

United Utilities Sources – INNS Assessment

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Technical note:

Invasive Non-native Species Risk Assessment of the United Utilities Sources Strategic Resource Option

1. Introduction

- 1.1.1 The United Utilities Sources (UUS) Strategic Resource Option (SRO) is being delivered by United Utilities (UU) and is one of three SROs the water company is participating in, the others being United Utilities Vyrnwy Aqueduct (UUVA) and Severn to Thames Transfer (STT). Although these schemes are separate SROs, they directly interface with each other to enable water to be transferred from North West England to the Midlands and South.
- 1.1.2 To meet the Regulators' Alliance for Progressing Infrastructure Development (RAPID) Gate 1 submission environmental requirements¹, the UUS SRO must be subject to a range of environmental assessments. As part of this process, UU commissioned Wood Environment and Infrastructure Solutions UK Ltd² (Wood) to undertake a screening assessment of invasive non-native species (INNS) for the options identified for the SRO to determine whether any future schemes will risk spreading INNS or create pathways which increase the risk of spreading INNS.
- 1.1.3 This Technical Note presents the findings of the INNS Screening Assessment of the UUS SRO options being taken forward at Gate 1.

1.2 United Utilities Sources Strategic Resource Option

- 1.2.1 The UUS SRO is one of 17 schemes promoted by Ofwat in the PR19 Final Determination¹ to identify new strategic water resources to address the water needs set out in the National Framework for Water Resources³. The SRO programme is managed by RAPID and governed through a gated process during AMP7 with the purpose of selecting the strategic resource options which provide best value for customers for delivery in AMP8. The gates are:
- **Gate 1:** Initial concept design and decision making;
 - **Gate 2:** Detailed feasibility, concept design and multi-solution decision making;
 - **Gate 3:** Developed design, finalised feasibility, pre-planning investigations and planning applications;
 - **Gate 4:** Planning applications, procurement and land purchase.
- 1.2.2 Gate 1 of this process takes place in July 2021 and involves initial concept design and decision making. The Gate 1 decision, if supportive, will provide further funding for development of the

¹ See Ofwat (2019) *PR19 final determinations: Strategic regional water resource solutions* and RAPID (2020) *Accelerated Gate One Assessment –summary of process and criteria Version 2*.

² Now Wood Group UK Ltd.

³ Environment Agency (2020) *Meeting our future water needs: a national framework for water resources*. Available from https://assets.publishing.service.gov.uk/government/uploads/system/uploads/attachment_data/file/872759/National_Framework_for_water_resources_main_report.pdf [Accessed September 2020].

schemes and the selected options will be included in the plan development process for the regional plans and Water Resources Management Plans 2024 (WRMP24s), as appropriate.

- 1.2.3 The purpose of the UUS SRO, alongside the UOVA SRO, is to support the STT SRO proposal to transfer up to 180 mega litres per day (ML/d) of water from Lake Vyrnwy to the Thames Water region via the River Severn by maintaining supply resilience to UU customers if water were to be transferred out of region.
- 1.2.4 Source options for the UUS SRO have been evaluated in terms of their benefits and costs and subject to environmental assessment in accordance with RAPID's Gate 1 requirements. This process has informed the selection of a preferred list of 27 options for the SRO including groundwater enhancement, improved reservoir release control, local interconnection and treatment, and river abstraction. The preferred list of options is presented in **Section 3** of this Technical Note.
- 1.2.5 It should be noted that, at this stage, the preferred options for the UUS SRO have not been selected. The options will be selected by Gate 2 (October 2022) with those ultimately chosen being dependent upon further assessment, investigation and the volume of water required for trading.

1.3 RAPID's Environmental Requirements

- 1.3.1 RAPID has requested environmental information from water companies to support their respective SROs as part of the Gate 1 submission (July 2021). To meet RAPID's Gate 1 submission requirements⁴, UU is to provide the following information for the UUS SRO options being taken forward:
- Initial option-level environmental assessments that meet local requirements and comply with Strategic Environmental Assessment (SEA) and Habitats Regulations Assessments (HRA) requirements, including consideration of in-combination effects and identification of environmental risks that need mitigating through the solution design and costing.
 - Initial environmental, social, and economic valuations (or metric benefits) consistent with principles in the National Planning Statement and Water Resource Planning Guidelines.
- 1.3.2 To meet RAPID's requirements, the following environmental assessments have been completed:
- Strategic Environmental Assessment⁵ (SEA);
 - Habitats Regulations Assessment⁶ (HRA);
 - WFD Screening Assessment⁷;
 - Natural Capital Assessment (NCA);
 - Biodiversity Net Gain (BNG) Assessment;
 - Invasive Non-native Species (INNS) Risk Assessment.
- 1.3.3 This Technical Notes relates to the INNS Risk Assessment.

⁴ See Ofwat (2019) *PR19 final determinations: Strategic regional water resource solutions* and RAPID (2020) *Accelerated Gate One Assessment –summary of process and criteria Version 2*.

⁵ *Statutory Instrument No.1633 - The Environmental Assessment of Plans and Programmes Regulations 2004*.

⁶ *Statutory Instrument No.1012 - Conservation of Habitats and Species Regulations 2017*.

⁷ *Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (the Water Framework Directive)*.

1.4 Invasive Non-native Species - Overview

- 1.4.1 Invasive non-native species are defined as any species introduced outside of its natural range (past or present) which may negatively impact upon the environment, the economy, or human health.
- 1.4.2 Both within the UK and internationally, INNS are considered the second largest threat to biodiversity, after the loss and destruction of habitat. The Environment Agency (EA) estimate the economic consequences of INNS within England to be of the order of £1.7 billion per year (2010 costs⁸).
- 1.4.3 In order to protect and improve the ecological and chemical health of the UK's surface and groundwater bodies the UK government, in 2003 transposed into English Law the EU Water Framework Directive (WFD) (2000/60/EC). The Directive required member states to put in place River Basin Management Plans that required a holistic approach to the management of water bodies, looking at the water within the wider ecosystem. The Directive (and its subsequent amendments) has subsequently been retained in English law following the UK's exit from Europe. Although not explicitly mentioned within the Water Framework Directive, UK government administrations have accepted that INNS should be considered as a pressure on water bodies that needs to be considered when implementing the Directive. River basin management plans are therefore required to consider INNS where they are considered to be causing (or contributing to) sites to fail to achieve good ecological status.
- 1.4.4 Given that most species are difficult or impossible to control or eradicate once introduced into the wild the prevention of their introduction is considered a priority. The EA expects water companies to prevent the deterioration of natural water bodies by reducing the risks of spread of INNS and reducing the impacts of INNS⁹.
- 1.4.5 A list of aquatic alien species classified according to their potential level of impact is published by the UK Technical Advisory Group (UK TAG)¹⁰ along with an Alarm List identifying those species thought to pose a risk to surface waters and their WFD ecological status, but whose presence has not yet been recorded in Great Britain. Species identified by UK TAG currently frequenting freshwater environments, along with their classification have been provided in **Appendix A**.
- 1.4.6 Within England and Wales, there are a number of further statutory obligations regulating the control of INNS, primarily Section 14 of the Wildlife and Countryside Act 1981 and more recently the Alien Species (Enforcement and Permitting) Order 2019. A comprehensive review of legislation, regulations and Directives designed to control the release and subsequent spread of INNS species within England and Wales is provided by GB Non-Native Species Secretariat¹¹.

⁸ Environment Agency (2013) *Water industry strategic environmental*

requirements (WISER). Strategic steer to water companies on the environment, resilience and flood risk for business planning purposes.

⁹ Directive 2000/60/EC of the European Parliament and of the Council of 23 October 2000 establishing a framework for Community action in the field of water policy (the Water Framework Directive).

¹⁰ UKTAG (2015) *UK Technical Advisory Group on the Water Framework Directive. Revised classification of aquatic alien species according to their level of impact.*

¹¹ GB Non-Native Species Secretariat - <http://www.nonnativespecies.org/home/>

1.5 This Technical Note

1.5.1 This Technical Note presents the findings of the INNS Screening Assessment for the preferred list of UU SRO options. The remainder of this Technical Note is structured as follows:

- **Section 2:** Outlines the methodology for the INNS Screening Assessment;
- **Section 3:** Describes the options identified for the UU SRO;
- **Section 4:** Describes the results of the raw Screening Assessment and the premise on which these were made;
- **Section 5:** Presents a summary of the assessment and the conclusions of the INNS Screening Assessments to inform UU's Gate 1 submission.

2. INNS Assessment

2.1 Methodology

2.1.1 An assessment was undertaken to identify the likelihood of each of the UUS SRO options being taken forward at Gate 1 contributing to the spread of INNS species.

2.1.2 The assessment methodology adopted has taken into consideration a number of key documents including *inter alia*: the EA (2019) 'Assessing the impact of new water transfers on the risk of spread of Invasive non-native species'; EA (2019) 'Environmental assessment for water company drought planning - supplementary guidance'; and UKTAG (2013) 'Guidance on the assessment of alien species pressures'.

2.1.3 For each option, a summary of the scheme, pertinent to the INNS assessment has been provided (**Table 3-1 UUS SRO Options**).

2.1.4 An assessment based on a matrix comprising the **likelihood** of the potential INNS transfer and the **impact** upon the receiving water was adopted to identify sites most at risk from propagating INNS.

2.1.5 It should be noted that, post-Gate 1, there will be a need to review the approach to the INNS assessment of the UUS SRO options to ensure that there is consistency with the methodologies employed for the assessments of the Regional Plan and WRMPs. However, at this stage, it is not anticipated that any such review would materially affect the findings of the assessment presented in this Technical Note.

2.2 Likelihood

2.2.1 The likelihood considers the potential for transfer and the probability of the impact occurring. This assessment takes into account the prevalence and category of INNS in the source supply. The presence of an INNS species within the source water was based on known occurrence within a 5km radius of the abstraction coordinates. Data was drawn from a review of free to access databases including NBN Atlas and the EA Ecology & Fish Data Explorer and key sources such as Gallardo and Aldridge (2013).

2.2.2 Species can be spread from place to place through a variety of methods, that can be grouped into common pathways, that include e.g., recreational activities, vehicle, operative and plant movements, sludge transfer and raw water transfer. Where water is abstracted direct from a borehole, it has

been assumed that no INNS are present within the source water and that the risk of transfer is, therefore, 'Negligible'. It is assumed that where water is pumped directly to a WTW located within the source water catchment (and subject to coarse screening, coagulations, flocculation, settlements, and fine filtration), the potential impact is also 'Low'. However, where the WTW lies outside of the source catchment area, the risk of transferring species has the potential to be 'Medium' as water may on occasion bypass the treatment facilities e.g. via break-pressure tanks, start-up to waste and wash-outs.

- 2.2.3 The assessment of likelihood assumes that all reasonable mitigation will be put in place to prevent spread. This mitigation of INNS may include the following:
- Check, clean, dry procedures should be adopted.
 - Plant such as pumps should be cleaned prior to moving. Any heavy encrustations and holdfasts should be removed with scrapers, prior to pressure-washing. Particular attention should be paid to parts of the structure where access is difficult. Washings must not be allowed to enter the water environment. Waste produced from the cleaning process must be disposed of appropriately.
 - Footwear should be clean (visually free from soil and debris) before operatives leave site. Where necessary footwear should be disinfected.
 - Vehicles should be kept clean – in particular, any accumulated mud should be removed before the vehicle moves off the site. Where necessary wheel arches should be disinfected.
 - At high-risk sites, access should be kept to a minimum. Vehicles should be parked on hard standing.
 - Where multiple sites are visited, high risk sites should be the last to be visited in the day.
- 2.2.4 Where a new raw water transfer scheme creates a hydrological pathway between water bodies not already connected, or were a proposed scheme increases the risk between locations already linked the only mitigation available may comprise treatment processes to remove all life stages of potential INNS (see **para 2.2.2**).
- 2.2.5 Measures adopted or trialled elsewhere for the control or eradication of INNS from raw water abstractions (although not necessarily for public water supply) include chemical treatment e.g. chlorination, or introduction of piscicides (such as antimycin A, rotenone and salicylanilide I), ultra-violet light treatment and the use of electric gradients to euthanise e.g. fish.

2.3 Impact

- 2.3.1 The potential for impact of INNS species has been categorised by UKTAG⁷. Where the potential impact of a species has yet to be categorised then a classification of 'High' (worst case) has been assumed. The impact considers the sensitivity of the receiving water body, taking into account both the prevalence of INNS in the receiving water course and any pertinent conservation designation or protected species present.

2.4 Risk Assessment

- 2.4.1 The likely risk presented by INNS at each of the UUS SRO's has been assigned based on the matrix tool described in **Figure 2-1** and **Table 2-1**.

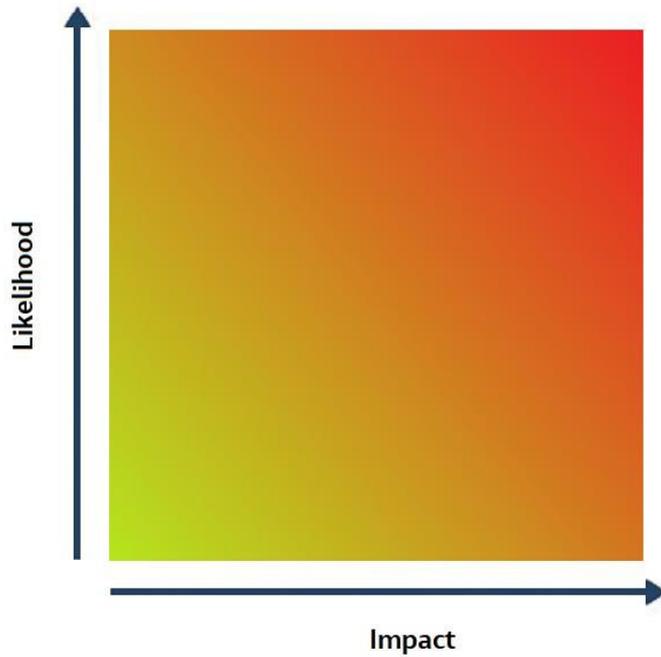


Figure 2-1 Matrix tool adopted in the assessment of INNS

Table 2-1 Impact Classification Categories

Level of impact	Description of impact
Negligible	Likelihood of INNS present in source water negligible e.g. source water drawn from a borehole.
Low	Impact classification of INNS species found in or near (5km) source water Low and/or transmission pathway low risk e.g., secondary treatment. Assumes all reasonable biosecurity measures adopted.
Medium	Impact classification of INNS species found in or near (5km) source water ≤ High and transmission pathway low/negligible e.g., secondary treatment. Assumes all reasonable biosecurity measures adopted; or Impact classification of INNS species found in or near (5km) source water ≤ Medium and transmission pathway ≤ medium e.g., primary treatment. Assumes all reasonable biosecurity measures adopted.
High	Impact classification of INNS species found in or near (5km) source High or GB NNSS alert species. Raw water transfer or transmission pathway considered medium risk e.g., primary treatment.

3. The UU Sources SRO Options

3.1 Overview

3.1.1 The options for the UUS SRO being taken forward at Gate 1 have been selected following a process of options identification and appraisal. UU initially identified a long list of possible options that were subject to screening (Primary Screening) to identify a total of 37 feasible options for the SRO. These feasible options were then assessed in terms of their Average Incremental Cost (AIC), modelled to determine their water resource benefit and subject to initial environmental assessment. Taking into account the AIC and the findings of the initial environmental assessments, as well as ongoing engagement with stakeholders, a preferred list of 27 feasible options for the UUS SRO has been identified.

3.2 UUS Sources SRO Options

3.2.1 The 27 options for the UUS SRO being taken forward by UU at Gate 1 are summarised in **Table 3-1**.

Table 3-1 UUS SRO Options

Option Number	Gate 1 Ref	Option Name	Summary Description
STT019	24	Transfer from Wirral to Liverpool via Mersey Tunnel	[✂]
STT029	6	River Lune Transfer	[✂]
STT034	11	Hollingworth Lake	[✂]
STT041	13	Heaton Park	[✂]
WR001	14	River Alt to Prescott WTW	[✂]
WR010	5	River Greta River Wenning to Lancaster	[✂]
WR049b	9	Abstraction from Ribble (lower) - Rivington	[✂]
WR076	25	New river abstraction, Upper Mersey (e.g. Bollin @ Lymm)	[✂]
WR099b	8	Worsthorne BH	[✂]
WR101	7	Franklaw BHs	[✂]

Option Number	Gate 1 Ref	Option Name	Summary Description
WR102b	17	Widnes BH Group	[✂]
WR102e	15	Bold Heath BHs	[✂]
WR105a	18	Lymm BH and WTW	[✂]
WR107b	12	Royal Oak	[✂]
WR112	21	Bramhall Borehole	[✂]
WR113	19	Tytherington BH	[✂]
WR123	23	Helsby and Foxhill BHs PBD	[✂]
WR141	10	New river abstraction, River Irwell (e.g. Medlock)	[✂]
WR149	16	Lightshaw increased WTW capacity (SW)	[✂]
WR153	20	Simmonds Hill WTW (Manley Quarry BH)	[✂]
WR154	22	Sandiford Increased Capacity	[✂]
WR159	2	Individual Reservoirs Compensation Release Control	[✂]
WR810	3	Cow Green to Heltondale	[✂]
WR812	1	Kielder to Heltondale	[✂]

Option Number	Gate 1 Ref	Option Name	Summary Description
WR814a	26	Increased treatment capacity at Huntingdon WTW	[✂]
WR815	4	Killington Reservoir to Thirlmere Aqueduct	[✂]
WR821	27	Llangollen Canal	[✂]

4. Options Assessment

- 4.1.1 Each of the UUS SRO options in **Table 3-1** have been assessed using the approach described in **Section 2**.
- 4.1.2 The assessments are based on freely available data sources that include NBN Atlas, Defra's MAGIC Map and the EA's Ecology & Fish Data Explorer website as well as the engineering scopes provided for each source option. These preliminary assessments consider feedback received to date from the EA, Natural England, and Natural Resources Wales. Due to the limited nature of the engineering and baseline information available at this stage, expert opinion has been employed in most cases on the SRO options. Where there was uncertainty over an option, a worst-case scenario approach has been used (e.g., the assessments have assumed an impact category of High). Where assumptions have been made they have been highlighted within the text.



Table 4-1 Level 1 INNS Screening Impacts from Option Activities.

Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
STT019 – 24	N7	Transfer from Wirral to Liverpool via Mersey Tunnel	[✂]	[✂]	Raw water pumped main	Signal crayfish (<i>Pacifastacus leniusculus</i>) Japanese knotweed (<i>Fallopia japonica</i>) Himalayan balsam (<i>Impatiens glandulifera</i>)	Y	Mersey Estuary SPA and Mersey Estuary Ramsar site within receiving water course area	Negligible	Negligible	Negligible	Negligible	Negligible Water treated before reaching the DMZ. INNS present within source catchment also present throughout catchment of DMZ. No discharge to surface water body.
STT029 – 6	N8	River Lune Transfer	[✂]	[✂]	Raw water main via water treatment works	Signal crayfish (<i>Pacifastacus leniusculus</i>) Water fern (<i>Azolla filiculoides</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea nuttallii</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Curly waterweed (<i>Lagarosiphon major</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Hybrid knotweed (<i>Fallopia japonica x Fallopia sachalinensis</i>) Rhododendron (<i>Rhododendron ponticum</i>) Rhododendron (<i>Rhododendron ponticum x Rhododendron maximum</i>) Variegated yellow archangel (<i>Lamium galeobdolon subsp. Argentatum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Montbetia (<i>Crocodylia x crocosmiflora</i>)	Y	None	High	High	Low	High	Low Resource option includes multistage treatment works adjacent to abstraction to include treatment processes sufficient to remove all life stages of potential INNS.
STT034 – 11	N4	Hollingworth Lake	[✂]	[✂]	Raw water pumped via main to water treatment works	Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea nuttallii</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Japanese knotweed (<i>Fallopia japonica</i>) Variegated yellow archangel (<i>Lamium galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Montbetia (<i>Crocodylia x crocosmiflora</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	High	High	Low	Low	High High impact aquatic and riparian INNS flora present within source water catchment. Current proposal includes the abstraction of raw water from Hollingworth Lake and transfer, through a pumped rising main, to Ogden Res. Raw water to be treated at Piethorne WTW downstream of Ogden Res. No proposed facility to treat raw water prior to discharge into Ogden Reservoir risking transfer of INNS.
STT041 – 13	N14	Heaton Park	[✂]	[✂]	Raw water pumped main via water treatment works	Montbetia (<i>Crocodylia x crocosmiflora</i>) Canadian waterweed (<i>Elodea Canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamium galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	Y	-	Medium	Medium	Low	Low	Medium High impact aquatic and riparian INNS flora present within source water catchment. All INNS present in or within 5km of source supply present in or within 5km of receiving water course. WTW lies outside of the immediate source catchment area.
WR001 – 14	N20	River Alt to Prescott WTW	[✂]	[✂]	Pumped raw water main	Water fern (<i>Azolla filiculoides</i>) Montbetia (<i>Crocodylia x crocosmiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Giant rhubarb (<i>Gunnera tinctoria</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamium galeobdolon subsp. Argentatum</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Medium	Medium	Low	Low	Medium High impact aquatic and riparian INNS flora present within source water catchment. Raw water treated outside of source water catchment. Potential for transfer from treatment works. Site management to incorporate biosecurity protocols.

Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR010 – 5	N21	River Greta River Wenning to Lancaster	[✂]	[✂]	Pumped raw water main	Water fern (<i>Azolla filiculoides</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Rhododendron (<i>Rhododendron ponticum</i>) Rhododendron (<i>Rhododendron ponticum</i> x <i>Rhododendron maximum</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon</i> subsp. <i>Argentatum</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Otter (<i>Lutra lutra</i>)	High	High	Low	Low	High High impact aquatic and riparian INNS flora present within 5km of source water catchment - not recorded within receiving water body. Current design detail suggests raw water transfer, resulting in untreated discharge to surface water body
WR049b - 9	N26	Abstraction from Ribble (lower) - Rivington	[✂]	[✂]	Raw water main	Chinese mitten crab (<i>Eriocheir sinensis</i>) Water fern (<i>Azolla filiculoides</i>) Montbretia (<i>Crocsmia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon</i> subsp. <i>Argentatum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	N	Adjacent to West Pennine Moors SSSI Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	High	High	Low	High	High High impact aquatic and riparian INNS flora and fauna present within 5km of source. Primary treatment not considered sufficient treatment to prevent spreading of species such as <i>D. haemobaphes</i> . No means of controlling <i>D. haemobaphes</i> at sites once established at this time.
WR076 – 25	N13	New river abstraction, Upper Mersey (e.g. Bollin @ Lymm)	[✂]	[✂]	Water treatment works and pumped treated water main	Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>)	Y	Adjacent to Dunham Park SSSI Great crested newt (<i>Triturus cristatus</i>) Natterjack toad (<i>Epidalea calamita</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Medium	Medium	Negligible	Negligible	Low High impact INNS present in or within 5km source water. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Resource option includes new WTW adjacent to abstraction to include treatment processes sufficient to remove all life stages of potential INNS.
WR099b – 8	N29	Worsthorne BH	[✂]	[✂]	Raw water pumped main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Water fern (<i>Azolla filiculoides</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Montbretia (<i>Crocsmia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon</i> subsp. <i>Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	Y	Immediately adjacent to South Pennine Moors SAC and South Pennine Moors Phase 2 SPA along shoreline	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.



Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR101 – 7	N30	Franklaw BHs	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Wels catfish (<i>Silurus glanis</i>) Montbretia (<i>Crocoshia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.
WR102b - 17	N31	Widnes BH Group	[✂]	[✂]	Raw water mains to WTW, then treated water mains	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Alpine newt (<i>Triturus alpestris</i>) Water fern (<i>Azolla filiculoides</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Montbretia (<i>Crocoshia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant rhubarb (<i>Gunnera tinctoria</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Parrot's feather (<i>Myriophyllum aquaticum</i>) Virginia creeper (<i>Parthenocissus inserta</i>) False Virginia creeper (<i>Parthenocissus quinquefolia</i>) Yellow azalea (<i>Rhododendron luteum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	Y	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.
WR102e - 15	N32	Bold Heath BHs	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Wels catfish (<i>Silurus glanis</i>) Water fern (<i>Azolla filiculoides</i>) Three-cornered garlic (<i>Allium triquetrum</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Montbretia (<i>Crocoshia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source (assumed no open pathway to source water prior discharge into Prescot open reservoirs). Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.



Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR105a - 18	N34	Lymm BH and WTW	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Marsh frog (<i>Rana ridibunda</i>) Wels catfish (<i>Silurus glanis</i>) Water fern (<i>Azolla filiculoides</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Parrot's feather (<i>Myriophyllum aquaticum</i>) False Virginia creeper (<i>Parthenocissus quinquefolia</i>) Yellow azalea (<i>Rhododendron luteum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	Y	Adjacent to Woolston Eyes SSSI Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Bore hole source with water passing to WTW. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.
WR107b - 12	N35	Royal Oak	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Water fern (<i>Azolla filiculoides</i>) Three-cornered garlic (<i>Allium triquetrum</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Montbretia (<i>Crocsmia x crocosmiiflora</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Virginia creeper (<i>Parthenocissus inserta</i>) False Virginia creeper (<i>Parthenocissus quinquefolia</i>) Yellow azalea (<i>Rhododendron luteum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	N	Adjacent to South Pennine Moors SAC and South Pennine Moors Phase 2 SPA No protected species records within 5km of receiving water course	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.
WR112		Bramhall Borehole	[✂]	[✂]		BOREHOLE ABSTRACTION			Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW.
WR113 - 19	N37	Tytherington BH	[✂]	[✂]	Treated water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Signal crayfish (<i>Pacifastacus leniusculus</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon majo</i>) Rhododendron (<i>Rhododendron ponticum</i>)	Y	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW. Existing source supply – no additional abstraction. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.



Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR123 – 23	N38	Helsby and Foxhill BHs PBD	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Water fern (<i>Azolla filiculoides</i>) Three-cornered garlic (<i>Allium triquetrum</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant rhubarb (<i>Gunnera tinctoria</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	N	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols. N.B. Demon shrimp (<i>Dikerogammarus haemobaphes</i>) present within 5km of source supply and not present in or within 5km of receiving water course. Site management to incorporate biosecurity protocols.
WR141 – 10	N12	New river abstraction, River Irwell (e.g. Medlock)	[✂]	[✂]	Raw water pumped main	Signal crayfish (<i>Pacifastacus leniusculus</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Yellow azalea (<i>Rhododendron luteum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	Y	White-clawed crayfish (<i>Austropotamobius pallipes</i>) Otter (<i>Lutra lutra</i>)	Low	Low	Low	Low	Low High impact fauna and flora present in or within 5km of the source water. White-clawed crayfish present within receiving water. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Resource option includes new abstraction from River Irwell with raw water transferred to Townsend Fold WTW (within R.Irwell catchment) with treatment processes sufficient to remove all life stages of potential INNS.
WR149 – 16	N39	Lightshaw increased WTW capacity (SW)	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Water fern (<i>Azolla filiculoides</i>) Three-cornered garlic (<i>Allium triquetrum</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Parrot's feather (<i>Myriophyllum aquaticum</i>)	Y	Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible – Borehole source with water passing to WTW. INNS present in or within 5km of source supply present in or within 5km of receiving water course. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols.



Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR153 – 20	N40	Simmonds Hill WTW (Manley Quarry BH)	[✂]	[✂]	Raw water main	BOREHOLE ABSTRACTION Species recorded in catchment (5km radius): Water fern (<i>Azolla filiculoides</i>) Three-cornered garlic (<i>Allium triquetrum</i>) New Zealand pygmy weed (<i>Crassula helmsii</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant rhubarb (<i>Gunnera tinctoria</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Floating pennywort (<i>Hydrocotyle ranunculoides</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Curly waterweed (<i>Lagarosiphon major</i>) Variegated yellow archangel (<i>Lamiastrum galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>) Demon shrimp (<i>Dikerogammarus haemobaphes</i>)	N	Adjacent to Dunsdale Hollow SSSI Great crested newt (<i>Triturus cristatus</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Medium	Medium	Medium	Medium	Medium Primary source from borehole however the multi-source option, records of <i>inter alia</i> Demon shrimp (<i>Dikerogammarus haemobaphes</i>) in source catchment and lack of clear design detail introduces risk to this option. Water passing to WTW. Number of High impact INNS fauna and flora within catchment of source (5km radius). Site management to incorporate biosecurity protocols. N.B. Demon shrimp (<i>Dikerogammarus haemobaphes</i>) present within 5km of source supply and not present in or within 5km of receiving water course. Site management to incorporate biosecurity protocols. No means of controlling <i>D. haemobaphes</i> at sites once established at this time. No means of controlling <i>D. haemobaphes</i> at sites once established at this time.
WR154 – 22	N41	Sandiford Increased Capacity	[✂]	[✂]	Raw and treated water mains	N/A – Water transfer already occurring. Only capacity of transfer increase	N/A - Water transfer already occurring. Only capacity of transfer increase	Adjacent to Yeadon Brickworks and Railway Cutting SSSI Great crested newt (<i>Triturus cristatus</i>) White-clawed crayfish (<i>Austropotamobius pallipes</i>) Water vole (<i>Arvicola terrestris</i>) Otter (<i>Lutra lutra</i>)	Negligible	Negligible	Negligible	Negligible	Negligible Increase in capacity of existing infrastructure. Water passing to WTW.
WR159 – 2	Options comprises regulation of compensation release for up to 76 reservoirs. No change to existing pathways. No additional risk perceived.												
WR810 – 3	N10	Cow Green to Heltondale	[✂]	[✂]	Raw water main	None	N	Adjacent to Naddle Forest SAC and Naddle Forest SSSI along shoreline. Haweswater Res. spills to Haweswater Beck designated a SAC (R. Eden SAC)	Medium	Medium	Medium	Medium	Medium No INNS currently recorded within source water. However, scheme consists of untreated raw water transfer between surface water reservoirs affording pathway for catchment transfer of INNS should they subsequently be introduced to source. Receiving water upstream of R.Eden SAC.
WR812 – 1	N11	Kielder to Heltondale	[✂]	[✂]	Raw water main	Himalayan balsam (<i>Impatiens glandulifera</i>) Rainbow trout (<i>Oncorhynchus mykiss</i>)	N	Adjacent to Naddle Forest SAC and Naddle Forest SSSI along shoreline. Haweswater Res. spills to Haweswater Beck designated a SAC (R. Eden SAC)	Medium	Medium	Medium	Medium	Medium No INNS currently recorded within source water. However, scheme consists of untreated raw water transfer between surface water reservoirs affording pathway for catchment transfer of INNS should they subsequently be introduced to source. Third party activities within Kielder Water considered to be potential high-risk pathway for subsequent INNS invasion. Receiving water upstream of R.Eden SAC.
WR814a - 26	N43	Increased treatment capacity at Huntington WTW	[✂]	[✂]	Raw water main	No change to existing infrastructure or pathways for release	-	Immediately adjacent to River Dee and Bala Lake SAC on South East boundary of site	Negligible	Negligible	Negligible	Negligible	Negligible No change to existing infrastructure or pathways for release



Option Number & Gate Ref.	No.	Name	Source water	Receiving water	Pathway for transfer	INNS present in and within 5 km of the source supply.	INNS present in source also present in or within 5km of receiving water course? (Y/N)	Conservation designation or protected species present within receiving water body	Potential likelihood (risk) of transfer for each INNS category				Perceive risk category and rationale (mitigation to be determined – see Section 2.2).
									Aquatic plants	Riparian plants	Attached aquatic invertebrates and fish eggs	Free swimming invertebrates and fish	
WR815 – 4	N44	Killington Reservoir to Thirlmere Aqueduct	[✂]	[✂]	Raw water main	Signal crayfish (<i>Pacifastacus leniusculus</i>) Canadian waterweed (<i>Elodea canadensis</i>) Nuttall's waterweed (<i>Elodea Nuttallii</i>) Japanese knotweed (<i>Fallopia japonica</i>) Giant knotweed (<i>Fallopia sachalinensis</i>) Giant hogweed (<i>Heracleum mantegazzianum</i>) Himalayan balsam (<i>Impatiens glandulifera</i>) Variegated yellow archangel (<i>Lamium galeobdolon subsp. Argentatum</i>) Rhododendron (<i>Rhododendron ponticum</i>)	N	-	High	High	Low	Medium	High – High Impact INNS present within source water, current design suggests raw water transfer, resulting in untreated discharge to surface water body.
WR821 – 27		Llangollen Canal	[✂]	[✂]	Raw water transfer	A range of INNS species are recorded within or adjacent to the Shropshire Union Canal including the following: Australian swamp stonecrop (<i>Crassula helmsii</i>); Parrot's feather (<i>Myriophyllum aquaticum</i>); Canadian pondweed (<i>Elodea canadensis</i>); Nuttall's pondweed (<i>Elodea nuttallii</i>); Japanese knotweed (<i>Fallopia japonica</i>); Himalayan balsam (<i>Impatiens glandulifera</i>); Giant hogweed (<i>Heracleum mantegazzianum</i>); Freshwater amphipod (<i>Dikerogammarus haemobaphes</i>); Zebra mussel (<i>Dreissena polymorpha</i>); Goldfish (<i>Carassius auratus</i>); Jenkins' spire shell (<i>Potamopyrgus antipodarum</i>); Sweetflag (<i>Acorus calamus</i>); Orange balsam (<i>Impatiens capensis</i>); Monkey-flower (<i>Mimulus guttatus</i>); Polychaete (<i>Hypania invalida</i>); Brook charr (<i>Salvelinus fontinalis</i>) & Common carp (<i>Cyprinus carpio</i>).	Y	Hurelstone WTW and storage reservoir lies adjacent and within the catchment of Shropshire Union Canal	Low	Low	Low	Low	Low - Within Catchment transfer. Abstracted water receiving secondary treatment at WTW including dosing with Hypochlorite.





5. Summary of Assessment Results

- 5.1.1 An INNS screening assessment has been undertaken of the preferred list of 27 UUS SRO options,
- 5.1.2 Four source options were considered to present a **High** risk of INNS transfer (**Table 5-1**). A further five source options were considered to present a **Medium** risk of INNS transfer. The remaining 17 source options were considered to have a **Low** or **Negligible** risk of INNS transfer.
- 5.1.3 Assigning a High or Medium level of impact to an option means that the activities that form part of the option pose a potential risk of either (i) deterioration of WFD status and/or (ii) the inability of a water body to attain its target status. In such cases, further WFD assessment is required to provide a more option-specific and robust conclusion that may include the requirement for bespoke design measures and/or environmental mitigation in order to ensure that WFD objectives are not compromised.
- 5.1.4 In addition, it is recommended that all options are reviewed post-Gate 1 to take account of the latest available information.

Table 5-1 UUS SRO options that have a potential High risk of spreading INNS from the source water.

Option Number	Gate 1 Ref	Option Name	Comments
STT034	11	Hollingworth Lake	[✂]
WR010	5	River Greta River Wenning to Lancaster	[✂]
WR049b	9	Abstraction from Ribble (lower) - Rivington	[✂]
WR815	4	Killington Reservoir to Thirlmere Aqueduct	[✂]

Table 5-2 UUS SRO options that have a potential Medium risk of spreading INNS from the source water.

Option Number	Gate 1 Ref	Option Name	Comments
STT041	13	Heaton Park	[✂]
WR001	14	River Alt to Prescott WTW	[✂]



Option Number	Gate 1 Ref	Option Name	Comments
			[✂]
WR153	20	Simmonds Hill WTW (Manley Quarry BH)	[✂]
WR810	3	Cow Green to Heltondale	[✂]
WR812	1	Kielder to Heltondale	[✂]

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Management systems

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Appendix A

Table A-0-1 Classification of aquatic alien species found in the UK in terms of their impact on native habitats and biota. Habitat classification: R, rivers; L, lakes; T, transitional waters; C, coastal waters (Source UKTAG, 2013)

	Common Name	Species	Plant/ Animal	Habitat	Species with updated risk assessments by GBNNSS
High Impact	Australian swamp stonecrop	Crassula helmsii	P	L	Yes
	Floating pennywort	Hydrocotyle ranunculoides	P	R	Yes
	Water fern	Azolla filiculoides	P	R/L	Yes
	Parrot's feather	Myriophyllum aquaticum	P	L	Yes
	Curly water-thyme	Lagarosiphon major	P	L	Yes
	Water primrose	Ludwigia grandiflora	P	L	Yes
	Canadian pondweed	Elodea canadensis	P	R/L	Pending
	Nuttall's pondweed	Elodea nuttallii	P	R/L	Pending
	Japanese knotweed	Fallopia japonica	P	R	Yes
	Giant knotweed	Fallopia sachalinensis	P	R	Yes
	Japanese knotweed/ Giant knotweed hybrid	Fallopia x bohemica	P	R	No
	Himalayan balsam	Impatiens glandulifera	P	R	Pending
	Giant hogweed	Heracleum mantegazzianum	P	R	Pending
	Rhododendron	Rhododendron ponticum (+ hybrids)	P	R	No
	North American signal crayfish	Pacifastacus leniusculus	A	R/L	Yes
	Red swamp crayfish	Procambarus clarkii	A	R/L	Yes
	Virile crayfish	Orconectes virilis	A	R/L	Yes
	Freshwater amphipod	Dikerogammarus villosus	A	R/L	Yes
	Freshwater amphipod	Dikerogammarus haemobaphes	A	R/L	Yes
	Mysid crustacean	Hemimysis anomala	A	R/L	No
Chinese mitten crab	Eriocheir sinensis	A	R/T/C	Yes	
Zebra mussel	Dreissena polymorpha	A	R/L	Yes	
Asiatic clam	Corbicula fluminea	A	R/L	Yes	
Topmouth gudgeon	Pseudorasbora parva	A	L	Yes	
Goldfish	Carassius auratus	A	R/L	No	
Moderate Impact	Carolina water-shield	Cabomba caroliniana	P	R/L	Yes
	Large-flowered water-thyme	Egeria densa	P	L	Yes
	Marbled crayfish	Procambarus spp.	A	R/L	Yes
	Spiny cheeked crayfish	Orconectes limosus	A	R/L	Yes
	Pikeperch (zander)	Sander lucioperca	A	R/L	Yes
Jenkins' spire shell	Potamopyrgus antipodarum	A	R/L/T/C	Yes	
Low Impact	Sweetflag	Acorus calamus	P	R	No
	Montbretia	Crococsmia x crocosmiiflora	P	R	No
	Orange balsam	Impatiens capensis	P	R	No
	Lupin	Lupinus nootkatensis	P	R	No
	Pink purslane	Montia sibirica	P	R	No

	Common Name	Species	Plant/ Animal	Habitat	Species with updated risk assessments by GBNNSS
	Cape pondweed	Aponogeton distachyos	P	L	No
	Water hyacinth	Eichhornia crassipes	P	L	Yes
	Giant butterbur	Petasites japonicus	P	R/L	Pending
	Tapegrass	Vallisneria spiralis	P	R	No
	Orfe	Leuciscus idus	A	R/L	No
	Freshwater amphipod	Crangonyx pseudogracilis	A	R/L	Yes
	Noble crayfish	Astacus astacus	A	R/L	Yes
	Narrow-clawed (Turkish) crayfish	Astacus leptodactylus	A	R/L	Yes
	Pumpkinseed	Lepomis gibbosus	A	R/L	Pending
	Rainbow trout	Oncorhynchus mykiss	A	R/L	No
	Grass carp	Ctenopharyngodon idella	A	R/L	No
Unknown Impact [Considered High]	Least duckweed	Lemna minuta (minuscula)	P	R/L	Pending
	Monkey-flower	Mimulus cupreus, M. guttatus and hybrids	P	R	Pending
	Other non-native <i>Myriophyllum</i> species		P	L	Pending
	Freshwater coelenterate	Craspedacusta sowerbyi	A	R/L	No
	Freshwater triclads	Dugesia tigrina Phagocata woodworthi Planaria torva	A	R/L	No
	Freshwater mollusc - Asiatic clam	Corbicula fluminea	A	R/L	Pending
	Freshwater molluscs	Ferissia wautieri Marstoniopsis scholtzi Menetus dilatatus Musculium transversum Physa acuta Physa gyrina Physa heterostropha	A	R/L	No
	Freshwater oligochaetes	Branchiura sowerbyi Limnodrilus cervix	A	R/L	No
	Polychaete	Hypania invalida	A	R/L/T	No
	Freshwater copepods	Achtheres percarum Ergasilus briani Ergasilus sieboldi Neoergasilus japonicus Tracheliaestes polycolpus	A	R/L	No
	Other freshwater malacostracans	Asellus communis Corophium curvispinum	A	R/L	No
	Brook charr	Salvelinus fontinalis	A	R/L	No
	Black bullhead	Ameiurus melas	A	R/L	Pending
	Sunbleak	Leucaspius delineatus	A	L	Pending
	Bitterling	Rhodeus amarus	A	R/L	No
	Sterlet/Sturgeons	All species except A. sturio, which is protected on Schedule 5 of the Wildlife & Countryside Act	A	R/T/C	Pending
	European (wels) catfish	Silurus glanis	A	R/L	Pending
	South American waterweed	Elodea callitrichoides/Hydrocharis callitrichoides	P	R/L	No

	Common Name	Species	Plant/ Animal	Habitat	Species with updated risk assessments by GBNNSS
	Swordleaf rush	<i>Juncus ensifolius</i>	P	R/L	No
	Floating primrose willow	<i>Ludwigia peploides</i>	P	R/L	No
	Freshwater amphipod	<i>Echinogammarus ischnus</i>	P	R/L/T	No
	Freshwater amphipod	<i>Echinogammarus trichiatus</i>	P	R/L/T	No
	White river crayfish	<i>Procambarus acutus</i>	P	R/L	Pending
	Freshwater cnidarian	<i>Cordylophora caspia</i>	P	R/L/T/C	No
Waiting List	Water Fern – high impact	<i>Azolla caroliniana</i>	P	R/L	Pending
	American skunk-cabbage – high impact	<i>Lysichiton americanus</i>	P	R/L	Yes
	Common Carp – high impact	<i>Cyprinus carpio</i>	A	R/L	Pending
	Quagga mussel – high impact	<i>Dreissena rostriformis bugensis</i>	A	R/L	Yes