WSP UK Limited

Wessex Water WRMP24

Invasive non-native species Compliance Assessment

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Project reference:	P000011460
Date of issue:	August 2023

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Revision and Amendment Register

Version Number	Date	Section(s)	Page(s)	Summary of Changes	Approved by
V1.0	16/09/22	6		First draft for client review	PS
V2.0	22/09/22	6		Revised version (internal)	PS
V3.0	23/09/22	6	46	Final draft	PS
V4.0	17/08/23	All		First draft for client review incorporating revised Feasible and Preferred options for Final WRMP24	HW

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Non-Technical Summary

Aims and approach

This report presents the invasive non-native species (INNS) risk assessment for the feasible and preferred options being considered for inclusion in Wessex Water's Water Resource Management Plan (WRMP) 2024. The aim of the report is to determine the level of risk associated with individual options regarding the transfer and movement of INNS.

From the feasible list of options an initial screening process was undertaken to assess whether there is likely any risk of INNS transfer. Those that were identified to have an element of risk were taken through an advanced screening process which explored in more depth the extent and location of the risk in relation to the pathways associated with the option.

Results

Of the 86 options, 10 were judged to have a potential risk of INNS transfer. These have been broken down in the advanced screening process to identify the risk related to each element, the INNS known to be present on site, and an average risk score for each option is provided. The elements of these 10 options have a mixture of high, medium and low risk which is dependent upon option specific details.

Wessex Water's WRMP24 preferred programme contains no options that have been identified to have a risk of INNS transfer in its design.

Recommendations

Recommendations have been made for further INNS assessment in order to establish the true risk INNS pose to the feasible plan.

1. Introduction

Non-native Species (NNS) are organisms that have been introduced by human activities to a location at which they would not normally be found. The activities that transport NNS, for example international shipping, recreational activities, or water company raw water transfer (RWT) operations, are known as introduction pathways, and effectively side-step the natural barriers, such as topographical or climatic features, that would otherwise prevent a species natural spread.

In the majority of cases, NNS introductions do not result in the establishment of a population, or if they do, the ecological impact is minimal or subtle. However, there are NNS that have a wide resilience to environmental conditions, are trophic-level generalists having the potential to occupy different parts of the food chain and introduced to a new location where natural predators are absent. These factors, along with other biotic and abiotic considerations, increase the likelihood of establishment and also the potential for detrimental impacts to the habitat into which they have been introduced.

Impacts can be broadly classified as ecological, economic, or towards human health; however, well documented ecological examples include predation pressures, resource competition, transmission of disease, habitat engineering, and hybridisation [with native species]. These negative impacts both singerly or in combination can endanger populations of native species, reducing biological diversity and ecosystem function. NNS that establish and have impact are known as invasive non-native species (INNS).

INNS impacts are fundamentally of most concern at the ecological level; however, they also negatively affect the value that can be obtained from ecosystem services, either by reducing yield or increasing the cost and difficultly of linked operations. A recently updated estimate suggest that INNS cost the UK economy over £4 billion per year (Eschen *et al* 2023)[1] – a significant increase to previous estimates. Another earlier report produced by UK Water Industry Research[2] provided some clarity of understanding of the water industry's INNS management activities, particularly regarding the costs levied against water-supply operations. For example, the estimated management costs to a water company for INN plant species (aquatic and terrestrial) control ranged from £4,000 – £75,000 per species per year.

[1] Eschen, R., Kadzamira, M., Stutz, S. et al. An updated assessment of the direct costs of invasive non-native species to the United Kingdom. Biol Invasions (2023). https://doi.org/10.1007/s10530-023-03107-2

[2] Aldous P, Aldridge D, Fredenham E, Nuttall C, Smithers R (2016). Invasive non-native species (INNS) implications on the water industry. UKWIR, p. 51.

In the absence of effective biosecurity measures to reduce the INNS introductions, these figures clearly represent a potentially significant and ongoing cost to the industry. There are also considerable legislative drivers that compel the water industry to effectively mitigate the transfer of INNS within their networks. Operating on the polluter-pays principle with respect to the movement of INNS, non-adherence to the legislation carries a considerable potential for liability and reputational damage to the industry.

The supply and demand for water resource in the UK, including additional strategic resource, is planned on a five-year cycle of statutory water resource management plans, which set out a company's approach for the next 25 years. Management plans include schemes for new water network connections, storage assets, treatment works, and more. Although these management plans are intended to provide resilience against the increasing challenge of supplying water to the UK population, there is the potential for negative environmental impacts, including the increased risk of INNS transfer. The first stage in mitigating any impacts is to identify the hazard and qualify the level of risk; potentially leading to the prioritisation of schemes based on their relative risk of causing harm. A scheme that is determined to be high risk can either be mothballed or redesigned to include risk-reducing adaptations. In the case of INNS transfer risk, a set of realistic, pragmatic and cost-effective measures can be implemented. Known collectively as biosecurity these measures singularly or in combination reduce the risk of INNS introduction and spread.

INNS spread by means of the life stage or stages most adapted to dispersal are referred to as propagules. Invasion success is influenced by: 1) the frequency of introductions; and, 2) the number of propagules per introduction. Biosecurity reduces these factors thereby decreasing the likelihood that expensive and largely reactive eradication or management programmes will be required. There are tangible operational and strategic benefits to the implementation of biosecurity – for example, pipelines operating at full efficiency in the absence of biofouling, and the continued adherence to the prevention of the deterioration in ecological status of Water Framework Directive water bodies.

1.1 Background and Purpose of Report

This report provides the technical summary of the risk assessment process of the strategic water resource schemes set out in Wessex Water's WRMP24. The specific purpose of the assessment was to qualify the risk of INNS transfer posed by each scheme, thereby identifying which schemes, or scheme elements could be prioritised for biosecurity.

INNS can cause the ecological status of WFD water bodies to deteriorate or fail to achieve ecological objectives. There is a commitment to review whether existing abstraction operations and future schemes will increase the risk of introducing and spreading INNS.

2. INNS Assessment Approach

2.1 Methodology

2.1.1 Initial screening

A preliminary qualitative assessment of each scheme was undertaken by APEM INNS consultants to identify which of the water resource schemes had an inherent risk of INNS introduction and spread. Those schemes which were considered to either: 1) create a new introduction pathway; or, 2) increase existing risk of INNS introduction and spread, were taken forward for advanced investigation.

The development of new Raw Water Transfers (RWTs), particularly those which link water bodies that do not have a natural or existing connection, essentially creates a new introduction pathway. Construction of new assets can potentially increase the risk of INNS movement by establishing new pathways; for example, recreational activities on a reservoir, or operational staff movements between new sites. However, design parameters and operational considerations can result in many of the schemes presenting little or no risk of INNS transfer and spread. APEM consultants used expert judgement, based on the information provided by Wessex Water, to sift out schemes for which this was considered the case. Although this review was essentially qualitative, general criteria which results in no INNS risk were agreed as:

1) The scheme seeks to move treated water.
2) The scheme abstracts water from a borehole (see section 2.1.2).
3) The scheme is for operational/ supply upgrades only. For example, mains replacement, or water treatment works construction.

While the risk of introduction and spread of INNS has been considered in relation to the operational aspect of the scheme, risk in relation to construction of the schemes has not. However, this would need to be considered and appropriate biosecurity measures put into place to ensure a reduction of risks during the construction process.

It should be noted that some of the schemes are multi element and do contain some options that would otherwise be deemed to have no risk of INNS introduction and spread. However, if the scheme included an element that would increase INNS risk, the entire scheme was still taken forward for advanced assessment.

In an attempt to ensure consistency and reliability of outputs the initial screen was carried out by multiple INNS consultants working independently. Progress was discussed between

consultants and included a peer-review to ensure consistency of opinion. The results of the initial screening, including a summary of advanced investigation exclusion criteria, are provided in section 3.1.

2.1.2 Groundwater

Groundwater (GW) is the water found underground within subterrestrial interfacial geological features. Known as aquifers these features are sedimentary water-bearing reservoirs which have formed with sufficient storage capacity (i.e. soil pores, rock fractures or voids between unconsolidated sediment) to provide a yield of useable water. GW is replenished from the surface by meteoric water and although GW naturally discharges as springs or seeps, it is also anthropogenically abstracted via wells or boreholes for agricultural, municipal and industrial use. Approximately one third of the UK's freshwater supply is GW sourced.

For all functional purposes, relative to INNS introduction pathways and establishment, aquifers and GW are considered to be isolated from surface waters. They provide specialist and nondiverse habitats, low primary production, short and simple food-webs, low oxygen levels, and are geologically less accessible. Although a small number of organisms have adapted to these conditions (e.g. the stygofauna), their relative abundance and frequency of transfer is likely to be very low. Even in the event of an organism being translocated it is unlikely that they could survive/ establish in a surface-water habitat/ niche. Meteoric water is sterile when it reaches the ground and any surface-water that goes on to become GW is filtered as it permeates through the surface substrates. This filtration combined with the abiotic conditions of GW habitats, greatly reduces, if not removes, the risk of viable (non-microbial) INNS being transferred to the GW. Therefore, assuming that the man-made abstraction points are suitably inaccessible to biological pollution, the risk of viable INNS being present or transferred from abstracted GW is negligible. It is for these reasons that GW scheme have been considered to not present a risk in relation to INNS transfer and not been taken forwards for advanced screening.

2.1.3 Advanced investigation using the Strategic Resource Option (SRO) assessment tool

The schemes that were determined to pose a risk of INNS transfer and spread were taken forward for advanced risk assessment. The primary risk assessment methodology used was that of the quantitative Strategic Resource Option (SRO) Aquatic INNS Risk Assessment Tool (SAI-RAT), that was developed by APEM Ltd on behalf of the Environment Agency to aid in assessing the risk of aquatic INNS introduction and spread by SROs. The tool has been developed to account for the diversity of assets and RWTs which may comprise any one SRO and uses a single assessment process via a modular approach, to provide a quantitative score of relative risk.

The assessment of assets and RWTs takes a pragmatic pathway and source-pathway-receptor model approach, respectively, building upon other assessment tools such as the Northumbrian Water Group (NWG) RWT assessment tool and the Wessex Water asset assessment tool, adopting similar approaches to the quantification of INNS risk. Similar to these tools, an extended functional group mechanism has been incorporated to account for future risks rather than only examining species known to be currently present.

The SRO tool provides:

- A robust and comparative means of assessing the risk of introducing and spreading INNS from assets and RWTs;
- An assessment that uses functional groups rather than a species-based approach, thereby providing a future- proofing to incorporate risks from INNS that are not yet recorded in England;

2.1.4 Schemes (for advanced screening) to which the SRO tool was not appropriate

There were several schemes taken forward for advanced screening that were less/ not appropriate for assessment with the SRO tool. This was due in part to the schemes in question resulting in increased risk rather than the creation of a new pathway; the SRO tool employs numerical parameters to define and assess the frequency or severity of an occurrence or pathway characteristic of an SRO. The volume of water moved by a RWT, for example, is accounted for in the tool and directly influences the scale of risk calculated; however, the volume of a source location, for example a reservoir, is not considered to directly impact INNS risk, so is therefore not included as a parameter that informs the output of the risk model. The schemes to which the SRO tool was less appropriate were mostly those which included a proposal for an increase in volume to an existing reservoir. Although, there were other exceptions. Were a comparison to be run, where the only difference was the volume of water storage, the output score would be the same. As the tool was not designed with this function in mind, clearly such a comparison is not appropriate; however, the tool can still provide an indicative risk score (treating the modifications to the reservoir as an entirely new asset). Such schemes were run through the tool to provide a risk score that could be compared alongside the other schemes. This allows for an indication of inherent risk of the asset and can provide inter-element biosecurity prioritisation, across all schemes.

Table 1 provides a summary of the schemes and a brief justification of why they were discounted. In instances where the risk of INNS transfer and spread is not clearly/ fully accounted for in the parameters of the tool we have signposted in Table 2 and provided qualitative comments alongside the scores in section 3.2 to contextualise the risk within the framework of the scheme/ element.

2.2 Supporting information and data used

Data for all schemes were obtained from the 'Wessex Water WRMP24 Options Assessment' spreadsheets provided to APEM by Wessex Water, except 41-06 where data was sourced from a technical note provided by Wood Group UK Ltd. ('Wessex water drought plan 2022 WFD assessment').

In completing SAI-RAT assessments for each scheme, INNS presence was assessed within a 1km buffer of assets, and priority habitat and designated sites within a 100m buffer using DEFRA's MAGIC Maps (https://magic.defra.gov.uk/).

To identify which INNS are present in the scheme/ element areas, data were downloaded from the National Biodiversity Network (NBN) Gateway (https://nbnatlas.org [accessed 10/07/2023]) using open access licensed data only (OGL and CC-BY)[3]. Where necessary, data contributors and attribution parties have been outlined in Section 6. Whilst APEM has endeavoured to provide accurate and reliable information, APEM is reliant on the accuracy of underlying data provided by third parties (i.e. record centres, wildlife trusts etc.). APEM will not be responsible for any data provided by these sources that is later shown to be inaccurate.

[3] Contains public sector information licensed under the Open Government Licence (OGL) v3.0, Creative commons with attribution v4.0 (CC-BY).

3. Summary of INNS assessment

3.1 Initial screening

76 of the 86 feasible strategic water resource schemes were not taken forward for advanced screening. These were discounted from further investigation as they were qualitatively determined to not result in an increased risk of INNS introduction and spread, nor create a new pathway of INNS introduction and spread. Table 1 provides a summary of the schemes and a brief justification of why they were discounted, while Table 2 provides the summary of the schemes that require advanced risk assessment. All current preferred options were determined to have no INNS risk.

1. Schemes not taken forward for advanced screening

Scheme reference	Feasible / Preferred	Scheme Title	Comments
9.16	P	Temporary use bans	Drought option. No INNS transfer risk.
9.19	P	Reduced levels of service, moving to 1:500 to 1:200	Drought option. No INNS transfer risk.
18.01	F	Somerset Spine main upgrade	Potable water. No INNS transfer risk due to water being treated.
18.02 (55.02)	F	CALM main upgrade and reversal	Potable water. No INNS transfer risk due to water being treated.
18.09	F	Chippenham to Devizes transfer upgrade	Potable water. No INNS transfer risk due to water being treated.
18.10	F	West Somerset Reservoirs transfer upgrade	Potable water. No INNS transfer risk due to water being treated.
18.26	F	Bristol import increase towards Trowbridge	Potable water. No INNS transfer risk due to water being treated.
18.27	F	Pewsey Resilience	Potable water. No INNS transfer risk due to water being treated.
18.28	F	North Bath Resilience	Increased flow between SR to SR. No INNS transfer risk due to water being treated.
19.06	F	Severn-Thames Transfer: WCWRG only at 15Ml/d	Multi-component and relies on other water company actions. WTW / SR to SR: No INNS transfer risk due to water being treated.
19.07	F	Severn-Thames Transfer: WCWRG only at 30Ml/d	Multi-component and relies on other water company actions. WTW / SR to SR: No INNS transfer risk due to water being treated.
19.10	F	Severn-Thames Transfer: WCWRG only at 15Ml/d	Multi-component and relies on other water company actions. WTW / SR to SR: No INNS transfer risk due to water being treated.
19.11	F	Severn-Thames Transfer: WCWRG only at 30Ml/d	Multi-component and relies on other water company actions. WTW / SR to SR: No INNS transfer risk due to water being treated.
21.06	F	Yeovil to Dorchester area new transfer	Treated water transfer
21.10	F	Bristol import increase towards Chippenham	Potable water. No INNS transfer risk due to water being treated.
21.11	F	Devizes resilience: Calne to Devizes new transfer	Potable water. No INNS transfer risk due to water being treated.
21.12	F	Pewsey resilience	Potable water. No INNS transfer risk due to water being treated.
21.13	F	Salisbury to Amesbury to Tidworth Transfer	Potable water. No INNS transfer risk due to water being treated.
22.04	P	Weymouth Source Improvements	Operational upgrades only – water treatment upgrades to include pesticide removal. No INNS transfer risk.
23.01	F	Yoevil Reservoir peak capacity	Operational upgrades only. Capacity of WTW increase. No INNS transfer risk.

Scheme reference	Feasible / Preferred	Scheme Title	Comments
25.03	F	Grid reinforcements - Wylye valley	Potable water. No INNS transfer risk due to water being treated.
25.04	F	South Grid Resilience	Multi-component. Potable water. No INNS transfer risk due to water being treated.
25.05 (55.06)	F	North Grid to South Grid reinforcements	Multi-component. Potable water. No INNS transfer risk due to water being treated.
26.17	F	Reinstatement of mothballed sources -Winterbourne Abbas	Boreholes and new WTW- Groundwater poses extremely low risk of INNS transfer.
27.04	F	Under-utilised licence - Wimborne Minster	Borehole-Groundwater poses extremely low risk of INNS transfer.
33.01	F	Groundwater: Aquifer Storage Recharge - Wareham Basin	Low risk as the water used to recharge will be treated
34.08	F	Groundwater - Hampshire Avon I	Groundwater poses extremely low risk of INNS transfer.
34.09	F	Groundwater - Hampshire Avon II	Groundwater poses extremely low risk of INNS transfer.
34.10	F	Amesbury boreholes	Groundwater poses extremely low risk of INNS transfer.
34.11	F	West Salisbury Boreholes	Groundwater poses extremely low risk of INNS transfer.
36.02	F	Desalination: North Coast Bristol Water - Avonmouth	No INNS transfer risk due to water being essentially treated and desalinated.
37.05	F	Effluent Re-use - Bridgwater Reservoir	Water is coming from WwTW through new pipeline to reservoir therefore treated. No INNS transfer risk.
37.06	F	Effluent Re-use - Quantock Reservoir	Water is coming from WwTW through new pipeline to reservoir therefore treated. No INNS transfer risk.
37.07	F	Effluent Re-use - North Somerset Non Household	Water will be treated and does not re-enter the environment. No INNS transfer risk.
37.10	F	Effluent Re-use Taunton Canal	New pipeline will be treated water. Raw water will then follow existing pathways. No INNS transfer risk.
38.01	F	Underutilised licence due to water quality: Purbeck	Boreholes and new WTW- Groundwater poses extremely low risk of INNS transfer.
38.04	F	Under-utilised licence - Mid Dorset	Operational upgrades. The addition of nitrate removal. No INNS transfer risk.
38.06	F	Under-utilised licence - mid Stour II	Operational upgrades. Additional UV and nitrate treatment. No INNS transfer risk.
38.11	F	Under-utilised licence - East Dorchester Source	Operational upgrades. Additional Treatment. No INNS transfer risk.
38.12	F	Under-utilised licence - North East Bath	Operational upgrades. Additional Nitrate treatment. No INNS transfer risk.
39.01	P	Under-utilised licence - East Weymouth Source	New WTW but existing pipelines. No INNS transfer risk.

Scheme reference	Feasible / Preferred	Scheme Title	Comments
39.02	P	Under-utilised Licence - North Warminster	Boreholes and new WTW- Groundwater poses extremely low risk of INNS transfer.
41.01	P	Drought Permit - Stour catchment	Groundwater poses extremely low risk of INNS transfer.
41.06	P	Drought Permit - Bride catchment	Groundwater poses extremely low risk of INNS transfer.
52.02	F	Poole Water Recycling and Transfer - Stour use 50%	Treated effluent release
52.03	F	Poole Water Recycling and Transfer – Stour use 100%	Treated effluent release
54.01	F	Mendips to Grid	Treated water transfer
54.03	F	Mendips to Trowbridge	Treated water transfer
54.04	F	Mendips to Grid and Trowbridge	Treated water transfer
54.06	F	Mendips to Grid - 50% capacity	Treated water transfer
54.07	F	Mendips to Trowbridge - 50% capacity	Treated water transfer
54.08	F	Mendips to Grid and Trowbridge - 50% capacity	Treated water transfer
55.01	F	CALM main upgrade and reversal - 10Ml/d	Treated water transfer
55.03	F	South Grid Resilience - 8Ml/d	Treated water transfer
55.05	F	North Grid to South Grid reinforcements - 5.5Ml/d	Treated water transfer
55.09	F	Trowbridge to Devizes	Treated water transfer
55.10	F	Trowbridge to Market Lavington	Treated water transfer
55.11	F	Trowbridge to North Warminster	Treated water transfer
55.12	F	Yeovil to Dorchester - 7Ml/d	Treated water transfer
56.01	F	Salisbury Boreholes - 7Ml/d	New borehole and treated water transfer
57.01	F	Demand strategy 1	No INNS risk
57.02	F	Demand strategy 2	No INNS risk
57.03	F	Demand strategy 3	No INNS risk
57.04	F	Demand strategy 4	No INNS risk
57.05	F	Demand strategy 5	No INNS risk
57.06	F	Demand strategy 6	No INNS risk
57.07	P	Demand strategy 7	No INNS risk
58.01	F	Bristol Import – 15 Ml/d	Treated water transfer
59.01	F	Stream Support at Mere	New borehole

Scheme reference	Feasible / Preferred	Scheme Title	Comments
70.01	P	Bristol Import and onwards transfer I	Treated water transfer
70.02	F	Bristol Import and onwards transfer II	Treated water transfer
70.03	F	Bristol Import and onwards transfer III	Treated water transfer
70.04	F	Bristol Import and onwards transfer IV	Treated water transfer
70.05	F	Bristol Import and onwards transfer V	Combination option. Risk inherent to 21.14 only
70.06	P	Increased Reservoir Capacity and East Transfer	Teated water transfer
70.07	F	Hampshire Avon Boreholes and Transfer	Combination option. Risk inherent to 21.14 only

2. Schemes taken forward for advanced screening

Scheme reference	Feasible / Preferred	Scheme Title	Primary Risk Type	Comments
19.03	F	SWW Reservoir Pump Storage - Tiverton to Taunton Transfer	New pathway	New raw water transfer
21.14	F	Amesbury to Tidworth transfer	New pathway	New IRE to IRE raw water transfer
25.01	F	Mendips to Stour	New pathway	New raw water transfer
30.02	F	Pump Storage - Quantock Reservoir	New pathway	New raw water transfer
31.02	F	Raising Dams - Yeovil Reservoir	Increased risk	Increased risk - raising dam and reservoir level
32.03	F	New Reservoir - Yeovil	New pathway	New Asset- therefore new risk
32.13	F	New Reservoir - Dorset Frome	New pathway	New Asset- therefore new risk
32.24	F	New Reservoir - Parrett	New pathway	New Asset- therefore new risk
32.36	F	New Reservoir: Pudding (- Bristol Avon)	New pathway	New Asset- therefore new risk
54.05	F	Mendips to Stour - 50% capacity	New pathway	

3.2 Advanced screening

3.2.1 Pathway approach

It is widely understood and recommended at all levels of INNS policy making, that the prevention of INNS introduction and spread is the most effective and cost-beneficial method for managing the threat of INNS. Prevention is best achieved at the pathway level, where equipment, procedures and practices can be focused the on the ways in which INNS are transferred between regions, rather than targeting individual species. This provides greater resilience against the range of invasive taxa which may have very different life histories and invasion characteristics, such as fecundity and propagule number. It also provides better coverage against unknown INNS threats – including horizon species - that are yet to introduced and/ or their invasiveness is less understood and therefore not prioritised as a species-level.

The advanced screening undertaken in this report approaches the risk assessment in this way; although, some examples of specific INNS, that are present or implicated in the context of a scheme(s) are provided and their impacts summarised for context.

3.2.2 Construction activities

The activities associated with construction work, such as the movement of waste product or spoil, machinery, equipment and personnel both on and off site are recognised as potential vectors of INNS transfer. Particularly in the case of invasive plant species, on-site construction activities, for example ground works and demolition, may disturb and fragment plant stands thereby increasing the likelihood that propagules will be transported elsewhere. The risk assessment process does not have the ability to provide a quantified risk associated with construction activities; however, the exact details of any works should consider this risk and the inclusion of an INNS biosecurity plan and, possibly, management programme to prevent the spread of INNS during construction.

4. INNS Assessment

None of the preferred options were screened in for advanced assessment – those summarised below are all included on the feasible programme. The SRO tool provides high-level average risk scores for each scheme. The average is derived as the mean of the individual scores for all elements of the scheme. These are ranked in Table 3 and can be interpreted as a basic high-level indication of the overall risk of each scheme.

However, it should be noted at the element-level there are other factors, not inherently considered by the SRO tool, that may influence the real-world realisation of the calculated risk. For example, and as also described in section 2.1, the tool is unable to interpret the change to risk posed by an existing reservoir as a result of increased capacity. It will calculate the score as if the reservoir was a brand-new asset. The scores produced for existing assets under this scenario are still useful, as they could be utilised by Wessex Water in the prioritisation of asset-specific biosecurity across the current network irrespective of future modifications.

All elements run through the SRO tool have also been independently (qualitatively) reviewed to sense check the scores and ensure that the calculated risk is appropriate and can be effectively managed. In practice for this assessment process, certain high scoring assets or operations have been identified as not requiring specialist biosecurity, for example a RWT that transfers directly to WTW. The status of all schemes regarding the need for a more detailed, element-specific biosecurity option review, should they move onto the preferred list, is signposted in the risk score summary table for each scheme.

3. Scheme Rankings Based on SRO average risk score

Scheme Number	Scheme Name	Scheme Average Risk Score	Rank
31.02	Raising Dams - Yeovil Reservoir	65.23	1
30.02	Pump Storage - Quantock Reservoir	51.07	2
19.03	SWW Reservoir Pump Storage - Tiverton to Taunton Transfer	33.27	3
21.14	Amesbury to Tidworth transfer	33.20	4
25.01 and 54.05	Mendips to Stour	29.29	5
32.13	New Reservoir - Dorset Frome	28.53	6
32.24	New Reservoir - Parrett	27.70	7
23.36	New Reservoir - Bristol Avon	24.90	8
32.03	New Reservoir - Yeovil	22.70	9

4.1 Scheme 19.03: SWW Reservoir Pump Storage - Tiverton to Taunton Transfer

Summary 19.03 risk assessment scores

Category	Element	Risk Score	Risk rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	46.63	2	Yes	-
	REDACTED	49.73	1	No	-
	REDACTED	40.35	3	No	-
	REDACTED	35.73	4	No	-
	REDACTED	32.83	5	No	-
	RWT ELEMENT AVERAGE	41.45	-	-	-
Assets	REDACTED	74.85	1	Yes	-
	REDACTED	21.15	2	No	-
	REDACTED	20.55	3	No	-
	REDACTED	19.95	4	No	-
	REDACTED	12.44	6	Yes	-
	REDACTED	12.44	6	Yes	-
	REDACTED	14.30	5	No	-
	ASSET ELEMENT AVERAGE	25.10	-	-	-
SCHEME AVERAGE (INTER-SCHEME PRIORITY)		33.27	3	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 19.03)
This option is a Strategic Resource Option (SRO) for the West Country Water Resource Group and has followed the information presented in the Gate One Report (July 2021). The scheme involves pumped storage to increase the yield from a reservoir in Devon, which would reduce the SWW demand on a Exmoor Reservoir. This increases the available resource from which could be treated by South West Water (SWW) and pumped to Wessex Water via a new main.

Potential impact of this scheme

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. However, other factors can temper this risk, resulting in lower scores being calculated by the SRO tool, or the need for further qualitative clarification. The transfers as part of this scheme are direct to WTW or transporting already

treated water. INNS will not survive this process so the risk should be considered as low as reflected in the fact that no further biosecurity review is needed. Potential leaks, and washout and maintenance points along the pipeline do represent a potential for the accidental release of INNS; however, such releases are likely to be rare and of minimal impact and should therefore be considered as a comparatively low priority for biosecurity optioneering.

The proposed RWT element of the scheme requires further biosecurity review due to the transfer providing an overland route for species that would normally be isolated from movement between the respective source and receptor. There is no water treatment as part of this transfer, nor are there other circumstances that could reduce the risk of viable INNS movement.

Although the risk of INNS introduction and spread posed by this RWT is framed at the pathway scale, rather than species-specific, multiple INNS records were identified in the various elements of this scheme. Records for three INNS listed in section 9 of the Wildlife and Countryside Act. 1982: Japanese Knotweed (*Fallopia japonica*), Himalayan Balsam (*Impatiens glandulifera*), and Giant Hogweed (*Heracleum mantegazzianum*), were identified within the approximate area of the abstraction point. Though Japanese Knotweed is already present at Roadford Reservoir, it is feasible that a new RWT would provide a new route for the transfer of all three species and their propagules to the receptor location. Beyond Japanese Knotweed, three further INNS listed in section 9 of the Wildlife and Countryside Act. 1982: New Zealand Pigmyweed (*Crassula helmsii*), Yellow Archangel (*Lamiastrum galeobdolon subsp. Argentatum*), and an unspecified *Elodea* species (either Canadian or Nuttall's Waterweed (*Elodea canadensis/nutallii*)) were present within 1km, alongside Jenkins' Spire Snail (*Potamopyrgus antipodarum*). Furthermore, Chinese Muntjac (*Muntiacus reevesi*), Eastern Grey Squirrel (*Sciurus carolinensis*), American Mink (*Neovison vison*), Canada Goose (*Branta canadensis*), and Common Carp (*Cyprinus carpio*), were also identified within 1km of the various other assets associated with this scheme. Please see section 5.2 for more information on these species.

4.2 Scheme 21.14: Amesbury to Tidworth transfer

Summary 21.14 risk assessment scores

Category	Element	Risk Score	Risk rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	41.63	1	Yes	-
	RWT ELEMENT AVERAGE	41.63	-	-	-
Assets	REDACTED	10.04	3	Yes	-
	REDACTED	31.55	2	Yes	-
	REDACTED	32.75	1	Yes	-
	ASSET ELEMENT AVERAGE	24.78	-	-	-
SCHEME AVERAGE (INTER-SCHEME PRIORITY)		33.20	4	-	-

**It has been assumed that the new pumping station is located at REDACTED*

Scheme Summary (Wessex Water, Supply Options Spreadsheet 21.14)
The scheme involves Transfer of water from the Amesbury areas north towards Ludgershall

Potential impact of this scheme

The proposed RWT element of the scheme, has been identified as presenting a risk of INNS transfer and spread due to the transfer providing an overland route for species that would normally be isolated from movement between the respective source and receptor waterbodies. There is no water treatment as part of this transfer, nor are there other known circumstances or processes inherent to the option that would reduce the risk of viable INNS movement. This scheme will require further biosecurity review.

Although the risk of INNS introduction and spread posed by this RWT is framed at the pathway scale, rather than species-specific, records for one INNS listed in section 9 of the Wildlife and Countryside Act. 1982: Giant Hogweed, was identified within the approximate area of the abstraction point of the RWT. Please see section 5.2 for more information on this species.

4.3 Scheme 25.01 and 54.05: Mendips to Stour

Summary 25.01 and 54.05 risk assessment scores

Category	Element		Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED		40.63	1	Yes	Although the intra-Mendips transfer is within same risk area, it forms an operational part of the Mendips to Stour transfer. It would be sensible to review these two separate element together for the potential appropriate biosecurity interventions.
	REDACTED		34.00	2		
	RWT ELEMENT AVERAGE		37.31	-	-	-
Asset		REDACTED	21.27	1	Yes	-
		ASSET ELEMENT AVERAGE	21.27	-	-	-
Scheme average (inter-scheme priority)			29.29	5	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 25.01 and 54.05)

Option takes water from the Mendips quarry source and pumps this into the river Stour in Dorset to offset licence reductions and maintain existing abstraction in the Stour catchment.

Potential impact of the scheme

The Mendips quarry is not currently operating as a reservoir. The construction/ conversion is covered under the separate scheme, 32.11, which was previously risk assessed and presented in the previous version of the report but which no longer appears on the feasible or preferred list.

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. The Mendips quarry to Mendips highpoint pipeline is a very short pipeline that is required to transfer water to a point after which gravity can power the transfer to the River Stour. It is essentially an operational requirement of the overall RWT element of this scheme. The reality of the quarry to highpoint RWT is actually of very low, if not no risk of INNS transfer and spread. The source and receptor of this transfer are within the same risk area and very close to one another. For the purpose of biosecurity review, unless there is scope for a specific/ local biosecurity installation, this transfer can be considered to be part of the Mendips to Stour RWT. In this instance it is, therefore, more appropriate to use the RWT ELEMENT AVERAGE score to understand and prioritise the risk of INNS introduction and spread. With this considered, the linked RWT elements of the scheme are still determined to be a high risk and require further biosecurity review due to the transfer providing an overland route for species that would normally be isolated from movement between the respective source and receptor. There is no water treatment as part of this transfer, nor are there other circumstances that reduce the risk of viable propagules being transferred.

No INNS were identified within a 1km radius of the approximate location of the proposed reservoir at Mendips (Tor) Quarry. It is likely that the community of organisms at the Mendips quarry will change as the reservoir is developed and the habitat changes. This may pose introductory potential for opportunistic invaders beyond 1km away which were not detected in this assessment.

4.4 Scheme 30.02: Pump Storage - Quantock Reservoir

Summary 30.02 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	50.98	1	Yes	-
	RWT ELEMENT AVERAGE	50.98	-	-	-
Assets	REDACTED	62.89	1	Yes	-
	REDACTED	39.42	2	Yes	-
	RWT ELEMENT AVERAGE	51.16	-	-	-
Scheme average (inter-scheme priority)		51.07	2	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 30.02)
Pump storage scheme to help conserve reservoir storage in the winter for summer use, by pumping from a local river in winter time, when there is more flow in the river, into a reservoir in the Quantock hills.

Potential impact of this scheme

It has been identified as a high risk for the movement of aquatic INNS and should be considered for further biosecurity review and biosecurity implementation. The transfer provides an overland route for species that would normally be isolated from movement between the respective source and receptor (although the two assets do appear to share a natural connection in the other direction). There is no water treatment as part of this transfer, nor are there other circumstances that could reduce the risk of viable INNS transfer.

Records for one INNS listed in section 9 of the Wildlife and Countryside Act. 1982: Himalayan Balsam, and one species not listed: Jenkins' Spire Snail were identified within a 1km. It is feasible that a new RWT would provide a new route for the transfer of both species and propagules to the receptor location. Furthermore, records for four INNS listed in section 9 of the Wildlife and Countryside Act. 1982: New Zealand Pigmyweed, Canada Goose, Mandarin Duck (*Aix galericulata*), and Eastern Grey Squirrel, were identified within 1km. Please see section 5.2 for more information on these species.

4.5 Scheme 31.02: Raising Dams - Yeovil Reservoir

Summary 31.02 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
Assets	REDACTED	65.23	1	Yes	-
Scheme average (inter-scheme priority)		65.23	1	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 31.02)
Increase the capacity of an existing reservoir in the Yeovil area and the River Yeo by increasing the size of the current earth embankment.

Potential impact of this scheme

The proposed scheme [to raise the dam height, thereby increasing the volume of the reservoir] could potentially impact the distribution and abundance of INNS at and around the asset. The increased water level would result in a corresponding increase to wetted areas around the current perimeter of the reservoir. This change to habitat type, and the pathway of spread provided by the water could allow aquatic INNS currently at the site to extend their range, with a potential increase to net impact. Assuming the increased volume will correspond to a larger perimeter, an increase in available riparian habitat may also result. Increased habitat could provide INNS with a greater competitive advantage over native species and provide opportunities / habitat corridors for impact against presently isolated populations of native species.

Records for two INNS all listed in section 9 of the Wildlife and Countryside Act. 1982: Canada Goose, and Signal Crayfish (*Pacifastacus leniusculus*), and two species not listed: Common Carp and Jenkins' Spire Snail were identified within a 1km radius of the approximate perimeter of the reservoir. Please see section 5.2 for more information on these species. Although there is potential for INNS to expand their range at this asset as a result of the scheme, any movement would still be within the same water body and is unlikely to result in a change in the current ecological/ invasion status of the site.

4.6 Scheme 32.03: New Reservoir - Yeovil

Summary 32.03 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	36.48	1	No	New Pipeline
	REDACTED	30.48	2	No	New Pipeline
	REDACTED	24.85	3	No	New Pipeline
	REDACTED	22.85	4	No	New Pipeline
	REDACTED	20.88	5	No	New Pipeline
	RWT ELEMENT AVERAGE	27.01	-	-	
Assets	REDACTED	34.56	1	Yes	New Feature
	REDACTED	19.95	2	No	New Feature
	REDACTED	11.24	5	Yes	New Feature (assumed)
	REDACTED	14.30	3	No	Existing Feature
	REDACTED	11.90	4	No	Existing Feature
	ASSET ELEMENT AVERAGE	18.39	-	-	-
Scheme average		22.70	9	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 32.03)
New reservoir near Yeovil of 7000Ml in a tributary of the River Yeo catchment.

The proposed elements of this scheme include new infrastructure which will create new pathways and risk of INNS transfer and spread. The open nature of the new reservoir will allow for INNS to establish at the reservoir should they be introduced. Therefore, the reservoir itself should still be considered a high-risk element and should be considered for further biosecurity review and biosecurity measures.

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. However, other factors can temper this risk, resulting in lower scores being calculated by the SRO tool, or the need for further qualitative

clarification. All transfer pipelines are direct to WTW or are transporting already treated water. INNS will not survive this process so the risk should be considered as low as reflected in the fact that no further biosecurity review is needed. Potential leaks, and washout and maintenance points along the pipeline do represent a potential for the accidental release of INNS; however, such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity.

There are no recognised high priority pathways requiring further biosecurity review associated with this option because all the elements have WTWs as source or receptor.

Although the risk of INNS introduction and spread posed by this RWT is framed at the pathway scale, rather than species-specific, records for one INNS listed in section 9 of the Wildlife and Countryside Act. 1982: Canada Goose was identified, alongside two species not listed in section 9: Comon Carp and Jenkins' Spire Snail within the approximate location that the proposed Gallica WTW is due to be constructed. Furthermore, Jenkins' Spire Snail and American Mink were identified within 1km. Canada Goose was also identified. Please see section 5.2 for more information on these species.

4.7 Scheme 32.13: New Reservoir - Dorset Frome

Summary 32.13 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	43.63	1	Yes	-
	REDACTED	35.10	2	No	-
	REDACTED	29.10	3	No	-
	RWT ELEMENT AVERAGE	35.94	-	-	-
Assets	REDACTED	14.24	3	Yes	-
	REDACTED	18.75	2	No	-
	REDACTED	30.35	1	Yes	-
	ASSET ELEMENT AVERAGE	21.11	-	-	-
Scheme average (inter-scheme priority)		28.53	6	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 32.13)
New reservoir in the River Frome catchment near Dorchester.

Potential impact of this scheme

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. However, other factors can temper this risk, resulting in lower scores being calculated by the SRO tool, or the need for further qualitative clarification. The transfers are direct to WTW or transporting already treated water. INNS will not survive this process so the risk should be considered as low as reflected in the fact that no further biosecurity review is needed. Potential leaks, and washout and maintenance points along the pipeline do represent a potential for the accidental release of INNS; however, such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity.

The proposed RWT element of the scheme has been identified as high risk and requires further biosecurity review due to it being a possible priority pathway for the movement of aquatic INNS. The transfer provides an overland route for species that would normally be

isolated from movement between the respective source and receptor. There is no water treatment as part of this transfer, nor are there other circumstances that could reduce the risk of viable INNS transfer. This is especially important as Himalayan Balsam is a known INNS located within 1km.

It should also be noted that the RWT which has a receptor joining a main pipeline is likely scoring a higher risk score than is true. This is because the SRO tool considers designated sites and priority habitats located at the receptor which will not be applicable because the connection to the main pipeline is likely to remain piped, and therefore not influence the surrounding receptor area. This being said, there is still some risk that should be considered from potential leakage, and washout and maintenance points in and around this area of the transfer, though such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity.

Although the risk of INNS introduction and spread posed by this RWT is framed at the pathway scale, rather than species-specific, records for one INNS listed in section 9 of the Wildlife and Countryside Act. 1982: Himalayan Balsam was identified in the approximate area of the abstraction point of the RWT. One further INNS, American Mink, was also identified in this area, though they are a terrestrial mammal and unlikely to be transferred via this pathway. Please see section 5.2 for more information on this species. Himalayan Balsam is not known to be present, it is therefore feasible that a new RWT from the River Frome would provide a new route for the transfer of Himalayan Balsam propagules to the receptor location. Wessex Water should consider additional biosecurity options targeted towards Frome pumping station.

4.8 Scheme 32.24: New Reservoir - Parrett

Summary 32.24 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	44.50	1	Yes	New Pipeline
	REDACTED	31.10	2	No	New Pipeline
	REDACTED	25.48	3	No	New Pipeline
	RWT ELEMENT AVERAGE	33.69	-	-	
Assets	REDACTED	32.75	1	Yes	New Feature
	REDACTED	19.95	2	No	New Feature
	REDACTED	12.44	3	Yes	New Feature (Assumed)
	ASSET ELEMENT AVERAGE	21.71	-	-	-
Scheme average		27.70	7	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 32.24)
New reservoir in the River Parrett catchment near Yeovil.

Potential impact of this scheme

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. However, other factors can temper this risk, resulting in lower scores being calculated by the SRO tool, or the need for further qualitative clarification. The transfers associated with this scheme are direct to WTW or transporting already treated water. INNS will not survive this process so the risk should be considered as low as reflected in the fact that no further biosecurity review is needed. Potential leaks, and washout and maintenance points along the pipeline do represent a potential for the accidental release of INNS; however, such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity.

The proposed RWT element of the scheme has been identified as high risk and requires further biosecurity review due to it being a possible priority pathway for the movement of aquatic INNS. The transfer provides an overland route for species that would normally be

isolated from movement between the respective source and receptor. There is no water treatment as part of this transfer, nor are there other circumstances that could reduce the risk of viable INNS transfer.

It should also be noted that the RWT which has a receptor joining a main pipeline is likely scoring a higher risk score than is true. This is because the SRO tool considers designated sites and priority habitats located at the receptor which will not be applicable because the connection to the main pipeline is likely to remain piped, and therefore not influence the surrounding receptor area. This being said, there is still some risk that should be considered from potential leakage, and washout and maintenance points in and around this area of the transfer, though such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity, or biosecure aware maintenance.

Although the risk of INNS introduction and spread posed by this RWT is framed at the pathway scale, rather than species-specific, records for one INNS listed in section 9 of the Wildlife and Countryside Act. 1982 was identified within 1km of the source, that being Himalayan Balsam. Records of two INNS not listed in Schedule 9, Common Carp and Jenkins' Spire Snail, were also present. It is feasible that a new RWT would provide a new route for the transfer of all three species and propagules to the receptor location. Please see section 5.2 for more information on these species.

4.9 Scheme 32.36: New Reservoir - Bristol Avon

Summary 32.36 risk assessment scores

Category	Element	Risk Score	Risk Rank	Biosecurity option review required?	Additional Comments
RWT	REDACTED	41.88	1	Yes	-
	REDACTED	31.10	2	No	-
	REDACTED	20.48	3	No	-
	RWT ELEMENT AVERAGE	31.15	-	-	-
Assets	REDACTED	12.44	4	Yes	New Pumping Station (assumed)
	REDACTED	30.35	1	Yes	New reservoir
	REDACTED	18.75	2	No	New WTW
	REDACTED	13.10	3	No	-
	ASSET ELEMENT AVERAGE	18.66	-	-	-
Scheme average		24.90	8	-	-

Scheme Summary (Wessex Water, Supply Options Spreadsheet 32.36)
New reservoir in the Bristol Avon catchment near Chippenham.

Potential impact of this scheme

The proposed RWTs are new infrastructure which create new pathways, and as such present increased risk of INNS introduction and spread. However, other factors can temper this risk, resulting in lower scores being calculated by the SRO tool, or the need for further qualitative clarification. The transfers associated with this scheme are direct to WTW or transporting already treated water. INNS will not survive this process so the risk should be considered as low as reflected in the fact that no further biosecurity review is needed. Potential leaks, and washout and maintenance points along the pipeline do represent a potential for the accidental release of INNS; however, such releases are likely to be rare and of minimal impact, and should therefore be considered as a comparatively low priority for biosecurity.

The proposed RWT element of the scheme has been identified as high risk and requires further biosecurity review due to it being a possible priority pathway for the movement of aquatic INNS. The transfer provides an overland route for species that would normally be isolated from movement between the respective source and receptor. There is no water treatment as part of this transfer, nor are there other circumstances that could reduce the risk of viable INNS transfer.

Although the risk of INNS introduction and spread posed by this scheme is framed at the pathway scale, rather than species-specific, records for three INNS listed in section 9 of the Wildlife and Countryside Act. 1982 that could be transferred by the RWT element were identified: Himalayan Balsam, Signal Crayfish, and Water Fern (*Azolla filiculoides*). It is feasible that a new RWT would provide a new route for the transfer of all three species and propagules to the receptor location. Canada Goose, Chinese Muntjac, and Mandarin Duck were also identified at RWT source locations, though these are terrestrial birds / mammals so do not pose a risk of transfer via this pathway. Please see section 5.2 for more information on these species.

4 Invasive species risk and mitigation

5.1 Mitigation options

Although not specifically provided within this report, biosecurity measures are pragmatic procedures and behaviours that reduce the risk of INNS introduction and spread. In an ideal world, biosecurity procedures would close a pathway and no longer allow any INNS to be translocated by that route. It is possible to achieve this by the complete elimination of the pathway, for example banning all boating from a reservoir, or shutting down a RWT would completely mitigate those pathways; however, biosecurity measures need to be realistic and find a balance between the precautionary principle and operational needs. INNS introduction pathways are dynamic and can be influenced by other/ unexpected factors; therefore, realistic and cost-effective biosecurity procedures should be strategically chosen, provide a good cost-benefit and, importantly, aim to reduce the number of introductions along a pathway to a level by which the chance of establishment is also reduced.

5.2 Invasive species present at scheme locations

NBN invasive species records were taken from within a 1km buffer around a known waterbody if listed in the schemes taken forward for advanced screening, or within the approximate location of any other asset listed in the scheme (as exact coordinates for these locations were not included in the summary). It should also be caveated that the NBN records only show the INNS that have been found at the specific locations queried; there is every possibility that unrecorded or upstream INNS are present at the source location, beyond the area that was assessed.

Species Name	Schedule 9 Species?	Options Present	Description
American Mink (*Neovison vison*)	Yes	19.03, 32.03, 32.13	American Mink are terrestrial mammals that are highly damaging to native wildlife particularly waterfowl, fish and water vole, on which it predates. This can impact local biodiversity.
Canada Goose (*Branta canadensis*), Mandarin Duck (Aix galericulata)	Yes	19.03, 30.02, 31.02, 32.03, 32.36	These Anatidae species are competitors against native species and a possible disease vector (avian influenza), they can be damaging to natural and agricultural habitats and can negatively impact recreation areas through fouling. Although comparatively rare and resulting in only minor or no injury, there are records of aggression towards animals and people.
Canadian / Nuttall's Waterweed (*Elodea canadensis/nutallii*)	Yes / No	19.03	Both *Elodea* species, Canadian and Nuttall's waterweed are two very similar invasive aquatic plants. Their fast growth outcompetes most native species, they have the potential to cause big fluctuations in the amount of oxygen available in the water, as well as impede flow and increase flooding in due to their dense nature.
Chinese Muntjac (*Muntiacus reevesi*)	Yes	19.03, 32.26	Chinese Muntjac are a small terrestrial deer species that was introduced to Great Britain in the early 20th century. Foraging by this species, particularly when in high densities, disturbs forests and private gardens. Muntjac also pose a collision risk on roads.
Common Carp (*Cyprinus carpio*)	No	19.03, 31.02, 32.03, 32.24	Common Carp are a species of freshwater fish that is commonly stocked for sport in lakes, though has been known to escape in times of flood. As bottom feeders, they can increase water turbidity which decreases macrophyte populations. Common Carp also compete with native species.
Eastern Grey Squirrel (*Sciurus carolinensis*)	Yes	19.03, 30.02	A terrestrial mammal, the Eastern Grey Squirrel is widespread across much of Great Britain. Most famously, they frequently outcompete the native Red Squirrel leading to a significant decline in their numbers. The species can also damage trees via bark stripping.
Giant Hogweed (*Heracleum mantegazzianum*)	Yes	19.03, 21.14,	Giant Hogweed is a large terrestrial and riparian plant which outcompetes native species and can lead to riverbank erosion and increased flood risk. The species provides a health hazard with its sap causing blistering when in contact with skin.

Species Name	Schedule 9 Species?	Options Present	Description
Himalayan Balsam (*Impatiens glandulifera*)	Yes	19.03, 30.02, 32.13, 32.24, 32.26	Although widely spread throughout the UK, there is a requirement to ensure that care is taken to not spread this INNS further. The plant grows in ecologically sensitive habitats and is a competitor to native flora. This plant is popular with pollinating insects, spreading it far and posing direct competition to native flowering plants. Its dense presence on riverbanks paired with its shallow root system often destabilises the bankside and poses a flood risk where the plant is most dense.
Japanese Knotweed (*Fallopia japonica*)	Yes	19.03	A tall perennial plant which forms dense stands. It has bright green leaves found in a zig zag pattern with red to purple flecks on its hollow stems. It flowers August to October producing hundreds of small white flowers. The plant does not yet produce fertile seeds in the UK and as a result spread is only attributed to spreading fragments of its roots and stem, usually in contaminated soil. Its impacts include shading and outcompeting native flora but also its strong roots can grow into and damage concrete. A particular problem is for structures where it can severely damage foundations.
Jenkins' Spire Snail (*Potamopyrgus antipodarum*)	No	19.03, 30.02, 31.02, 32.03, 32.24	Jenkins' spire snail (syn. New Zealand mud snail) are aquatic organisms, and very robust. It is feasible that they could be transferred by this pathway. The species is highly fecund and known for being of significant invasiveness. The species can reach incredibly high densities whereby they can affect the abiotic conditions of an ecosystem, specifically the nitrogen fixation rate. They also outcompete and displace native species.
New Zealand Pigmyweed (*Crassula helmsii*)	Yes	19.03, 30.02	New Zealand Pigmyweed is a small succulent herb that can grow on land, as an emergent aquatic or submerged within the water column. The plant itself is quite fragile leading to easy breakage and has small green succulent leaves with tiny white flowers. It can produce seeds (although very rarely) and primarily spreads through fragmentation which can easily be caught in clothing and equipment. It forms dense and extensive carpets which outcompete native species.
Signal Crayfish (*Pacifastacus leniusculus*)	Yes	31.02, 32.26	Signal Crayfish have a distinctive red underside to its claws. Females can produce up to 400 eggs per season. Crayfish can also walk over land to find other suitable waterbodies and therefore waterbodies need not be connected for spread. Juveniles can be easily moved with angling and water sports equipment, and watercraft. The main impacts of crayfish are the predation of macroinvertebrates and fish. Additionally, it burrows into riverbanks leading to increased sediment loading and bank destabilization. Signal crayfish are also carriers of crayfish plague that causes no harm to the species itself but is devastating to native white clawed crayfish. The plague can easily be carried via wet equipment and clothing if not thoroughly cleaned in between waterbodies.

Species Name	Schedule 9 Species?	Options Present	Description
Water Fern (*Azolla filiculoides*)	Yes	32.36	Water Fern has small leaves with a rough granular appearance. Black / brown roots under these leaves. The species is often green in spring / summer and red during autumn / winter. The species can outcompete native vegetation and reduce oxygen levels in the water. The species also reduces water quality and increases water loss.
Yellow Archangel (*Lamiastrum galeobdolon subsp. argentatum*)	Yes	19.03	Yellow archangel is a hairy perennial with leaves that resemble stinging nettle. The plant produces yellow flowers that grow up the stem. Preferring shaded habitats this invasive plant grows in dense mats that smother and outcompete native flora whilst providing poor food and shelter for wildlife. It produces seeds and can spread through fragmentation which can easily be caught in clothing and equipment.

5 Preferred programme

5.2 INNS risk associated with the options under the preferred programme

The preferred programme for Wessex Water's draft WRMP24 is presented below, along with a summary of the INNS results at the option-level.

Table 1 Wessex Water WRMP24 draft plan preferred programme

Scheme ref	Scheme title	INNS screening result	INNS advanced screening
9.16	Temporary use bans	Screened Out	n/a
9.19	Reduced levels of service, moving to 1:500 to 1:200	Screened Out	n/a
22.04	Weymouth Source Improvements	Screened out	n/a
39.01	Under-utilised licence - East Weymouth Source	Screened out	n/a
39.02	Under-utilised Licence - North Warminster	Screened out	n/a
41.01	Drought Permit - Stour catchment	Screened out	n/a
41.06	Drought Permit - Bride catchment	Screened out	n/a
57.07	Demand Strategy 7	Screened out	n/a
59.01	Stream Support at Mere	Screened out	n/a
70.01	Bristol Import and onwards transfer I	Screened out	n/a
70.06	Increased Reservoir Capacity and East Transfer	Screened out	n/a

5.2 Preferred programme summary

Of the 11 options outlined in the preferred programme, all were screened out during the INNS assessment initial screening as presenting no INNS risk.

6 INNS Data References

Rightsholders	Data Providers
Biological Records Centre	Biological Records Centre
Botanical Society of Britain and Ireland and Biological Records Centre	Botanical Society of Britain and Ireland
BTO	British Trust for Ornithology
Environment Agency	Environment Agency
The Mammal Society, and Biological Records Centre	Mammal Society

NBN Atlas occurrence download at https://nbnatlas.org accessed on Mon Jul 10 15:11:28 UTC 2023

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