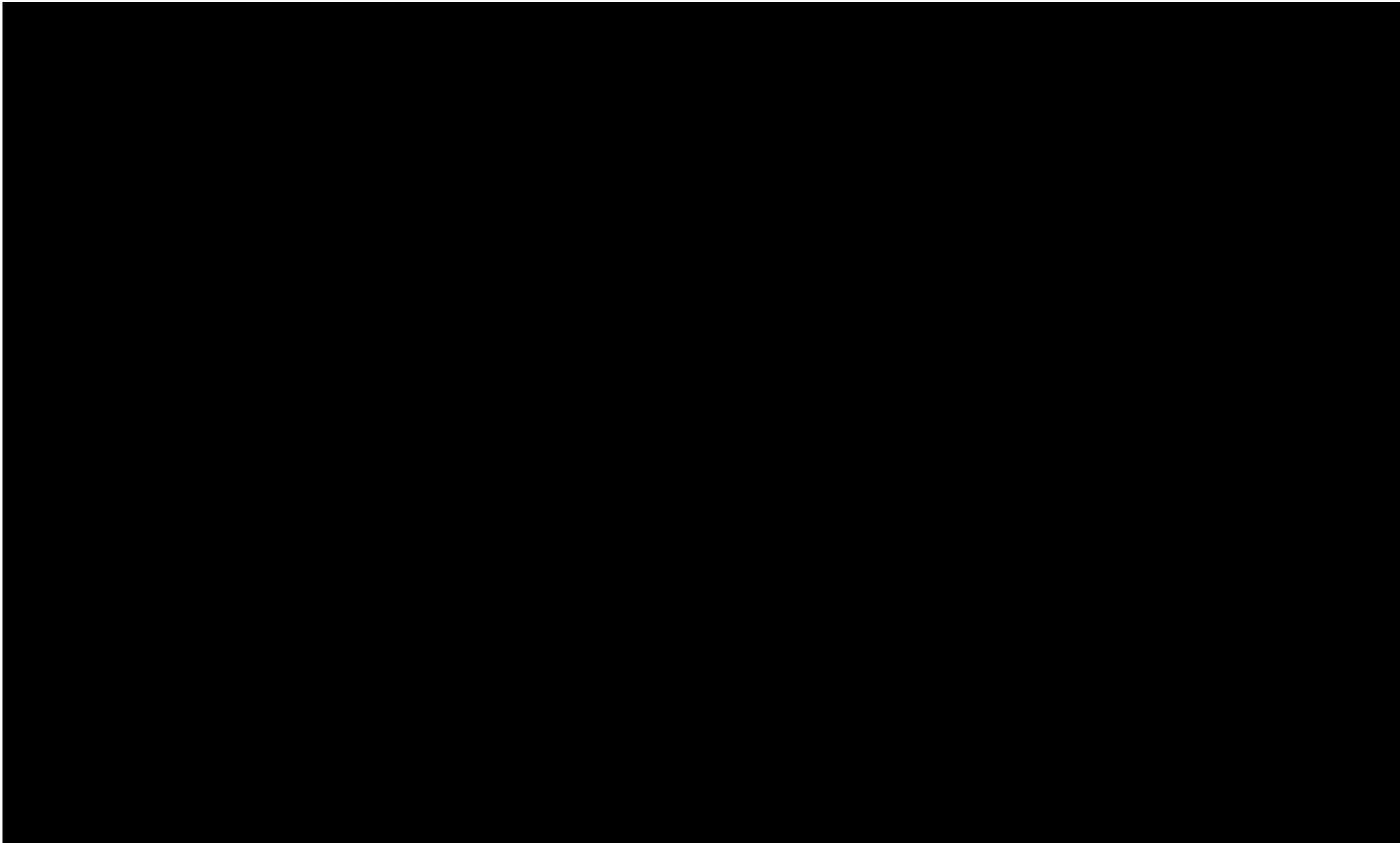


Figure 2.8 Indicative locations of water booster stations and break pressure tanks: Route 3



Figure 2.9 Indicative locations of water booster stations and break pressure tanks: Route 4



2.3.3 B5 - 75 Ml/d Recycling Water from new Water Recycling Plant (fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne⁸ environmental buffer

The components of the water recycling solution are as follows:

- Site for water recycling plant
 - Seven separate sites are currently being considered in the vicinity of [REDACTED].
- Pipeline connection between [REDACTED] and water recycling plant site (assumed tunnelled under watercourse).
- Final effluent transfer from [REDACTED] to water recycling plant.
- The transfer from the water recycling plant will either utilise the Lake Otterbourne environmental buffer as described in B2 (Section 2.3.2).
- Pre-disinfection ceramic membrane plant at Otterbourne WSW.

2.4 Havant Thicket Reservoir Alternative Use

An operating regime will be explored jointly with Portsmouth Water and include elements such as the introduction of recycled water and increased abstraction volumes in drought events.

The components of the alternative water transfer are the same transfer routes between Havant Thicket Reservoir and Otterbourne WSW, and high lift pumping station, as described in B4 (Section 2.3.2). The Havant Thicket Reservoir itself is not included in the assessment.

Therefore, the following components have been considered:

- Transfer pipeline from Havant Thicket Reservoir to Otterbourne WSW:
 - Route 1
 - Route 2
 - Route 3
 - Route 4
- Initial high lift pumping station close to Havant Thicket Reservoir – indicative location.
- 2nd Stage Pumping stations and break pressure tanks along routes – indicative locations.

⁸ There is currently no option being progressed where B5 would use Havant Thicket Reservoir as an environmental buffer instead of Lake Otterbourne. (*pers. Correspondence Southern Water 21.05.2021*).

3 Approach

3.1 Biodiversity Net Gain

A Biodiversity Net Gain (BNG) assessment has been carried out for each SRO described above and the associated components to identify the potential biodiversity loss of the components and what replacement habitat could be required to achieve a 10% biodiversity net gain. The potential for mitigation and offsetting opportunities for each component have been considered in section 4.1 and then the opportunities relating to the configurations have been assessed in section 5.2. Although BNG is not currently a statutory requirement, there is a mandatory requirement for provision of 10% biodiversity net gain in the Environment Bill, which will likely become a legal requirement for developments under the Town and Country Planning Act 1990 and the Planning Act 2008, once the Bill becomes an Act of Parliament. For the purposes of this report BNG opportunities have been assessed based on a 10% biodiversity net gain noting that this is a minimum uplift but that following discussion post Gate 2 submission with wider stakeholders, Southern Water's ambitions are likely to increase to above this minimum.

The Biodiversity Net Gain (BNG) assessment is carried out in line with the All Company Working Group (ACWG) environmental assessment guidance for SROs⁹ (hereafter referred to as ACWG Guidance). The requirements and outputs of the assessment are also consistent with WRPG¹ guidance for WRMP24.

The outputs provide both an assessment of biodiversity losses and potential net gain opportunities and the data upon which the NCA is compiled related to habitat type (both losses and Net Gain uplift opportunities) for the NC biodiversity metric. A wider NCA is also provided which is based on the habitat hectare outputs of the BNG opportunities.

The Defra BNG metric is a habitats-based assessment. In accordance with the guidance, our approach uses a GIS-based system to allow for rapid assessment of multiple components and the application of Defra's Biodiversity tool 'The Biodiversity Metric 2.0' (Defra BNG Metric) as a means of scoring the biodiversity gain or loss of each component. The assessment applies the principles of Net Gain, by taking a hierarchical approach to mitigation seeking to avoid loss of key habitats (such as those identified through the Defra BNG Metric as 'irreplaceable' habitat), and therefore species, to enable identification of lower impact alternatives.

The mitigation hierarchy was also applied to net gain opportunities where this hierarchy first looks to enhance existing habitats prior to considering succession or creation. An assessment was undertaken, using open source data, of land strategically identified for enhancement/restoration that lies within close proximity to each component. A more detailed assessment of specific opportunities will be required at the next stage, through an assessment of local plans/policies and consultation with stakeholders.

The BNG assessment has comprised a full assessment for each component of each SRO¹⁰. Further survey and assessment will be required at the next stage to ground truth the open source data. The assessment using the Defra BNG Metric includes terrestrial habitats and hedgerows. The current Biodiversity Metric tool (2.0) has not been developed sufficiently to work out river mitigation and units gained. The new Defra BNG Metric version 3.0 of the tool has just been released (6th July 2021). This needs to be reviewed in detail, however based on an initial assessment of the version 3 tool this should also allow river BNG to be calculated at the next stage (see **Section 3.1.5** for further detail) of this report for more explanation and limitations of current biodiversity metric tool).

The assessment methodology and data sources are provided below, with assumptions made.

⁹ All Company Working Group (2020). WRMP environment assessment guidance and applicability with SROs

¹⁰ At this stage 10% net gain has been assessed at a high level in terms of habitats required to achieve within a buffer zone. Ground truthing will be required for the project level assessment supporting the consenting process.

3.1.1 Data collection and review

The first stage involved collection of data and review of relevant, available information to inform of key BNG constraints and opportunities. All the data sets used open source data that is readily available and can be uploaded to a centralised GIS database.

3.1.2 Identifying the biodiversity baseline conditions

To demonstrate the most effective way (i.e., habitat types) to achieve a % BNG uplift requires a baseline calculation of the current biodiversity value/score of the relevant configurations and associated components that make up this assessment. The Defra BNG Metric tool quantifies each habitat type into 'units' based on a number of factors, including habitat distinctiveness, area (or linear equivalent), condition, ecological connectivity and strategic significance. The assessment of BNG components is based on available open source data and assessable data. Firstly, the habitat data was provided by the Phase I habitat maps provided by Southern Water and areas within the footprint of the associated temporarily affect area during scheme construction (working easement) measured in GIS. Secondly, the identification of habitat distinctiveness and condition, was determined through the Defra BNG Metric tool and assuming 'moderate' condition for all habitats due to the limits of the data. This approach has been considered as the most precautionary approach (see **Section 3.3.1.2** for more detail). Habitats that are Priority Habitat were determined through mapping on the Priority Habitat Inventory.

The baseline scores were adjusted for the associated habitat impacts (gains or losses) related to the construction of each component as area of habitat loss (assuming total loss within the footprint), taking into account the assumption of good practice construction methods and re-instatement (where applicable). There are no operational losses to be considered for river habitats and marine habitat impacts cannot be currently assessed through the metric. It is also noted that the Environment Bill does not include any requirements in relation to achieving a net gain in the marine environment. Bespoke approaches to assessing and mitigating any intertidal and marine habitat losses will be developed in consultation with the relevant stakeholders after Gate 2, subject to ongoing refinements and additions to the Defra BNG Metric tool. It should be noted, that since the Defra BNG Metric tool does include Marine habitats (including the latest version 3) therefore this assessment will not change and remains robust in the context of terrestrial habitats.

At this stage, this assessment focuses on high risk areas where the SRO components are likely to result in biodiversity loss and where offsetting (referring to offsite habitat creation or enhancement required to compensate for losses and achieve 10% net gain, following any onsite reinstatement) will be more onerous and 'irreplaceable habitats' that should not be lost, such as certain priority habitats have been identified with a focus on terrestrial habitats.

The output of the BNG assessment is a series of Defra BNG Metric derived spreadsheets and a table of baseline unit scores (habitat losses) for each component. This provides early warning of components with high scores where offsetting would be onerous. The results feed into the Natural Capital assessment and outputs also support planning and evaluation and into the MCDA approach by comparing overall impacts and BNG opportunities.

3.1.2.1 Baseline mapping

The construction area (working easement) of the components was mapped using QGIS so that habitat analysis could be conducted on the construction area. Phase I habitat maps supplied by Southern Water from March 2021 were used as the base map. Habitat types were converted into the UK Hab classifications using the conversation table within the Technical Data tab in the Defra BNG Metric. The area (ha) of each habitat type within the buffer was measured in GIS.

3.1.2.2 Working Width Calculations

The specific construction zone will need to be refined once more construction data becomes available. However, a temporary loss of habitat type, based on a ZoL of 50m for each of the pipelines included within the Southern Water SRO (i.e., 25m working width for the pipeline) and a reduced working width to 12m where hedgerows, rivers and roads exist is seen as a reasonable approximation at this stage base on experience of previous similar construction: aerial imagery was used to locate sections where the working width changed.

For this assessment, certain additional assumptions (as discussed in sections below **3.1.2.3 – 3.1.4.5**) have been made to quantify the potential biodiversity loss and requirements for achieving 10% biodiversity net gain, which are based on a worst-case scenario, assuming all habitat within the working easement will be lost during construction and re-instated.

3.1.2.3 Woodland and trees

Within the working width GIS layer particular sections of pipeline have descriptions listed as '*trees avoided where possible*'. The majority of areas with high tree cover are usually classified as a woodland habitat. Due to the uncertainty associated with the number of trees which may be retained a worst-case scenario will be assumed of total habitat loss in these areas, which will be refined at the next stage.

3.1.2.4 Arable Field Margins

Arable field margin priority habitat is not currently mapped within the Natural England Priority Habitat Inventory dataset or within the Phase I habitat maps provided by Southern Water and are therefore not included within this high level assessment. Ground truthing will be required to support the open source data going forward together with a more detailed assessment based on aerial imagery. However, the assessment remains robust because consistently applied across all components and therefore does not affect the overall comparison calculations.

3.1.3 Terrestrial habitats

The Defra BNG Metric requires the assessment of the following characteristics of the habitats for site habitat baseline:

- Distinctiveness
- Condition
- Ecological connectivity
- Strategic significance

The Defra BNG Metric requires the assessment of the following characteristics of the habitats for habitat creation:

- Distinctiveness
- Condition
- Ecological connectivity
- Strategic significance
- Temporal risk
- Difficulty risk
- Spatial risk

The data sources and how they are used for the assessment are described in the sections below.

3.1.3.1 Distinctiveness

Each UK Habitat category is automatically assigned a distinctiveness score by the biodiversity Metric tool (see **Table 3.1**) which is based on an assessment of the habitat type's features, including species richness, rarity, percentage of habitat protected within Sites of Special Scientific Interest (SSSIs) and the capability of the habitat to support rare species which may not be found in other habitat types.

Table 3.1 Distinctiveness categories (Natural England, 2019¹¹)

Category	Score	Example of habitat type
Very High	8	Priority habitats as defined in Section 41 of the Natural Environment and Rural Communities (NERC) Act that are highly threatened, internationally scarce and require conservation action e.g., blanket bog
High	6	Priority habitats as defined in Section 41 of the NERC Act requiring conservation action e.g., lowland fens
Medium	4	Semi-natural vegetation not classed as a priority habitat e.g., hazel scrub
Low	2	Semi-natural or modified vegetation not classed as a priority habitat and of lower relative value to most wildlife e.g., temporary grass and clover ley; intensive orchard; rhododendron scrub
Very Low	0	Habitats and land cover of little or no value to wildlife e.g., hardstanding or sealed surface

3.1.3.2 Condition

Normally, the condition of each habitat type is assessed against specific requirements listed within the guidance documents from field survey data. These requirements are specific to each habitat type and relate to physical characteristics, structural attributes, typical species present and positive and negative indicators, such as the presence of invasive species. See **Table 3.2** below.

Table 3.2 Condition categories (Natural England, 2019)

Category	Multiplier
Good	3
Fairly good	2.5
Moderate	2
Fairly poor	1.5
Poor	1
N/A - Agriculture	1
N/A - Other	0

The lack of data on baseline habitat condition means that habitat condition is assumed to be 'moderate' in all cases. This provides a multiplier of 2 which equates to the average condition score between poor and good and therefore is the best estimate thus holding this variable constant and allowing comparison between components. Further future work will be required in the context of a condition assessment survey as a spot check of habitats.

3.1.3.3 Ecological connectivity

Each habitat type is assessed for its connectivity to other surrounding similar semi-natural habitats, which could enable the movement of species throughout the wider environment (see **Table 3.3**). Connectivity is automatically assigned in the Biodiversity Metric tool based on distinctiveness. Low and Medium distinctiveness habitats are always low connectivity. High or very high distinctiveness are medium connectivity.

¹¹ <http://publications.naturalengland.org.uk/publication/5850908674228224>

Table 3.3 Connectivity categories (Natural England, 2019)

Category	Multiplier
Medium connectivity	1.1
Low connectivity	1

3.1.3.4 Strategic significance

Strategic significance is measured at a landscape scale, taking into consideration local plans for green infrastructure and biodiversity, national character areas and national objectives. This category gives value to habitats that are situated within optimal locations which could enable biodiversity objectives to be met (see **Table 3.4**). For the purposes of this assessment, strategic significance is assumed to be 'medium' in all cases where habitat is lost, thus holding this variable constant. Where mitigation is required Biodiversity Opportunity Areas were identified and therefore assessed as 'high'.

Table 3.4 Strategic significance categories (Natural England, 2019)

Category	Multiplier	Point applied to calculation	
		Pre-impact	Post-impact
High strategic significance Within an area formally identified as being of good environmental potential in local policy	1.15	Yes	Yes
Medium strategic significance Good environmental potential but not in an area formally identified as being of good environmental potential in local policy	1.1	Yes	Yes
Low strategic significance Low environmental potential and not in an area formally identified as being of good environmental potential in local policy	1	Yes	Yes

3.1.3.5 Temporal risk

Temporal and difficulty multipliers are automatically applied to the biodiversity unit calculation in the case of habitat creation, restoration, or enhancement in order to consider the time it will likely take to achieve the target condition and how difficult it will be to achieve the desired result. This gives some weighting to the level of uncertainty that these factors create (see **Table 3.5**).

There can be a negative impact on biodiversity for a period of time whilst newly created or enhanced habitat is establishing to its required level of maturity. The temporal risk accounts for this time lag.

Table 3.5 Temporal risk multipliers (Natural England, 2019b) - automatically generated

Time to Target Condition (years)	Time to Target Multiplier
30	0.343
20	0.49
10	0.7
5	0.837
1	0.965
0	1

3.1.3.6 Difficulty risk

The Biodiversity Metric considers how difficult (**Table 3.6**) it is to create or restore different habitat types and applies a multiplier to account for the uncertainty of achieving the target state.

Table 3.6 Difficulty categories (Natural England, 2019) – automatically generated

Difficulty of Creation Category	Difficulty of Creation Multiplier
Very High	0.1
High	0.33
Medium	0.67
Low	1

3.1.3.7 Spatial risk

Compensatory habitat created at a greater distance from the site of habitat loss will deplete a local area of natural habitat, risking reduced habitat connectivity and limiting available food sources for a variety of wildlife. As all compensatory habitat discussed is within the Local Planning Authority (LPA) areas associated with each pipeline or process unit, a multiplier of 1 is used in all cases (see **Table 3.7**). Where pipeline routes are across multiple LPAs it is assumed that habitat compensation will occur as required in the relevant LPA.

Table 3.7 Spatial risk categories (Natural England, 2019)

Local Risk Category	Spatial Risk Multiplier
Compensation inside LPA, or deemed to be sufficiently local to site of biodiversity loss	1
Compensation outside LPA of impact site but in neighbouring LPA	0.75
Compensation outside LPA of impact site and beyond neighbouring LPA	0.5

3.1.4 Hedgerows

Terrestrial habitat loss and hedgerow loss are two separate assessments within the Defra BNG Metric. In order to calculate approximate hedgerow loss aerial imagery was used to count the number of hedgerows intersected by each component. The number of hedgerow intersections was then multiplied by the working width to give an overall length of hedgerow loss. This was then entered into the Defra BNG Metric and classified as '*Native species rich hedgerow*' which then quantified the hedgerow loss to provide a precautionary and conservative approach.

The current working width for all components is reduced to 12m where hedgerows are impacted; however, as the detail of the components evolves, this width and number of hedgerows that may be avoided is expected to change as a result of the use of direction drilling techniques during construction.

3.1.5 Rivers

In the Defra BNG Metric 2.0, rivers and streams are defined as those classified as 'Main River' or 'Ordinary Watercourse'. This classification includes all types of watercourses, including canals, canalised rivers and rivers with an ephemeral (temporary), chalk streams etc, noting that the data to populate the Defra BNG Metric 2.0 tool are normally based on the assessment outputs obtained through a Modular River Survey and the River Condition Assessment Tool¹². Coastal, tidal and inter-tidal reaches are not currently measured within the rivers and streams component of the biodiversity metric.

¹² <https://modularriversurvey.org/>

The Defra BNG Metric requires the assessment of the following characteristics of rivers/streams and canals.

- River type and condition
- Distinctiveness
- Strategic significance
- Risk multipliers
- Time to target condition
- Difficulty of creation

The construction area is based on GIS data of the component pipeline locations and other structures. In order to calculate approximate temporary river length loss during construction, aerial imagery and WFD waterbody data was used to count the number of watercourses intersections for each component. The number of river intersections was then multiplied by the working width to give an overall length of river loss. For all watercourses, it was assumed there would be temporary habitat loss along a 12m easement and re-instatement for all watercourses less than 2m wide. All ordinary watercourses (which includes main rivers) >2m would be trenchless construction techniques and therefore, impacts avoided. All water courses were assessed including those related headwaters. The Priority River Habitat headwater data set was used to identify any head water streams and none were identified.

The Defra BNG Metric for rivers assesses direct impacts to biodiversity from construction habitat losses. Any operational impacts to biodiversity are not assessed, the tool is only designed to assess construction impacts. This together with Defra BNG Metric 2.0 river habitat uncertainties prevents accurate assessment of the uplift required for net gain: the classification has now been changed via the newly released will be resolved with the release of version 3.0 of the Defra BNG Metric. At this stage however using the Defra BNG Metric 2.0 baseline habitat loss cannot be used to calculate the uplift required for net gain related to water courses which is currently recognised as a limitation to the overall assessment. The assessment will need to be re-run with the Defra BNG Metric 3.0 at the detailed planning stage, and discussion with the Environment Agency and specific area ground-truthing may identify specific headwater and other small (less than 2m wide) watercourses that may need to be considered within the metric.

The data sources and how they are used for the assessment are described in the sections below.

3.1.5.1 River Type and Condition

The rivers and streams condition (**Table 3.8**) assessment for the Defra BNG Metric is based on the extent and diversity of observed physical features in the river channel and riparian zone (including the physical structure of vegetation) as well as the extent and types of any human modifications. The rivers and streams condition assessment, called the River Metric Survey, is based on geomorphic principles and comprises largely desk-based reach-scale assessment. The river metric survey indicates the current hydro-geomorphological river type. A sub-reach scale field survey would inform the river type and assesses its baseline condition (the Monitoring of River Physical habitat (MoRPh) survey). The available phase 1 habitat data from the flyover survey conducted by APEM does not give sufficient level of detail to be able to inform the condition of riverine habitats due to the specific attributes about the watercourse that need to be collected for MoRPh surveys to inform the condition. Survey work to collect MoRPh data, however, has not been possible to inform the assessment given the timing constraints. Instead, the principles have been applied in making assumptions on these data by scoring all rivers with a condition baseline of 'moderate condition (**Table 3.8**)' noting that this is a fixed approach that has been agreed by Natural England to enable cross comparison on the context of biodiversity and therefore provides a precautionary and robust approach given that current WFD assessment does not provide the level of detail for evaluation of current river condition. The outputs of this report will need to be reconsidered as part of the scheme development and following MoRPh surveying.

Table 3.8 Condition categories (Natural England, 2019)

Category	Multiplier
Good	5
Fairly good	4
Moderate	3
Fairly poor	2
Poor	1

It should also be noted that the river type at this stage has been assumed to be ‘Rivers and Streams - other’ within the Biodiversity Metric for all rivers impacted by the components, as they are all <2m wide and non-main rivers. All ordinary/main watercourses >2m wide have been assumed to be subject to trenchless construction techniques and hence excluded from the assessment, as there will be no habitat loss. These are taken account of in the assessment of temporary impacts to biodiversity from construction of the pipeline route. As a result, at this stage of the assessment for Gate 2 it has been assumed that none fall into the other categories, such as Priority Rivers, active shingle rivers, headwater streams etc (full list provided within **Table 3.9**)¹³.

3.1.5.2 Distinctiveness

By nature, rivers have a high biological diversity. Their distinctiveness is assessed within the Biodiversity Metric tool by entering the river type, which is automatically assigned a distinctiveness score (see **Table 3.9**).

Table 3.9 Distinctiveness categories (Natural England, 2019)

Category	Score	River type
Very High	8	On Priority Rivers Map Class I River Naturalness Assessment
High	6	Class 2 or 3 River Naturalness Assessment Is a Priority River Habitat sub-type: <ul style="list-style-type: none"> • Headwater Streams • Chalk Rivers • River – Abundance of Water crowfoot • Active Shingle Rivers
Medium	4	Class 4 or 5 river Naturalness Assessment Rivers and Streams (other) Canals

3.1.5.3 Strategic significance

Strategic significance of each river/stream/canal considers whether it is present within local and catchment plans, Catchment Planning Systems, River Basin Management Plans and Priority Habitats for Restoration. This category gives value to watercourses that are identified for action, which could enable biodiversity objectives to be met (see **Table 3.10**). There are only two scoring categories (1) high - within and (2) low - not within a plan. The rationale for assigning the level of strategic significance to impacted watercourses is that as the only rivers impacted (noting that watercourses >2m are trenchless) are non-main rivers, <2m, and they are therefore unlikely to feature in a plan. As such they all been scored of ‘Low strategic significance’. This needs to be recognised in the context that the BNG

¹³ Whilst we are aware that for example, the Itchen, Meon Rivers are priority habitat, at the point of crossing in the current conceptual designs the crossings are presumed to be trenchless because of their width at the crossing locations and hence no impact. This data was also compared to river priority habitat headwater areas and the chalk stream data sets England.

metric only accounts for direct habitat loss and currently crossings on priority habitats are assumed to be related to watercourse less than 2m in width and designed to be trenchless. At this stage it is recognised that this approach may under represent smaller watercourses with a higher scoring category which will need to be reviewed as part of the planning and consenting stage for the preferred option.

Table 3.10 Strategic significance categories (Natural England, 2019)

Category	Multiplier	Point applied to calculation	
		Pre-impact	Post-impact
High strategic significance Within local and catchment plans, Catchment Planning Systems, River Basin Management Plans and Priority Habitats for Restoration	1.15	Yes	Yes
Low strategic significance Low environmental potential and not formally identified in any local plan	1	Yes	Yes

3.1.5.4 Risk multipliers

The Defra BNG Metric for rivers includes risk multipliers to take account of uncertainty and difficulty of restoration/enhancement and creation of offsets.

A temporal multiplier (**Table 3.11**) accounts for the time to target condition follow re-instatement or creation and a difficulty of creation multiplier for all rivers and streams. However, there are errors in this multiplier within the metric, which have been recognised by Defra and will be addressed for version 3.0, whereby the multipliers are reversed. Therefore, assessing the units delivered through enhancements and habitat creation is not possible with version 2.0.

Table 3.11 Temporal multiplier (Natural England, 2019)

Condition	Time to target condition (years)	Multiplier
Good	10	0.7
Fairly good	8	0.752
Moderate	5	0.837
Fairly poor	2	0.931
Poor	1	0.965

3.1.6 Net gains/losses

The calculation of net loss/gain within the Defra BNG Metric 2.0 only considers direct impacts resulting in habitat loss, whether permanent or temporary, during construction rather than operation. The baseline habitat scores are then adjusted for the associated habitat impacts (gains or losses) related to the construction of each component (terrestrial habitat and hedgerows only). This is assessed following construction and prior to habitat re-instatement and assumes typical good practice construction methods and mitigation will be used, such that potential for downstream effects of construction will be fully mitigated. This part of the assessment identifies high risk areas where the proposals will result in a significant loss of biodiversity and offsetting (as described in Section 3.1.2, to compensate for losses and achieve net gain) will be more onerous or may identify an 'irreplaceable habitat' that should be avoided, such as certain priority habitats. These irreplaceable habitats are flagged by the Defra BNG Metric as 'unacceptable loss' and require a bespoke mitigation strategy if unable to be avoided. These habitats are then removed from the mitigation calculations which can account for a difference between onsite area lost and onsite habitat creation.

To identify the type and quantity of habitat required for offsetting/BNG, the gains and losses are then calculated assuming all habitat within the construction easement will be reinstated (where applicable,

as listed below) with the same habitat and to the same condition¹⁴ and the timing to reinstate is automatically calculated in the tool. This is assessed as on-site habitat creation within the Defra BNG Metric.

The following components will result in permanent habitat loss, with no habitat replacement within the footprint of the components and temporary loss within the remainder of the relevant site footprint:

- Lake Otterbourne Habitat BNG
- Water Recycling Plant (WRP) options:
 - WRP 68
 - WRP 70
 - WRP 71
 - WRP 72
 - WRP 73
 - WRP 74
 - WRP 75
- Desalination plant [REDACTED]
- D55 Desalination Plant Meon
- Meon Pumping Station
- Fawley Pumping station (FAWPS) Sites 19, 21, and 23
- Havant Thicket Pumping station (HTPS) parcels 3, 5, 8, and 9
- Water pumping stations (WPS) and break pressure tanks (BPT)
- Pre-disinfection ceramic membrane plant at Otterbourne WSW
- Reception tanks at Testwood WSW
- Otterbourne EBL Emergency Drawdown/Overflow Options:
 - Option 1: Overflow and Drawdown to the River Itchen Tributary
 - Option 2: Overflow and Drawdown to Overland Flow

All other components will be subject to temporary loss and re-instatement. Due to the risk factors in habitat creation, such as time lags and difficulty in creation, the habitat units for reinstatement will not equally compensate for the units lost due to construction activities. Furthermore, careful consideration of habitat reinstatement along the pipeline easement will be required to avoid detrimental impact on the buried asset associated with root ingress for example associated with tree planting. For example, if trees were removed to facilitate pipeline installation it may not be feasible to plant the same species of tree within the easement. Instead, the best reinstatement will be necessary whilst also protecting the future integrity of the asset. The results of the deficit 'net loss' for each habitat type per component are provided in Section 4 in table format in habitat units and hectares or linear meters of river/hedgerow. The number of units/hectares to provide 10% net gain are also given for terrestrial habitat and hedgerows. The outputs are presented as summary data tables of habitat gains/losses.

Maximum biodiversity units can be achieved through identifying opportunities for enhancing the habitat that is lost/degraded rather than replacement offsite. However, it has been assumed at this stage that habitat re-instatement will be the same condition as that lost and that enhancement will not be appropriate (as this maybe a strip through the centre of a field): this will be reviewed during scheme development.

3.1.7 Identifying BNG opportunities and calculating the benefit score

As habitat losses will require additional habitat enhancement/provision to achieve net gain, offsite enhancement / creation is expected to be required, which is termed the 'uplift' required in this report. Offsite enhancement measures (always considered as a priority) can include the provision of new habitats, provision of new habitat features and the improved management of existing habitats which will

¹⁴ At Gate 2 this is a high level assessment and it is recognised that in some cases it may not be feasible to reinstate some habitats (e.g. mature woodland along the pipeline route). Further investigation will be required at Gate 3 to review on-the-ground feasibility once preferred detail design route has been identified. At Gate 2 the assessment is more related to comparison of routes rather than specifics. Walk over surveys will be required at Gate 3.

result in a net benefit to biodiversity, over and above the measures required to mitigate and compensate for the impacts of a proposed solution.

Enhancement opportunities are added to the Defra BNG Metric as a habitat area and the Metric recalculates the quantity or balance of (units) of BNG provided, which is also given as a % change from the baseline. For this assessment, the mitigation hierarchy was followed. The Defra BNG Metric identifies for each habitat type lost, the habitat type required for offsetting (as described in section 3.1.2, to compensate for losses and achieve net gain), for example habitats of the same type, or same distinctiveness. These rules have been applied to this assessment and applied consistently for each habitat to allow fair comparison between components. Further refinement of these opportunities will be required through the gateway process, which will require significant manipulation of habitat restoration/creation options to identify the best outcomes, in line with strategic opportunities (refer to Section 3.1.8).

Enhancement opportunities were added to the Defra BNG Metric as a habitat area and the Metric recalculates the quantity or balance of (units) of BNG provided, until a minimum 10 % change from the baseline was achieved.

The output of the BNG assessment at this stage is the Defra BNG Metric 2.0 tool derived spreadsheet and a table of the habitats and areas required for enhancement/creation to offset (as described in section 3.1.2, to compensate for losses and achieve net gain) the impacts of each component and provide a minimum 10% BNG (see Section 4). This assessment will be built on at Gate 3 as more detailed design and data is available during the planning phase. The BNG and Natural Capital models can then be re-run with this information and the ground truthing data to identify opportunity areas whilst at that stage accounting for any other planning consideration that may affect the selected option.

3.1.8 Strategic assessment of Biodiversity Opportunity Areas

A strategic assessment of offsite opportunity areas has been undertaken to identify suitable parcels of land where the best biodiversity gain could be achieved. These opportunity areas will interface with the Natural Capital approach to identify where benefits can be achieved and are described further below.

A review was undertaken of the BNG opportunities, habitat enhancements or creation, that lie within strategic biodiversity opportunity areas (Natural England's Habitat Network zones). The purpose is to represent the area of enhancement /creation required for a rapid assessment of achievability and flag any unmitigable impacts.

Specific detail of possible mitigation measures and the identification of specific objectives within National and Local plans and policies will need to be assessed at the next stage to support the development and planning of the selected option. Providing more detail around mitigation measures and objectives at this current stage would not be meaningful given the assumptions in the data, no stakeholder engagement or detailed understanding and discussion of local ambitions and planning. Instead for this assessment the area/length of habitat required for offsetting/net gain has been identified and assessed against whether this land area is available within the surrounding area and supported by local/national strategies.

3.1.8.1 Habitats

Natural England has produced a spatial dataset that describes the geographic extent and location of Habitat Networks for 18 Priority Habitats¹⁵. The data includes the locations of various zones identified as suitable for restoration that would provide better resilience and connectivity for priority habitats. The components would result in the temporary/permanent habitat loss of a number of Priority Habitats and non-Priority Habitats and these Habitat Networks could potentially provide suitable locations for offsetting these biodiversity losses.

The data comprises the 'Habitat Components', the location of existing patches of primary habitat (Priority Habitat Inventory). As well as other network zones, the data includes the location of sites where data suggests small fragments of the primary habitat or degraded habitat exists where restoration may

¹⁵ <https://magic.defra.gov.uk/magicmap>

be possible, called 'Restorable habitat'. Buffering these zones are Fragmentation Action Zones where habitat creation is also possible to help reduce habitat fragmentation. Land within close proximity to the Habitat Components that are more likely to be suitable for habitat re-creation of that component are termed 'Network Enhancement Zone 1'. Therefore, zones provide opportunities for offsetting and net gain in relation to impacts on priority habitats from the proposed components, as well as non-priority habitats. Buffering these zones are Network Enhancement Zone 2 and Network Expansion Zones, which provide further opportunities within the wider area for green infrastructure.

A qualitative assessment was undertaken to map the locations of these Habitat Networks within 1km of the components to determine the likelihood of suitable biodiversity opportunities. An initial quantification was undertaken of likely suitable area available for offsetting/net gain by measuring the area of habitat within the Restorable habitat, Network Enhancement Zone 1 and Fragmentation Action Zones within 1km of the components. This provided an indication of the biodiversity opportunities local to the components.

Further assessment to refine data inputs will be undertaken at the next stage to link the availability of offsetting habitat within these zones to the particular Habitat Components (priority habitat type).

The output is a habitat map with strategic areas and a quantification of habitat availability within 1km of the components.

3.1.8.2 Rivers

At this stage the Defra BNG Metric 2.0 was available which cannot calculate the uplift required for net gain, offsetting and net gain for rivers. Instead, therefore, at this stage a high-level indication of the river restoration opportunities has been provided using Natural England's spatial dataset for Priority Habitats for Restoration and Restorable Habitat (NE Habitat Network). This was compared to the locations of the components to identify the locations and length of rivers within NE networks for restoration within 1km of the components.

In addition, although mitigation that would be outlined in the project level WFD compliance assessment can be used to account for 'no net loss', it can't be used for 'net gain'. Net gain instead, needs to be additional to, rather than part of, a statutory requirement. More detailed assessment will need to be undertaken, alongside the WFD as part of the project level assessment to identify:

- a. Actions within the river basin /catchment plans that could be offsets (to be agreed with the Regulators); and
- b. Mitigation for WFD compliance.

These opportunities can then be assessed for their suitability for specific net gain features, connectivity opportunities and achievability. Values will then be assigned against areas of mitigation opportunity with potential condition improvement for each feature and opportunity including specific mitigations recommendations. In addition, the assessment can be run through the Defra BNG Metric 3 at Gate 3 given this has just been released. Key updates are can be found in the Natural England's Summary of changes from Biodiversity Metric 2.0 to version 3.0¹⁶.

3.2 Natural Capital

A Natural Capital Assessment has been carried out to identify the potential environmental benefits and impacts of the SRO components to inform the options appraisal for Gate 2. The socio economic aspects of impacted features have also been considered to provide a more holistic view of the consequences of SRO implementation. This highlights the relationships between people and the affected environments and identifies how these relationships could change as a result of the options.

Natural Capital Assessment is not a specific statutory requirement, and the approach outlined here satisfies the requirements of RAPID which is underpinned by the ACWG [Error! Bookmark not defined.](#) for assessment for the Gate 2 submission, and the EA's Water Resources Planning Guideline (WRPG) to include natural capital in environmental assessment of water resource options. This document provides

¹⁶ <http://nepubprod.appspot.com/file/6511288110022656>

an overall assessment regarding how solutions contribute to environmental net gain within the context of data availability.

This report sets out a high-level review of the potential natural capital benefits of the SRO components for the purposes of informing options appraisal for Gate 2. The assessments are divided below as outputs per scheme component and configurations.

The potential for mitigation and offsetting (as described in section 3.1.2, to compensate for losses and achieve net gain) opportunities for each component have been considered (see Section 4.2 for details) and then the opportunities relating to the configurations have been assessed in Section 5.2, with detailed assessments being found in appendices **A4.IX** to **A4.XLIV**.

The configurations (see Section 5) are made up of the components. The configurations were required (i.e., combinations of components) were required to support and inform the [REDACTED] assessment. It is not possible to simply combine the data for the components to quantify the configurations (i.e., if the data for the individual components is simply summed it would not necessarily equal the data presented for configurations and could result in double counting related to both the BNG and the associated NC assessments). Therefore, this NC assessment highlights which components present the greatest opportunities for environmental enhancement. It also highlights which components do not have natural capital benefits in their current design, but which could incorporate enhancement opportunities to promote biodiversity environmental net gain. It should be noted that all components have been included in this assessment as they have collectively supported the decision making process.

This information will feed into the design process to ensure that net gain requirements are met and opportunities for enhancement are maximised. At this conceptual design stage, it is not feasible to provide a detailed quantified and/or monetised account for all the Natural Capital metrics: instead, the assessment is focused on assessing the baseline natural capital assets and benefits associated with net gain and providing an initial monetised assessment where possible, which can be built upon in further scheme development. Qualitative assessment will also be used to describe the benefits and disbenefits to ecosystem services where reliable monetary values cannot be calculated due to lack of detailed design information or suitable valuation methodologies.

3.2.1 High-level component assessment

The Natural Capital Assessment has included an assessment of baseline natural capital assets and their ability to provide ecosystem services, and how these are likely to change as a result of the components. The approach to Natural Capital Assessment is in line with the ACWG Guidance⁹ which was produced to facilitate consistency across all the SRO solutions going through the RAPID Gated process.

Natural capital assets are the renewable or non-renewable stocks and benefits that we stand to gain, as well as the natural processes behind them. In order to assess the ability of natural capital assets to provide ecosystem services we have to use **ecosystem service metrics**; these are key, measurable benefits that intrinsically link environmental health to the benefits we gain from natural capital assets. There are numerous metrics to choose from so selecting those most relevant to a particular study is an important step to take in the Natural Capital Assessment process.

The EA's WRPG Supplementary Guidance states that Natural Capital Assessments in England should include as a minimum five ecosystem services. The ecosystem services included in the natural capital assessments include the five stated in the guidance starred (*) and additional services as shown below:

- Biodiversity*
- Climate Regulation (carbon storage)*
- Water Purification*
- Water Regulation*
- Natural Hazard regulation*
- Food production
- Cultural Services (in this case recreation and tourism); and
- Air quality

In addition to those services required as a minimum, we have also considered a **food production** ecosystem service metric. Assessment of social benefits is also advocated by the RAPID, therefore additional ecosystem services of **recreation and tourism** and **air quality** have been included to support this requirement (where the latter has used urban and Air Quality Management Areas to identify key air quality issues).

3.2.2 Regulatory drivers

The following provides a summary of key guidance relevant to NCA and also biodiversity net gain, noting that the latter underpins the NCA in the context of the biodiversity outputs.

- WRMP24 Supplementary Guidance: Environment and society in decision-making, taking into account the assessment of five minimum ecosystem services (England) namely biodiversity, climate regulation (carbon storage); water purification and natural hazard regulation.

The approach in this assessment follows that outlined in the ACWG Guidance⁹ whilst also taking account of the key requirements above and draws on the EA¹⁷ Water Resources Planning Guideline (WRPG) WRMP24 Supplementary Guidance on Environment and Society in Decision-Making. Additionally, RAPID Gate-2 expectations (as per RAPIDS guidance for Gate 2) for Natural Capital Assessment have been incorporated which include:

- Desktop baseline assessment of the five key metrics as included in the WRPG¹⁸;
- List of assumptions made during the assessment including but not limited to: a theory-based Zone of Influence (Zol); the use of landcover data derived from satellite imagery and;
- The application of a Gross Domestic Product (GDP) inflator for monetised value adjustment (where applicable).

The NCA output in this assessment is high-level, appropriate to the current stage of scheme development, and intrinsically linked to the BNG assessment (i.e., provides the Natural Capital biodiversity assessment where the outputs from the Defra Metric Tool provide the hectare figures for habitats). Where feasible, valuations (both spatially quantitative and monetised) have been provided, noting key assumptions especially in the context of outline design related limitations as detailed in Section 3.2.3. The assessment has therefore focused on construction related-biodiversity losses and potential gain related to a 10% BNG uplift based on open source data currently available which is used to feed into the NCA.

3.2.3 Data sources and gaps

The NCA has been completed using the following data sources, as recommended by the ACWG Guidance^{Error! Bookmark not defined.} and the EA's Natural Capital Assessment Guidance¹ (including Annex 1 of the WRPG Supplementary Guidance¹).

3.2.3.1 Natural Capital stocks

The ACWG Guidance for a Natural Capital Approach advises that land use should be used as a proxy for habitats, from which ecosystem services and benefits to society can be attributed and then monetised. The assessment for the Natural Capital approach is based on available open source data and assessable data. Firstly, the habitat data was provided by the Phase I habitat maps provided by Southern Water and areas within the footprint (working easement) measured in GIS. Habitat types were converted into the UK Hab classifications using the conversion table within the Technical Data tab in the BNG Metric. The area (ha) of each habitat type within the buffer was measured in GIS. The UK Hab Classifications were then converted into eight broad habitat types to give the total area of each broad habitat within each components' Zol. The conversion from the detailed habitat layers to broad habitat was undertaken and is outlined in **Table 3.12**. The broad habitat types were determined

¹⁷ Environment Agency (2020) Water resources planning guideline 2024 supplementary guidance- Environment and society in decision-making (England).

¹⁸ Accessed via <https://www.gov.uk/government/publications/water-resources-planning-guideline/water-resources-planning-guideline>

following those identified for calculation of carbon sequestration by land use from the EA's Supplementary Guidance¹⁷ (see **Table 3.13** below). Where a land cover class could belong in multiple broad habitat groups it was placed within the one that had a lower carbon sequestration rate to give a more conservative estimate of benefits. Where either no habitat or an unclear habitat type was identified, such as Natural Environment, the area was put into the urban land cover class, as to not overestimate benefits.

Table 3.12 Conversion from habitat data to broad habitat types

Land Cover Classification	Broad habitat type
Cropland – Cereal crops	Arable
Modified grassland	Arable
Heathland and shrub	Heathland
Developed land, sealed surface	Urban
Built linear features	Urban
Lowland mixed deciduous woodland	Deciduous woodland
Neutral grassland	Grassland
Lakes – pond	Freshwater
Other coniferous woodland	Coniferous woodland
Purple moor grassland	Freshwater
Natural environment	Urban
Glasshouse	Urban
Landform	Urban
Roads, rails, tracks	Urban
Mixed scrub	Shrub
No habitat	Urban
Broadleaved woodland	Deciduous woodland
Poor semi-improved grassland	Grassland
Cultivated / disturbed land	Arable
Hardstanding	Urban
Other rivers and streams	Freshwater
Eutrophic standing waters	Freshwater
River and streams	Freshwater
Sparsely vegetated land	Sparsely vegetated land
Purple moor grass and rush pastures	Wetland

3.2.3.2 Ecosystem Services

Stocks of Natural Capital underpin the provision of ecosystem services, i.e., the goods and services provided by nature that benefit humans and society. Some ecosystem services can be valued in monetary terms based on the benefits they provide. The data sources used to value ecosystem services are described below, these have been taken from the WRPGE¹⁸, ACWG Guidance¹⁹ and Defra's Enabling a Natural Capital Approach (ENCA) Guidance¹⁹. Please note that the Gate 2 assessment makes use of the ENCA Guidance as it was prior to its update in August 2021. The Gate 3 assessment of Natural Capital will make use of this updated ENCA Guidance. Specific updates to ecosystem services as a result of this updated Guidance are described where applicable in **Section 7.2**.

3.2.3.3 Biodiversity and Habitat

Assessment of biodiversity has been based on the habitat data used in the BNG assessments and described above and in **Section 3.1.1**. Further incorporation of these into the Natural Capital Assessment will be included post the gate 2 submission (see **Section 5**).

¹⁹ Defra, Enabling a Natural Capital Approach (2020). <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca>

3.2.3.4 Climate Regulations (carbon sequestration)

The carbon sequestration rates for Natural Capital stocks have been taken from the EA WRPB Supplementary Guidance²⁰ as shown in **Table 3.13**. Carbon sequestration rates of the relevant Natural Capital assets have been converted into monetary values using the Department for Business, Energy, and Industrial Strategy (BEIS) Interim Non-Traded Carbon Values. Non-traded carbon values have been applied to carbon sequestered as these emissions are not captured by the EU Emissions Trading Scheme. As the prices published by BEIS are in £2018, GDP deflators were used to adjust them to the 2019 base year of modelling.

Table 3.13 Carbon sequestration of land use from EA WRPB Supplementary Guidance

Land use type	C seq rate (t/CO2e/ha/yr)
Woodland (deciduous)	4.97
Woodland (coniferous)	12.66
Arable land	0.10
Pastoral land	0.39
Peatland – Undamaged	4.11
Peatland – Overgrazed	-0.1
Peatland – Rotationally burnt	-3.66
Peatland – Extracted	-4.87
Grassland	0.39
Heathland	0.7
Shrub	0.7
Saltmarsh	5.19
Urban	0
Green urban	0.40

3.2.3.5 Climate Regulations (carbon sequestration) Approach for Configurations

The climate regulation impact of off-site habitat succession (i.e. the time frames for woodland and grassland reinstate times as embedded in the Defra Metric 2 calculator) was studied for the configurations noting that whilst a Natural Capital assessment cannot quantify the specific enhancement, it can however, account for overall habitat enhancement or succession (as provided as an overall output from the Defra Metric 2) and hence capture associated climate regulation via carbon sequestration for key habitats. To achieve this habitat succession related estimate, the carbon sequestration value of the original habitat and the succeeded habitat were calculated. Then, the carbon sequestration value of the original habitat was subtracted from the value of the succeeded habitat. This then gives the carbon sequestration value of the succeeded habitat, while capturing the carbon sequestration value that was lost when succeeding the habitat. Then as before, carbon sequestration rates of the relevant Natural Capital assets have been converted into monetary values using the Department for Business, Energy, and Industrial Strategy (BEIS) Interim Non-Traded Carbon Values. Non-traded carbon values have been applied to carbon sequestered as these emissions are not captured by the EU Emissions Trading Scheme. As the prices published by BEIS are in £2018, GDP deflators were used to adjust them to the 2019 base year of modelling.

²⁰ Table 7 of the EA Supplementary Guidance: Environment and Society in Decision-Making (2020).

3.2.3.6 Natural Hazard Regulation

For the purposes of this assessment, flooding was determined to be the most significant natural hazard risk. This is because although the options are likely to be fulling operational during drought periods only (noting that there would be a constant 15Ml/d sweetening flow) the physical changes to Natural Capital stocks may impact the capacity of habitats to slow the flow of flood water year-round. Monetary values were sourced per broad habitat type from existing studies conducted in the UK. Values for woodland and wetlands/ floodplains broad habitat types were identified using the ENCA Services Databook²¹ where the associated studies were evaluated to ensure their suitability for benefit transfer. A value for semi-natural grasslands was not available. Additional studies were identified with the final best estimate for semi-natural grasslands derived from a benefit function from an existing ecosystem services assessment (Christie et al, 2011²⁵) noting however, that this value is mainly applicable to lowland meadows (Holzinger & Haysom, 2017²⁶). This value was used as a proxy.

An annual monetary value was only derived for the flood regulating services of woodland, semi-natural grassland, and wetland/ floodplain assets (see **Table 3.14**). Robust monetary values for the urban and enclosed farmland broad habitat types are not currently available and hence it has not been possible to provide a monetised estimate of these services.

For example, estimates for enclosed farmland (71.4 EUR/ha) and urban (0.42 EUR/ha) habitats regarding their contribution to natural hazard regulation were identified (Vallecillo et al., 2020²²) however these were only applicable at EU level and therefore not considered specific enough for application to the context of this study. For example, the estimates derived by Vallecillo et al. (2020) for broad habitat types other than agriculture are not comparable with the estimates employed within this study for semi-natural grasslands, woodlands and freshwater. For example, the natural hazard benefits provided per hectare of woodland were estimated to be approx. £60 (in £2019) in comparison to the approx. £117 (in £2019) used within this study. In the case of Vallecillo et al. (2020) the estimates were derived following the approach outlined in the United Nations System of Environmental-Economic Accounting-Experimental Ecosystem Accounts (SEEA EEA)²³ with monetisation following a damage cost approach. However, as Vallecillo (2020) notes, damage functions are specific to each country and therefore these estimates may not reflect the UK context.

As a result, the overall value of the NC values related to hazard regulation is likely to be understated at this stage.

Table 3.14 Benefit Transfer Values: Natural Hazard Regulation

Broad habitat type	Annual Value	Reference	Additional Comments
Woodland	█ (£2018/ha)	Forest Research (2018) ²⁴ & ENCA Services Databook	These results are experimental noting no semi-grassland value

²¹ <https://www.gov.uk/guidance/enabling-a-natural-capital-approach-enca#enca-services-databook>

²² Vallecillo et al. (2020), Accounting for changes in flood control delivered by ecosystems at the EU level. *Ecosystem Services* (44), pp. 1-16.

²³ UN, 2017. Technical Recommendations in support of the System of Environmental Economic Accounting 2012 – Experimental Ecosystem Accounting. Available at:

https://seea.un.org/sites/seea.un.org/files/technical_recommendations_in_support_of_the_seea_eea_final_white_cover.pdf

²⁴ Forest Research (2018). Valuing flood regulation services of existing forest cover to inform natural capital accounts. Accessed via: [file:///C:/Users/se17/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/Final_report_valuing_flood_regulation_services_051218%20\(3\).pdf](file:///C:/Users/se17/AppData/Local/Packages/Microsoft.MicrosoftEdge_8wekyb3d8bbwe/TempState/Downloads/Final_report_valuing_flood_regulation_services_051218%20(3).pdf)

Broad habitat type	Annual Value	Reference	Additional Comments
Semi-natural grasslands	█ (£2015/ha)	Christie et al (2011) ²⁵ & Holzinger & Haysom (2017) ²⁶	Appear applicable to lowland meadow only. Based on an ecosystem services assessment of Chimney Meadows Reserve (UK)
Freshwater (Open waters/ wetlands/ floodplains)	█ (£2011/ha)	Morris & Camino (2011) ²⁷ & ENCA Services Databook	

3.2.3.7 Water Purification

Since, the WRPG [Error! Bookmark not defined.](#) does not require the monetisation of Water Purification Services (p. 36) because these services are highly dependent on local factors and there are limited tools available to provide accurate monetised assessment we have, at this stage, only undertaken a qualitative rather than a monetised assessment of this service based on habitat data and WFD status information from the EA's Catchment Explorer.²⁸ A baseline quantitative assessment for Water purification was discounted using the Natural Environment Valuation Online (NEVO)²⁹ tool due to no data being available for the River Test near Testwood lakes and other areas. Furthermore, the WFD assessment assesses water quality, therefore, to avoid double counting water quality is discounted.

3.2.3.8 Water Regulation

The WRPG [Error! Bookmark not defined.](#) does not require the monetisation of Water Regulation Services (p. 42). The main benefit of the Southern Water SRO is the deployable output from the desalination plants, therefore this is not considered as an additional Natural Capital benefit to avoid double counting, and Water Regulation has been screened out of the assessment.

3.2.3.9 Cultural services - Recreation and Tourism

Within the context of additional cultural services only recreation and tourism has been considered given data constraints at this stage. This provide an estimate of the non-material benefits or losses to people from key ecosystems services and hence supports the over NCA. The Outdoor Recreation Valuation Tool (ORVal)³⁰ was used to estimate recreation demand from existing or new greenspace as a proxy for recreation value. The values derived from the ORVal³⁰ tool are estimated using a Random Utility Model of travel cost estimates³¹. The values represent the total welfare lost if the site in question were to be removed. In cases where components consist of more than one site, the marginal values of each site are aggregated based on the assumption that other sites that exist outside of the component scope are substitutes³². The welfare values are based on £2016 and were uplifted to £2019 for the assessment. The following rules were applied during the assessment of recreation and tourism using the ORVal tool.

- If the construction is located on the periphery of a recreation site and is judged to not impact any key attributes of a recreation site that would significantly impact visitor numbers, then we can apply the per ha average value of the recreation site to the area of construction.
- If the construction is located in or near the centre of the recreation site and/or is judged to impact key attributes of a recreation site that would significantly impact visitor numbers, then the whole site value is used.

²⁵ Christie, Mike, Tony Hyde, Rob Cooper, Ioan Fazey, Petter Dennis, John Warren, Sergio Colombo, and Nick Hanley. 2011. Economic Valuation of the Benefits of Ecosystem Services delivered by the UK Biodiversity Action Plan. Report to Defra, London: Aberystwyth University.

²⁶ Holzinger, Oliver, and Karen Haysom. 2017. Chimney Meadows Ecosystem Services Assessment: An Assessment of how the new management of Chimney Meadows Nature Reserve by Bers, Bucks and Oxon Wildlife Trust impacts on the value of ecosystem services. Oxford: Berks, Bucks and Oxon Wildlife Trust.

²⁷ Morris & Camino (2011) UK National Ecosystem Assessment Economic Analysis Report, School of Applied Sciences, Cranfield University.

²⁸ <https://environment.data.gov.uk/catchment-planning/>

²⁹ <https://sweep.ac.uk/portfolios/natural-environment-valuation-online-tool-nevo/>

³⁰ <https://www.leep.exeter.ac.uk/orval/>

³¹ Day & Smith (2017) The ORVal Recreation Demand Model: Extension Project. Accessed via:

https://www.leep.exeter.ac.uk/orval/pdf-reports/ORValII_Modelling_Report.pdf

³² https://www.leep.exeter.ac.uk/orval/pdf-reports/ORVal2_User_Guide.pdf

- A conditional percentage could be applied to the footpath values depending on the number of footpath intersections (and therefore alternative routes) present. For example:
 - If there are no intersections, and therefore no alternative routes, then we take 100% of the footpath value.
 - If there are 1-2 intersections present, then we take 50% of the value.
 - If there are 3-4 intersections present, then we take 25%.
 - And if there are 5+ intersections present, then we take 10% of the value.

3.2.3.10 Air Quality

Airborne pollutants represent a serious threat to human health and wellbeing: assessment of air quality regulation services is therefore also relevant to the well-being goals set out by the UK Government. Natural habitats are able to reduce these harmful effects by absorbing air pollution providing ecosystem service benefit to society. However, as none of the options fall within an Air Quality Management Area, and therefore no receptors are identified as being impacted, Air Quality has been screened out of the assessment as these are recognised as the key areas that would most likely result in further air quality degradation. For the purposes of comparison at gate 2 this approach is robust as it identifies any components and associated configuration that would have the highest risk. This will need to be revisited at the detailed planning stage of the chosen option that is taken forward to assess both risks and opportunities to air quality in the context of both construction and operation.

3.2.3.11 Agriculture

This assessment adopts the same principles to ecosystem services associated with agriculture as outlined in the UK Natural Capital Accounts. Namely, the distinction between what is considered natural capital, and therefore what is included in the estimation of provisioning services, and what is produced capital is defined as the “*point at which vegetable biomass is extracted*”³³. For the purposes of this assessment, to estimate the annual value per ha of ecosystem services relevant to agricultural production, an adaptation of the whole-farm income method outlined by the UK Office of National Statistics Natural Capital Accounts was used³⁴. This approach was used as opposed to the industry residual value method adopted for the 2020 ONS Natural Capital Accounts as this method allows for differentiation between the provisioning services associated with different farm types - in this case arable and pasture- and were therefore considered more appropriate for this assessment. The marginal values estimated per hectare derived from this method (presented in **Table 3.15** below) remain comparable to the estimated industry residual value per hectare reported by the ONS for their 2020 accounts (£241.80/ ha in 2018)³⁵.

Table 3.15 Benefit transfer values: provisioning services supporting agriculture

Farm type	Estimated average £2019 /ha	
	England	South East
All farm types		
Arable (cropping)		
Pasture (grazing livestock)		

These values represent the average farm output level estimate of the industry residual value for farms in the South East of England. Data was obtained from the Farm Business Survey (England)³⁶ and was subject to the following high-level calculation.

³³ ONS (2017) Principles of Natural Capital Accounting. [Last accessed 29/04/2021] Accessible via: <https://www.ons.gov.uk/economy/environmentalaccounts/methodologies/principlesofnaturalcapitalaccounting>

³⁴ Office for National Statistics (ONS), 2019. *UK natural capital accounts methodology guide: October 2019*, s.l.: ONS

³⁵ This was calculated by dividing the aggregate industry residual value reported by utilised agricultural area in the UK in 2018.

³⁶ <https://farmbusinesssurvey.co.uk/>

$$\frac{\text{Average output from agriculture} - \text{Average costs for agriculture}}{\text{Average total farm area (ha)}}$$

The original method outlined by the ONS (2019) was adapted after calculations with South East specific data resulted in a negative residual value per hectare for both arable and pasture. This would imply that the provisioning services of these natural assets have no inherent value and that they do not contribute to agricultural production. It is concluded in the literature that a probable explanation of negative resource rents is that they reflect market distortions such as subsidies³⁷. The original method outlined by the ONS excludes subsidies and agri-environment payments and activities from their calculation, however the adapted method adopted for this assessment includes these factors which in turn is able to translate the original figures developed for the South East to a more locally derived estimate and hence more robust figures. An overview of what is included is outlined in **Table 3.16** below.

Table 3.16 Components included within the adapted farm income method

Variable	Components included
Output from agriculture	<ul style="list-style-type: none"> - Output from agriculture (excl. subsidies and agri-environment payments) - Services resulting from subsidies and payments to agriculture (excl. agri-environment payments) - Services resulting from Agri-environment and related payments (incl. HFA) - Services resulting from basic Farm payments - Output from diversification
Costs for agriculture	<ul style="list-style-type: none"> - Costs for agriculture (excluding agri-environment activities) - Costs for agri-environment work - Costs of diversification out of agriculture - Costs associated with Basic Payment Scheme

The total annual benefit values calculated for this assessment make use of the South East estimated averages calculated for each of the variables and component for each of the high-level farm types associated with this assessment (arable and pasture).

³⁷ Obst, C., Hein, L., & Edens, B., (2016). National Accounting and the Valuation of Ecosystem Assets and their Services, *Environ Resource Econ* 64,pp 1-23.

4 Site Selection Assessment Findings: Component Level

4.1 Component Level Biodiversity Net Gain

4.1.1 Baseline BNG loss

4.1.1.1 Terrestrial Habitats

A detailed breakdown of baseline habitat loss for terrestrial habitats and hedgerows per component are provided within the 'Baseline' tab of the excel spreadsheet **Appendix A2**. Configuration baseline habitat loss is discussed below in **Section 5** which incorporates individual component data. Component level Natural Capital outcomes are discussed in **Section 4.2** with configuration outcomes discussed in **Section 5.2**

Baseline habitat loss for terrestrial habitats and hedgerows losses are pre-mitigation (pre-reinstatement) given in hectares (kilometres for hedgerows) and biodiversity units. As terrestrial habitat and linear habitats (hedgerows) are assessed differently in the metric, the units cannot be added together, and terrestrial habitats and hedgerows must be assessed separately. The Defra Metric assessments for each component are provided in **Appendix A2i-xxxviii**.

The habitat losses following re-instatement can also be obtained from the metric data. This provides a measure of the uplift (habitat compensation and net gain, as described in Section 3.1.2) required for 10% net gain. The following tables (**Table 4.1** and **Table 4.2**) present a summary of the biodiversity deficit pre-offsite compensation. **Table 4-1** comprises components that result in permanent habitat loss with no-re-instatement possible. **Table 4.2** comprises components with temporary loss and re-instatement.

To address habitat loss, the action required in accordance with the technical guidance for the Defra Metric is given for each habitat loss per component within the tables in **Appendix A2**, 'Baseline' tab. This may be the same broad habitat type or the same habitat in compensation, for example. This identifies which components impact upon habitats that have less flexibility and possible challenges in offsetting. Of particular note are habitats where there is an 'unacceptable loss'. These priority habitats are unable to be assessed within the DEFRA Metric owing to their uniqueness and difficulty of re-creation and compensation. If lost they require a bespoke compensation strategy and a net gain cannot be achieved for such losses. These habitats are not taken forward within the Defra Metric assessment and therefore, no units are given. The hectarage of this loss is shown in **Table 4.1** and **Table 4.2** and these habitats should be avoided at the design stage where possible. The unacceptable loss habitats and their individual areas are given within the baseline metric data, provided within **Appendix A2i-xxxviii** for each component. Referring to **Table 4.1** and **Table 4.2**, unacceptable losses of habitats occur within the following component footprints:

- A1 and A2: Fawley to Testwood Route 3
- A3: Meon to Otterbourne Route 1
- A1 and A2: [REDACTED] Desal Plant
- B4 and D2: Havant Thicket to Otterbourne Route 3
- B2 and B5: WRP to Otterbourne Route 1
- B2 and B5: WRP to Otterbourne Route SIA

Ground truthing of the selected option will be required to confirm the extent of these unacceptable loss habitats. Where they are confirmed a re-routing or alternative component should be considered to avoid these impacts.

Table 4.1 and **Table 4.2** also show the components which impact upon Priority Habitats. The data shows that certain components score particularly high (i.e., a large impact equating to a loss of over 30 units for single site components or over 40 units for pipeline routes) in terms of their impact on Priority Habitats and whilst avoidance and alternatives should be considered for all components that impact Priority Habitats, these are of particular note due to the scale of impact:

- A1 and A2: Desalination [REDACTED]
- B4 and D2: Havant Thicket Pumping Station HTPS 8
- B2, B4 and B5: Water recycling plant site 72
- B2, B4 and B5: Water recycling plant site 73
- B5: [REDACTED] Route 1
- A1 and A2: Fawley to Testwood Route 1
- A1 and A2: Fawley to Testwood Route 2
- A1 and A2: Fawley to Testwood Route 3
- A1 and A2: Fawley to Testwood Route 4
- A1 and A2: Fawley to Testwood Route SIA
- B4 and B5: WRP to Otterbourne Route 2
- B4 and B5: WRP to Otterbourne Route SIA

Most priority habitats lost are deciduous woodland. The extent of this habitat needs to be confirmed through ground truthing of the open source habitat data to confirm the presence and extent of the priority habitat Lowland mixed deciduous woodland. This habitat has a high number of BNG units and accounts for most of the units shown for the components. When re-instating this habitat, few units are gained back due to risk multipliers (time lag for restoration and difficulty of achieving it). This highlights the challenge with offsetting (compensating and achieving net gain for) woodland loss and the importance of avoidance, where possible. The purpose of **Table 4.1** and **Table 4.2** is to highlight the components which would result in the loss of Priority Habitat and 'Unacceptable Habitat' loss and therefore these habitats should be avoided at the design stage where possible. Ground truthing would be required to confirm the extent of these habitats for the selected configuration only. Where they are confirmed a re-routing or alternative component should be considered to avoid these impacts.

4.1.1.2 Hedgerows

The hedgerow loss is also provided in **Table 4.1** and **Table 4.2**. Post re-instatement, the components with the highest losses are:

- A3: Meon Desal plant including pumping station
- B4 and D2: Havant Thicket to Otterbourne Route 1
- B4 and D2: Havant Thicket to Otterbourne Route 2
- B4 and D2: Havant Thicket to Otterbourne Route 3
- A3: Meon to Otterbourne Route 1
- A3: Meon to Otterbourne Route 2
- B2 and B5: WRP to Otterbourne Route 1
- B2 and B5: Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow

Further assessment should be undertaken to identify whether they could have an impact on habitat fragmentation associated with Priority Habitats and should be avoided, such as through construction methods for configuration selected only.

4.1.1.3 Rivers

A detailed breakdown of baseline habitat loss for rivers per component are provided within the 'Rivers Baseline' tab of the excel spreadsheet **Appendix A2**. The river assessment found one of the components with permanent habitat loss to support rivers; Otterbourne EBL Emergency Drawdown/Overflow: Option 1: Overflow and Drawdown to the River Itchen Tributary, due to the construction of an outfall structure along the tributary of the River Itchen (Otter Bourne).

Of those with temporary loss and re-instatement, the following components experience the greatest losses relating to temporary loss of over 0.1km equating to the loss of over 1 unit:

- B4: Havant Thicket to Otterbourne Route 3
- A3: Meon to Otterbourne Route 2
- B2 and B5: WRP to Otterbourne Route 1
- B2 and B5: WRP to Otterbourne Route SIA

It should be noted that the suggested action within the Biodiversity Metric for any loss of river habitat, permanent or temporary, should be to avoid the loss.

Table 4.1 Summary of the overall unit construction loss for components with permanent on-site loss (pre off-site compensation) for habitats and hedgerow

	Net Biodiversity Unit Loss				Loss of river (units)
	Loss of habitat (units)	Un-acceptable habitat loss (ha)	Loss of Priority Habitat (units)	Loss of hedgerow (units)	
Lake Otterbourne					
WRP 68					
WRP 70					
WRP 71					
WRP 72					
WRP 73					
WRP 74					
WRP 75					
Meon Desal plant including pumping station					
Meon Pumping Station					
Desalination [REDACTED]					
Fawley Pumping Station					
Fawley Pumping Station (FAWPS) 19					
FAWPS 21					
FAWPS 23					
Havant Thicket Pumping Station HTPS 3					
Havant Thicket Pumping Station HTPS 5					
Havant Thicket Pumping Station HTPS 8					
Havant Thicket Pumping Station HTPS 9					
Havant thicket HLPS alternate HT-OT3					
Havant thicket HLPS					
Break Pressure Tank					
[REDACTED]					
[REDACTED]					
WfLH Denmead WBS					
WfLH Drayton WBS					
WfLH Horndean WBS					
WfLH Lower Upham BPT Break Pressure Tank					

	Net Biodiversity Unit Loss				
	Loss of habitat (units)	Un-acceptable habitat loss (ha)	Loss of Priority Habitat (units)	Loss of hedgerow (units)	Loss of river (units)
WfLH North Boarhunt WBS					
WfLH North Fareham WBS					
WfLH Upper Swanmore Break Pressure Tank					
Pre-disinfection ceramic membrane plant at Otterbourne WSW					
Reception tanks at Testwood WSW					
Otterbourne EBL Emergency Drawdown/Overflow: Option 1: Overflow and Drawdown to the River Itchen Tributary					
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow					

Table 4.2 Summary of the overall unit construction loss for components with temporary on-site loss (post on-site compensation and pre off-site compensation) for habitats and hedgerow

Component	Net Biodiversity Unit Loss				
	Loss of habitat (units)	Un-acceptable habitat loss (ha)	Loss of Priority Habitat (units)	Loss of hedgerow (units)	Loss of river (units)
██████████ to WRP Route 1					
██████████ to WRP Route 1					
Fawley to Abstraction and Discharge Pipeline: Calshot Route					
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1					
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2					
Fawley to Testwood Route 1					
Fawley to Testwood Route 2					
Fawley to Testwood Route 3					
Fawley to Testwood Route 4					
Fawley to Testwood Route SIA					
Havant Thicket to Otterbourne Route 1					
Havant Thicket to Otterbourne Route 2					
Havant Thicket to Otterbourne Route 3					
Havant Thicket to Otterbourne Route 4					
Meon to Otterbourne Route 1					
Meon to Otterbourne Route 2					
WRP to Havant Thicket Route 1					
WRP to Havant Thicket Route 2					
WRP to Otterbourne Route 1					
WRP to Otterbourne Route 2					
WRP to Otterbourne Route SIA					
Construction Compound 75x100m ³⁸					
██████████ Intake					
Calshot Intake/Outfall					

³⁸ A main compound will be needed in the middle of each of the pipeline routes and will be required for storage of materials (e.g. fittings) that cannot be delivered direct to the working areas. These compounds are assumed to be approx. 75x100m and will be topsoil stripped and reinstated following completion of construction. As the location has not been determined an example has been included based on the assumption that all would be sited in low value grassland and should be considered in association with all pipeline routes.

4.1.2 Component level Biodiversity Net Gain opportunities

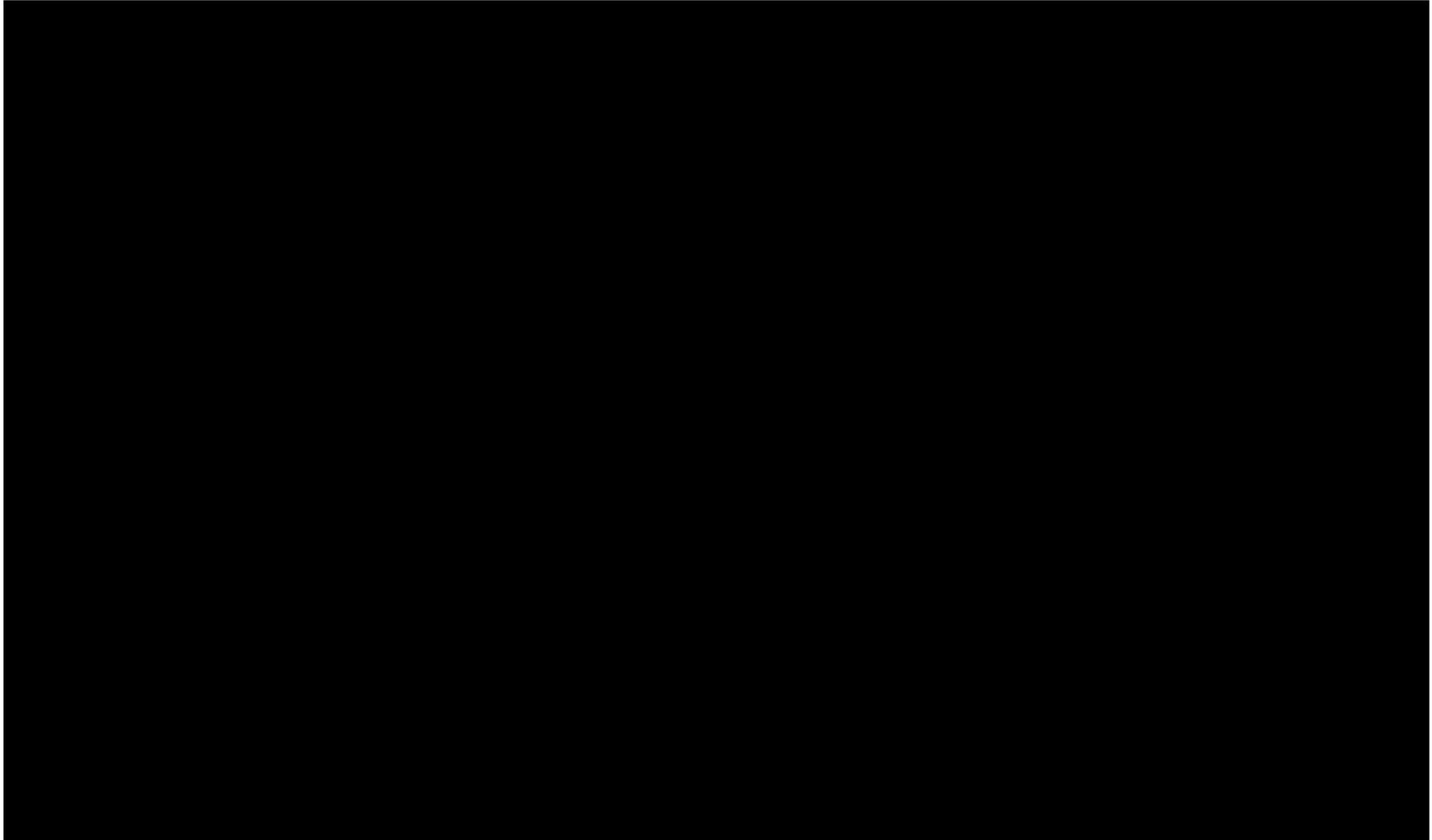
4.1.2.1 Habitats and Hedgerows

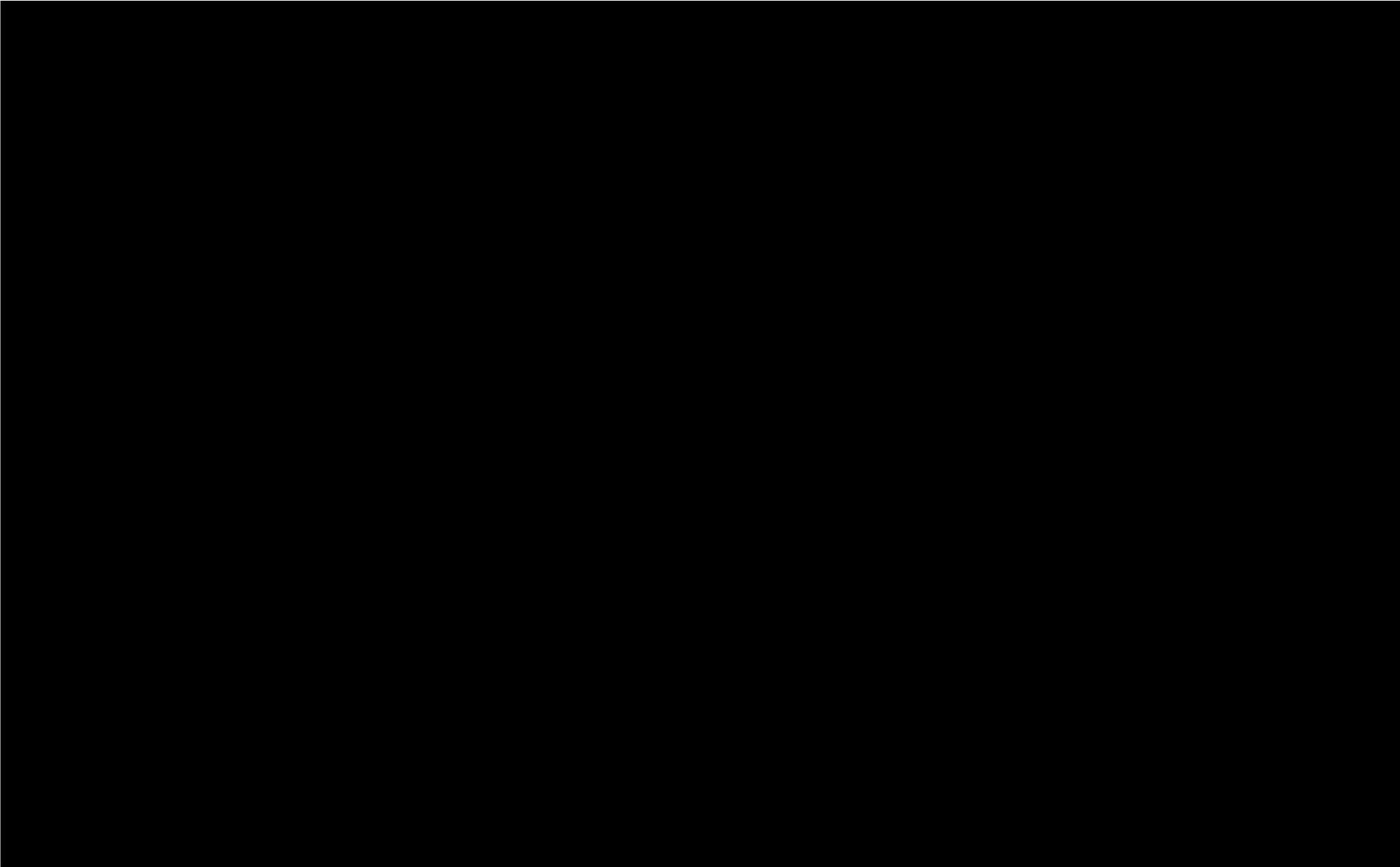
To achieve biodiversity net-gain there are opportunities locally for the following habitat enhancement and creation/succession (the change in the habitat to a more mature habitat e.g., grassland to woodland through woodland planting). **Table 4.3** shows for each habitat type lost by the component, the offsite hectareage /km of habitat enhancement or creation required for a minimum 10% biodiversity net gain of each habitat type, reported for habitats and hedgerows. The table also includes the hectareage /km of habitats strategically identified for enhancement or restoration within close proximity (1km) of the component. The strategic land has been identified from NE Habitat Networks zones: Fragmentation Actions Zones, Enhancement Zone 1 and Restorable habitat zones, as these lie within closest proximity to Priority Habitats and would typically be the first target for restoration. **Figures 2.6 (Appendix A1)** show the locations of these zones within 1km of each component.

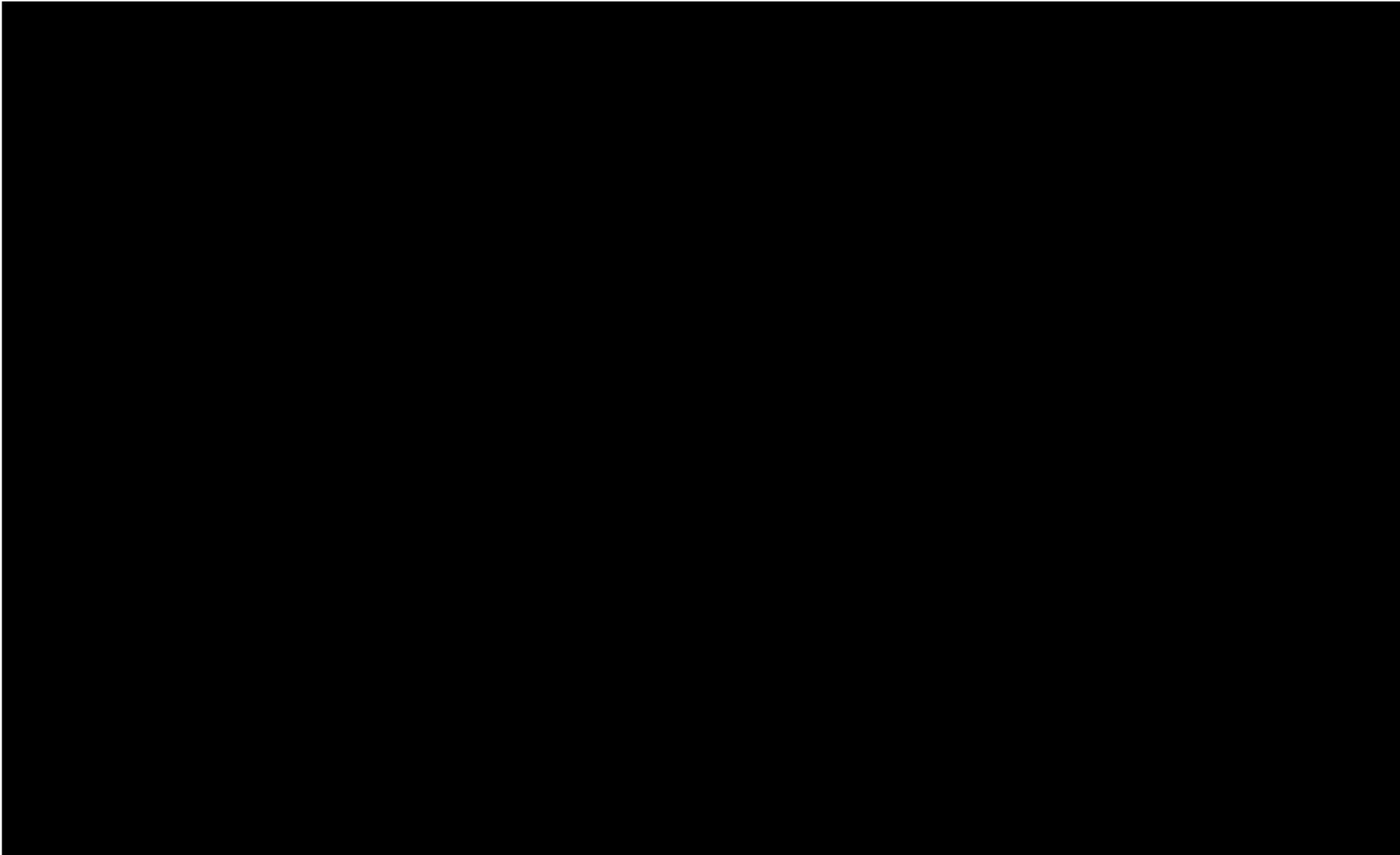
The results in **Table 4.3** show there is more than sufficient *land* available within the strategic biodiversity opportunities area to offset (compensate for losses and provide 10% net gain) the impacts for all components. However, there is insufficient available data on the habitat types within these strategic areas to confirm whether this land supports the specific habitats required and therefore they are not necessarily present but given the extent of the areas within the strategic areas is typically 100 times greater than the offsetting land required, it is likely to support sufficient habitat. Further assessment will be required at the next stage of scheme development to identify specific opportunities by habitat type.

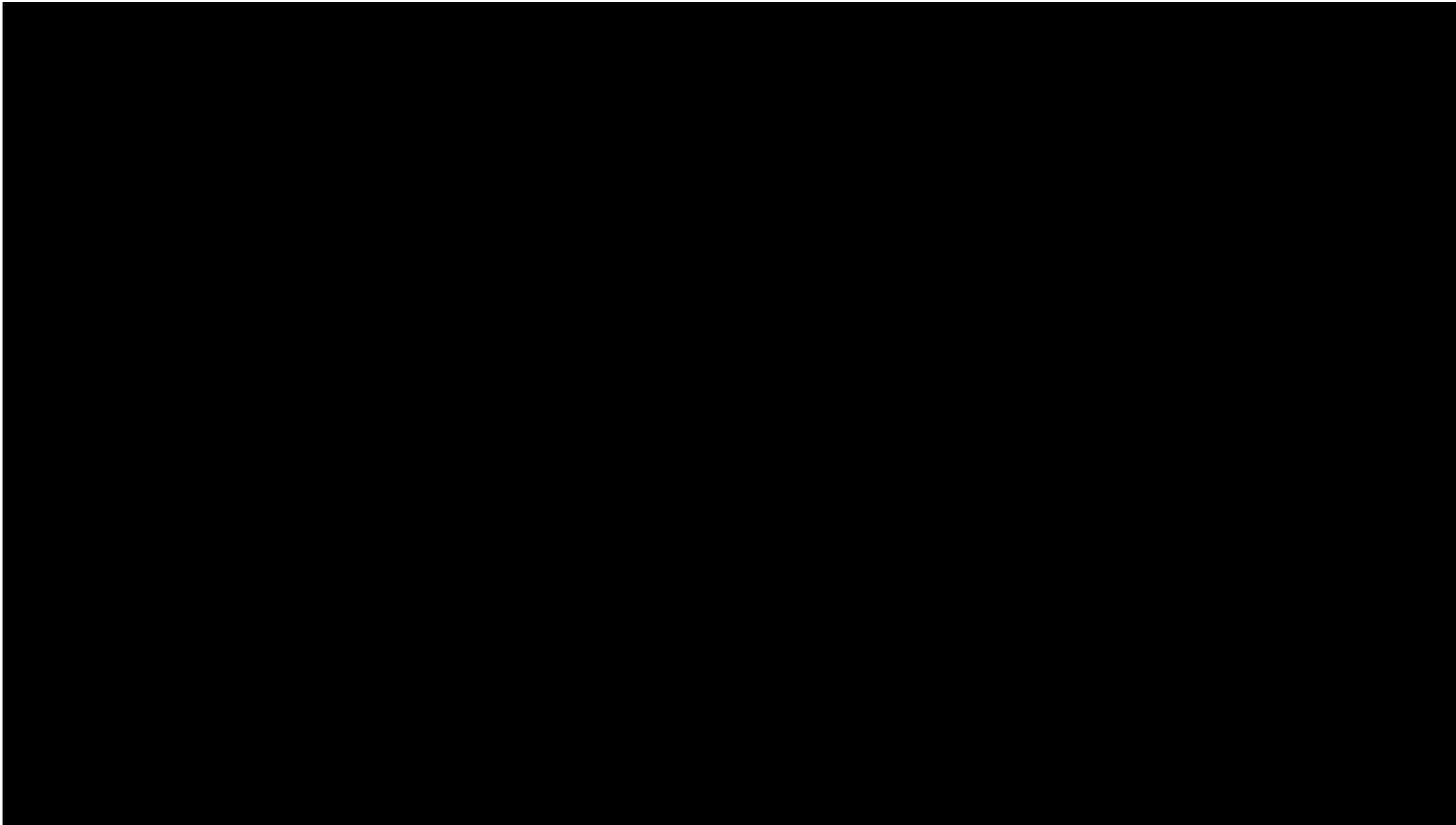
As stated in the methodology, baseline habitats lost were assumed to be in moderate condition. Hectareage required can be halved if habitats are in poor condition. The offsite baseline habitat was assumed to be in poor condition and enhanced to moderate condition (if the habitats are found to be in good condition, then other areas will be selected, although this is unlikely given that they have been strategically identified for enhancement). The requirement can be approximately halved if it is assumed good condition can be reached, although this is considered unachievable for woodland, for example, in the metric. The individual requirements per component are provided in **Appendix A2i-xxxviii**. It is important to also consider the need to avoid Priority Habitats where possible. Priority Habitats require the need for bespoke mitigation / compensation as they are considered an 'unacceptable loss'. The Defra Metric does not include 'unacceptable loss' habitats within the calculations of biodiversity units lost, as they must be dealt with separately and can be onerous to resolve.

Table 4.3 Summary of the offsetting requirements to achieve an approximate 10% net gain for habitats and hedgerows for each grouping and availability of biodiversity opportunities within 1km of each component

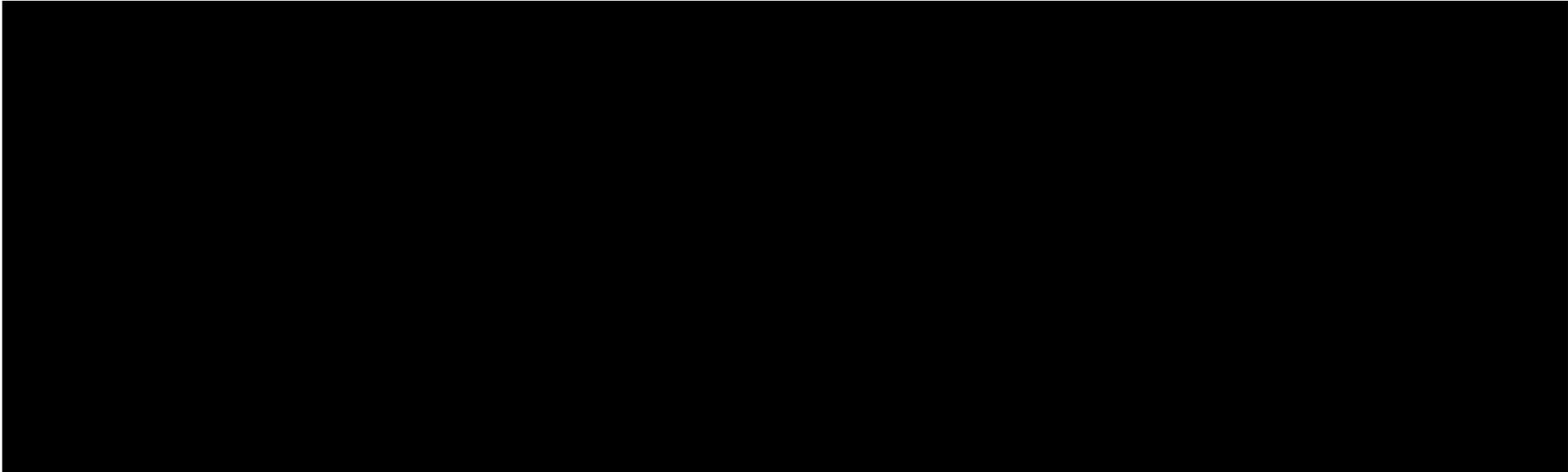








³⁹ A main compound will be needed in the middle of each of the pipeline routes and will be required for storage of materials (e.g. fittings) that cannot be delivered direct to the working areas. These compounds are assumed to be approx. 75x100m and will be topsoil stripped and reinstated following completion of construction. As the location has not been determined an example has been included based on the assumption that all would be sited in low value arable field and should be considered in association with each pipeline route.



* Also have 'unacceptable' loss habitats (refer to **Table 4.1**)

Desalination

Of the desalination components, D55 Meon to Otterbourne Route 1 Habitat requires the greatest habitat area for offsetting (██████████), however the route also has a large area for potential offsetting with (██████████) of strategic biodiversity opportunities within 1km. The D55 Meon to Otterbourne Route 2 and D55 Meon Desal Plant incl. Pumping Station also have comparable and high offsetting requirements for modified grassland with (██████████) required respectively. Modified grassland is not a 'like for like' offset requirement and therefore a smaller area of higher distinctiveness habitat could be proposed; however, this assessment has applied the same rules to offsetting for comparative purposes. More challenging is woodland creation and of the Fawley to Testwood Routes, Route 1 has the greatest requirement for modified grassland succession to woodland (██████████) but has extensive biodiversity opportunities (██████████). This has been strategically identified but at the planning and consenting stage more detail will be assessed in terms of habitat type. However, at gate 2 the approach identifies overall hectareage requirement to compare again configuration and associated components which have support the MCDA for comparison purposes.

The routes with **least impact** on terrestrial habitat biodiversity and therefore least requirement for 10% net gain are:

- A1 and A2: Fawley to Abstraction and Discharge Pipeline: Lepe Route 1
- A1 and A2: Fawley to Testwood Route 4
- A3: Meon to Otterbourne Route 2

Regarding hedgerows, the routes with **least impact** on biodiversity and therefore least requirement for 10% net gain are:

- A1 and A2: Fawley to Abstraction and Discharge Pipeline: Calshot Route
- A1 and A2: Fawley to Testwood Route 4
- A3: Meon to Otterbourne 2
- A1 and A2: Calshott Outfall

As noted in **Table 4.1** habitats which are categorised as 'unacceptable losses' which is a major consideration due to the requirement for a bespoke mitigation strategy, are highest for:

- A3: Meon to Otterbourne Route 1
- A1 and A2: Fawley to Testwood Route 3
- A1 and A2: Desal (██████████) New Boundary Habitat

Additional offsite mitigation would be required for these components.

Water Recycling

Of the Water Recycling components, Havant Thicket to Otterbourne Route 2 requires the greatest habitat area for offsetting (██████████) but has a high proportion of the surrounding area comprising strategic biodiversity offsetting opportunities (██████████). The route with the highest proportion of strategic Biodiversity opportunity areas within 1 km is WRP to Otterbourne Route 2 with (██████████). This has been strategically identified but at the planning and consenting stage more detail will be assessed in terms of habitat type. However, at gate 2 the approach identifies overall hectareage requirement to compare again configuration and associated components which have support the MCDA for comparison purposes.

The routes with **least impact** on terrestrial habitat biodiversity and therefore least requirement for 10% net gain are:

- B4 and D2: Havant Thicket to Otterbourne Route 4
- B4: WRP to Havant Thicket Route 1
- B2 and B5: WRP to Otterbourne Route 2
- B2, B4 and B5 (██████████) to WRP Route 1

Regarding hedgerows, the routes with **least impact** on biodiversity and therefore least requirement for 10% net gain are:

- B4 and D2: Havant Thicket to Otterbourne Route 4
- B4: WRP to Havant Thicket Route 1
- B2 and B5: WRP to Otterbourne SIA
- B2, B4 and B5: ██████████ to WRP Route 1

The Water Recycling Plant options, for B2, B4 and B5 configurations, with **least impact on terrestrial habitat biodiversity and therefore least requirement for 10% net gain** are:

- WRP 71
- WRP 70
- WRP 74

Regarding hedgerows, the options with **least impact on biodiversity and therefore least requirement for 10% net gain** are:

- WRP 68 (no hedgerows)
- WRP 70 (no hedgerows)
- WRP 71 (no hedgerows)
- WRP 73 (no hedgerows)

4.1.2.2 Rivers

There are opportunities locally for the following river habitat enhancement identified from rivers within the NE Habitats Networks (Fragmentation Actions Zones, Enhancement Zone 1 and Restorable habitat zones) within 1km of each component. **Table 4.4** shows for each component, the km of temporary river loss and corresponding km of river strategically identified within 1km. There is no open source GIS data set showing Priority Rivers for Restoration. However, further assessment of Priority Rivers for Restoration should be included within further assessment at the next stage of scheme development. **Figures 2.6 (Appendix A1)** show the locations of these zones within 1km of each component.

Table 4.4 Area of habitat with biodiversity opportunities (NE's Habitat Network Zones) within 1km of the component

Offsetting Requirements for 10% BNG		
Component	River habitat loss (km)	Biodiversity Opportunities (restorable river habitat) within 1km of component (km)
Desalination		
Meon Desal Plant incl. Pumping Station		
Meon Pumping Station		
Desal ██████████ New Boundary Habitat*		
Fawley FAWPS Sites Habitats		
Fawley to Abstraction and Discharge Pipeline: Calshot Route		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2		
D55 Meon to Otterbourne Route 1		
D55 Meon to Otterbourne Route 2		
Fawley to Testwood Route 1		
Fawley to Testwood Route 2		
Fawley to Testwood Route 3		
Fawley to Testwood Route 4		
Fawley to Testwood Route SIA		
Fawley Pumping Station		

FAWPS 19	
FAWPS 21	
FAWPS 23	
Reception tanks at Testwood WSW	
██████████ Intake	
Calshot Intake/ Outfall	
Water Recycling	
Water Recycling Plant (WRP) 68	
WRP 70	
WRP 71	
WRP 72	
WRP 73	
WRP 74	
WRP 75	
Lake Otterbourne	
██████████ to WRP Route 1	
██████████ to WRP Route 1	
Havant Thicket to Otterbourne Route 1	
Havant Thicket to Otterbourne Route 2	
Havant Thicket to Otterbourne Route 3	
Havant Thicket to Otterbourne Route 4	
Havant thicket Pumping Station (HTPS) 3	
Havant thicket Pumping Station (HTPS) 5	
Havant thicket Pumping Station (HTPS) 8	
Havant thicket Pumping Station (HTPS) 9	
WRP to Havant Thicket Route 1	
WRP to Havant Thicket Route 2	
WRP to Otterbourne Route 1	
WRP to Otterbourne Route 2	
Construction Compound 75x100m ⁴⁰	
██	
WfLH Denmead WBS	
WfLH Drayton WBS	
WfLH Horndean WBS Habitat	
WfLH Lower Upham BPT Break Pressure Tank	
WfLH North Boarhunt WBS	
WfLH North Fareham WBS	
WfLH Upper Swanmore Break Pressure Tank	
Havant Thicket HLPS	
Havant Thicket HLPS alternate HT-OT3	
Pre-disinfection ceramic membrane plant at Otterbourne WSW	
Otterbourne EBL Emergency Drawdown/Overflow Options: Option 1: Overflow and Drawdown to the River Itchen Tributary	

⁴⁰ The locations of the construction compounds required for each of pipeline route have not been determined but it is assumed they will not be sited so as do include a watercourse therefore no offsetting would be required for watercourses at these locations.

Otterbourne EBL Emergency
Drawdown/Overflow Options: Option 2: Overflow
and Drawdown to Overland Flow

* Also have 'unacceptable loss habitats (refer to Table 4.1)

Desalination

Of the D55 Meon Desalination components, D55 Meon to Otterbourne Route 2 requires the greatest river length for offsetting (████████), however, there are ██████████ or rivers within strategically identified areas within 1 km of this component, which at a high level of assessment would indicate there is potential for offsetting; however, further assessment of Priority Rivers or the wider catchment should be undertaken to confirm the suitability of these locations at the next stage. D55 Meon to Otterbourne Route 1 has slightly less impact on rivers than Route 1 (████████) and also includes rivers within strategic areas within 1km (████████). This has been strategically identified but at the planning and consenting stage more detail will be assessed in terms of habitat type. However, at gate 2 the approach identifies overall hectareage requirement to compare again configuration and associated components which have support the MCDA for comparison purposes.

Of the Fawley Desalination components the pipeline route Fawley to Testwood Route 4 requires the greatest river length for offsetting (████████), however, there are ██████████ of river within strategically identified areas within 1km of this component. Fawley to Abstraction and Discharge Pipeline: Lepe Route 2 impacts upon ██████████, however, no rivers were identified within strategic areas and further assessment of Priority Rivers or the wider catchment should be undertaken to identify other opportunities.

Of the Fawley to Testwood Routes, Routes 1 and 3 require the least offsetting and both have ██████████ of strategically identified rivers within 1km. Of the Fawley to Abstraction and Discharge Routes, the Calshot route and Lepe Route 1 have no impacts on rivers and no requirement for offsetting.

Water Recycling

Of the Water Recycling pipeline routes, the Havant Thicket to Otterbourne Routes 1 and 2 have the least impact (████████ and both have rivers within strategic areas within 1km (████████ respectively).

WRP to Otterbourne has the greatest impact on rivers out of the WRP pipeline options with a total of ██████████ of river impacted, however, there are ██████████ of river within strategically identified areas within 1km of this component therefore further assessment of Priority Rivers or the wider catchment should be undertaken to identify other opportunities. WRP to Otterbourne Route 2 has a slightly lower impact on rivers than route 1 (████████) and also includes rivers within strategic areas within 1km (████████).

The Water Recycling Plant parcel options WRP 68, WRP 70, WRP 71, WRP 72, WRP 73, WRP 74, and WRP 75 did not contain any impacted watercourses therefore there were no differences in impacts or offsetting requirements for watercourses between the options.

4.2 Natural Capital

4.2.1 Biodiversity and habitat

Table 4.5 summarises the temporary loss of habitat type, based on a Zol of 50m for each of the components included within the Southern Water SRO (i.e., 25m working width). The working width reduces to 12m through hedgerows, rivers and roads. Aerial imagery was used to locate sections where the working width changed between 25m and 12m.

Only habitats that are present within the Zol are included. It is assumed that all habitat falling within the Zol will be temporary lost during the construction period for some option components, such as pipelines and replaced following construction. Therefore, loss of associated ecosystem services will occur only for the period of construction and subsequent habitat reinstatement.

Additional components subsequently included in this report include Lake Otterbourne Overland flow, Overflow drawdown: River Itchen, Fawley marina intake and the receiving tanks at Testwood WTW. Additionally, Fawley to abstraction and discharge pipeline: Calshot route has been updated as new information was given.

Table 4.5 also presents the area of permanent habitat loss, area of habitat reinstatement, and area proposed for offsite habitat improvement to deliver the required compensation for habitat losses and achieve biodiversity net gain.

Table 4.5 Summary of broad habitat types for components

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
HTPS_ST3 Land Parcel 3	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
HTPS_ST3 Land Parcel 5	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
HTPS_ST3 Land Parcel 8	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
HTPS_ST3 Land Parcel 9	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Woodland (Deciduous)				
Havant Thicket to Otterbourne Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Havant Thicket to Otterbourne Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Havant Thicket to Otterbourne Route 3	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Havant Thicket to Otterbourne Route 4	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Desal D55 Meon to Otterbourne Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Desal D55 Meon to Otterbourne Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
[REDACTED] to WRP Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP to Havant Thicket Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP to Havant Thicket Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP to Otterbourne Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP to Otterbourne Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP to Otterbourne SIA	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
[REDACTED] to WRP Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 68	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 70	Arable land				
	Freshwater				
	Grassland				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 71	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 72	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 73	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 74	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WRP Parcel 75	Arable land				
	Freshwater				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
	Sparsely vegetated land				
	[REDACTED]	Arable land			
Freshwater					
Grassland					
Heathland					
Shrub					
Urban					
Woodland (Coniferous)					
Woodland (Deciduous)					
WfLH Lower Upham BPT	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WfLH Upper Swanmore BPT	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WfLH Denmead WBS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Woodland (Deciduous)				
WfLH Drayton WBS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WfLH Horndean WBS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WfLH North Boarhunt WBS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
WfLH North Fareham WBS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Havant thicket HLPS alternate HT-OT3	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Urban				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Havant thicket HLPS	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley FAWPS Sites Habitats (Parcel 19)	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley FAWPS Sites Habitats (Parcel 21)	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley FAWPS Sites Habitats (Parcel 23)	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley PS	Arable land				
	Freshwater				
	Grassland				
	Heathland				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Lake Otterbourne Habitat	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Lake Otterbourne Overland flow	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Overflow drawdown: River Itchen	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley marina Intake	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Receiving tanks at	Arable land				
	Freshwater				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
Testwood WTW	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Abstraction and Discharge Pipeline: Calshot Route	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
Woodland (Deciduous)					
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Testwood Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
Fawley to Testwood Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Testwood Route 3	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Testwood Route 4	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Fawley to Testwood Route SIA	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
Desal Habitat	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				

Component	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	Area planned for habitat reinstatement (ha)	Area proposed for habitat improvement (ha) – compensation and net gain
D55 Meon Desal Plant including PS	Woodland (Deciduous)				
	Wetland				
	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				

4.2.2 Climate regulation

Table 4.6 summarises the baseline land use types within the 50m Zol of each Southern Water SRO’s and the momentary value of the climate regulation ecosystem services they provide. The Fawley to Testwood Routes provide some of the greatest carbon sequestration under baseline conditions: this is related to the presence of woodland which provides carbon sequestration services. **Table 4.6** also presents the change in carbon sequestration including consideration of required BNG. The results show a loss of carbon sequestration for almost all options, even with BNG mitigation in place. This is because only creation of habitats and not enhancement can be quantified from a Natural Capital perspective (i.e., there is not sufficient data in terms of current habitat quality without ground truthing). The assessment (see **Section 4.1**) outlines the required offsetting to produce an overall net gain, however this includes mostly habitat enhancement rather than creation, affecting the quality but not the stock of natural assets. It is not possible to quantify the non-spatial changes in biodiversity and habitat ecosystem services arising from habitat condition improvement. The only expect habitat creation to avoid loss is deciduous woodland. As to not overestimate the impact of the change in non-traded carbon sequestration value following habitat creation / reinstatement, this value has been calculated by summing the change in non-traded carbon sequestration value during construction (the temporary loss), the permanent loss and creation.

Table 4.6 Summary of non-traded carbon sequestration values per component

Component	Change in non-traded carbon sequestration value during construction (£2019)	Change in non-traded carbon sequestration value (permanent loss) (£2019)	Change in non-traded carbon sequestration value including BNG habitat creation / reinstatement (£2019)
HTPS_ST3 Land Parcel 3			
HTPS_ST3 Land Parcel 5			
HTPS_ST3 Land Parcel 8			
HTPS_ST3 Land Parcel 9			
Havant Thicket to Otterbourne Route 1			
Havant Thicket to Otterbourne Route 2			

Component	Change in non-traded carbon sequestration value during construction (£2019)	Change in non-traded carbon sequestration value (permanent loss) (£2019)	Change in non-traded carbon sequestration value including BNG habitat creation / reinstatement (£2019)
Havant Thicket to Otterbourne Route 3			
Havant Thicket to Otterbourne Route 4			
Desal D55 to Otterbourne Route 1			
Desal Meon D55 to Otterbourne Route 2			
██████████ to WRP Route 1			
WRP to Havant Thicket Route 1			
WRP to Havant Thicket Route 2			
WRP to Otterbourne Route 1			
WRP to Otterbourne Route 2			
WRP to Otterbourne SIA			
Budds Farm to WRP Route 1			
WRP Parcel 68			
WRP Parcel 70			
WRP Parcel 71			
WRP Parcel 72			
WRP Parcel 73			
WRP Parcel 74			
WRP Parcel 75			
WfLH Beckford Lane BPT			
WfLH Lower Upham BPT			
WfLH Upper Swanmore BPT			
WfLH Denmead WBS			
WfLH Drayton WBS			
WfLH Horndean WBS			
WfLH North Boarhunt WBS			
WfLH North Fareham WBS			

Component	Change in non-traded carbon sequestration value during construction (£2019)	Change in non-traded carbon sequestration value (permanent loss) (£2019)	Change in non-traded carbon sequestration value including BNG habitat creation / reinstatement (£2019)
Havant thicket HLPS alternate HT-OT3			
Havant thicket HLPS			
Fawley FAWPS Sites Habitats (Parcel 19)			
Fawley FAWPS Sites Habitats (Parcel 21)			
Fawley FAWPS Sites Habitats (Parcel 23)			
Fawley PS			
Lake Otterbourne Habitat			
Lake Otterbourne Overland flow			
Overflow drawdown: River Itchen			
Fawley marina Intake			
Receiving tanks at Testwood WTW			
Fawley to Abstraction and Discharge Pipeline: Calshot intake/ Outfall Route			
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1			
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2			
Fawley to Testwood Route 1			
Fawley to Testwood Route 2			
Fawley to Testwood Route 3			
Fawley to Testwood Route 4			
Fawley to Testwood Route SIA			
Desal Ashlett Creek Habitat			
D55 Meon Desal Plant including PS			

*positive high values related to offsetting and BNG estimates in the context of high woodland requirements because of location .

4.2.3 Natural hazard regulation

Table 4.7 presents the baseline assessment of natural hazard regulation. Only areas located within flood plain and within urban areas (where impacts of flooding are likely to be more costly) have been scoped into the assessment. The areas susceptible to flooding were identified using Flood Zone 2 and 3 definitions outlined in National Planning Policy⁴¹.

Baseline loss in land cover was converted to monetary value based on data outlined in **Section 3**. A benefit transfer value has not been identified at this stage for agricultural land, therefore this has not been accounted for in the baseline assessment.

Table 4.7 Summary of the natural hazard regulation impacts per component

Component	Change in natural hazard regulation value during construction (£2019)	Change in natural hazard regulation value the permanent loss (£2019)	Change in natural hazard regulation related to BNG habitat creation (£2019)
HTPS_ST3 Land Parcel 3			
HTPS_ST3 Land Parcel 5			
HTPS_ST3 Land Parcel 8			
HTPS_ST3 Land Parcel 9			
Havant Thicket to Otterbourne Route 1			
Havant Thicket to Otterbourne Route 2			
Havant Thicket to Otterbourne Route 3			
Havant Thicket to Otterbourne Route 4			
██████████ to WRP Route 1			
WRP to Havant Thicket Route 1			
WRP to Havant Thicket Route 2			
WRP to Otterbourne Route 1			
WRP to Otterbourne Route 2			
WRP to Otterbourne SIA			
██████████ to WRP Route 1			
WRP Parcel 68			
WRP Parcel 70			
WRP Parcel 71			
WRP Parcel 72			
WRP Parcel 73			

⁴¹ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

Component	Change in natural hazard regulation value during construction (£2019)	Change in natural hazard regulation value the permanent loss (£2019)	Change in natural hazard regulation related to BNG habitat creation (£2019)
WRP Parcel 74			
WRP Parcel 75			
Lake Otterbourne			
WfLH Lower Upham BPT			
WfLH Upper Swanmore BPT			
WfLH Denmead WBS			
WfLH Drayton WBS			
WfLH Horndean WBS			
WfLH North Boarhunt WBS			
WfLH North Fareham WBS			
Havant thicket HLPS alternate HT-OT3			
Havant thicket HLPS			
Fawley FAWPS Sites Habitats Parcel 19			
Fawley FAWPS Sites Habitats Parcel 21			
Fawley FAWPS Sites Habitats Parcel 23			
Fawley PS			
Lake Otterbourne Overland flow			
Overflow drawdown: River Itchen			
Fawley marina Intake			
Receiving tanks at Testwood WTW			
Fawley to Abstraction and Discharge Pipeline: Calshot Route			
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1			
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2			
Fawley to Testwood Route 1			
Fawley to Testwood Route 2			
Fawley to Testwood Route 3			
Fawley to Testwood Route 4			
Fawley to Testwood Route SIA			

Component	Change in natural hazard regulation value during construction (£2019)	Change in natural hazard regulation value the permanent loss (£2019)	Change in natural hazard regulation related to BNG habitat creation (£2019)
Desal [REDACTED] Habitat			
Desal D55 Habitat Including PS			
Desal D55 to Otterbourne Route 1			
Desal D55 to Otterbourne Route 2			

4.2.4 Water purification

Baseline provision of water purification services is dependent on the following:

- Land cover (habitat)
- Proximity to receptor (i.e., a water body)
- Current water quality of receptors

Baseline water purification provision has not been quantified at this stage as described in **Section 3.2**. No water quality baseline data was available for the River Test near Testwood lakes and other areas. A brief summary of the baseline and potential change is included below in **Table 4.8**.

Table 4.8 Summary of baseline and potential change to water purification service provision per component

Components	Water purification ecosystem service provision assessment
HTPS ST3 Land Parcel 3	Water purification services are currently provided by greenfield habitats. Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
HTPS ST3 Land Parcel 5	Water purification services are currently provided by greenfield and woodland habitats. Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
HTPS ST3 Land Parcel 8	Water purification services are currently provided by greenfield and woodland habitats. Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
HTPS ST3 Land Parcel 9	Water purification services are currently provided by greenfield habitats. Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
Component 1 – 4: Havant Thicket to Otterbourne WSW	Water purification services are currently provided by greenspace and urban habitats. Hermitage Stream WFD waterbody is currently achieving Moderate status. Therefore, the decrease in flow has a potential to decline water purification services as dilution of pollutants downstream will decline.

Components	Water purification ecosystem service provision assessment
	<p>The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p>
Component 9: ██████████ to WRP	<p>The final effluent from ██████████ will be transferred to WRP. Therefore, there would be no change to water purification to the WRP as the water will be transferred via a pipeline from Peel Common.</p>
Component 10 – 11: WRP to Havant Thicket	<p>Water purification services are currently provided by greenspace and urban habitats. Hermitage Stream WFD waterbody is currently achieving Moderate status. There would be no change in water purification services.</p>
Component 12 – 14: WRP to Otterbourne WSW	<p>The water will be transferred to Otterbourne Lake which will be created as an environmental buffer lake. The lake will not be in hydraulic continuity with the groundwater. River Itchen flows nearby and the WFD waterbody is achieving a Moderate status. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. Therefore, this may either temporarily improve water or decline water purification depending on the water quality in the lake and related to the increased flow during an emergency,</p>
Component 15: ██████████ to WRP	<p>██████████ currently discharges water via the ██████████ LSO. The WRP waste stream will be mixed with the remaining final effluent at ██████████ before being transferred to ██████████ Outfall.</p> <p>Therefore, this could potentially decline water purification of the receiving waterbody as dilution of pollutants downstream will decline. No change to water purification to the WRP as the water will be transferred via a pipeline from ██████████.</p>
WRP Parcel 68	<p>Water purification services are currently provided by grassland habitats. The Langstone Harbour is nearby, and a water recycling plant will be constructed. Therefore, the change in land cover has a potential to decline water purification services.</p>
WRP Parcel 70	<p>Water purification services are currently provided by arable, pasture, and grassland habitats. Lavant Stream flows nearby and the WFD waterbody is currently achieving Poor status. The construction of water recycling plant will change the land cover which could potentially decline water purification services</p>
WRP Parcel 71	<p>Water purification services are currently provided by greenspace and urban habitats. Brockhampton Stream flows adjacent to the land parcel and has no WFD classification. However, the Stream flows into the Langstone Harbour and a water recycling plant will be constructed. Therefore, the change in land cover has a potential to decline water purification services.</p>
WRP Parcel 72	<p>Water purification services are currently provided by grassland and woodland habitats. Hermitage Stream flows adjacent to the land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p>
WRP Parcel 73	<p>Water purification services are currently provided by grassland and woodland habitats. Hermitage Stream flows adjacent to the land parcel and the WFD waterbody is currently achieving Moderate status. Langstone Harbour is nearby, and the construction of water recycling</p>

Components	Water purification ecosystem service provision assessment
	plant will change the land cover which could potentially decline water purification services.
WRP Parcel 74	Water purification services are currently provided by grassland and woodland habitats. The Langstone Harbour is nearby, and a water recycling plant will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
WRP Parcel 75	Water purification services are currently provided by grassland and woodland habitats. The Langstone Harbour is nearby, and a water recycling plant will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
Lake Otterbourne	Otterbourne Lake will be an environmental buffer lake. The lake will be lined and will therefore have no effect on water purification services. There may be some vegetation planting around the lake but this is currently unknown therefore impacts on water regulation cannot be assessed.
Lake Otterbourne Overland flow	Water purification services are currently provided by arable, pasture, and grassland habitats. River Itchen flows nearby and the WFD waterbody is achieving a Moderate status. During an emergency when drawdown of the lake is required, water will be discharged to the overflow land area. Therefore, this will temporarily improve water purification with the increased flow during an emergency but dependent on water quality in the lake and flow conditions in the Itchen.
Overflow drawdown: River Itchen	Water purification services are currently provided by arable, pasture, and grassland habitats. River Itchen flows nearby and the WFD waterbody is achieving a Moderate status. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. Therefore, this could temporarily improve water purification with the increased flow during an emergency but will depend on the water quality discharged and time of year.
██████████	Water purification services are currently provided by arable, and greenfield habitats. River Wallington flows nearby and the WFD waterbody is currently achieving Moderate status. As a Break Pressure Tank (BPT) will be constructed, the change in land cover has a potential to decline water purification services.
WfLH Lower Upham BPT	Water purification services are currently provided by arable, and greenfield habitats. River Hamble (Upper Hamble) flows nearby and the WFD waterbody is currently achieving Moderate status. As a BPT will be constructed, the change in land cover has a potential to decline water purification services.
WfLH Upper Swanmore BPT	Water purification services are currently provided by greenfield and grassland habitats. A BPT will be constructed. No change to water purification as there are no waterbodies within close proximity of the BPT.
WfLH Denmead WBS	Water purification services are currently provided by woodland habitats. A Water Booster Station (WBS) will be constructed. No change to water purification as there are no waterbodies within close proximity of the WBS.
WfLH Drayton WBS	Water purification services are currently provided by greenfield and grassland habitats. A WBS will be constructed. No change to water purification as there are no waterbodies within close proximity of the WBS.

Components	Water purification ecosystem service provision assessment
WfLH Horndean WBS	Water purification services are currently provided by arable, pasture and grassland habitats. A WBS will be constructed. No change to water purification as there are no waterbodies within close proximity of the WBS.
WfLH North Boarhunt WBS	Water purification services are currently provided by arable, pasture and grassland habitats. A WBS will be constructed. No change to water purification as there are no waterbodies within close proximity of the WBS.
WfLH North Fareham WBS	Water purification services are currently provided by arable, and greenfield habitats. River Wallington flows nearby and the WFD waterbody is currently achieving Moderate status. As a WBS will be constructed, the change in land cover has a potential to decline water purification services.
Havant thicket HLPS alternate HT-OT3	Water purification services are currently provided by arable, and greenfield habitats. Bidbury Mead Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
Havant Thicket HLPS	Water purification services are currently provided by greenfield and woodland habitats. Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services.
Desalination Component 1: Fawley FAWPS Sites Habitats	Water purification services are currently provided by arable, pasture, woodland and grassland habitats. Water for the Ashlett Creek desalination plant will be abstracted from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is potential impact to water purification services.
Fawley marina Intake	Water purification services are currently provided by urban and grassland habitats. Water will be abstracted from the marina from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is a potential impact to water purification services.
Receiving tanks at Testwood WTW	Water purification services are currently provided by urban and grassland habitats. Water will be transferred into the receiving tanks, therefore there will a negligible impact on water purification services.
Fawley PS	Water purification services are currently provided by grassland, and woodland habitats. A pumping station will be constructed. The Solent is nearby and has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is a potential impact to water purification services.
Desalination Component 2 – 4: Fawley Abstraction and Discharge	Fawley desalination plant will abstract water from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is a potential impact to water purification services.
Desalination Component 5 – 9: Fawley Abstraction to Testwood	Fawley desalination plant will abstract water from The Solent. The desalinated water will be transferred to Testwood WTW which will reduce the abstraction in the River Test.

Components	Water purification ecosystem service provision assessment
	Water purification services are currently provided by arable, pasture, woodland and grassland habitats. River Test (Lower) WFD waterbody is currently achieving Moderate status. Therefore, the increase in flow has a potential to improve water purification services as dilution of pollutants downstream will increase.
Desalination Component 10: Desal Ashlett Creek Habitat	Water purification services are currently provided by woodland and grassland habitats. The construction involves a desalination plant which will be receive water from Fawley FAWPS Site. Therefore, there is no change to water purification services.
Desalination Component 11: Desal D55 Habitat Including PS	The D55 desalinisation plant will abstract water from The Solent. The Solent is a European Marine Site with Special Protection Area (SPA), Special Area of Conservation (SAC) and Ramsar designations. Therefore, there is a potential impact to water purification services.
Desalination Component 12 -13: Desal D55 to Otterbourne WTW	The D55 desalinisation plant will abstract water from The Solent. The desalinated water will be transferred to a receiving tank at Otterbourne WTW. River Itchen flows nearby and the WFD waterbody is achieving a Moderate status. No change to water purification to waterbodies will occur as the water will be transferred via a pipeline to Otterbourne WTW.

4.2.5 Tourism and recreation (cultural services)

Table 4.9 depicts the baseline cultural services using a value for the recreation assets only affected by each component, as well as the estimated visitation to those assets on a given year. This data is derived from the ORVal³⁰ tool as described in **Section 3.2**.

Table 4.9 ORVal outputs – Welfare Value and Estimated Visits for affected recreation sites

Components	Estimated Welfare Value (£2019/ year)	Estimated visits (per year)
HTPS ST3 Land Parcel 3		
HTPS ST3 Land Parcel 5		
HTPS ST3 Land Parcel 8		
HTPS ST3 Land Parcel 9		
Havant Thicket to Otterbourne Route 1		
Havant Thicket to Otterbourne Route 2		
Havant Thicket to Otterbourne Route 3		
Havant Thicket to Otterbourne Route 4		
██████████ Route 1		
WRP to Havant Thicket Route 1		
WRP to Havant Thicket Route 2		
WRP to Otterbourne Route 1		
WRP to Otterbourne Route 2		
WRP to Otterbourne SIA		
██████████ Route 1		
WRP Parcel 68		
WRP Parcel 70		
WRP Parcel 71		
WRP Parcel 72		
WRP Parcel 73		

Components	Estimated Welfare Value (£2019/ year)	Estimated visits (per year)
WRP Parcel 74		
WRP Parcel 75		
Lake Otterbourne		
Lake Otterbourne Overland flow		
Overflow drawdown: River Itchen		
██████████		
WfLH Lower Upham BPT		
WfLH Upper Swanmore BPT		
WfLH Denmead WBS		
WfLH Drayton WBS		
WfLH Horndean WBS		
WfLH North Boarhunt WBS		
WfLH North Fareham WBS		
Havant thicket HLPS alternate HT-OT3		
Havant thicket HLPS		
Fawley FAWPS Sites Habitats (Parcel 19, 21, 23)		
Fawley marina Intake		
Receiving tanks at Testwood WTW		
Fawley to Abstraction and Discharge Pipeline: Calshot Route		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2		
Fawley PS		
Fawley to Testwood Route 1		
Fawley to Testwood Route 2		
Fawley to Testwood Route 3		
Fawley to Testwood Route 4		
Fawley to Testwood Route SIA		
Desal ██████████ Habitat		
Desal D55 Habitat Including PS		
Desal D55 to Otterbourne Route 1		
Desal D55 to Otterbourne Route 2		

The cultural service values are based on the proposed pipeline route and a 50m buffer zone. The pipeline crosses agricultural/greenfield areas and alongside roads across the majority of the pipeline routes for majority of the components. The loss to welfare for agricultural/greenfield areas or any road closure are not included in this assessment noting that this will be assessed as part of the strategic environment assessment (SEA) in terms of any local impact.

The proposed pipeline route crosses paths part of national parks which have higher welfare values. For these components, the closure of paths, would be temporary and have not been included in the assessment. Buffer going through woodland areas are not assessed as the impact to nearby woodland would be minimal.

It has not been possible to monetise the recreation and tourism benefits of the component with BNG uplift as the details of the habitat creation opportunities have not been agreed, therefore these cannot be assessed using the NEVO tool. It is unknown whether new habitat creation sites will provide additional recreation facilities as public access is unknown. However, the potential impacts to recreation are assessed qualitatively below. Where recreation facilities have been noted on the GIS data it is

assumed that these will be affected. Given the extent (numbers of small sites) these have not been identified by name in the following.

4.2.5.1 HTPS ST3 Land Parcel 3

No recreation sites are affected during the construction however, whilst noting the site is part of the now closed [REDACTED]

4.2.5.2 HTPS ST3 Land Parcel 5

Majority of the estimated welfare is attributed to [REDACTED] woodland and a path part of [REDACTED] [REDACTED] This is reflected in the visitor numbers modelled by the ORVal tool. There are potential short-term impacts to recreation and access during the construction.

4.2.5.3 HTPS ST3 Land Parcel 8

Majority of the estimated welfare is attributed to [REDACTED] woodland part of [REDACTED] This is reflected in the visitor numbers modelled by the ORVal tool. There are potential short-term impacts to recreation and access during the construction.

4.2.5.4 HTPS ST3 Land Parcel 9

No recreation sites are affected during the construction however, the site is part of the now closed [REDACTED]

4.2.5.5 WRP Component 5 – 8: Havant Thicket to Otterbourne

The pipeline routes crosses agricultural/greenfield areas along majority of the route. The loss to welfare for agricultural/greenfield areas are not included in this assessment. Most of the estimated welfare value for routes 1, 2 and 3 is attributed to paths through [REDACTED] which has an annual value of £244,587 by the model, this is reflected in the high visitor numbers modelled by the ORVal tool. There are potential short-term impacts to recreation where construction may impede access to local recreation sites..

4.2.5.6 WRP Component 9: [REDACTED] to WRP

The majority of the tourism and recreation value is attributed to several footpaths which will impacted during the construction of the pipeline. There are paths which are within the zone of influence for local recreation sites such as Bedhampton and Farlington Marshes, Birchfrith Copse, Carpenters Copse, Birching Copse and Orchard Copse. Potential short-term impacts to recreation where construction may impede access to local recreation sites within the zone of influence.

4.2.5.7 WRP Component 10 – 11: WRP to Havant Thicket

Majority of pipeline Route 1 is along roads and pipeline Route 2 which is partially tunnelled crosses through urban area. The loss to welfare for urban areas are not included in this assessment. Most of the estimated welfare value is attributed to [REDACTED]. The model predicts a high footfall and therefore a high annual welfare value is estimated. It is assumed that any specific local small recreation park facilities (not specified) will be affected with the tunnelled route. Construction may have potential short-term impacts to access local recreation sites within the zone of influence .

4.2.5.8 WRP Component 12 – 14: WRP to Otterbourne

The pipeline routes 1, 2 and SIA cross agricultural/greenfield areas along majority of the route. The loss to welfare for agricultural/greenfield areas are not included in this assessment. Most of the estimated welfare value is attributed to paths through local recreation sites such as Bedhampton and Farlington Marshes and a path that runs through woodland along River Itchen. The Bedhampton and Farlington Marshes path has an annual value of £83,802 by the model, this is reflected in the high visitor numbers modelled by the ORVal tool. Route SIA crosses through Forest of Bere which has an estimated annual welfare value of £1,146,670 of which £4,863 will be impacted by construction. There are potential short-term impacts to recreation where construction may impede access to local recreation sites.

4.2.5.9 WRP Component 15: [REDACTED] to WRP

Most of the estimated welfare value is attributed to paths part of Southmoor Nature Reserve and Bedhampton and Farlington Marshes. Construction may have potential short-term impacts to access specific local small recreation park facilities (not specified) within the zone of influence. It is assumed a year of temporary closure of paths and roads as part of construction of the pipelines.

4.2.5.10 WRP Parcel 68

The estimated welfare value is attributed to paths surrounding Parcel 68 which is part Southmoor Nature Reserve. The construction may have potential short-term impacts to access nature reserve. It is assumed a year of temporary closure of paths as part of construction.

4.2.5.11 WRP Parcel 70

No recreation sites are affected during the construction as the Site is a greenfield area.

4.2.5.12 WRP Parcel 71

No recreation sites are affected during the construction as the Site is currently occupied by various industrial uses.

4.2.5.13 WRP Parcel 72

The estimated welfare value is attributed to paths from Mill Lane towards Brockhampton Mill Lake, Bedhampton and Farlington Marshes. The annual value of the path is [REDACTED] and Three paths towards Harts Farm Way will be permanently closed as the paths cut through the site. A path along the boundary of the site will may be impacted by construction. Construction will have an impact to access local specific small recreation park facilities within the zone of influence.

4.2.5.14 WRP Parcel 73

The estimated welfare value is attributed to a path which has an annual value of [REDACTED]. The path is along the eastern and northern boundary of the land parcel. The path is part various access paths towards Bedhampton, Broadmarsh and Farlington Marshes. Construction will have an impact to specific local small recreation park facilities within the zone of influence.

4.2.5.15 WRP Parcel 74

The estimated welfare value is attributed to a path which is along the northern and southern boundary of the land parcel. The path is part various access paths towards Bedhampton, Broadmarsh and Farlington Marshes. Construction will have an impact to access to specific local small recreation park facilities within the zone of influence

4.2.5.16 WRP Parcel 75

The estimated welfare value is attributed to a path which is along the western, northern and southern boundary of the land parcel. The path is part various access paths towards Bedhampton, Broadmarsh and Farlington Marshes. Construction will have an impact to access of specific local small recreation park facilities within the zone of influence.

4.2.5.17 WRP Component 23: Lake Otterbourne

No recreation sites will be affected during the construction.

4.2.5.18 WRP Component 24: Lake Otterbourne Overland flow

No recreation sites will be affected during the construction.

4.2.5.19 WRP Component 25: Overflow drawdown: River Itchen

No recreation sites will be affected during the construction.

[REDACTED]
No recreation sites will be affected during the construction.

4.2.5.21 WRP Component 27: WfLH Lower Upham BPT

No recreation sites will be affected during the construction.

4.2.5.22 WRP Component 28: WfLH Upper Swanmore BPT

No recreation sites will be affected during the construction. However, a path attributed to a woodland which has an estimated welfare value of [REDACTED] is located nearby and may be impacted during construction.

4.2.5.23 WRP Component 29: WfLH Denmead WBS

The estimated welfare value is attributed to Creech Woods which will be affected with the long-term impact. There may be a permanent impact to recreation as WBS is placed near two footpaths which will restrict access. Construction may have potential short-term impacts to access the woodland. It is assumed a year of temporary closure of paths within the woodland near the WBS as part of construction.

4.2.5.24 WRP Component 30: WfLH Drayton WBS

No recreation sites will be affected during the construction.

4.2.5.25 WRP Component 31: WfLH Horndean WBS

No recreation sites will be affected during the construction.

4.2.5.26 WRP Component 32: WfLH North Boarhunt WBS

No recreation sites will be affected during the construction.

4.2.5.27 WRP Component 33: WfLH North Fareham WBS

No recreation sites will be affected during the construction.

4.2.5.28 WRP Component 34: WfLH Havant thicket HLPS alternate HT-OT3

No recreation sites will be affected during the construction.

4.2.5.29 WRP Component 35: WfLH Havant thicket HLPS

The estimated welfare value is attributed to paths towards Bell Copse woodland and the Waterlooville Bypass. The proposed pumping station is adjacent to the path which will be impacted during construction. Construction may have potential short-term impacts to access and is assumed a year of temporary closure of paths as part of construction.

4.2.5.30 Desalination Component 1: Fawley FAWPS Sites Habitats (Parcel 19, 21, 23)

No recreation sites will be affected during the construction.

4.2.5.31 Desalination Component 2: Fawley marina Intake

No recreation sites will be affected during the construction.

4.2.5.32 Desalination Component 3: Receiving tanks at Testwood WTW

No recreation sites will be affected during the construction.

4.2.5.33 Desalination Component 3 – 5: Fawley to Abstraction and Discharge

[REDACTED] However, the Lepe pipeline routes cross agricultural/greenfield areas along majority of the route. Most of the estimated welfare value is attributed to woodland and paths through local recreation sites such as Stanswood Common, Calshot Spit and Tom's Down. Potential short-term impacts to recreation where construction may impede access to specific local small recreation park within the zone of influence. The pipeline Lepe Route 2 crosses Tom's Down which has an annual value of [REDACTED] by the model, this is reflected in the high visitor numbers modelled by the ORVal tool.

4.2.5.34 [REDACTED]

The estimated welfare value is attributed to paths from Calshot to Calshot Marsh Nature Reserve. The proposed pumping station is will lead to a permanent closure of one path and paths adjacent to the

Components	Permanent Loss Estimated agriculture value (£2019)	Temporary Loss Estimated agriculture value (£2019)
HTPS ST3 Land Parcel 5		
HTPS ST3 Land Parcel 8		
HTPS ST3 Land Parcel 9		
Havant Thicket to Otterbourne Route 1		
Havant Thicket to Otterbourne Route 2		
Havant Thicket to Otterbourne Route 3		
Havant Thicket to Otterbourne Route 4		
██████████ to WRP Route 1		
WRP to Havant Thicket Route 1		
WRP to Havant Thicket Route 2		
WRP to Otterbourne Route 1		
WRP to Otterbourne Route 2		
WRP to Otterbourne SIA		
██████████ to WRP Route 1		
WRP Parcel 68		
WRP Parcel 70		
WRP Parcel 71		
WRP Parcel 72		
WRP Parcel 73		
WRP Parcel 74		
WRP Parcel 75		
Lake Otterbourne		
Lake Otterbourne Overland flow		
Overflow drawdown: River Itchen		
██████████		
WfLH Lower Upham BPT		
WfLH Upper Swanmore BPT		
WfLH Denmead WBS		
WfLH Drayton WBS		
WfLH Horndean WBS		
WfLH North Boarhunt WBS		
WfLH North Fareham WBS		
Havant thicket HLPS alternate HT-OT3		
Havant thicket HLPS		
Fawley FAWPS Sites Habitats Parcel 19		
Fawley FAWPS Sites Habitats Parcel 21		
Fawley FAWPS Sites Habitats Parcel 23		
Fawley PS		
Fawley marina Intake		
Receiving tanks at Testwood WTW		
Fawley to Abstraction and Discharge Pipeline: Calshot Route		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 1		
Fawley to Abstraction and Discharge Pipeline: Lepe Route 2		
Fawley to Testwood Route 1		
Fawley to Testwood Route 2		
Fawley to Testwood Route 3		

Components	Permanent Loss Estimated agriculture value (£2019)	Temporary Loss Estimated agriculture value (£2019)
Fawley to Testwood Route 4		
Fawley to Testwood Route SIA		
Desal Ashlett Creek Habitat		
Desal D55 Habitat including PS		
Desal D55 to Otterbourne Route 1		
Desal D55 to Otterbourne Route 2		

4.3 Solution Level Analysis and Cumulative Effects

No cumulative assessment with other schemes or plans has been undertaken, as the assessment assumes that for any biodiversity loss not fully mitigated, compensation (offsetting) will be undertaken with an additional provision of 10% net gain. Cumulative assessment would only be necessary/feasible when specific land parcels are identified and if these have been identified and providing mitigation or net gain opportunity for another scheme. At that stage a cumulative assessment of opportunity net gain potential would be necessary to ensure no double counting of habitat uplift.

5 Option Appraisal Assessment Findings: Configuration Level

5.1 Overview

Following completion of the site selection work, one configuration for each solution was identified to be progressed through the BNG and NC assessments, which also informed the MCDA work. This section therefore documents the configuration assessment, which are comprised of the components detailed in **Table 5.1**. The table only details the components where there was, or remains, optionality. All other components are as described in Section 2.

Table 5.1 Assessed Configurations and Component Variations

Preferences	Solution					
	A1	A2	B2	B4	B5	D2
Marine intake and outfall	Calshot intake/outfall into Southampton Water (preferred) Fawley Marina Intake (alternative)	Calshot intake/outfall into Southampton Water (preferred) Fawley Marina Intake (alternative)	N/A	N/A	N/A	N/A
Site	██████████	██████████	Parcel 72	Parcel 72	Parcel 72	Havant Thicket Pumping Station 5
Pipeline route	Fawley to Testwood WSW Route 2 (preferred) Fawley to Testwood WSW Route 1 (alternative)	Fawley to Testwood WSW Route 2 (preferred) Fawley to Testwood WSW Route 1 (alternative)	WRP to Otterbourne WSW Route 1 (preferred) WRP to Otterbourne WSW Route 2 (alternative)	Havant Thicket Reservoir to Otterbourne WSW Route 3 (preferred) Havant Thicket Reservoir to Otterbourne WSW Route 4 (alternative)	WRP to Otterbourne WSW Route 1 (preferred) WRP to Otterbourne WSW Route 2 (alternative)	Havant Thicket Reservoir to Otterbourne WSW Route 3 (preferred) Havant Thicket Reservoir to Otterbourne WSW Route 4 (alternative)
Other Infrastructure/Components				WRP – Havant Thicket Route 1 (preferred) WRP – Havant Thicket Route 2 (alternative)		

5.2 Biodiversity Net Gain

5.2.1 Baseline BNG loss

5.2.1.1 Terrestrial Habitats

A detailed breakdown of baseline habitat loss for terrestrial habitats and hedgerows per individual component are provided within the 'Baseline' tab of the excel spreadsheet **Appendix A2** and discussed above in **Section 4**. **Section 5** discusses the baseline habitat loss at a configuration level, composed of component groupings as displayed in **Section 2**. As above these losses are pre-mitigation (pre-reinstatement) given in hectares (kilometres for hedgerows) and biodiversity units. As terrestrial habitat and linear habitats (hedgerows) are assessed differently in the metric, the units cannot be added

together, and terrestrial habitats and hedgerows must be assessed separately. The Defra Metric assessments for each component are provided in **Appendix A2i-xxxviii**.

The habitat losses following re-instatement can also be obtained from the metric data. This provides a measure of the uplift (compensation for losses) required for no net loss. The following table (**Table 4.1**) presents a summary of the biodiversity deficit pre-offsite compensation. **Table 5.1** comprises of the components that result in permanent (no-re-instatement) and temporary habitat loss (with re-instatement). The purpose of **Table 5.1** is to highlight the components which will result in the loss of Priority Habitat and 'Unacceptable Habitat' loss and therefore these habitats should be avoided at the design stage where possible.

To address habitat loss, the action required in accordance with the technical guidance for the Defra Metric is given for each habitat loss per individual component within the tables in **Appendix A2** and configuration tables within **Appendix 3** 'Baseline' tab. This may be the same broad habitat type or the same habitat in compensation, for example. This identifies which individual components and solution configurations impact upon habitats that have less flexibility and possible challenges in offsetting. Of particular note are habitats where there is an 'unacceptable loss'. These priority habitats are unable to be assessed within the DEFRA Metric owing to their uniqueness and difficulty of re-creation and compensation. If lost they require a bespoke compensation strategy and a net gain cannot be achieved for such losses. These habitats are not taken forward within the Defra Metric assessment and therefore, no units are given. The hectareage of this loss is shown in **Table 4.1** and these habitats should be avoided at the design stage where possible. The unacceptable loss habitats and their individual areas are given within the baseline metric data, provided within **Appendix A2i-xxxviii** for each component and **Appendix 3** at configuration level. Referring to **Table 4.1**, unacceptable losses of habitats occur within the following configuration footprints with the relevant component listed:

- **A1 75MI/d Route 1**
 - [REDACTED] Desal Plant
- **A1 75MI/d Route 2**
 - [REDACTED] Desal Plant
- **A2 61MI/d Route 1**
 - [REDACTED] Desal Plant
- **A2 61MI/d Route 2**
 - [REDACTED] Desal Plant
- **B4 61MI/d WRP (fed f from [REDACTED]) to Otterbourne via Havant Thicket Route 3**
 - Havant Thicket to Otterbourne Route 3
- **D2 75MI/d Alternative Bulk Supply Route 3**
 - Havant Thicket to Otterbourne Route 3
- **B2 WRP (fed from [REDACTED]) to Otterbourne WSW Route 1**
 - WRP to Otterbourne Route 1
- **B5 WRO (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1**
 - WRP to Otterbourne Route 1

Ground truthing is required to confirm the extent of these unacceptable loss habitats. Where they are confirmed a re-routing or alternative component should be considered to avoid these impacts .

Five components; D2 75MI/d Alternative Bulk Supply Route 4, B5 [REDACTED] and [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 2, B4 61M/d Recycled Water from [REDACTED] to Otterbourne via Havant Thicket Route 2, B4 61M/d Recycled Water from [REDACTED] to Otterbourne via Havant Thicket Route 1 and B2 [REDACTED] to Otterbourne WSW Route 2 do not have unacceptable loss of habitats.

Table 4.1 also show the components and subsequent configurations which impact upon Priority Habitats. The data shows that certain components score particularly high (i.e., a large impact equating to a loss of over 30 units for single site components or over 40 units for pipeline routes) in terms of their impact on Priority Habitats and whilst avoidance and alternatives should be considered for all components that impact Priority Habitats, these are of particular note due to the scale of impact:

- **A1 75MI/d Route 1**
 - [REDACTED] Desal Plant
 - Fawley to Testwood Route 1
- **A1 75MI/d Route 2**
 - [REDACTED] Desal Plant
 - Fawley to Testwood Route 2
- **A2 61MI/d Route 1**
 - [REDACTED] Desal Plant
 - Fawley to Testwood Route 1
- **A2 61MI/d Route 2**
 - [REDACTED] Desal Plant
 - Fawley to Testwood Route 2
- **B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW Route 1**
 - Water recycling plant site 72
- **B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW Route 2**
 - Water recycling plant site 72
 - WRP to Otterbourne Route 2
- **B4 15MI/d WRP(fed from [REDACTED]) to Otterbourne via Havant Thicket Route 1**
 - Water recycling plant site 72⁴²
- **B4 15M/d WRP(fed from [REDACTED]) to Otterbourne via Havant Thicket Route 2**
 - Water recycling plant site 72
- **B4 15M/d WRP (fed from [REDACTED]) to Otterbourne via Havant Thicket Route 3**
 - Water recycling plant site 72
- **B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1**
 - Water recycling plant site 72
 - [REDACTED] to WRP Route 1
- **B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 2**
 - Water recycling plant site 72
 - [REDACTED] to WRP Route 1
 - WRP to Otterbourne Route 2

Only two components; D2 75MI/d Alternative Bulk Supply Route 3 and D2 75MI/d Alternative Bulk Supply Route 4 do not result in the loss of Priority habitats. Most priority habitats lost are deciduous woodland. The extent of this habitat needs to be confirmed through ground truthing of the habitat data to confirm the presence and extent of the priority habitat Lowland mixed deciduous woodland. This habitat has a high number of BNG units and accounts for most of the units shown for the individual components. When re-instating this habitat, few units are gained back due to risk multipliers (time lag for restoration and difficulty of achieving it). This highlights the challenge with offsetting woodland loss and the importance of avoidance, where possible.

5.2.1.2 Hedgerows

The hedgerow loss for all components is provided in **Table 4.1**, **Table 5.1** details hedgerow loss for those associated with the configurations listed in **Section 2**. All of the configurations have some hedgerow loss. Post re-instatement, the configurations with the highest losses are:

- B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 2
- B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1
- B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW) Route 2

⁴² The assessment has been based on a worst case landtake of 45,000m². The land take required for the smaller WRP is likely to be c.25,000m². However, the 'red line boundary' within the overall site has not been defined, and therefore it cannot be confirmed the priority habitats and hedgerows will not be lost, simply because of a reduction in footprint. As such, the worst case has been retained.

- B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1
- B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW Route 1
- B4 15MI/d WRP (fed from [REDACTED]) to Otterbourne via Havant Thicket Route 2

Further assessment should be undertaken to identify whether they could have an impact on habitat fragmentation associated with Priority Habitats and should be avoided, such as through construction methods

5.2.1.3 Rivers

A detailed breakdown of baseline habitat loss for rivers per component are provided within the 'Rivers Baseline' tab of the excel spreadsheet **Appendix A2**. The river assessment found none of the components associated with the configurations to have with permanent habitat loss to support rivers. All configurations contained some degree of temporary loss and re-instatement, the following components experience the greatest losses relating to temporary loss of over 0.1km equating to the loss of over 1 unit:

- B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW Route 1
- B4 15MI/d WRP (fed from [REDACTED]) to Otterbourne via Havant Thicket Route 3
- B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1
- D2 75MI/d Alternative Bulk Supply Route 3

It should be noted that the suggested action within the Biodiversity Metric for any loss of river habitat, permanent or temporary, should be to avoid the loss.

Table 5.5.2 Summary of the overall unit construction loss for components with permanent (*) and temporary on-site loss (pre off-site compensation) for habitats and hedgerow

Configuration	Net Biodiversity Unit Loss				
	Loss of habitat (units)	Un-acceptable habitat loss (ha)	Loss of Priority Habitat (units)	Loss of hedgerow (units)	Loss of river (units)
A1 75MI/d and A2 61MI/d Desalination with Route 1					
██████████ Intake					
Calshot Intake/ Outfall					
Desalination ██████████					
Fawley to Testwood Route 1					
Reception tanks at Testwood WSW*					
A1 75MI/d Desalination with Route 1 Summary					
A1 75MI/d and A2 61MI/d Desalination with Route 2					
██████████ Intake					
Calshot Intake/ Outfall					
Desalination ██████████					
Fawley to Testwood Route 2					
Reception tanks at Testwood WSW*					
A1 75ML/d Route 2 Summary					
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 1					
WRP 72*					
██████████ to WRP Route 1					
WRP to Otterbourne Route 1					
WfLH Lower Upham BPT Break Pressure Tank*					
WfLH North Boarhunt WBS*					
Lake Otterbourne*					
Pre-disinfection ceramic membrane plant at Otterbourne WSW*					
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow*					
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 1 Summary					
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 2					
WRP 72*					
██████████ to WRP Route 1					
WRP to Otterbourne Route 2					
WfLH Lower Upham BPT Break Pressure Tank*					
WfLH North Boarhunt WBS*					

Lake Otterbourne*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow*	
B2 61MI/d WRP fed from [REDACTED] to Otterbourne WSW Route 2 Summary	
B4 15M/d WRP fed from [REDACTED] to Otterbourne via Havant Thicket Route 3	
WRP 72*	
[REDACTED] to WRP Route 1	
WRP to Havant Thicket Route 1	
Havant Thicket Pumping Station HTPS 5*	
Havant thicket HLPS*	
WfLH Lower Upham BPT Break Pressure Tank*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
Havant Thicket to Otterbourne Route 3	
WfLH Drayton WBS*	
B4 15M/d WRP fed from [REDACTED] to Otterbourne via Havant Thicket Route 3 Summary	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 1	
WRP 72*	
[REDACTED] to WRP Route 1	
WRP to Otterbourne Route 1	
WfLH Lower Upham BPT Break Pressure Tank*	
WfLH North Boarhunt WBS*	
Lake Otterbourne*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow*	
[REDACTED] to WRP Route 1	
WfLH North Fareham WBS*	
B5 75M/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 1 Summary	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 2	
WRP 72*	

██████████ to WRP Route 1	[REDACTED]
WRP to Otterbourne Route 2	
WfLH Lower Upham BPT Break Pressure Tank*	
WfLH North Boarhunt WBS*	
Lake Otterbourne*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow*	
██████████ to WRP Route 1	
WfLH North Fareham WBS*	
B5 WRP fed from ██████████ to Otterbourne WSW via Lake Otterbourne Route 2 Summary	
D2 75MI/d Alternative Bulk Supply Route 3	
Havant Thicket Pumping Station HTPS 5*	[REDACTED]
Havant Thicket to Otterbourne Route 3	
Havant thicket HLPS*	
WfLH Lower Upham BPT Break Pressure Tank*	
WfLH Drayton WBS*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
D2 75MI/d Alternative Bulk Supply Route 3 Summary	
D2 75MI/d Alternative Bulk Supply Route 4	
Havant Thicket Pumping Station HTPS 5*	[REDACTED]
Havant Thicket to Otterbourne Route 4	
Havant thicket HLPS*	
WfLH Lower Upham BPT Break Pressure Tank*	
WfLH Denmead WBS*	
Pre-disinfection ceramic membrane plant at Otterbourne WSW*	
D2 75MI/d Alternative Bulk Supply Route 4 Summary	

* Indicates that the individual component includes areas of permanent habitat loss.

5.2.2 Configuration Level Biodiversity Net Gain Opportunities

5.2.2.1 Habitats and Hedgerows

To achieve biodiversity net-gain there are opportunities locally for the following habitat enhancement and creation/succession (establishing woodland within existing grassland). **Table 4.3** shows for each habitat type impacted by the individual component and the associated configuration, the offsite hectareage /km of habitat enhancement or creation required for a minimum 10% net gain in habitats and hedgerows. The table also includes the hectareage /km of habitats strategically identified for enhancement or restoration within close proximity (1km) of the component. The strategic land has been

identified from NE Habitat Networks zones: Fragmentation Actions Zones, Enhancement Zone 1 and Restorable habitat zones, as these lie within closest proximity to Priority Habitats and would typically be the first target for restoration. **Figures 2.6 (Appendix A1)** show the locations of these zones within 1km of each component. This has been strategically identified but at the planning and consenting stage more detail will be assessed in terms of habitat type. However, at gate 2 the approach identifies overall hectareage requirement to compare again configuration and associated components which have support the MCDA for comparison purposes.

The results in **Table 4.32** show there is more than sufficient land available within the strategic biodiversity opportunities area to off offset the impacts for all components. However, there is insufficient available data on the habitat types within these strategic areas to confirm whether this land supports the specific habitats required but given the extent of the areas within the strategic areas is typically 100 times greater than the offsetting land required, it is likely to support sufficient habitat. Further assessment will be required at the next stage to identify specific opportunities by habitat type as described in the paragraph above.

As stated in the methodology, baseline habitats lost were assumed to be in moderate condition. Hectareage required can be halved if habitats are in poor condition. The offsite baseline habitat was assumed to be in poor condition and enhanced to moderate condition. The requirement can be approximately halved if it is assumed good condition can be reached, although this is considered unachievable for woodland, for example, in the metric. The individual requirements per component are provided in **Appendix A2i-xxxviii** and **Appendix 3** at a configuration level. It is important to also consider the need for bespoke mitigation / compensation or 'unacceptable loss of habitat'.

Table 5.2 Summary of the offsetting requirements to achieve an approximate 10% net gain for habitats and hedgerows for each grouping and availability of biodiversity opportunities within 1km of each component

Offsetting Requirements for 10% BNG								
Configuration	Modified Grassland Enhancement to neutral grassland (ha)	Modified Grassland Succession to woodland (ha)	Neutral Grassland Enhancement to lowland meadow (ha)	Mixed Scrub Enhancement from poor to moderate condition (ha)	Lakes – Pond Enhancement from poor to moderate condition (ha)	Lowland Heathland Enhancement from poor to moderate condition (ha)	Native Species Rich Hedgerow Creation (km)	Biodiversity Opportunities within 1km of component (ha)
A1 75MI/d and A2 61MI/d Route 1								
██████████ Intake								
Calshot Intake/Outfall								
Desalination ██████████								
Fawley to Testwood Route 1								
Reception tanks at Testwood WSW								
A1 75MI/d Route 1 Summary								
A1 75MI/d and A2 61MI/d Route 2								
██████████ Intake								
Calshot Intake/Outfall								
Desalination ██████████								
Fawley to Testwood Route 2								
Reception tanks at Testwood WSW								
A1 75MI/d Route 2 Summary								
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 1								
WRP 72								
██████████ to WRP Route 1								
WRP to Otterbourne Route 1*								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH North Boarhunt WBS								
Lake Otterbourne								

Offsetting Requirements for 10% BNG								
Configuration	Modified Grassland Enhancement to neutral grassland (ha)	Modified Grassland Succession to woodland (ha)	Neutral Grassland Enhancement to lowland meadow (ha)	Mixed Scrub Enhancement from poor to moderate condition (ha)	Lakes – Pond Enhancement from poor to moderate condition (ha)	Lowland Heathland Enhancement from poor to moderate condition (ha)	Native Species Rich Hedgerow Creation (km)	Biodiversity Opportunities within 1km of component (ha)
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow								
B2 WRP fed from [REDACTED] to Otterbourne WSW Route 1 Summary								
B2 61MI/d WRP fed from [REDACTED] to Otterbourne WSW Route 2								
WRP 72								
[REDACTED] to WRP Route 1								
WRP to Otterbourne Route 2								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH North Boarhunt WBS								
Lake Otterbourne								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow								
B2 WRP fed from [REDACTED] to Otterbourne WSW Route 2 Summary								
B4 15M/d WRP fed from [REDACTED] to Otterbourne via Havant Thicket Route 3								

Offsetting Requirements for 10% BNG								
Configuration	Modified Grassland Enhancement to neutral grassland (ha)	Modified Grassland Succession to woodland (ha)	Neutral Grassland Enhancement to lowland meadow (ha)	Mixed Scrub Enhancement from poor to moderate condition (ha)	Lakes – Pond Enhancement from poor to moderate condition (ha)	Lowland Heathland Enhancement from poor to moderate condition (ha)	Native Species Rich Hedgerow Creation (km)	Biodiversity Opportunities within 1km of component (ha)
WRP 72								
██████████ to WRP Route 1								
WRP to Havant Thicket Route 1								
Havant Thicket Pumping Station HTPS 5								
Havant thicket HLPS								
WfLH Lower Upham BPT Break Pressure Tank								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
Havant Thicket to Otterbourne Route 3*								
WfLH Drayton WBS								
B4 61M/d WRP fed from ██████████ to Otterbourne via Havant Thicket Route 3 Summary								
B5 75M/d WRP fed from ██████████ to Otterbourne WSW via Lake Otterbourne Route 1								
WRP 72								
██████████ to WRP Route 1								
WRP to Otterbourne Route 1*								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH North Boarhunt WBS								
Lake Otterbourne								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
Otterbourne EBL Emergency Drawdown/Overflow: Option 2:								

Offsetting Requirements for 10% BNG								
Configuration	Modified Grassland Enhancement to neutral grassland (ha)	Modified Grassland Succession to woodland (ha)	Neutral Grassland Enhancement to lowland meadow (ha)	Mixed Scrub Enhancement from poor to moderate condition (ha)	Lakes – Pond Enhancement from poor to moderate condition (ha)	Lowland Heathland Enhancement from poor to moderate condition (ha)	Native Species Rich Hedgerow Creation (km)	Biodiversity Opportunities within 1km of component (ha)
Overflow and Drawdown to Overland Flow								
██████████ to WRP Route 1								
WfLH North Fareham WBS								
B5 75MI/d WRP fed from ██████████ to Otterbourne WSW via Lake Otterbourne Route 1 Summary								
B5 75MI/d WRP fed from ██████████ to Otterbourne WSW via Lake Otterbourne Route 2								
WRP 72								
██████████ to WRP Route 1								
WRP to Otterbourne Route 2								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH North Boarhunt WBS								
Lake Otterbourne								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow								
██████████ to WRP Route 1								
WfLH North Fareham WBS								
B5 75MI/d WRP fed from ██████████ to Otterbourne WSW via Lake Otterbourne Route 2 Summary								

Offsetting Requirements for 10% BNG								
Configuration	Modified Grassland Enhancement to neutral grassland (ha)	Modified Grassland Succession to woodland (ha)	Neutral Grassland Enhancement to lowland meadow (ha)	Mixed Scrub Enhancement from poor to moderate condition (ha)	Lakes – Pond Enhancement from poor to moderate condition (ha)	Lowland Heathland Enhancement from poor to moderate condition (ha)	Native Species Rich Hedgerow Creation (km)	Biodiversity Opportunities within 1km of component (ha)
D2 75MI/d Alternative Bulk Supply Route 3								
Havant Thicket Pumping Station HTPS 5								
Havant Thicket to Otterbourne Route 3								
Havant thicket HLPS								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH Drayton WBS								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
D2 75MI/d Alternative Bulk Supply Route 3 Summary								
D2 75MI/d Alternative Bulk Supply Route 4								
Havant Thicket Pumping Station HTPS 5								
Havant Thicket to Otterbourne Route 4								
Havant thicket HLPS								
WfLH Lower Upham BPT Break Pressure Tank								
WfLH Denmead WBS								
Pre-disinfection ceramic membrane plant at Otterbourne WSW								
D2 75MI/d Alternative Bulk Supply Route 4 Summary								

* Also have 'unacceptable' loss habitats (refer to **Table 5.1**)

Configurations

Of the configurations; B5 75MI/d [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 1 and B5 75MI/d [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 2 have high offsetting requirements for modified grassland with 53.9 and 48.08 ha required respectively. Modified grassland is not a 'like for like' offset requirement and therefore a smaller area of higher distinctiveness habitat could be proposed; however, this assessment has applied the same rules to offsetting for comparative purposes. More challenging is woodland creation of which A1 75MI/d Route 1 and A2 61MI/d Route 2 have the greatest requirement for modified grassland succession to woodland (23.22 ha) but both have extensive biodiversity opportunities (1916.06ha).

The configurations with **least impact** on terrestrial habitat biodiversity and therefore least requirement for 10% net gain are:

- D2 75MI/d Alternative Bulk Supply Route 4
- D2 75MI/d Alternative Bulk Supply Route 3
- B2 61MI/d Budds Farm WTW to Otterbourne WSW Route 2

Regarding hedgerows, the routes with **least impact** on biodiversity and therefore least requirement for 10% net gain are:

- D2 75MI/d Alternative Bulk Supply Route 3
- D2 75MI/d Alternative Bulk Supply Route 4
- A1 75MI/d and A2 61MI/d Route 1

As noted in **Table 5.1** habitats which are categorised as 'unacceptable losses' which is a major consideration due to the requirement for a bespoke mitigation strategy, are present in the following configurations:

- A1 75MI/d and A2 61MI/d Route 1
- A1 75MI/d and A2 61MI/d Route 2
- B4 15MI/d WRP (fed from [REDACTED]) to Otterbourne via Havant Thicket Route 3
- D2 75MI/d Alternative Bulk Supply Route 3
- B2 61MI/d WRP (fed from [REDACTED]) to Otterbourne WSW Route 1
- B5 75MI/d WRP (fed from [REDACTED]) to Otterbourne WSW via Lake Otterbourne Route 1

Additional offsite mitigation would be required for these components.

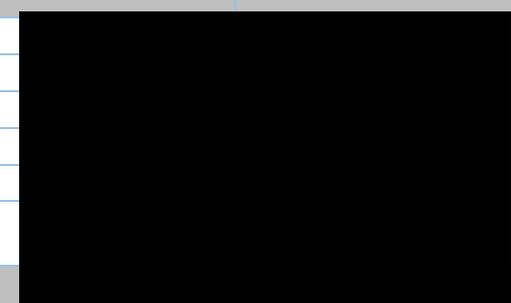
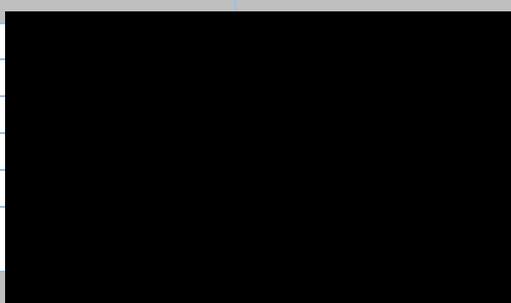
5.2.2.2 Rivers

There are opportunities locally for the following river habitat enhancement identified from rivers within the NE Habitats Networks (Fragmentation Actions Zones, Enhancement Zone 1 and Restorable habitat zones) within 1km of each component associated with the various configurations. **Table 4.4** shows for each configuration, the km of temporary river loss and corresponding km of river strategically identified within 1km. There is no open source GIS data set showing Priority Rivers for Restoration. However, further assessment of Priority Rivers for Restoration should be included within further assessment at the next stage. **Figures 2.6 (Appendix A1)** show the locations of these zones within 1km of each component.

Table 5.3 Area of habitat with biodiversity opportunities (NE's Habitat Network Zones) within 1km of the configurations

Offsetting Requirements for 10% BNG		
Component	River habitat loss (km)	Biodiversity Opportunities (restorable river habitat) within 1km of component (km)
A1 75MI/d and A2 61MI/d Route 1		
██████████ Intake		
Calshot Intake/Outfall		
Desalination ██████████		
Fawley to Testwood Route 1		
Reception tanks at Testwood WSW		
A1 75MI/d and A2 61MI/d Route 1 Summary		
A1 75MI/d and A2 61MI/d Route 2		
██████████ Intake		
Calshot Intake/Outfall		
Desalination ██████████ Creek		
Fawley to Testwood Route 2		
Reception tanks at Testwood WSW		
A1 75MI/d and A2 61MI/d Route 2 Summary		
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 1		
WRP 72		
██████████ to WRP Route 1		
WRP to Otterbourne Route 1		
WfLH Lower Upham BPT Break Pressure Tank		
WfLH North Boarhunt WBS		
Lake Otterbourne		
Pre-disinfection ceramic membrane plant at Otterbourne WSW		
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow		
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 1 Summary		
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 2		
WRP 72		
██████████ to WRP Route 1		
WRP to Otterbourne Route 2		
WfLH Lower Upham BPT Break Pressure Tank		
WfLH North Boarhunt WBS		
Lake Otterbourne		
Pre-disinfection ceramic membrane plant at Otterbourne WSW		
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow		
B2 61MI/d WRP fed from ██████████ to Otterbourne WSW Route 2 Summary		

B4 15M/d WRP fed from [REDACTED] to Otterbourne via Havant Thicket Route 3	
WRP 72	
[REDACTED] to WRP Route 1	
WRP to Havant Thicket Route 1	
Havant Thicket Pumping Station HTPS 5	
Havant thicket HLPS	
WfLH Lower Upham BPT Break Pressure Tank	
Pre-disinfection ceramic membrane plant at Otterbourne WSW	
Havant Thicket to Otterbourne Route 3	
WfLH Drayton WBS	
B4 15M/d WRP fed from [REDACTED] to Otterbourne via Havant Thicket Route 3 Summary	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 1	
WRP 72	
[REDACTED] to WRP Route 1	
WRP to Otterbourne Route 1	
WfLH Lower Upham BPT Break Pressure Tank	
WfLH North Boarhunt WBS	
Lake Otterbourne	
Pre-disinfection ceramic membrane plant at Otterbourne WSW	
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow	
[REDACTED] to WRP Route 1	
WfLH North Fareham WBS	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 1 Summary	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 2	
WRP 72	
[REDACTED] to WRP Route 1	
WRP to Otterbourne Route 2	
WfLH Lower Upham BPT Break Pressure Tank	
WfLH North Boarhunt WBS	
Lake Otterbourne	
Pre-disinfection ceramic membrane plant at Otterbourne WSW	
Otterbourne EBL Emergency Drawdown/Overflow: Option 2: Overflow and Drawdown to Overland Flow	
[REDACTED] to WRP Route 1	
WfLH North Fareham WBS	
B5 75MI/d WRP fed from [REDACTED] to Otterbourne WSW via Lake Otterbourne Route 2 Summary	

D2 75MI/d Alternative Bulk Supply Route 3		
Havant Thicket Pumping Station HTPS 5		
Havant Thicket to Otterbourne Route 3		
Havant thicket HLPS		
WfLH Lower Upham BPT Break Pressure Tank		
WfLH Drayton WBS		
Pre-disinfection ceramic membrane plant at Otterbourne WSW		
D2 75MI/d Alternative Bulk Supply Route 3 Summary		
D2 75MI/d Alternative Bulk Supply Route 4		
Havant Thicket Pumping Station HTPS 5		
Havant Thicket to Otterbourne Route 4		
Havant thicket HLPS		
WfLH Lower Upham BPT Break Pressure Tank		
WfLH Denmead WBS		
Pre-disinfection ceramic membrane plant at Otterbourne WSW		
D2 75MI/d Alternative Bulk Supply Route 4 Summary		

* Also have 'unacceptable loss habitats (refer to Table 4.1)

Configurations

B5  to Otterbourne WSW via Lake Otterbourne Route 1 requires the greatest river length for offsetting (), however, there are  of rivers within strategically identified areas within 1 km of this configuration and further assessment of Priority Rivers or the wider catchment should be undertaken to confirm the suitability of these locations. B5  to Otterbourne WSW via Lake Otterbourne Route 2 has slightly less impact on rivers than Route 1 () and also includes rivers within strategic areas within 1km ().

A1 75MI/d and A2 61MI/d Route 1 require the least offsetting and both have  of strategically identified rivers within 1km. All of the configurations require some degree of offsetting; however, all have rivers within strategic areas within 1km.

5.3 Natural Capital

5.3.1 Biodiversity and habitat

Table 5.4 summarises the temporary loss of habitat type, based on a ZoI of 50m for each of the configurations included within the Southern Water SRO (i.e., 25m working width as discussed in section 4. The working width reduces to 12m through hedgerows, rivers and roads. Aerial imagery was used to locate sections where the working width changed between 25m and 12m.

Only habitats that are present within the ZoI are included. It is assumed that all habitat falling within the ZoI will be temporary lost during the construction period and replaced following construction. Therefore, loss of associated ecosystem services will occur only for the period of construction and habitat reinstatement. It is important to note that while the configurations are made up of the components, due to the method using the Defra BNG metric tool, it is not possible to simply combine the data for the components to quantify the configurations. Thus, if the biodiversity and habitat data for the individual components is summed it will not necessarily equal the biodiversity and habitat data presented in **Table 5.4**.

Table 5.4 also presents the permanent habitat loss, area planned for habitat creation and area planned for habitat improvement including consideration of required mitigation for BNG.

Table 5.4 Summary of broad habitat types for configurations

Configurations	Habitat type	Temporary habitat loss during construction (Area within Zol) (ha)	Permanent habitat loss (ha)	On-site habitat creation / reinstatement (ha)	Off-site habitat creation/ BNG uplift (ha)
A1 A2 Pipeline 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
A1 A2 Pipeline 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
B2 Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
B2 Route 2	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				
	Urban				
	Woodland (Coniferous)				
	Woodland (Deciduous)				
B4 Route 1	Arable land				
	Freshwater				
	Grassland				
	Heathland				
	Shrub				

	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	
B4 Route 2	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	
B4 Route 3	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	
B5 Route 1	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	
B5 Route 2	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	
D2 Route 3	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	

	Woodland (Deciduous)	
D2 Route 4	Arable land	
	Freshwater	
	Grassland	
	Heathland	
	Shrub	
	Urban	
	Woodland (Coniferous)	
	Woodland (Deciduous)	

5.3.2 Climate regulation

Table 5.5 summarises the baseline land use types within the 50m ZoI of each Southern Water SRO and the momentary value of the climate regulation ecosystem services they provide. The configuration B4 Route 1 provides some of the greatest carbon sequestration under baseline conditions.

Table 5.5 also presents the change in carbon sequestration including consideration of required mitigation for BNG. The results show a loss of carbon sequestration for some options, even with BNG mitigation in place. This is because at this moment in time only creation of habitats and not enhancement can be quantified from a Natural Capital standpoint. The BNG assessment (see **Section 5.1**) outlines the required mitigation to produce an overall net gain, however this includes mostly habitat enhancement rather than creation, affecting the quality but not the stock of natural assets. It is not possible to quantify the non-spatial changes in biodiversity and habitat ecosystem services arising from habitat condition improvement. The only planned habitat creation is deciduous woodland. As to not overestimate the beneficial impact of the change in non-traded carbon sequestration value following BNG habitat creation / reinstatement, this value has been calculated by summing the change in non-traded carbon sequestration value during construction (the temporary loss), the permanent loss and creation.

Off-site habitat succession has been presented for the configurations in order to capture more possible benefits within the Natural Capital assessment. However, this value has not been included in the change in non-traded carbon sequestration value following BNG habitat creation / reinstatement value to not overestimate the benefits.

Table 5.5 Summary of non-traded carbon sequestration values per configuration

Configuration	Change in non-traded carbon sequestration value during construction (£2019)	Change in non-traded carbon sequestration value (permanent loss) (£2019)	Off-site habitat succession (£2019)	Change in non-traded carbon sequestration value including BNG habitat creation / reinstatement (£2019)
A1 A2 Pipeline 1				
A1 A2 Pipeline 2				
B2 Route 1				
B2 Route 2				
B4 Route 1				
B4 Route 2				

Configuration	Change in non-traded carbon sequestration value during construction (£2019)	Change in non-traded carbon sequestration value (permanent loss) (£2019)	Off-site habitat succession (£2019)	Change in non-traded carbon sequestration value including BNG habitat creation / reinstatement (£2019)
B4 Route 3				
B5 Route 1				
B5 Route 2				
D2 Route 3				
D2 Route 4				

5.3.3 Natural hazard regulation

Table 5.66 presents the baseline assessment of natural hazard regulation. Only areas located within flood plain and within urban areas (where impacts of flooding are likely to be more costly) have been scoped into the assessment. The areas susceptible to flooding were identified using Flood Zone 2 and 3 definitions outlined in National Planning Policy⁴³.

Baseline land cover was converted to monetary value based on data outlined in **Section 3**. A benefit transfer value has not been identified at this stage for agricultural land, therefore this has not been accounted for in the baseline assessment.

Off-site habitat succession has been presented for the configurations in order to capture more possible benefits within the Natural Capital assessment. However, this value has not been included in the change in natural hazard regulation related to BNG habitat creation in order to not overestimate the benefits.

Table 5.6 Summary of the natural hazard regulation impacts per configuration

Configuration	Change in natural hazard regulation value during construction (£2019)	Change in natural hazard regulation value the permanent loss (£2019)	Off-site habitat succession (£2019)	Change in natural hazard regulation related to BNG habitat creation (£2019)
A1 A2 Pipeline 1				
A1 A2 Pipeline 2				
B2 Route 1				
B2 Route 2				
B4 Route 1				
B4 Route 2				
B4 Route 3				
B5 Route 1				

⁴³ <https://www.gov.uk/government/publications/national-planning-policy-framework--2>

B5 Route 2	
D2 Route 3	
D2 Route 4	

5.3.4 Water purification

Baseline provision of water purification services is dependent on the following:

- Land cover (habitat)
- Proximity to receptor (i.e., a water body)
- Current water quality of receptors

Baseline water purification provision has not been quantified at this stage as described in **Section 3.2**. No water quality baseline data was available for the River Test near Testwood lakes and other areas. A brief summary of the baseline and potential change is included below in **Table 5.7**.

Table 5.7 Summary of baseline and potential change to water purification service provision per component

Components	Water purification ecosystem service provision assessment
A1 A2 Pipeline 1	<p>Water purification services are currently provided by arable, pasture, woodland and grassland habitats. Water for the [REDACTED] desalination plant will be abstracted from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is no impact to water purification services.</p> <p>However, the construction involves a desalination plant which will receive water from Fawley ([REDACTED]) Site. Therefore, the permanent land cover change will have a minor impact to water purification services.</p> <p>The desalinated water will be transferred to Testwood WSW which will reduce the abstraction in the River Test. River Test (Lower) WFD waterbody is currently achieving Moderate status. Therefore, the increase in flow (as desalination plant will transfer 75MI/d or 61MI/d) has a potential to improve water purification services as dilution of pollutants downstream will increase.</p>
A1 A2 Pipeline 2	<p>Water purification services are currently provided by arable, pasture, woodland and grassland habitats. Water for the [REDACTED] desalination plant will be abstracted from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation. Therefore, there is no impact to water purification services.</p> <p>However, the construction involves a desalination plant which will be receive water from Fawley FAWPS Site. Therefore, the permanent land cover change will have a minor impact to water purification services.</p> <p>The desalinated water will be transferred to Testwood WSW which will reduce the abstraction in the River Test. River Test (Lower) WFD waterbody is currently achieving Moderate status. Therefore, the increase in flow (as desalination plant will transfer 75MI/d or 61MI/d) has a potential to improve water purification services as dilution of pollutants downstream will increase.</p>
B2 Route 1	<p>Water purification services are currently provided by grassland, greenfield and woodland habitats. Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services. However, [REDACTED] currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at [REDACTED] before being transferred to [REDACTED] Outfall. Therefore, this could potentially decline water purification of the receiving waterbody as dilution of pollutants downstream will decline.</p> <p>The water will be transferred to Otterbourne Lake which will be created as an environmental buffer lake. The lake will have some vegetation planting around the lake be lined and will therefore have no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Therefore, this will temporarily improve water purification</p>

Components	Water purification ecosystem service provision assessment
	<p>with the increased flow during an emergency subject to water quality from the lake and current flow conditions in the Itchen.</p> <p>A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen and the change in land cover has a potential to decline water purification services. There are no waterbodies within close proximity of the WBS however, the change in land cover has a potential to decline water purification services. A BPT will be constructed, the change in land cover has a potential to decline water purification services. River Hamble (Upper Hamble) flows nearby and the WFD waterbody is currently achieving Moderate status.</p>
B2 Route 2	<p>Water purification services are currently provided by grassland, greenfield and woodland habitats. Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p>However, Budds Farm WTW currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at Budds Farm WTW before being transferred to [REDACTED] Outfall. Therefore, this could potentially decline water purification of the receiving waterbody as dilution of pollutants downstream will decline.</p> <p>The water will be transferred to Otterbourne Lake which will be created as an environmental buffer lake. The lake will have some vegetation planting around the lake be lined and will therefore have no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Therefore, this will temporarily improve water purification with the increased flow during an emergency subject to water quality from the lake and flow conditions in the Itchen.</p> <p>A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen and the change in land cover has a potential to decline water purification services. There are no waterbodies within close proximity of the WBS however, the change in land cover has a potential to decline water purification services. A BPT will be constructed, the change in land cover has a potential to decline water purification services. River Hamble (Upper Hamble) flows nearby and the WFD waterbody is currently achieving Moderate status.</p>
B4 Route 1	<p>Water purification services are currently provided by grassland and woodland habitats. Hermitage Stream flows adjacent to the land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p>Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services. Water will be transferred from WRP to Havant Thicket therefore, there is no change to water purification. The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p>The pre-disinfection ceramic membrane plant will be constructed. River Itchen is in close proximity of the plant and the change in land cover has a potential to decline water purification services. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover has a potential to decline water purification services.</p>
B4 Route 2	<p>Water purification services are currently provided by grassland and woodland habitats. Hermitage Stream flows adjacent to the land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p>Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services. Water will be transferred from WRP to Havant Thicket therefore, there is no change to water purification. The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p>The pre-disinfection ceramic membrane plant will be constructed. River Itchen is in close proximity of the plant and the change in land cover has a potential to decline water purification services. Where a WBS will be constructed, there are no waterbodies within close proximity however, the change in land cover has a potential to decline water</p>

Components	Water purification ecosystem service provision assessment
B4 Route 3	<p>purification services. . A BPT will be constructed, the change in land cover has a potential to decline water purification services. River Hamble (Upper Hamble) flows nearby and the WFD waterbody is currently achieving Moderate status.</p> <p>Water purification services are currently provided by grassland and woodland habitats. Hermitage Stream flows adjacent to the land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p>Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. A pumping station will be constructed. Therefore, the change in land cover has a potential to decline water purification services. Water will be transferred from WRP to Havant Thicket therefore, there is no change to water purification. The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p>The pre-disinfection ceramic membrane plant will be constructed. River Itchen is in close proximity of the plant and the change in land cover has a potential to decline water purification services. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover has a potential to decline water purification services.</p>
B5 Route 1	<p>Water purification services are currently provided by grassland, greenfield and woodland habitats. Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services. However, Budds Farm WTW currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at Budds Farm WTW before being transferred to [REDACTED] Outfall. Therefore, this could potentially decline water purification of the receiving waterbody as dilution of pollutants downstream will decline.</p> <p>The water will be transferred to Otterbourne Lake which will be created as an environmental buffer lake*. The lake is likely to have some vegetation planting around the lake that is to be lined and, on that assumption, will therefore have no effect on water purification services*. The lake will not be in hydraulic continuity with the groundwater. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Therefore, this will temporarily improve water purification with the increased flow during an emergency subject to water quality from the lake and flow conditions in the Itchen</p> <p>A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen and the change in land cover has a potential to decline water purification services.</p> <p>A BPT will be constructed in close proximity to River Hamble (Upper Hamble) and the WFD waterbody is currently achieving Moderate status. River Wallington flows nearby the WBS and the WFD waterbody is currently achieving Moderate status Therefore, the change in land cover has a potential to decline water purification services.</p>
B5 Route 2	<p>Water purification services are currently provided by grassland, greenfield and woodland habitats. Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services. However, Budds Farm WTW currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at Budds Farm WTW before being transferred to [REDACTED] Outfall. Therefore, this could potentially decline water purification of the receiving waterbody as dilution of pollutants downstream will decline.</p> <p>The water will be transferred to Otterbourne Lake which will be created as an environmental buffer lake*. The lake will have some vegetation planting around the lake be lined and will therefore have no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During an emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Therefore, this will temporarily improve water purification with the increased flow during an emergency depending on water quality from the lake and flows in the Itchen.</p> <p>A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen and the change in land cover has a potential to decline water purification services.</p> <p>A BPT will be constructed in close proximity to River Hamble (Upper Hamble) and the WFD waterbody is currently achieving Moderate status. River Wallington flows nearby the</p>

Components	Water purification ecosystem service provision assessment
	WBS and the WFD waterbody is currently achieving Moderate status Therefore, the change in land cover has a potential to decline water purification services.
D2 Route 3	<p>Water purification services are currently provided by greenfield and woodland habitats. A pumping station will be constructed nearby Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. Therefore, the change in land cover has a potential to decline water purification services.</p> <p>Water will be transferred from WRP to Havant Thicket therefore, there is no change to water purification. The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p>The pre-disinfection ceramic membrane plant will be constructed. River Itchen is in close proximity of the plant and the change in land cover has a potential to decline water purification services.</p> <p>There are no waterbodies within close proximity of the WBS however, the change in land cover has a potential to decline water purification services. A BPT will be constructed in close proximity to River Hamble (Upper Hamble) flows and the WFD waterbody is currently achieving Moderate status. The change in land cover has a potential to decline water purification services.</p>
D2 Route 4	<p>Water purification services are currently provided by greenfield and woodland habitats. A pumping station will be constructed nearby Park Lane Stream has no WFD classification which flows into Hermitage Stream WFD waterbody is currently achieving Moderate status. Therefore, the change in land cover has a potential to decline water purification services.</p> <p>Water will be transferred from WRP to Havant Thicket therefore, there is no change to water purification. The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p>The pre-disinfection ceramic membrane plant will be constructed. River Itchen is in close proximity of the plant and the change in land cover has a potential to decline water purification services.</p> <p>There are no waterbodies within close proximity of the WBS however, the change in land cover has a potential to decline water purification services. A BPT will be constructed in close proximity to River Hamble (Upper Hamble) flows and the WFD waterbody is currently achieving Moderate status. The change in land cover has a potential to decline water purification services.</p>

**It should be noted that Figure 2.1 provides details of the buffer lake that is beyond the detail of most of the other comments. There is also additional documentation that supports Figure 2.1 and identifies that there will be a vegetation buffer – hence included here.*

5.3.5 Tourism and recreation

Table 5.8 depicts the baseline welfare value for the recreation assets affected by each component, as well as the estimated visitation to those assets on a given year. This data is derived from the ORVal³⁰ tool as described in **Section 3.2**.

Table 5.8 ORVal outputs – Welfare Value and Estimated Visits for affected recreation sites

Configuration	Estimated Welfare Value (£ per year)	Estimated visits (per year)
A1 A2 Pipeline 1		
A1 A2 Pipeline 2		
B2 Route 1		
B2 Route 2		
B4 Route 1		
B4 Route 2		
B4 Route 3		
B5 Route 1		
B5 Route 2		
D2 Route 3		

Configuration	Estimated Welfare Value (£ per year)	Estimated visits (per year)
D2 Route 4		

5.3.6 Air Quality

As discussed in **Section 3.2.3.10**, air quality has been screened out for all SRO components as no Air Quality Management Areas (i.e., key receptors) are impacted by the construction or operations of the components.

5.3.7 Agriculture

Table 5.9 depicts the baseline agriculture value for each configuration. This data is derived using the adapted whole-farm income method outlined by the ONS as part of their Natural Capital Accounts Methodology Guide (2020) with data from the Farm Business Survey (England) on farms located in the South East of England as described in **Section Error! Reference source not found.** The values below represent the annual value of provisioning services that support agricultural production for the estimated area of each component.

For pipeline routes, it is assumed that this value will be lost during the construction period only as agricultural land will be reinstated.

Table 5.9 Baseline assessment of agriculture ecosystem service provision

Configuration	Permanent Loss Estimated agriculture value (£2019)	Temporary Loss Estimated agriculture value (£2019)
A1 A2 Pipeline 1		
A1 A2 Pipeline 2		
B2 Route 1		
B2 Route 2		
B4 Route 1		
B4 Route 2		
B4 Route 3		
B5 Route 1		
B5 Route 2		
D2 Route 3		
D2 Route 4		

6 Summary of Configurations

6.1 Preferred Configurations

Table 6.1.1 Preferred desalination configuration

Configuration	Metric	Assessment	Units
A1/A2 Fawley (XXXXXXXXXX) Configuration – with Pipeline Route 2 (AC to Testwood WSW)	Biodiversity	Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement/creation	
		Total off-site habitat creation/ BNG uplift	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	

Configuration	Metric	Assessment	Units
		Non-traded carbon sequestration value for on-site re-instatement/creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism	Estimated Welfare Value	
		Estimated visits	
	Agriculture	Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	<p>Current provision: arable, pasture, woodland and grassland habitats.</p> <p><i>Impact related to abstraction = none:</i> Water for the [redacted] desalination plant will be abstracted from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation.</p> <p><i>Impact related to construction = minor negative:</i> desalination plant will receive water from Fawley FAWPS Site so permanent land cover change to engineered structure.</p> <p><i>Water transfer = improvement:</i> desalinated water will be transferred to Testwood WSW which will reduce the abstraction in the River Test. River Test (Lower) WFD waterbody is currently achieving Moderate status. Therefore, the increase in flow (as desalination plant will transfer 75Ml/d or 61Ml/d) has a potential to dilute any pollutant impacts due to increase in clean water flow.</p>	

Table 6.2 Preferred water recycling configurations

Configuration	Metric	Assessment	Units
B2 WRP fed from [redacted] to Lake Otterbourne Environmental Buffer Configuration - Route 1 (WRP to Lake Otterbourne)	Biodiversity	Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement/creation	
		Total off-site habitat creation/ BNG uplift	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement/creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism	Estimated Welfare Value	
		Estimated visits	
	Agriculture	Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	Current provision: grassland, greenfield and woodland habitats.	

Configuration	Metric	Assessment	Units
		<p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Construction of water recycling plant could potentially decline water purification service. Also, a pre-disinfection ceramic membrane plant and a BPT will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status.</p> <p><i>Impact on receiving waterbody = potential decline:</i> [REDACTED] currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at [REDACTED] before being transferred to [REDACTED] Outfall which will result in limited change in concentrations, although potentially a different spread of the discharge plume along Hayling Island.</p> <p><i>Otterbourne Lake = temporary improvement during emergency operation:</i> Water transferred to Otterbourne Lake will provide an environmental buffer (see * at end of Table 5.4)f . The lake will be lined with bank vegetation, so no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Drawdown will temporarily increase flow so potentially improvement but dependent on water quality from lake and flow conditions in the Itchen.</p>	
Configuration	Metric	Assessment	Units
B4 WRP fed from [REDACTED] to Havant Thicket Reservoir Configuration – Route 3 pipeline (HTR to Otterbourne WSW)	Biodiversity	Total temporary habitat lost during construction	[REDACTED]
		Total permanent habitat loss	
		Total on-site re-instatement/creation	
		Total off-site habitat creation/ BNG uplift	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement/creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism	Estimated Welfare Value	
		Estimated visits	
	Agriculture	Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
Water purification	<p>Current provision: grassland and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.</p> <p><i>Water transfer (WRP to Havant Thicket) = no change:</i> The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.</p>		
Configuration	Metric	Assessment	Units
B5 WRP fed from [REDACTED] and [REDACTED]	Biodiversity	Total temporary habitat lost during construction	[REDACTED]

Configuration	Metric	Assessment	Units		
[REDACTED] WRP to Lake Otterbourne Environmental Buffer Configuration - Route 1 (WRP to Lake Otterbourne)		Total permanent habitat loss	[REDACTED]		
		Total on-site re-instatement/creation			
		Total off-site habitat creation/ BNG uplift			
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction			
		Change in non-traded carbon sequestration value for permanent habitat loss			
		Non-traded carbon sequestration value for on-site re-instatement/creation			
		Non-traded carbon sequestration value for off-site habitat succession			
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction			
		Change in natural hazard regulation value for permanent habitat loss			
		Natural hazard regulation value for on-site re-instatement/creation			
		Natural hazard regulation value for off-site habitat succession			
	Recreation & tourism	Estimated Welfare Value			
		Estimated visits			
	Agriculture	Temporary loss estimated agriculture value			
		Permanent loss estimated agriculture value			
	Water purification	<p>Current provision: grassland, greenfield and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p><i>Impact on receiving waterbody = potential decline:</i> [REDACTED] currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at [REDACTED] before being transferred to [REDACTED] Outfall which could result in a decline in dilution of pollutants.</p> <p><i>Otterbourne Lake = temporary improvement during emergency operation:</i> Water transferred to Otterbourne Lake will provide an environmental buffer. The lake will be lined with bank vegetation, so no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Drawdown will temporarily increase flow so potentially improvement but dependant on water quality from lake and existing flow conditions in the Itchen.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.</p>			
	Configuration	Metric		Assessment	Units
	D2 Route 3 Configuration	Biodiversity		Total temporary habitat lost during construction	[REDACTED]
				Total permanent habitat loss	
				Total on-site re-instatement/creation	
Total off-site habitat creation/ BNG uplift					
Climate regulation		Change in non-traded carbon sequestration value for temporary habitat loss during construction			
		Change in non-traded carbon sequestration value for permanent habitat loss			
		Non-traded carbon sequestration value for on-site re-instatement/creation			
		Non-traded carbon sequestration value for off-site habitat succession			
Natural hazard regulation		Change in natural hazard regulation value for temporary habitat loss during construction			

Configuration	Metric	Assessment	Units	
		Change in natural hazard regulation value for permanent habitat loss		
		Natural hazard regulation value for on-site re-instatement/creation		
		Natural hazard regulation value for off-site habitat succession		
	Recreation & tourism	Estimated Welfare Value		
		Estimated visits		
	Agriculture	Temporary loss estimated agriculture value		
		Permanent loss estimated agriculture value		
	Water purification	<p>Current provision: greenfield and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.</p> <p><i>Water transfer (WRP to Havant Thicket) = no change:</i> The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.</p>		

6.2 Alternative Configurations

As discussed in **Table 5.1**, there were a number of alternative pipelines retained following site selection, to explore alongside the preferred configurations.

Table 6.3 Alternative desalination configurations (included as feed into the MCDA process)

Configuration	Metric	Assessment	Units
A1/A2 Fawley Configuration – with Pipeline Route 1 (AC to Testwood WSW)	Biodiversity	Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement/creation	
		Total off-site habitat creation/ BNG uplift	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement/creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism	Estimated Welfare Value	

Configuration	Metric	Assessment	Units
		Estimated visits	
	Agriculture		
		Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	<p>Current provision: arable, pasture, woodland and grassland habitats.</p> <p><i>Impact related to abstraction = none:</i> Water for the [redacted] desalination plant will be abstracted from The Solent. The Solent has a Special Protection Area (SPA) and Special Area of Conservation (SAC) designation.</p> <p><i>Impact related to construction = minor negative:</i> desalination plant will be receiving water from Fawley FAWPS Site so permeant land cover change to engineered structure.</p> <p><i>Water transfer = improvement:</i> desalinated water will be transferred to Testwood WSW which will reduce the abstraction in the River Test. River Test (Lower) WFD waterbody is currently achieving Moderate status. Therefore, the increase in flow (as desalination plant will transfer 75MI/d or 61MI/d) has a potential to dilute any pollutant impacts.</p>	

Table 6.4 Alternative water recycling configurations

Configuration	Metric	Assessment	Units
B2 WRP fed from Budds Farm WTW WRP to Lake Otterbourne Environmental Buffer Configuration - Route 2 (WRP to Lake Otterbourne)	Biodiversity	Total temporary habitat lost during construction	
		Total permanent habitat loss	
		Total on-site re-instatement/creation	
		Total off-site habitat creation/ BNG uplift	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	
		Change in non-traded carbon sequestration value for permanent habitat loss	
		Non-traded carbon sequestration value for on-site re-instatement/creation	
		Non-traded carbon sequestration value for off-site habitat succession	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	
		Change in natural hazard regulation value for permanent habitat loss	
		Natural hazard regulation value for on-site re-instatement/creation	
		Natural hazard regulation value for off-site habitat succession	
	Recreation & tourism	Estimated Welfare Value	
		Estimated visits	
	Agriculture	Temporary loss estimated agriculture value	
		Permanent loss estimated agriculture value	
	Water purification	<p>Current provision: grassland, greenfield and woodland habitats.</p> <p><i>Impact related to land change = potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Construction of water recycling plant could potentially decline water purification service. Also a pre-disinfection ceramic membrane plant and a BPT will be constructed in close proximity to River Itchen resulting land cover change and negative water purification with potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status.</p> <p><i>Impact on receiving waterbody = potential decline:</i> Budds Farm WTW currently discharges water via the [redacted] LSO. The WRP waste stream will be mixed with the remaining final effluent at Budds Farm WTW before being transferred to [redacted] Outfall which could result in a decline in dilution of pollutants.</p> <p><i>Otterbourne Lake = temporary improvement during emergency operation:</i> Water transferred to Otterbourne Lake will provide an environmental buffer. The lake will be lined with bank vegetation, so no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Drawdown will temporarily increase flow so potentially improvement.</p>	

Configuration	Metric	Assessment	Units	
B4 WRP fed from [REDACTED] to Havant Thicket Reservoir Configuration – Route 1 pipeline (HTR to Otterbourne WSW)	Biodiversity	Total temporary habitat lost during construction		
		Total permanent habitat loss		
		Total on-site re-instatement/creation		
		Total off-site habitat creation/ BNG uplift		
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction		
		Change in non-traded carbon sequestration value for permanent habitat loss		
		Non-traded carbon sequestration value for on-site re-instatement/creation		
		Non-traded carbon sequestration value for off-site habitat succession		
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction		
		Change in natural hazard regulation value for permanent habitat loss		
		Natural hazard regulation value for on-site re-instatement/creation		
		Natural hazard regulation value for off-site habitat succession		
	Recreation & tourism	Estimated Welfare Value		
		Estimated visits		
	Agriculture	Temporary loss estimated agriculture value		
		Permanent loss estimated agriculture value		
	Water purification	<p>Current provision: grassland and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.</p> <p><i>Water transfer (WRP to Havant Thicket) = no change:</i> The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change. Where a WBS and BPT will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.</p>		
	Configuration	Metric	Assessment	Units
	B4 WRP fed from [REDACTED] to Havant Thicket Reservoir Configuration – Route 2 pipeline (HTR to Otterbourne WSW)	Biodiversity	Total temporary habitat lost during construction	
			Total permanent habitat loss	
Total on-site re-instatement/creation				
Total off-site habitat creation/ BNG uplift				
Climate regulation		Change in non-traded carbon sequestration value for temporary habitat loss during construction		
		Change in non-traded carbon sequestration value for permanent habitat loss		
		Non-traded carbon sequestration value for on-site re-instatement/creation		
		Non-traded carbon sequestration value for off-site habitat succession		
Natural hazard regulation		Change in natural hazard regulation value for temporary habitat loss during construction		
		Change in natural hazard regulation value for permanent habitat loss		
		Natural hazard regulation value for on-site re-instatement/creation		
		Natural hazard regulation value for off-site habitat succession		
Recreation & tourism		Estimated Welfare Value		
		Estimated visits		
Agriculture				

Configuration	Metric	Assessment	Units	
	Water purification	Temporary loss estimated agriculture value	-£32,340.96	
		Permanent loss estimated agriculture value	-£6,351.27	
		<p>Current provision: grassland and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.</p> <p><i>Water transfer (WRP to Havant Thicket) = no change:</i> The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change. Where a WBS will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services. Where a BPT will be constructed, there is a potential impact on the River Hamble (Upper Hamble) nearby where the WFD waterbody is currently achieving Moderate status.</p>		
Configuration	Metric	Assessment	Units	
B5 WRP fed from [REDACTED] WRP to Lake Otterbourne Environmental Buffer Configuration - Route 2 (WRP to Lake Otterbourne)	Biodiversity	Total temporary habitat lost during construction	[REDACTED]	
		Total permanent habitat loss	[REDACTED]	
		Total on-site re-instatement/creation	[REDACTED]	
		Total off-site habitat creation/ BNG uplift	[REDACTED]	
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction	[REDACTED]	
		Change in non-traded carbon sequestration value for permanent habitat loss	[REDACTED]	
		Non-traded carbon sequestration value for on-site re-instatement/creation	[REDACTED]	
		Non-traded carbon sequestration value for off-site habitat succession	[REDACTED]	
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction	[REDACTED]	
		Change in natural hazard regulation value for permanent habitat loss	[REDACTED]	
		Natural hazard regulation value for on-site re-instatement/creation	[REDACTED]	
		Natural hazard regulation value for off-site habitat succession	[REDACTED]	
	Recreation & tourism	Estimated Welfare Value	[REDACTED]	
		Estimated visits	[REDACTED]	
	Agriculture	Temporary loss estimated agriculture value	[REDACTED]	
		Permanent loss estimated agriculture value	[REDACTED]	
		Water purification	<p>Current provision: grassland, greenfield and woodland habitats.</p> <p><i>Impact related to land change =potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. The construction of water recycling plant will change the land cover which could potentially decline water purification services.</p> <p><i>Impact on receiving waterbody = potential decline:</i> [REDACTED] currently discharges water via the [REDACTED] LSO. The WRP waste stream will be mixed with the remaining final effluent at [REDACTED] before being transferred to [REDACTED] Outfall which could result in a decline in dilution of pollutants.</p> <p><i>Otterbourne Lake = temporary improvement during emergency operation:</i> Water transferred to Otterbourne Lake will provide an environmental buffer. The lake will be lined with bank vegetation, so no effect on water purification services. The lake will not be in hydraulic continuity with the groundwater. During emergency when drawdown of the lake is required, water will be discharged to River Itchen. River Itchen WFD waterbody is achieving a Moderate status. Drawdown will temporarily increase flow so potentially improvement.</p> <p><i>Impact related to land change =potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change. Where a WBS will be constructed is in close proximity to River Hamble (Upper Hamble) where the WFD waterbody is currently achieving Moderate status, the change in land cover still has a potential to decline water purification services. Where a BPT will be constructed, there is a potential impact</p>	

Configuration	Metric	Assessment	Units	
		on the River Wallington nearby where the WFD waterbody is currently achieving Moderate status.		
Configuration	Metric	Assessment	Units	
D2 Route 4 Configuration	Biodiversity	Total temporary habitat lost during construction		
		Total permanent habitat loss		
		Total on-site re-instatement/creation		
		Total off-site habitat creation/ BNG uplift		
	Climate regulation	Change in non-traded carbon sequestration value for temporary habitat loss during construction		
		Change in non-traded carbon sequestration value for permanent habitat loss		
		Non-traded carbon sequestration value for on-site re-instatement/creation		
		Non-traded carbon sequestration value for off-site habitat succession		
	Natural hazard regulation	Change in natural hazard regulation value for temporary habitat loss during construction		
		Change in natural hazard regulation value for permanent habitat loss		
		Natural hazard regulation value for on-site re-instatement/creation		
		Natural hazard regulation value for off-site habitat succession		
	Recreation & tourism	Estimated Welfare Value		
		Estimated visits		
	Agriculture	Temporary loss estimated agriculture value		
		Permanent loss estimated agriculture value		
	Water purification	<p>Current provision: greenfield and woodland habitats.</p> <p><i>Impact related to land change –potential decline:</i> Hermitage Stream flows adjacent to the WRP land parcel and the WFD waterbody is currently achieving Moderate status. Park Lane Stream has no WFD classification but flows into Hermitage Stream WFD waterbody. A pumping station will be constructed. Resulting in land cover change and impact on water purification.</p> <p><i>Water transfer (WRP to Havant Thicket) = no change:</i> The water will be transferred to Otterbourne WSW. Therefore, no change to water purification to River Itchen which flows nearby and the WFD waterbody is achieving a Moderate status.</p> <p><i>Impact related to land change –potential decline:</i> A pre-disinfection ceramic membrane plant will be constructed in close proximity to River Itchen resulting land cover change. Where a BPT will be constructed is in close proximity to River Hamble (Upper Hamble) where the WFD waterbody is currently achieving Moderate status, the change in land cover still has a potential to decline water purification services. Where a WBS will be constructed, there are no waterbodies within close proximity however, the change in land cover still has a potential to decline water purification services.</p>		

7 Monitoring and Assessment for Selected Solution

It should be noted that this section refers to the further assessment required for the selected solution that will be taken to the development and consenting process. This section outlines the key steps needed to build on the knowledge gained from the Gate 2 site selection process but with a focus on providing a detailed assessment of mitigation, offsetting and uplift to achieve no net loss and net gain opportunities and an associated NCA and detailed benefits assessment of the selected option. As such detailed ground truthing and wider stakeholder understanding will be essential to the process.

7.1 Biodiversity Net Gain

The current Biodiversity Metric tool (2.0), available at the time of the Gate 2 submission, has provided an initial understanding of the impacts that the relevant components and overarching configurations have on the surrounding habitats, including Priority Habitats and those of 'Unacceptable loss' which, should be avoided at the design stage and are identified as such in the Biodiversity Metric tool (2.0) noting that all assumption made are both precautionary and conservative. Ground truthing would be

required to confirm the extent and condition of habitats prior to rerunning for the selected solution to understand opportunities to improve condition on and offsite. Where any re-routing, update on existing routes or change to the footprint of specific component in the selected option occurs this will need to be considered to avoid impacts. The improvement of baseline data is required to support the design development of the selected solution will require site habitat surveys (condition assessment), ground truthing with UK Habs surveys and river MoRPh surveys and habitat condition scoring. Survey locations should be targeted to sensitive areas and to ground truth the variation across the working easements.

At this stage of assessment, opportunities to meet a minimum 10% biodiversity net gain have been the focus within the data presented. This data and new data will be reviewed in the context of further scheme development to consider opportunities to go beyond the minimum biodiversity net gain requirement, measures to prevent biodiversity net loss, and ensure planning for early mitigation.

A review should be undertaken of National and Local plans and policies, such as River Basin Management Plans, catchment or WFD objectives and Priority Rivers for Restoration to identify any specific objectives for BNG that can be delivered. Using the principles of Nature Recovery Networks, core areas for biodiversity have been identified within BOAs. Opportunities for connecting these through habitat restoration/creation should be explored as part of further scheme development, including those already identified within Local Plans/LBAPs/strategies. The opportunities should be assessed for their suitability for specific net gain features, connectivity opportunities and achievability. Values will then need to be assigned against areas of mitigation opportunity with potential condition improvement for each feature and opportunity using the principles of the scoring of the River Biodiversity Metric tool.

During this assessment version 3.0 of the Biodiversity Metric tool was released with river metric updates, and this and any later versions should use as the basis for further assessment in the context of scheme development and the consenting process.

As part on the selected option phase greater detail on the construction methods and construction easement will be available for the selected option which will provide greater clarity on the impact pathways and habitat scores which in turn will support the assessment of on and offsite mitigation and BNG specific opportunities.

Stakeholder consultation is essential to identify opportunities. This will be critical to the opportunity assessment related to mitigation and enhancement. We propose a series of short workshops for key stakeholder to discuss opportunities. This will include key water company representatives and stakeholders. The opportunities which may be discussed include:

- Landowners' land and landownership constraints
 - Local wildlife sites
 - Whether local councils have allocated land for BNG
 - Criteria for prioritisation
- Consideration of specific species targets for net gain options

7.2 Natural Capital

7.2.1 Refining the zone of influence

Currently the ZoI for the assessed components extends to the assumed construction zones. Whilst acceptable, greater detail will be necessary following stakeholder engagement, agreed detailed engineering specification etc as part of the selected option development. Factors such as water quality, bankside habitats or groundwater flow will then be possible to assess and this will highlight a necessity to expand or reduce our chosen zones. This will result in refinement of the calculations derived from more specific areas (i.e. details of the development process) of habitat extent and condition. It will also allow for a greater understanding of the impact on the freshwater environment, as rivers and groundwater are likely to have a different zone of interest to terrestrial impacts.

7.2.2 Representation of recreational areas and wider cultural services

ORVal³⁰, used in this assessment to value recreation and tourism, derives site values from a statistical model. This model does not account for individual characteristics which may determine the site's welfare benefit. During the development and consenting assessment phase it would be beneficial to capture site specific features and a less generalised figure for visitor numbers to enable accurate valuation of recreation services: in affect a full benefits assessment for the selected options.

7.2.3 Natural hazard regulation

The assessment used takes flooding into account as the primary natural hazard, but further investigation into the impact that drought has on habitats ability to slow-flow and provide natural flood resilience. This would help to more accurately identify any risk to natural habitat regulation. In order to accomplish this will require a greater breadth of data than currently available.

7.2.4 Climate change predictions

Habitat type and land usage may change in the future due to changes in global climate, creating disparity between the predicted changes caused by component implementation and the observed changes in the future.

7.2.5 Land use predictions

The vast majority of our Natural Capital Assessment in the gate 2 assessment is based on land cover. Upcoming changes in land use related to the planning and consenting selected option phase will need to be accounted and check to ensure no specific changes in land use prediction.

7.2.6 Confirming component impacts

During the planning and consenting phases there will be more detailed engineering design and expected changes to the precise location of key selected option components. These change will affect surrounding habitat assessment carried out to date in the site selection process. These updates will need to be accounted for within the Natural Capital and wider benefits assessment during the planning and consenting phase.

7.2.7 Incorporating Net Gain into component design and Natural Capital Assessment

The BNG assessment focusses on quantifying disbenefits to biodiversity and providing the guidelines to not only mitigate them but to create a 10% increase in biodiversity. It will be necessary to incorporate the quantified values and mitigation plans so that changes in Natural Capital can be calculated with them in mind including air quality and carbon assessment.

7.2.8 Accounting for habitat condition improvement

The BNG assessment considers options to increase the biodiversity metric score through both habitat creation and enhancement. It has not been possible to account for the natural capital benefits related to habitat enhancement as habitat extent has been used as a proxy for natural capital stock. For Gate 2 it will be important to consider how habitat condition contributes to delivery of ecosystem services and assess how habitat enhancement measures will affect natural capital values.

7.2.9 Key partner and wider ambition collaboration

For the Gate 2 site selection process, the NCA has focused on the base line Natural Capital within a given Zol, an assessment of the potential opportunities for uplift related to BNG and predicted Natural Capital loss as a result of construction/operation. This has been a desked based assessment using open source data. There will be a need to understand and incorporated other wider more locally focused Natural Capital work being completed by local partners to ensure any finding and local ambitions are realised within the selection option. This could be started as soon as possible to support the planning and consenting phase for the selected solution.

7.2.10 Accounting for biodiversity and habitat ecosystem services

Natural Capital benefits have been aligned with overall high level BNG opportunity areas which have been based on Priority Habitats etc where information has been gained from online sources. This has allowed for a comparative approach as part of the site selection. However, there has been no ground truthing to establish where opportunity is most likely to be greatest on-the-ground. Ground-truthed BNG and mitigation options (informed by BNG surveys) together with stakeholder engagement (to better understand local authorities) will support the net gain and NCA detail required for the planning and consenting process.

7.2.11 Accounting for human wellbeing

Within this report, human wellbeing has been considered mostly in connection with recreation. However, wider cultural ESS such as physical and mental health, education and volunteering will also be considered for inclusion in the planning and consenting process. However, it is important to note that overlaps exist between these ecosystem services (as outlined in the ENCA Services databook) i.e. recreation overlaps with physical and mental health. Therefore, at this stage only recreation was considered due to time constraints, lack of data and to avoid double counting of benefits.

7.2.12 Solution level analysis and cumulative effects

For this assessment no cumulative assessment with other schemes or plans has been undertaken, as the assessment assumes that for any biodiversity loss not fully mitigated, compensation (offsetting) will be undertaken with an additional provision of 10% net gain. Cumulative assessment would only be necessary/feasible when specific land parcels are identified via the planning and consenting phase for the selected option. It will then be possible for these to be identified to ascertain if they are providing mitigation or net gain opportunity for another scheme. At that stage a cumulative assessment of opportunity net gain potential would be necessary to ensure no double counting of habitat uplift.

Appendices

A1 All figures A2 Summary BNG Assessment

A2.IX FAWPS 23

A2.V D55 Meon to Otterbourne Route 1

A2.VI DS5 Meon to Otterbourne Route 2

A2.VII FAWPS 19

A2.VIII FAWPS 21

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A2.XI Fawley to Abstraction and Discharge Route 2

A2.XII Fawley to Abstraction and Discharge Route 3

A2.XIII Fawley to Abstraction and Discharge Route 4

A2.XIV Fawley to Testwood Route 1

A2.XIX Havant Thicket HLPS

A2.XL WfLH North Boarhunt WBS

A2.XLI WfLH North Fareham WBS

A2.XLII WfLH Upper Swanmore Break Pressure Tank

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A2.XLIX WRP 75

A2.XLV WRP 71

A2.XLV WRP to Havant Thicket Route 1

A2.XLVI WRP 72

A2.XLVI WRP to Havant Thicket Route 2

A2.XLVII WRP 73

A2.XLVII WRP to Otterbourne Route 1

A2.XLVIII WRP 74

A2.XLVIII WRP to Otterbourne Route 2

A2.XLVIV WRP to Otterbourne Route SIA

A2.XV Fawley to Testwood Route 2

A2.XVI Fawley to Testwood Route 3

A2.XVII Fawley to Testwood Route 4

A2.XVIII Fawley to Testwood Route SIA

A2.XX Havant Thicket HLPS alternate HT-OT3

A2.XXI Havant Thicket to Otterbourne Route 1

A2.XXII Havant Thicket to Otterbourne Route 2

A2.XXIII Havant Thicket to Otterbourne Route 3

A2.XXIV Havant Thicket to Otterbourne Route 4

- A2.XXIX Lake Otterbourne
- A2.XXV HTPS ST3 land parcel 3
- A2.XXVI HTPS ST3 land parcel 5
- A2.XXVII HTPS ST3 land parcel 8
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- A2.XXX Meon D55 desal plant incl. pumping station
- A2.XXXI Meon D55 to Otterbourne Route SIA
- A2.XXXII Meon Pumping station
- A2.XXXIII [REDACTED] to WRP Route 1
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- A2.XXXIX WfLH Lower Upham Break Pressure Tank
- A2.XXXV [REDACTED]
- A2.XXXVI WfLH Denmead WBS
- A2.XXXVII WfLH Drayton WBS
- A2.XXXVIII WfLH Horndean WBS
- A2.I [REDACTED] Desal Plant
- A2.II Break Pressure Tank
- A2.III [REDACTED] to WRP Route 1
- A2.IV Construction compound example
- A3 Configuration Summary Assessment
- A4.IX SWS G2 Natural Capital Workbook - BPT and WBS
- A4.V SWS G2 Natural Capital Workbook - Desal
- A4.VI SWS G2 Natural Capital Workbook - WRP
- A4.VII NCA A1 A2 pipeline 1
- A4.VII NCA A1 A2 pipeline 2
- A4.X NCA B2 Route 1
- A4.XI NCA B2 Route 2
- A4.XII NCA B4 recycled water from [REDACTED] WTW route 1
- A4.XIV NCA B4 recycled water from [REDACTED] WTW route 2
- A4.XIX NCA B4 water from [REDACTED] WTW route 3
- A4.XL NCA B5 Route 1
- A4.XLI NCA B5 Route 2
- A4.XLII NCA D2 75Mld alternative bulk supply route 4
- A4.XLIV NCA D2 75Mld alternative supply route 3



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