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Dear Madelyn,

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 is prepared to meet the requirements 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. In accordance with the approved Translocation Plan, Parks Victoria may use excess nursery material gained from divisions of the Insurance Plants in plantings and revegetation, so long as enough insurance material is kept in the nursery to cover any deaths for the first 5 years of the translocation plan. 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 14 and 15 October 2015 at the four receptor sites. All of the translocated (direct and delayed translocation) matted flax-lily were monitored. The monitoring of direct translocated plants corresponds with the Year 5 monitoring period, the monitoring of delayed translocated plants corresponds with the Year 4 monitoring period.

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 378 direct and delayed translocated matted flax-lily sections were monitored. This includes 183 direct translocated sections and 195 delayed translocation sections. Of these, only eight 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 97.9 per cent. This is the same survival rate as the previous monitoring period (2014) and well above the required target survival rate of 85 per cent (SMREP 2014).

It is interesting to note that while the number of plants categorised as 'Dead' has not changed between the 2014 and 2015 monitoring period, only two out of the eight individual plants are the same. Meaning that six of the eight plants that were categorised as 'Dead' in 2014 have regenerated, and a further six plants have suffered dieback in the current year.

During the 2014 monitoring period seven out of the eight plants categorised as 'Dead' were located within receptor site 2. While this year the spread of 'Dead' plants is distributed across all sites: one plant at receptor site 1, four plants at receptor site 2, two plants at receptor site 3 and one plant at receptor site 4.

The overall health of both direct and delayed translocated plants showed a highly significant increase (p-value <0.01) during the period, and as detailed below.

Direct translocation

The overall plant health (i.e. average health index) showed a highly significant increase across the sites from 69 (moderate - good) in 2014 to 93 (good - very good) in 2015 (Table 1). This was mainly due to the highly significant increase observed at site 2 where the average plant health increased from 65 (moderate - good) in 2014 to 94 (good - very healthy) in 2015. While the average plant health index increased at both site 1 and 4, these changes were not considered significant.

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**

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

Delayed translocation

The average plant health of the delayed translocated plants showed a highly significant (P-value = <0.01) increase at three out of the four receptor sites including sites 1, 2 and 3 (Table 2). Consequently there was a highly significant increase in overall plant health across the sites from 57 (moderate - good) in 2014 to 79 (good - very healthy) in 2015.

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*
5 years	89**	80**	75**	96	79**

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

Site Condition and Adaptive Management

Site 1

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. In 2014 biomass from kangaroo grass was notably high around translocated plants situated towards the southern end of the site. While kangaroo grass remains the dominate species across the site biomass appears to have reduced around the translocated matted flax-lily, opening up inter-tussock spacing and allowing native orchids and lilies including matted flax-lily to prosper. This is potentially due to the lower than average rainfall observed during winter and spring 2015 (BOM 2015).

The cover of annual weeds has increased slightly across the site particularly around previously disturbed areas (i.e. near the site gate and perimeter fence). Since the locality of annual weeds is situated towards the perimeter of the site and away from the translocated matted flax-lily they do not currently pose a threat to translocated plants.

There was no evidence of pest animals (e.g. rabbits and kangaroos) entering the site. No recommendations to the ongoing management are proposed for Site 1.

Site 2

The condition of Site 2 has improved since the previous monitoring period due to a controlled burn that was carried out in March 2015. However, it was evident that the controlled burn did not reach the ideal temperature (i.e. it was not very hot) to kill weed seed stored in the soil and subsequently a high cover of exotic annual grasses have quickly regenerated. The most dominant weed species include sweet vernal-grass (*Anthoxanthum odoratum*), phalaris (*Phalaris aquatica*) and Yorkshire fog (*Holcus lanatus*). In addition, a number of high treat weeds remain present at the site and include Chilean needle-grass (*Nassella neesiana*), Paterson's curse (*Echium plantagineum*), thistles, and blackberry (*Rubus fruticosus aggregate*). An immediate follow-up spray is recommended to control the re-emergence of these weeds. This action was raised with local Parks Victoria personnel during monitoring (verbal communication with Ion Maher).

The plastic flags identifying the location of the translocated matted flax-lily were not removed prior to the controlled burn and consequently are no longer visible (i.e. plastic tags melted in burn). GIS mapping was used located the plants on site, which was relatively successful due to the low cover of biomass. However this is likely to become an issue for subsequent monitoring, particularly as biomass and cover increase. It is recommended that replacement flags be installed in the immediate future (i.e. while biomass cover is low) to facilitate future monitoring.

As previously mentioned six out of the seven matted flax-lily that were considered 'Dead' in 2014 regenerated following the controlled burn. It is evident that when the species is given light and space, they are able to regenerate above ground material from rhizomes buried within the soil. However it should be noted a further three matted flax-lily suffered dieback during the period.

There was evidence that rabbits had breached the site, particularly in the north-west and north-east (main gate) corner. While light grazing can be beneficial to reduce excess biomass, a number of matted flax-lily had suffered grazing and digging was visible around plants. It is recommended that fence and gate maintenance is undertaken to prevent pest animals entering the site.

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

- Immediate follow-up spray with fusilade to control the emergence of high threat weeds. The target species should include sweet vernal-grass, phalaris and Yorkshire fog particularly around matted flax-lily
- Replacement location flags to be installed at each translocated matted flax-lily
- Undertake fence and gate maintenance to prevent pest animals entering the site.

Site 3

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). The two plots within the 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 (*Crataegus monogyna*), blackberry, sweet briar (*Rosa rubiginosa L.*) and Chilean needle-grass.

Following regular biomass control the plots are scheduled to be burnt by Parks Victoria in 2016. Increased and targeted weed spraying of high-treat weeds including exotic grasses should be implemented following the controlled burn to encourage successful establishment of native grasses and matted flax-lily.

As recommended by Flora Victoria, exotic annual and perennial grasses will be targeted with fusilade. Applying fusilade around matted flax-lily has produced positive results in the past with exotic species dieback and improved health (i.e. regenerating tillers) of underlying matted flax-lily. Fusilade should only be sprayed around native species in autumn or winter when they are not in flower.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: Controlled burn for biomass control in 2016
- Targeted weed spraying with fusilade in autumn or winter to reduce biomass and exotic grass cover
- Follow-up targeted spraying of high-threat weeds.

Site 4

The two plots containing the translocated matted flax-lily are in good condition. The matted flax-lily look healthy (85% of translocated plants received a health score of ‘very healthy’) and plenty of space is available for tillers to spread around the plants. Minimal threats from exotic weed species were noted, due to low weed cover throughout the site. Furthermore, no evidence of vandalism or animal grazing was observed.

Throughout the South Morang Grassy Eucalypt Woodland (SMGEW) there are increased levels of annual grasses, particularly *Bromus* spp. including greater brome (*Bromus diandrus*) and soft brome (*Bromus hordeaceus)*. The cover of cocksfoot (*Dactylis glomerata)* is also increasing across the site. Similarly the cover of Chilean needle-grass has increased since the previous monitoring period however its overall cover remains low across the site.

Additionally, the cover and diversity of native lilies and other forbs and herbs remains high within the SMGEW.

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.
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 is 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	This report demonstrates compliance with this condition.

Conditions of approval	Compliance with approval 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.	
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.
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 tis 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.

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Conclusion

Overall the current survival rate for the translocated matted flax-lily remained unchanged at 97.9% in 2015, which is well above the required target survival rate of 85%. In general, this indicates that the species is well suited to translocation and that management of the receptor sites has been adequate to maintain the presence of the species. In addition, the general health of plants showed a highly significant increase (p-value <0.01) during the period. This was mainly due to the highly significant (p-value <0.01) increase in plant health observed at site 2, following the controlled burn in March 2015.

One of the most important factors to note is that six out of eight matted flax-lily that were considered 'Dead' in 2014 regenerated during the period, however a further six plants suffered die-back, so there was no change to the overall number of plants categorised as dead. This is important because it demonstrates that matted flax-lily can regenerate from underground rhizomes when the site conditions are favourable (i.e. available light and space). The distribution of plants that suffered die back in 2015 are spread more evenly across the four sites, as opposed to 2014 when seven out of the eight plants categorised at dead were within Site 2.

While the controlled burn at Site 2 has shown positive results for matted flax-lily (e.g. highly significant increase in health and decrease in the number of dead plants), the burn did not reach the ideal temperature to kill off weed seed stored in the soil. Therefore weed spraying is required to manage the rapid emergence of annual weed species including sweet vernal-grass, phalaris and Yorkshire fog.

During the current period two planted at site 3 suffered die back and this is likely due to the high biomass and exotic grass cover throughout the two translocated plots. Despite the persistence of the species, it is considered particularly vulnerable to a high biomass of perennial grasses during dry and hot periods, when the plant responds to water-stress by becoming deciduous and losing all above ground material. Matted flax-lily will typically reappear following autumn rains, but may stay dormant in the soil if no space is available to germinate into or if there is high competition for resources, such as soil moisture. If biomass is not removed physically, the matted flax-lily may not regenerate.

The adaptive management described in this report is recommended at Site 3 to manage weeds and biomass levels and thereby minimise further impacts to the translocated matted flax-lily. As seen during the current monitoring at Site 2, when space is created around matted flax-lily they can quickly regenerate.

Overall the focus for future and 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

References

Bureau of Metrology (BOM), 2015. Victoria in winter 2015: Below-average rainfall and cool temperatures, viewed online 2 November 2015, http://www.bom.gov.au/climate/current/season/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.

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