Final Expert Review Report of the Feral Pig Management Offset Strategy - Implementation Plan for Feral Pigs

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Prepared for RTA Weipa Pty Ltd/Rio Tinto by
***LET Consultants* (Laurie Twigg)**

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Important Disclaimer

Whilst due care and diligence was undertaken in preparing this report, neither LET Consultants, nor Laurence (Laurie) Twigg, accept any liability whatsoever for any loss or damage suffered as a result of relying on the information in this report, or with applying it either directly or indirectly in any manner - May, 2016.

1. Introduction

This Report is in two Sections: Section 1 contains the Reviewer's comments on the final version of the Plan provided by RIO Tinto on 6th May 2016. Section 2 contains the original comments made by LET Consultants on the provisional Plan dated 14th April 2016. These latter comments were used by RTA Weipa Ltd /RIO Tinto to amened the final Plan as appropriate.

The final Expert Review again utilised 'desktop study' methodology, and was conducted according to the approved criteria listed in Appendix 1 (see Section 2). A site visit to Cape York has not been undertaken.

2. Revised Plan

It is/was clearly acknowledged that an adaptive management approach is to be undertaken. This is sensible as it allows for ongoing modification to the Plan as it is implemented. The revised Plan has addressed the issues raised during the initial review, and subsequent discussions, of the provisional Review Report provided by LET Consultants. However, it would be wise to keep in mind the potential for a range of predators/scavengers to be attracted to the control sites by the 400+ pig carcases likely to be present should the Plan be implemented as expected. It is accepted that feral pigs (adult boars) are the main predators of turtle eggs but a range of predators can consume turtle nestlings. Consequently, all reasonable efforts to minimise the potential effect of carcases attracting predators should be undertaken as much as is practical, and as fits with the current approved scope of the Plan. That is, regardless of pest being managed, any control strategy used should not result in the impact on the protected resource being maintained (or even increased).

In the Expert Reviewer's opinion, the Plan would not need to reviewed again once the minor corrections and additions are completed

3. Response to Comments by *RTA Weipa* Ltd on the Provisional Review Report

The Reviewer accepts most of the comments provided by *RTA Weipa* Ltd, and I only provide a response for those points where further clarification is required. The comments by *RTA Weipa* Ltd on the two review documents (Final and Provisional) are included as Appendices 2 and 3.

- The Review criteria approved by the Commonwealth Department of Environment are provided in Appendix 1 (Section 2) so that readers can appreciate the context under which the external review was undertaken.
- The timing of the initial knockdown is acknowledged but please note my comments above (Pt. 2).
- It is now acknowledged that the scope for changing the approved control zone is limited, but it is an adaptive management program, and it would be beneficial to keep the control area as large as possible to reduce immigration into these areas. This may be appropriate in future years.
- Adding the expected number of pigs to destroyed, and the area over which control activities are to be undertaken, add to the clarity of the Plan.
- It is accepted that undertaking only one (1) 2-3 day shoot per control area per year should help to reduce avoidance behaviour by pigs with respect to low flying aircraft.
- The suggestions regarding alternative toxic bait material (e.g. wheat) were provided as future options for poison baiting should PIGOUT baits be less acceptable to pigs than hoped.
- Comments regarding fermented grain are accepted.
- I stand by my comment: "*to be successful, any baiting program must be well planned and well conducted with a dedicated and disciplined approach. Successful baiting programs also require consistent pre-feeding/bait take before the toxic baits are introduced."* Baiting programs are rarely successful unless this is so, but I accept that this is the planned approach by *RTA Weipa* Ltd.
- Justification of 1080 and 1080-bearing vegetation. The key point here is that the use of 1080 products in vertebrate pest control is very well researched and regulated in both Australia and New Zealand. You do not need increased tolerance by native animals to 1080 to be able to use 1080 products safely and effectively. The fluoroacetate-bearing plant species on Cape York is

Gastrolobium grandiflorum but its occurrence is patchy (Twigg and King 1991). Its distribution is based upon records from the Queensland Museum in the early 1980s which were collated and mapped for my PhD thesis. Also note, that while many native animal species have developed some tolerance to 1080 due to their past association with the poison plants, no animal species have been tested for their sensitivity to 1080 (fluoroacetate) from far north Queensland (e.g. Weipa). Thus, it may be best to exclude the reference to the poison plants, and simply keep the reference to 1080 being well researched as has been currently added to the revised Plan.

- *The Plan has a target of a 70% reduction in the predation of turtle nests by feral pigs within 3 years.* However, I would like to reiterate that the potential impact of other predators should not be discounted here. While accepting that determining total predation rates may be outside the scope of the current Plan, the effect of overall predation rates will be important in determining the recruitment rate of turtle nestlings from the areas with feral pig control. That is, you need to be aware that the feral pig control operations could attract other pigs and/or other predators to the 'protected' turtle nesting grounds resulting in a detrimental impact on turtle productivity.

4. Minor Corrections/Typos

- Pg 61, Para 3: Research data ~~has~~ **have** ---------- which are considered **the** more ……
- Pg 62, Para 2: However, **these** generally ---------- considered, but ---------- to deploy baits, **it was not a preferred option as it can be less target specific than the currently chosen methods.**
- Pg 69, Para 4, Pt. 3: ------- waterhole**i** to waterholes.
- Pg 69, **References** – the following references need to be added here:

Seawright, A.A. and Eason C.T. (1994). Proceedings of the science workshop on 1080. The Royal Society of New Zealand. SIR Publishing: Wellington. New Zealand. 173 pg.

Twigg, L.E., and King D.R. (1991). The impact of fluoroacetate-bearing vegetation on native Australian fauna: A review. *Oikos*, **61**, 412-430.

Twigg, L.E., and Parker, R.W. (2010). Is sodium fluoroacetate (1080) a humane poison? – The influence of mode of action, metabolism, and target specificity. *Animal Welfare* **19,** 249-263.

Twigg, L. E., and Socha, L.V. (2001). Defluorination of sodium monofluoroacetate by soil microorganisms from Central Australia. *Soil Biology and Biochemistry* **33,** 227-234.

Section 2: Expert Review of the Provisional Feral Pig Management Offset Strategy - Implementation Plan for Feral Pigs – Review Report prepared by LET Consultants, April 2016

1. Background

As part of the approval process for the Amrun project (i.e. *South of Embley Project)* on western Cape York, management plans/strategies were developed to protect turtle nests and hatchlings from predation, particularly that inflicted by feral pigs. However, under the EPBC Act, the final approval of these plans requires that they are reviewed by an independent expert. This document provides a written review of the developed plan: *the Feral Pig Management Offset Strategy- Implementation Plan* (dated 14th April 2016), which was undertaken by LET Consultants in April 2016. The Review utilised 'desktop study' methodology, and a site visit to Cape York was not undertaken. It was conducted according to the criteria listed in (Appendix 1). As requested, this review only considered those sections dealing specifically with the reduction of feral pig predation on turtle nests and nestlings.

Also note that this review is provided in a format that may be suitable for tabulation at the request of Rio Tinto. Consequently, a Table of Contents, and the other more common report Sections, have not been included in this report.

2. Executive Summary

To the best of my knowledge, the *Feral Pig Management Offset Strategy- Implementation Plan* developed is consistent with the stated requirements of the relevant Acts, Recovery Plans, Threat Abatement Plans, and Codes of Practice, although it is somewhat unusual in that it aims to mainly target alpha males in the first year rather than specifically aiming for an overall population reduction. Alpha males are thought to inflict a disproportionate level of predation on turtle nests. The successful implementation of the actions described in the Plan will add to the current knowledge of feral pig biology, control, and impacts in a tropical climate - a region about which there is limited knowledge.

The proposed actions in the Implementation Plan generally follow accepted practice and are likely to be successful in reducing the impact of feral pigs on turtle productivity, particularly as an adaptive management approach is to be adopted. However, *I believe the timing of the initial knockdown in each year requires further consideration*. This is because it seems that pig carcases are to remain *in situ*, and these are likely to attract other predators and scavengers to the targeted areas, potentially resulting in additional predation of nests and hatchlings (see below). The frequency of shooting campaigns also requires careful consideration.

Aside from the timing of the initial knockdown, the following comments mainly involve points of clarification, suggest minor modifications, provide additional information, or suggest other considerations to enable a long term reduction in the abundance of feral pigs to be achieved. The feasibility of these suggestions is probably best decided by those directly involved in the *Feral Pig Management Offset Strategy- Implementation Plan*, including those undertaking the feral pig control program. Hopefully, these comments will assistance with finalising the Plan so that the likelihood of achieving the stated goals is maximised.

5. Timing

Start the feral pig control program before turtle nesting reaches its peak.

Rationale: I could find no information on how pig carcases are to be dealt with, nor on how many pigs are expected to be destroyed during the initial knock-down. However, it is recognised that removing pig carcases from the control area/s is likely to be impractical due to the type of terrain and the associated costs involved. Consequently, these pigs will remain as a food source for a range of animals and are likely to attract other predators into the controlled areas. These would include, but are not limited to, other feral pigs, wild dogs/dingoes, goannas, some birds of prey, and possibly, some scavenging sea-birds (take nestlings and uncovered eggs). It is possible that such a response could

result in the overall level of predation being maintained even though feral pig numbers have been reduced, at least in the short term. Obviously, this will depend upon the number of feral pigs killed (i.e. carcases present), but I anticipate this will be in the 100s in the first year. *Thus, I feel the timing of the initial knockdown may require further consideration.*

Irrespective of habitat type (i.e. tropical, Mediterranean), feral pig carcases are known to degrade rapidly and become inedible food items to most vertebrates within 4-10 days (Twigg *et al.* 2005b). Thus, commencing the initial knockdown each year around 2 weeks before turtles are expected to start laying would largely overcome the potential for increased predation resulting from the presence of pig carcases. It is recognised that control activities may need to be conducted further from the beach as some pigs do not seem to regularly patrol the turtle nesting areas until eggs are being laid. It is also accepted that earlier commencement may not be feasible for all target areas.

Clearly, the timing of the control program will need to be a trade off between maximising the number of pigs killed and the total level of protection actually provided to turtle nests and hatchlings. This would be best determined by those implementing the feral pig control program.

6. Area of control

Expand the targeted control area/s

The rationale for mainly conducting the control program within 2 km of the beach/nesting areas is understood. It was also stated that the large adult males would be preferentially targeted as such pigs seem to cause a disproportionate amount of predation. However, such males are also capable of travelling over 20 km to favoured food resources and a control effort only within '2 km' of the beach may or may not remove these males. Personally, I feel that the 500 m to 2 km aerial shooting 'zone' may be to narrow to achieve the stated outcomes. Thus, I recommend that areas to be controlled include other relevant sites further inland where possible, and as practical.

The control area may be able to be expanded in future years as pig numbers are reduced, which may free up some resources. An expanded control area would help to reduce immigration by other feral pigs, particularly if a large pig-free buffer zone could ultimately be created out towards Ward river. It is recognised that such an approach may not be possible within the first few years of the Implementation Plan. It is also recognised that such an approach may be cost prohibited and would need to be at the discretion of RTA Weipa/RIO Tinto.

The use of a helicopter survey immediately prior to control operations to establish where feral pigs are most abundant (logged to a GPS) is a sensible approach as this will complement the data already collected on damaged turtle nests. It will also help with setting control priorities.

7. Number of feral pigs needing to be destroyed

Whilst appreciating that the actual number of feral pigs inhabiting the targeted areas is unknown, I feel some 'guesstimate' as to the likely number needing to be destroyed during the initial knockdown in Year 1 would be beneficial and help readers to place things in better context. I therefore suggest that such a statement is included within the Plan. I assume these numbers will be 150+ in the first year. Mention of the actual size of the pig reduction zone (i.e. x ha) would also be beneficial.

8. Age class targeted

Aim for a long term reduction of the feral pig population

While appreciating that the short term goal is reducing the number of large adult males in the targeted areas, this alone will not result in a long-term reduction in feral pig numbers and hence may not reduce the long term level of predation. It is the adult females who actually produce the young, so a control program which targets all pigs is more likely to ultimately result in a sustained reduction in the feral pig population. A sustained reduction is likely to result in three main things, fewer large adult males, less feral pigs overall, and a reduction in the learned behaviour that the turtle nests

provide a ready food source. Consequently, the short term goal of reducing the number of alpha males present should not preclude the need to gain an overall reduction in the numbers of feral pigs in the longer term.

Because of their often cryptic and cautious behaviour, targeting large (alpha) males during a shooting campaign may be difficult depending upon the amount of vegetation cover where these pigs reside and feed. In fact, poison baiting (see Twigg *et al.* 2005a; 2006) may provide a more reliable option for removing the desired numbers of these pigs so as to obtain a reduction in the predation levels on turtle nests and nestlings. It is recognised that an adaptive management approach is to be used, and that some alpha males should be destroyed by shooting from the hides on the beach, but some backup method for targeting these males (e.g. 1080-baiting) needs to be in place should the shooting campaign not produce the desired outcomes. Because of the cautious behaviour of these pigs, bait stations specifically aimed at removing large adult/alpha males should be kept as simple and natural as possible (e.g. pre-feed and toxic bait simply placed on raked track plots next to adjacent shelter) as these pigs are less likely to feed at the artificial hoppers.

As recognised in the Plan, it is also worth remembering that a small number of pigs can do considerable damage in a single nights feeding session, including rooting up vast areas. Consequently, feral pigs may need to be driven to fairly low numbers to achieve the targeted 70% reduction in damage to turtle nests within 3 years.

9. Learned behaviour

It was readily recognised by the Implementation Plan that learned behaviour and changes in home range use were important aspects of the behaviour of feral pigs in this region. Thus, as the Plan is implemented, a sustained long term reduction in feral pig numbers should result in less feral pigs recognising that the turtle nesting beaches provide an easy food source thereby ultimately reducing predation rates on turtle nests and hatchlings.

As I am sure all are aware, large adult male pigs can be cryptic and extremely hard to shoot or trap. You usually only get one go at each individual pig, so those undertaking the control need to be as sure as possible they are going to be successful at their first attempt.

Similarly, it is well recognised that persecution of a pig population, particularly with aerial shooting, can markedly effect pig behaviour. Surviving pigs may disperse, hide, or change their feeding patterns to avoid the control efforts and this can impact upon efficacy (Choquenot *et al*. 1996). Thus, the frequency of shooting campaigns will need to be an important consideration.

A combination of aerial shooting, ground shooting, and poison baiting are to be used as part of the Offset Plan strategy. However, it needs to be mentioned exactly how this is to occur. It is usually quite counter-productive to use two different control techniques (e.g. shooting and baiting) in the same area simultaneously, as this can often result in poor overall efficacy of the pig control program. For this reason, follow up control with 1080-baits is not usually undertaken until some time (weeks?) after any aerial or ground shooting exercises have been completed, and possibly vice versa.

10. Aerial and ground shooting

Most shooting campaigns, particularly aerial shooting, are most successful when a grid system is used to systematically cover the target area, rather than using an *ad hoc*, random approach. Feral pigs are generally most active at first and last light, and often seek shelter once sunrise has occurred. Consequently, any shooting campaigns are best conducted during these times, which is generally the approach recommended in the Implementation Plan. However, I am not optimistic that the alpha males will be 'flushed out' into open ground (away form the beaches) by the helicopter during the aerial shooting campaigns, as such individuals often 'go to ground' and are difficult to locate. Our experience is that poison baiting accounts for more of these large adult males. The use of hides

along the beach should enable some of theses males to be destroyed, however. The use of an adaptive management approach is probably the only viable option to achieve the desired outcome of removing alpha males.

There is a need for more clarity regarding both the within and between frequency of the shooting campaigns for each separate targeted location. It appears that each selected priority area will be targeted for 2-4 consecutive days, but how many days are allowed before the next cycle of shooting occurs. Allowing sufficient time between shoots will help with reducing the learned aversion behaviour mentioned above. Or, is only one 'cycle' to occur per site, per year?

Ground shooting is to occur over approximately 2 weeks, but this will depend upon '*the level of pig control achieved*' (Page 65). How will this be known unless formal before and after control surveys are conducted. Probably needs to be clarified a bit more in the Plan.

11. Follow up control

Although the need for follow up control is mentioned in the Plan, the timing of this has not been indicated. It is recognised that this is likely to vary depending upon seasons and control outcomes, however, I believe some follow up control should be implemented at the end of the dry season. Food, water, and shelter are likely to be at their lowest at this time which may aid the destruction of the more recalcitrant pigs. This should take place ***even*** if turtle nests have hatched, and the hatchings have dispersed, as any benefits gained are likely to carry over into the following year/nesting season.

12. Non-toxic feeding stations

Fermented wheat is to be used as an attractant next to the stations/feeders containing the non-toxic PIGOUT baits. However, soaking wheat for 5 days to prepare the fermented wheat is too long as only 24-48 h is usually all that is required. The addition of a small handful of smelly (i.e. not de-odourised) blood and bone next to the fermented wheat can also increase the attractiveness of this well recognised census baiting technique for feral pigs (Saunders *et al.* 1993; Twigg *et al.* 2005a; 2006).

If the take of non-toxic PIGOUT bait is less than ideal, then a cereal replacement, preferably wheat, could be used. The feral pigs would then need to be 'switched' onto the toxic PIGOUT baits, which has been done successfully in the past (Cowled *et al.* 2006). Alternatively, a wheat-based bait (Twigg *et al.* 2005a; 2006) could be considered if PIGOUT baits are not readily accepted by pigs. However, note that grain may also attract granivorous birds which could become an unwanted non-target species.

13. Poison baiting

To be successful, any baiting program ***must*** be well planned and well conducted with a dedicated and disciplined approach. Successful baiting programs also require consistent pre-feeding/bait take before the toxic baits are introduced, so the 3 days allowed for pre-feeding may need to be extended until the pigs are readily accepting non-toxic bait. As the Plan is aware, failure to get adequate pre-feeding rates usually results in poor efficacy outcomes.

Although it can be labour intensive, baiting with 1080-poisoned wheat has been shown to be the most successful control option for reducing feral pig numbers in northern (tropical) Western Australia (see Twigg *et al.* 2005a; 2006). This method achieved a high knockdown of pig numbers over a relatively large area in only a few weeks (2-3). This approach could be considered if the use of PIGOUT baits does not achieve the desired outcomes. 1080-concentrates are registered for use on grain for feral pig control in Queensland (APVMA 2016).

It is suggested that the feeding stations may be used for both shooting or toxic baiting operations (Page 61). However, it would be unwise to undertake these activities simultaneously at the same site. The shooting of pigs at active bait stations is likely to change the behaviour of the remaining pigs such

that these bait stations effectively become inoperable. A brief comment clarify this situation would be beneficial.

14. 1080 use

I believe it would be useful to include some brief information justifying the use of 1080-baits to control feral pigs. For example, the use of 1080 in vertebrate pest control has been extensively researched in Australia and New Zealand and has been found to be target specific, humane, efficacious, cost effective with no environmental persistence or long-term effects on non-target populations (see Seawright and Eason 1994; Twigg and King 1991; Twigg and Parker 2010). The toxic principle of 1080, fluoroacetate, also occurs naturally in 3 genera of Australian plants with one species occurring on Cape York. It has also been demonstrated that native animals with evolutionary exposure to this fluoroacetate-bearing vegetation have developed varying levels of tolerance to fluoroacetate (1080), thereby often providing them with an additional safety net during 1080-baiting operations (Twigg and King 1991). A range of microorganisms also readily degrade 1080 into harmless by-products (Seawright and Eason 1994; Twigg and Socha 2001).

15. Monitoring

The techniques planned to monitor the success of the Plan are appropriate, including the use of remote sensing cameras. The suggestion that formal aerial surveys be undertaken before and after control operations is ***strongly*** supported as such data would provide valuable information of the efficacy of feral pig control in this habitat. Currently, there are limited data on feral pig biology and control in these types of habitats.

The use of a pre-control helicopter survey to determine where pig density is high will be an important, and economical, part of helping to set control priorities. The use of strategically placed track plots (e.g. on pads), without attractants or bait, and which are formally monitored, may also help to determine the presence absence, and possibly the age class, of pigs. Where practical, routine raking of the soil around the feeding/baiting stations may also help determine if, and what, feral pigs remain.

One area that does not seem to be covered in the Plan, however, is whether any biological measurements or samples are to be collected. For example, a record of the age, sex, breeding condition, general body condition etc. of destroyed pigs would be useful additional information to collect even if this is not undertaken for all sites or all pigs (i.e. predetermined sub-sampling techniques are used).

Data handling and storage are going to be very important during the implementation of the Plan, and mechanisms, including backup procedures, to facilitate this need to be put in place ***before*** the Plan is implemented. Prior attention to data collection and storage will also aid the production of the necessary reports and publications.

16. Animal welfare

The inclusion of statements regarding the accepted practice and standards for each control option, in addition to that provided in Section 5, page 14 of the Plan, was a sensible approach. Including such statements helps to reassure the general public that RIO Tinto takes such matters seriously, and that RIO Tinto is aware of its obligations in this area. The only other addition I would suggest here involves 1080 use; you could add: *The use of 1080 products will be in accordance with the label directions for these products in Queensland.*

17. Success of the Plan

The Plan has a target of a 70% reduction in the predation of turtle nests by feral pigs within 3 years, but is it possible to estimate what effect this outcome would have on overall predation rates? Are steps needed to ensure that the reduced predation by feral pigs is not simply replaced by predation by other species, such that current predation levels are maintained. Or, as predicted in the Plan, feral pigs

are the key predator of turtle nests and removing this threat will result in overall positive benefits to turtle reproduction. I feel a brief comment around these points could be made in the Introduction on Page 61.

If the Plan results in a sustainable, long-term reduction in the numbers of feral pigs in the region, then there are likely to be benefits to other fauna and some flora, in addition to those obtained by turtles. This could be mentioned (or cross referenced) within the Plan, with care not to overstate this aspect, as it would add to RIO Tinto's 'environmental credits'.

Also, is there a need for an alternative approach if the current Plan does not prove to be as successful as hoped in reducing predation of turtle nests? That is, what other options could be considered to reduce the impact of predation on turtle reproductive success. Strategic fencing comes to mind, but it is likely to be cost prohibitive. Sustained trapping may also be a future option if needed, but trapping can be labour intensive and is unlikely to remove all pigs. Any trapped pigs must be destroyed humanely. Switching to a wheat-based baiting program (see Twigg *et al.* 2005a; 2006) may be appropriate if the acceptance of PIGOUT baits by feral pigs is not as high as hoped.

18. References

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Seawright, A.A. and Eason C.T. (1994). Proceedings of the science workshop on 1080. The Royal Society of New Zealand. SIR Publishing: Wellington. New Zealand. 173 pg.

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Twigg, L. E., and Socha, L.V. (2001). Defluorination of sodium monofluoroacetate by soil microorganisms from Central Australia. *Soil Biology and Biochemistry* **33,** 227-234.

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APPENDIX 1: Peer Review Criteria as Approved by the Commonwealth Department of Environment

The independent peer review shall consider the extent to which the Feral Pig Management Offset Strategy satisfactorily meets the following criteria:

1. The Feral Pig Management Offset Strategy:

1.1 Measures to be implemented to reduce the annual level of feral pig predation on listed turtle species nests;
1.2 provides for implementation in the area illustrated in the figure below;
1.3 provides for surveying to develop significantly robust baseline data for listed turtle species nesting in the SoE project area;
1.4 identifies desired outcomes, benchmarks, readily measureable performance indicators and goals, timeframes for reporting and implementation and reporting, corrective actions and contingency measures, and, specify the person/s roles with responsibility for implementing actions;
1.5 details Traditional Owner employment opportunities, and mechanisms for reporting the number of local indigenous person/s actually employed in the implementation of the Feral Pig Management Offset Strategy (as per EPBC Approval Condition 42);
1.6 is consistent with the feral pig relevant management measures contained in the National Recovery Plan for Marine Turtles;
1.7 adheres to the most current versions of the *Threat Abatement Plan for Predation, Habitat Degradation, Competition And Disease Transmission By Feral Pigs* and the *Humane Pest Animal Control: Code of Practice And Standard Operating Procedures*;
1.8 identifies the relationship of this strategy with other Commonwealth, State or Local programs on feral pig management to minimise duplication or conflicting outcomes;
1.9 states whether the strategy will be developed to either build on existing programmes or be independent of any other programs for the nominated area;
1.10 states that the findings from the Feral Pig Management Offset Strategy will be used to inform the marine and Shipping Management Plan on an ongoing basis; and,
1.11 adequately identifies publication requirements as per EPBC approval condition 59.

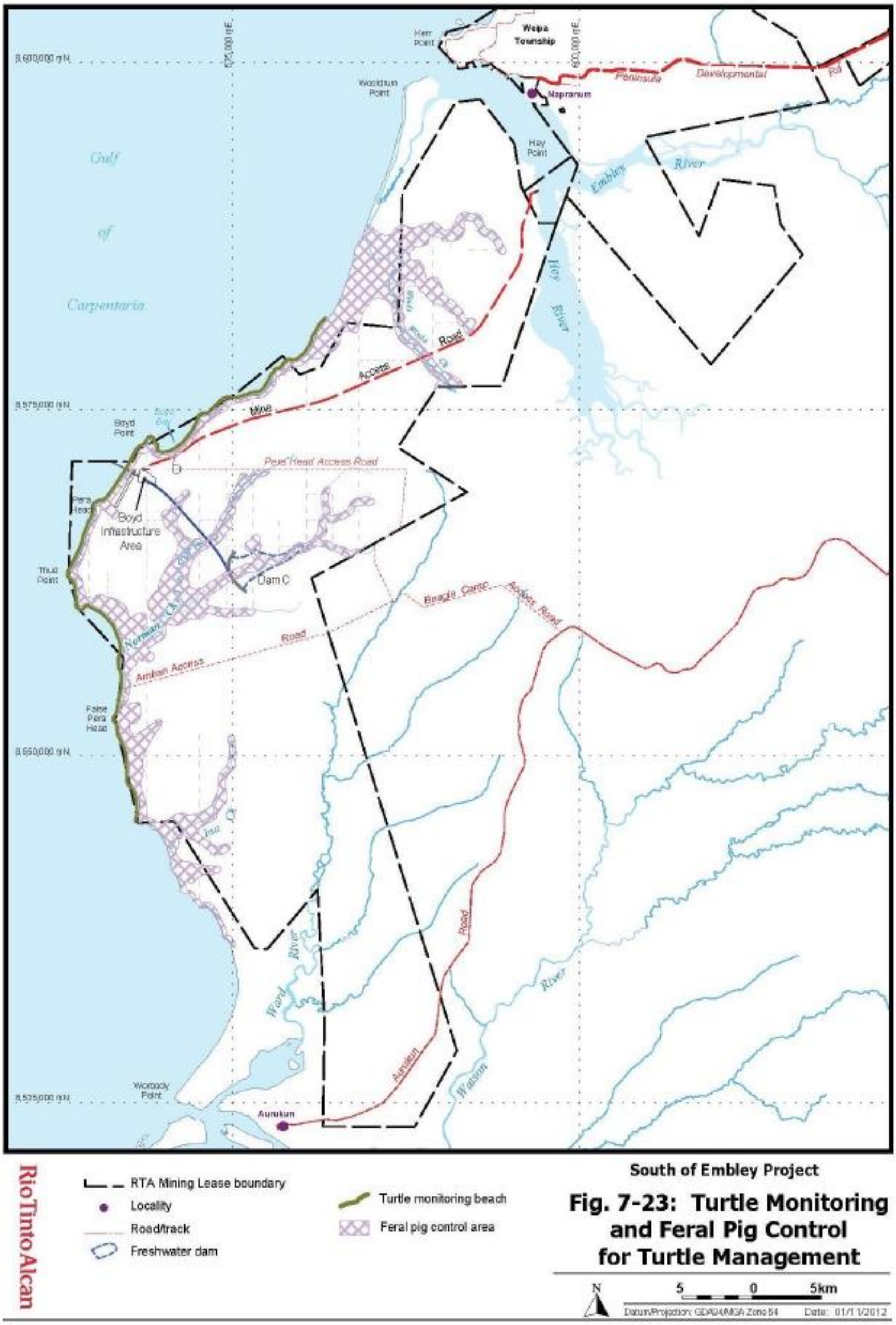

Fig. 7-23: Turtle Monitoring and Feral Pig Control for Turtle Management

2. The review is consistent with the EPBC Approval Definitions:

> Independent/ly Peer reviewed/ Independent Peer Reviewer – assessment of the assumptions, calculations, extrapolations, alternate interpretations, methodologies, performance goals and performance criteria, and conclusions pertaining to the management plans/strategies/programs by a person/organisation/technical committee, independent of the approval holder and/or employed in any subsidiary company of the approval holder. This person/organisation/technical committee must have demonstrated expertise in the matter of national environmental significance being reviewed and be approved by the Minister prior to commencement of the review.

Appendix 2: Responses from RTA Weipa Ltd. on the Final Review Report *(dated 6 May 2016)*

#	Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants	RTA Weipa Pty Ltd response to review comments
Introduction		
1	The final Expert Review was conducted according to the approved criteria listed in Appendix 1	Noted.
Revised Plan		
2	It is/was clearly acknowledged that an adaptive management approach is to be undertaken. This is sensible as it allows for ongoing modification to the Plan as it is implemented.	Noted.
3	The revised Plan has addressed the issues raised during the initial review	Noted. Refer to Section 2 below for comments in the initial review.
4	However, it would be wise to keep in mind the potential for a range of predators/scavengers to be attracted to the control sites by the 400+ pig carcases likely to be present should the Plan be implemented as expected. It is accepted that feral pigs (adult boars) are the main predators of turtle eggs but a range of predators can consume turtle nestlings. Consequently, all reasonable efforts to minimise the potential effect of carcases attracting predators should be undertaken as much as is practical, and as fits with the current approved scope of the Plan. That is, regardless of pest being managed, any control strategy used should not result in the impact on the protected resource being maintained (or even increased).	As detailed in comment 19 below, timing of the annual control program is a trade-off between the between maximising the number of pigs killed and the total level of protection actually provided to turtle nests and hatchlings. As detailed in response to comment 19 below, Section 2.1 of the Implementation Plan identifies that timing of shooting will be reviewed annually to target the time when the majority of predating boars will be operating on the beaches. Additionally annual timing of the shooting program can also aim to minimise impacts of predation by other animals. This has been clarified in Section 2.1 of the Implementation Plan. As detailed in response to comment 19 below, predation of turtle nests by other animals will be monitored by nest cameras (This was clarified in Section 3 of the Implementation Plan). In addition following the shooting program monitoring of predation of turtle hatchlings by predators attracted to carcasses will be conducted by traditional owners through the Land and Sea Management Program. This has been added to Section 3 of the Implementation Plan.
5	In the Expert Reviewer's opinion, the Plan would not need to reviewed again once the minor corrections and additions are completed	Noted. Minor corrections and additions recommended have been incorporated (refer to response to comment 16 below).
Response to Comments by RTA Weipa Ltd on the Provisional Review Report		
6	The Reviewer accepts most of the comments provided by RTA Weipa Ltd, and I only provide a response for those points where further clarification is required.	Noted.

7	The timing of the initial knockdown is acknowledged but please note my comments above.	Noted. Refer to response to comment 4 above detailing amendments to Implementation Plan regarding timing of the control activity.
8	It is now acknowledged that the scope for changing the approved control zone is limited, but it is an adaptive management program, and it would be beneficial to keep the control area as large as possible to reduce immigration into these areas. This may be appropriate in future years.	As detailed in response to comment 20 below, while the findings of recent research programs indicate that targeting control efforts along the beaches is a more effective use of available resources, Section 2.1 of the Implementation Plan identifies that control activities may then be expanded to inland water sources (as shown on Figure 2) if resources are available. Targeting control efforts along the beaches has already been approved in section 4 of the FPMOS.
9	Adding the expected number of pigs to destroyed, and the area over which control activities are to be undertaken, add to the clarity of the Plan.	Noted. As detailed in response to comment 21 below an estimate of pig numbers is provided in Section 1 of the Implementation Plan.
10	It is accepted that undertaking only one (1) 2-3 day shoot per control area per year should help to reduce avoidance behaviour by pigs with respect to low flying aircraft.	Section 2.1 of the Implementation Plan identifies that the shooting operation will be conducted over 2 to 4 days. The length of shooting operation will be dependent on the level of pig control achieved, as observed on a daily basis. As detailed in response to comment 23, there is no evidence that aerial shooting has been conducted in this area so pigs are not expected to become habituated to the danger of helicopter noise and associated aerial shooting quickly. The aim is to achieve a total eradication of adult males in the control zone each year. This will reduce the number of "teachers" so the number of boars who have learned nest predating behaviour may be reduced over time. This has been clarified in Section 2.1 of the Implementation Plan.
11	The suggestions regarding alternative toxic bait material (e.g. wheat) were provided as future options for poison baiting should PIGOUT baits be less acceptable to pigs than hoped.	As detailed in response to comment 25, use of fermented grain in conjunction with the non-toxic PIGOUT baits within free feeders is expected to overcome the reluctance of pigs to eat the PIGOUT baits and is in accordance with the Standard Operating Procedure for PIGOUT baits (NSW DPI 2015). The use of non-target specific baiting techniques, including placing toxic bait outside of target specific feeding hoppers, has been discounted due to potential for impacts to other wildlife.
12	Comments regarding fermented grain are accepted.	Noted. Refer to response to comment 25 below.

13	I stand by my comment: "*to be successful, any baiting program must be well planned and well conducted with a dedicated and disciplined approach. Successful baiting programs also require consistent pre-feeding/bait take before the toxic baits are introduced.*" Baiting programs are rarely successful unless this is so, but I accept that this is the planned approach by RTA Weipa Ltd.	Section 2.1 of the Implementation Plan identifies planning activities for implementation of the shooting activities including an assessment team consisting of the SoE Project Environmental Specialist, Land and Sea Management Program (Traditional Owner) representatives, aerial shooter, pilot and feral pig expert, will be formed to oversee the control program. The assessment team will meet prior to the program and as necessary during the program as monitoring data is obtained and assessed. Section 2.3 of the Implementation Plan identifies that pre-feeding will occur from free feeders until pigs are constantly feeding at a free feeding site then a toxin feeder will be introduced. Once toxin feeders are introduced the pre-feeding will continue until the pigs are consistently feeding for three days.
14	Justification of 1080 and 1080-bearing vegetation. The key point here is that the use of 1080 products in vertebrate pest control is very well researched and regulated in both Australia and New Zealand. You do not need increased tolerance by native animals to 1080 to be able to use 1080 products safely and effectively. The fluoroacetate-bearing plant species on Cape York is *Gastrolobium grandiflorum* but its occurrence is patchy (Twigg and King 1991). Its distribution is based upon records from the Queensland Museum in the early 1980s which were collated and mapped for my PhD thesis. Also note, that while many native animal species have developed some tolerance to 1080 due to their past association with the poison plants, no animal species have been tested for their sensitivity to 1080 (fluoroacetate) from far north Queensland (e.g. Weipa). Thus, it may be best to exclude the reference to the poison plants, and simply keep the reference to 1080 being well researched as has been currently added to the revised Plan.	Noted. No reference to the poison plants has been made in the Implementation Plan.

15	*The Plan has a target of a 70% reduction in the predation of turtle nests by feral pigs within 3 years.* However, I would like to reiterate that the potential impact of other predators should not be discounted here. While accepting that determining total predation rates may be outside the scope of the current Plan, the effect of overall predation rates will be important in determining the recruitment rate of turtle nestlings from the areas with feral pig control. That is, you need to be aware that the feral pig control operations could attract other pigs and/or other predators to the 'protected' turtle nesting grounds resulting in a detrimental impact on turtle productivity.	Refer to response to comment 4 above, the plan has been amended to include monitoring of predation by other animals and timing of control activities will aim to minimise the impacts from this predation. This has been clarified in Sections 2.1 and 3 of the Implementation Plan.
Minor Corrections/Typos		
16	*• Pg 61, Para 3: Research data ~~has~~* ***have*** *---------- which are considered* ***the*** *more ……* *• Pg 62, Para 2: However, these generally ---------- considered, but ---------- to deploy baits,* ***it was not a preferred option as it can be less target specific than the currently chosen methods****.* *• Pg 69, Para 4, Pt. 3: ------- waterholes****i*** *to waterholes.* *•Pg 69,* ***References*** *– the following references need to be added here:* Seawright, A.A. and Eason C.T. (1994). Proceedings of the science workshop on 1080. The Royal Society of New Zealand. SIR Publishing: Wellington. New Zealand. 173 pg. Twigg, L.E., and King D.R. (1991). The impact of fluoroacetate-bearing vegetation on native Australian fauna: A review. *Oikos,* **61**, 412-430. Twigg, L.E., and Parker, R.W. (2010). Is sodium fluoroacetate (1080) a humane poison? – The influence of mode of action, metabolism, and target specificity. *Animal Welfare* **19,** 249-263. Twigg, L. E., and Socha, L.V. (2001). Defluorination of sodium monofluoroacetate by soil microorganisms from Central Australia. *Soil Biology and Biochemistry* **33,** 227-234.	These recommended corrections and changes have all been incorporated into the Implementation Plan.

Appendix 3: Responses from RTA Weipa Ltd. on the Provisional Review Report *(dated 14 April 2016).*

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
Background		
17	As part of the approval process for the Amrun project (i.e. *South of Embley Project)* on western Cape York, management plans/strategies were developed to protect turtle nests and hatchlings from predation, particularly that inflicted by feral pigs. However, under the EPBC Act, the final approval of these plans requires that they are reviewed by an independent expert. This document provides a written review of the developed plan: *the Feral Pig Management Offset Strategy- Implementation Plan* (dated 14th April 2016), which was undertaken by LET Consultants in April 2016. The Review utilised 'desktop study' methodology, and a site visit to Cape York was not undertaken. It was conducted according to the criteria listed in Appendix 1. As requested, this review only considered those sections dealing specifically with the reduction of feral pig predation on turtle nests and nestlings. Also note that this review is provided in a format that may be suitable for tabulation at the request of Rio Tinto. Consequently, a Table of Contents, and the other more common report Sections, have not been included in this report.	Noted
Executive Summary		
18	To the best of my knowledge, the *Feral Pig Management Offset Strategy- Implementation Plan* developed is consistent with the stated requirements of the relevant Acts, Recovery Plans, Threat Abatement Plans, and Codes of Practice, although it is somewhat unusual in that it aims to mainly target alpha males in the first year rather than specifically aiming for an overall population reduction. Alpha males are thought to inflict a disproportionate level of predation on turtle nests. The successful implementation of the actions described in the Plan will add to the current knowledge of feral pig biology, control, and impacts in a tropical climate - a region about which there is limited knowledge. The proposed actions in the Implementation Plan generally follow accepted practice and are likely to be successful in reducing the impact of feral pigs on turtle productivity, particularly as an adaptive management approach is to be adopted. However, *I believe the timing of the*	Noted Refer to response below Refer to response below

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	initial knockdown in each year requires further consideration. This is because it seems that pig carcases are to remain *in situ*, and these are likely to attract other predators and scavengers to the targeted areas, potentially resulting in additional predation of nests and hatchlings (see below). The frequency of shooting campaigns also requires careful consideration. Aside from the timing of the initial knockdown, the following comments mainly involve points of clarification, suggest minor modifications, provide additional information, or suggest other considerations to enable a long term reduction in the abundance of feral pigs to be achieved. The feasibility of these suggestions is probably best decided by those directly involved in the *Feral Pig Management Offset Strategy- Implementation Plan*, including those undertaking the feral pig control program. Hopefully, these comments will assistance with finalising the Plan so that the likelihood of achieving the stated goals is maximised.	Refer to responses below
Timing: Start the feral pig control program before turtle nesting reaches its peak.		
19	*Rationale:* I could find no information on how pig carcases are to be dealt with, nor on how many pigs are expected to be destroyed during the initial knock-down. However, it is recognised that removing pig carcases from the control area/s is likely to be impractical due to the type of terrain and the associated costs involved. Consequently, these pigs will remain as a food source for a range of animals and are likely to attract other predators into the controlled areas. These would include, but are not limited to, other feral pigs, wild dogs/dingoes, goannas, some birds of prey, and possibly, some scavenging sea-birds (take nestlings and uncovered eggs). It is possible that such a response could result in the overall level of predation being maintained even though feral pig numbers have been reduced, at least in the short term. Obviously, this will depend upon the number of feral pigs killed (i.e. carcases present), but I anticipate this will be in the 100s in the first year. *Thus, I feel the timing of the initial knockdown may require further consideration.* Irrespective of habitat type (i.e. tropical, Mediterranean), feral pig carcases are known to degrade rapidly and become inedible food items to most vertebrates within 4-10 days (Twigg *et al.* 2005b). Thus, commencing the	It is agreed that timing is a trade-off. Feral pigs are clearly the primary predator of turtle nests in this area and the plan proposes that timing of shooting will be reviewed annually to target the time when the majority of predating boars will be operating on the beaches. Any increased nest predation from goannas and dogs would be expected to be short term, decreasing in line with decreased pig numbers. Predation by other animals will be monitored by nest cameras (This has been clarified in Section 3 of the Implementation Plan), if required, the program will consider adaptive management measures (e.g. alteration of timing of feral pig control activities). The incubation period for turtle eggs is generally between 50 to 80 days. Given feral pig carcasses degrade rapidly (within 4-10 days) (Twigg *et al.* 2005b), the carcasses would not likely attract predators of hatchlings from eggs laid during the peak nesting season. Feral pig carcass retrieval was considered impractical across the entire control area.

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	initial knockdown each year around 2 weeks before turtles are expected to start laying would largely overcome the potential for increased predation resulting from the presence of pig carcases. It is recognised that control activities may need to be conducted further from the beach as some pigs do not seem to regularly patrol the turtle nesting areas until eggs are being laid. It is also accepted that earlier commencement may not be feasible for all target areas. Clearly, the timing of the control program will need to be a trade off between maximising the number of pigs killed and the total level of protection actually provided to turtle nests and hatchlings. This would be best determined by those implementing the feral pig control program.	Feral pigs shot on the beach (predominantly adult males) will be a small proportion of the total feral pigs killed during control activities (estimated to be approximately 100 or less, and not 100s - refer to estimate in response to below).
Area of control: Expand the targeted control area/s		
20	The rationale for mainly conducting the control program within 2 km of the beach/nesting areas is understood. It was also stated that the large adult males would be preferentially targeted as such pigs seem to cause a disproportionate amount of predation. However, such males are also capable of travelling over 20 km to favoured food resources and a control effort only within '2 km' of the beach may or may not remove these males. Personally, I feel that the 500 m to 2 km aerial shooting 'zone' may be to narrow to achieve the stated outcomes. Thus, I recommend that areas to be controlled include other relevant sites further inland where possible, and as practical. The control area may be able to be expanded in future years as pig numbers are reduced, which may free up some resources. An expanded control area would help to reduce immigration by other feral pigs, particularly if a large pig-free buffer zone could ultimately be created out towards Ward river. It is recognised that such an approach may not be possible within the first few years of the Implementation Plan. It is also recognised that such an approach may be cost prohibited and would need to be at the discretion of RTA Weipa/RIO Tinto. The use of a helicopter survey immediately prior to control operations to establish where feral pigs are most abundant (logged to a GPS) is a sensible approach as this will complement the data already collected on damaged turtle nests. It will also help with setting control priorities.	Changing the approved control zone is outside the scope of the Implementation Plan. Targeting control efforts along the beaches has already been approved in section 4 of the FPMOS (below). Section 4 of the approved Feral Pig Management Offset Strategy identified that: *The South of Embley Project Environmental Impact Statement (RTA 2013) contemplated extending feral pig control from beaches to certain riparian hinterland areas (refer to map in Appendix B) based on the assumption that feral pigs would travel large distances from inland to the nesting beaches. The findings of Fuentes et al 2014, Whytlaw et al 2013, Mitchell 2006 and Mitchell 2010 indicate that targeting control efforts along the beaches is a more effective use of available resources. It is therefore proposed to concentrate controls on the coastal zone.* While the commitment to concentrating controls on the coastal zone has already been approved by the Department of Environment, the plan identifies that control activities may then be expanded to inland water sources (as shown on Figure 2) if resources are available The last paragraph is a repeated comment from Monitoring. The response is detailed below and not repeated here.

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
Number of feral pigs needing to be destroyed		
21	Whilst appreciating that the actual number of feral pigs inhabiting the targeted areas is unknown, I feel some 'guesstimate' as to the likely number needing to be destroyed during the initial knockdown in Year 1 would be beneficial and help readers to place things in better context. I therefore suggest that such a statement is included within the Plan. I assume these numbers will be 150+ in the first year. Mention of the actual size of the pig reduction zone (i.e. x ha) would also be beneficial.	Research data has documented pig populations in coastal areas on Cape York: • 40/km² - south of Aurukun. Dexter, N. (1990). Population density and management of feral pigs at Aurukan north Queensland. Canberra, Bureau of Rural Resources. • 9/km² Rutland Plains. Cape York Weeds and Feral Animal Program. Internal report • 4/km² and 3/km² at Lilyvale and Lakefield NP. Mitchell, J. (1998). The effectiveness of aerial baiting for control of feral pigs in north Queensland. *Wildlife Research*. **25** (3) 297. All of these densities were for more preferred marine plains and associated coastal swamp habitats and not for beach frontage areas. Assuming a reasonable estimate of 4 / km² then 480 pigs may inhabit the 2km wide x 60km long coastal strip targeted within the FPMOS. Adult boar population densities are a low proportion of this total population, expected to be less than 1 /km² or approximately 100 boars or less. This has been added to Section 1 of the Implementation Plan.
Age class targeted: Aim for a long term reduction of the feral pig population		
22	While appreciating that the short term goal is reducing the number of large adult males in the targeted areas, this alone will not result in a long-term reduction in feral pig numbers and hence may not reduce the long term level of predation. It is the adult females who actually produce the young, so a control program which targets all pigs is more likely to ultimately result in a sustained reduction in the feral pig population. A sustained reduction is likely to result in three main things, fewer large adult males, less feral pigs overall, and a reduction in the learned behaviour that the turtle nests provide a ready food source. Consequently, the short term goal of reducing the number of alpha males present should not preclude the need to gain an overall reduction in the numbers of feral pigs in the longer term. Because of their often cryptic and cautious behaviour, targeting large (alpha) males during a shooting campaign may be difficult depending upon the amount of vegetation cover where	The first and second paragraphs of the comment have misinterpreted the program, as clarified below. The second paragraph is also partially repeated in comments on aerial and ground shooting. Comments on bait stations can be added to the bait station comments. The same response would otherwise be repeated by duplicating the comment here. The implementation plan identifies that the shooting activities will target mature males through focusing efforts on high priority beach sections, however the plan also states that the shooting programs will aim to eradicate all pigs found in these high priority areas (Section 1, Section 2.1 and Section 2.2) . In addition, the bait stations will provide a wider population control.. Therefore the program proposed aims to provide for both shorter term reduction in feral pig predation of turtle nests and also longer reduction in pig population. The available research supports targeting mature males inhabiting

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	these pigs reside and feed. In fact, poison baiting (see Twigg *et al.* 2005a; 2006) may provide a more reliable option for removing the desired numbers of these pigs so as to obtain a reduction in the predation levels on turtle nests and nestlings. It is recognised that an adaptive management approach is to be used, and that some alpha males should be destroyed by shooting from the hides on the beach, but some backup method for targeting these males (e.g. 1080-baiting) needs to be in place should the shooting campaign not produce the desired outcomes. Because of the cautious behaviour of these pigs, bait stations specifically aimed at removing large adult/alpha males should be kept as simple and natural as possible (e.g. pre-feed and toxic bait simply placed on raked track plots next to adjacent shelter) as these pigs are less likely to feed at the artificial hoppers. As recognised in the Plan, it is also worth remembering that a small number of pigs can do considerable damage in a single nights feeding session, including rooting up vast areas. Consequently, feral pigs may need to be driven to fairly low numbers to achieve the targeted 70% reduction in damage to turtle nests within 3 years.	the beach zone as the method with the highest likelihood of reducing predation on turtle nests. The use of non-target specific baiting techniques including placing toxic bait outside of target specific feeding hoppers has been discounted due to potential for impacts to other wildlife. Age class of feral pigs and presence of other native animals at the feeding stations will be monitored by cameras and during shooting activities to the extent possible and if required the program would consider adaptive management measures (e.g. alteration of baiting methods). The third paragraph is more related to the comment above about Number of feral pigs needing to be destroyed and can be moved to the comment above easily. Noted. The aim is to achieve a total eradication of adult males in the control zone each year. If this is achievable then any nest predation would be by "late comers", probably sub-adult males who would be targeted in subsequent years.
Learned behaviour		
23	It was readily recognised by the Implementation Plan that learned behaviour and changes in home range use were important aspects of the behaviour of feral pigs in this region. Thus, as the Plan is implemented, a sustained long term reduction in feral pig numbers should result in less feral pigs recognising that the turtle nesting beaches provide an easy food source thereby ultimately reducing predation rates on turtle nests and hatchlings. As I am sure all are aware, large adult male pigs can be cryptic and extremely hard to shoot or trap. You usually only get one go at each individual pig, so those undertaking the control need to be as sure as possible they are going to be successful at their first attempt. Similarly, it is well recognised that persecution of a pig population, particularly with aerial shooting, can markedly effect pig behaviour. Surviving pigs may disperse, hide, or change their feeding patterns to avoid the control efforts and this can impact upon efficacy (Choquenot	There is no evidence that aerial shooting has been conducted in this area so pigs are not expected to become habituated to the danger of helicopter noise and associated aerial shooting quickly. The aim is to achieve a total eradication of adult males in the control zone each year. This will reduce the number of "teachers" so the number of boars who have learned nest predating behaviour may be reduced over time. This has been clarified in Section 2.1 of the Implementation Plan. It has been confirmed that one shoot per year is proposed.

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	et al. 1996). Thus, the frequency of shooting campaigns will need to be an important consideration. A combination of aerial shooting, ground shooting, and poison baiting are to be used as part of the Offset Plan strategy. However, it needs to be mentioned exactly how this is to occur. It is usually quite counter-productive to use two different control techniques (e.g. shooting and baiting) in the same area simultaneously, as this can often result in poor overall efficacy of the pig control program. For this reason, follow up control with 1080-baits is not usually undertaken until some time (weeks?) after any aerial or ground shooting exercises have been completed, and possibly vice versa.	The Implementation Plan identifies that Bait stations will be used over an approximate two month period from the start of the season (early to mid-August), and shooting over a period of days (aerial shooting) or weeks (ground shooting) commencing approximately 2 weeks after the start of the turtle nesting season. The overlap during the peak nesting season will be minimal. There is also opportunity for baiting activities to occur before or sometime after the shooting activity, as required.
Aerial and ground shooting		
24	Most shooting campaigns, particularly aerial shooting, are most successful when a grid system is used to systematically cover the target area, rather than using an ad hoc, random approach. Feral pigs are generally most active at first and last light, and often seek shelter once sunrise has occurred. Consequently, any shooting campaigns are best conducted during these times, which is generally the approach recommended in the Implementation Plan. However, I am not optimistic that the alpha males will be 'flushed out' into open ground (away form the beaches) by the helicopter during the aerial shooting campaigns, as such individuals often 'go to ground' and are difficult to locate. Our experience is that poison baiting accounts for more of these large adult males. The use of hides along the beach should enable some of theses males to be destroyed, however. The use of an adaptive management approach is probably the only viable option to achieve the desired outcome of removing alpha males. There is a need for more clarity regarding both the within and between frequency of the shooting campaigns for each separate targeted location. It appears that each selected priority area will be targeted for 2-4 consecutive days, but how many days are allowed before the next cycle of shooting occurs. Allowing sufficient time between shoots will help with reducing the learned aversion behaviour mentioned above. Or, is only one 'cycle' to occur per site, per year?	As identified in the FPMOS, the proposed program has been developed following aerial inspection of the Project area by a feral pig control expert and the flushing method has been recommended for the Project area based on success of this activity in control programs on Cape York, including Lakefield National Park (*J. Mitchell pers. comm.*). This has been added to Section 2.1 of the Implementation Plan. It is acknowledged that most shooting programs do not use this approach as they are generally after large numbers of shot pigs to justify the funding. Generally flushing is more time consuming, more expensive and yields lower numbers of total pigs shot. The flushing approach is proposed here as the aim of the shooting program is to target the primary cause of turtle nest predation, mature boars. Shooting will be conducted in daylight hours as the search and destroy method does not need the pigs to be active. However the majority of shooting will be concentrated at dawn and dusk. Shooter and pilot compulsory rest stops will need to be considered. Cameras selectively located at bait stations and turtle nests will provide for monitoring before and after the shooting program. In addition, the shooting program itself will allow comparison between the number of pigs shot with the number of pigs recorded in camera's before the shoot. This has been clarified in

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	Ground shooting is to occur over approximately 2 weeks, but this will depend upon 'the level of pig control achieved' (Page 65). How will this be known unless formal before and after control surveys are conducted. Probably needs to be clarified a bit more in the Plan.	Section 3 of the Implementation Plan. An adaptive management approach is proposed which uses the data from the monitoring plan. It has been Confirmed that one shoot per year is proposed.
Follow up control		
	Although the need for follow up control is mentioned in the Plan, the timing of this has not been indicated. It is recognised that this is likely to vary depending upon seasons and control outcomes, however, I believe some follow up control should be implemented at the end of the dry season. Food, water, and shelter are likely to be at their lowest at this time which may aid the destruction of the more recalcitrant pigs. This should take place *even* if turtle nests have hatched, and the hatchings have dispersed, as any benefits gained are likely to carry over into the following year/nesting season.	It has been Confirmed that one shoot per year is proposed. The only reference to a follow-up control is the reference to free feeders being followed by toxin feeders. The timing of this is detailed in the plan.
Non-toxic feeding stations		
25	Fermented wheat is to be used as an attractant next to the stations/feeders containing the non-toxic PIGOUT baits. However, soaking wheat for 5 days to prepare the fermented wheat is too long as only 24-48 h is usually all that is required. The addition of a small handful of smelly (i.e. not de-odourised) blood and bone next to the fermented wheat can also increase the attractiveness of this well recognised census baiting technique for feral pigs (Saunders et al. 1993; Twigg et al. 2005a; 2006). If the take of non-toxic PIGOUT bait is less than ideal, then a cereal replacement, preferably wheat, could be used. The feral pigs would then need to be 'switched' onto the toxic PIGOUT baits, which has been done successfully in the past (Cowled et al. 2006). Alternatively, a wheat-based bait (Twigg et al. 2005a; 2006) could be considered if PIGOUT baits are not readily accepted by pigs. However, note that grain may also attract granivorous birds which could become an unwanted non-target species.	The comment about 5 days being too long is not substantiated. Cape York experience indicates that there is no limit to the soaking time for grain. *The grain can be fermenting over long periods in these drums without any adverse effects as long as water is covering the grain. In my experience the longer the fermentation the more pungent the smell. I have used fermented grain over 1 year old – the alcohol in the fermentation preserves the grain (*J. Mitchell *pers. Comm*). It is acknowledged that blood and bone may be an effective attractant and will be considered for use in addition to fermented grain. This has been added to Section 2.3 of the Implementation Plan. Use of fermented grain in conjunction with the non-toxic PIGOUT baits within free feeders is expected to overcome the reluctance of pigs to eat the PIGOUT baits and is in accordance with the Standard Operating Procedure for PIGOUT baits (NSW DPI 2015). The use of non-target specific baiting techniques, including placing toxic bait outside of target specific feeding hoppers, has been discounted due to potential for impacts to other wildlife.

#	Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants	RTA Weipa Pty Ltd response to review comments
Poison baiting		
26	To be successful, any baiting program *must* be well planned and well conducted with a dedicated and disciplined approach. Successful baiting programs also require consistent pre-feeding/bait take before the toxic baits are introduced, so the 3 days allowed for pre-feeding may need to be extended until the pigs are readily accepting non-toxic bait. As the Plan is aware, failure to get adequate pre-feeding rates usually results in poor efficacy outcomes. Although it can be labour intensive, baiting with 1080-poisoned wheat has been shown to be the most successful control option for reducing feral pig numbers in northern (tropical) Western Australia (see Twigg *et al.* 2005a; 2006). This method achieved a high knockdown of pig numbers over a relatively large area in only a few weeks (2-3). This approach could be considered if the use of PIGOUT baits does not achieve the desired outcomes. 1080-concentrates are registered for use on grain for feral pig control in Queensland (APVMA 2016). It is suggested that the feeding stations may be used for both shooting or toxic baiting operations (Page 61). However, it would be unwise to undertake these activities simultaneously at the same site. The shooting of pigs at active bait stations is likely to change the behaviour of the remaining pigs such that these bait stations effectively become inoperable. A brief comment clarify this situation would be beneficial.	The pre-feeding time is longer than 3 days. The Implementation Plan identified that pre-feeding will occur from free feeders until pigs are constantly feeding at a free feeding site then a toxin feeder will be introduced. Once toxin feeders are introduced the pre-feeding will continue until the pigs are consistently feeding for 3 days. The use of non-target specific baiting techniques including placing toxic bait outside of target specific feeding hoppers has been discounted due to potential for impacts to other wildlife. Feeding stations are to be used as a monitoring tool, as a toxic baiting tool and also as a lure for shooting tool. There is no evidence to recommend that the three uses won't be complementary over the time frame of the control program. The success of each use will be monitored through field cameras and an adaptive management approach taken if necessary. The shooting program will also primarily target pigs within the beach zone and at waterholes adjacent to the beaches that are the primary cause of turtle nest predation.
1080 use		
27	I believe it would be useful to include some brief information justifying the use of 1080-baits to control feral pigs. For example, the use of 1080 in vertebrate pest control has been extensively researched in Australia and New Zealand and has been found to be target specific, humane, efficacious, cost effective with no environmental persistence or long-term effects on non-target populations (see Seawright and Eason 1994; Twigg and King 1991; Twigg and Parker 2010). The toxic principle of 1080, fluoroacetate, also occurs naturally in 3 genera of Australian plants with one species occurring on Cape York. It has also been demonstrated that native animals with evolutionary exposure to this fluoroacetate-	Further information justifying the use of 1080-baits to control feral pigs has been added to Section 2.3 of the Implementation Plan. Can the plant occurring on Cape York be confirmed, so as to confirm its relevance to the Project area. This information has not yet been added to the plan.

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	bearing vegetation have developed varying levels of tolerance to fluoroacetate (1080), thereby often providing them with an additional safety net during 1080-baiting operations (Twigg and King 1991). A range of microorganisms also readily degrade 1080 into harmless by-products (Seawright and Eason 1994; Twigg and Socha 2001).	
Monitoring		
28	The techniques planned to monitor the success of the Plan are appropriate, including the use of remote sensing cameras. The suggestion that formal aerial surveys be undertaken before and after control operations is strongly supported as such data would provide valuable information of the efficacy of feral pig control in this habitat. Currently, there are limited data on feral pig biology and control in these types of habitats. The use of a pre-control helicopter survey to determine where pig density is high will be an important, and economical, part of helping to set control priorities. The use of strategically placed track plots (e.g. on pads), without attractants or bait, and which are formally monitored, may also help to determine the presence absence, and possibly the age class, of pigs. Where practical, routine raking of the soil around the feeding/baiting stations may also help determine if, and what, feral pigs remain. One area that does not seem to be covered in the Plan, however, is whether any biological measurements or samples are to be collected. For example, a record of the age, sex, breeding condition, general body condition etc. of destroyed pigs would be useful additional information to collect even if this is not undertaken for all sites or all pigs (i.e. predetermined sub-sampling techniques are used). Data handling and storage are going to be very important during the implementation of the Plan, and mechanisms, including backup procedures, to facilitate this need to be put in place before the Plan is implemented. Prior attention to data collection and storage will also aid the production of the necessary reports and publications.	Noted Cameras will be the primary monitoring tool for the program, however raked track plots can be used to support the camera monitoring. This has been added to Section 3 of the Implementation Plan. Cameras will allow for biological monitoring specifically sex and age class of the feral pigs as well as presence of other animals. This has been added to Section 3 of the Implementation Plan. All collected data should be stored on the RTA Weipa Pty Ltd GIS system or filing system which is routinely backed-up in accordance with company IT policies. Contractors engaged for field work will be contractually required to have comparable polices for data handling and storage.
Animal welfare		
29	The inclusion of statements regarding the accepted practice and standards for each control option, in addition to that provided in Section 5, page 14 of the Plan, was a sensible	The suggested addition has been added to Section 2.3 of the Implementation Plan.

#	**Amrun Project – Feral Pig Management Offset Strategy Implantation Plan Independent Review by LET Consultants**	**RTA Weipa Pty Ltd response to review comments**
	approach. Including such statements helps to reassure the general public that Rio Tinto takes such matters seriously, and that Rio Tinto is aware of its obligations in this area. The only other addition I would suggest here involves 1080 use; you could add: The use of 1080 products will be in accordance with the label directions for these products in Queensland.	
Success of the Plan		
30	The Plan has a target of a 70% reduction in the predation of turtle nests by feral pigs within 3 years, but is it possible to estimate what effect this outcome would have on overall predation rates? Are steps needed to ensure that the reduced predation by feral pigs is not simply replaced by predation by other species, such that current predation levels are maintained. Or, as predicted in the Plan, feral pigs are the key predator of turtle nests and removing this threat will result in overall positive benefits to turtle reproduction. I feel a brief comment around these points could be made in the Introduction on Page 61. If the Plan results in a sustainable, long-term reduction in the numbers of feral pigs in the region, then there are likely to be benefits to other fauna and some flora, in addition to those obtained by turtles. This could be mentioned (or cross referenced) within the Plan, with care not to overstate this aspect, as it would add to RIO Tinto's 'environmental credits'. Also, is there a need for an alternative approach if the current Plan does not prove to be as successful as hoped in reducing predation of turtle nests? That is, what other options could be considered to reduce the impact of predation on turtle reproductive success. Strategic fencing comes to mind, but it is likely to be cost prohibitive. Sustained trapping may also be a future option if needed, but trapping can be labour intensive and is unlikely to remove all pigs. Any trapped pigs must be destroyed humanely. Switching to a wheat-based baiting program (see Twigg et al. 2005a; 2006) may be appropriate if the acceptance of PIGOUT baits by feral pigs is not as high as hoped.	This is outside the scope of this review. The scope of this Implementation Plan is the selection of which feral pig control approach, or combination of approaches, is best suited to the SoE Project situation, as detailed in Section 5. Noted. The additional environmental benefits were considered and noted in the EIS. These additional benefits have not been repeated in the Implementation Plan in order to focus on the feral pig control activities to offset impacts to turtle nesting. The start of Section 2 identifies why the proposed methods are considered to be the most effective. The Plan proposes two complementary methods and attempts to balance the positives and negative of each method. The plan commits to adaptive management and includes an extensive monitoring program to support this. Section 2 has been updated to note that the other control methods were considered but are considered less effective given the Cape York location, resourcing requirements or, in the case of aerial baiting is non-target specific. Wheat based-baiting comments are repeated from the comments above.

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