GUIDE TO VEGETATION MANAGEMENT IN THE RAIL CORRIDOR

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Introduction

Vegetation management is often given a low priority when it comes to rail corridor construction and maintenance activities. However, the various forms of vegetation supported within the rail corridor, from native bushland to heavily weed infested sites, can significantly impact on rail activities. Vegetation growing within the track formation and trees within the safety envelope of overhead structures or sight lines directly impacts on train running and safety. In turn the presence of threatened plant species or communities can trigger the operation of various environmental laws with which public authorities must comply.

Effective vegetation management is therefore an essential and vital component of the state wide rail maintenance and construction program.

The main objectives of vegetation management are to:

- Protect native threatened plant species and communities as required under relevant species conservation legislation;
- Provide for visually pleasing rail corridors and the control of environmental weeds as expected by the community;
- Control and manage noxious weeds as required under the *Noxious Weeds* Act, 1993;
- Maintain low fuel levels and reduce fire hazards;
- Manage vegetation to allow adequate access and operation of the rail corridor for maintenance activities.

The prime goal of vegetation management is to minimise maintenance inputs and cost by following the above objectives. This is best achieved through the establishment of stable vegetation communities. The following best practice guidelines for vegetation management can assist in establishing and maintaining stable vegetation communities.

Figure 1. *A population of Acacia pubescens at Flemington, protected under the Threatened Species Conservation Act, 1995*

Towards stable vegetation communities

Effective vegetation management begins with an initial assessment of plant communities including their current condition and operational activities influencing their condition.

Assessment of vegetation in a section of rail corridor will identify:

- the areas of significant remnant native vegetation
- the areas requiring minimal management inputs
- the areas requiring major management inputs

Assessment is a vital first step in the process as issues can be identified and incorporated into the planning process to achieve the most sustainable and cost-effective vegetation management. Priorities can be set and a program of management activities initiated in a management plan.

The aim of good vegetation management is to create an inherently stable vegetation community. A stable community may range from a grassed corridor slashed regularly to an area of remnant native vegetation. Such stable vegetation communities require little management input except for regular monitoring and light weed control.

Figure 2. *An excellent stand of Cumberland Plain Woodland an endangered ecological community located at Pendle Hill. Vegetation in this section of corridor requires little maintenance.*

Figure 3. *Weed infested rail corridors such as this one at Clyde, are difficult and expensive to maintain*

Native vegetation in its original state is very resilient to weed invasion and is environmentally desirable. Once a stable community such as native vegetation is removed or disturbed weed invasion is often rapid and difficult to manage.

Therefore it is preferable to preserve these areas. Additionally, environmental laws have been established to ensure the protection of native vegetation.

What causes stable vegetation decline?

Any disturbance can adversely impact on remnant vegetation or other stable vegetation communities and allow invasion by exotic plants and weeds. Control of noxious weeds costs Sydney Trains hundreds of thousands of dollars each year. The value of stable corridor vegetation is the significant saving that may result from the reduced need for weed control.

Many operations on the rail corridor have the potential to cause disturbance to stable vegetation communities. They include:

- earthworks, construction and vehicle movement;
- plant and materials storage;
- inappropriate slashing;
- inappropriate herbicide usage;
- fire; and
- excessive tree removal and vegetation clearing.

Legal aspects of vegetation management

Numerous Acts under state and federal Parliament influence the way vegetation is managed. Sydney Trains are bound by such legislation. All staff who work on the rail corridor should be aware of the major aspects of each of these acts and what limitations they impose on works.

Consult EMS-06-PR_0003 *Biodiversity* for a summary of the major influence the law has on vegetation management on rail corridors. Legislation is continually changing and people involved in corridor management must keep abreast of such changes.

Figure 4. *An example of signage placed on the corridor at Rookwood to protect listed threatened woodland.*

The major legislation currently enforceable includes:

- *Protection of the Environment Operations Act 1997,*
- *Environmental Planning and Assessment Act 1979;*
- *Environment Protection and Biodiversity Conservation Act 1999*
- *National Parks and Wildlife Act 1974;*
- *Rural Fires Act 1997; Biosecurity Act 2015;* and *Fisheries Management Act 1994*.

It is important to be aware of the requirements under provisions of applicable legislation. A breach of any of these provisions often amounts to an offence, and can attract substantial penalties.

Minimising impacts during earthworks and construction

Earthworks are high impact activities that have the potential to cause major disturbance to native vegetation and the soil. Effective planning, seeking expert advice and communication to all those involved on site will greatly minimise the impact these activities have on the environment.

Figure 5. *Identify areas not to be disturbed within the construction zone.*

Always consult the Sensitive Sites List, the District Biodiversity Management maps or contact the Environmental Practitioner during the planning stage of works. If an environmental assessment is required for the activity then this search will become part of the assessment process, generally all activities that disturb vegetation and the ground will require some level of environmental assessment.

Delineate work sites

Before commencement of construction activities, limit and clearly mark out the construction area with flagging tape. This ensures that people working on site will not inadvertently disturb vegetation beyond that designated.

Vehicle turning circles and parking areas should be clearly marked. In addition supervisors should ensure that all plant and vehicle operators remain within the construction area.

Only the minimum required machinery should be stored and used at the work site. Excessive movement of vehicles leads to soil compaction, which reduces the health of the environment and reduces the potential of the area to regenerate native plants after construction has been completed.

Protect native vegetation

Areas of native and/or stable vegetation and those areas known to support threatened vegetation should be identified prior to any vehicles coming onto the site. Check the district or site Biodiversity Management maps and Sensitive Sites List. The areas should be clearly marked and fenced off to avoid disturbance.

Figure 6. *Stable vegetation adjacent delineated to prevent disturbance*

Always keep the construction area to a minimum to reduce disturbance. Work on and access the construction area from the least number of sides as possible. For example it may be possible to work on a cutting widening project entirely from the base of the cutting and avoid disturbance of remnant vegetation on top. Cuttings often have remnant vegetation in very good condition because of difficult access and should be retained as a priority.

Excessive disturbance of native vegetation can significantly increase costs, as this will necessitate replanting the area to reduce the risk of soil erosion. Disturbance will encourage weed invasion, further increasing future maintenance costs.

Stockpiling of materials

Stockpiles should be made on land devoid of stable vegetation. Stockpiles of material and parking heavy machinery near trees compacts soil and may lead to the death of trees and shrubs. If heavy plant or stockpiles need to be stored near established trees they should be placed outside the canopy of the tree to minimise compaction over the root zone.

Always try to access a stockpile from the same side to minimise disturbance to the surrounding area.

Remove and stockpile good quality, weed free topsoil on an already cleared site for later respreading. This will substantially enhance the regeneration of the site after construction. This top 100-200 mm of soil contains the seed of the existing vegetation, which will form the population of replacement vegetation. Where possible, any cleared vegetation containing seed should be stored adjacent to the worksite and used at the completion of the job for revegetation. It should NOT be mulched.

Figure 7. *A steep smooth cutting is difficult to stabilise.*

The topsoil once spread may need stabilising to prevent soil erosion. When constructing batters keep them rough to hold topsoil and encourage plant establishment and reduce the risk of erosion.

Batters should be benched where possible and kept rough to hold mulch and assist vegetation to establish.

Erosion management and revegetation

Erosion and sedimentation control is mandatory for any construction activity. Often this is limited to sowing of a cover crop of exotic annual grass. This will assist in erosion control but contribute little to producing a stable vegetation community in the future. Sowing seed is

generally only a temporary soil stabilisation practice. For more detail consult EMS-14-PR-0012 *Erosion and Sediment Control*.

All construction projects should incorporate a portion of the budget for appropriate revegetation works. The cost constitutes only a small percentage of the total budget and substantially reduces the cost in the future. Revegetation should utilise local native flora and include a diverse range of species. However avoid planting trees likely to impact on infrastructure as it matures. Always confirm the mature height of trees and shrubs prior to planting.

You should consult the Sydney Trains EMS-06-TP-0066 *Revegetation Technical Specification* for guidance or seek professional advice on the selection of suitable species and establishment techniques.

Plant hygiene

Plant and equipment can readily spread weeds from one site to another along the rail corridor. Soil and vegetation that could contain weed material should be removed from machinery prior to any move to another site. Consideration should be given to the use of 'shakers' and site entry/exit treatments that will assist the removal of soil (and seed) from vehicle tyres.

Minimising impacts during normal maintenance activities

Any disturbance to soil or vegetation will allow exotic and weed species to establish and will also increase the risk of soil erosion. There are costs involved in correcting this in the future.

Only disturb vegetation where absolutely necessary.

Always consult the Sensitive Sites List and Biodiversity Management maps or contact your Environment Practitioner before undertaking maintenance activities likely to cause any impact.

Vehicle movement

Vehicle movement about the corridor should be restricted to established access tracks.

Figure 8. *An established access track in the Blue Mountains. Driving on the access track reduces disturbance to stable vegetation.*

Unnecessary movement will cause disturbance and compaction and lead to a decline in stable vegetation quality. Vehicle movement is also responsible for the transfer of noxious and environmental weeds throughout the corridor costing hundreds of thousands of dollars each year.

The number and width of access tracks should be kept to a minimum. Where possible, access tracks and firebreaks should be

one and the same, substantially reducing the cost of maintenance and disturbance to the corridor. Access track maintenance in National Parks is to be in accordance with the Office of Environment and Heritage guideline; *Erosion and Sediment Control on Unsealed Roads,* 2012.

Care in the maintenance of access tracks is important, as it is a source of disturbance in and around the corridor. Access tracks should not be widened unnecessarily.

Access tracks should be monitored for the appearance of weeds that may have been carried on vehicles to the site. Early intervention may reduce the risk of stable vegetation communities being invaded by weeds. Get to know the common weeds of your area and report any new infestations. Consult EMS-06-GD-0070 *Identification of Common Rail Corridor Weeds* for identification and control information.

When moving along the corridor or preparing to commence work in an area, take notice of any signs erected to protect significant areas. Signs usually have a phone number that should be contacted before commencement of work on the site.

Plant and materials storage

Plant, stockpiles and removed infrastructure like sleepers and rail should be stored on land already cleared of native trees, shrubs and grasses. Stockpiles of material and parking heavy machinery near trees compacts soil and may lead to the death of trees and shrubs.

Always try to access a stockpile from the same side to minimise disturbance to the surrounding area. If heavy plant or stockpiles need to be stored near established trees they should be placed outside the canopy of the tree to minimise compaction over the root zone.

Slashing

Slashing is widely practiced around structures, for maintaining lines of sight about level crossings and curves, and along the corridor in urban areas. Excessive slashing can be detrimental to native vegetation and its regeneration ability.

Slashing should be kept to a minimum to achieve the required safety standards if near native vegetation. However if an area is degraded and does not contain native vegetation then slashed areas should be expanded. This will reduce weed growth and encourage grass cover. If excessive slashing takes place adjacent to native vegetation the slashed area should be reduced and native plants allowed to regenerate from the border. Stakes may be necessary to mark regenerating native plants to prevent other vehicle operators causing damage.

Figure 9. *Only slash native grass stands after they have set mature seed. This area of Kangaroo Grass is located on the Carlingford Line.*

Slashing under powerlines to maintain clearances is not a

sustainable practice. A program of selectively removing only those species that will breach the allowable clearances of the powerlines should be implemented.

Where slashing is practiced for aesthetic reasons, encouraging regenerating plants will improve the aesthetics and over time reduce the maintenance requirements of the area.

Native grasses can be successfully slashed if they are allowed to set seed each year.

Herbicide usage

Before using herbicide make sure you know what the target plants are and the areas needing treatment. Keep the area to a minimum and contact only target plants. Blanket spraying of herbicide should only be carried out for operationally specific requirements such as for gravel areas around substations.

Excessive herbicide use can lead to the destruction of stable vegetation and invasion by weeds, greatly increasing the future maintenance requirements of an area.

The use of residual herbicides requires skilled personnel as incorrect application can lead to leaching from the site and possible damage to stable vegetation communities on or off the rail corridor.

Note: Only qualified staff and contractors can use herbicides on Sydney Trains land. The project manager of any herbicide application program must consult and follow the *Sydney Trains Pesticides System Procedure* (EMS-11-PR-0017*)* before undertaking any herbicide application. Only herbicides approved for use can be used on Sydney Trains lands, Consult EMS-11-RG-0073 *Sydney Trains Pesticides Register*.

Fire hazard reduction

Fire hazard management is an important consideration for the rail corridor, both for safety, infrastructure protection and for its influence on vegetation.

Regular burning is detrimental to remnant vegetation as it changes the stability and structure of the vegetation community. Burning may encourage undesirable plants to establish.

Do not burn off vegetation unless it is part of a planned hazard reduction program or ecological burn in areas identified in the local Bushfire Management Plan, prepared by the local Bushfire Management Committee.

Note: To undertake hazard reduction by either mechanical or burning means you must undertake appropriate environmental impact assessment. See EMS-06-WI-0071 *Bushfire Hazard Reduction.*

Firebreaks

Firebreaks can take the form of either a graded swathe or a regularly slashed area either alongside the track or along the corridor boundary. Only construct firebreaks where genuine fire hazard has been identified, and if required create firebreaks only in already disturbed areas.

Constructing and maintaining firebreaks on the corridor can often lead to ground disturbance that may cause major problems with weed invasion, drainage issues and soil erosion, and can lead to increased vegetation growth and potentially higher fire hazard risk.

When maintaining firebreaks;

- It should not be necessary to construct a break between the rail corridor and an adjacent roadway, and the structure of the corridor already provides a firebreak.
- Construct firebreaks on adjoining disturbed land if possible, in agreement with neighbouring landholders.
- When maintaining graded breaks it is best to not leave any windrows of soil and logs etc as this can causes water to become concentrated and can severely erode tracks and embankments. If this is not possible then alternate the direction of grading each time so as to reduce the build up of windrowed soil.
- Where possible, access tracks and firebreaks should be one of the same. This will minimise disturbance.
- Slashing of fire breaks, of minimal width only, allows the slashed material to become mulch.
- Do not use herbicide to create firebreaks as this is unsustainable practice.

Note: To construct new firebreaks you must undertake appropriate environmental impact assessment. See the EMS-06-WI-0071 *Bushfire Hazard Reduction*.

Weed control

Weeds are plants not wanted in an area and can be broadly categorised as noxious weeds or environmental weeds. Noxious weeds are those defined under the *Noxious Weeds* Act 1993. Each local government area has a listing of noxious weeds and their specific control requirements. Environmental weeds are those weeds not declared noxious but may still be required to be controlled in certain circumstances in the interests of the local environment.

Although there is no legal requirement to control environmental weeds, it is within the best interest of sustainable vegetation management that control programs are put in place. The uncontrolled presence of such weeds in stable vegetation communities such as remnant bushland is undesirable and will lead to increase maintenance into the future as the site degrades.

Management programs should incorporate the control of both noxious and environmental weeds.

Weed identification

It is essential to either know what plants are considered to be weeds, or are classified as weeds if you are likely to impact on vegetation when doing your work. If you do not know what constitutes a 'weed' in your area of operation, consult EMS-06-GD-0070 *Identification of Common Rail Corridor Weeds*.

This guide is available on the intranet and provides a general description and control method for commonly occurring rail corridor weeds. Alternatively seek professional advice but remember, if in doubt- do not touch it as it may be a protected species.

Weed control techniques

Foliar spraying

Foliar spraying is the use of spray equipment to cover the foliage of vegetation with herbicide. Herbicide must only be used by qualified persons and in accordance with the label directions and must be registered for use on the species of weeds to be targeted. It is an offence to use herbicide contrary to the label, including on species not registered for use by that product.

Many herbaceous weeds can be sprayed with a broad-spectrum herbicide, such as glyphosate (eg. Roundup®). Woody plants can be sprayed with herbicides specific for their control.

It is important to fully wet all foliage to achieve optimum results. Wetting agents may need to be added to the spray mix to assist with adhesion to the foliage.

Foliar spraying should only be used where there is no risk of off target damage to desirable plants located nearby, as the spray is difficult to control. Spraying should only be used where there are large weed infestations or for spot spraying of low growing weed species. Care should be taken near open water and on windy days.

Full safety clothing and all other appropriate PPE should be worn when spraying herbicide. Consult the Material Safety Data Sheet (MSDS) for the correct PPE and safeguards.

NOTE: All herbicide use is restricted to qualified and experienced staff and contractors only. Consult the *Sydney Trains Pesticides System Procedure* (EMS-11-PR-0017*)* for qualifications required and approved herbicides. These procedures must be followed when planning and implementing any herbicide application program. If in any doubt, consult your Environmental Officer.

Manual clearing

Manual clearing using heavy machinery, slashers and brush-cutters should only be used in heavily weed-infested areas. Such techniques are only useful if remedial action, such as revegetation is to be implemented immediately. The high disturbance to the soil and the large bank of weed seed in the soil will result in re-infestation.

Weeding by hand is useful if weed infestations are light and there are desirable species close by. Small weeds can be fully removed with their root system intact if soil moisture is adequate.

Cut and Paint

Woody plants in light to medium infestations should be controlled using the cut and paint technique (sometimes referred to as the “Cut-Stump” method). There is no risk of off-target damage with this technique.

All stems should be cut off close to ground level and the stumps immediately painted with concentrated herbicide such as glyphosate (undiluted) or a woody weed herbicide.

A similar method to 'Cut & Paint' should be used for vines. For vines, where the main trunk of the vine is too difficult to locate, stems should be cut and the remainder dipped in herbicide.

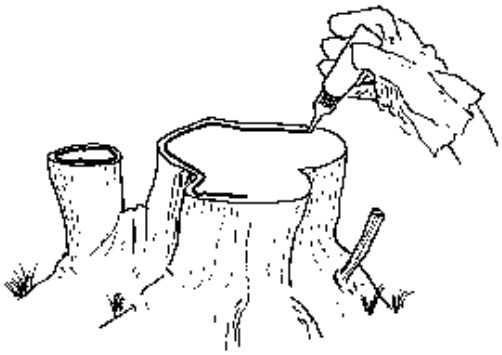

Figure 10. *Cut and paint technique[1], Bush Regenerators Handbook, National Trust of Australia (1991)*

Figure 12. *The incorrect choice of weed control technique has been employed at this site near Sydenham. These castor oil plants have been foliar sprayed, resulting in the death of the underlying grassland. Removing this stable vegetation allows weeds to germinate without competition. The cut and paint technique should have been used.*

Figure 11. *This eucalypt (Gum tree) growing beneath powerlines was cut near the base. Unfortunately the stump was not painted with glyphosate. As a result it has re-shooted and will become a bigger problem again in several years.*

Frilling or drilling

Woody plants can be controlled using various techniques that allow the plant to be left in situ and removed at a later stage, if required. Frilling involves using an axe or chisel to make frills around the base of the trunk of the woody plant and applying concentrated (undiluted) herbicide to the cuts immediately. Alternatively holes can be drilled at a 45 degree angle into the tissue of the tree and the holes filled with herbicide.

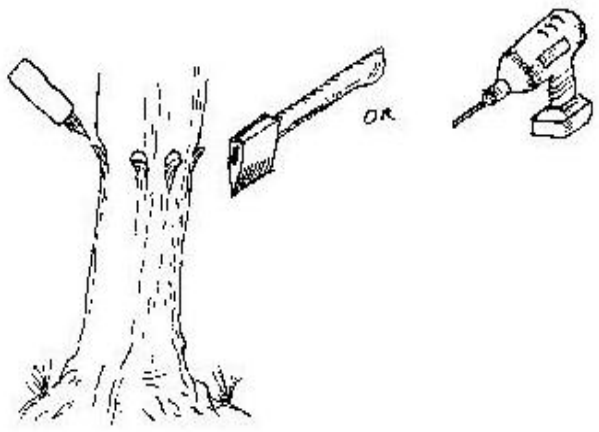

Figure 13. *Frilling or drilling technique*

Revegetation

Revegetation should aim to create the stable vegetation community, which requires minimal maintenance after an establishment period. Revegetation can be undertaken by planting young seedlings or more established plants, or by direct seeding. The method used will depend on many factors such as the existing weed burden and the public profile of the site.

Note: always consult the district or site Biodiversity Management maps to ensure the proposed revegetation treatment is consistent with the objectives of the plan.

Figure 14. *A previously weed infested embankment at Sydenham that has been revegetated with local indigenous plants, creating a low maintenance and aesthetically pleasing corridor.*

Direct seeding

Direct seeding requires thorough soil preparation as well as pre- and post planting weed control. Hydro-seeding and mulching involves the application of seed with a binding agent such as straw and bitumen from some type of blower onto difficult to access areas such as cutting. Applying seed directly to the soil is most suited to revegetation on clean sites after major construction has cleared large areas, or where a 'cover crop' is required immediately while natural revegetation takes place. Experienced personnel, using appropriate equipment should undertake direct seeding. This method is not as successful for native species in the short term as manual planting, but offers a quicker cover against erosion.

In urban areas where the potential for weed infestation is high, direct seeding is not particularly successful and planting seedlings is likely to be a more appropriate revegetation technique.

Planting seedlings

This method involves the planting of newly grown seedlings from small pots called tubes directly into the soil at the desired location. If these plants are well maintained during the establishment period, the chance of success is high.

Figure 15. *Planting of tubestock (seedlings) on a previously weed infested area at Flemington to improve visual amenity and reduce maintenance.*

Species selection

Revegetation procedures usually specify that species should be indigenous to the local area where the work is to be undertaken. Indigenous plants can include trees, shrubs, groundcovers and grasses. The more layers in the created vegetation community the more successful and sustainable it is likely to be. Seed and plant propagation material should be collected from a nearby site as it maintains the inherent biological diversity of the area and is more likely to adapt to the planting site. For suitable species consult EMS-06-TP-0066 *Sydney Trains Revegetation Specification* and EMS-06-GD-0074 *Revegetation Guide*

Selecting appropriate species to plant adjacent to rail lines and near structures is important in minimising the maintenance of such plantings in the future. The mature height of the plant must always be taken into consideration, in the interests of rail safety and operations. In addition, the selection of appropriate species is essential for plant survival and the ability of the new plant community to compete with weed species.

Corridor placement guidelines

The nature of the rail infrastructure, particularly in metropolitan areas, requires plant communities be kept to a low, mature height. For instance, it is undesirable to establish tall trees in areas where they will obstruct overhead structures and cabling.

Note: Consult the EMS-06-TP-0066 *Sydney Trains Revegetation Specification* and EMS-06-GD-0074 *Revegetation Guide* document for guidance on species selection and landscape design considerations.

Dense planting of shrubs less than four metres tall and of varying heights and densities will create a suitable community that will not interfere with the operation of the rail network.

Restrict trees to areas further than six metres from the track or overhead services. Only use tall growing trees for specific purposes such as screening an unattractive vista.

Use ground covers and grasses within two metres from the track other infrastructure.

Figure 17. *Clearing under powerlines is both expensive and time consuming. The ultimate height of the tree must be considered before planting under or near any electrical powerlines or overhead wiring.*

Figure 17. *This tree at Belmore is continually pruned to achieve suitable clearance from the electrical feeder. This unsustainable and expensive situation could be solved by replacing the large trees with suitable vegetation in consultation with Local Council.*

There are many landscape uses for plants to achieve the desired effect, and it is important to choose appropriate applications and suitable species to achieve the desired objective. The EMS-06-TP-0066 *Sydney Trains Revegetation Specification* and EMS-06-GD-0074 *Revegetation Guide* provides information to assist with such decision making.

Ground preparation

Weedy areas should be sprayed with suitable herbicide to kill existing weeds and allow to die-off prior to clearing with a brush cutter or slasher. It is desirable to re-apply herbicide to any weed regrowth if time is available. Compacted soils may require ripping to between 300 mm and 500 mm in irregular, random lines prior to planting. All herbicide use must be in accordance with EMS-11-PR-0017 Pesticides System Procedure.

Where possible, rabbit infestations should be controlled prior to planting.

Planting procedure

The planting season is in the cooler months from April to September. The soil should be moist prior to planting.

Small seedlings come in tubes or eco tubes, and are the preferred size of plant to use as they tend to establish and adapt to the new site more readily than larger plants.

The steps involved in planting include:

1. Water plants before planting;
2. Dig a planting hole as deep as the plant container, and several times wider than the tube;
3. Add fertiliser and moisture retention agent;
4. Remove the plant from the tube, taking care not to break the column of soil;
5. Place the plant in the hole with the base of the trunk level with the top of the soil;
6. Gently press soil around the plant;
7. Form a dish of soil around the plant to hold water;
8. Mulch around the plant to a minimum depth of 75 mm using clean woodchip or eucalyptus mulch, but ensure that mulch does not touch the trunk;
9. Place a tree guard around the plant to protect against the weather and rabbits; and
10. Water the plant thoroughly, to ensure the surrounding soil is moist.

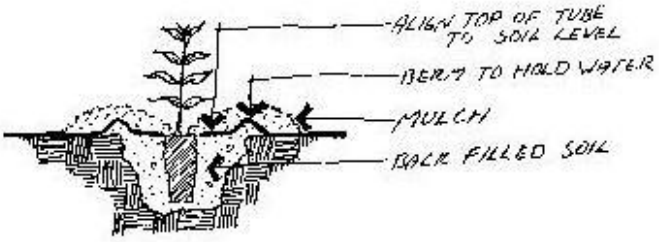

Figure 18. *Detail of typical tube stock planting.*

Maintenance of plantings

Plantings should be checked regularly in the first few months to ensure they are establishing well. Weed control is essential and may require hand removal of weeds or spot spraying with herbicide. Plants should be watered regularly and re-mulched as required. Tubestock may require up to ten litres of water per week, depending upon weather conditions and the type of soil they are planted in. Mulching helps prevent the surrounding soil from drying-out, which in turn helps the plant survive.

Any dead plants, plants that appear sick or plants that do not perform as would be expected should be replaced as soon as possible.

Tree pruning and removal

Unless directly impacting on rail infrastructure or train operations, native and non-invasive introduced trees should be retained wherever possible. Healthy trees and shrubs do not pose a safety risk in the corridor as they rarely fall over.

There are a number of legal restrictions in place to control the removal and pruning of vegetation. See EMS-06-PR-0003 *Biodiversity* for Sydney Trains position and procedures regarding tree management.

It is advisable that shrubs or trees be removed or pruned where:

- the limbs of any tree or shrub are causing an obstruction to train operations or safety;
- the tree or shrub is a noxious weed species;
- the tree is a neglected fruit tree affecting fruit fly programs; and
- the tree is weak and at risk of failing.

Inspection of trees located on and close to the rail corridor should be regularly undertaken by a qualified, independent, consultant arborist as part of a risk management program.

Management of trees and shrubs should be restricted to pruning wherever possible unless it is absolutely necessary to remove the entire plant, or the tree is a recognised weed species such as Privet, Camphor laurel or Silky Oak. Pruning should only be carried out by skilled operators, as unskilled lopping can cause increased growth, weak branch attachment and lead to an increase in future maintenance needs. If selected branches are correctly removed at the branch collar, regrowth is less likely. In addition, effective pruning will also improve the aesthetic form of the tree.

Note: All pruning of trees for Sydney Trains purposes should be carried out as per the *Australian Standard for Pruning of Amenity Trees, AS4373-1996.*

A three cut system should always be used to reduce the risk of bark stripping as the branch fails. Stripping causes damage to the trunk, which can weaken trees and increase the risk to safety.

The three cut system involves:

1. ***The undercut****;* this should be at right angles to the branch axis, and should not extend in more than about one third the diameter of the branch,
2. ***The uppercut****,* which removes the branch, should be made further up the branch, away from the trunk. The idea is that the branch then hinges on the undercut.; and
3. ***The final trim cut****,* which is an extension of the undercut. This removes the stump. It should be made close to the trunk at the branch bark ridge, and at right angle to the branch - NOT flush with the trunk. In this way it leaves as smaller area as possible for the tree to heal.

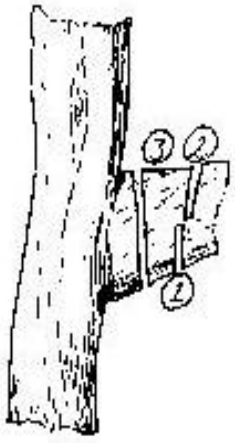

Figure 19. *The 3-Cut System*

Note: Where a branch is particularly long or thick, or where there is a risk of a failing branch damaging property or infrastructure, it is advisable to repeat steps 1 & 2 until the stump is of a manageable size.

To effectively remove an entire tree or shrub and reduce the likelihood of tree regrowth, stumps should be treated using the cut and paint technique (See the Weed Control section). Under no circumstances should herbicide be used on a tree that is to remain, or is only to be pruned.

Pruned material should be quickly disposed of as it can become shelter for vermin, a fire hazard, block culverts and access roads and lead to a source of weed seed stock for future spread. As a first option disposal should be to chip on site. If this is not appropriate then consideration should be given to mulching off-site, or taking the material to a licensed landfill for green waste recycling facility.

Vegetation assessment and developing a management plan

Vegetation assessment is essential before putting together a management plan. Assessment involves classifying existing vegetation on the level of degradation, such as the extent of stable vegetation or weed infestation.

Revegetation programs require long term strategies to reverse the degradation and enhance the condition of rail corridors. Action to remediate the area can be planned and programmed into a management plan that may extend for five, ten or more years. Highly degraded areas are expensive to repair and therefore any revegetation program should target areas of least disturbance, or least weed infestation first. The original condition of the corridor will determine the level of remedial action required.

Consult EMS-06-PR-0003 *Biodiversity* and Biodiversity Management maps for the area of interest to see current assessment of vegetation and the vegetation works proposed.

Highly degraded sites

High disturbance weed control techniques (such as mechanical clearing or spraying of herbicide) can be used on highly degraded sites. This should be followed by a revegetation program or an ongoing slashing program, depending on the accessibility and topography of the site.

Figure 21. *Weeds within this degraded North Shore corridor supporting only weed species should only be controlled if some remedial action is implemented such as revegetation with tubestock to prevent reinfestation.*

Figure 20. *This rail embankment at Sydenham is regularly sprayed to control the continual growth of castor oil, a Noxious Weed. Such practice is unsustainable and very expensive. A long-term solution would be to progressively revegetate this area with local native shrubs.*

Mildly degraded sites

Minimal disturbance weed control techniques should be used in mildly degraded sites that support remnant native vegetation or other desirable, stable vegetation. This type of weeding is called bush regeneration. Only qualified bush regenerators should be used as highly developed skills in plant identification and weed control techniques is required. Bush regeneration over time will tip the balance back in favour of the native or desirable plants and the site will be more resilient to degradation and require less maintenance input.

Figure 22. *This corridor at Rookwood contains remnant native vegetation of the Endangered Ecological Community, Cooks River/ Castlereagh Ironbark Forest and is mildly infested with Lantana and Pampas grass (both noxious weeds).*

Where sites are dominated by stable exotic vegetation such as grasses but with scattered weeds, these should be managed by removing the weeds using minimum impact techniques. Using techniques such as cut and paint will ensure the grasses are not damaged and they can now out-compete any new colonising weed species.

Undegraded sites

Minimal impact techniques should be used in undegraded sites whenever weeds appear so that no off-target damage can occur. It does not matter if the undegraded site is remnant native vegetation or a stable exotic grass community, this type of weed control will ensure the site remains low maintenance. An ongoing monitoring program should be implemented for early detection and treatment of weeds.

Certain aspects should be considered when planning weeding priorities. High priority sites may include ones visible to commuters and/or the community, those in close proximity to bushland reserves or waterways. Mildly infested sites should be a high priority and require quick action to halt further degradation. The priority for heavily weed-infested areas is less, as the level of degradation is unlikely to be reduced further.

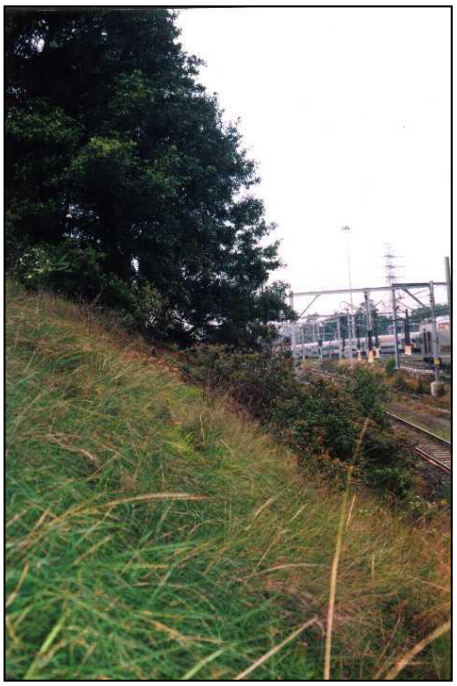

Figure 23. *This stable corridor of remnant woodland should only require occasional bush regeneration so there is no disturbance to native vegetation*

Figure 24. *This stable Corridor on the Carlingford line is maintained by slashing. Any weed control should be undertaken using minimal impact techniques so as not to disturb the stable grass sward*

Professional advice should be sought when developing a vegetation work program for rail corridors or specific rail sites or depots and EMS-06-PR-0003 *Biodiversity* and associated maps and plans should always be followed.

Further information

Your first source of information should be the Sydney Trains Environment intranet site, where there are considerable resources for the management of plants and animals. You should also consult with your environmental officer who has contact with specialist vegetation resources.

EMS-06-PR_0003 *Biodiversity*

EMS-14-PR-0012 *Erosion and Sediment Control*.

EMS-06-TP-0066 *Revegetation Technical Specification*

EMS-06-GD-0070 *Identification of Common Rail Corridor Weeds*

EMS-11-PR-0017 *Sydney Trains Pesticides System Procedure*

EMS-11-RG-0073 *Sydney Trains Pesticides Register*.

EMS-06-WI-0071 *Bushfire Hazard Reduction*.

EMS-06-GD-0074 *Revegetation Guide*

NSW NPWS *Erosion and Sediment Control on Unsealed Roads,* 2012.

Environmentally Sensitive Sites List

Australian Standard for Pruning of Amenity Trees, AS4373-1996

Document control

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4.0	01/07/2013	P Semple	First document issue for Sydney Trains
5.0	05/04/2019	L. Durrington	Reformatted in line with EMS Simplification initiative