



Natural Resources Wales

Llyn Tegid Reservoir Safety Project

Invasive Species Management Plan

November 2019

LLYN TEGID RESERVOIR SAFETY PROJECT INVASIVE SPECIES MANAGEMENT PLAN

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APPENDICES

Appendix A: Invasive Species Location Plan

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Llyn Tegid Reservoir Safety Project Invasive Species Management Plan

1. LOCATION AND DESCRIPTION OF INVASIVE SPECIES

Introduction

This Invasive Species Management Plan has been prepared to support the proposed construction project by Natural Resources Wales (NRW) to undertake important safety upgrades on the embankments around Llyn Tegid and the River Dee. It was prepared following a verification survey of the Extended Phase 1 Habitat Survey undertaken in 2017 (Enfys Ecology), which was undertaken by Black & Veatch on 17th July 2019. The locations of invasive species identified in the plan were correct at the time of publication. Owing to the potential for the further spread of invasive species from the time of publication to works being undertaken on site, users of the plan are advised to reassess the recommendations made and ensure they remain valid.

Himalayan balsam

Numerous stands of Himalayan balsam (HB) are present along the left (north) bank of the River Dee, along both banks of the Tryweryn from the A494 bridge to the confluence with the Dee, and at the lake foreshore close to sluices feeding the Dee.

Largely, HB is confined to the river banks, meaning a lower risk of it being impacted by works along the crest or landward of the existing embankment. There is however one dense stand on the lakeshore in close proximity to the construction working area.

HB is spread throughout the entire riverbank (Dee and Tryweryn) with concentrated points and surveyed locations shown on the locations plans contained in Appendix A. Stands of HB which could be impacted by the works are summarised in Table 1.1.

NRW have undertaken wide-scale control of HB in advance of the proposed works, which is described in section 3.

Japanese knotweed

Japanese knotweed (JK) is not widely prevalent throughout the Llyn Tegid Reservoir Safety Project area. Three stands of JK have been identified through the surveys undertaken to date. Two of these are located along the lake foreshore; the works in this location comprise of removing and replacing the existing slate stone rip-rap with imported granite (or similar) stone. While the stands of JK are not located within the rip-rap they are located within the construction working area.

A third stand of JK is located on the left (east) bank of the Afon Tryweryn just downstream of the A494 bridge. As this stand is located on the opposite bank to where works will take place no impact is considered to occur, therefore no recommendations for treatment are presented here.

The three surveyed locations for JK are shown on the location plan contained in Appendix A and the two locations which could be impacted by the works are summarised in Table 1.1.

Table 1.1 Reach 1 invasive species locations (as of 17th July 2019)*(Table 1.1 should be read in conjunction with drg 122918-BVL-Z0-00-DR-I-00008 in Appendix A)*

Location Reference	Description	Approximate grid reference
HB-1	Dense stands of Himalayan balsam within the scrub and nettles in the southern lakeshore. The balsam was concentrated inland near the embankment, with scattered individuals closer to the lake. The stands could be within the construction working area and impacted by works to lake embankment.	SH 92910 35249
HB-3	Himalayan balsam was present all along this area as widely scattered individual plants. The stands are located on the river side of the embankment while works will focus on the landward side and crest.	SH 93199 35391
HB-4	Throughout this area there are numerous scattered Himalayan balsam plants, essentially everywhere at low density. The plant was found along this entire bank including the large swathe of inundation vegetation to the south. The stands are located on the river side of the embankment while works will focus on the landward side and crest.	SH 93217 35722
HB-5	There were dense stands of Himalayan balsam throughout this area, including on numerous small river islands either side of the weir. There were dense stands of this plant on the right (west) bank, and scattered plants throughout, including inland at the top of the embankment and individual plants in the dry ditch to the east behind it. Where located on the embankment crest they will be impacted by the works to resurface the footpath.	SH 93178 35941
HB-6	Small islands have formed in the river here due to the bridge arches. They are covered in inundation vegetation similar to the river margins, including scrub and ruderal vegetation, and clearly flood occasionally. Both contain numerous well established Himalayan balsam. Balsam is also found scattered at the river's edge on both banks in this area, particularly in scrub on the east bank. Where located on the embankment crest they will be impacted by the works to resurface the footpath.	SH 92933 36244
JK-1, JK-2	Two small patches of Japanese knotweed located close to the lake embankment within an area of tall ruderal vegetation. The stands are located within the construction working area but are not located within the existing rip rap.	SH 92735 35461, SH 92926 35245

2. LEGISLATION

JK is listed within Part II of Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) and HB is listed within Part 2 of Schedule 2 of The Invasive Alien Species (Enforcement and Permitting) Order 2019. It is a criminal offence to plant or to cause them to grow in the wild under these Regulations. Penalties may include a fine and/or 6 months imprisonment, or 2 years and/or an unlimited fine on indictment.

Legislation covering the handling and disposal of invasive species include the following:

- § The Invasive Alien Species (Enforcement and Permitting) Order 2019
- § The Highways Act 1980;
- § The Control of Pesticides Regulations 1986;
- § The Environmental Protection Act 1990;
- § The Town and Country Planning Act 1990 (as amended);
- § The Environmental Protection (Duty of Care) Regulations 1991;
- § The Water Resources Act 1991;
- § The Landfill (England and Wales) Regulations 2007;
- § The Hazardous Waste Regulations 2005;
- § The Waste Management Licensing Regulations 1994;
- § The Environmental Permitting Regulations 2010 (as amended);
- § The Control of Substances Hazardous to Health (COSHH).

In addition, because the site is located within a SAC/ Ramsar and SSSI then the control of invasive species needs to be assessed under these regulations (Habitat Regulations Assessment and SSSI Assent).

3. CURRENT TREATMENT

Natural Resources Wales let a contract in 2018 and 2019 to control HB by strimming (2018) and pulling (2019) along the northern bank of Llyn Tegid, and the banks of the River Dee and Tryweryn. HB seeds are usually viable for three years or more and if effective control has been carried out before seeding, complete eradication may be achieved in advance of construction commencing provided there are no other sources of seeds in the catchment area which could cause the area to become re-infested. Some seeds however, can remain viable for up to three years and the success of this HB treatment will be evaluated in spring 2020 and follow up work will be undertaken if required; either through the Llyn Tegid construction contract, or a separate contract depending on timing and location i.e. if within contractors work area and if the contract has been awarded.

Spraying of JK takes places annually in order to contain its spread.

4. GENERAL RECOMMENDATIONS FOR INVASIVE SPECIES MANAGEMENT ON CONSTRUCTION SITES

Japanese knotweed

As a general rule, a 7m horizontal construction exclusion zone should be implemented around a stand of JK, unless otherwise advised by a specialist and suitably-qualified contractor¹. This is considered to be the maximum horizontal distance that JK rhizomes

¹ Appointed contractors should be Amenity Assured and BACCS registered, and should hold NPTC certification PA1, PA6B and PA6AW. They should hold ISO 9001 accreditation from the British Standards Institute (preferably UKAS approved).

are likely to cause infestation of the soil. The JK stand and construction exclusion zone should be isolated with fencing and a restricted access sign attached. There is no specified vertical limit of potential rhizome infestation however, the rhizome rarely penetrates deeper than 3m.

Long-term herbicide treatment is advised as the first line of treatment. Stands of JK should initially be treated with a suitable herbicide in advance of the works. Glyphosate is the preferred product, which is used later in the season during late August to September when the plants are flowering. Foliar spraying on both sides of the leaf with a glyphosate based herbicide is recommended at this time as there is maximum leaf growth and the plant will be starting to take its reserves down into the rhizomes. The adjuvant 'Top Film' should be used with a bioactive formulation of glyphosate. This increases herbicide uptake and makes the product rain-fast. 2-4-D amine could be used with glyphosate to increase glyphosate uptake. Individual isolated stands of JK could be targeted using a stem injection, however stems must be at least 0.8cm diameter. This method maximises herbicide uptake and reduces non-target damage. There should be a maximum area of healthy leaves to treat and so damage to the plant, cutting and spraying should be avoided earlier in the year.

Herbicide treatment is to be undertaken by an appropriately qualified contractor and if JK stands are in proximity to water a licence is required from NRW.

Herbicide treatments can be expected to continue for at least two years before the JK stops growing back. Even if JK does not exhibit signs of future growth, precautionary measures should be followed as the rhizome has been known to stay alive for more than 20 years.

The programme of works on most development sites rarely allow for at least three years of herbicide treatment in advance of the works, and even if this has been possible, it may not have eradicated the JK completely. Any excavations from within the 7m buffer area would be considered as controlled waste and the advice of a suitably qualified contractor should be sought. Where three years is not possible then JK stands should be treated with a suitable herbicide for as long as possible in advance of the works. Short-term options should also be considered for the treatment of excavated material. This may include the following:

- i. Supervision of excavations by suitably qualified contractors to advise whether the material is contaminated with JK. If JK material is present, the suitably qualified contractor should advise of appropriate treatments that may be based on recommendations ii to v, below.
- ii. On-site burial of JK contaminated material. Burial would be required to a depth of at least 5m and covered with a root barrier membrane, or as otherwise advised by a suitably qualified contractor.
- iii. Creation of a bund for the storage and long-term treatment of JK contaminated material.
- iv. Stockpiling contaminated soil and replacement in situ following the works (i.e. to ensure contaminated soil is not relocated elsewhere allowing the JK to spread). Stockpiles of contaminated soil should be placed on a geotextile layer, clearly indicated, isolated and contained, and treated with a suitable herbicide during the temporary storage period. The replaced material should be treated with a suitable herbicide for a specified period of time through a Landscape Maintenance Contract.
- v. Off-site disposal of contaminated soil to a licensed landfill operator and with adequate capacity to receive the controlled waste. This is the least preferred and least sustainable option.

JK was identified in two locations along the lake foreshore within the construction working area. A 7m construction exclusion zone will be implemented around the two locations. It will not be possible to avoid ground disturbance within the specified construction exclusion zone, therefore a management approach for JK will be needed as set out in Section 5. This will include excavation and full removal of JK stands.

Himalayan balsam

In years where the spring season comes early, seeds can ripen in late June – and seeds are still produced until the first frost (typically October). If effective control is carried out before seeding, complete eradication may be achieved in two seasons, however seeds can remain viable for 3 years or more. Effective control methods are best carried out before seeding for maximum effectiveness and include:

- § Strimming or cutting; ensuring all stems are completely severed below the lowest node or joint.
- § Pulling or uprooting the plant. Some seedlings can mature as late as November and so the site must be closely monitored and any late emerging plants pulled. Care must be taken to completely uproot each plant. Provided they are removed before the plant begins to seed (in 2019 this was later and pulling was still possible in late July, other years might be earlier), cut or pulled plants can be safely left on site to decompose, though this must be done in a dry open area.
- § Chemical control with herbicides containing glyphosate.
- § Repeated removal is required during the growing period prior to seed production – ideally 3 removals, every 3 to 4 weeks, starting in early June. After a single control session dormant seeds will germinate, reach maturity and seed.

Current treatment and management by NRW contractors may mean that there is no HB or limited regrowth prior to the commencement of construction. A pre-construction survey should be undertaken to establish the location of HB and level of infestation. Treatment and management in line with the effective control methods detailed above should be undertaken during summer months prior to commencement of construction for any HB locations identified.

There will also be the potential for the soil to contain HB seeds, therefore any excavation works should ensure the seeds are not spread elsewhere. This can be achieved in much the same way as for JK; refer to Section 4 iv. to v. above.

Aquatic invertebrate invasive species

Ecological survey and reporting to date has not identified the presence of aquatic invertebrate invasive species. In order to reduce the risk of introducing aquatic invertebrate invasive species into the area standard biosecurity requirements will be followed (see good site practice below) in accordance with guidance from the GB non-native species secretariat's Check, Clean, Dry campaign (<http://www.nonnativespecies.org/checkcleandry/biosecurity-for-everyone.cfm>).

Good site practice

Good site practice and hygiene should ensure the following:

- § All areas of JK and HB not within the physical working areas to be demarcated to ensure no accidental spread.
- § All vehicles and footwear entering working area to be clean on arrival.
- § Vehicles or staff required to enter a 7m JK construction exclusion zone, or areas previously infested with HB, should be thoroughly inspected and boots or vehicles cleaned before moving outside of the working area.

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- § Areas within 7m of JK locations, or areas previously infested with HB that are likely to be disturbed by vehicles should be protected by a root barrier membrane to reduce spread and likelihood of heavy contamination of vehicles and footwear.
 - § Vehicles used to transport infested soils must be thoroughly inspected and appropriately cleaned in a designated area before being used for other work.
 - § The designated cleaning area must be within an area of hard standing or covered by a root barrier membrane that can contain and collect the material washed off. The cleaning area must be located so as not to allow material to contaminate drains, ditches or watercourses.
 - § The most appropriate methods of cleaning should be determined by a suitably qualified contractor following a visual inspection. The suitably qualified contractor should supervise the cleaning, which should pay particular attention to tyre treads, wheel arches and any other areas that might retain rhizomes or seeds.
 - § The material left within the designated area after vehicles have been cleaned must be contained, collected and disposed of along with other contaminated material. For HB this needs to be done in accordance with the licencing requirements in The Invasive Alien Species (Enforcement and Permitting) Order 2019.
 - § All staff should be aware of what JK (including regrowth of JK following treatment with glyphosate) and HB look like and what their responsibilities are. Awareness training should be undertaken in the form of Tool Box Talks covering JK and HB.
 - § An Environmental Clerk of Works (ECW) should undertake pre-construction invasive species survey and update the Invasive Species Management Plan accordingly. The ECW should oversee the implementation of the Invasive Species Management Plan on site. Everyone working on site should clearly understand the role and authority of the ECW, which will be included within the site induction.

5. PROPOSED INVASIVE SPECIES MANAGEMENT AS PART OF THE LLYN TEGID RESERVOIR SAFETY PROJECT

Prior to commencement of construction works a pre-construction survey should be undertaken to establish the location and level of infestation of HB and JK. Treatment and management in line with the effective control methods detailed in Section 4 should be undertaken during summer months prior to commencement of construction for any HB locations identified.

Table 5.1 details the areas of invasive species and their recommended course of treatment prior to and during construction. In all cases the principal contractor should develop species specific method statements for the management and treatment of invasive species in accordance with this Invasive Species Management Plan prior to commencement of construction.

Section 6 of this plan details the recommended treatment during the landscape maintenance period on completion of the works (post construction).

In all cases good site practice (as outlined in Section 4) should be followed throughout construction. A toolbox talk will be provided to the contractor to advise them of this Invasive Species Management Plan, what JK and HB look like and what their responsibilities are.

Table 5.1 Recommended treatment of invasive species prior to and during construction works

Location Reference	Recommended treatment
HB-1	<p><i>Prior to construction:</i> A pre-construction survey should be undertaken to establish the location and level of infestation of HB. Treatment and management in line with the effective control methods detailed in Section 4 should be undertaken during summer months prior to commencement of construction for any HB locations identified.</p> <p><i>During construction:</i> Good site practice to be followed. Where areas previously infested with HB are likely to be disturbed by vehicles these should be protected by a root barrier membrane. Any excavations required within the areas previously infested with HB may still contain the seeds within the soil. Excavations should therefore be temporarily stockpiled in a designated area prepared to receive such material. On completion of the works, the material should be replaced in situ. Any material that cannot be replaced in situ should be taken off site to a landfill site licensed to receive controlled waste, as detailed in Section 4 (v).</p>
HB-3, HB-4, HB-5, HB-6	<p><i>Prior to construction:</i> A pre-construction survey should be undertaken to establish the location and level of infestation of HB. Treatment and management in line with the effective control methods detailed in Section 4 should be undertaken during summer months prior to commencement of construction for any HB locations identified.</p> <p><i>During construction:</i> Good site practice to be followed. Any excavations required within the areas previously infested with HB may still contain the seeds within the soil. Excavations should therefore be temporarily stockpiled in a designated area prepared to receive such material. On completion of the works, the material should be replaced in situ. Any material that cannot be replaced in situ should be taken off site to a landfill site licensed to receive controlled waste, as detailed in Section 4 (v).</p>
JK-1, JK-2	<p><i>Prior to construction:</i> A pre-construction survey should be undertaken to confirm the location and level of infestation of JK. JK-2 will be fully removed through excavation prior to construction with the method of disposal to be determined through contractor method statement. It may be possible to undertake construction without disturbance to JK-1, however if considered necessary it will be removed following the method established for JK-2.</p> <p>Treatment with glyphosate for JK-1 (if not removed) to be undertaken during late August to September and subsequently</p>

Location Reference	Recommended treatment
	<p>throughout construction. Where possible stem injection is recommended, however stems need to be 0.8cm diameter. Treatment with glyphosate to be undertaken by an appropriately qualified contractor and licence obtained from NRW.</p> <p><i>During construction:</i></p> <p>Good site practice to be followed. Locations where JK is removed are to be regularly inspected for signs of new growth, any new growth to be immediately treated with glyphosate. A 7m JK construction exclusion zone will be established around JK locations (JK-1 and JK-2). Areas within 7m of the JK locations (JK-1 and JK-2) that are likely to be disturbed by vehicles should be protected by a root barrier membrane. Any excavations required within 7m of the JK locations (JK-1 and JK-2) should be undertaken in accordance with Section 4 (i. to v.). Glyphosate treatment of JK-1 (if not removed) to continue throughout construction at appropriate times.</p>

6. ONGOING MONITORING AND MANAGEMENT

This Invasive Species Management Plan will be regularly monitored by the suitably qualified contractor, and the Environmental Clerk of Works (ECW) throughout construction alongside species specific method statements to be developed by the principal contractor. Detailed measures will be included within the Environmental Action Plan regular audits.

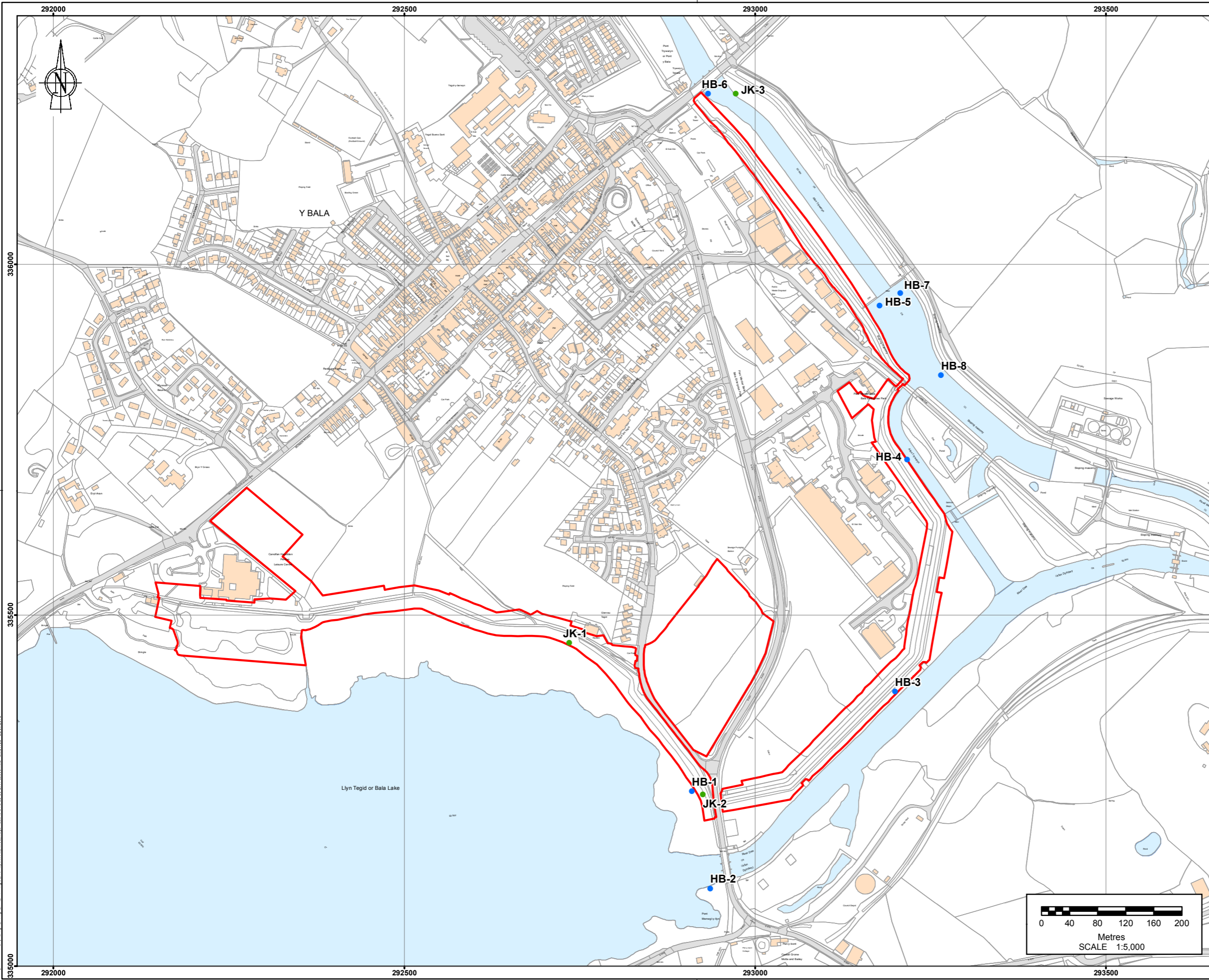
Site workers and the ECW will remain vigilant for the new growth of invasive species within and in close proximity to the works, and this Invasive Species Management Plan will be updated accordingly.

NRW plan to continue undertaking measures to remove areas of JK and HB within and adjacent to their construction area through implementation of a post scheme management plan of spraying and uprooting. The scope of the management plan is envisaged to include:

- Areas of HB occurring along the River Dee and Tryweryn throughout the scheme area will be subject to cutting or uprooting plants, starting in early June and repeating 3 times (every 3 to 4 weeks) during the growing period prior to seed production, for a minimum period of 2 years/growing seasons.
- Areas of JK occurring along the lake foreshore throughout the scheme area will be treated with glyphosate for a period of 3 to 5 years/growing seasons. Stands of JK previously treated/removed are to be monitored for 2 years after the last regrowth is recorded.

NRW may also work with other groups in the area, such as the Dee INNS project, to identify and strategically treat areas that will help the wider control of invasive species within the catchment.

Appendix A
Invasive Species Location Plan



Note: The limits, including the height and depths of the Works, shown in this drawing are not to be taken as limiting the obligations of the contractor under Contract.
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- LEGEND:**
- HIMALAYAN BALSAM
 - JAPANESE KNOTWEED
 - CONSTRUCTION WORKING AREA



SAFETY, HEALTH AND ENVIRONMENTAL INFORMATION
 IN ADDITION TO THE HAZARDS OR RISKS NORMALLY ASSOCIATED WITH THE TYPES OF WORK DETAILED ON THIS DRAWING, THE FOLLOWING SIGNIFICANT RESIDUAL RISKS SHOULD BE NOTED. FURTHER DETAILS ARE INCLUDED IN THE CDM DESIGN RISK MANAGEMENT REGISTER

CONSTRUCTION :
 NOT APPLICABLE

MAINTENANCE, CLEANING AND OPERATION :
 NOT APPLICABLE

DECOMMISSIONING OR DEMOLITION :
 NOT APPLICABLE

Rev	Drawn	Chkd	Rvwd	Apprvd	Date	Description
P01	ZO	DJ	PGN	SPC	30/07/2019	SUITABLE FOR INFORMATION

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