KBR
We Deliver

Level 3, 441 St Kilda Road | Melbourne, VIC, 3004 | Australia
GPO Box 7440 | Melbourne, VIC, 3004 | Australia
Phone: +61.3.9828.5333 | Fax: +61.3.9820.0136

MEN403-C1-S0110

15 November 2016

Madelyn Nunn
VICTRACK
Level 8
1010 LaTrobe Street
DOCKLANDS VIC 3008

Dear Madelyn,

YEAR 6 ANNUAL MONITORING OF TRANSLOCATED MATTED FLAX-LILY FOR THE SOUTH MORANG RAIL EXTENSION PROJECT

The South Morang Rail Extension Project (SMREP) was a controlled action based on the impacts of two Matters of National Environmental Significance (MNES), matted flax-lily (*Dianella amoena*) and Grassy Eucalypt Woodland of the Victorian Volcanic Plain (GEWVVP). The project was granted approval under the *Environment Protection and Biodiversity Conservation Act 1999* (EPBC Act), subject to conditions, which include the implementation of the *Translocation Plan for the Matted Flax-lily (Translocation Plan)*. The Translocation Plan Revision 3 (SMREP 2014) is referenced throughout this report. Condition 5 of the EPBC 2010/5313 approval requires ongoing reporting of the projects compliance with the approval conditions.

Purpose

The translocation plan developed for the matted flax-lily requires that an annual report be prepared every year for ten years on the status of the plan and the condition of the translocated plants following translocation. This document has been prepared to document the results of the Year 6 monitoring of matted flax-lily and meets the requirement of the translocation plan and includes the following:

- reporting on the health and success of the translocated plants
- current condition of each of the four receptor sites, including an assessment of the state of threats to translocated matted flax-lily health and survival, such as weeds, pest animals and biomass
- proposed changes to site management if required, to appropriately manage threats to the translocated matted flax-lily
- reporting against each approval condition required for the project under EPBC 2010/5313.

Salvage and Translocation

The salvage of the matted flax-lily from the SMREP corridor took place from 30 September to 6 October 2010. A total of 98 distinct patches were removed from the corridor. From the 98 patches, 422 sections were removed, which resulted in the following distribution of sections:

- 183 sections directly planted into the receptor sites, excluding Receptor Site 3
- 135 sections taken to the nursery for subsequent plantings (delayed translocation)
- 104 sections taken to the nursery for insurance.

The total sections that were planted into each receptor site via direct translocation (September - October 2010) or delayed translocation (August 2011) were as follows:

- 50 sections planted into site 1
- 186 sections planted into site 2
- 109 sections planted into site 3 (site 3 includes only delayed translocation plants)
- 33 sections planted into site 4.

The remaining plants were held and managed at a Parks Victoria nursery for use as Insurance Plants. The insurance plants are no longer required for the Translocation Plan and are now the property of Parks Victoria.

Method

Annual matted flax-lily monitoring was undertaken by two ecologists over two days, on 20 and 24 October 2016 at the four receptor sites. Monitoring was completed in accordance with the reduced monitoring method outlined in the translocation plan (SMREP 2014), which included a presence/absence survey and assessment of general health of each plant.

All of the translocated (direct and delayed translocation) matted flax-lily were monitored. The monitoring of direct translocated plants corresponds with the Year 6 monitoring period, the monitoring of delayed translocated plants corresponds with the Year 5 monitoring period.

Identification of threats and risks to the translocated matted flax-lily are based on observations made by the ecologists over several years monitoring the sites and the species. These observations are considered in the recommendations for any adaptive management.

Data collection

The assessment of the general health of the plant at the time of translocation was recorded based on five discrete categories ranging from Dead to Very Healthy. Similarly, during the current annual monitoring each section translocated into a receptor site was assigned one of the following health categories:

- Dead; plant generally with dead or dying leaves and no new growth

- Poor health; most leaves in poor condition, evidence of heavy herbivory or large areas of ‘browning’ of the leaves; > 30% of leaf area affected
- Moderate health; leaves either containing some level of ‘browning’ or some herbivory; 10 to 30% of leaf area affected
- Good health; leaves generally healthy, containing minimal evidence of herbivory or ‘browning’; < 10% of leaf area affected
- Very healthy; plant very healthy with no signs of herbivory or ‘browning’.

Data analysis

Data derived on the health of each plant was assigned an arbitrary health index score ranging from 0 to 100 to allow statistical analysis of health over time (Dead 0, Poor 25, Moderate 50, Good health 75, and Very healthy 100).

Plant health was analysed using T–tests (Excel 2010) to determine whether change in health was statistically significant. T–tests are a simple measure of similarity, used to compare the mean of two data sets and determine if they are significantly different. Results with a p-values of <0.05 were considered to be a significant change, and results with p-values of <0.01 were considered to be highly significant.

Results

Plant health

In total 381 direct and delayed translocated matted flax-lily sections were monitored. This includes 183 direct translocated sections and 197 delayed translocation sections. Of these, thirteen sections were not located during the current monitoring, with no above ground material present. These plants were assigned a rating of ‘Dead’ in the general health assessment. Therefore the current survival rate for the translocated matted flax-lily is 96.6 per cent.

The survival rate has decreased since the previous monitoring period (2015), with a further five plants considered dead, though this is still well above the required target survival rate of 85 per cent (SMREP 2014).

The majority of plants considered to be dead were located in Site 2, where no material was observed for 10 plants. Two plants within Site 3 were considered dead and one in Site 1. It is noted that five of the eight dead plants from the 2015 monitoring have recovered to display above ground material.

The overall health of the translocated plants is generally steady, with a decrease observed in delayed translocated plants, with the direct translocated plants stable. The observed health of all plants from Very Healthy to Dead is presented in Figure 1, below.

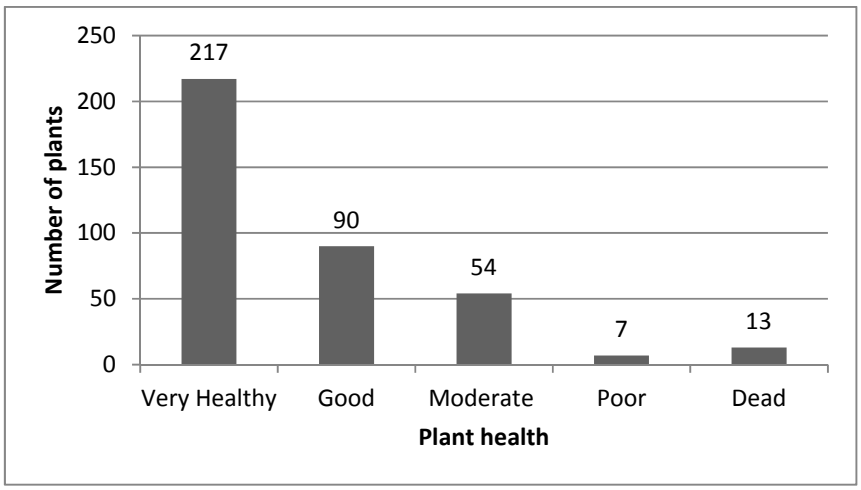

Figure 1. Overall plant health of translocated matted flax-lily

Direct translocation

The overall plant health (i.e. average health index) was stable from the results recorded in 2015 (Table 1), where the overall health index was an average of 93. Although increases in average health were observed in Sites 1 and 4 to the healthiest levels observed for both sites, the decrease in health at Site 2, where the majority of plants are, has stabilised the overall plant health recorded.

Table 1 Average health results for direct translocation matted flax -lily

Time since translocation	Site 1	Site 2	Site 4	Overall
Baseline	81	82	78	82
1 month	68**	63**	80	65**
3 months	79**	72**	84	74**
6 months	97**	93**	96**	94**
12 months	96	93	96	94
18 months	72**	67**	81**	68**
2 years	75	53**	91*	61**
3 years	94**	67**	88	74**
4 years	78**	65	81	69*
5 years	86	94**	93	93**
6 years	97*	91	99	93

*Significance of mean health variables using T-test where *P<0.05 and P<0.01***

Delayed translocation

The overall average plant health of the delayed translocated plants showed a highly significant (P-value = <0.01) decrease (Table 2). This was driven by a highly significant decrease in plant health observed at Site 3. Increases of plant health were observed at Site 1 and Site 4, although only the increase at Site 1 was considered significant.

Table 2 Average health results for delayed translocation matted flax-lily

Time since translocation	Site 1	Site 2	Site 3	Site 4	Overall
Baseline	75	79	81	79	80
1 month	49**	31**	43**	81	43**
3 months	75**	70**	71**	81	72**
12 months	88	73	95**	96**	88**
18 months	24**	16**	24**	25**	22**
2 years	100**	55**	57**	83**	62**
3 years	76**	50	53*	94*	57*
4 years	89**	80**	75**	96	79**
5 years	98*	79	46**	100	73**

*Significance of mean health variables using T-test where *P<0.05 and P<0.01***

Site Condition and Adaptive Management

Site 1

Site 1 is located toward the southern end of the Plenty Gorge Parklands, Mill Park, and is managed by Parks Victoria.

This site is considered to be in very good condition, with a high cover of native vegetation, particularly kangaroo grass (*Themeda triandra*) across the site and high abundance of other native lilies and orchids. Biomass was comparatively low compared to the other receptor sites and surrounding areas. This is likely due to the dominance of native grasses at Receptor Site 1, compared to higher levels of exotic grasses within the other receptor sites.

The cover of exotic grasses observed through some areas of the site, including cocksfoot (*Dactylis glomerata*) and annual veldt grass (*Ehrharta longiflora*), is considered to be the highest in several years. This is likely due to the wet and mild conditions experienced in the region from June to October (BoM 2016). However, these grasses are generally not located where matted flax-lily are present and therefore do not currently pose a risk to the health of the translocated plants.

Parks Victoria has also removed a dense thicket of the native shrub, kangaroo thorn (*Acacia paradox*a). The thicket was adjacent to some of the translocated plants and was likely to out-compete the plants if the thicket expanded out.

Evidence of rabbits and kangaroos were present on site. Scats at the entrance gate (Figure 2) indicated the presence of rabbits, while a single kangaroo scat was observed near matted flax-lily in the centre of the site.

The site should be assessed for current rabbit activity, including for any warrens, and breaches in the fence. If rabbits are found, rabbit control should be conducted and any warrens should be destroyed. Any damages or breaches in the fence should be fixed. No recommendations for adaptive management are required.

Figure 2. Rabbit scats on the inside of the access gate into Receptor Site 1

Site 2

Site 2 is located in the northern end of Plenty Gorge Parklands, accessed from Bridge Inn Road, Mernda and is managed by Parks Victoria.

Biomass within the overall site appears moderate in comparison to previous years, particularly before the burn conducted in 2015. However, weed levels remain high across the site. The apparent reduction in biomass is likely due to the increase in cover of sweet vernal-grass (*Anthoxanthum odoratum*). The species has a lower stature than other species that previously dominated the site, particularly phalaris (*Phalaris aquatica*).

Sweet vernal-grass forms dense clumps and appears to have an allelopathic effect on surrounding vegetation. Yorkshire fog (*Holcus lanatus*) is also in reasonably high concentrations and also forms dense clumps. These two species are considered to be a significant factor in the decrease in health and survival within the site as they were often observed to be in high concentrations where matted flax-lily was found to be dead or in poor condition.

In addition to exotic grass cover, a number of high threat weeds remain present at the site and include Chilean needle-grass (*Nassella neesiana*), Paterson's curse (*Echium plantagineum*), hawthorn (*Crateagus monogyna*) and blackberry (*Rubus fruticosus* spp. agg.). Spear thistle (*Cirsium vulgare*) was observed in high concentrations over the site and was the most prolific high threat weed.

There was evidence that rabbits had breached the site. The breach occurred along the south west side of the site, adjacent to the Plenty River. The skirt was raised in a small section and rabbits have been entering the site. Several locations have been grazed low by the rabbits and matted flax-lily plants have been targeted. While light grazing can be beneficial to reduce excess biomass, prolonged targeting by

rabbits on matted flax-lily is likely to affect the plants, including preventing flowering and seeding. It is recommended that the skirt of the fence be repaired and rabbit control undertaken as a priority thereafter.

It is recognised that Parks Victoria has limited resources to manage the high amount of biomass and weeds that are present within the site. It was observed in Receptor Site 4, that kangaroos are present, but have had minimal impacts on the matted flax-lily. In an attempt to supplement resources to manage the weeds and biomass on site, Parks Victoria may consider modifying the fence to allow kangaroos to access and graze the site. This option would require consideration of impacts to kangaroos prior to implementation..

If this option is implemented it is recommended that modifications to the fence should still enable the fence to be rabbit-proof and that this be restricted to specific times of the year. The recommended period would be from May to September, excluding grazing from October to April. This will aim to graze outside of matted flax-lily flowering and seeding period. This will also aim to benefit key native grass species on site, kangaroo grass (*Themeda triandra*) and mat grass (*Hemarthria uncinata*), which are summer growing species.

In summary, the following recommendations are proposed for adaptive management at Site 2:

- Control the emergence of high threat weeds. Spear thistle was in high concentrations and should be targeted along with blackberry, hawthorn and Chilean needle-grass
- High threat grass species, sweet vernal-grass, phalaris and Yorkshire fog should be sprayed within the vicinity of matted flax-lily plants
- Undertake fence and gate maintenance to prevent rabbits entering the site. Review the site for rabbit activity following fence repairs. Conduct rabbit control if rabbits are within the site. The area should also be searched for any active warrens.
- Consideration by Parks Victoria to modify the fence to allow seasonal access and grazing by kangaroos between May and September.

Site 3

Site 3 is also located at the northern end of Plenty Gorge Parklands, on the west side of Plenty River and to the south of Site 2. The site is managed jointly by Parks Victoria and Flora Victoria, on behalf of PTV.

Site 3 is managed by Public Transport Victoria (PTV), who engaged KBR and Flora Victoria to manage a rehabilitation program. The majority of the site has been cleared in preparation for re-seeding with native grasses (e.g. kangaroo grass). This excludes two plots that contain the translocated matted flax-lily that are jointly managed by Parks Victoria and Flora Victoria, and the north east section of the site, which is managed by Parks Victoria.

The two plots within Site 3 which contain the translocated matted flax-lily are considered to be in a moderate condition with high levels of biomass and increased annual and perennial grass cover across the plots. In addition, several high threat weeds were observed within these plots including hawthorn, blackberry, sweet briar (*Rosa rubiginosa L.*) and Chilean needle-grass.

These plots were recently sprayed by Parks Victoria to control the biomass and high threat weeds around translocated matted flax-lily. As a result, this affected the health of the matted flax-lily, as there has been some off-target damage, however, the majority of matted flax-lily plants have already responded to the reduction in competition by displaying new growth (Figure 3). The spraying is likely to benefit the immediate survival of the plants.

Figure 3. Matted flax-lily following spraying of surrounding sweet vernal grass with fusillade

It is important that the recent weed control is followed up to manage weeds within the two plots. Flora Victoria will conduct weed control within the plots through to April 2017. Considering the good growing conditions experienced on site with high rainfall, weed control and minimising the amount of weed seed entering the seed bank this spring and early summer is likely to be critical for ongoing protection of the matted flax-lily.

The other section managed by Parks Victoria contains significant amounts of high threat weeds. These include high amounts of Chilean needle-grass and Montpellier broom (*Genista monspessulana*). Parks Victoria has committed to controlling these weeds, but is constrained by limited resources.

No threats from pest animals were observed within the plots containing the translocated matted flax-lily.

In summary the following recommendations have been proposed for adaptive management at Site 3:

- Target the high threat weeds that are present in the north east of the site, focussing on Chilean needle-grass, Paterson's curse and Montpellier broom
- Increase weed control in the two translocated plots to control exotic grasses, including sweet vernal grass, Yorkshire fog and phalaris.

Site 4

Site is located on VicTrack land to the south of the South Morang rail station car park. The site is managed by VicTrack.

The two plots containing the translocated matted flax-lily are in good condition. All except one matted flax-lily was considered to be in a 'very healthy' condition. The site contained only minimal exotic species, generally present as occasional clumps of exotic grasses, such as cocksfoot. The use of mulch on this site combined with revegetating with native species and ongoing hand-weeding and spraying, is maintaining the condition of the site. It is noted that the use of kidney weed (*Dichondra repens*) in the revegetation has been particularly successful, as the species has formed a mat around matted flax-lily plants, supressing weed growth.

Through continued management of the receptor site, minimal threats from exotic weed species are present. No evidence of vandalism was observed, although kangaroo scats were observed for the first time within the two plots however, no damage had occurred to the matted flax-lily.

Throughout the South Morang Grassy Eucalypt Woodland (SMGEW) increased levels of annual grasses, particularly *Bromus* spp. including greater brome (*Bromus diandrus*) and soft brome (*Bromus hordeaceus)* and large quaking-grass (Briza maxima) were observed. The cover of perennial grasses has also increased, including cocksfoot (*Dactylis glomerata)* and Chilean needle-grass.

Although there is no adaptive management proposed for Site 4, it is recommended for VicTrack to concentrate management during the current spring season to target annual grass control, to control the expected high levels of annual grass seed that will enter the seed bank.

Compliance with EPBC Act conditions

The following table (Table 3) describes how SMREP and PTV have demonstrated compliance with each of the EPBC approval conditions for the project (referral number EPBC 2010/5313).

Table 3 Compliance with EPBC Act conditions

Conditions of approval	Compliance with approval conditions
1. For the protection of the endangered matted flax-lily (Dianella amoena) and the critically endangered Grassy Eucalypt Woodland of the Victorian Volcanic Plan (GEWVVP) within the rail reserve, adjacent E6 road easement, McDonald Road reserve and South Morang Protection Zone (see Attachment 1) the Matters of National Environmental Significance, Document No. SMREP–APP–PW–ENV–010, Revision 0, South Morang Rail Extension Project (September 2010), must be implemented.	Implementation of this plan occurred during the construction phase of the project. Construction is now complete and there are no remaining actions that are required to be implemented.

Conditions of approval	Compliance with approval conditions
2. For the protection of the endangered D. amoena the Translocation Plan for Matted Flax-lily, Document No. SMREP–REP–PW–ENV–002, Revision 1, South Morang Rail Extension Project (September 2010), must commence prior to the commencement of construction and be implemented for a period of at least 10 years.	The salvage effort to translocate affected matted flax-lily began on 30 September 2010 and was completed on 6 October 2010. Construction commenced on the 13 October 2010, following the salvage of matted flax-lily. This report reviews the state of plant and receptor site health and the management actions being implemented.
3. Within 7 days of construction commencing the person taking the action must advise the Department in writing of the actual date of commencement.	An email was sent by Shelley Heron (SMREP Environment & Approvals Manager) to Narelle Sutherland (DoE Assessment Officer) to confirm the commencement of construction on 15 October 2010.
4. If ownership and/or management of the protected land are to be transferred to another party, the person taking the actions must provide the Department with evidence that the other party has agreed to assume all the management responsibilities in accordance with the Translocation Plan and MNES Plan, and the conditions of this approval prior to any transfer occurring.	PTV has assumed the overall responsibility of the project approvals, with assistance from VicTrack, who have agreed to complete monitoring and reporting actions of all sites and management actions for Site 4. PTV and VicTrack have been assigned responsibility of actions within the current Translocation Plan, issued to DoE on 22 September 2014.
5. Within three months of every 12 month anniversary of the commencement of salvage of material for the translocation of D. amoena, the person taking the actions must submit to the Department a report addressing compliance with the conditions of this approval. Annual reports must be provided until the Minister is satisfied that the proponent has complied with all conditions of the approval.	This report demonstrates compliance with this condition.
6. If the person taking the action wishes to carry out any activity otherwise than in accordance with the MNES Plan or Translocation Plan referred to in condition 1 and 2 the person taking the action must submit for the Minister's approval a revised version of the MNES Plan or Translocation Plan. The varied activity shall not commence until the Minister has approved the varied MNES Plan or Translocation Plan in writing. If the Minister approves such a revised plan that plan must be implemented in place of the MNES Plan or Translocation Plan originally approved.	Revision 3 (May 2014) of the Translocation Plan was submitted to DoE on 22 September 2014.

Conditions of approval	Compliance with approval conditions
7. If the Minister believes that it is necessary or desirable for the better protection of listed threatened species and communities (under sections 18 and 18A of the EPBC Act) to do so, the Minister may request that the person taking the action make specified revisions to the MNES Plan or Translocation Plan approved pursuant to condition 1 and 2 and submit the revised MNES Plan or Translocation Plan, for the Minister's approval. The person taking the action must comply with any such request. The revised approved MNES Plan or Translocation Plan must be implemented. Unless the Minister has approved the revised MNES Plan or Translocation Plan then the person taking the action must continue to implement the MNES Plan or Translocation Plan originally approved, referred to in condition 1 and 2.	No such request has been made.
8. The person taking the action must maintain accurate records substantiating all activities associated with or relevant to the above conditions of approval, including measures taken to implement the MNES Plan or Translocation Plan required by this approval, and make them available upon request to the Department. Such records may be subject to audit by the Department or an independent auditor in accordance with section 458 of the EPBC Act, or used to verify compliance with the conditions of approval. Summaries of audits will be posted on the Departments website. The results of audits may also be publicised through the general media.	Records on the health of the matted flax-lily have been compiled and reported on in this report.

Conclusion

Overall the current survival rate for the translocated matted flax-lily decreased from 97.9 per cent in 2015 to 96.6 per cent. However, this is still well above the required target survival rate of 85%.

As noted in previous monitoring reports, this indicates that the species is well suited to translocation, has become established and that management of the receptor sites has generally been adequate to maintain the presence of the species.

It is interesting to note that there has been a slight decrease in the overall health averages of translocated plants. This is in contrast to other vegetation in the receptor sites, particularly exotic grasses, which have had a significant increase in cover and abundance in response to high rainfall that has occurred in the region from June to October (BoM 2016).

The species appears to respond positively (through increase in appearance of health) where effective management is occurring, such as Site 4 and Site 1, where there are minimal threats. It is also noted that the health of plants in Site 2 was also stable from 2015 following a controlled burn on the site, which resulted in a significant increase in plant health due to reduced competition and biomass.

The overall decrease in health across all sites was attributed to recent management in Site 3. The majority of plants appeared to be affected by recent spraying on the site to control the high levels of exotic grasses. Despite the observed effect on their appearance, the majority of these plants appeared to be recovering from overspray that has killed off surrounding exotic grasses. This method has been successful previously to manage weeds and biomass and promote the growth and health of matted flax-lily.

The species also has the ability to recover from temporary competition for resources. This is evident through the regeneration of five of the eight plants that were last year considered 'dead' following active management actions. Continual management of threats to matted flax-lily, mainly biomass of exotic grasses, is therefore considered important, even for those considered dead, as the plants may regenerate when suitable conditions arise, mostly likely when there is sufficient space and light.

Currently, the overall focus for adaptive management should be regular control of biomass particularly perennial grasses which will allow the translocated matted flax-lily space to grow and prosper.

If you have any queries regarding the above please contact me at Adam.Rigg@kbr.com or on (03) 9828 5421.

Yours sincerely,

Adam Rigg
Senior Ecologist

Level 3, 441 St Kilda Road | Melbourne, VIC, 3004 | Australia
GPO Box 7440 | Melbourne, VIC, 3004 | Australia
Phone: +61.3.9828.5333 | Fax: +61.3.9820.0136

References

Bureau of Metrology (BoM), 2016. Victoria in winter 2016: wet with mild overnight temperatures, viewed online 21 October 201, Bureau of Metrology
http://www.bom.gov.au/climate/current/season/vic/summary.shtml

Bureau of Metrology (BoM), 2016. Victoria in September 2016: wet in the west and north, warm nights in the east, viewed online 21 October 201, Bureau of Metrology.
http://www.bom.gov.au/climate/current/month/vic/summary.shtml

Kellogg Brown & Root Pty Ltd (KBR) 2014, Translocation Plan for the Matted Flax-lily; Year 4 Annual Report, MEN403-TD-EV-REP-0001 Rev. 0.

Kellogg Brown & Root Pty Ltd (KBR) 2015, Translocation Plan for the Matted Flax-lily; Year 5 Annual Report, MEN403-C1-S0060. Report prepared for VicTrack.

South Morang Rail Extension Project (SMREP), 2014. Translocation Plan for Matted Flax-lily, SMREP-REP-PW-ENV-002 Revision 3.