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Northumbrian Water - Water Resources Management Plan 2024

Environmental Report - Appendix I

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Environmental Report - Appendix I

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Contents

I. Invasive Non-Native Species

I.1 Purpose of document

I.1.1 This document describes a high-level methodology for assessing the risk of transfer of aquatic invasive non-native species (INNS) associated with water resource options being considered under Water Resources Management Plan 2024 (WRMP24).

I.2 Methodology

Level 1 screening

Overview

I.2.1 This methodology is based on the concept of risk as the product of the frequency and severity of INNS being transferred as the result of a water resource management options. Therefore, the methodology involves an assessor determining a **Frequency of Impact** and **Severity of Impact** which are combined to give an overall **Magnitude of Risk**.

Frequency of Impact

I.2.2 Within this methodology, Frequency of Impact is analogous to the frequency with which water would be transferred under the water resource option being assessed. Therefore, the assessor should determine the Frequency of Impact on a three-point scale of Infrequent/Periodical/Regular, as shown in Table I.1 below.

Table I.1: INNS assessment Frequency of Impact scale.

Frequency of Impact	Criteria
Infrequent	Only occurs in emergency or during situations not considered part of the normal running of the scheme
Periodical	Will happen during start up or shut down, or periodically during routine maintenance or operation of the option
Regular	Will occur throughout the regular operation of the option

Severity of Impact

I.2.3 Severity of Impact should be determined using a four-point scale of Very Low/Low/Medium/High as shown in Table I.2 below. For the purpose of this assessment, ‘waterbodies’ include natural as well as heavily modified waters such as estuaries, rivers, streams, ponds, lakes and wetlands. Artificial waterbodies such as ponds, lakes, canals, and reservoirs are also included in this definition where they are open and able to interact with the surrounding environment. Artificial underground/closed storage reservoirs are not included in this definition as they have negligible conservation value and are closed from transferring species both to and from the wider environment. Consequently, there are no inherent risks associated with these assets unless they facilitate the connectivity to other waterbodies, in which case this should be accounted for in the assessment of risk.

- Severity of Impact is considered **Very Low** when the water source is treated water, effluent, or groundwater (and therefore highly likely to be free of INNS), and no water is transferred between waterbodies.
- Severity of Impact is considered **Low** where treated water, effluent, or groundwater (which is highly likely to be free of INNS) would be transferred using an existing pathway between water bodies.
- Severity of Impact is considered **Medium** when the option would result in a change (presumed increase) in the volume of transfer between waterbodies already connected, where the transferred water may contain INNS.
- Severity of Impact is considered **High** when the option would involve the creation of a new pathway between waterbodies not already connected, where the transferred water may contain INNS; or where the option has the potential to cause the introduction of new INNS not currently known in the UK.

Table I.2: INNS assessment Severity of Impact scale.

Severity	Criteria
Very Low	Treated water, effluent or groundwater
Low	Existing pathway between waterbodies or treated water/groundwater/effluent with no INNS risk being transferred
Medium	Change in volume of transfer between waterbodies which are already connected
High	New pathway between waterbodies not currently connected or potential to introduce new INNS not currently observed in the UK

Magnitude of Risk

I.2.4 The Magnitude of Risk is found by cross-referencing the Frequency of Impact and the Severity of Impact using the matrix shown in Table I.3 below.

Table I.3: INNS assessment Magnitude of Risk matrix.

Severity/ Frequency	Infrequent	Periodical	Regular
Very Low	1 = Very Low	1 = Very Low	1 = Very Low
Low	2 = Low	2 = Low	3 = Low
Medium	3 = Low	4 = Moderate	4 = Moderate
High	4 = Moderate	5 = High	6 = High

Screening for Level 2 assessment

I.2.5 Following the Level 1 screening, options which are assessed as Low, Moderate or High Risk were progressed to a Level 2 assessment. The Level 2 assessment methodology is shown in paragraphs I.2.6 to I.2.11 below.

Level 2 assessment

I.2.6 The Level 2 assessment methodology utilised the Strategic Resource Option (SRO) Aquatic INNS Risk Assessment Tool (SAI-RAT; "the tool") developed by APEM on behalf of the Environment Agency (EA) to quantify the INNS risk associated with all WRMP options, based on the conceptual design information currently available.

I.2.7 Risk assessments are processes by which the level of risk presented by certain hazards can be assessed, where hazards are anything that can cause harm. The level of risk is typically the combination of the chance and extent of the harm which could be caused. In the case of the tool, the hazard is the potential movement of INNS along key pathways, and the risk is the chance of that movement occurring combined with the extent of the harm this could cause.

I.2.8 The tool takes a pragmatic pathway and source-pathway-receptor model approach to the assessment of INNS risk relating to assets and raw water transfers (RWTs). A desk-based search for INNS within 1km of the source and pathway is undertaken. The list of High Impact INNS that were cross-referenced for these assessments is detailed within the UKTAG Guidance[1] revised classification of aquatic alien species – this includes aquatic and riparian species.

I.2.9 The SAI-RAT takes the form of a Microsoft Excel spreadsheet, into which data and information about water transfer options are entered by the assessor to automatically generate an Overall Risk Score. Risk Scores are presented as a percentage of the highest potential score, with a higher score signifying an increased risk of introducing and transferring INNS.

I.2.10 The SAI-RAT requires a significant amount of information about options to be entered in order to assess the level of risk. As options may be in an early stage of conceptualisation, the full range of information was not available for all WRMP options. It is likely that a failure to complete fields in the absence of information would result in the general under-estimation of risk; therefore, an alternate approach was adopted for the assessment of INNS risk for these WRMP options. This method was adopted to find a consistent way to populate the tool for options with limited information available. This approach uses pre-determined default values for criteria where information is not yet available. Appropriate default 'assumed values' were agreed during a workshop in June 2022 (attended by water companies undertaking INNS risk assessments for WRMP24, and assessors working on their behalf). These assumed values are intended to represent the most likely or realistic input values. The use of assumed values in this way gives an estimation of a typical interaction with a pathway or asset, allowing a cautious assessment of risk to be made in the absence of specific information. Assumed values are described and detailed in Section 1.4.

I.2.11 The proposed decision process for entering information into the SAI-RAT tool is shown below:

- For any given criterion, if information is available for the option, then this should be entered into the tool.
- If information is not available, 'Unknown' should be selected if available.

[1] UK TAG WFD (2021), UK Technical Advisory Group on the Water Framework Directive Revised classification of aquatic alien species according to their level of impact. [online]. Available at: <https://wfduk.org/sites/default/files/UKTAG%20classification%20of%20alien%20species%20working%20paper%20v8.pdf> [Accessed 26th September 2023].

- If 'Unknown' is not available to select, then an assumed value should be entered.

I.2.12 The Level 2 assessment input tables for the Supplying Teesside Industrial Water option are shown below. The SAI-RAT RWT components are shown in Table I.4: SAI-RAT RWT components. and the asset components are shown in Table I.5: SAI-RAT Asset component inputs and Table I.6: SAI-RAT Asset component inputs

Table I.4: SAI-RAT RWT components.

SAI-RAT criterion	Low Worsall to Kirkleatham Reservoir	Blackwell Pumping Station to Gately Moor Reservoir	Blackwell Pumping Station to Long Newton Reservoir	Low Worsall to I.C.I Reservoir	Assumptions / comments
Source Name	Low Worsall Pumping Station	Blackwell Pumping Station	Blackwell Pumping Station	Low Worsall Pumping Station	N/A
Source Management Catchment	Tees	Tees	Tees	Tees	N/A
Source Operational Catchment	Tees Lower and Estuary	Tees Middle	Tees Middle	Tees Lower and Estuary	N/A
Source Waterbody ID	GB103025072595	GB103025072190	GB103025072190	GB103025072595	N/A
Source Type	River	River	River	River	N/A
Number of RWT inputs into source	Unknown	Unknown	Unknown	Unknown	N/A
Pathway Type	Pipeline	Pipeline	Pipeline	Pipeline	N/A
Receptor Name	Kirkleatham Reservoir	Gately Moor Reservoir	Long Newton Reservoir	ICI Reservoir	N/A
Receptor Management Catchment	Tees	Tees	Tees	Tees	N/A
Receptor Operational Catchment	Tees Lower and Estuary	Tees Lower and Estuary	Tees Lower and Estuary	Tees Lower and Estuary	N/A
Receptor Waterbody	GB103025072320	GB103025072280	GB103025072550	GB103025072320	N/A
Receptor Type	Offline waterbody	Offline waterbody	Offline waterbody	Offline waterbody	N/A
Isolated Receptor Catchment	No	No	No	No	N/A
Volume of Water (Ml/day)	101-150 Ml/d	151-200 Ml/d	151-200 Ml/d	101-150 Ml/d	Based on available information at time of assessment.
Frequency of Operation	Year round - continuous, variable flow	Year round - continuous, variable flow	Year round - continuous, variable flow	Year round - continuous, variable flow	Worst case approach taken as limited information available at time of assessment.

SAI-RAT criterion	Low Worsall to Kirkleatham Reservoir	Blackwell Pumping Station to Gately Moor Reservoir	Blackwell Pumping Station to Long Newton Reservoir	Low Worsall to I.C.I Reservoir	Assumptions / comments
Transfer Distance (km)	20.1-25	10.1-15	10.1-15	20.1-25	Exact pathway unknown and direct line from abstraction to receptor used.
Washout/maintenance points outside of catchments	Unknown	Unknown	Unknown	Unknown	Unknown at time of assessment.
Details of washout/maintenance points	N/A	N/A	N/A	N/A	N/A
Source Navigable	Unknown	Unknown	Unknown	Unknown	N/A
Pathway Navigable	No	No	No	No	N/A
Angling at Source	Unknown	Unknown	Unknown	Unknown	N/A
Angling on Pathway	No	No	No	No	N/A
Water sports at Source	Unknown	Unknown	Unknown	Unknown	N/A
Water sports on Pathway	No	No	No	No	N/A
Presence of high priority INNS Source	Known to be present	Known to be present	Known to be present	Known to be present	Exact pathway unknown and direct line from abstraction to receptor used.
Presence of high priority INNS Pathway	Known to be present	Known to be present	Known to be present	Known to be present	Exact pathway unknown and direct line from abstraction to receptor used.
Details of INNS present	Himalayan balsam *Impatiens glandulifera*, Nuttall's pondweed *Elodea nuttallii*, Japanese knotweed *Reynoutria japonica*, giant hogweed *Heracleum mantegazzianum*	Signal crayfish, Himalayan balsam *Impatiens glandulifera*, giant hogweed *Heracleum mantegazzianum*	Signal crayfish, Himalayan balsam *Impatiens glandulifera*, giant hogweed *Heracleum mantegazzi*anum, curly waterweed *Lagarosiphon major*	Himalayan balsam *Impatiens glandulifera*, Nuttall's pondweed *Elodea nuttallii*, Japanese knotweed *Reynoutria japonica*, Giant hogweed *Heracleum mantegazzianum*	Exact pathway unknown and direct line from abstraction to receptor used.
Highest order site designation Receptor	None	None	None	None	Exact pathway unknown and direct line from abstraction to receptor used.

SAI-RAT criterion	Low Worsall to Kirkleatham Reservoir	Blackwell Pumping Station to Gately Moor Reservoir	Blackwell Pumping Station to Long Newton Reservoir	Low Worsall to I.C.I Reservoir	Assumptions / comments
Presence of priority habitat pathway	Known to be present	Known to be present	Known to be present	Known to be present	Exact pathway unknown and direct line from abstraction to receptor used.
Presence of priority habitat receptor	Known to be present	Not known to be present	Known to be present	Known to be present	Exact pathway unknown and direct line from abstraction to receptor used.
Details of priority habitat present	Priority Habitat Inventory - Deciduous Woodland (England)Priority Habitat Inventory - Lowland Heathland (England)	Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England)Priority Habitat Inventory - Lowland Heathland (England)	Exact pathway unknown and direct line from abstraction to receptor used.
Other existing connections between source and receptor	Unknown	Unknown	Unknown	Unknown	N/A
Details of other existing connections	N/A	N/A	N/A	N/A	N/A

Table I.5: SAI-RAT Asset component inputs – Low Worsall Pumping Station, Blackwell Pumping Station, and Gately Moor Reservoir.

SAI-RAT criterion	Low Worsall Pumping Station	Blackwell Pumping Station	Gately Moor Reservoir	Assumptions/comments
Asset Type	Pumping Station	Pumping Station	Reservoir	N/A
Asset Location	Low Worsall	Blackwell	Gately Moor	N/A
Asset Size (m^2)	Unknown	Unknown	Unknown	N/A
Existing high impact INNS records on site/area of proposed site	Known to be present	Known to be present	Not surveyed - unknown	N/A
Details of high impact INNS present	Himalayan balsam, giant Hogweed	Signal crayfish, Himalayan balsam, giant hogweed	N/A	N/A
Existing Priority Habitats on Site	Known to be present	Known to be present	Not known to be present	N/A
Details of existing priority habitats present	Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England)	N/A	N/A

SAI-RAT criterion	Low Worsall Pumping Station	Blackwell Pumping Station	Gately Moor Reservoir	Assumptions/comments
Highest order site designation of asset	None	None	None	N/A
Staff site visit (not entering water) frequency	1.5	1.5	2	Assumed value
Staff site visit entering or in contact with raw water frequency	0	0	2	Assumed value
Road Vehicle site visit frequency	1.5	1.5	2	Assumed value
Maintenance not entering water frequency	1.5	1.5	1	Assumed value
Maintenance in contact with raw water frequency	0	0	1	Assumed value
Angling equipment frequency	0	0	0	Assumed value
Live bait frequency	0	0	0	Assumed value
Fish stocking frequency	0	0	0	Assumed value
Large vessels (over 28ft) frequency	0	0	0	Assumed value
Small vessel (under 28ft) frequency	0	0	0	Assumed value
Water sports equipment (SUPs, Canoe, Kayaks) frequency	0	0	0	Assumed value
Water Safety Equipment Temporary moorings, jetties, inflatables, buoys) frequency	0	0	2	Assumed value
Mammals/waterfowl on site frequency	0	0	2	Assumed value
Transfer of waste sludge to land frequency	0	0	0	Assumed value
Recreational walker/jogger/runner frequency	0	0	0	Assumed value

Table I.6: SAI-RAT Asset component inputs – Long Newton Reservoir, Kirkleatham Reservoir, and LCJ Reservoir.

SAI-RAT criterion	Long Newton Reservoir	Kirkleatham Reservoir	I.C.I Reservoir	Assumptions/comments
Asset Type	Reservoir	Reservoir	Reservoir	N/A
Asset Location	Long Newton	Kirkleatham	Lazenby	N/A
Asset Size (m^2)	Unknown	Unknown	Unknown	N/A
Existing high impact INNS records on site/area of proposed site	Not recorded	Not recorded	Not recorded	N/A
Details of high impact INNS present	N/A	N/A	N/A	N/A
Existing Priority Habitats on Site	Known to be present	Known to be present	Known to be present	N/A

SAI-RAT criterion	Long Newton Reservoir	Kirkleatham Reservoir	I.C.I Reservoir	Assumptions/comments
Details of existing priority habitats present	Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England)	N/A
Highest order site designation of asset	None	None	None	N/A
Staff site visit (not entering water) frequency	2	2	2	Assumed value
Staff site visit entering or in contact with raw water frequency	2	2	2	Assumed value
Road Vehicle site visit frequency	2	2	2	Assumed value
Maintenance not entering water frequency	1	1	1	Assumed value
Maintenance in contact with raw water frequency	1	1	1	Assumed value
Angling equipment frequency	0	0	0	Assumed value
Live bait frequency	0	0	0	Assumed value
Fish stocking frequency	0	0	0	Assumed value
Large vessels (over 28ft) frequency	0	0	0	Assumed value
Small vessel (under 28ft) frequency	0	0	0	Assumed value
Water sports equipment (SUPs, Canoe, Kayaks) frequency	0	0	0	Assumed value
Water Safety Equipment Temporary moorings, jetties, inflatables, buoys) frequency	2	2	2	Assumed value
Mammals/waterfowl on site frequency	2	2	2	Assumed value
Transfer of waste sludge to land frequency	0	0	0	Assumed value
Recreational walker/jogger/runner frequency	0	0	0	Assumed value

Limitations and assumptions

I.2.13 Several input values within the risk assessment tool were not known at this stage of the design and therefore the value ‘Unknown’ was selected (see Section 1.7). Selecting

Unknown within the tool results in a median risk score being added for that criterion which may not be an accurate reflection of the actual risk.

I.2.14 As described in paragraph I.2.10, 'assumed values' (detailed in Section 1.7) were used where 'Unknown' was not available as an option within the tool.

I.2.15 The overall level of risk indicated may be subject to change as further information about options become available and the results are updated with more representative input data.

I.2.16 Water abstractions, transfers and discharges have the potential to alter INNS habitat suitability or dispersal rates within waterbodies by altering flow regimes and water quality. Such risks are not accounted for within SAI-RAT, which focuses on the pathways which an option may create or exacerbate. Such impacts may need to be assessed at a later stage in option development.

I.2.17 Recommendations for operational biosecurity measures are not being considered at this stage due to the limited information available for the options.

I.2.18 For the Level 2 assessment of the Supplying Teesside Industrial Water option, the RWT component from Blackwell Pumping Station considers the risk of the whole transfer and not just the increased risk associated with the greater volume of water which will be transferred as part of the scheme. This should be taken into account in interpretation of the resulting risk scores and is discussed in paragraph I.3.4.

I.2.19 For the Level 2 assessment of the Supplying Teesside Industrial Water option, It was assumed that there will be no recreational activity associated with the reservoirs involved in this scheme.

I.3 INNS assessment results – all Northumbrian Water WRMP24 options

I.3.1 The results of the Level 1 screening assessments are shown in Table I.7: INNS options Level 1 screening results – Northumbrian Water WRMP24. Five of the six options were screened as presenting a Very Low risk of INNS transfer and were not progressed to a Level 2 assessment.

I.3.2 One option – Supplying Teesside Industrial Water – was screened as presenting a High risk of INNS transfer and as such was progressed to a Level 2 assessment.

Table I.7: INNS options Level 1 screening results – Northumbrian Water WRMP24.

Option ID	Option name	Frequency of Impact	Severity of Impact	Magnitude of Risk	Comments
BOT-TRA-001	Warkworth WTW to Berwick Upon Tweed Transfer	Regular	Very Low	1 =Very Low	WTW and service reservoirs are both closed systems. Water is transferred via pipeline. Negligible risk of INNS being introduced at source, pathway, or receptor.
BOT-TRA-002	Warkworth Network to Berwick Upon Tweed Transfer	Regular	Very Low	1 = Very Low	Both service reservoirs are closed systems. Chemical dosing applied at source for hardness and alkalinity but will not affect INNS risk. Water is transferred via pipeline. Negligible risk of INNS being introduced at source, pathway, or receptor.
BOT-TRA-004	Watchlaw to Murton transfer	Regular	Very Low	1=Very Low	Transfer of water from one WTW to another via existing pipeline. Water transferred through closed system – therefore negligible risk of INNS being introduced at source, transfer, or receptor.
BOT-ABS-002	New Borehole at Duddo	Regular	Very Low	1= Very Low	Source water to be extracted from new borehole and transferred via new 2.1km pipeline and existing pipeline to Murton WTW. No open water is present in this option, therefore there is a negligible risk of INNS being introduced to the receptor, pathway, or source.
BOT-ABS-007	Fosberry Borehole Abstraction	Regular	Very Low	1=Very Low	Source water to be extracted from recommissioned borehole and transferred via existing pipeline to new Wooler WTW. No open water is present in this option, therefore there is a negligible risk of INNS being introduced to the receptor, pathway or source.
N/A	Supplying Teesside Industrial Water	Regular	High	5 = High	Source water to be abstracted from River Tees at two locations – Blackwell Pumping Station and Low Worsall Pumping station – for onwards transfer to associated reservoirs via a pipeline. Low Worsall Pumping Station is currently unconnected to the Kirkleatham and I.C.I reservoirs and this will be a new pathway. Blackwell Pumping Station is connected to Gately Moor Reservoir and Long Newton Reservoir, and this will be an increase in abstraction. The water transferred is untreated and there is associated risk of INNS being introduced to the receptor or pathway.

I.3.3 The results of the Level 2 assessment are summarised in Table I.8: INNS options Level 2 assessment results – Northumbrian Water WRMP24. This assessment generated an overall risk score of 39.16%. The highest component risk score was associated with the Blackwell Pumping Station to Long Newton Reservoir RWT, which had a risk score of 53.63%.

I.3.4 Although the Blackwell Pumping Station to Long Newton Reservoir RWT generated the highest risk score, both RWTs from Blackwell Pumping Station are already in operation; therefore, the additional risk of INNS transfer may be less than initially suggested by their risk scores. Under the current licenced use, Blackwell Pumping Station to Gately Moor Reservoir and Blackwell Pumping Station to Long Newton Reservoir would generate RWT scores of 50.63% and 52.63% respectively. The risk scores of 51.63% and 53.65% respectively calculated for this proposal do not, therefore, present a significant increase compared to the current licenced use.

I.3.5 As it is assumed that there will be no recreational activity associated with the reservoirs assessed in the Supplying Teesside Industrial Water scheme; the risk scores generated were relatively low for this asset type.

Table I.8: INNS options Level 2 assessment results – Northumbrian Water WRMP24.

Option ID	Option Name	Level 1 Risk Magnitude	Asset component	Asset score	RWT component	RWT score	Overall Risk Score
N/A	Supplying Teesside Industrial Water	High	Low Worsall Pumping Station	12.92%	Low Worsall to Kirkleatham Reservoir	48.38%	39.16%
			Blackwell Pumping Station	12.92%	Blackwell Pumping Station to Gately Moor Reservoir	51.63%*	
			Gately Moor Reservoir	34.38%	Blackwell Pumping Station to Long Newton Reservoir	53.63%*	
			Long Newton Reservoir	35.48%	Low Worsall to I.C.I Reservoir	48.38%	
			Kirkleatham Reservoir	35.48%			
			I.C.I Reservoir	35.48%			

*Under the current regime for Blackwell Pumping Station the two existing transfers, Blackwell Pumping Station to Gately Moor Reservoir and Blackwell Pumping Station to Long Newton Reservoir, would generate risk scores of 50.63% and 52.63% respectively.

I.4 Conclusions

I.4.1 The Level 1 screening assessments found that five options present a Very Low INNS transfer risk, and one option (Supplying Teesside Industrial Water) was screened as High INNS transfer risk. This option was screened as High risk as it involves a new transfer of raw water between waterbodies, specifically due to the reinstatement of the Low Worsall Pumping Station. This option was therefore progressed to a Level 2 assessment.

I.4.2 The Level 2 assessment of the Supplying Teesside Industrial Water option assessed the asset and RWT components of which it is comprised. The overall risk score calculated (combining all components) for the option was 39.16%.

I.4.3 The components which generated the highest risk scores were the two RWTs from Blackwell Pumping Station to reservoir receptors. However, as these transfers involve increasing the volume of existing RWT transfers rather than new transfers, the actual increased risk is lower than indicated by these scores.

I.4.4 The two reinstated RWTs from Low Worsall Pumping Station to receptor reservoirs are therefore considered to present the greatest increased INNS transfer risk, with both transfers generating a risk score of 48.48%.

I.4.5 The risk scores associated with all RWT components are elevated by records of high-impact INNS within 1km of sources and pathways, and the movement of raw water between WFD catchments. The risk scores associated with the reservoir components were relatively low for this asset type as they are assumed not be used for recreation.