DixonBrosnan

environmental consultants

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Contents

1. Introduction

DixonBrosnan were commissioned to survey for invasive species within the proposed development area and develop an invasive species management plan.

2. Invasive species – desktop review

Non-native plants are defined as those plants which have been introduced outside of their native range by humans and their activities, either purposefully or accidentally. Invasive non-native species are so-called as they typically display one or more of the following characteristics or features: (1) prolific reproduction through seed dispersal and/or re-growth from plant fragments; (2) rapid growth patterns; and, (3) resistance to standard weed control methods.

Where a non-native species displays invasive qualities and is not managed it can potentially: (1) out compete native vegetation, affecting plant community structure and habitat for wildlife; (2) cause damage to infrastructure including road carriageways, footpaths, walls and foundations; and, (3) have an adverse effect on landscape quality. The NBDC lists several high impact invasive species which have been recorded within grid squares S61, S71, S70, S80 within which the development will be located (**Table 1**).

Table 1: NBDC list of high impact invasive species.

Grid Square	Common Name	Latin Name
S61	Chinese Mitten Crab	*Eriocheir sinensis*
S61, S71	Canadian Waterweed	*Elodea canadensis*
S61, S71, S70, S80	Cherry Laurel	*Prunus laurocerasus*
S61, S71, S70, S80	Common Cord-grass	*Spartina anglica*
S71, S70	Giant-rhubarb	*Gunnera tinctoria*
S61	Hybrid Knotweed	*Fallopia japonica x sachalinensis = F. x bohemica*
S61	Giant Knotweed	*Fallopia sachalinensis*
S61, S70	Indian Balsam	*Impatiens glandulifera*
S61, S71, S70, S80	Japanese Knotweed	*Fallopia japonica*
S61	New Zealand Pigmyweed	*Crassula helmsi*
S61, S71, S70, S80	Rhododendron	*Rhododendron ponticum*
S61, S71, S70, S80	Brown Rat	*Rattus norvegicus*
S61, S71, S70, S80	American Mink	*Mustela vison*
S61, S71, S70	Eastern Grey Squirrel	*Sciurus carolinensis*
S71	Feral Ferret	*Mustela furo*

S61, S71	House Mouse	*Mus musculus*
S61	Sika Deer	*Cervus nippon*

Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011 make it an offence to plant, disperse, allow dispersal or cause the spread of certain species e.g. Japanese knotweed, Himalayan balsam and Rhododendron, keep the plant in possession for purpose of sale, breeding, reproduction, propagation, distribution, introduction or release, keep anything from which the plant can be reproduced or propagated from the species, without a granted licence and keep any vector material for the purposes of breeding, distribution, introduction or release. Regulation 49 deals with the '*Prohibition on introduction and dispersal*' while Regulation 50 deals with the '*Prohibition on dealing with and keeping certain species*'. Regulation 50 has yet to be brought into Irish law. Regulation 74 is a transitional provision in relation to Regulation 49 and 50.

The Wildlife (Amendment) Act 2000 states that anyone who plants or otherwise causes to grow in a wild state in any place in the State any species of (exotic) flora, or the flowers, roots, seeds or spores of (exotic) flora shall be guilty of an offence.

There is a statutory obligation under S.I. 477 of 2011 of the European Communities (Birds and Natural Habitats) Regulations 2011 to address invasive species in Ireland. Rhododendron and Japanese Knotweed are listed under the *3rd Schedule: Part 1 – Plants; Non-native species subject to restrictions under Regulations 49 & 50*.

The non-native and invasive species Japanese Knotweed (*Fallopia japonica*), Rhododendron (*Rhododendron ponticum*) and Three Conered Leek (*Allium triquetrum*) were recorded within or in proximity to the proposed works area. All three species are listed on both the "Most Unwanted: Established Threat" and on the "High Risk: Recorded Species" list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS. All invasive species listed are also included in the NRA Guidelines on the Management of Noxious Weeds and Non-native Species on National Roads (NRA, 2010) as these species have been shown to have an adverse impact on landscape quality, native biodiversity or infrastructure; and are likely to be encountered during road schemes. The location of Japanese knotweed, Three Cornered Leek and Rhododendron within the or in proximity to the proposed development area is shown in **Figure 1**. The Amber listed species Winter Heliotrope was recorded within the works area and is ubiquitous along roadside verges in this area and was too prevalent to effectively map.

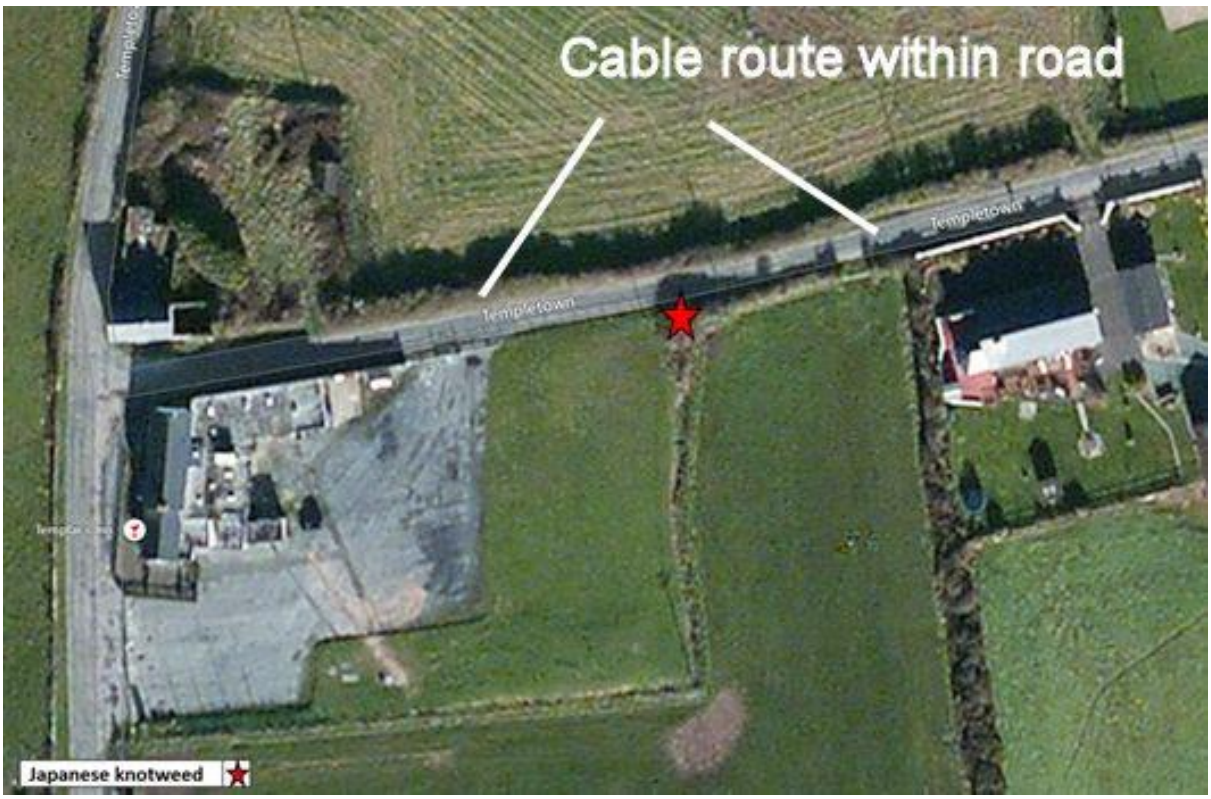

Figure 1. Location of the high-risk invasive species Japanese knotweed,

Figure 2 Location of Three-cornered Leek | not to scale

Figure 3 Location of Rhododendron| not to scale

3. Rhododendron (Rhododendron ponticum)

This species is listed on both the “Most Unwanted: Established Threat” and on the “High Risk: Recorded Species” list compiled by Invasive Species Ireland a joint initiative by the Northern Ireland Environment Agency and NPWS.

Under the right ecological condition, Rhododendron can become a highly invasive and once rhododendron has invaded an area, few native plants survive. Rhododendron can regenerate via seeds, suckers or rootlets. It forms extensive dense thickets which cast a very deep shade, leading in woodland to loss of ground flora, epiphytic bryophytes and lichens, modifying the fauna and preventing regeneration of trees. In addition to the effect of shade, it may produce biochemicals which can affect other plants, inhibiting the germination or seedling establishment of other species. There is also evidence for the prevention of mycorrhizal development in the roots of seedlings of competing plant species. *R. ponticum* is identified as a serious threat to upland oakwood. It is also identified as a threat for several lower plants and fungi including *Acrobolbus wilsonii, Arthothelium macounii, Lejeunea mandonii.* The characteristics of

this species are illustrated in **Figure 2** & **Photographs 1.** Within the study area this species is strongly associated with woodland and hedgerow habitat.

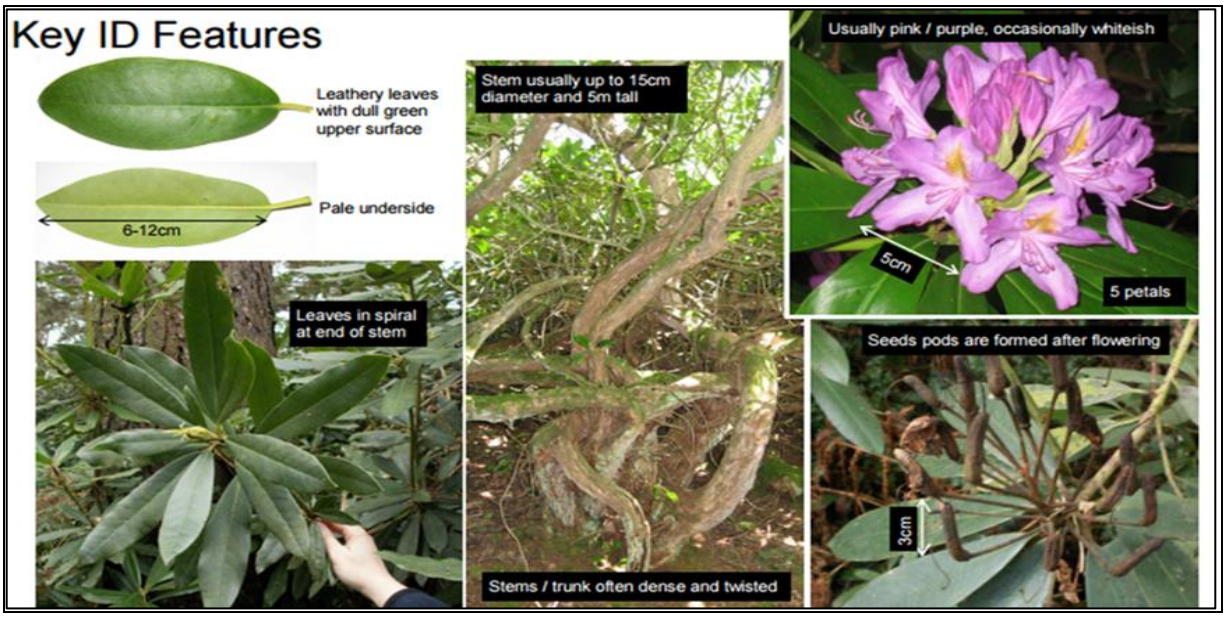

Figure 4. Key features of Rhododendron.

4. Japanese Knotweed (*Fallopia japonica*)

Japanese knotweed was recorded scattered within the western section of the existing quarry. It was recorded growing in stands of various ages and sizes, primarily in scrub/recolonising bare ground habitat. A small number of emerging shoots were noted in a recently cleared area of the site. Therefore, potential contamination of further sections of the quarry is possible due to anthropogenic causes e.g. movement of rhizomes around the site on caterpillar tracks.

Japanese knotweed is a highly invasive, non-native species which was originally introduced as an ornamental plant but has since spread along transport routes and rivers to become a serious problem. From an ecological viewpoint it out-competes native species by forming dense stands which suppresses growth of other species. It grows extremely vigorously and can penetrate through small faults in tarmac and concrete and thus can damage footpaths, roads and flood defence structures. As it can survive in poor quality soils, including spoil, it often thrives in brownfield sites and in urban areas. The key features of the plant are summarised below:

- Produces fleshy red tinged asparagus like shoots when it first breaks through the ground in an established stand.
- Has large, heart or spade-shaped green leaves which are approximately the size of your hand.
- Has leaves arranged in a zig-zag pattern along the stem.
- Grows up to 3 metres in height.
- Yellow / cream flowers in late summer (Typically the start forming from late July onwards).

- Hollow bamboo like stems which have distinctive ring like nodules at regular intervals along it.
- Brown stem remain in winter once it has died back.
- Extensive rhizome system (roots) (7m radius x 3m depth approximately)
- Orange centred rhizome.
- Spread entirely via the movement of plant and rhizome fragments.

The plant has woody underground rhizomes which can extend 7m laterally from a parent plant. The leaves and stems die back during winter, but growth is extremely rapid during spring. The plants spread mainly through fragments of rhizomes -as little as 0.7g of material or the size of a small fingernail is sufficient-and through cut stems. Stem material cannot regenerate once it has dried, but rhizome material may be viable for up to 20 years in the soil. Thus, control of this species is very difficult. The characteristics of this species is shown in **Figure 4** and **Photographs 2 and 3.**

Figure 5. Key features of Japanese Knotweed

5. Three Cornered Leek (*Allium triquetrum*)

Three-cornered leek (*Allium triquetrum*), a species also listed under Regulations 49 and 50 of the European Communities (Birds and Natural Habitats) Regulations 2011, was also recorded near the proposed cable route. Three-cornered leek is known to have serious impacts on the natural habitats that it invades and is very aggressive, having the potential to rapidly occupy large tracts of land. Plants form dense and persistent stands that totally dominate the ground-flora when conditions are suitable (*moist and shaded*). These stands crowd out and displace the indigenous grasses and groundcover and can also seriously impede the regeneration of the overstorey vegetation. It is noted that this species was recorded approximately 86m from the proposed car parking area, which is the closest point of the proposed development at Baginbun Beach. Therefore, other than avoidance and standard biosecurity measures as outlined below, a management plan is not required in relation to this species. An invasive species survey will be carried out prior to the

commencement of works to ascertain if the distribution of this species has changed, the supervising ecologist will update this ISMP as required based on up to date data.

Figure 6: Three-Cornered Leek

6. Winter Heliotrope (*Petasites fragrans)*

Short hairy herbaceous perennial, up to 30cm with heart shaped leaves 20-50cm wide persisting in winter. White to lilac flowers, smelling strongly of almonds or Reproduces vegetative as only male plants found in Britain and Ireland. It occurs on unvegetated or sparsely vegetated habitats including constructed, industrial or other artificial habitats. It is also found in hedgerows, roadsides, stream banks, waste ground and the edges of woodland. Forms dense stands excluding native vegetation. Following best practice guidance, the Amber Listed species Winter Heliotrope (*Petasites fragrans*), can be readily managed through standard eradication/control methods post construction. On the basis of their invasive qualities, the ecological value and types of habitats recorded during the walkover survey and their Amber Listing by Invasive Species Ireland, this species will not have a significant effect on habitats outside the works area.

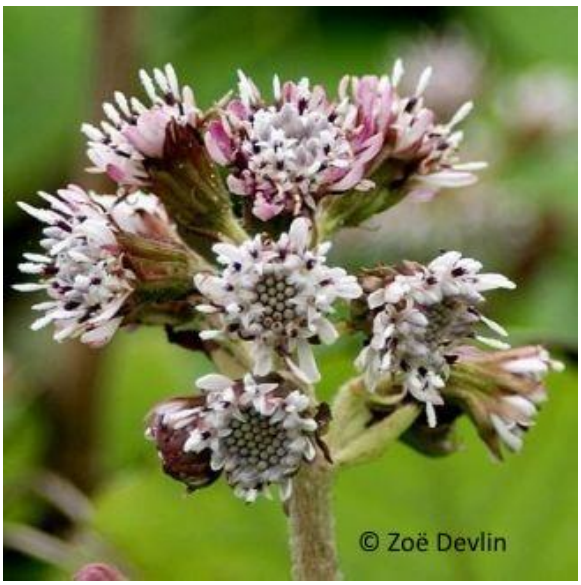

Figure 7 Winter Heliotrope

7. Development of a management plan for Japanese Knotweed and Rhododendron

The following factors are considered when developing a management plan.

- Timeframe in which the work needs to be completed.
- Structural or environmental features that might affect control action, such as proximity to watercourses, designated sites
- Future plans for the site, such as development or landscaping plans.
- Hazards or risks identified during the site inspection, such as underground services and chemical contamination.
- Availability of storage areas on or off site.
- Access for machinery through private residences
- Agreement with landowners where a stand is partially within the works area and partially within the landholding of another person or entity.
- Timeframe for works to be completed
- Seasonal restrictions to work
- Commencement date for proposed works.
- Financial constraints
- Location of underground services

- Site hygiene
- Rivers provide particular issues with respect to Japanese Knotweed and Giant Rhubarb treatment. During the excavation process small fragments of rhizome or stem falling into the river can lead to inadvertent spread of the plant downstream.

8. Management of Japanese knotweed

8.1 Literature on control of Japanese knotweed

There is an extensive body of literature on control of this species including the *NRA Guidelines on The Management of Noxious Weeds and Non-Native Invasive Plant Species on National Roads (2008)*, *Best Practice Management Guidelines Japanese knotweed Fallopia japonica (2008)* and *Best Practice Management Guidelines Himalayan balsam Impatiens glandulifera (2008),* prepared for NIEA and NPWS as part of Invasive Species Ireland. The most extensive guidelines are available from the UK including *Managing Japanese knotweed on development sites - The Knotweed Code of Practice produced by the Environmental Agency*. Appropriate methods are also outlined in *Irish Water guidelines, (Irish Water Report Information and Guidance Document on Japanese Knotweed Asset Strategy and Sustainability)*

8.2 Potential treatment procedures

A number of different methodologies are employed to treat Japanese Knotweed. These include the following:

- Herbicide treatment in situ
- Combined treatment methods
- Excavation and Burial
- Excavation and Bund Method
- Excavation and Root Barrier Cell Method
- Removal of contaminated soil to landfill
- Pulling or digging out

8.3 Outline methodology

It is noted that the existing stand of Japanese Knotweed is located alongside a road along which the cable route will run. The preferred option is avoidance to within 7m of the stand. However, this species spreads rapidly and such avoidance may not be possible. This ISMP will be updated by the supervising ecologist prior to the commencement of works based on up to date survey data.

If the infestation cannot be avoided, then site investigations will be carried out to determine the extent of the infestation within the works area.

If there are visible rhizomes, then contaminated soils be excavated, and excavated materials will be placed directly into removal trucks for direct disposal to licensed facility. Any above ground visible units will be bagged and sealed to avoid spread during excavation. All bio-security protocols as detailed below will be taken to ensure site vehicles are fully washed down before movement of the materials through the site as detailed below.

The supervising ecologist will apply to the National Parks and Wildlife Services (NPWS) for the required license to remove Knotweed contaminated materials from site. This process will include an application inclusive of the Ecologist's updated Invasive Species Management Plan.

On receipt of NPWS license the removal of contaminated material from site to licensed facility will be carried out by the contractor and an approved licensed haulier who has the required permits from the National Waste Collection Permit Office (NWCPO) to transport Knotweed contaminated materials. All licenses and permits from hauliers and disposal facilities will be issued for approval prior to the commencement of any Knotweed removal.

8.4. Site hygiene

The following site hygiene protocols need to be put in place to prevent inadvertent spread of plant fragments during site investigations and during subsequent excavation and removal/treatment.

1. All biosecurity measures will be approved by the supervising ecologist prior to commencement of any works.

2. Ensure all site users are aware of measures to be taken and alert them to the presence of the Invasive Species Management Plan. Management of invasive species will be assigned to a nominated individual who will walk the entire works area with the supervising ecologist. In relation to knotweed species the information that the extent of the rhizome (root) system underground can extend up to 7m horizontally and 3 meters vertically must be clearly communicated

3. Prior to the commencement of works the works area will be resurveyed to accurately assess any changes in distribution in the intervening period.

4. All stands of Japanese Knotweed will be clearly delineated with hazard tape and fenced in a manner visible to machine operators prior to the commencement of works.

5. Appropriate signage will be put in place to deter any entrance by people or machinery into the areas within which the Japanese Knotweed is growing.

6. Prior notification will be given to all contractors that parts of the works area are contaminated with Japanese Knotweed and that they must adhere to this protocol to avoid the spread of the plant within and more importantly, outside of the works area.

This includes any site investigation works in advance of commencement of excavation works.

7. Only vehicles required for the works within the contaminated works area will be brought on site and the number of visits minimised as much as practicable. Vehicle movements within this area swill be kept a minimum. It is noted that vehicles will only enter these areas under the supervision of the supervising ecologist.

8. At each location a specialised wash down area will be created for machinery and footwear. All machinery and equipment (including footwear) should be power washed prior to leaving the contaminated works area within this wash down area. All water from the wheel wash will be collected, fully contained, and dispatched for treatment and disposal off-site. They will also be visually checked for clods of soil, bits of vegetation etc. and particular care is required with tracked machinery;

9. This wash down area will be located in close proximity to existing stands and the wash down area will be included in the post-works treatment programme for Japanese Knotweed.

10. Ideally works including site investigation works should be undertaken in dry weather to minimise the potential for dispersal of fragments of invasive species.

11. A supervising ecologist will be present on site to identify pieces of Japanese Knotweed fragments and to determine the volume of spoil to be removed. In the case of mature stands, spoil from a 7m buffer around the parent plant may require removal.

12 Should stockpiling of contaminated material be required, the areas will be clearly marked out on site. These areas will not be within 50m of the seashore or within a flood zone;

13. Any trucks used to transport spoil offsite must be sealed so that no fragments of material can escape on route. Vehicles leaving the site will be inspected for any plant material and washed down into a contained wash down area.

14. Vehicles used in the transport of contaminated material will need to be visually checked and washed down in the contained wash before being used for any other work, either on the same site or at a different site.

15. To prevent Japanese Knotweed from outside the site being inadvertently being brought into the site, the contractor will be required to inspect vehicles before using them on site and will pay particular attention to caterpillar tracks and where trucks and dumpers are stowed.

9. Management of Rhododendron

The eradication of rhododendron from an infested habitat can only be carried out effectively by understanding the ecology of the species and by strategically planning the clearance work. In order to rid a habitat of rhododendron, a number of steps should be followed, including cutting all standing rhododendron and killing the stumps by

uprooting or herbicide treatment. All habitats cleared of rhododendron must be regularly and systematically re-visited to remove any seedlings that have germinated and become established. Appropriate guidelines are provided in The Control of Rhododendron in Native Woodlands (Native Woodland Scheme Information Note No. 3) and Higgins, G.T. (2008) *Rhododendron ponticum: A guide to management on nature conservation sites.* Irish Wildlife Manuals, No. 33.

9.1 Cutting and removal

The first operation in clearing rhododendron is the cutting of individual stems with hand or chainsaws. Stems will be cut as close to the ground as possible. The cut material will be removed from the area to allow for effective follow-up work. If the terrain and layout of the woodland are suitable, the material can be used to build a "dead hedge" around the area as a barrier to exclude grazing animals. Burning under the supervision of personnel with fire experience is another option. Rhododendron material can be burnt green immediately after being cut. Fires should be carefully located so as not to damage any trees or other vegetation close by, and old tyres or diesel should not be used. If burning is not an immediate option, the cut material can be piled neatly outside the treated area, allowing them to be dismantled easily to facilitate burning at a later stage (ideally 1-2 years later).

Where burning is envisaged, contact will be made with the Local Authority to obtain permission. Flailing is another method of rhododendron clearance. This involves the flailing of the thickets down to ground level, using a mechanical flail head mounted on a tracked machine. Although not suitable on all sites, especially those that are steeply sloping or very wet, it is a very effective as it mulches the material upon contact.

9.2 Killing rhododendron

Some method of killing must be used as rhododendron invariably grows back vigorously when cut. The following approaches can be considered:

9.2.1. Digging out

Digging the stumps out of the ground is an effective way of killing rhododendron. Its effectiveness is maximized by removing all viable roots. Digging out can be carried out manually or, if the terrain allows, by machine (e.g. a tractor and chain). To prevent regrowth, as much soil as possible should be knocked off the root system, and the stumps should be turned upside down to expose the roots to the air and to allow the rain to wash off any remaining soil. Stumps that are dug out should be burnt along with the cut material.

This method avoids any use of herbicides. However, the impact to tree root systems and the potential for soil compaction and disturbance caused by the use of machinery in certain habitats means that this option will only be implemented under ecological supervision to minimise inadvertent disturbance of habitats.

9.2.2. Direct stump treatment

Rhododendron kill can be achieved by direct stump treatment, whereby freshly cut stumps are painted or spot sprayed with a herbicide solution. Ideally this should be carried out when rain is not imminent, to avoid the solution from being washed off. Stems are cut as close to the ground as possible, and the fresh stump surfaces treated with herbicide immediately, i.e. within minutes. A vegetable dye is used to clearly identify which stumps have been treated. Painting of stumps with glyphosate solutions (25-100%) was found to be 100% effective when carried out between May and March at an experimental site in Scotland (Tabbush and Williamson, 1987). This method is regarded as being most effective outside the time of spring sap flow. The following are herbicides (including application rates, methods and timing) used in the control of rhododendron by stump treatment (after Willoughby and Dewar (1995)).

- Glyphosate: Apply 'Roundup' in a 20% solution in water to all freshly cut stump surfaces using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Best results can be obtained during the period October to February.
- Tryclopyr: Apply 'Garlon 4' in an 8% solution in water using one of the following: a knapsack sprayer at low pressure; a forestry spot gun fitted with a solid stream nozzle; a cleaning saw fitted with a suitable spray attachment; or a paint brush. Apply at any time between cutting and the appearance of new growth.
- Ammonium sulphamate: Apply as a 40% solution between April and September. Optimum control resulting from treatments applied between June and September. Surfactant additives are not appropriate for stump application. It is important to ensure that all cut surfaces are treated. In Ireland, trials in Killarney using stump treatment resulted in extremely successful kill rates among a range of plant sizes throughout all months of the year. Chemical concentrations from 10% to 20% have been used effectively and further trials are ongoing.

A major advantage of stump treatment is that all initial clearance work can be carried out in a single sweep. Also, as the application of the herbicide is carried out with a handheld applicator, spray drift is avoided and the impact to the surrounding non-target area is minimal. In addition, small volumes of herbicide are used. Although stump treatments can result in total kill, regrowth from the cut stumps can occur. This regrowth is usually slow and stunted. Carefully timed foliar application of herbicide to the regrowth will subsequently achieve full kill.

9.2.3 Spraying of regrowth and large seedlings

Stumps and large seedlings (less than 1.5 m in height) can be effectively killed by spraying the regrowth with a suitable herbicide. Success is dependent on the plants being dry at the time of herbicide application and remaining dry for a sufficient time thereafter to allow the herbicide to be absorbed into the plant (at least 6 hours, preferably longer). The addition of a surfactant (e.g. Mixture B) can increase the rate of herbicide absorption and reduce the amount of 'dry-time' required after foliar herbicide application. Surfactants are often more environmentally damaging than the

herbicides themselves and must be used with great care, especially adjacent to aquatic habitats. Spraying should be carried out in near windless conditions, to maximise herbicide contact and absorbance of the chemical into the plant. Conversely, spraying in windy conditions should be avoided at all costs, as this will lead to herbicide drift, resulting in 'collateral damage' which will kill nearby native flora, including herbaceous species and young regenerating trees. This delays the establishment of a ground cover and facilitates further rhododendron establishment.

It is important to ensure at all times that chemical solutions do not enter watercourses, as this can have a severe impact on the aquatic habitat and on aquatic life. At all times, adhere to best practice regarding safety and environmental protection, as set out in the manufacturer's guidelines, Ward (1998), and the Forest Service Forestry and Water Quality Guidelines and Forest Protection Guidelines. As spraying is not 100% effective, some plants may require two or more applications before they are killed. Since cut stumps generally produce multiple shoots of regrowth, delaying the spraying for more than three years after the initial stump cutting can actually result in the infestation becoming even more severe. At this stage, the regrowth is likely to be too tall to be sprayed effectively, forming dense impenetrable thickets. Regrowth is also likely to flower more vigorously than naturally regenerated rhododendron.

9.2.4. Stem injection

Stem injection, using the 'drill and drop' method (Edwards, 2006), can be used for the control of established rhododendron bushes, where access to the main stem is possible and where the stem is large enough for a hole to be drilled into it. One of the main advantages of this technique is that it facilitates the controlled application of herbicide to target plants, thereby reducing damage to other flora adjacent to treated bushes. It is a particularly useful method on difficult, sloping terrain, where other methods may be impractical.

A handheld cordless drill with several re-chargeable batteries and a spot gun are the only tools required. A 25% solution of glyphosate (i.e. 1:3 mix with water) is recommended. No additives are required. Applications during March, April and October have been successful in giving complete control of target bushes. Treated bushes can be left standing on site to rot. However, bear in mind that standing, dead rhododendron may persist for 10 to 15 years, is unsightly and can inhibit access to the woodland for management operations. Therefore, it may be better to cut and remove the treated bushes at a later date.

The effectiveness of control should be assessed initially every 12 months following the treatment. The main steps involved in stem injection are as follows.

1. Stems to be treated should be greater than 3 cm in diameter. In order to maximise the potential of killing the entire plant, choose a position on the stem as close to the main root system as possible, and at least below the lowest fork.

2. Drill as vertically as possible into the stem to create a hole that will hold the herbicide solution. The drill bit used should be 11-16 mm in diameter, depending on the stem diameter. There is no upper limit to the size of stem that can be treated.

3. Apply the herbicide to the hole immediately after drilling. The recommended amount is 2ml of herbicide solution per stem. Do not allow the herbicide to overflow from the hole. The use of a forestry spot gun with a calibrated 10ml chamber is recommended, as this allows for the accurate application of a calibrated 2ml of herbicide per hole.

4. It is recommended that each plant be marked immediately after treatment, to track progress. Treated plants can be marked with a spray of coloured paint or by attaching coloured biodegradable tape.

5. Applications can be made in light rain, provided that rainwater is not running down the stem into the application hole and washing the herbicide solution out into the surrounding area.

6. Bush death should occur between 9 and 31 months, depending on application date and bush size.

9.3. Outline methodology Rhododendron

The preferred option is to avoid any works within the area within which this species is growing. Where this is not possible the following will be carried out.

1. The exact treatment details will be outlined in a detailed management plant prepared by the treatment contractor and supervising ecologist will be finalized prior to the commencement of treatment. The following principles/guidelines will be implemented.

2. The entire site and adjacent area will be surveyed, and the level of infestation assessed and mapped prior to the commencement of treatment works.

3. The age, condition and any previous treatments of all stands will be noted and mapped.

4. Areas to be treated will be prioritized. However, the objective is complete removal within the works area.

5. An updated Rhododendron Management Plan will be prepared by the contractor with input from the supervising ecologist. The plan will encompass the entire site and include projections over a suitable timeframe. All work to be carried out in the area should be mapped and clearly dated and detailed in an accompanying schedule, along with a timeframe for follow-up work.

6. Treatment options will follow the following guideline methods:

Young plants - single stemmed, typically < 10 years old & up to 1m tall

- These plants will be cut off as close to the ground as possible (with secateurs or pruning saw) and the stem treated with herbicide.
- Plants may be pulled by hand, if necessary, loosening the adjacent soil with a mattock or pickaxe.
- Foliage will be treated with herbicide.

Isolated plants, typically >10 years old

- The plant may be cut down to the stump, as low to the ground as possible and the stump treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- If low growing enough (usually less than 1.5m) foliage may be sprayed with herbicide.
- The plant may be cut to the ground/low stump and regrowth later treated with herbicide.
- The plants may be cut to c. 40cm above ground, each stem broken off from the root and the root treated with herbicide (New method under trial, see p. 28).
- If chemical treatments are not an option, the only alternative method of killing to rootstock is stump extraction. This may be done manually (using a mattock) or mechanically.

Mature stands of dense rhododendron

- The plant may be cut down to the stump, as low to the ground as possible and the stump may be treated with herbicide.
- If access to the base of the main stems is possible, stem application of herbicide may be used.
- The plant may be cut to the ground/low stump and regrowth later (after c. 18 months) treated with herbicide.
- The plant may be cut to the ground/low stump and regrowth later knocked off and the stump collar treated with herbicide.
- If chemical treatments are not an option, the only alternative method of killing the rootstock is stump extraction. This may be done manually (using a mattock) or mechanically, but the use of heavy machinery on nature conservation sites is often inadvisable.

7. In all sites, follow-up work will be necessary to ensure that any small plants or seedlings which were either missed on the previous visit or have entered the site subsequently from adjacent seed sources, are removed before they reach the flowering age (10-12 years). Ideally remove them when they are c. 0.5 m tall. At this stage, they are more easily seen, and any young seedlings likely to die naturally through desiccation will have done so. The systematic checking for re-infestation is necessary if the area is to be maintained free of seed-producing rhododendron. Also, re-infestation brought about by poor follow-up will negate the considerable time and cost invested in the initial clearance.

8. The use of track mounted machinery can offer a relatively fast approach to rhododendron clearance by this method. A fork or bucket can extract either entire standing plants or stumps. This method is not suitable where vehicular access to a site is very difficult, where very steep slopes require clearance and where terrain (e.g. boulders) hinders the movement of machinery around the clearance site. In addition, the disturbance caused by heavy machinery to soil and to tree roots requires consideration and there is also potential for damage to standing trees, although a good

operator can often avoid this. Extraction of the rootstock by this method gives good kill, although some regrowth from root fragments may require further treatment. Given that the applicant has access to suitable machinery this is preferred option on areas within the proposed extension area. How usage of this method on areas within the landholding outside the proposed extension area need to be carefully evaluated based on up to date survey results to ensure inadvertent damage of adjacent habitats is minimized.

9. The treatment programme will be carried out by a suitably qualified person who has experience of treating invasive species and will be carried out in line with the herbicide manufacturer's instructions. Site hygiene protocols to prevent spread of this species will be specified by the management plan and will be strictly enforced.

10. Conclusions

This invasive species management plan will be updated by the supervising ecologist, based on up to date data and in consultation with the contractor. No impediment to the removal of these species within proposed development area. as part of a detailed invasive species management plan, have been identified. No risk to local ecology has been identified from the spread of invasive species.

11. References

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