ARUP

Natural Resources Wales

Llanfair Talhaiarn

INNS Management Plan

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Ove Arup & Partners Limited
4 Pierhead Street
Capital Waterside
Cardiff
CF10 4QP
United Kingdom
arup.com

ARUP

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			Prepared by	**Checked by**	**Approved by**
		Name	Rhodri Thomas	Philip Smith	Derek Hamer
		Signature			
		Filename			
		Description			
			Prepared by	**Checked by**	**Approved by**
		Name			
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1. Introduction

Ove Arup and Partners Limited (Arup) has been appointed by Natural Resources Wales (NRW) to undertake a range of engineering and environmental services in relation to removing a redundant weir on the River Elwy at Llanfair Talhaiarn to improve fish passage. The weir is located at NGR SH 93052 70474. Removal of the weir will provide access to 20km of suitable spawning and juvenile salmonid habitat upstream.

A Preliminary Ecological Appraisal (PEA)[1] identified the following invasive non-native species (Target Note (TN) references as given in PEA report) at the site:

- TN 2, 7 and 8: Himalayan balsam (*Impatiens glandulifera*) scattered throughout the tall ruderal habitat on both banks of the river.
- TN 4: Japanese knotweed (*Reynoutria japonica*) – a 1.5 x 1m stand adjacent to the weir on the northern bank of the river.

This Invasive Non-Native Species (INNS) Management Plan provides locations, extents and general guidance for managing the INNS on site. A specialist contractor will need to be employed to provide specific advice and undertake some control measures should avoidance not be possible.

[1] AECOM (October 2020). *Llanfair Weir Fish Pass: Salmon for Tomorrow 2, Preliminary Ecological Appraisal*. Report for Natural Resources Wales.

2. Proposed Works

The works are anticipated to comprise of:

- Demolition and disposal of the existing concrete weir, base, wing walls and adjacent concrete slabs.
- Minor earthworks and bank protection works to stabilise the channel where the structure has been removed. The left-hand bank of the removed weir will be regraded and lined with bank protection. The right-hand bank of the removed weir will be restored to a natural slope without bank protection.
- Sediment that is required to be removed by the contractor to facilitate the works is to be placed downstream of the weir. The river bed material will be reworked to form a low flow channel at the removed weir location.
- Construction of a blockstone check weir, approximately 170m upstream of the existing weir, and 50m downstream of the indicated location of a Welsh Water water main crossing beneath the river. This blockstone weir will have a low flow channel in the centre. The banks adjacent to the check weir are to be graded and lined with bank protection.
- The eroded left-hand bank approximately 60 metres downstream of the toe of the removed weir will be reprofiled to minimise future erosion. Site won brash will be used to reinstate the bank, sourced through the coppicing of one small tree upstream and a larger tree downstream as well as the removal of a tree on the opposing bank's gravel bed. A layer of gravel will be taken from the gravel bar opposite the eroded riverbank and willow harvested from a sustainable source downstream.
- The coppicing and removal of trees and vegetation on site is to be undertaken in accordance with the Tree Constraints Plan.
- Planting of approximately twenty trees to replace those that have been removed or coppiced is to be carried out across the site, in areas shown on the drawings. Exact locations are to be agreed with the Employer's Representative.
- Installation and / or replacement of fencing around the works.

The access route and site compound are anticipated to be located on the left (northern) bank of the River Elwy, accessed via an existing field gate from the A544.

3. Legislation

Schedule 9 of the Wildlife & Countryside Act 1981 (as amended) lists certain plants and animals that are not native to Great Britain and could pose a threat to our native species and habitats. Under this legislation it is an offence to plant or otherwise causes to grow in the wild any plant which is included in Part II of Schedule 9. It is also an offence to sell or to release into the wild any plants or animals on the Schedule.

The Invasive Alien Species (Enforcement and Permitting) Order 2019 allows for the enforcement of the EU Invasive Alien Species Regulation 1143/2014 on the prevention and management of invasive alien plant and animal species in England and Wales, including the relevant licenses, permits and rules for keeping invasive alien species. Plant species to which this legislation applies are listed on Part II of Schedule 2. Species on this list are no longer listed on Schedule 9 of the Wildlife & Countryside Act 1981 (as amended).

Some species are also listed on the Environmental Protection Act (Duty of Care) Regulations 1991. Under this legislation, any plant material of these species, and any soil contaminated with them, is classed as "controlled waste". Therefore, it must be disposed of safely at a licensed facility.

4. Methodology

The presence of INNS were noted during an extended Phase 1 habitat survey undertaken on the 14th September 2020. This field survey informed a Preliminary Ecological Appraisal[1] of the site.

The locations of any INNS plants on site were mapped using GPS, photographs were taken and their extents were estimated. Their locations are shown on Figure 1 and photographs are provided within Table 1 of this report.

4.1 Limitations

The findings presented in this report represent those at the time of survey and reporting. By nature, INNS plant species readily spread and therefore extents should be used as a guide only and may have increased since the issue of this report.

Given the length of time between the original survey in September 2020 and the likely construction start (Spring/Summer 2024), a pre-construction survey is planned to establish the current extent of INNS as it may have changed since the survey took place.

The absence of evidence of any particular plant species should not be taken as conclusive proof that the species is not present or that it will not be present in the future.

5. Results

Table 1: INNS identified at the site.

Ref. No	Species	Description	Photograph
TNs 2, 7 and 8	Himalayan Balsam	Scattered throughout tall ruderal habitat on both banks of the river.	 
TN 4	Japanese Knotweed	Stand of approximately 1.5x1m on northern bank downstream of the weir.	

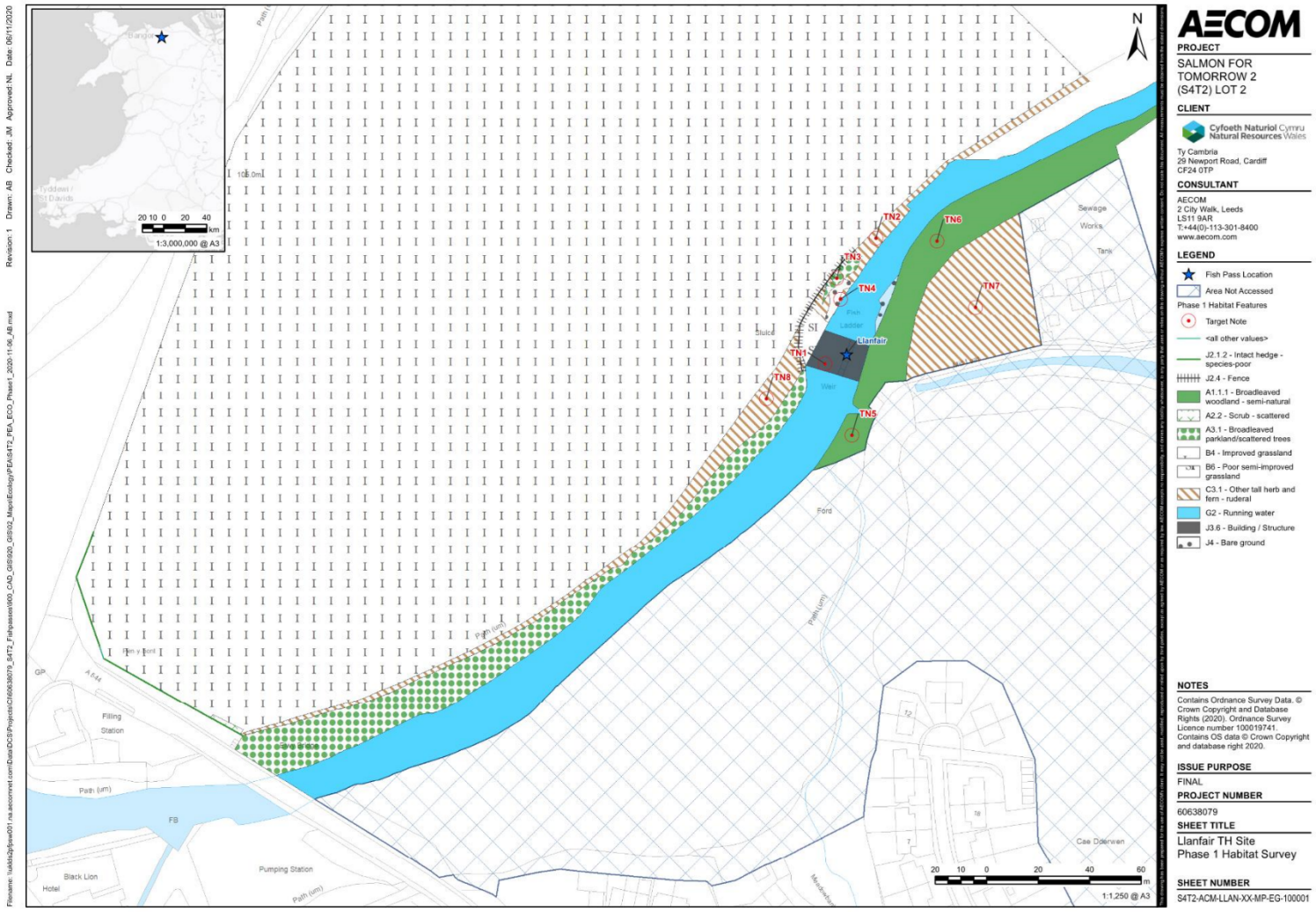

Figure 1: Phase 1 Habitat Survey Map.

6. Recommendations

Himalayan balsam and Japanese knotweed were identified in close proximity to the weir. There is the possibility of disturbing and spreading these species during works.

Himalayan balsam is most often spread by seeds, as the mature seed pods readily explode when ripe and the seeds can remain viable for up to three years[2]. Japanese knotweed spreads as a result of the plants' stems, or rhizomes, being moved/spread. Trials have shown that as little as 0.7g of rhizome material can produce a new plant within ten days[3].

The most common ways that INNS plants can be spread during site works are:

- Site and vegetation clearance or other landscaping activities;
- Spread of seeds or plant fragments during the movement or transport of soil;
- Spread of seeds or plant fragments through surface water and drainage network;
- Contamination of vehicles or equipment with seeds or plant fragments which are then transported to other areas; and
- Importation of soil from off-site sources contaminated with INNS plant material.

A number of measures to minimise the risk of spreading INNS have been identified.

6.1 Avoidance

Physically avoiding areas of INNS is the simplest way of not disturbing these species. Due to the distance at which Himalayan Balsam seeds can disperse, it is recommended that works must be at least 7 m away from the plants in order to avoid spreading them.

The proposed works will be unable to avoid the located INNS, although works close to the stand of Japanese Knotweed can be minimised as far as practicable.

It is recommended that all areas where these species have been confirmed as growing should be demarcated/fenced off before or after the Himalayan Balsam comes into seed (i.e. demarcation/fencing should be completed between November and May). Checks should be made to ensure new season growth is not present outside fenced off areas.

6.2 Control Measures

A specialist INNS contractor may need to be appointed to devise a detailed treatment plan for the INNS.

The following control measures are detailed within these publications:

- Environment Agency (2010). Managing Invasive Non-Native Plants in or Near Fresh Water.
- Reducing and Preventing Invasive Alien Species Dispersal (RAPID) (2018). Good Practice Management Guide for Himalayan Balsam (*Impatiens glandulifera*).
- Reducing and Preventing Invasive Alien Species Dispersal (RAPID) (2018). Good Practice Management Guide for Japanese Knotweed (*Fallopia japonica*).

[2] https://gov.wales/sites/default/files/publications/2018-01/himalayan-balsam-controlling-it-on-your-land.pdf [Accessed: 13/12/2023].

[3] www.Japaneseknotweed.co.uk [Accessed: 13/12/2023].

Summaries of potential control measures are provided below for information:

6.2.1 Himalayan Balsam

Control measures should aim to prevent flowering and are best carried out before June. It is recommended that to fully eradicate Himalayan balsam from a site, at least two or three years of control will be required, followed by a period of monitoring for two years to ensure eradication[2]. Additionally, the seeds are also spread by water, which can lead to new infestations along riverbanks. Therefore, good site hygiene, as described in Section 5.4 below, will also need to be adopted throughout construction, as it is unlikely that Himalayan balsam will be completely eradicated from the site.

Mechanical Control

Hand-pulling is an effective method of removing Himalayan balsam because it has a shallow root system. Hand-pulling can start in March and continue into June or until seeds start to form. If stems snap, they must be pulled out with the roots as the balsam can re-shoot and send up new flowerheads.

Cutting or mowing can also be carried out from March and continue until the balsam starts to flower in June. The plants must be cut below the lowest node to avoid re-flowering. Cutting may be required more than once a year and it will take several years before the balsam stops re-growing.

The pulled or cut material can be disposed of by composting (if there are no seeds present), burning or taking off-site to a licensed waste facility.

Chemical Control

Chemical control near water can be carried out using herbicides containing glyphosate or 2,4-D amine. Glyphosate is a broad-spectrum herbicide, while 2,4-D amine will kill only broad-leaved weeds. Herbicides are most effective if used when the plants are small and actively growing (i.e. in spring). Repeated treatment over several years is recommended for complete control of balsam.

6.2.2 Japanese Knotweed

Japanese knotweed is not an easy plant to control for several reasons:

- It can proliferate from fragments as small as a fingernail. In riparian areas, high water flows disperse fragments of the plant downstream where new colonies form.
- It is extremely resilient to a range of conditions and herbicides.
- It has an extensive underground rhizome system that can sustain the plant in a dormant state for years (observations suggest rhizome can stay alive for more than 20 years), even when top growth is removed.

The success of the species has been partially attributed to its tolerance of a wide range of soil types, pH and salinity. Its rhizomes can survive temperatures of −35 °C (−31 °F) and can extend 7m (23 ft) horizontally and 3m (9.8 ft) deep, making removal by excavation extremely difficult.

Regeneration from this dormant state can be triggered by a change in site conditions or more often by site disturbance, which is commonly the case on riverbanks. With these issues in mind, often treatment needs to be repeated for long-term control to be achieved and long-term monitoring is essential.

Japanese knotweed may take two or three years to show significant signs of the control efforts working, although with two or more treatments per year results can be faster. The effectiveness of the control work can be seen in the strength, colour and form of the Japanese knotweed as it regenerates, tending to produce less dense stands, that do not grow very high and have dwarf features. Again, it is important to continue monitoring sites even after apparent success as Japanese knotweed can lay dormant for several years before regenerating. Where possible, it is useful to disturb sites where Japanese knotweed has apparently been controlled as the disturbance can activate dormant roots which can then be treated to kill off any remnants.

When planning Japanese knotweed management, it is best to use a multifaceted and adaptive approach. It is important to select control methods that reflect the project resources. Management will require dedication over a number of years and should allow for flexibility in method as appropriate.

Non-chemical methods for the control of Japanese knotweed can take up to ten years to eradicate the weed and often may fail to achieve eradication. Great care needs to be taken with the cut material to avoid further spread. Non-chemical methods are generally suited to low populations in small areas but present problems of disposal of plant fragments. Although there are potentially successful mechanical or manual control options for small patches of Japanese knotweed, landscape level projects and larger sites will likely require integrating herbicide into the control strategy.

Mechanical Control

Cutting or mowing: Wherever possible Japanese knotweed should be cut with a single clean cut near the base of the stem. Use a cutting method that prevents fragmentation of the stem. Avoid flail mowing, strimming or similar methods that fragment the stem and rhizomes. Stems can regenerate from nodes, or fragments of nodes. If cut stem is dried until it is crisp and brown it can be burnt or disposed of as an inert waste. If stems have been pulled up, they will have fragments of knotweed crown still attached at their base. This is highly regenerative and will regrow, even after the stem has dried. Avoid pulling stems. Cutting will need to be done at least four times per year or every two-four weeks during the growing season if it is the only method of control. Cutting annually may take up to ten years to achieve death of the plant.

Plant material accumulated by this technique will need appropriate disposal. Disposal of cuttings should be done on site either by composting or burning. Stems should be dried on a layer of polythene to prevent rooting and once they become dark brown in colour they cannot regenerate. Dried cut stems can then be safely composted. Pulled stems, which will include crowns, are not suitable for composting. When burning pulled stems, ensure that the crown is in the centre of the fire and is thoroughly combusted.

Grazing: Grazing by horses, donkeys, sheep and goats can keep Japanese knotweed in check provided previous dead growth is removed. Grazing is not an eradication tool but is helpful in suppressing the plant and reducing spread.

Digging: Stand-alone digging as a management option is not suitable for most sites. This option is most commonly used on large, flat development sites where the costs and disturbance caused by the process are mitigated by the potential gains and the expediency of the solution. It involves digging down and removing all root material and all soil including a 2m halo of soil around the furthest extent of the rhizome system using a registered contractor.

In combination with herbicide spraying site trials have shown that digging is effective in reducing the time needed for chemical control. Great care is needed with this method to avoid spreading plant material. The aim of the treatment is to break up the rhizome, which stimulates leaf production and therefore makes the plant more vulnerable to herbicide treatment. The rhizome is also stimulated to produce green growth if it is near or on the surface. Therefore, the success of the treatment will be determined by the amount of rhizome that is brought to the surface layer. Whilst this disturbance technique (in conjunction with chemical control) may have the potential to eradicate Japanese knotweed infestations, it cannot guarantee it.

Root barrier membranes: Various root barrier membranes are available which claim to prevent Japanese knotweed penetrating. A root barrier membrane is only as good as the way in which it has been laid. It is essential that there is expert supervision when the root barrier membrane is supplied. It is important that the suppliers of root barrier membranes can advise the designing architect of potential problems and supervise installation.

There is little information available on the efficacy of this approach, but as it is used widely in large scale infrastructure projects, it is presumably quite effective.

Chemical Control

Chemical control using glyphosate is the most successful treatment for controlling Japanese knotweed as it kills the extensive rhizome system. However, complete control will seldom be achieved in one season. It is necessary to repeat herbicide treatment for at least three years before Japanese knotweed stops regrowing.

Herbicides should only be used by suitably qualified persons.

Herbicidal control adjacent to the river may require agreement from within NRW[4]. NRW also recommend that the National Bee Unit[5] or the Welsh Beekeepers Association[6] should be contacted to ensure that proposed activities will not adversely impact local honeybee populations.

6.3 Pre-Construction Survey

As species may have spread, or their distribution may have changed, between the INNS survey and the commencement of construction on site, a pre-construction survey by a suitably qualified person is recommended. Ideally undertaken between April and November, this would produce up-to-date mapping of the INNS on site and provide extents of the species on site, in order that accurate treatment methods can be devised by the contractor.

6.4 Site Hygiene

General good hygiene should be practiced on site during construction to prevent the spread of INNS. These measures should include but are not limited to:

- If possible, avoid using machinery with tracks where INNS may be present as seeds may be present in topsoil on site;
- Fence off areas of known INNS prior to and during construction works where possible, with a 7m buffer;
- A single access route should be used to the site in order to reduce potential spread of INNS;
- Install dedicated footwear and vehicular wheel wash down facility into a contained area within the site;
- Vehicles leaving the site to be inspected for any plant material and washed down into the contained area;
- Material gathered in dedicated wash down contained areas will need to be appropriately treated/transported to appropriate facility along with other contaminated soil on site;
- If soil is imported to the site, the contractor shall gain documentation from suppliers to ensure that it is free from INNS; and
- Ensure all site users are aware of measures to be taken by including them within a toolbox talk.

[4] https://naturalresources.wales/permits-and-permissions/water-discharges-and-septic-tanks/using-herbicides/?lang=en [Accessed: 13/12/2023].

[5] http://www.nationalbeeunit.com/index.cfm [Accessed: 13/12/2023].

[6] http://www.wbka.com/associations [Accessed: 13/12/2023].

7. Conclusions

Field survey has identified INNS plants at the site, which comprise of the following species: Himalayan Balsam and Japanese Knotweed.

Recommendations have been provided to prevent accidental spreading of these species during construction, including the appointment of a specialist contractor.

The removal of these species will benefit biodiversity within the site, by allowing native species to grow, where they would have otherwise been outcompeted by the invasive species.

This report is based upon the results of survey work undertaken in September 2020. This report refers, within the limitations stated, to the condition of the site at the time of the inspections. Changes in legislation, guidance, best practice, etc. may necessitate a re-assessment/survey.

It is also advised that as there has been a period of over 3 years between the original survey and the start of works, an updated survey is required to ensure the baseline conditions have not changed[7]. No warranty is given as to the possibility of future changes in the condition of the site.

This report is produced solely for the benefit of NRW and no liability is accepted for any reliance placed on it by any other party. This report is prepared for the proposed uses stated in the report and should not be used in a different context.

[7] https://cieem.net/wp-content/uploads/2019/04/Advice-Note.pdf [Accessed: 13/12/2023].