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Essex & Suffolk Water - Water Resources Management Plan 2024 Environmental Report

Appendix I - Invasive Non-Native Species (INNS)

October 2024

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Appendix I - Invasive Non-Native Species (INNS)

October 2024

Issue and Revision Record

Revision	Date	Originator	Checker	Approver	Description
A	01/09/22	S S	C S	Ja F	Draft for client comment
B	03/10/22	S S	C S	I S	Draft for consultation
C	11/09/23	B FL	A A	N H	Updated following the addition of in-combination effects assessment
D	20/10/23	B FL	N H	C S Ja F	Updated following client comments.
E	16/10/24	Je F	T K	Ja F	Formatting updated, no material change in content

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I. Invasive Non-Native Species

I.1 Purpose of Document

I.1.1 This document identifies, quantifies and evaluates the risk of transfer of aquatic invasive non-native species (INNS) associated with water resource options being considered under Essex & Suffolk Water Resources Management Plan 24 (WRMP24).

I.1.2 A two-stage approach was applied to the INNS risk assessment of individual options:

1. 1. A Level 1 screening was undertaken for all feasible options to generate a high-level understanding of risk.
2. 2. Level 2 assessments were undertaken where determined as necessary by the outcome of the Level 1 screening. At Level 2 the INNS risk was rated using more detailed option information.

I.1.3 In addition, the potential for individual options to combine to create a greater overall INNS transfer risk was evaluated through a four-stage in-combination effects assessment process.

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. Table I.1 below shows the criteria for determining the Frequency of Impact rating.

Table I.1: Level 1 screening Frequency of Impact scale

Frequency of Impact	Criteria
None	Does not occur/no impact for which to determine a frequency.
Infrequent	Only occurs in emergency or during situations not considered part of the normal running of the option.
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.

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Severity of Impact

I.2.3 Severity of Impact was determined based on the connectivity that an option may create between waterbodies, with new hydrological connections between waterbodies posing a greater risk. Options involving waterbodies with an existing hydrological connection would pose less additional risk as INNS may already be able to move between them.

I.2.4 For the purpose of these assessment, 'waterbodies' included 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 were also included in this definition where they are open and able to interact with the surrounding environment. Artificial underground/closed storage reservoirs were not included in this definition as they have negligible conservation value and are closed from transferring species to- and from the wider environment.

I.2.5 An option involving the transfer of raw water to sealed infrastructure (e.g., artificial underground/closed storage reservoir) would create a relatively low risk, though some risk would be associated with potential leakage. Options involving the transfer of treated water or groundwater unlikely to contain INNS are considered to present a Very Low additional risk, whilst options relating to licence or infrastructure changes may not involve additional water transfer and are considered to have no impact to INNS transfer risk.

I.2.6 Table I.2 below shows the criteria for determining the Severity of Impact rating.

Table I.2: Level 1 screening Severity of Impact scale

Severity	Criteria
None	No additional severity of impact risk beyond risk associated with existing operations.
Very Low	Treated water, effluent or groundwater – assumed no aquatic or riparian INNS present.
Low	Existing pathway between waterbodies or treated water / groundwater / effluent with no risk of INNS 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.2.7 The Magnitude of Risk is determined by cross-referencing the Frequency of Impact and the Severity of Impact using the matrix shown in Table I.3 below. If 'None' was selected for Frequency of Impact and/or Severity of Impact, the Magnitude of Risk level was also determined to be 'None'.

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Table I.3: Level 1 screening Magnitude of Risk matrix

Frequency/Severity	None	Infrequent	Periodical	Regular
None	0 = None	0 = None	0 = None	0 = None
Very Low	0 = None	1 = Very Low	1 = Very Low	1 = Very Low
Low	0 = None	2 = Low	2 = Low	3 = Low
Medium	0 = None	3 = Low	4 = Moderate	4 = Moderate
High	0 = None	4 = Moderate	5 = High	6 = High

Progression to Level 2 Assessment

I.2.8 All options initially screened as having a Low, Moderate or High INNS transfer risk at Level 1 were progressed to Level 2 assessment.

Level 2 Assessment

Assessment Methodology

I.2.9 The Level 2 assessment methodology utilised the SRO Aquatic INNS Risk Assessment Tool (SAI-RAT)[1] ("the tool") developed by APEM on behalf of the Environment Agency (EA) to quantify the INNS risk associated with all options considered, based on the conceptual design information currently available.

I.2.10 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 the extent of the harm which could be caused. In the case of this 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. 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. 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 *UK Technical Advisory Group on the Water Framework Directive Revised classification of aquatic alien species according to their level of impact*[2] revised classification of aquatic alien species - this includes aquatic and riparian species.

I.2.11 The SAI-RAT takes data and information about water transfer options, entered by the assessor, to automatically generate an Overall Risk Score. Risk scores are presented as a percentage of

[1] APEM, 2021. SRO Aquatic INNS Risk Assessment Tool (SAI-RAT) – User Guide. Produced on behalf of the Environment Agency [pdf].

[2] WFD-UKTAG, 2015. 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://www.wfduk.org/sites/default/files/Media/Assessing%20the%20status%20of%20the%20water%20environment/UKTAG%20classification%20of%20alien%20species%20working%20paper%20v7.6.pdf> [Accessed 19 July 2023].

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the highest potential score, with a higher score signifying an increased risk of introducing and transferring INNS.

I.2.12 The SAI-RAT requires a significant amount of information about options to be entered in order to assess the level of risk. As WRMP options are in an early stage of conceptualisation, the full range of information was not available for all 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 WRMP options.

I.2.13 This alternative approach involved the use of default 'assumed values' in place of otherwise missing information. These assumed values were agreed during a workshop in June 2022 (attended by water companies undertaking INNS risk assessments for rdWRMP24, and assessors working on their behalf), and subsequently agreed with the EA. These assumed values are intended to represent the most likely or realistic input values where the tool does not allow for "Unknown" to be selected. The use of assumed values gives an estimation of a typical interaction with a pathway or asset, allowing a precautionary assessment of risk to be made in the absence of specific information.

I.2.14 The decision process for entering information into this risk assessment tool was as follows:

1. For any given criterion, if information was available for the option, then it was entered into the tool.
2. If information was not available, 'Unknown' was selected, if available in the tool. Selecting 'Unknown' within the tool results in a median risk score being added for that criterion.
3. If 'Unknown' was not available to select in the tool, then an assumed value was entered.

I.2.15 Specific inputs SAI-RAT for each Level 2 assessment are shown below. Assumed values are shown subsequently.

SAI-RAT input data for DES-001

I.2.16 The tool input data for DES-001 assets are shown in Table I.4.

Table I.4: SAI-RAT asset input data DES-001

Site name	Canvey Island Terrestrial Desalination Plant	Raw Water Balance Tank	Brine/waste Storage Tank	Outfall Pump Station	Assumptions
Asset type	Desalination plant	Storage tank	Storage tank	Pumping station	N/A
Asset location	Canvey Island	Canvey Island	Canvey Island	Canvey Island	N/A
Asset National Grid Reference	TQ 78563 82464	TQ 78649 82218	TQ 78350 82621	TQ 78386 82540	N/A
Asset easting	578563	578649	578350	578386	N/A
Asset northing	182464	182218	182621	182540	N/A
Asset size (m^2)	Unknown	Unknown	Unknown	Unknown	Input value not known at time of assessment
Existing High Impact INNS records on site/area of proposed site?	Known to be present	Known to be present	Known to be present	Known to be present	N/A

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Site name	**Canvey Island Terrestrial Desalination Plant**	**Raw Water Balance Tank**	**Brine/waste Storage Tank**	**Outfall Pump Station**	**Assumptions**
Details of High Impact INNS present	*Eriocheir sinensis* *Crepidula fornicata*	*Eriocheir sinensis* *Crepidula fornicata*	*Eriocheir sinensis* *Crepidula fornicata*	*Eriocheir sinensis* *Crepidula fornicata*	N/A
Existing Priority Habitats on Site?	Known to be present	Known to be present	Known to be present	Known to be present	N/A
Details of existing Priority Habitats present	Deciduous woodland Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	Deciduous woodland Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	Deciduous woodland Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	Deciduous woodland Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	N/A
Highest order site designation of asset	National	National	National	National	N/A
Staff site visit (not entering water) frequency	2 (weekly)	1.5	1.5	1.5	Assumed value
Staff site visit entering or in contact with raw water frequency	2 (weekly)	0 (never)	0 (never)	0 (never)	Assumed value
Road vehicle site visit frequency	2 (weekly)	1.5 (monthly)	1.5 (monthly)	1.5 (monthly)	Assumed value
Maintenance not entering water frequency	2 (weekly)	1.5 (monthly)	1.5 (monthly)	1.5 (monthly)	Assumed value
Maintenance in water frequency	2 (weekly)	0 (never)	0 (never)	0 (never)	Assumed value
Angling equipment frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Live bait frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Fish stocking frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Large vessels (over 28ft) frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Small vessel (under 28ft) frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Water sports equipment (SUP, canoe, kayak) frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value

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Site name	Canvey Island Terrestrial Desalination Plant	Raw Water Balance Tank	Brine/waste Storage Tank	Outfall Pump Station	Assumptions
Water safety equipment (temporary moorings, jetties, inflatables, buoys) frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Mammals/ waterfowl on site frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value
Transfer of waste sludge to land frequency	1 (annually)	0 (never)	0 (never)	0 (never)	Assumed value
Recreational walker/jogger/ runner frequency	0 (never)	0 (never)	0 (never)	0 (never)	Assumed value

I.2.17 The tool inputs for the RWT component of the DES-001 option are shown in Table I.5.

Table I.5: SAI-RAT RWT input data DES-001

RWT Name	Canvey Island Terrestrial Desalination Plant Intake	Canvey Island Terrestrial Desalination Plant Outfall	Canvey Island Terrestrial Desalination Plant to Hanningfield Service Reservoir	Assumptions
Source name	Thames Estuary	Desalinisation plant	Canvey Island Terrestrial Desalination	N/A
Source easting	578754	578563	578563	N/A
Source northing	181864	182464	182464	N/A
Source management catchment	Thames TraC Management Catchment	Thames TraC Management Catchment	Thames TraC Management Catchment	N/A
Source operational catchment	Tidal Thames Operational Catchment	Tidal Thames Operational Catchment	Tidal Thames Operational Catchment	N/A
Source waterbody ID	GB530603911401	GB530603911401	GB530603911401	N/A
Source type	River	Online waterbody	Online waterbody	N/A
Number of RWT inputs into source	Unknown	1	1	N/A
Pathway type	Pipeline	Pipeline	Pipeline	N/A
Receptor name	Desalinisation plant	Thames Estuary	Hanningfield Service Reservoir	N/A
Receptor easting	578563	578754	574139	N/A
Receptor northing	182464	181864	198713	N/A
Receptor management catchment	Thames TraC Management Catchment	Thames TraC Management Catchment	Essex Combined Management Catchment	N/A
Receptor operational catchment	Tidal Thames Operational Catchment	Tidal Thames Operational Catchment	Chelmer Operational Catchment	N/A

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RWT Name	Canvey Island Terrestrial Desalination Plant Intake	Canvey Island Terrestrial Desalination Plant Outfall	Canvey Island Terrestrial Desalination Plant to Hanningfield Service Reservoir	Assumptions
Receptor waterbody	GB530603911401	GB530603911401	GB30541427	N/A
Receptor type	Online waterbody	River	Offline waterbody	N/A
Isolated receptor catchment	Yes	Yes	Yes	N/A
Volume of water	151-200 Ml/d	151-200 Ml/d	151-200 Ml/d	N/A
Frequency of operation	Unknown	Unknown	Unknown	Input value not known at time of assessment
Transfer distance (km)	<1	<1	20.1-25	N/A
Washout/ maintenance points outside of catchments	Unknown	Unknown	Unknown	N/A
Details of washout/ maintenance points	N/A	N/A	N/A	N/A
Source navigable	Yes	No	No	N/A
Pathway navigable	No	No	No	N/A
Angling at source	Unknown	No	No	N/A
Angling on pathway	No	Members only, no matches	No	N/A
Water sports at source	Local events	No	No	N/A
Water sports on pathway	No	No	No	N/A
Presence of High impact INNS source	N/A*	Known to be present	Known to be present	*Below tidal limit
Presence of High Impact INNS pathway	Known to be present	Known to be present	Known to be present	N/A
Details of High Impact INNS present	Eriocheir sinensis Crepidula fornicata	Eriocheir sinensis Crepidula fornicata	Carassius auratus Elodea nuttallii Impatiens glandulifera Crepidula fornicata Elodea canadensis Sander lucioperca Oncorhynchus mykiss	N/A
Highest order site designation receptor	National	National	International	N/A
Presence of Priority Habitat pathway	Known to be present	Known to be present	Known to be present	N/A
Details of Priority Habitat present	Deciduous woodland	Deciduous woodland	Thames Estuary & Marshes Ramsar	N/A

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RWT Name	Canvey Island Terrestrial Desalination Plant Intake	Canvey Island Terrestrial Desalination Plant Outfall	Canvey Island Terrestrial Desalination Plant to Hanningfield Service Reservoir	Assumptions
	Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	Mudflats Thames Estuary & Marshes Ramsar South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI	South Thames Estuary and Marshes SSSI Thames Estuary & Marshes SSSI Holehaven Creek SSSI Benfleet and Southend Marshes SSSI Benfleet and Southend Marshes SPA Benfleet and Southend Marshes Ramsar Hanningfield Reservoir SSSI Canvey Lake LNR Canvey Lake Deciduous woodland Coastal and floodplain grazing marsh No main habitat but additional habitats present Coastal saltmarsh Traditional orchard	
Other existing connections between source and receptor	None	None	None	N/A
Details of other existing connections	N/A	N/A	N/A	N/A

SAI-RAT input data for DES-008

I.2.18 The tool inputs for the RWT component of the DES-008 option are shown in Table I.6.

Table I.6: SAI-RAT RWT input data DES-008

RWT Name	Beach wells to Desalination Plant	Desalination plant to Barsham WTW	Assumptions
Source name	Beach wells	Desalination plant	N/A
Source easting	654234	653579	N/A
Source northing	298015	297775	N/A
Source management catchment	Anglian TraC Management Catchment	Broadland Rivers Management Catchment	N/A
Source operational catchment	Norfolk East TraC Operational Catchment	Waveney Operational Catchment	N/A
Source waterbody ID	GB650503520003	N/A	N/A
Source type	River	Online waterbody	N/A

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RWT Name	Beach wells to Desalination Plant	Desalination plant to Barsham WTW	Assumptions
Number of RWT inputs into source	Unknown	Unknown	N/A
Pathway type	Pipeline	Pipeline	N/A
Receptor name	Desalination plant	Barsham WTW	N/A
Receptor easting	653579	640651	N/A
Receptor northing	297775	289465	N/A
Receptor management catchment	Broadland Rivers Management Catchment	Broadland Rivers Management Catchment	N/A
Receptor operational catchment	Waveney Operational Catchment	Waveney Operational Catchment	N/A
Receptor waterbody	N/A	GB105034045903	N/A
Receptor type	Online waterbody	Wastewater Treatment Works	N/A
Isolated receptor catchment	No	No	N/A
Volume of water	6-50 Ml/d	6-50 Ml/d	N/A
Frequency of operation	Unknown	Unknown	N/A
Transfer distance (km)	<1	20.1-25	N/A
Washout/ maintenance points outside of catchments	Unknown	Unknown	Input value not known at time of assessment
Details of washout/ maintenance points			N/A
Source navigable	Yes	No	N/A
Pathway navigable	No	No	N/A
Angling at source	Unknown	No	N/A
Angling on pathway	No	No	N/A
Water sports at source	Local events	No	N/A
Water sports on pathway	No	No	N/A
Presence of High Impact INNS source	Not recorded	Not recorded	N/A
Presence of High Impact INNS pathway	Not recorded	Known to be present	N/A
Details of High Impact INNS present	N/A	Japanese knotweed, New Zealand pigmyweed, Three-cornered Garlic, Water Fern, Chilean rhubarb, Himalayan balsam, American skunk cabbage, Yellow Azalea, Japanese rose	N/A

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RWT Name	Beach wells to Desalination Plant	Desalination plant to Barsham WTW	Assumptions
Highest order site designation receptor	International	None	N/A
Presence of Priority Habitat pathway	Known to be present	Known to be present	N/A
Presence of Priority Habitat receptor	Known to be present	Known to be present	N/A
Details of Priority Habitat present	Southern North Sea SAC, Outer Thames SPA, Gunton Warren and Corton Woods LNR, Corton Cliffs SSSI, Priority Habitat Inventory - Maritime Cliffs and Slopes (England), Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Deciduous Woodland (England) Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh (England), Priority Habitat Inventory - Lowland Fens (England),Priority Habitat Inventory - Reedbeds (England)Priority Habitat Inventory - Good quality semi-improved grassland (Non Priority) (England)Priority Habitat Inventory - Purple Moor Grass and Rush Pasture (England)	N/A
Other existing connections between source and receptor	Unknown	Unknown	N/A
Details of other existing connections	N/A	N/A	N/A

SAI-RAT input data for RES-002C1

I.2.1 The tool input data for RES-002C1 assets are shown in Table I.7.

Table I.7: SAI-RAT asset input data for RES-002C1

Site name	Winter Storage Reservoir	Assumptions
Asset type	Reservoir	N/A
Asset location	Essex	N/A
Asset national grid reference	TM 37291 89232	N/A
Asset easting	637291	N/A
Asset northing	289232	N/A
Asset size (m^2)	910,093	N/A

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Site name	Winter Storage Reservoir	Assumptions
Existing High Impact INNS records on site/area of proposed site?	Not recorded	N/A
Details of High Impact INNS present	N/A	N/A
Existing Priority Habitats on site?	Known to be present	N/A
Details of existing Priority Habitats present	Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh (England)Priority Habitat Inventory - Good quality semi-improved grassland (Non Priority) (England)Priority Habitat Inventory - Deciduous Woodland (England)	N/A
Highest order site designation of asset	None	N/A
Staff site visit (not entering water) frequency	2 (weekly)	Assumed value
Staff site visit entering or in contact with raw water frequency	2 (weekly)	Assumed value
Road vehicle site visit frequency	2 (weekly)	Assumed value
Maintenance not entering water frequency	1 (annually)	Assumed value
Maintenance in water frequency	1 (annually)	Assumed value
Angling equipment frequency	2 (weekly)	Assumed value
Live bait frequency	0 (never)	Assumed value
Fish stocking frequency	1 (annually)	Assumed value
Large vessels (over 28ft) frequency	0.5 (rarely)	Assumed value
Small vessel (under 28ft) frequency	2 (weekly)	Assumed value
Water sports equipment (SUP, canoe, kayak) frequency	2 (weekly)	Assumed value
Water safety equipment (temporary moorings, jetties, inflatables, buoys) frequency	0.5 (rarely)	Assumed value
Mammals/waterfowl on site frequency	2 (weekly)	Assumed value
Transfer of waste sludge to land frequency	0 (never)	Assumed value
Recreational walker/jogger/runner frequency	2 (weekly)	Assumed value

I.2.2 The tool inputs for the RWT component of the RES-002C1 option are shown in Table I.8.

Table I.8: SAI-RAT RWT input data RES-002C1

RWT Name	River Waveney to Reservoir	Reservoir to Barsham WTW	Assumptions
Source name	River Waveney	Reservoir	N/A
Source easting	638552	637291	N/A
Source northing	290737	289232	N/A

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RWT Name	River Waveney to Reservoir	Reservoir to Barsham WTW	Assumptions
Source management catchment	Broadland Rivers Management Catchment	Broadland Rivers Management Catchment	N/A
Source operational catchment	Waveney Operational Catchment	Waveney Operational Catchment	N/A
Source waterbody ID	GB105034045903	GB105034045903	N/A
Source type	River	Offline waterbody	N/A
Number of RWT inputs into source	Unknown	Unknown	N/A
Pathway type	Pipeline	Pipeline	N/A
Receptor name	Reservoir	Barsham WTW	N/A
Receptor easting	637291	640651	N/A
Receptor northing	289232	289465	N/A
Receptor management catchment	Broadland Rivers Management Catchment	Broadland Rivers Management Catchment	N/A
Receptor operational catchment	Waveney Operational Catchment	Waveney Operational Catchment	N/A
Receptor waterbody	GB105034045903	GB105034045903	N/A
Receptor type	Offline waterbody	Water treatment works	N/A
Isolated receptor catchment	No	No	N/A
Volume of water	6-50 Ml/d	6-50 Ml/d	N/A
Frequency of operation	Unknown	Unknown	Input value not known at time of assessment
Transfer distance (km)	1.1-5	1.1-5	N/A
Washout/ maintenance points outside of catchments	Unknown	Unknown	Input value not known at time of assessment
Details of washout/ maintenance points	N/A	N/A	N/A
Source navigable	Yes	Unknown*	*Input value not known at time of assessment
Pathway navigable	No	No	N/A
Angling at source	Members only, no matches	Unknown	N/A
Angling on pathway	No	No	N/A
Water sports at source	Casual use by individuals/clubs	Unknown	N/A
Water sports on pathway	No	No	N/A
Presence of High Impact INNS source	Known to be present	Not recorded	N/A
Presence of High Impact INNS pathway	Not recorded	Not recorded	N/A
Details of High Impact INNS present	*Elodea nuttallii, Elodea canadensis, Hydrocotyle ranunculoides*		N/A
Highest order site designation receptor	None	None	N/A
Presence of Priority Habitat pathway	Known to be present	Known to be present	N/A

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RWT Name	River Waveney to Reservoir	Reservoir to Barsham WTW	Assumptions
Presence of Priority Habitat receptor	Known to be present	Known to be present	N/A
Details of Priority Habitat present	Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh (England)Priority Habitat Inventory - Good quality semi-improved grassland (Non Priority) (England)Priority Habitat Inventory - Deciduous Woodland (England)	Priority Habitat Inventory - Coastal and Floodplain Grazing Marsh (England)Priority Habitat Inventory - Good quality semi-improved grassland (Non Priority) (England)Priority Habitat Inventory - Deciduous Woodland (England)	N/A
Other existing connections between source and receptor	Unknown	Unknown	Input value not known at time of assessment
Details of other existing connections	N/A	N/A	N/A

Assumed values for SAI-RAT

I.2.3 With respect to staff visits and maintenance activities at assets, the SAI-RAT requires an estimate of frequency to be entered. The options are the same for each criterion, as follows:

- 0 – never
- 0.5 – rarely (once every 2 years)
- 1 – annually
- 1.5 – monthly
- 2 – weekly

I.2.4 It is likely that the frequency of such visits would vary according to asset type; therefore the 'assumed value' for each activity and asset type within the SAI-RAT is shown in Table I.9 below.

Table I.9: Assumed values for staff visit and maintenance activities at assets.

Asset type	Visit or maintenance activity	Assumed value (frequency)	Comment/rationale
Reservoir	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	1 (annually)	Assumes maintenance visits would be relatively infrequent
	Maintenance in water	1 (annually)	Assumes maintenance visits within water would be relatively infrequent
	Transfer of waste sludge to land	0 (never)	Sludge removal not associated with this asset type

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Asset type	Visit or maintenance activity	Assumed value (frequency)	Comment/rationale
Water treatment works	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land	1 (annually)	Sludge removal occasionally likely to be needed
Sealed water tank	Staff site visit (not entering water)	1.5 (monthly)	Assumes visit frequency should be at least monthly
	Staff site visit entering or in contact with raw water	0 (never)	Sealed water tanks are likely to be used to store treated rather than raw water
	Road vehicle site visit	1.5 (monthly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	1.5 (monthly)	Assumes relatively frequent maintenance
	Maintenance in water	0 (never)	Maintenance should not involve contact with treated water
	Transfer of waste sludge to land	0 (never)	Asset type should not generate sludge
Wastewater treatment site	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land frequency	0.5 (rarely)	Sludge removal occasionally likely to be needed
Sewerage treatment works	Staff site visit (not entering water) frequency	2 (weekly)	Assumes visit frequency should be at least weekly

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Asset type	Visit or maintenance activity	Assumed value (frequency)	Comment/rationale
	Staff site visit entering or in contact with raw water frequency	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit frequency	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land frequency	0.5 (rarely)	Sludge removal occasionally likely to be needed

I.2.5 Assets also require assessment for recreational use within the SAI-RAT. In practice, four of the five asset types included (water treatment works, sealed water tank, wastewater treatment site, sewerage treatment works) are unlikely to be accessible for recreational use or by wildlife. Therefore, these asset types should be assigned a value of 0 ('never') for all recreational activities.

I.2.6 Reservoirs are frequently host to recreational activities and accessible by wildlife, though the extent of this is likely to be variable. In the potential absence of available information, the assumed values for activities relating to recreation or wildlife are shown in Table I.10 below.

Table I.10: Assumed values for recreational activities at assets.

Asset	Asset recreational or associated activity	Assumed value (frequency)	Comment/rationale
Reservoir	Angling equipment	2 (weekly)	Angling is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Live bait	0 (never)	Live bait is not typically allowed at reservoirs
	Fish stocking	1 (annually)	Considered a typical stocking frequency
	Large vessels (over 28ft)	0.5 (rarely)	Vessels of this large size are rarely likely to be brought onto a reservoir
	Small vessels (under 28ft)	2 (weekly)	Boating is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Water sports equipment (Stand-up paddleboards, canoe, kayaks)	2 (weekly)	Boating is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Water safety equipment (temporary moorings, jetties, inflatables, buoys)	0.5 (rarely)	It is considered that such equipment is rarely brought to a reservoir
	Mammals/waterfowl on-site	2 (weekly)	If a reservoir is accessible to mammals and waterfowl, they

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Asset	Asset recreational or associated activity	Assumed value (frequency)	Comment/rationale
			are likely to access the asset frequently
	Recreational walker/jogger/runner	2 (weekly)	Relatively common activities at reservoirs. If reservoir is accessible for this purpose, likely to occur frequently
Water treatment works Sealed water tank Wastewater Treatment site Sewerage Treatment works	Angling equipment	0 (never)	Angling not expected at these asset types
	Live bait	0 (never)	Angling not expected at these asset types
	Fish stocking	0 (never)	Angling not expected at these asset types
	Large vessels (over 28ft)	0 (never)	Boating not expected at these asset types
	Small vessels (under 28ft)	0 (never)	Boating not expected at these asset types
	Water sports equipment (SUPs, Canoe, Kayaks)	0 (never)	Water sports not expected at these asset types
	Water safety equipment (temporary moorings, jetties, inflatables, buoys)	0 (never)	Associated activities not expected at these asset types
	Mammals/waterfowl on-site	0 (never)	Mammals/waterfowl unlikely to access these asset types
	Recreational walker/jogger/runner	0 (never)	Walking/jogging/running not expected at these asset types

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Assumed values for SAI-RAT

I.2.7 With respect to staff visits and maintenance activities at assets, the SAI-RAT requires an estimate of frequency to be entered. The options are the same for each criterion, as follows:

- 0 – never
- 0.5 – rarely (once every 2 years)
- 1 – annually
- 1.5 – monthly
- 2 – weekly

I.2.8 It is likely that the frequency of such visits would vary according to asset type; therefore the 'assumed value' for each activity and asset type within the SAI-RAT is shown in Table I.11 below.

Table I.11: Assumed values for staff visit and maintenance activities at assets.

Asset type	Visit or maintenance activity	Assumed value (frequency)	Comment/rationale
Reservoir	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	1 (annually)	Assumes maintenance visits would be relatively infrequent
	Maintenance in water	1 (annually)	Assumes maintenance visits within water would be relatively infrequent
	Transfer of waste sludge to land	0 (never)	Sludge removal not associated with this asset type
Water treatment works	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land	1 (annually)	Sludge removal occasionally likely to be needed
Sealed water tank	Staff site visit (not entering water)	1.5 (monthly)	Assumes visit frequency should be at least monthly

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Asset type	Visit or maintenance activity	Assumed value (frequency)	Comment/rationale
	Staff site visit entering or in contact with raw water	0 (never)	Sealed water tanks are likely to be used to store treated rather than raw water
	Road vehicle site visit	1.5 (monthly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water	1.5 (monthly)	Assumes relatively frequent maintenance
	Maintenance in water	0 (never)	Maintenance should not involve contact with treated water
	Transfer of waste sludge to land	0 (never)	Asset type should not generate sludge
Wastewater treatment site	Staff site visit (not entering water)	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land frequency	0.5 (rarely)	Sludge removal occasionally likely to be needed
Sewerage treatment works	Staff site visit (not entering water) frequency	2 (weekly)	Assumes visit frequency should be at least weekly
	Staff site visit entering or in contact with raw water frequency	2 (weekly)	Assumes visit frequency should be at least weekly
	Road vehicle site visit frequency	2 (weekly)	Aligned with staff visits, assuming arrival is most likely to be by road vehicle
	Maintenance not entering water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Maintenance in water frequency	2 (weekly)	Assumes maintenance would need to be at least weekly
	Transfer of waste sludge to land frequency	0.5 (rarely)	Sludge removal occasionally likely to be needed

I.2.9 Assets also require assessment for recreational use within the SAI-RAT. In practice, four of the five asset types included (water treatment works, sealed water tank, wastewater treatment site, sewerage treatment works) are unlikely to be accessible for recreational use or by wildlife.

I.2.10 Therefore, these asset types should be assigned a value of 0 ('never') for all recreational activities.

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I.2.11 Reservoirs are frequently host to recreational activities and accessible by wildlife, though the extent of this is likely to be variable. In the potential absence of available information, the assumed values for activities relating to recreation or wildlife are shown in Table I.12 below.

Table I.12: Assumed values for recreational activities at assets.

Asset	Asset recreational or associated activity	Assumed value (frequency)	Comment/rationale
Reservoir	Angling equipment	2 (weekly)	Angling is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Live bait	0 (never)	Live bait is not typically allowed at reservoirs
	Fish stocking	1 (annually)	Considered a typical stocking frequency
	Large vessels (over 28ft)	0.5 (rarely)	Vessels of this large size are rarely likely to be brought onto a reservoir
	Small vessels (under 28ft)	2 (weekly)	Boating is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Water sports equipment (Stand-up paddleboards, canoe, kayaks)	2 (weekly)	Boating is a relatively common activity at reservoirs. If permitted at a reservoir, likely to occur frequently
	Water safety equipment (temporary moorings, jetties, inflatables, buoys)	0.5 (rarely)	It is considered that such equipment is rarely brought to a reservoir
	Mammals/waterfowl on-site	2 (weekly)	If a reservoir is accessible to mammals and waterfowl, they are likely to access the asset frequently
	Recreational walker/jogger/runner	2 (weekly)	Relatively common activities at reservoirs. If reservoir is accessible for this purpose, likely to occur frequently
Water treatment works Sealed water tank Wastewater Treatment site Sewerage Treatment works	Angling equipment	0 (never)	Angling not expected at these asset types
	Live bait	0 (never)	Angling not expected at these asset types
	Fish stocking	0 (never)	Angling not expected at these asset types
	Large vessels (over 28ft)	0 (never)	Boating not expected at these asset types
	Small vessels (under 28ft)	0 (never)	Boating not expected at these asset types
	Water sports equipment (SUPs, Canoe, Kayaks)	0 (never)	Water sports not expected at these asset types
	Water safety equipment (temporary moorings, jetties, inflatables, buoys)	0 (never)	Associated activities not expected at these asset types
	Mammals/waterfowl on-site	0 (never)	Mammals/waterfowl unlikely to access these asset types

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Asset	Asset recreational or associated activity	Assumed value (frequency)	Comment/rationale
	Recreational walker/jogger/runner	0 (never)	Walking/jogging/running not expected at these asset types

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In-combination Effects

I.2.12 The additional in-combination effects of interacting WRMP options were assessed using the following four-stage process:

1. Screening out of options assessed as being of None or Very Low risk during Level 1 screening, as such options would not involve the movement of raw water likely to contain INNS to a new site.
2. Spatial analysis of the Low, Moderate and High risk options to determine connectivity between them, and to derive a list of connected option combinations requiring further assessment.
3. Qualitative (descriptive) screening assessment of the additional risk presented by any connected option combinations identified, to identify those options requiring a combined quantitative assessment using SAI-RAT.
4. Amalgamation of individual SAI-RAT assessments to quantify the INNS risk for each connected option combination, where a risk of in-combination effects was identified.

Limitations and Assumptions

I.2.13 In accordance with the EA position statement on raw water transfers[3], the screening methodology does not account for INNS distribution and other specific local considerations. By progressing all options screened as Low, Medium or High additional risk to a more detailed Level 2 assessment, all options which may be affected by local issues, such as important nature conservation sites or High impact INNS, would be subject to this more detailed risk assessment. By their nature, it is unlikely that those options initially screened as presenting No additional risk or Very Low risk would be affected by such local issues, as they would not involve the additional transfer of water likely to contain INNS.

I.2.14 Assessments within this report are based on operational INNS transfer risk. Construction-phase risks, which are not accounted for in the Level 1 screening methodology or in SAI-RAT. Construction-phase risks are best evaluated and mitigated on a case-by-case basis at a more advanced stage in option design and implementation. It is therefore assumed that construction-phase impacts will be assessed at the appropriate phase of option design, that any construction-phase impacts will be appropriately mitigated, and that biosecurity best practice will be followed.

I.2.15 Appropriate mitigation will be addressed during further design and construction phases.

I.2.16 Desalination options were assessed using the same methodologies as for freshwater options, as saline or brackish environments may harbour invasive species with a tolerance for different salinity levels.

I.2.17 In accordance with the EA position statement on raw water transfers, the screening methodology does not account for INNS distribution and other specific local considerations. By progressing all options screened as Low, Medium or High additional risk to a more detailed Level 2 assessment, all options which may be affected by local issues, such as important nature conservation sites or High impact INNS, would be subject to this more detailed risk assessment. By their nature, it is unlikely that those options initially screened as presenting No additional risk or Very Low risk would be affected by such local issues, as they would not involve the additional transfer of water likely to contain INNS.

[3] Environment Agency, 2022. Managing the Risk of Spread of Invasive Non-Native Species Through Raw Water Transfer.

I.2.18 The EA INNS Isolated Catchment Mapping[4] defines the limit of INNS spread between natural waterbodies as the tidal limit of the watercourse.

I.2.19 It is noted that through abstraction and transfer of water, effects on habitats from reduced or increased flows may alter habitat suitability or dispersal of INNS already present in a waterbody. Such effects would not be accounted for within this methodology, and any such changes may need to be investigated at a later stage of option development.

I.2.20 The determination of option combinations for assessment, and the assessment of risk may be limited by the information available at the time of assessment. As such, screening results may only be indicative of additional INNS transfer risk. Several input values within SAI-RAT were not known at this stage of the design and therefore the value 'Unknown' was selected. Selecting Unknown within the tool results in a median risk score being added for that criterion.

I.2.21 As described in the methodology, 'assumed values' were used where 'Unknown' was not available as an option within the tool. For this purpose, it was assumed that staff visits to WTWs will be frequent. Whilst staff visits to reservoirs may still be frequent, maintenance activities are likely to be less so.

I.2.22 The determination of option combinations for assessment, and the assessment of risk may be limited by the information available at the time of assessment. As such, screening results may only be indicative of additional INNS transfer risk.

I.3 INNS Assessment Results

Level 1 Screening Results

I.3.1 Seventeen options underwent Level 1 screening. Table I.13 below summarises the results of the Level 1 screening of the Essex & Suffolk WRMP24 options for the mainland. Five options were assessed as having a Magnitude of Risk of 'None', eight options were assessed as having Very Low risk, one options were assessed as having Low risk, two options were assessed as having Moderate risk and one option was assessed as having High risk.

I.3.2 Three options assessed in the Level 1 screening as having a Low or High risk (none were assessed at Moderate) were progressed to a Level 2 assessment. This did not include ESW-DES-004 as this option is not included the Best Value Plan, the OFWAT Core Plan, the Best Environment and Society Plan or the Adaptive Programmes.

[4] Environment Agency, 2018. Invasive Non-Native Species Isolated Catchment Mapping. v3.

Table I.13: Level 1 screening results

Option ID	Option name	Description of risk	Frequency of Impact	Severity of Impact	Magnitude of Risk	Level 2 assessment required
ESW-ABS-003C	New Linford WTW	Very limited risk as the source water is likely to be entirely free of INNS. It is assumed that groundwater is free of INNS, and that accessing it will not increase the risk of INNS transfer.	Infrequent	Very Low	1 = Very Low	No
ESW-DES-001	Canvey Island Terrestrial Desalination (Max Capacity)	Physical transfer of treated water (between two locations assumed currently unconnected). During construction best practice will be implemented to prevent the spread of INNS. High risk of INNS being abstracted at source and but low risk of INNS being transferred through pipeline and introduced into reservoir due to water treatment prior to storage. Negligible risk of INNS released into the environment in the short raw water pipeline between the abstraction location and water treatment facility in the event of pipeline bursts or water leakage. This may be considered unlikely and as no waterbodies are present within close proximity to the transfer, the associated risk is minimal.	Regular	Low	3 = Low	Yes
ESW-DES-004	California beachwell desalination	As source water is untreated, there is a risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). Transfer from the desalination plant to Barsham WTW involves treated water in a closed system therefore the risk of INNS introduction is negligible.	Regular	Medium	4 = Moderate	Yes[5]
ESW-DES-008	Corton beachwell desalination	During construction, best practice will be implemented to prevent the spread of INNS. As source water is untreated, there is a risk of INNS transfer from source and potential for pipe bursts to cause water to be released to the environment (creating pathway for the transfer of INNS). Transfer from the desalination plant to Barsham WTW involves treated water in a closed system therefore the risk of INNS introduction is negligible.	Regular	Medium	4 = Moderate	Yes
ESW-EFR-001	Southend-on-Sea Effluent Re-use (max capacity)	During construction, best practice will be implemented to prevent the spread of INNS. Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS).	Regular	Very Low	1 = Very Low	No
ESW-EFR-002A	Lowestoft water reuse (transfer to River Waveney)	Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS). Excludes potential for additional flows input into River Waveney to change habitat suitability for any INNS present or facilitate further spread along the river. During construction, best practice will be implemented to prevent the spread of INNS.	Regular	Very Low	1 = Very Low	No
03b0478B	Effluent Reuse at Caister and transfer to Ormesby	Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS).	Regular	Very Low	1 = Very Low	No
ESW-NIT-004	Barsham EDR Nitrate Removal + Pipeline	During construction, best practice will be implemented to prevent the spread of INNS. No risk of transfer/movement of invasive or non-native species with this option type as the transfer is of wastewater/brine, which is assumed to be free of INNS. Additionally, transfer of wastewater/brine is within a closed system (i.e., between WTWs) rather than to a watercourse.	None	None	None	No
ESW-NIT-005	Langford EDR Nitrate Removal + Pipeline	During construction, best practice will be implemented to prevent the spread of INNS. No risk of transfer/movement of invasive or non-native species with this option type as the transfer is of wastewater/brine, which is assumed to be free of INNS. Additionally, transfer of wastewater/brine is within a closed system (i.e., between WTWs) rather than to a watercourse.	None	None	None	No
ESW-NIT-006	Langham EDR Nitrate Removal + Pipeline	During construction, best practice will be implemented to prevent the spread of INNS. No risk of transfer/movement of invasive or non-native species with this option type as the transfer is of wastewater/brine, which is assumed to be free of INNS. Additionally, transfer of wastewater/brine is within a closed system (i.e., between WTWs) rather than to a watercourse.	None	None	None	No
ESW-PMP-001	Langford WTW upgrade + Abberton RWPS Pump Replacement	During construction, best practice will be implemented to prevent the spread of INNS. No risk of transfer/movement of invasive or non-native species with this option type as the transfer is of wastewater/brine, which is assumed to be free of INNS. Additionally, transfer of wastewater/brine is within a closed system (i.e., between WTWs) rather than to a watercourse.	None	None	None	No
ESW-RES002C1	North Suffolk Winter Storage Reservoir	Physical transfer of untreated water (between two locations assumed currently unconnected). Additional risks from pipeline washout, pipeline bursts, washwater discharge, overflows and sludge disposal.	Regular	High	6 = High	Yes
ESW-TRA-001	Barsham to Saxmundham Tower Transfer Main	During construction, best practice will be implemented to prevent the spread of INNS. Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS).	Regular	Very Low	1 = Very Low	No

[5] This option has not been assessed at Level 2 because it is not considered in any of the alternative plan or adaptive path.

Option ID	Option name	Description of risk	Frequency of Impact	Severity of Impact	Magnitude of Risk	Level 2 assessment required
ESW-TRA-018	Bungay Wells to Broome WTW	During construction, best practice will be implemented to prevent the spread of INNS. Very limited risk as the source water is likely to be entirely free of INNS. It is assumed that groundwater is free of INNS, and that accessing it will not permit any additional inputs of INNS.	Regular	Very low	1 = Very Low	No
ESW-TRA-019	Transfer from Holton WTW to Eye Airfield	During construction, best practice will be implemented to prevent the spread of INNS. Physical transfer of treated water (between two locations assumed currently unconnected) (no INNS risk as treated water will be free from INNS).	Regular	Very Low	1 = Very Low	No
ESW-TRA-023	Broome to Barsham Transfer	During construction, best practice will be implemented to prevent the spread of INNS. Very limited risk as the source water is likely to be entirely free of INNS. It is assumed that groundwater is free of INNS, and that accessing it will not permit any additional inputs of INNS.	Regular	Very low	1 = Very Low	No
ESW-UVC-001	Langford UV (Crypto)	No INNS risk associated with this option as it relates to water treatment and does not involve the movement of raw water.	None	None	None	No

Level 2 Assessment Results

I.3.3 The INNS risk assessment results for the progressed options as derived from the EA tool are summarised from Table I.14 to Table I.16. There were three options which progressed to a Level 2 assessment: ESW-DES-001, ESW-DES-008, and ESW-RES002C1. It should be noted that these scores do not consider any engineering interventions that may be required as mitigation to prevent the spread of INNS.

Table I.14: Summary INNS Risk Assessment Scores for ESW-DES-001

Identifier	Component type	Risk score (%)
Canvey Island Terrestrial Desalination Plant	Asset	31.01
Raw Water Balance Tank	Asset	14.72
Brine/waste Storage Tank	Asset	14.72
Outfall Pump Station_	Asset	14.72
Canvey Island Terrestrial Desalination Plant Intake	RWT	55.05
Canvey Island Terrestrial Desalination Plant intake Outfall	RWT	50.88
Canvey Island Terrestrial Desalination Plant to Hanningfield Service Reservoir	RWT	54.88
Overall Risk Score (%)		**36.27**

Table I.15: Summary INNS Risk Assessment Scores for ESW-DES-008

Identifier	Component type	Risk score (%)
Beach wells to Desalination Plant	RWT	54.00
Desalination plant to Barsham WTW	RWT	25.08
Overall Risk Score (%)		**39.54**

Table I.16: Summary INNS Risk Assessment Scores for ESW-RES002C1

Identifier	Component type	Risk score (%)
Winter Storage Reservoir	Asset	65.08
River Waveney to Reservoir	RWT	40.5
Reservoir to Barsham WTW	RWT	33.98
Overall Risk Score (%)		**51.16**

I.4 In-combination Effects

I.4.1 Following stage 1 of the process described in Section I.2, the following options were included in the in-combination effects assessment for each plan:

- Best Value Plan (BVP): RES-002C1
- Least Cost (LC): RES-002C1
- OFWAT Core: None
- Best Environment and Society (BESP): DES-001

I.4.2 No option combinations were identified in stage one so the assessment for in-combination effects was not taken any further. It is assumed there will be no additional INNS transfer risks associated with the option combinations in the plans outlined above.

I.5 Conclusions

Level 1 Screening

I.5.1 Seventeen options within Essex & Suffolk WRMP24 were screened and assessed for risk of INNS spread. A summary of the Level 1 screening results is shown in Table I.17 below.

Table I.17: INNS Level 1 screening results summary

Risk Score	Options
None	ESW-NIT-004, ESW-NIT-005, ESW-NIT-006, ESW-PMP-001A, ESW-UVC-001
1 = Very Low	ESW-ABS-003C, ESW-EFR-001, ESW-EFR-002A, 03b0478B, ESW-TRA-001, ESW-TRA-018, ESW-TRA-019, ESW-TRA-023
2 = Low	No options
3 = Low	ESW-DES-001
4 = Moderate	ESW-DES-004, ESW-DES-008
5 = High	No options
6 = High	ESW-RES002C1

I.5.2 As a results of the Level 1 screening, the three options initially assessed as presenting a Low, Moderate or High risk were progressed to Level 2 assessment. ESW-DES-004 also presented a moderate risk but this was not assessed at Level 2 as it is not in the alternative plan or adaptive path.

Level 2 Assessment

I.5.3 Using the Level 2 INNS assessment methodology (using the SAI-RAT), the maximum component Risk Score and Overall Risk Score for the three assessed options has been summarised in Table I.18below. Of these options, the lowest Overall Risk Score was associated with option ESW-DES-001. Although, the lowest maximum component Risk Score was associated with ESW-DES-008. The highest Overall Risk Score was associated with option ESW-RES002C1, which includes the component – a winter storage reservoir – which at 65.08% scored the highest component Risk Score of any option.

Table I.18: INNS Level 2 assessment results summary

Risk Score	Maximum component Risk Score (%)	Overall Risk Score (%)
ESW-DES-001	Canvey Island Terrestrial Desalination Plant Intake (55.05)	36.27
ESW-DES-008	Beach wells to Desalination Plant (54.00)	39.54
ESW-RES002C1	Winter Storage Reservoir (65.08)	51.16

In-combination Effects WRMP

I.5.4 No in-combination effects that would significantly increase risk of INNS transfer above that of individual options are expected for the BVP, LC, OFWAT Core or BESP.

I.6 Recommendations

It is recommended that the INNS risk assessment is revised using the SAI-RAT for options which are taken forward as more information becomes available. Given the current uncertainty surrounding the final option design, several inputs into the tool are ‘Unknown’ and therefore an average score has been generated to mitigate for the uncertainty surrounding these values. This however may be a slight under or over representation of the risk assessment score of the final scheme design, and final risk score values may be subject to change as information is updated.

When more information is available, it is recommended that options are re-assessed using the SAI-RAT biosecurity tab to identity potential biosecurity measures which should be considered as part of option design.

Appropriate mitigation of INNS risk should be considered for all options which are progressed, including asset and water transfer elements. Options which have been assessed as having a higher risk score will be of the highest priority for future mitigation development at the project level and may not be considered appropriate if this level of risk cannot be mitigated. In addition to standard mitigation practices adopted by water companies, it is recommended that engagement with the EA is considered to help to identify those measures which are most appropriate.

For options which are likely to be implemented, the INNS risk associated with the construction phase should be considered and mitigated through best practice.