CONSTRUCTION STAGE
I.A.P.S. MANAGEMENT PLAN

PROPOSED RESIDENTIAL DEVELOPMENT
on
LANDS at CORNELSCOURT VILLAGE
OLD BRAY ROAD
CABINTEELY
CO. DUBLIN

NOVEMBER 2019

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1 INTRODUCTION

1.1 Background to this plan

Invasive Plant Solutions were retained by Cornel Living Limited to prepare a Construction Stage Invasive Alien Plant Species Management Plan, for the effective long term control and management of Japanese Knotweed, Spanish Bluebell, and Three Cornered Garlic, all of which have been identified on the site of a proposed new residential development on Lands at Cornelscourt Village, Cabinteely, Co. Dublin.

The client, and their agents, engaged in a Pre-Application Consultation Process with An Bord Pleanala, with a view to seeking planning permission for a new residential development on the lands, under the Planning and Development (Housing) and Residential Tenancies Act 2016 and the Planning and Development (Strategic Housing Development) Regulations 2017. On foot of the outcome of that pre-planning consultation process it is now intended to proceed to the full Planning Permission stage, with the preparation and lodgement of a planning application for the proposed development to An Bord Pleanala.

This Construction Stage I.A.P.S. Management Plan has been prepared for inclusion in the planning application documentation to be submitted in support of the Planning Application.

The site has been subject to ecological survey, assessment, and screening, which was carried out by Openfield Ecological Consultants, and which identified the presence of invasive alien plant species on the lands. The proposals and actions contained in this I.A.P.S. Management Plan have taken full account of these ecological assessments in its development and preparation.

Invasive Plant Solutions are fully familiar with the site, and have been providing Japanese Knotweed and Invasive Alien Plant Species management and treatment services to the property owners since March 2019. This has been carried out in accordance with the initial measures identified in Section 3. of this plan, and with best practice, as set out in the UK Environment Agency's *The Knotweed Code of Practice: Managing Japanese Knotweed on development sites*.

1.2 Legislative background

Japanese Knotweed *Fallopia Japonica*, and its hybrids, are listed as Invasive Alien Plant Species in Part 1 of the Third Schedule of the *European Communities (Birds and Natural Habitats) Regulations* 2011 (SI 477 of 2011, as amended). In addition, soils and other material containing Japanese Knotweed, and its hybrids, are classified in Part 3 of the Third Schedule as vector materials and are subject to the same strict legal controls.

Three Cornered Garlic and Spanish Bluebell are also classified as Invasive Alien Plant Species under SI 477 of 2011, with the same legal conditions and restrictions applying to them.

Failure to comply with the legal requirements set out can result in either civil or criminal prosecution, which very severe penalties accruing. The relevant sections of the regulations are reproduced below.

49(2) *Save in accordance with a licence granted* [by the Department of Arts, Heritage and the Gaeltacht]*, any person who plants, disperses, allows or causes to disperse, spreads or otherwise causes to grow in any place* [a restricted non-native plant]*, shall be guilty of an offence.*

49(3) *… it shall be a defence to a charge of committing an offence under paragraph (1) or (2) to prove that the accused took all reasonable steps and exercised all due diligence to avoid committing the offence.*

50(1) *Save in accordance with a licence, a person shall be guilty of an offence if he or she* […] *offers or exposes for sale, transportation, distribution, introduction or release—*

- *(a)* [any restricted non-native animal or plant species]*,*
- *(b) anything from which an animal or plant referred to in subparagraph (a) can be reproduced or propagated, or*
- *(c) a vector material listed in the Third Schedule,* [which includes] *soil or spoil taken from places infested with Japanese Knotweed (Fallopia japonica)*

It is an offence under regulations 49(2) and 50(1) to spread, or cause to spread, Japanese Knotweed and its hybrids, and all other Invasive Alien Plant Species scheduled. An offence may be avoided only if the relevant party can prove that they took all reasonable steps to avoid causing an offence under the legislation. Therefore, in compliance with these regulations, this management plan will rely solely on methodologies that are necessary, and proven, to ensure strict compliance.

140 **[477]**

THIRD SCHEDULE

Non-native species subject to restrictions under *Regulations 49 and 50*

Part 1: PLANTS

First column	Second column	Third column
Common name	Scientific name	Geographical application
American skunk-cabbage	*Lysichiton americanus*	Throughout the State
A red alga	*Grateloupia doryphora*	Throughout the State
Brazilian giant-rhubarb	*Gunnera manicata*	Throughout the State
Broad-leaved rush	*Juncus planifolius*	Throughout the State
Cape pondweed	*Aponogeton distachyos*	Throughout the State
Cord-grasses	*Spartina* (all species and hybrids)	Throughout the State
Curly waterweed	*Lagarosiphon major*	Throughout the State
Dwarf eel-grass	*Zostera japonica*	Throughout the State
Fanwort	*Cabomba caroliniana*	Throughout the State
Floating pennywort	*Hydrocotyle ranunculoides*	Throughout the State
Fringed water-lily	*Nymphoides peltata*	Throughout the State
Giant hogweed	*Heracleum mantegazzianum*	Throughout the State
Giant knotweed	*Fallopia sachalinensis*	Throughout the State
Giant-rhubarb	*Gunnera tinctoria*	Throughout the State
Giant salvinia	*Salvinia molesta*	Throughout the State
Himalayan balsam	*Impatiens glandulifera*	Throughout the State
Himalayan knotweed	*Persicaria wallichii*	Throughout the State
Hottentot-fig	*Carpobrotus edulis*	Throughout the State
Japanese knotweed	*Fallopia japonica*	Throughout the State
Large-flowered waterweed	*Egeria densa*	Throughout the State
Mile-a-minute weed	*Persicaria perfoliata*	Throughout the State
New Zealand pigmyweed	*Crassula helmsii*	Throughout the State
Parrot's feather	*Myriophyllum aquaticum*	Throughout the State
Rhododendron	*Rhododendron ponticum*	Throughout the State
Salmonberry	*Rubus spectabilis*	Throughout the State
Sea-buckthorn	*Hippophae rhamnoides*	Throughout the State
Spanish bluebell	*Hyacinthoides hispanica*	Throughout the State
Three-cornered leek	*Allium triquetrum*	Throughout the State
Wakame	*Undaria pinnatifida*	Throughout the State
Water chestnut	*Trapa natans*	Throughout the State
Water fern	*Azolla filiculoides*	Throughout the State
Water lettuce	*Pistia stratiotes*	Throughout the State
Water-primrose	*Ludwigia* (all species)	Throughout the State
Waterweeds	*Elodea* (all species)	Throughout the State
Wireweed	*Sargassum muticum*	Throughout the State

Figure 1 : S.I. 477 of 2011 - Schedule 3, Part 1

First column	Second column	Third Column
Siberian chipmunk	*Tamias sibiricus*	Throughout the State
Slipper limpet	*Crepidula fornicata*	Throughout the State
Stalked sea squirt	*Styela clava*	Throughout the State
Tawny owl	*Strix aluco*	Throughout the State
Wild boar	*Sus scrofa*	Throughout the State
Zebra mussel	*Dreissena polymorpha*	Throughout the State

B: animals to which specified provisions of Regulations 49 and 50 apply.

First column	Second column	Third Column
Common name	Scientific name	Geographical application
Fallow deer	*Dama dama*	Throughout the State
Sika deer	*Cervus nippon*	Throughout the State

Part 3: VECTOR MATERIALS

First column	Second column	Third Column
Vector material	Species referred to	Geographical application
Blue mussel (*Mytilus edulis*) seed for aquaculture taken from places (including places outside the State) where there are established populations of the slipper limpet *(Crepidula fornicata)* or from places within 50 km. of such places	Mussel *(Mytilus edulis)* Slipper limpet *(Crepidula fornicata)*	Throughout the State
Soil or spoil taken from places infested with Japanese knotweed *(Fallopia japonica)*, giant knotweed *(Fallopia sachalinensis)* or their hybrid Bohemian knotweed (*Fallopia x bohemica*)	Japanese knotweed *(Fallopia japonica)* Giant knotweed *(Fallopia sachalinensis)* Bohemian knotweed (*Fallopia x bohemica*)	Throughout the State

Figure 2 : S.I. 477 of 2011 - Schedule 3, Part 2

1.3 Characteristics of Japanese Knotweed

Japanese Knotweed is an herbaceous perennial plant that can grow to heights of 2-4m. In summer it produces dense bushes of purplish bamboo-like stems with large, triangular leaves. In winter the herbaceous material dies back, leaving only its dead canes. It has robust creeping rhizomes (roots) that can spread up to 7m horizontally from the parent plant. Rhizomes can extend vertically underground to a depth of 3m, and up to over 6m in ground which has been subject to disturbance or placement of imported material.

In its native Japan it usually grows in harsh rocky habitats, including cliffs faces and active volcanoes. It was introduced to Europe in the 19th Century as an ornamental plant, favoured for its adaptability and rapid growth. However, due to its excessive growth and persistence it quickly gained a reputation as a nuisance plant. In the latter part of the 20th century it was spread throughout the UK and Ireland, primarily by illegal dumping and/or movements of building materials. It is now widespread in Ireland.

Japanese Knotweed is spread primarily by fragmentation and dispersal of its roots or stems. Its flowers cannot produce viable seed, as only female Japanese Knotweed plants have been recorded to date in Ireland. Fragments of the plant will set root and grow to form new plants, allowing the plant to spread very quickly in areas that are frequently disturbed, notably in quarries, building sites and hedges that are cut using flails. New plants can grow from root fragments weighing as little as 0.7g, and buried material can occasionally regrow from depths of up to 6m. If buried in a location from which it cannot regrow, plant material can remain dormant for many years.

As a result of its highly-invasive characteristics and vigorous growth, Japanese Knotweed is recognised as a significant constraint on construction sites. It can easily be spread by the movement of earth, gravel or rocks, and by snagging on construction vehicles, machinery, equipment, tools, materials and workwear. Viable rhizome and plant fragments can also force their way to the surface through weak surfaces such as tarmac and permeable paving, as well as through joints between building materials and via control / expansion joints in concrete surfaces.

The most cost-effective method to control of Japanese Knotweed is with herbicide, usually requiring between 3 and 5 years to achieve successful eradication. If there is insufficient time to complete a herbicide treatment programme the infected material may be moved to an undisturbed location, placed in an underground cell or be disposed of off-site.

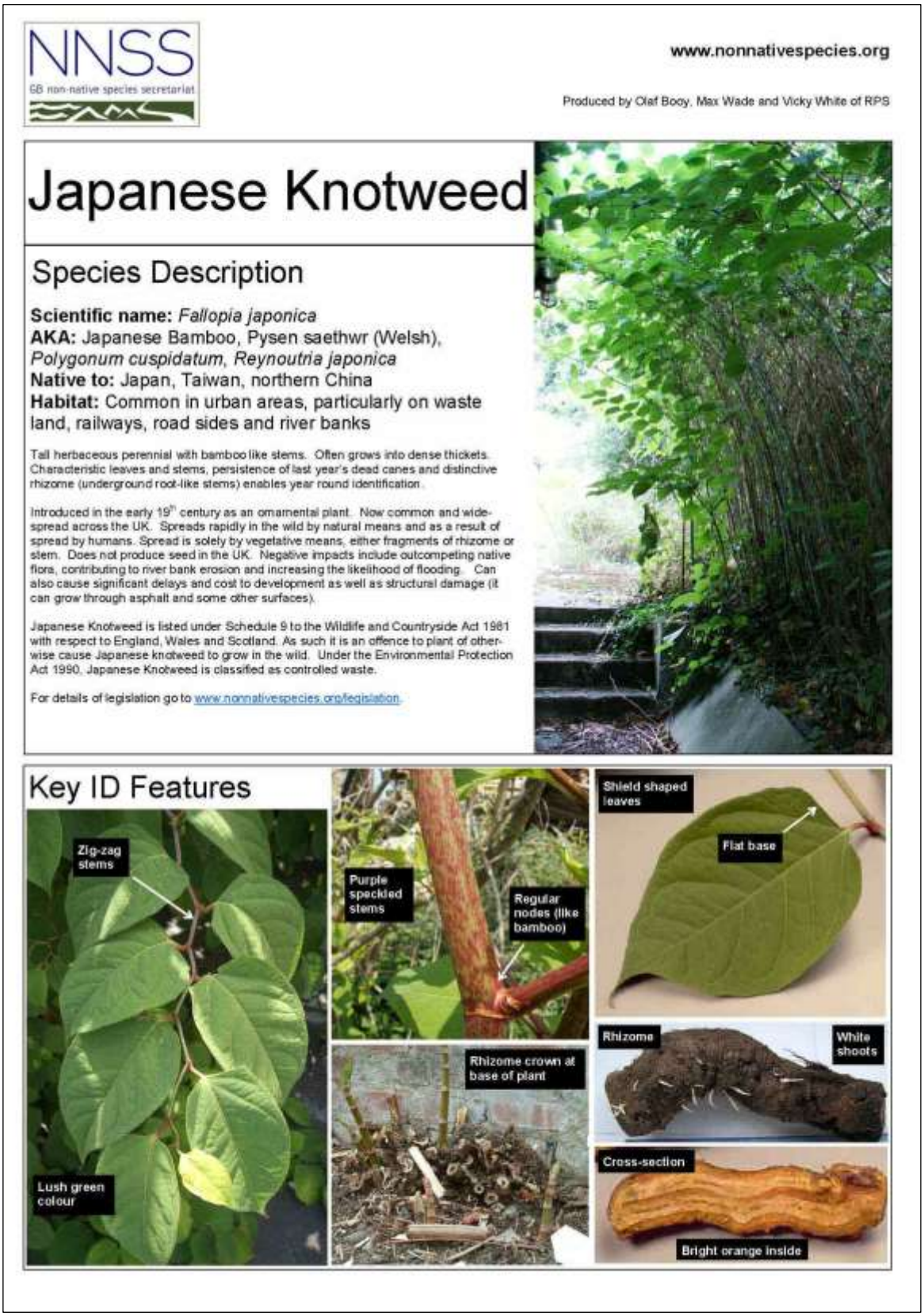

Figure 3 : Non Native Species Secretariat - Japanese Knotweed I.D. Sheet, Page 1

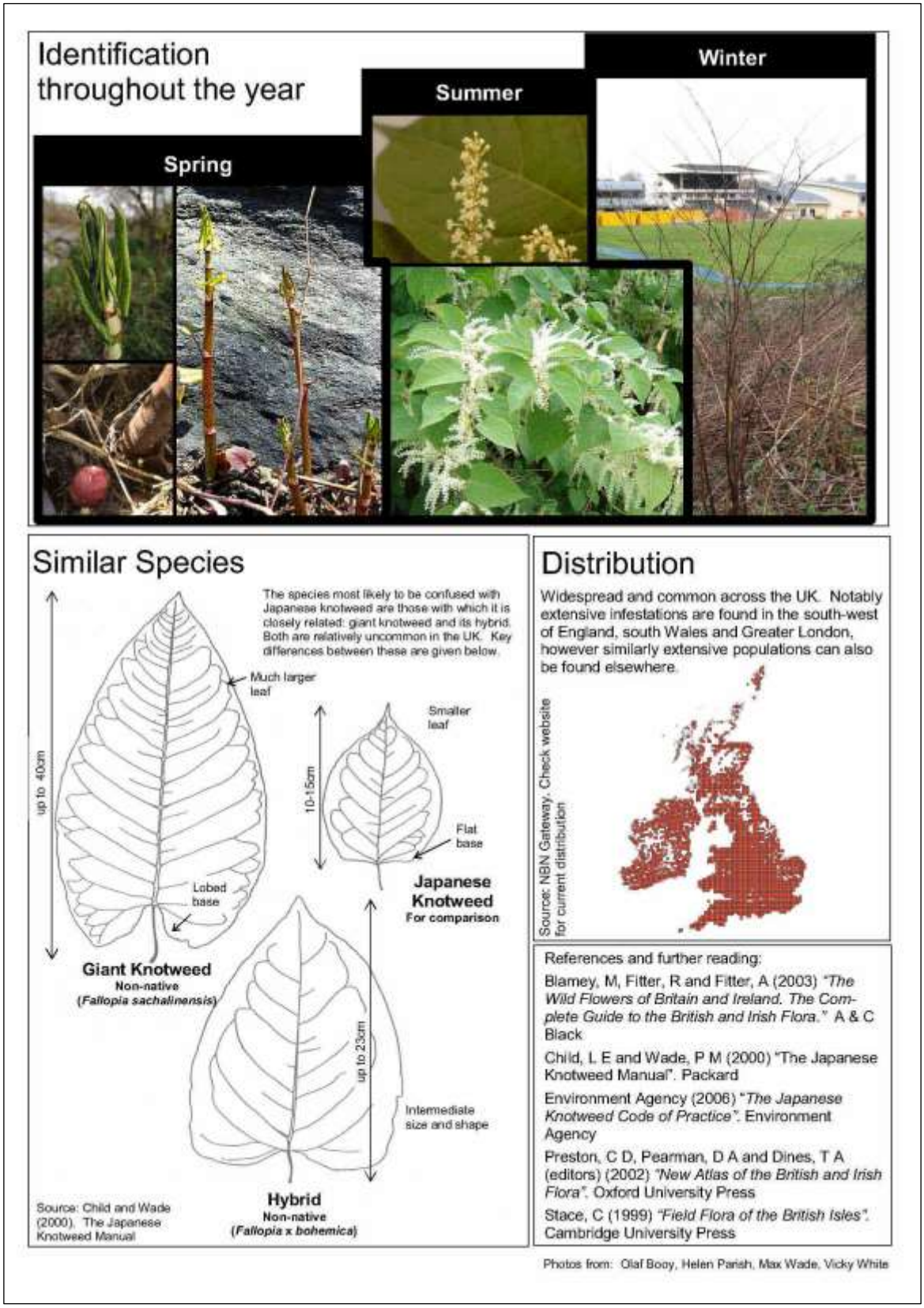

Figure 4 : Non Native Species Secretariat - Japanese Knotweed I.D. Sheet, Page 2

1.4 Knotweed Code of Practice principles

In order to help specifiers, consultants and contractors to select the most appropriate treatment option, some excerpts from the *Knotweed Code of Practice*[1] are reproduced below. The code of practice has been developed by experts in the control of knotweed, and is based on the successes and failures of hundreds of knotweed management plans in the United Kingdom. As such, it represents the best available guidance on the different treatment options.

- *"Unless an area of Japanese knotweed is likely to have a direct impact on the development, you should control it in its original location with herbicide over a suitable period of time, usually two - five years.*

- *You should only consider excavating Japanese knotweed as a last resort, and if so you should keep the amount of knotweed excavated to a minimum.*

- *Soil containing Japanese knotweed material may be buried on the site where it is produced to ensure that you completely kill it. In this case, you must bury material at least 5m deep.*

- *Where local conditions mean you cannot use burial as an option, it may be possible to create a Japanese knotweed bund. The purpose of the bund is to move the Japanese knotweed to an area of the site that is not used. This 'buys time' for treatment that would not be possible where the Japanese knotweed was originally located.*

- *Sometimes, due to shortage of time and location, landfill is the only reliable option, but it should be treated as a last resort. Landfill is very expensive for the development industry, and needs haulage, which increases the risk of Japanese knotweed spreading.*

- *When you transport soil infested with Japanese knotweed to landfill, it is essential to carry out strict hygiene measures. If you do not follow these standards, this may lead to Japanese knotweed spreading. Japanese knotweed is a particular problem along transport corridors, where it interferes with the line of vision and can cause accidents."*

[1] UK Environment Agency (2013) *The Knotweed Code of Practice: Managing Japanese Knotweed on development sites*. Version 3. Published by the UK Environment Agency, Bristol. Available online at https://www.gov.uk/government/publications/japanese-knotweed-managing-on-development-sites

1.5 Characteristics of Three Cornered Garlic and Spanish Bluebell

Non-native Garlics

See Figures 5 and 6 below for general identification details and photographs of Three Cornered, and other, non-native Garlics

Spanish Bluebell

The Spanish bluebell, *Hyacinthoides Hispanica*, is native to the western Iberian peninsula (Portugal and western Spain) and North Africa (Hackney, 2008; Meek, 2011; Parnell and Curtis, 2012; Taylor, 2002).

The common bluebell, *Hyacinthoides Non-scripta*, is native to Ireland, Britain & Western Europe as far south as central Spain (Hackney, 2008; Kohn *et al*., 2009 Taylor, 2002).

Invasive (hereafter referring to both the Spanish and hybrid bluebells) and native bluebells are spring-flowering, bulbous perennials, producing the fresh season's leaves in about December (Kohn *et al*., 2009). Flower spikes appear in May and the flowers are insect-pollinated (Hackney, 2008). The hybrid is fully fertile and produces abundant seed.

All bluebells retain much of their seed in the papery fruits until well into the winter and leaves die back completely from about the end of summer (Hackney, 2008).

The native bluebell, *Hyacinthoides Non-scripta*, has stems to 50cm; leaves up to 20mm wide; racemes pendent at apex, 1-sided, with pendent strongly sweetly scented flowers; tepals 14-20mm, forming +/- parallel-sided tubular perianth, strongly recurved at apex, outer 3 stamens fused to perianth for >3/4 their length" (Stace, 1997).

The Spanish bluebell, *Hyacinthoides Hispanica* has stems to 40cm; leaves up to 35mm wide; racemes erect, not 1-sided, with erect to patent, faintly scented flowers; tepals 12- 18mm, forming bell-shaped perianth, not recurved at apex; outer 3 stamens fused to perianth for <3/4 their length" (Stace, 1997)

The hybrid bluebell (*Hyacinthoides Non-scripta x Hyacinthoides Hispanica)* is intermediate in all characters and fertile, forming a complete spectrum between the parents (Stace, 1997)

Invasive bluebells have a localised distribution in Ireland, with most existing records of the species concentrated in the south east and south (BSBI, 2010, Taylor, 2002). The hybrid bluebell's range and frequency is increasing but it is still unevenly recorded (Taylor, 2002). The Spanish bluebell may be continuing to increase slowly, but it is often confused with the hybrid bluebell and may remain somewhat over recorded (Hackney, 2008; Reynolds, 2002; Taylor, 2002).

See Figures 7 and 8 below for further general identification details and photographs of native and Spanish / Hybrid Bluebells

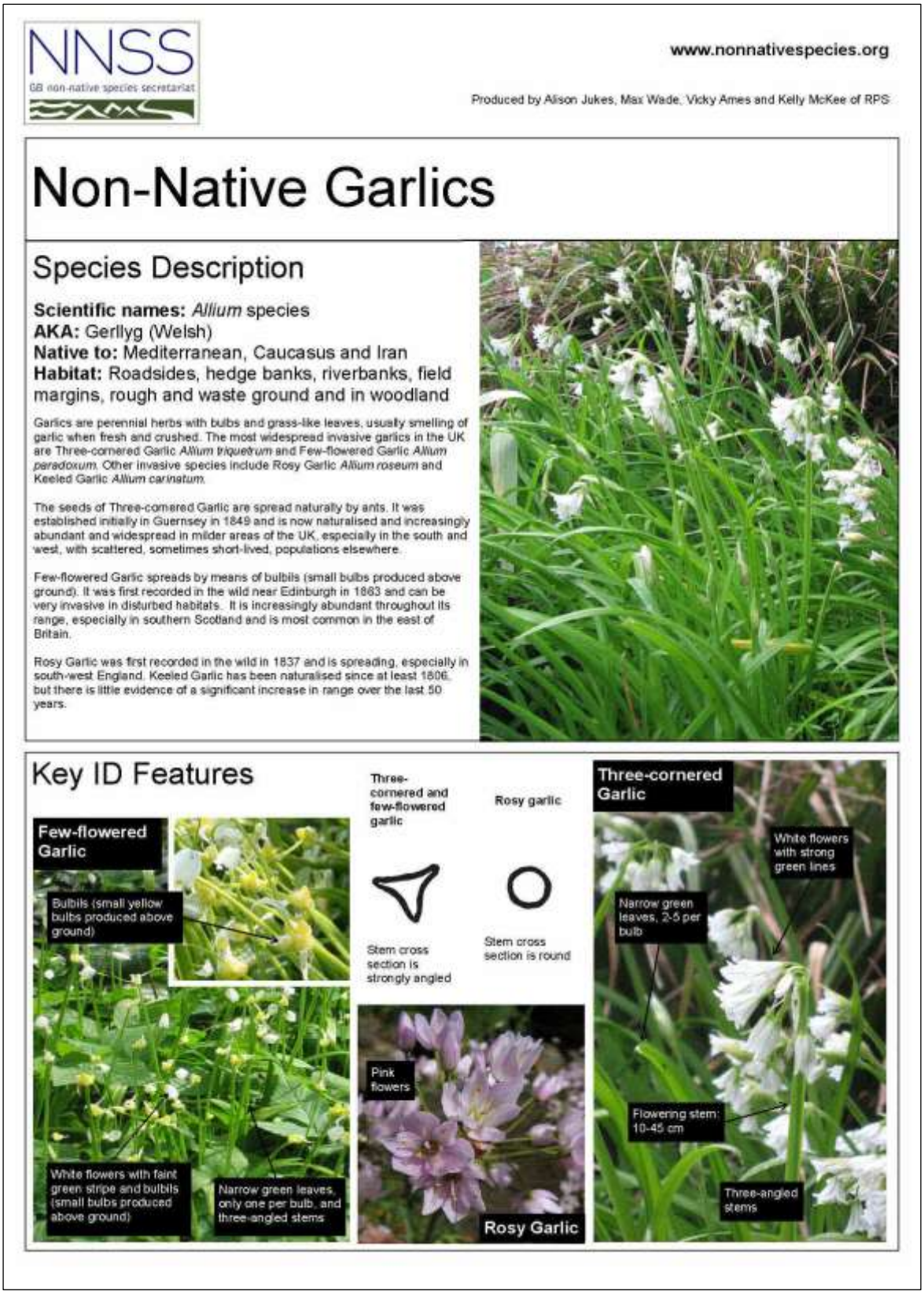

Figure 5 : Non Native Species Secretariat – Non-native Garlics I.D. Sheet, Page 1

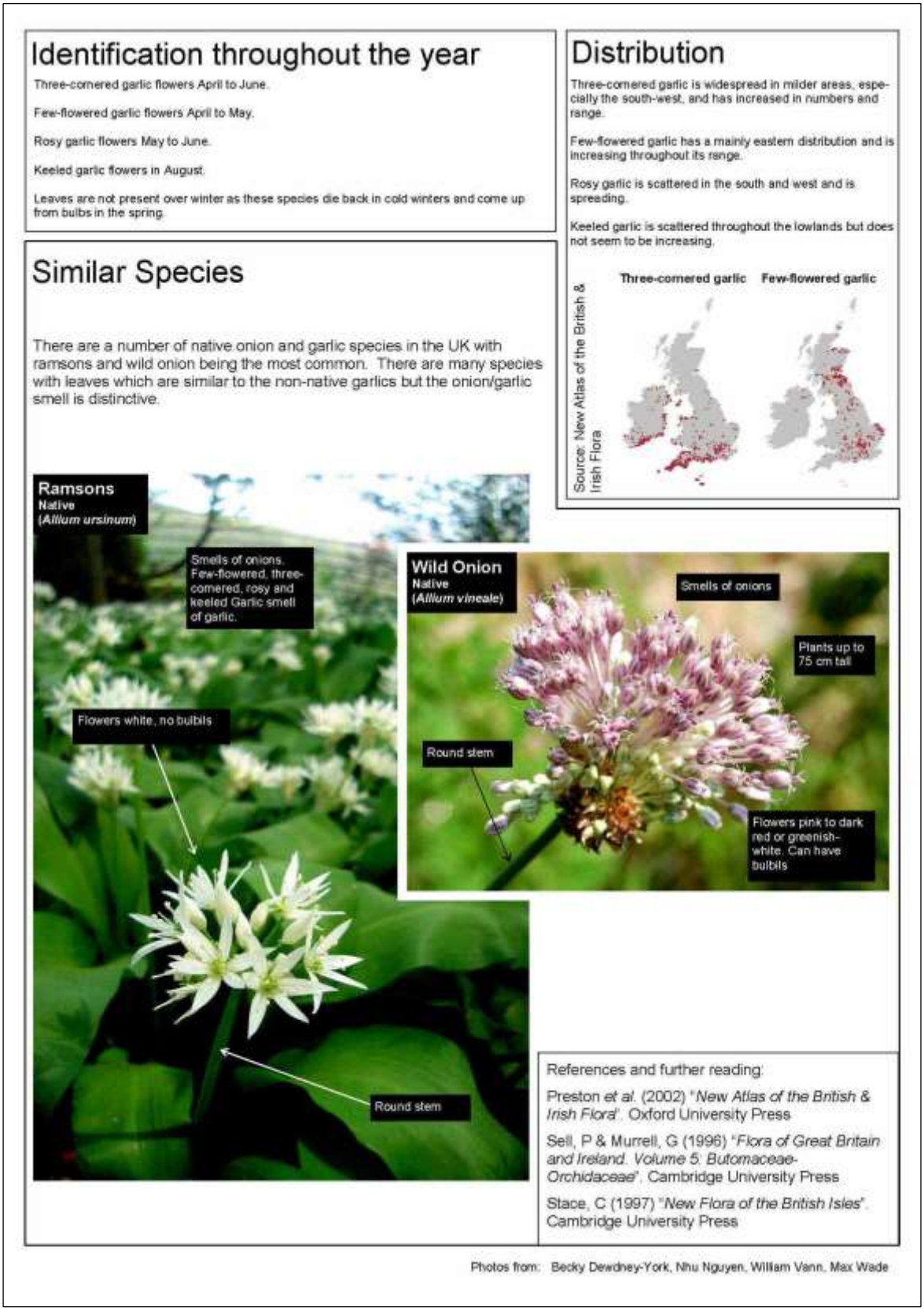

Figure 6 : Non Native Species Secretariat - Non-native Garlics I.D. Sheet, Page 2

WIKIPEDIA

Hyacinthoides hispanica

Hyacinthoides hispanica (syn. *Endymion hispanicus* or *Scilla hispanica*), the **Spanish bluebell**, is a spring-flowering bulbous perennial native to the Iberian Peninsula. It is one of around 11 species in the genus *Hyacinthoides*, others including the common bluebell (*Hyacinthoides non-scripta*) in northwestern Europe, and the Italian bluebell (*Hyacinthoides italica*) further east in the Mediterranean region.[1]

It is distinguished from the common bluebell by its paler and larger blue flowers, which are less pendulous and not all drooping to one side like the common bluebell; plus a more erect flower stem (raceme), broader leaves, blue anthers (where the common bluebell has creamy-white ones) and little or no scent compared to the strong fragrant scent of the northern species. Like *Hyacinthoides non-scripta*, both pink- and white-flowered forms occur.

The Spanish bluebell was introduced in the United Kingdom. Since then, it has hybridised frequently with the native common bluebell and the resulting hybrids are regarded as invasive. The resulting hybrid *Hyacinthoides* × *massartiana* and the Spanish bluebell both produce highly fertile seed but it is generally the hybrid that invades areas of the native common bluebell. This has caused the common bluebell to be viewed as a threatened species.

The Spanish bluebell is also cultivated as a garden plant, and several named cultivars exist with flowers in various shades of white, pink and blue.

Hyacinthoides hispanica

Scientific classification

Kingdom:	Plantae
Clade:	Angiosperms
Clade:	Monocots
Order:	Asparagales
Family:	Asparagaceae
Subfamily:	Scilloideae
Genus:	*Hyacinthoides*
Species:	***H. hispanica***

Binomial name

Hyacinthoides hispanica

(Mill.) Chouard ex Rothm.

References

1. *World Checklist of Selected Plant Families* (http://apps.kew.org/wcsp/home.do). The Board of Trustees of the Royal Botanic Gardens, Kew. retrieved 2011-07-05. search for "Hyacinthoides"

General

- The-Tree.org: Bluebell (https://web.archive.org/web/20060427035443/http://www.the-tree.org.uk/EnchantedForest/WoodlandFlowers/bluebell.htm) (includes key to identification of hybrids)
- Huxley, A. (1992). *New RHS Dictionary of Gardening* vol. 2: 604. Macmillan.

External links

- Media related to *Hyacinthoides hispanica* at Wikimedia Commons

Figure 7 : Wikipedia – Spanish Bluebell information page

Native bluebells *(Hyacinthoides non-scripta)*

- Distinctive 'droop' like the top of a shepherd's crook
- Sweet, cool perfume
- Narrow bell-shaped flowers with rolled back tips
- Creamy white pollen

If your bluebells have all of these characteristics then they're native bluebells.

Spanish bluebells (*Hyacinthoides hispanica)* and hybrids

- Upright stems
- No scent
- Conical bell-shaped flowers with open tips
- Blue pollen

If the bluebells you see have some or all of these characteristics then they're not a pure native bluebell.

Figure 8 : Berkshire Buckinghamshire & Oxfordshire Wildlife Trusts – Spanish Bluebell identification

2. SITE DETAILS AND ECOLOGICAL SENSITIVITIES

2.1 General Site Description

The Cornelscourt lands comprise a generally rectilinear and level greenfield site, sloping down gently from south to north. It is located on the northern fringe of Cornelscourt village, bounded by the N11 to the north east, the A.I.B. Bank site to the north west, by the rear of residential properties on Willow Grove to the south east, and by the rear of residential properties and a garage on Old Bray Road to the south east.

All boundaries are clearly defined, and typically demarcated a combination of masonry walls, stone walls, timber fencing and metal fencing.

The site is in one single holding and is currently in native meadow.

The site has man made earthen banks running along the inside of its north western and north eastern boundaries. While the main body of the site is grassed, there is evidence of recent clearance or grading in its western half. There is also evidence of localised ground disturbance across the site, most likely associated with ground investigation activities.

The site comprises an area of c. 2.14 Ha. / 5.29 Acres.

See Figures 9, 10 and 11 below for the location and overall layout of the existing site.

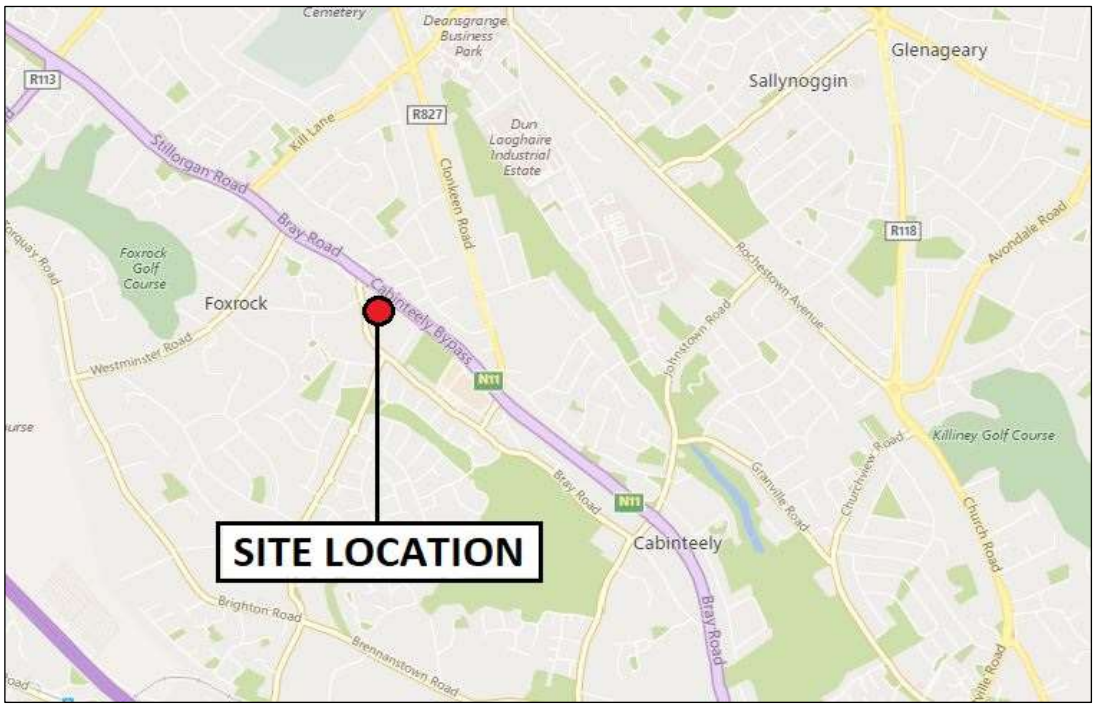

Figure 9 : Aerial Site Location Map

(Source: Bing Maps)

Figure 10 : Site Location Plan**

(Source: Henry J. Lyons, Architects)

Figure 11 : Aerial Site Layout

(Source: Bing Maps)

** Always refer to Henry J. Lyons Drawing No. PL0001 C, partly reproduced at Figure 10 above, for the precise position of the property boundaries

2.2 Designated Sites

The site is located in an established suburban fringe of south Dublin, consisting of a mix of village fabric, residential areas, commercial and retail elements, public recreation and sporting facilities, and public infrastructure, interspersed with older but fragmented residential neighbourhoods, spreading south towards the foothills of the Dublin and Wicklow Mountains. There is also a significant amount of undeveloped parkland and greenfield lands in the general vicinity of the site.

By reference to the NPWS data base, the site is approx. 2.6km to the west of the nearest designated site, the **Dalkey Coastal Zone pNHA No. 001206.** The **Loughlinstown Wood pNHA No. 001211** is approx. 3.2km to the south east of the development site and the **South Dublin Bay SAC No. 000210** is approx. 3.0km to the north of the site

For the purposes of managing the Japanese Knotweed present on the site, there is no evident pathway for either herbicide or viable plant material to pass from the Cornelscourt development site to any of the Designated Sites referred to above.

Figure 12 below illustrates the site location and it's relationship to the nearest designated site, the Dalkey Coastal Zone pNHA.

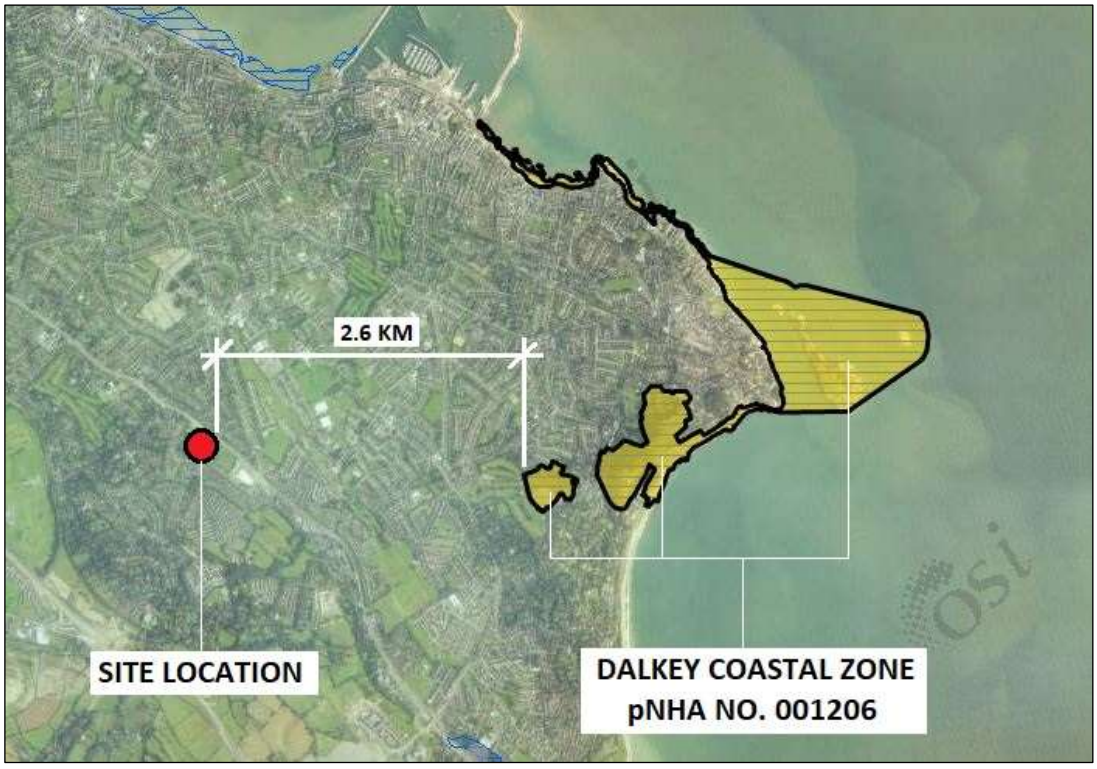

Figure 12 : Site Location relative to Designated Sites

(Source: NPWS Map Viewer)

2.3 Local Ecological Sensitivities

As part of site assessment process, ecological screening of the lands was carried out. For the purposes of managing the Japanese Knotweed present on the site no ecological sensitivities or receptors were identified on, or in the vicinity of, the development site.

3 DISTRIBUTION OF INVASIVE SPECIES ON THE DEVELOPMENT SITE

3.1 Extent of Invasive Alien Plant Species on the Site

There are two I.A.P.S. infestations located on the site, as follows :

Japanese Knotweed : Infestation JK 1 & JK 1A

JK 1 is a healthy, linear, stand of mature Japanese Knotweed which runs along the south eastern site boundary wall, in the vicinity of the rear wall of No. 12 Willowgrove. The stand has extended out onto the site, in a north westerly direction, into a zone of recently disturbed soil, approx. 16m from the boundary wall. New season shoots are emerging across the area, with the potential for more shoots to present beyond the identified locations. A related, single, healthy shoot of Japanese Knotweed, JK 1A, has been identified immediately inside the rear boundary wall of No. 12 Willowgrove. **Total Area = +/- 100 sq.m.**

Three Cornered Garlic and Spanish Bluebell : Infestation TCL/SB 1

A healthy, linear, mixed stand of Three Cornered Garlic & Spanish Bluebell runs along the south western site boundary of the site, in the vicinity of the rear of No's. 3 and 4 Old Bray Road. The plants are interspersed amongst native grasses, scrub and bushes **Total Area = +/- 60 sq.m.**

The location of the IAPS stands are shown on the distribution map at Figure 13 below

Figure 13 : Site Layout showing distribution of IAPS

(Source: Bing Maps)

3.2 Photographs of I.A.P.S. Infestations

Some of the photographs were taken in March 2019, when the Japanese Knotweed was only starting to produce new shoots, following it's period of winter dormancy, and in advance of the commencement of a initial herbicide control programme for the Japanese Knotweed, Three Cornered Garlic and Spanish Bluebell.

JK 1 : Last seasons Japanese Knotweed plant stems along the south eastern boundary wall – March 2019

JK 1 : South eastern boundary wall, looking east – March 2019

JK 1 : No. 12 Willowgrove in the background and disturbed ground containing Japanese Knotweed in the foreground

JK 1 : South eastern boundary wall, looking south. Emergent Japanese Knotweed showing good growth – May 2019

JK 1 : New season Japanese Knotweed shoots emerging along the south eastern boundary wall – March 2019

JK 1 : New season Japanese Knotweed shoots emerging within the disturbed ground – March 2019

JK 1 : Japanese Knotweed rhizome within disturbed ground March 2019

JK 1A : New season Japanese Knotweed shoot behind the site boundary wall, in the rear garden of No. 12 Willowgrove

TCL/SB 1 : Three cornered garlic and Spanish Bluebell amongst native grasses, along the south western boundary

TCL/SB 1 : Three cornered garlic in flower – March 2019

JK 1 : Fitting temporary fencing and advisory signage - May 2019

TCL/SB 1 : Temporary fencing and advisory signage - May 2019

4 OVERVIEW OF JAPANESE KNOTWEED MANAGEMENT OPTIONS

The management options outlined below follow the flow chart contained in the *Knotweed Code of Practice,* published by The Environment Agency in the UK, and reproduced below at Figure 14. It provides details of the range of options available for the treatment of Japanese Knotweed in a relative hierarchy, with the optimum treatment solution being determined by the nature of the constraints presented by each particular development or site.

Based on the nature of this particular site, and the intention for its comprehensive development in the short term, the process of management selection for Three Cornered Garlic and Spanish Bluebell are considered to be equivalent, and compatible, with that for Japanese Knotweed. The location of the I.A.P.S. stands JK1/1A and TCL/SB 1, and their relationship to the current development proposals are illustrated at Figures 15 and 16, in section 4.1 below.

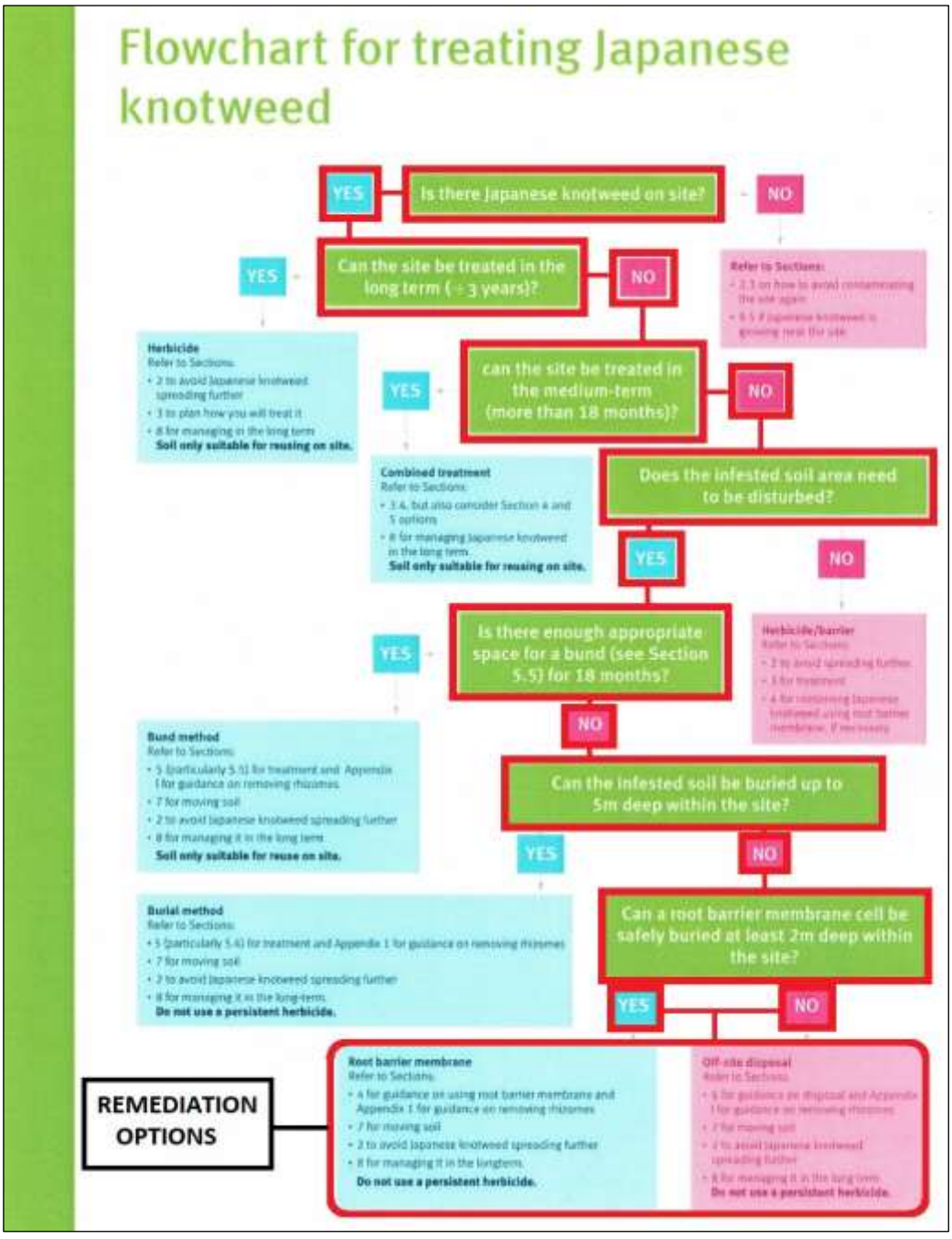

Figure 14 : Flowchart for establishing preferred treatment option for the Cornelscourt site
(Source: UK Environment Agency)

4.1 I.A.P.S. locations in relation to site development proposals

Figure 15 : Location of I.A.P.S. stands in relation to the basement footprint of the development
(Source: Henry J. Lyons, Architects)

Figure 16 : Location of I.A.P.S. stands in relation to the ground level layout of the development
(Source: Henry J. Lyons, Architects)

4.2 Japanese Knotweed Management Options

4.2.1 Option 1 – Avoidance

Japanese Knotweed, and other I.A.P.S., have been identified within the proposed works area on the Cornelscourt site, at the locations illustrated in Section 2 above. Typically a minimum horizontal distance of 7m from the outer limits of the above ground Japanese Knotweed plants is required to ensure that the plant and rhizomes are not disturbed.

Given the size of the site, the nature and scope of the development, and the footprint of the proposed buildings and roads, it is not possible for the development works to safely avoid the Japanese Knotweed and other I.A.P.S. stands. **Conclusion – Not suitable for this site**

4.2.2 Option 2 –Treatment with Herbicides

The use of an in-situ multi annual herbicide treatment programme is a very effective, and bio-secure method of controlling Japanese Knotweed and other I.A.P.S. plants. For Japanese Knotweed in particular this treatment method requires the application of herbicide to the full area of infestation, with annual or bi-annual applications carried out over a minimum of three to four years, with a further minimum two years of monitoring to validate its eradication. No works within a zone of 7m around the infestations should proceed until full eradication is achieved.

It is intended that development works will proceed as soon as practicable following the receipt of planning approval for the scheme. Therefore there is not sufficient time available to safely complete a multi-annual Japanese Knotweed treatment programme. **Conclusion – Not suitable for this site**

4.2.3 Option 3 - Combined Treatment

Combined treatment involves herbicide control carried out in conjunction with digging the infested ground. The aim of the treatment is to break up the rhizome, which stimulates leaf production and therefore make the plant more vulnerable to herbicide treatment. Digging can be conducted during the winter, if care is taken no to compact wet soil. Fresh regrowth then can be treated during the spring and summer. This method reduces the amount of time required to chemically treat Knotweed but it must still be carried out for at least 18 months to be effective, and preferably be followed by a further two year monitoring period, to validate eradication

As above, this method is deemed unsuitable as there is not sufficient time available to safely complete a Japanese Knotweed treatment programme. **Conclusion – Not suitable for this site**

4.2.4 Option 4 - Soil Screening and Sieving

At sites where conditions allow, it can be possible to use mobile plant to sieve and screen soil. This allows the majority of the knotweed rhizome to be separated out, and disposed of by incineration or deep burial at landfill. If the screened soil is free from Japanese Knotweed rhizome it is suitable for reuse, and can be utilised on site. However the reuse of screened soil presents its own bio-security risks, as the screening process involves multiple soil handlings. A single fragment of only 0.7g of rhizome can regenerate into fresh Japanese Knotweed growth, and it has also been demonstrated that Japanese Knotweed rhizome can remain dormant, but viable, for up to 20 years. Therefore the careful handling, placement, management and monitoring of screened soil material is essential if this methodology is to be used successfully, and even then there is a risk that viable rhizome could be moved to other locations within the site. In this instance this would most likely be within the development footprint.

This option has been discounted given that there are significant risks of viable rhizome material remaining within screened soil, which could be moved to other areas of the site, posing a long term bio-security risk which is incompatible with the development. **Conclusion – Not suitable for this site**

4.2.5 Option 5 - Horizontal Root Barrier Membrane

This option seeks to minimise the amount of handling of Japanese Knotweed infested soils. It applies to situations where the majority of infested soil does not have to be disturbed to facilitate the proposed development or construction works, by virtue of the infested soil being located within the construction footprint, but principally below formation level. In such circumstances only the uppermost level of infested soil, located above formation level, is removed. The rest of the infested soil is then overlain with a proprietary root barrier membrane system which will contain it and prevent the rhizome from regenerating. The excavated soil must then be remediated using one of the approved methods, including the options of using and on-site cell or bund, and off-site disposal

Based on the current design proposals, the I.A.P.S. infested soils at JK1/1A and TCL/SB 1 are located partially or wholly within the footprint of proposed dwelling houses, as well as immediately adjacent to existing site boundaries. It is anticipated that the construction works to be carried out in these locations will include extensive soil disturbance and ground reduction, significant excavation for buildings and underground services, as well as extensive replacement and / or upgrading of site boundary structures. These works are expected to exceed the anticipated depth of Japanese Knotweed rhizome, and other I.A.P.S. plant material present. Therefore all infested soil material will need to be removed. **Conclusion – Not suitable for this site**

4.2.6 Option 6 – Burial Method

This option involves the deep burial of Japanese Knotweed infested soil, and other I.A.P.S. plant material, on-site, to a depth of five metres or greater, measured from finished ground level to the top of the buried infested soil. It is advisable to apply non-persistent herbicide to the growing plants, at least once, in advance of excavation to prevent the potential regrowth of infested material prior to burial. The treated material should be left a sufficient amount of time to allow the herbicide to take effect on the plant prior to excavation and burial. Following placement, the top of the infested soil should be capped with a proprietary root barrier membrane system.

This option has been discounted due to the engineering demands posed by the nature of the excavation required to achieve the necessary depths of 7 – 10m, particularly when considered in conjunction with the suitable areas for soil burial being all located within the lowest lying sections of the site, and typically below the footprint of the buildings. **Conclusion – Not suitable for this site**

4.2.7 Option 7 – Temporary Bund Method

Where on-site burial is not an option, it can be possible to create a temporary Japanese Knotweed containment bund. A bund is a shallow structure designed to safely contain Japanese Knotweed contaminated soil while it undergoes herbicide treatment. Typically infested soil is evenly placed in the bund to a depth of 0.5m, which results in the bund having a significant footprint, unless. The bund can either be raised, on top of the ground, or placed within an excavation to make the surface flush with the surrounding area. The purpose of the bund is to move the knotweed to an area of the site that is not in use, and where it can be treated over an extended period of time, from 18 months - 2 years. After the successful completion of the Japanese Knotweed treatment the bund can be dismantled and removed. However the continuing management of the treated soil, as noted in Section 4.2.4 above, will still be required.

This method is deemed unsuitable as the site will be developed comprehensively, as a single integrated phase, with no suitable quarantine area available in which to place a large soil containment bund. **Conclusion – Not suitable for this site**

4.2.8 Option 8 – Below Ground Sealed Containment Cell

This option involves the construction of an underground containment cell, sized to permanently store all infested soil. The cell is formed using a proprietary root barrier membrane system which securely holds the soil. The cell must then be covered by a minimum of 2m of soil or inert material, which protects the integrity of the root barrier membrane from plant roots and burrowing animals.

Careful consideration must be given to the location of any containment cell, to ensure that it is positioned in a location which is stable, which will not be at risk of disturbance from future development, and where long term soil subsidence is deemed acceptable. It is also recommended that such a cell should be located as close as possible to the original infestations, reducing the distance that viable rhizome material needs to be transported, and thus minimising bio-security risks. As a cell becomes a permanent feature on a site, its location needs to be mapped, shown on all drawings, and included on the legal maps pertaining to the property.

From a review of the design proposals, it is theoretically feasible to utilise this solution to successfully remediate the Japanese Knotweed infested soils and other I.A.P.S. plant material. However, although there are to be green areas provided within the development, which could be suitable to accommodate containment cells below, the locations of these areas are mostly central to the site, and either on top of the basement footprint or very close to new large scale structures. Engineering, and site management, constraints would be very significant if construction has to be organised to avoid these locations across the full development programme. There are, however, two locations which may not be fully subject to the above constraints, namely in the north west and south east sectors of the site, and are indicated on the site layout plan at Figure 17 below.

This option could be considered in more detail but will likely be discounted due to the work constraints posed by the siting of the cells and with the legal burden remaining on site, when weighed against the differential cost of the off-site disposal option considered at 4.2.9 below.
Conclusion – Potentially feasible but likely discounted due to construction & legal constraints

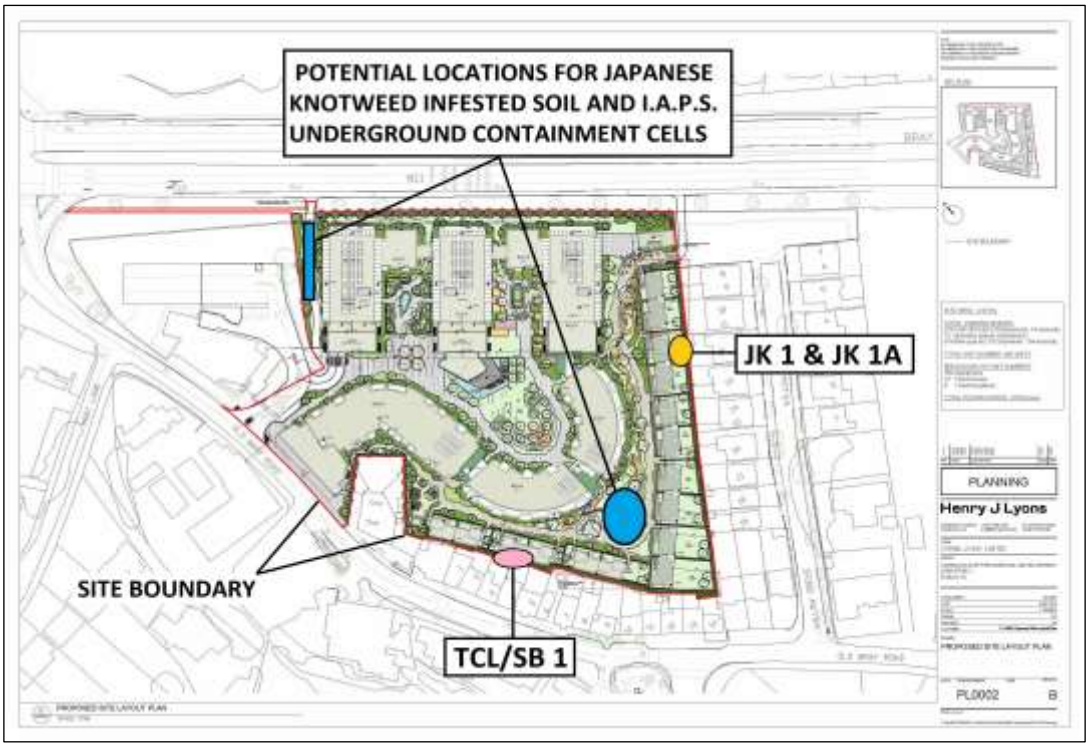

Figure 17 : Potential locations for Japanese Knotweed soil & I.A.P.S. underground containment cells
(Source: Henry J. Lyons, Architects)

4.2.9 Option 9 – Off-site Disposal

The off-site disposal of Japanese Knotweed infested soil and other I.A.P.S. plant material is generally only considered when none of the other treatment options available are deemed to be feasible. Although there are some bio-security challenges to the off-site disposal option, these are no greater than those associated with any of the alternative solutions which involve the handling and movement of infested soils. However, the off-site disposal option typically works out to be the most expensive solution, as waste handling charges and levies, and specialist transport costs, can add significantly to the overall remediation costs.

However these disadvantages are balanced out by the obvious advantage of ensuring that a site is fully remediated, with all infested soils removed, and with the property being relieved of what would be a continuing legal burden on it. This is of particular benefit where institutional investors are party to the development and where the property, either in part or in whole, may be subject to sale in the future. In addition, if the remediation of the Japanese Knotweed infested soils and other I.A.P.S. plant material is carried out in advance of the commencement of the main construction package, then the site can be handed over to the building contractor in a remediated state, with no impediment to construction works proceeding unhindered. **Conclusion – Suitable for this site**

4.3 Conclusion

Based on the review of all the remediation options, as listed above, and taking into consideration the specific design, engineering and legal considerations that pertain to this particular site and development, it is our conclusion that the bio-secure removal, and off-site disposal, of Japanese Knotweed infested soils, and other I.A.P.S. plant material, offers the most practical and appropriate remediation solution.

The option of forming an on-site underground containment cell could be explored in more detail, in consultation with the client architects, engineers, project management team, planning consultants and legal advisors. However, it is our opinion that the only real benefit from applying such a solution would be from a cost point of view, but that such savings could be more than offset by the additional costs associated with managing and working around the cell throughout the construction stage . A cost benefit analysis will likely show that the off-site disposal option would be the preferred approach so, therefore, it is this option which we will consider in the next stage of this management plan.

We would note that, irrespective of the final solution selected, the I.A.P.S. remediation programme should be scheduled as early as possible in the development schedule, to ensure that the infested soils and plant material are removed, and disposed of, prior to the commencement of all other construction activity and enabling works.

5 DETAILS OF JAPANESE KNOTWEED MANAGEMENT MEASURES

This plan has been developed, based on the following objectives:

1. Monitor the existing extent of Japanese Knotweed and other I.A.P.S. within the site
2. Prevent the spread of Japanese Knotweed and other I.A.P.S., to ensure compliance with the relevant legislation
3. Treat in-situ and remove viable plant material from the footprint of works, in order to protect new construction from future growth
4. Protect the works from risk of regrowth of viable plant material, by the use of approved vertical and horizontal root barrier membranes, where appropriate
5. Monitor and control Japanese Knotweed, and other I.A.P.S., regrowth on the site during the development phase
6. Establish a follow up monitoring and treatment programme on completion of the development, for a period of at least 5 years

5.1 Overall approach

To achieve the management objectives outlined above, the overall approach will be as follows:

- Carry out ongoing inspections of the site. Update distribution maps, if required
- Facilitate development works using the following measures :
  - Isolate infested areas and implement bio-security measures
  - Carry out a test trenching programme to establish the extent of infested soils
  - Excavate knotweed-contaminated soils from the footprint of proposed works, as part of a bio-secure management programme, to ensure the safe, off-site, disposal of all Japanese Knotweed infested soil and I.A.P.S. plant material to a licenced land fill facility or to an overseas processing facility
  - Use a proprietary vertical root-barrier membrane system along vulnerable site boundaries, to protect the property from the potential re-introduction of viable Japanese Knotweed and other I.A.P.S. plant growth from adjoining properties
- Develop a construction stage monitoring programme for inadvertent plant regrowth or spread, and future control using herbicide treatment or further physical remediation
- Implement a monitoring programme as an integral and mandatory part of the post development property management plan, to run for a period of at least 5 years following the completion of the development

5.2 Indicative Programme for Japanese Knotweed site remediation

We set out below the preliminary programme for the work stages required to remediate the development site and to monitor it for potential regrowth into the future. Due to the nature of the infestations on this particular site, their position relative to proposed buildings and structures, the site topography, and bio-security measures required in relation to handling Japanese Knotweed and soils infested with its rhizomes, we advised that the ground remediation should be carried out in advance of the main development / construction phase.

The client has taken this advice into consideration and recognises the fact that, for as long as Japanese Knotweed and other I.A.P.S. plant material remains on the site, such a presence acts as a burden on the property. Therefore it is considered that the remediation of the site from Japanese Knotweed and other I.A.P.S. plant material should not necessarily be dictated solely by the site development programme, but should be considered in its own right, as a standalone process.

In decoupling the Japanese Knotweed soil remediation process from the site development programme, it is the client's intention to proceed with the remediation works as soon as practicable, with the clear intention of having this process completed in advance of any other enabling works or site development activities. In adapting this approach it facilitates maximum bio-security, by ensuring that there are neither time nor co-ordination constraints, nor the risk of cross contamination, which would otherwise prevail if the remediation works were carried out as part of an integrated construction programme.

In applying the above strategy the indicative milestone dates would be as follows :

WORK STAGE	ACTIVITY	DATE	STATUS
STAGE 1	**INITIAL MANAGEMENT MEASURES**		
	CARRY OUT INITIAL SITE ASSESSMENT & REPORT	MARCH 2019	**COMPLETE**
	PREPARE PLANNING STAGE MANAGEMENT PLAN	MARCH 2019	**COMPLETE**
	FIT PROTECTIVE FENCING AND WARNING SIGNS	MAY 2019	**COMPLETE**
	FIRST HERBICIDE TREATMENT – JK1, JK1A & TCL/SB 1	MAY 2019	**COMPLETE**
	CARRY OUT FOLLOW UP SITE INSPECTION	AUGUST 2019	**COMPLETE**
	SECOND HERBICIDE TREATMENT – JK1 & JK1A	OCTOBER 2019	**PENDING**
	THIRD HERBICIDE TREATMENT – TCL/SB 1	FEBRUARY 2020	**PENDING**
STAGE 2	**ENABLING & REMEDIATION WORKS**		
	PREPARE CONSTRUCTION STAGE MANAGEMENT PLAN	SEPTEMBER 2019	**COMPLETE**
	COMMISSION SOIL TESTING AT JK1, JK1A & TCL/SB 1	OCTOBER 2019	**PENDING**
	CARRY OUT TEST TRENCHING AT JK1 & JK1A	NOVEMBER 2019	**PENDING**
	APPLY FOR LICENCE FROM N.P.W.S. FOR SOIL MOVEMENT	DECEMBER 2019	**PENDING**
	CARRY OUT SITE REMEDIATION PROGRAMME	FEBRUARY 2020	**PENDING**
	CONFIRM REMOVAL OF ALL INFESTED SOILS	FEBRUARY 2020	**PENDING**
	MONTHLY VALIDATION INSPECTIONS	UNTIL CONSTRUCTION	**PENDING**
STAGE 3	**CONSTRUCTION**		
	SPECIALIST MONITORING OF THE CONSTRUCTION WORKS FOR THE INTRODUCTION OR REGROWTH OF JAPANESE KNOTWEED AND OTHER I.A.P.S. TREAT / REMEDIATE IF REQUIRED	MONTHLY DURING THE GROWING SEASON, THROUGHOUT CONSTRUCTION STAGE	**SUBJECT TO OUTCOME OF PLANNING PROCESS**
STAGE 4	**POST CONSTRUCTION**		
	BI ANNUAL INSPECTION OF PROPERTY FOR JAPANESE KNOTWEED INTRODUCTION OR REGROWTH, INCORPORATED INTO PROPERTY MANAGEMENT PLAN	MINIMUM PERIOD 5 YEARS	**SUBJECT TO OUTCOME OF PLANNING PROCESS**

5.3 Remediation Measures

5.3.1 Ongoing Inspection and Monitoring

Site inspections and treatment visits have been carried out across the 2019 I.A.P.S. growing season. The conclusion from these visits is that the Japanese Knotweed and other I.A.P.S. plants identified on the site are now under good control, with the risk of further spread greatly reduced. It should also be noted that there was no evidence of further emergence of viable Japanese Knotweed over the same growing period.

Notwithstanding the results of the 2019 inspection and treatment programme, and in consideration of the fact that the Japanese Knotweed stands are typically located adjacent to disturbed ground, there is a small risk of viable knotweed rhizome and other I.A.P.S. being present beyond that observed and recorded in 2019. Although we are now approaching the period of winter dormancy, if that period is particularly mild, then early emergence of these plants may occur in advance of the infested soil removal programme commencing. In such a circumstance, or if the remediation programme is delayed for any reason, then follow up inspection and treatment visits should be carried out early in the 2020 growing season.

If the site inspections require the clearance of vegetation then the following considerations should be borne in mind :

- The Wildlife Acts set out certain vegetation that cannot be cleared between the 1st of March and 31st of August, in order to avoid impacting on nesting birds.
- Vegetation should be cut by a specialist, stockpiled by hand, and cut material retained within infested areas
- The specialist should take appropriate bio-security measures to ensure that no invasive material is carried out of infested areas on equipment, tools, materials or workwear
- The specialist should take appropriate measures to avoid impacts on any protected fauna present, to ensure compliance with Articles 23 and 40 of the Wildlife Act 1976

If further Japanese Knotweed, or other I.A.P.S., are detected within the site the following measures should be implemented :

- A dedicated, detailed, walk-over survey to be carried out across the entire site
- Any further invasive species encountered on the site to be identified, recorded and mapped
- GPS records to be incorporated into an updated site assessment report
- Maps to be circulated to the relevant project team members
- I.A.P.S. Management Plan to be reviewed and updated
- Buffer zones of 5 - 7m around all I.A.P.S. plants to be established on site, with secure fencing and warning signage fitted
- The initial herbicide treatment programme to be reviewed and updated, to include newly identified invasive plant species

5.3.2 Follow up herbicide treatment

Based on the outcome of follow up site inspections, the prevailing climatic conditions in Spring 2020, and the precise timing of the commencement of the Japanese Knotweed infested soil and I.A.P.S. remediation programme, it may be necessary to carry out further herbicide control on site. If so required then the following measures should be followed :

- Herbicide treatments should always be applied by a competent and licensed operator.
- Herbicide operators should take appropriate measures to avoid or minimise risks to themselves, construction personnel, members of the public and the surrounding environment. Details of any health or environmental hazards will be provided on the manufacturer's label or in accompanying documentation.
    - Most herbicides are harmful to humans, and some are toxic or carcinogenic. They may also harm domestic pets and wild animals that enter the site.
    - If herbicides enter water they can kill aquatic plants and organisms. Care should be taken when working around streams, drains or ponds.
    - Broad-spectrum systemic herbicides such as glyphosates can be toxic to non-target organisms, including trees and native vegetation.
- Prior to any herbicide applications a temporary construction fence should be placed around the treatment areas, in order to prevent access by members of the public.
- Herbicides should be applied as a foliar spray, stem injection or stem fill application.
- We recommend that non-persistent glyphosate based herbicides should be used, such as Round-up Flex or Round-up Biactive XL. Glyphosate based herbicides are most effective if applied at the end of the growing season. An initial application in early summer can also be considered, and incorporated into a structured multi annual treatment programme, where circumstances are appropriate
- To reduce the bio-security risk during handling and transport the surface of the Japanese Knotweed infested soil and the other I.A.P.S. plants being removed should be sprayed off, using a non-systemic herbicide in solution, up to 3 weeks in advance of its disturbance

5.3.3 Isolation of infested areas and implementation of bio-security measures

Exclusion zones have been established around all known areas infested by Japanese Knotweed and other I.A.P.S., and have been delineated using robust temporary construction fencing and warning / advisory signage. These should be kept in position for the full duration of the enabling and remediation works.

In order to avoid any risk of spread of Japanese Knotweed and other I.A.P.S. plants from the infested areas, the following bio-security measures must be implemented for all or any personnel who may seek or require access to these exclusion zones, including those carrying out the Japanese Knotweed soil and I.A.P.S. remediation process. The measures should also be included in all induction briefings, and communicated directly to relevant personnel via 'toolbox talks'. Personnel should also be informed of their legal obligations to prevent the spread of invasive species, and of the penalties that apply.

- All unnecessary work within the exclusion zones must be avoided.
- The exclusion zones cannot be used as an access route or parking area for vehicles or personnel.
- No soil, vegetation, rubbish or any other material should be removed from the exclusion zones, unless under the strict supervision of a Japanese Knotweed specialist
- All work within the exclusion zones should be carefully planned, in co-ordination with, and under the strict supervision of, an I.A.P.S. specialist
- The use of tracked vehicles within the exclusion zones should be avoided, unless being used as part of the remediation process
- Any vehicles operating within the exclusion zones must be cleaned thoroughly when entering and / or leaving the zones :
    - A designated wash-down area should be set up at a suitable access point to the exclusion zones.
    - The cleaning area should be positioned on a slope so that run-off will flow back into the exclusion zone.
    - Vehicles must be cleaned of all earth and loose sediments, with particular attention paid to tyre treads, wheel arches and hinged joints.
    - All tools, materials and workwear should be inspected, and cleaned as necessary, with particular attention paid to footwear and hand tools
    - All removed or disturbed plant material must remain within the exclusion zone

5.3.4 Test trenching to establish the extent of rhizomes / infested soils

In order to accurately establish the full extent of the Japanese Knotweed rhizome network, and calculate the volume of infested soil on site, a programme of test trenching should be carried out. The results of these investigations should be used to confirm the detailed scope of the soil remediation programme and establish the effective overall depth required for vertical root barrier membranes. The test trench programme should follow the following methodology :

- Select the number and location of trenches to be opened up, sufficient to provide a detailed understanding of the vertical and horizontal spread of Japanese Knotweed rhizomes
- Where site conditions dictate that trenches are not possible, but where information is required, select a suitable location for opening up a trial pit to the maximum depth feasible
- All machinery, equipment, tools, materials and workwear to be cleaned down prior to entry into the Japanese Knotweed buffer zones.
- Open up trenches, working inwards from the boundary of the 5 - 7m buffer zones.
- Place excavated material on a solid surface such as metal sleeting or plywood boards, with a protective impermeable membrane laid underneath
- Carefully inspect trench faces and base for evidence of Japanese Knotweed rhizome. When rhizomes are encountered proceed with further vertical excavation to establish their overall depth. Continue with this methodology until reaching the edge of the above ground infestation.
- Open up at least one trial pit at each infestation, centrally located within each infestation, to determine the rhizome depth directly underneath the plants themselves
- Measure and record all details of the Japanese Knotweed rhizome present in each test trench and trial pit
- Carefully replace the excavated material back into the trench on completion, marking the limits of each trench, and treating the entire trench as being infested soil for the purposes of the soil volume calculations
- Wash down all machinery, equipment, tools, materials and workwear at each trench and pit location, on completion, ensuring run off is contained within the infested area
- Reset the temporary fencing, to include a 2 - 2.5m buffer zone, beyond the actual limits of the Japanese Knotweed rhizome spread. In locations where the rhizome spread cannot be established it should be assumed that the spread is 5 - 7m, and the original buffer zone should be maintained
- Compile the results of the test trench programme into report form, including infested soil calculations, and circulate to the relevant personnel

5.3.5 Excavation of infested soils

In order to fully remediate the site, the complete removal of the infested soils, and their bio-secure disposal off-site will take place. The following steps in the process are required and should be initiated well in advance of the intended site remediation date :

Soil Testing

Before the removal of infested soils can commence it is necessary to ensure that the material meets the waste acceptance criteria established under the licence of the waste receiver. Typically such a requirement dictates that the material must comprise mainly organic soil, free from contaminants and other elements which could change the material's standard EWC Code classification.

To achieve this a WAC test is required, and this should be carried out on a minimum of one soil sample taken from each of the Japanese Knotweed locations. Samples should be sent to a fully recognised testing laboratory, such as FitzScientific or Jones Environmental, where the Rialta suite of tests, or recognized equivalent, will be conducted. Based on the outcome of the tests, the appropriate waste channel, chain of disposal, and waste receiver can be selected.

Based on a positive soil test outcome, the appropriate chain of disposal should be to either to the Integrated Management Solutions engineered landfill facility at The Naul, in north Co. Dublin or via Rilta's or Indaver's licenced waste transfer facility, for onward shipment overseas to specialist soil processing facilities on mainland Europe

Licence Application

In order to transport Japanese Knotweed and other I.A.P.S. plant material from one location to another, a licence must first be obtained from the National Parks and Wildlife Service. A licence application must include:

- Complete details on the removal, transportation and treatment of the species in question
- A detailed description of the biosecurity measures that will be in place
- Copies of necessary waste permits and licences, and material test results
- Details of the chain of custody for the movement of infested soils
- Details of the programme and schedule for carrying out the work
- A copy of the Knotweed Management plan

Under the **Waste Management (Facility, Permit and Registration) Regulations 2007**, Japanese Knotweed soils and other I.A.P.S. plant material can only be disposed of at an appropriately licenced waste facility. The waste can only be transported offsite by an licenced haulier with the correct NWCPO permit. The licenced waste facility must be notified in advance of the nature of the waste and must have formally agreed to accept the waste material prior to its dispatch.

Excavation and Transport of Infested Soils

The main principles to be followed for excavation of infested soil are as follows :

- All material should be excavated and moved in a single, self-contained operation.
- A designated haul route should be established between the excavation site / exclusion zone and the underground containment cell, and should be surfaced with min. 200 Clause 804, with a root barrier membrane and protective layers underneath.
- The haul route should be lined with temporary construction fences and advisory signage, to mitigate the risk of contamination to adjoining areas of the site.
- If excavation work is undertaken during the growing season all knotweed plants should be treated three weeks prior to excavation.

See Figure 18 below for the schematic site set up at the areas at JK1 and TCL/SB 1

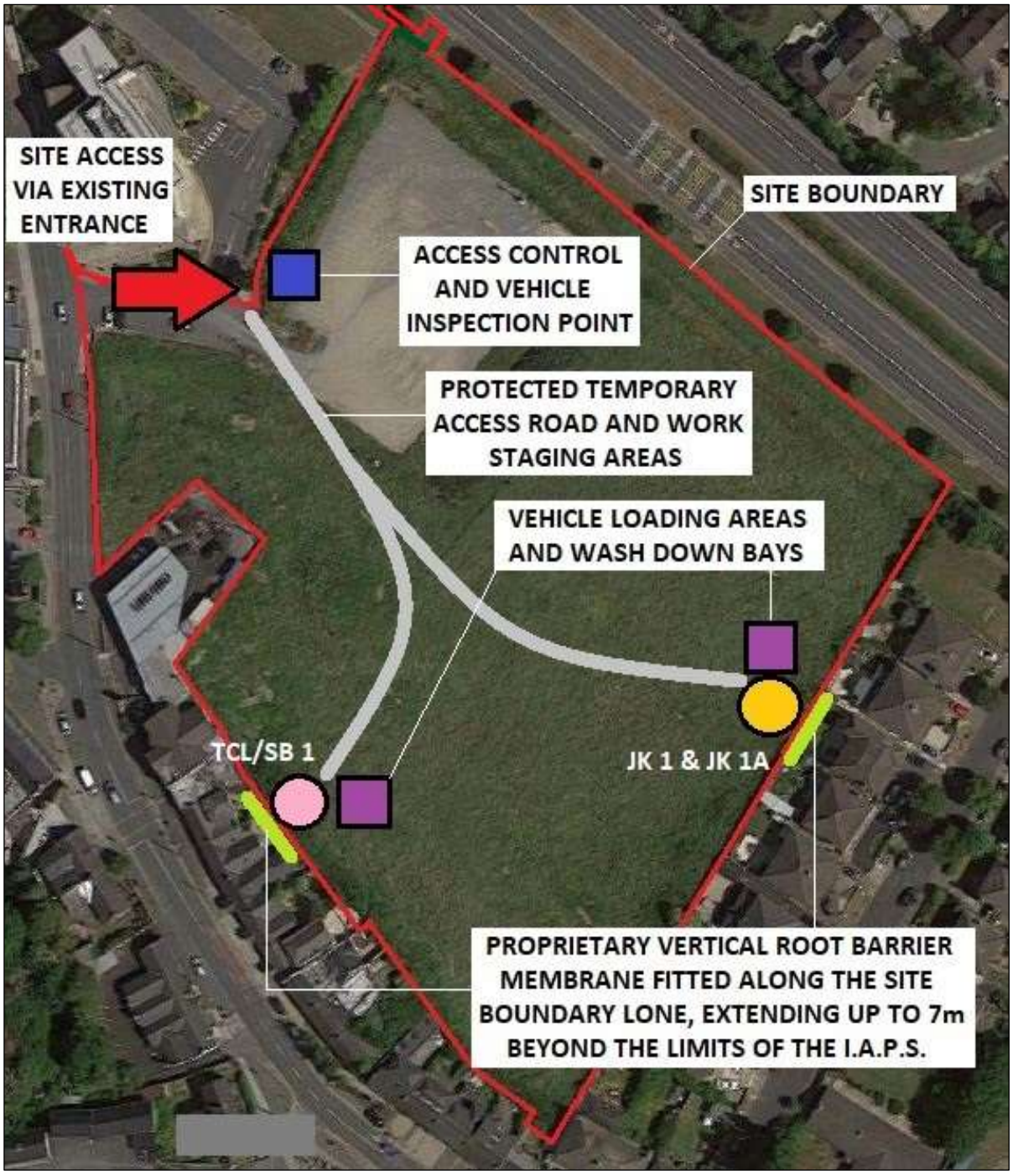

Figure 18 : Aerial Site Layout showing schematic set up of works areas

(Source: Google Maps)

5.3.6 Use of root-barrier membranes to prevent re-growth within the site

This plan identifies the potential use of root barrier membranes in one situation, namely

- Proprietary vertical root-barrier membranes along the south eastern boundary line of the property, at the Japanese Knotweed stand JK1, to prevent potential re-entry onto the site of viable Japanese Knotweed rhizome or plant material, which may currently be present in the soil under the existing masonry boundary wall

A number of different permeable and impermeable membranes may be considered suitable, such as the Dendro-Scott or GSE root barrier membrane systems. In general they must be made of a material that is fit for purpose and can be:

- Used without damage
- Provided in large sizes, to minimise the number of site joints required
- Sealed securely
- Remain intact for at least 25 years
- Resistant to UV light
- Approved, tested and certified for use with Japanese Knotweed

<u>Installation of root-barrier membranes</u>

The following procedures should be followed when installing root barrier membranes. For the purposed of this plan only the items relating to vertical root barrier installation need apply. Further technical and installation details are included in Appendix 3 of this Management Plan:

- When the ground reduction work is complete, all remaining roots, stones and coarse materials should be removed by hand.
- The ground should be levelled using fine sand, to provide a soft surface for the protection of the underside of the membrane.
- A continuous layer of root barrier membrane, in the largest practical sheet sizes, should be placed across the full extent of area to be protected, in a single operation.
- Ensure that there are no holes or gaps in the membrane, and that any dressing around objects or surfaces are carried out in full compliance with the manufacturer's instructions.
- All seams should be formed by creating a minimum lap of 300mm between sheets, and sealed using two lines of double sided, self-adhesive, butyl sealing tape
- On vertical and sloping surfaces the membrane should be held in position, and protected from damage, by continuous plywood sheeting fitted to both sides of the membrane.
- Where possible underground services should be laid above the horizontal membrane, in order to facilitate future access for maintenance. If services must be laid deeper then additional trenches can be created, with the root barrier membrane extending down the sides and across the base of the excavations. In these circumstances extreme care must be taken when installing the particular services or pipework, ensuring that the installation process does not risk damage to the root barrier membrane, and that appropriate trench fill material is carefully placed.
- A fine sand protective layer should be laid on top of the horizontal membrane to protect it during construction work.
- When installation is complete, construction can proceed, but taking all necessary care and precautions, to avoid any risk of damaging the membrane.

6. ONGOING MONITORING AND TREATMENT

Although this plan seeks to ensure that all Japanese Knotweed infested soil and other I.A.P.S. are dealt with in a manner that ensures that there is no regrowth, there remains a risk that some viable Japanese Knotweed and other I.A.P.S. material may remain within the development site. In such an instance it is essential that the material is identified and treated appropriately, as soon as possible. We therefore recommend that monitoring and treatment programmes are put in place for both the construction and post-construction stages of the site development.

6.1 Construction stage monitoring and treatment

Construction activity can pose a high risk of disturbing and dispersing Japanese Knotweed and other I.A.P.S. infested soil. Sections 4 and 5 of this report deal with the remediation measures that seek to mitigate this risk, and particularly if an enabling works contract is used to achieve the measures in advance of the main construction programme. Notwithstanding these measures no procedure can be deemed as completely bio-secure, and there is always a possibility that viable plant material can be spread elsewhere, either inadvertently or by outside interventions. Therefore strict site management procedures and regular inspections of the works site should be deployed throughout the construction stage of the site development programme. The contractor must prepare bio-security procedures and a works inspection programme, for the approval of, and monitoring by, a Japanese Knotweed specialist prior to any construction commencing on site.

6.2 Post construction monitoring and treatment

The property management plan should include a specific section relating to the routine inspection and treatment of Japanese Knotweed and other I.A.P.S. on the property. The following measures should be incorporated in such a plan :

- The site to be surveyed in March / April of each year. If no Japanese Knotweed or other I.A.P.S. are detected in March / April, then a second survey should be carried out in June / August, to look for late season growth
- If Japanese Knotweed or other I.A.P.S. are detected then a site specific management plan should be prepared and implemented
- Following treatment, if no growth is detected for at least two consecutive years, then the plant may be considered to be eradicated, and annual treatment may no longer be required
- Bi-annual inspections should continue for a minimum of 5 years following any sighting of Japanese Knotweed or other I.A.P.S.
- If no growth is detected for five consecutive years, then the plant can be considered to be eradicated
- Inspection reports, treatment records and distribution maps, where relevant, should be produced and updated in each year

7 LEGAL CONSIDERATIONS

7.1 Reliability of treatment options

It is acknowledged that Japanese Knotweed and other I.A.P.S. are a highly invasive plants, and that they can be very difficult to manage on construction sites. This management plan has been developed by Invasive Plant Solutions, but the measures outlined herein are based on the advice and guidance given in the *Knotweed Code of Practice*, published by the Environment Agency of the United Kingdom. The code of practice has been developed by experts in the control of knotweed, and is based on the successes and failures of hundreds of knotweed management plans. It is widely accepted to represent the best practice in the treatment of Japanese Knotweed in the United Kingdom but it is not considered to be fail-proof. The following disclaimer is included with their documentation.

> *"We cannot guarantee that any of the methods we describe in this code will be successful. We believe the methods within this code are among the best that are currently available, but do not reflect the complete choice that is available. The contractor and client need to agree a contract for effectively treating the problem. Remember that Japanese knotweed can stay dormant for many years.*
>
> *You may wish to use this code of practice to assist you in carrying out your legal duties concerning knotweed. However this code does not constitute legal advice and it does not aim to give a detailed or comprehensive account of the legislation that could apply to you. You should be aware that is your responsibility to make sure that the law is complied with."*

7.2 Implementation of the Management Plan

This management plan has been developed on behalf of the client, and the implementation of the plan will be the responsibility of the specialist invasive plant contractor that is appointed to carry out the remediation works. All parties must therefore ensure that all staff working on the site are fully aware of, and abide by, the measures outlined in this plan, and ensure that such measures are implemented fully and correctly.

If this plan is carried out in full, in advance of the commencement of construction, then the presence of Invasive Alien Plant Species will not inhibit the proposed development of the site.

---

invasiveplantsolutions

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Station Road
Dundrum
Co. Tipperary

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Website : www.knotweed.ie
Email : info@knotweed.ie

CONSTRUCTION STAGE
I.A.P.S. MANAGEMENT PLAN

PROPOSED RESIDENTIAL DEVELOPMENT
on
LANDS at CORNELSCOURT VILLAGE
OLD BRAY ROAD
CABINTEELY
CO. DUBLIN

APPENDIX 1
Samples of advisory / warning signage


invasiveplantsolutions
www.knotweed.ie
Warning
This is a multi-hazard area
No unauthorised admittance
Bio-security protocols in operation


invasiveplantsolutions
www.knotweed.ie
Restricted Access
The soil in this area
contains Japanese Knotweed
and is being treated.
Do not enter unless authorised.
Do not remove soil from this
area without authorisation.

CONSTRUCTION STAGE
I.A.P.S. MANAGEMENT PLAN

PROPOSED RESIDENTIAL DEVELOPMENT
on
LANDS at CORNELSCOURT VILLAGE
OLD BRAY ROAD
CABINTEELY
CO. DUBLIN

APPENDIX 2
Dendro-Scott root barrier membrane – Data Sheet

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Root Barrier Specialists

DENDRO-SCOTT™ Root Barrier

SPECIFICATION DATA SHEET

Properties	Unit Value	Test Data	Standard
CONSTRUCTION			
Raw material	Polymer ID	Polyethylene	
Colour		Grey/Blue	
MECHANICAL PROPERTIES			
Tensile Strength (machine direction)	N(FMAX)	191	EN ISO 10319
Puncture Resistance	N (FMAX)	150	EN ISO 12236
PHYSICAL PROPERTIES			
Grammage	Gsm	220	EN 965
Thickness	micron	345	D EN 964-1
HYDRAULIC PROPERTIES			
Water Vapour Permeation	$g/m^2/24hrs$	Water impermeable <1.0 (max)	
SUBSTANCES OF VERY HIGH CONCERN		Free of substances of high concern	EC Packaging Waste Directive

Note: above are based on typical representative values of the product DENDRO-SCOTT™ Root Barrier.

Testing was carried out by an independent laboratory, **Edwards' Analytical**, in controlled laboratory environment (EA Project Number: 14/EA/01/09).

edwards' analytical

Caring for the present is preserving the future

Peter Scott Tree Care (Southern) Limited
Registered in England and Wales Number 03878026

CONSTRUCTION STAGE
I.A.P.S. MANAGEMENT PLAN

PROPOSED RESIDENTIAL DEVELOPMENT
on
LANDS at CORNELSCOURT VILLAGE
OLD BRAY ROAD
CABINTEELY
CO. DUBLIN

APPENDIX 3

Dendro-Scott root barrier membrane – Installation Details

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DENDRO-SCOTT™ Root Barrier

... why use anything else?

DENDRO-SCOTT™ Root Barrier, recognised by the Environment Agency, is known for its quality and reliability. It is flexible and adaptable, specified for all types of projects, from the very large, including new builds, to small residential projects. It is an excellent and proven way to protect structures and services from **tree roots** and **Japanese Knotweed.**

Due to enhanced storage capacity, we are now able to offer a much wider range of sizes (rolls and sheets) from 1m x 10m rolls to 30m x 30m sheets. Our new Price List is available on our website: www.rootbarrier.com.

Also, we have changed the method of jointing the membrane on site from the previous glue and tape system to a butyl tape system. This makes installation quicker, easier and considerably more cost-effective.

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Revised: 27 March 2015

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General installation guidelines for DENDRO-SCOTT™ Root Barrier

Vertical Installation

The root barrier membrane should be installed vertically and as taut as possible, with the grey side facing the tree. The root barrier should line the side of the trench nearest the tree, with back-filling to the blue side.

To prevent roots growing over the top, the root barrier should be brought up to ground level, or just above.

When back-filling the excavated trench, care must be taken that any sharp stones or debris that may damage the root barrier must be removed. The back-filling should be carried out to Institute of Civil Engineers standards, to prevent subsidence. As back-filling takes place, the root barrier can, in some circumstances, be dragged down during consolidation. It is important that the installer should allow for this to prevent the top of the root barrier being lower than required.

Where the soil contains flint, sharp stone or any other sharp object, these should be removed from the face of the trench, which is to be lined with root barrier membrane. If this is not practicable, consideration should be given to lining both sides of the root barrier membrane with plywood or another suitable material.

Where the root barrier will be bisected by existing services, it will be necessary to cut the root barrier membrane and to re-seal it with DENDRO-SCOTT™ double-sided butyl jointing tape; preferably from both sides.

Where land drains will be dissected by the root barrier, it is important that they be re-routed around the root barrier and not through it.

As with all root barriers, it is important to determine the correct depth, length and position to prevent the roots from growing under and around the root barrier.

Care must be taken that the position of a root barrier does not affect the stability of the tree(s) and that the loss of rooting material is such that it does not cause the tree(s) to go into terminal decline.

These are guidelines only—the installer must taken into account the varying conditions of individual sites; for example, the necessity to install drainage to prevent the build-up of hydrostatic pressure on sloping ground. The installer should also ascertain whether the input of a structural engineer is required, for example, if the excavation of the trench to take the root barrier could affect existing foundations.

The manufacturers or suppliers cannot be held responsible for the non-performance of this product due to misuse of incorrect installation practices.

It is advisable when installing root barrier on depths of 2.0 metres or more that the blue side should be lined with plywood or similar to prevent damage or 'drag-down' during back-filling.

When it is deemed necessary to line the sides of individual tree pits, consideration should be given to the use of DENDRO-SCOTT™ ready-made tree pit liners, which can line pits up to a circumference of 6 metres (diameter of 1.9 metres). If a larger planting pit is required, then creating a tree pit liner for your own requirements is a simple operation using the DENDRO-SCOTT™ Root Barrier and DENDRO-SCOTT™ double-sided butyl jointing tape. As the installation of the DENDRO-SCOTT™ tree pit liner will initially restrict the development of the tree root system, there will be a need to maintain the tree(s) in a staked condition for a longer period than if it were growing in an open ground situation.

When using the DENDRO-SCOTT™ double-sided butyl jointing tape, and/or PVC cover tape, surfaces must be smooth, free from dirt, dust, etc., and dry. The joint must then be pressed together to ensure a good, continuous seal; this may be achieved by using a small roller.

Horizontal Installation

Where the DENDRO-SCOTT™ root barrier is being laid horizontally, for example, to control Japanese knotweed, Operatives should first consult with Peter Scott Tree Care (Southern) Limited.

Peter Scott Tree Care (Southern) Limited reserves the right to alter these guidelines at any time.

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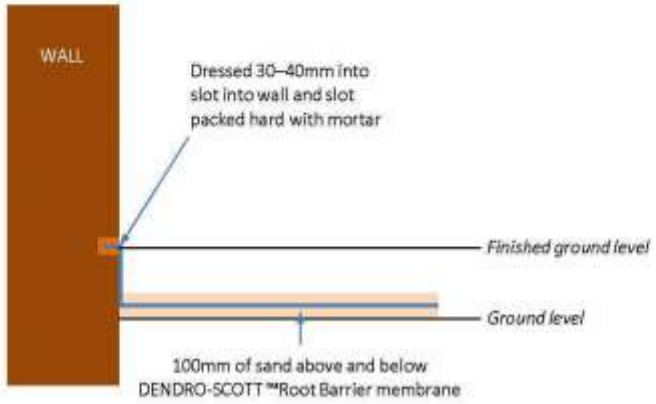
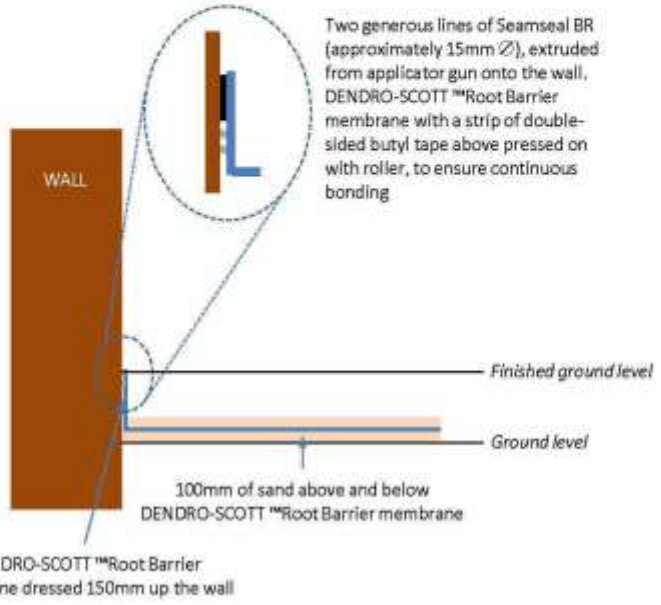
Securing DENDRO-SCOTT™ Root Barrier to a wall—External

We recommend two options for securing DENDRO-SCOTT™ Root Barrier to a wall ...

Option A:



Option B:



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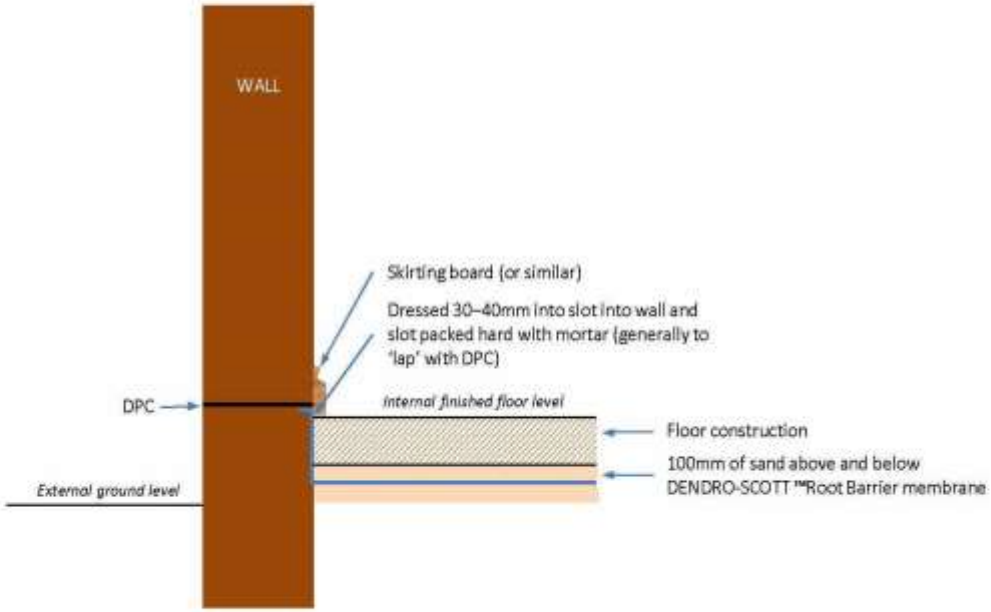
Securing DENDRO-SCOTT™ Root Barrier to a wall—Internal



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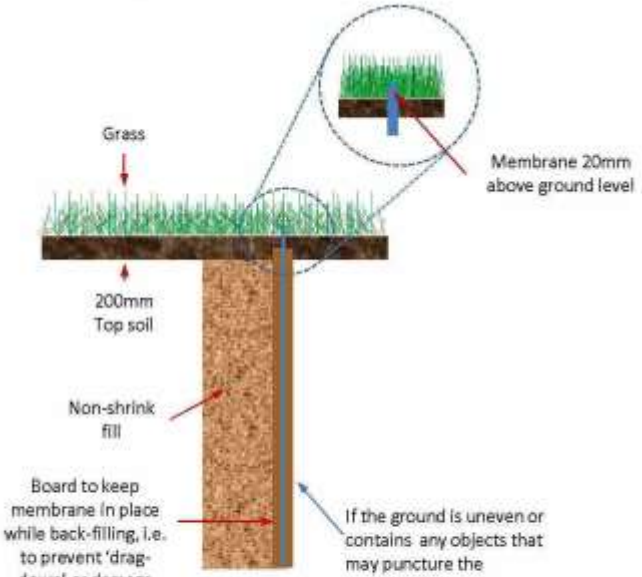
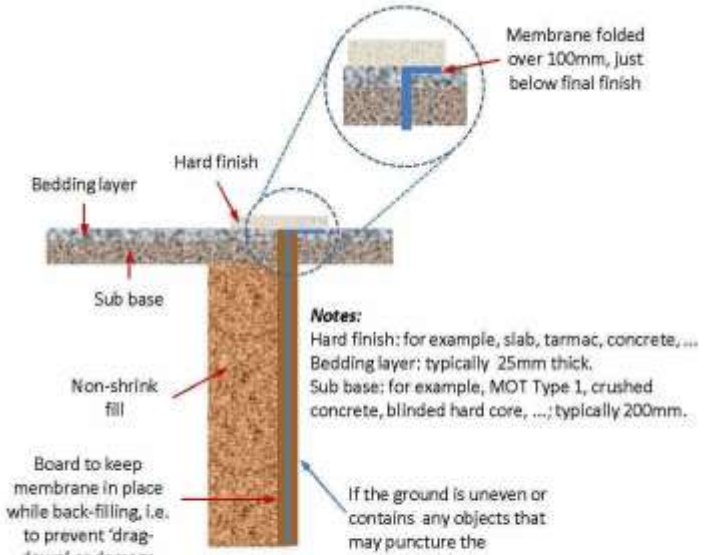
Finishing top edge of DENDRO-SCOTT™ Root Barrier (soft and hard landscapes)

Soft landscape ...



Hard landscape ...



Notes:
Hard finish: for example, slab, tarmac, concrete, ...
Bedding layer: typically 25mm thick.
Sub base: for example, MOT Type 1, crushed concrete, blinded hard core, ...; typically 200mm.

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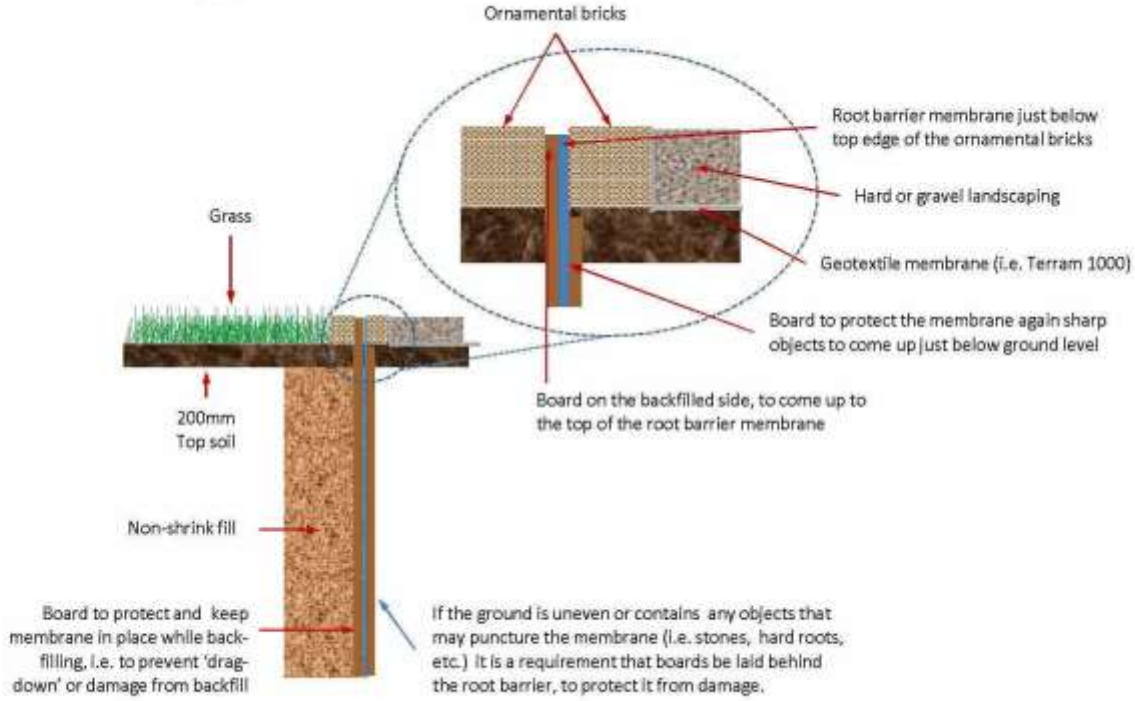
Finishing top edge of DENDRO-SCOTT™ Root Barrier (using ornamental bricks and landscaping)

Using ornamental bricks and landscaping finish ...



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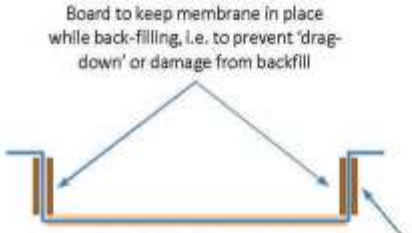
General example of DENDRO-SCOTT™ Root Barrier installation



If the ground is uneven or contains any objects that may puncture the membrane (i.e. stones, hard roots, etc.) it is a requirement that boards be laid behind the root barrier, to protect it from damage.

Place the DENDRO-SCOTT™ Root Barrier membrane in the prepared excavation up to ground level at the sides and leave at least 100mm along the ground. Lay 100mm of sand (or more as may be required to fully protect the membrane from any damage), then lay the membrane.

Lay 100m of sand on top of the membrane, so that there is 100mm above and below the membrane.

For the sides, place boards against the sides to stop it slipping back, being dragged down or damaged whilst back-filling.

The result will be a barrier against root penetration and Japanese Knotweed.

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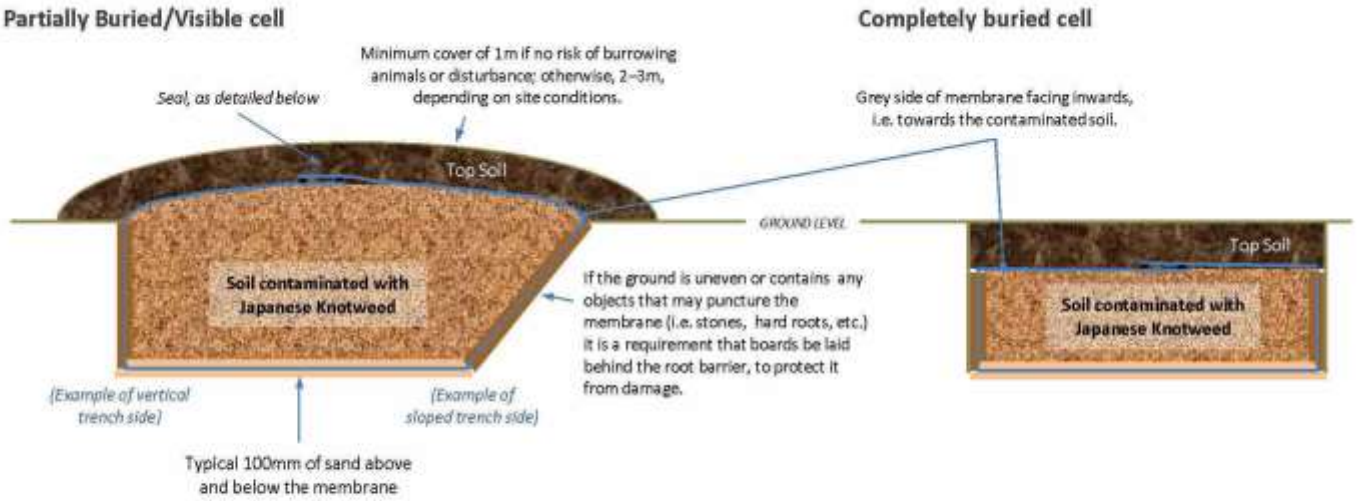
Building a 'Cell' with DENDRO-SCOTT™ Root Barrier (detail)

Building a cell is a cost-effective way to contain Japanese Knotweed on site.



Sealing cells, using DENDRO-SCOTT™ tape

Two strips of double-sided butyl tape, pressed well with roller, to seal the cell
(See detail on Pages 8 and 9.)

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Jointing DENDRO-SCOTT™ Root Barrier (method)

DENDRO-SCOTT™ Root Barrier membrane comes in various sizes , but it may necessary to cut and joint to achieve the shape you require. We also supply some ready-made larger sizes—please check with our Sales team.

Place the rolls of membrane adjacent to each other and overlap each one to make the joint, or cut it into required size pieces *(if applicable)*. These will need to be jointed together, side-by-side with tape.

Min 250mm overlap on each joint

Note: the grey side of the membrane to face the tree/roots. Therefore, for vertical installations the blue side will be visible during installation.
For 'cells' to bury contaminated soil, the grey side will be the inside of the cell and the blue side will be on the outside.

Apply two strips of double-sided butyl tape, as shown and press well with roller.

The result will be a barrier against root penetration and Japanese Knotweed

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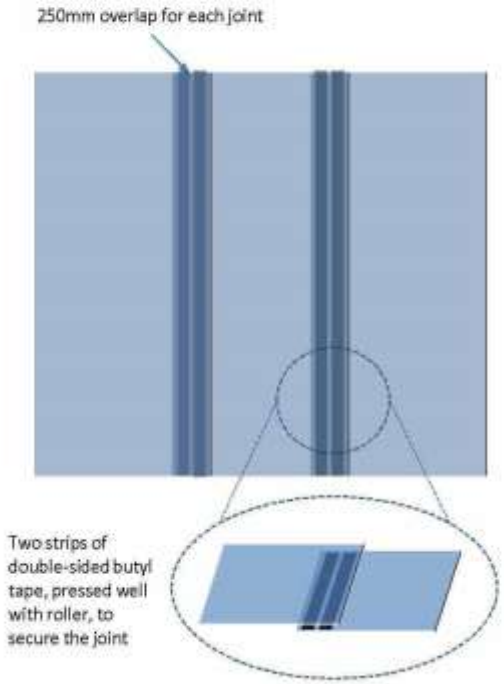
Jointing DENDRO-SCOTT™ Root Barrier (example)

Standard rolls or sheets can be jointed together to create larger custom sheets ...



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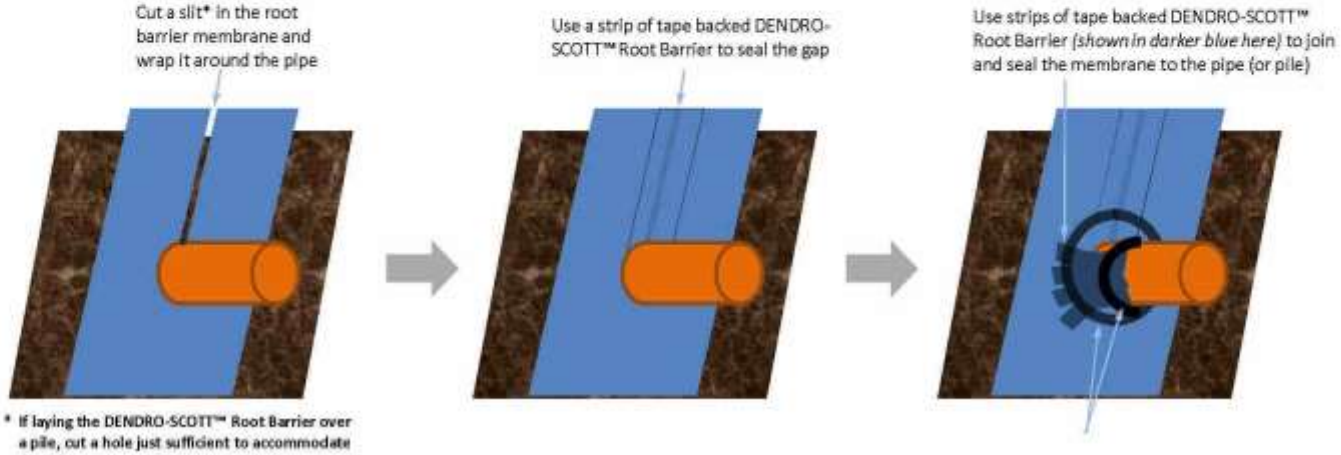
Services/objects passing through DENDRO-SCOTT™ Root Barrier

Prepare 100mm wide strips of DENDRO-SCOTT™ Root Barrier. Stick onto one side of double-sided butyl tape.

Note:
If the object passing through the DENDRO-SCOTT™ Root Barrier has a rough surface (i.e. Concrete pile) its surface should be primed with a bonding slurry, using Cementone SBR/ordinary Portland cement. The bonding slurry should be allowed to cure and dry prior to applying DENDRO-SCOTT™ double-sided butyl tape.



*** If laying the DENDRO-SCOTT™ Root Barrier over a pile, cut a hole just sufficient to accommodate the pile.**

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Example of vertical installation of DENDRO-SCOTT™ Root Barrier

Buildings can be protected from root intrusion. The use of boards ensures that the root barrier remains in place while back-filling.

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Example of using DENDRO-SCOTT™ Root Barrier to protect services

Root barriers can protect services and the membrane can be installed across service lines.

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Example of residential use of DENDRO-SCOTT™ Root Barrier

Root barriers are not only for large projects; they can be used in small residential projects, with rolls from as small as 1m x 10m.

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Example of custom sheet of DENDRO-SCOTT™ Root Barrier—Large cell

Custom sheets are typically the most cost-effective option for large installations.




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Example of building a very large 'Cell' with DENDRO-SCOTT™ Root Barrier

Removing Japanese Knotweed from site can be problematic and extremely expensive.
DENDRO-SCOTT™ Root Barrier can be used to build a cell. In which to bury soil contaminated with Japanese Knotweed, on site.

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Example of protecting foundations with DENDRO-SCOTT™ Root Barrier

Root barriers can be used to protect foundations. After the concrete has been poured, the remaining rectangular areas (floors) can be protected with sheets, jointed (with two strips of double-sided butyl tape) to effectively 'line' under the whole building.