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Reference: 18/1/2/**R019**/2/10
Date: 19 October 2018

Thesen Island HOA

INVASIVE PLANT SPECIES CONTROL & REHABILITATION RERPOT

Erf 13840 & Erf 16435, Knysna, 6570.

In terms of the National Environmental Management Biodiversity Act, 2004 (Act no. 10 of 2004), the Invasive Species Regulations (GNR 598, October 2014) and the Alien and Invasive Species Lists (GNR 599, October 2014).

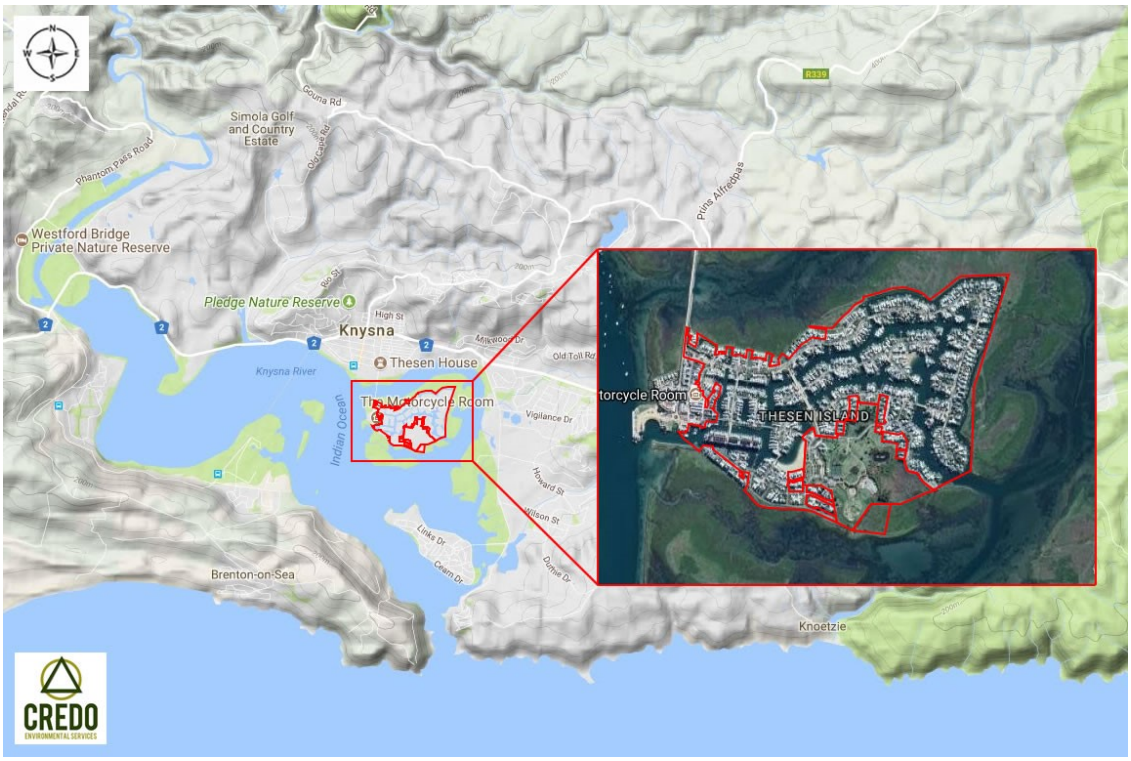

Figure 1: Locality map with the Focused area on Thesen Island HOW (red boundary), Knysna.

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DEPARTMENT OF ENVIRONMENTAL AFFAIRS
BIOSECURITY - COMPLIANCE

_____

Date: _____

SPECIAL CONDITIONS OF THIS REPORT:

This report is submitted for the *Invasive Plant Species Control & Rehabilitation Report* for the *Thesen Island HOA*, Knysna, 6570. The methodology, findings, results, conclusions and recommendations in this report are based on the author's best scientific and professional knowledge, and on referenced material and available knowledge. *Credo Environmental Services* reserve the right to modify aspects of the report, including the recommendations and conclusions, if and when additional relevant information becomes available. *Credo Environmental Services* is indemnified against any claim for damages that may result from any publication of specifications, recommendations or statements that are not administered or controlled by *Credo Environmental Services*.

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I, Rudi Minnie (ID 8606045155088) of *Credo Environmental Services*, do hereby declare that I am financially and otherwise independent of the client and their consultants and that all opinions expressed in this document are substantially my own.

RJMinnie

CONTENTS

1 INTRODUCTION

Property name: Thesen Island HOA
Erf number: 13840 & 16435 (*Project area*)
Property size: Roughly 65.803 ha
Landuse: Urban development
GPS: Lat: 34° 03'01.39"S | Lon: 23 ° 03'15.02"E

Name and contact details:

- Mr. Paul Burchell
- Thesen Island HOA
- Tell: (+27) 044 382 2192
- Email: gm@tihoa.co.za

Figure 2: Thesen Island HOA, Knysna (red boundary lines).

The Thesen Island HOA (**TIHOA**) is managed by a Board of Trustees while the day-to-day activities are delegated to a team of seven (7) individuals that is headed by Mr Paul Burchell. ***Credo Environmental Services*** has been appointed by ***Mr. Paul Burchell*** on behalf of the TIHOA (hereinafter referred to as **the Applicant)**, as an independent environmental specialist, to help inform and draft an Invasive Plant Species Control & rehabilitation Report for Erf 13840 & Erf 16435 (hereafter be referred to as **the Project area**).

The TIHOA manages the majority of Thesen Island, which is situated in the Knysna Estuary. Thesen Island is connected to mainland via Long street. The project area is the majority of Thesen Island (Figure 2, see red lines) and only excludes the western most part of the Island.

During a site inspection on 14 August 2018 by ***Credo Environmental Services*** it was confirmed that Alien Invasive species has established on the property and that a control plan was necessary to prevent the Applicant from failing to comply with the duties as set out in section 73(3) of the NEMBA. Controlling these invasive species will prevent them from spreading to other parts of Knysna and secure the ecological diversity provided by the indigenous species currently surrounding the greater Knysna area.

2 PURPOSE AND SCOPE OF THE CONTROL PLAN

The purpose of this invasive plant control plan is to ensure compliance with the National Environmental Management Biodiversity Act, 2004 (Act No. 10 of 2004) (NEMBA) and the Invasive Species Regulations (October 2014) by controlling listed invasive plant species. Having biodiversity experience and knowledge, while understanding ecological processes is some of the skills required to compile and review this Invasive Alien Species Control Plan.

The construction of Thesen Island started in the mid-2000's. Today, Thesen Island is a multi-award winning marina development consisting of 19 man-made islands and is situated in the scenic Knysna Estuary. The marina consists of 512 individual houses and 56 apartment units. As mentioned before, TIHOA manages the majority of Thesen Island (see figure 2) and day-to-day operations is headed by Mr Paul Burchell (General Manager). The marina is a high density urban development with little natural area between the man-made islands, however, large open spaces surround the club house. These open spaces consist of natural gardens, ponds and foot paths. On the eastern side of these open spaces is the Bird Reserve which can be considered as natural habitat. The Bird Reserve is fenced off and no access is allowed.

The size of the project area (65.8 aha) requires an implementation timeframe stretching over the recommended period of 10 years. However, since no Directive (for non-compliance) was issued by the Department of Environmental Affairs and since the natural or near-natural area make up less than 50%, it is recommended that the control plan stretches over a period of 5 years (November 2018 – October 2023, see AIS control schedule). This allows the Applicant to systematically phase out the Alien Invasive plant Species (AIS) and rehabilitate the property with indigenous species (where required). This phasing out approach will provide the indigenous vegetation the necessary time and protection to become established while preventing any relapse of AIS to re-establish. The plan applies to the entire project area (Erf 13840 & Erf 16435) and comprises of invasive plant species (both alien and indigenous). For the purpose of managing and controlling the AIS on the property and monitoring progress and costs, a map was created for all AIS on the property and must be read with the AIS control plan for each of the nine (9) management units (See figure 3).

Figure 3: Map showing the Management Units on the Property.

The species, extent and size classes depict the prioritisation, control schedule and estimated the cost of control. As mentioned above, it is suggested that the property is divided into nine (9) smaller Management Units (MU) in order to practically approach the invasive level and the financial costs of the eradication process. Follow up control is a long-term process and needs to be conducted at regular intervals to secure the investment of initial clearing. The purpose is to take all the required follow-up steps to achieve the desired result. The desired result should be determined for each Management Unit individually, but also as an overarching objective for the entire property.

The entire project area is mapped as **Cape Estuarine Salt Marshes (AZe2)** (see figure 4), however, through ground-truthing during the site inspection on 14 August 2018, found that only the perimeter of the Island is the originally mapped Cape Estuarine Salt Marshes, as that is the only part that is directly influenced by the open-mouth estuary that experience tidal fluctuation. Furthermore, the Bird Reserve more likely represents **Southern Cape Dune Fynbos (FFd11)** vegetation type, with the remainder of the project area made up of the built up urban area.

Alien invasive plant species have dispersed in the project area over the years, as have been the case in the surrounding greater Knysna area. There are also numerous private residential properties in TIHOA that possess listed invasive alien plant species. Although this report does not focus on the listed invasive alien plant species on the aforementioned private residential properties, those species are recorded and listed below in Table 1. It should also be clarified that no private property was entered nor focused, merely species noted as the survey was conducted on the project area were added. It is strongly recommended that the TIHOA inform private residential property owners of the listed invasive alien plant species that are in contravention of the NEMBA.

TIHOA is in possession of numerous *Encephalartos spp.* that are listed as Endangered or Critically Endangered and requires possession permits from CapeNature (Western Cape Nature Conservation). Legal possession of these remarkable species is encouraged and Credo Environmental Services commend TIHOA for being in possession of these endangered plants.

Figure 4: The area surrounding Thesen Island represent **Cape Estuarine Salt Marshes (AZe2)** and not the Island itself.

3 LISTED INVASIVE ALIEN PLANTS PRESENT ON THE PROPERTY

The Alien Invasive Species (AIS) were identified on the property during the site visit carried out on 14 August 2018. The NEMBA listed AIS present on the property are recorded in Table 1, according to scientific names, common names and the category listed in the NEMBA Alien and Invasive Species list (October 2014). As this Control Plan stretches over 5 years, the list must be updated when more baseline information is collected and updated with every 6 to 12 month cycle review.

No invasive animals were observed during the site assessment. Surveys to detect invasive invertebrates were not conducted and should any invasive invertebrate species be detected, the Department of Environmental Affairs should immediately be informed. AIS present on the property were identified along with their size and the extent of the infestation.

A monitoring program will be implemented to detect and remove new and/or secondary invasions as and when they occur. The AIS list will be updated regularly to include new and/or secondary infestations as and when detected.

Table 1: The NEMBA listed AIS present on the property.

Species	Common name	NEMBA Category
Acacia cyclops	Red eye	1b
Acacia melanoxylon	Australian Blackwood	2
Acacia saligna	Port Jackson	1b
Agave americana	Sentry plant	3
Agave sisalana	Sisal	2
Anredera cordifolia	Madeira-vine	1b
Canna indica	Indian Shot	1b
Cestrum sp.	Cestrum	3
Cereus hildmannianus	Hedge cactus	1b
Cereus jamacaru	Queen of the Night	1b
Furcraea foetida	Mauritius hemp	1a
Hedera helix	English Ivy	3
Malva dendromorha	Tree mallow	1b
Myoporum sp.	Manatoka	3
Opuntia ficus-indica	Sweet prickly pear	1b
Opuntia microdasys	Bunny-ear Cactus	1b
Populus alba	White Poplar	2
Schefflera arboricola	Dwarf umbrella tree	3
Senna didymobotrya	Peanut butter cassia	1b
Tradescantia fluminensis	Wandering Jew	1b
Vinca major	Greater periwinkle	1b

Agave attenuata	Foxtail
Fumaria officinalis	Common fumitory (aggressive weed)
Kalanchoe sp.	
Melilotus indica	Annual yellow sweetclover
Polypodium aureum	Rabbit-foot Fern
Pteridium aquilinum	Bracken Fern (poisonous)
Vinca rosea	Madagascar periwinkle
Vitex agnus-castus	Abraham's Balm
Yucca filamentosa	Adam's needle

Equisetum hyemale	Snake grass	1a
Ludwigia peruviana	Peruvian water primrose	1a
Pistia stratiotes	Water lettuce	1b
Pontederia cordata	Pickerelweed	1b

	Listed as Category 1a (see below)
	Not currently listed, but is recommended to be monitored
	Previously recorded on Thesen island

The NEMBA Regulations classify alien invasive species in four (4) categories, however, the species found on the property comprise of only three (3) of the four (4) categories. See the four (4) categories:

Category 1a Listed Invasive Species

- A species which must be combated or eradicated.
- A person in control of a Category 1a Listed Invasive Species must-
    - immediately take steps to combat or eradicate listed invasive species;
    - allow an authorised official from the Department of Environmental Affairs (DEA) Biosecurity to enter onto the land to monitor, assist with or implement the combating or eradication of the listed invasive species.

Category 1b Listed Invasive Species

- A species which must be controlled.
- A person in control of a Category 1 b Listed Invasive Species must-
    - control the listed invasive species;
    - allow an authorised official from DEA Biosecurity to enter onto the land to monitor, assist with or implement the control of the listed invasive species.

Category 2 Listed Invasive Species

- A species which require a permit.
- A person in possession of a permit, must
    - ensure that the specimens of the species do not spread outside of the land or the area under their control;
- Category 2 species without a permit, must be controlled.
- Category 2 species occurring within a riparian area or protected area, must be controlled.

Category 3 Listed Invasive Species

- A species which are subject to exemptions and prohibitions.
- Any plant species identified as a Category 3 Listed Invasive Species that occurs in riparian areas, or protected areas must be controlled.

4 EXTENT OF THE INFESTATION

The site was visited on 14 August 2018 and a survey of the TIHOA area was conducted by Credo Environmental Services. Various characteristics of the property were photographed, while numerous invasive alien species were observed and identified. The northern, eastern and southern boundaries of the project area are the Knysna Estuary, while the western boundary borders urban development on Thesen Island (see figure 2 & 3).

The majority of the project area is as mentioned, high density urban development with little natural area between the man-made islands, however, large open spaces surround the club house. Due to the high density urban development, 'low' levels of AIS infestation were encountered in the project area. Most AIS encountered were individual species that were planted, unlike the vast and dense infestation levels of AIS currently seen re-growing /re-establishing in the 2017-burnt area around the greater Knysna.

As mentioned before, only the vegetation surrounding Thesen Island represents **Cape Estuarine Salt Marshes (AZe2)**. The vegetation on the island itself might represent a different vegetation type as the island is elevated from the surrounding Cape estuarine salt marshes. Terrestrial vegetation on Thesen Island might have historically represented the same vegetation type currently experienced in the Steenbok Private Nature Reserve, on the neighbouring island, Leisure Island. It is strongly recommended that TIHOA monitor the surrounding estuarine salt marshes for *Spartina alterniflora*, an aggressive Category 1a AIS found at Great Brak Estuary.

The property is divided into nine (9) smaller Management Units (see figure 3). The extent of the AIS was captured as a percentage overall infestation for each of the management units (see table 2). Each management unit (MU) was given an alpha-numerical unique identity, starting with the letters TSI (Thesen Island) followed by numeric 001 to 007.

Table 2: Total AIS infestation per management unit (1).

MU	Extent of overall invasion (%)	Comment	Risk
TSI 001	2%	The management unit is predominantly urban development.	Low
TSI 002	2%	The management unit is predominantly urban development.	Low
TSI 003	2%	The management unit is predominantly urban development.	Low
TSI 004	2%	The management unit is predominantly urban development.	Low
TSI 005	2%	The management unit is predominantly urban development.	Low
TSI 006	2%	The management unit is predominantly urban development.	Low
TSI 007	2%	The management unit is predominantly urban development.	Low
TSI 008	2%	The management unit is predominantly urban development.	Low
TSI 009	15%	This might be the only management unit that can experience higher levels of invasion.	Med

Table 3: AIS infestation per management unit.

Species	MU 1	MU 2	MU 3	MU 4	MU 5	MU 6	MU 7	MU 8	MU 9
Acacia Cyclops (1b) Red eye									x
Acacia melanoxylon (2) Australian Blackwood									x
Acacia saligna (1b) Port Jackson									x
Agave Americana (3) Sentry plant	x	x	x	x	x	x	x	x	x
Agave sisalana (2) Sisal	x	x	x	x	x	x	x	x	x
Anredera cordifolia (1b) Madeira-vine									x
Canna indica (1b) Indian Shot						x			
Cestrum sp. (3) Cestrum									
Cereus hildmannianus (1b) Hedge cactus				x					
Cereus jamacaru (1b) Queen of the Night				x					
Hedera helix (3) English Ivy								x	
Furcraea foetida (1a) Mauritius hemp	x			x				x	
Malva dendromorpha (1b) Tree mallow						x			x
Myoporum sp. (3) Manatoka								x	x
Opuntia ficus-indica (1b) Sweet prickly pear			x						
Opuntia microdasys (1b) Bunny-ear Cactus	x	x	x	x	x	x	x	x	x
Populus alba (2) White Poplar							x		
Schefflera arboricola (3) Dwarf umbrella tree						x			
Senna didymobotrya (1b) Peanut butter cassia									
Tradescantia fluminensis (1b) Wandering Jew							x		
Vinca major (1b) Greater periwinkle								x	

5 OBJECTIVES AND ACTIONS

The main objective is to bring the infestation of AIS on the property under control by October 2023, which includes the detection and prevention of new AIS establishing on the property. Measures will be put in place to assure compliance with the NEMBA requirements. Priorities were assigned to each of the management units (see table 5). The reason for assigning a certain priority may include the following:

- Species present (Category 1b seedlings or young plants - less expensive to control and relatively easier to bring under control (want to maintain the gain),
- Biodiversity protection (i.e. restoration of the **Southern Cape Dune Fynbos** in the Bird Reserve),
- Catchment/resource restoration and protection (water security),
- Overall indigenous feel to TIHOA, &
- Potential seed pollution to neighbouring management units or other properties adjacent the Knysna Estuary.

The most appropriate control method for each management unit and AIS will be selected based on the priority, season, timeframes and finances. Clearing will start by first targeting areas that have a low infestation level and/or Category 1a listed species. Local authorities such as CapeNature and Working for Water can be approached for assistance and guidance.

There are different control methods such as Mechanical (chainsaw or brush-cutter), manual (hand tools, hand pulling), herbicide (follar or cut-stump) or biological. The integration of these control methods will yield more desirable results, keeping in mind that the means and methods of control must be appropriate for the AIS and the environment. Control methods must be taken with caution and cause minimum harm to the environment. Chemical (Herbicide) control is strongly advised against due to the locality of TIHOA and the potential of chemical leaching into the Knysna Estuary. Guidelines are provided for control methods (Annexure A), Herbicides and Safety, Health & Environment (Annexure E).

1) Objective 1: Prevention

Prevention is to put measures in place to prevent the introduction of new NEMBA listed AIS onto the property, and invasive species from spreading from bordering Management units or other properties adjacent to the Knysna Estuary.

- It is advisable that a Standard Operating Procedure (SOP) will be developed for the general procedures around AIS control and eradication methods.
- Regarding the Bird reserve, as part as a preventative action to cease the introduction of more AIS into the property, no new species originating from outside the specific vegetation type will be planted. Once AIS are cleared, some natural vegetation will grow back, while species that are representative of **Southern Cape Dune Fynbos** can be planted to assist in the recovery of the vegetation.
- This is a great opportunity to create and informal education program for the purpose of educating residence living on Thesen Island.
- It is also advisable to further the education process by incorporating prevention mitigation measures into what homeowners have in their gardens, or what they are allowed in their gardens (according to NEMBA).
- The preventative measures will be communicated to all users of the property (where applicable).

2) Objective 2: Early detection & Rapid response (EDRR)

This is to put measures in place where emerging AIS are detected through regular surveys and removed before establishing sustainable populations, produce seeds and start spreading.

- Quarterly to Bi-annual surveying the property to detect any new or emerging listed AIS.
- Learn more about the SANBI's (South African National Botanical Institute) EDRR programs and register as a spotter where applicable.

- Report any category 1a species immediately to the Department of Environmental Affairs and ask for assistance with the control of the species.
- Do not allow new emerging AIS to produce seeds, or start growing vegetatively.
- Update baseline data and maps by including these species and indicate where on the property they were located.
- Increase surveillance in those areas to ensure the plants don't re-sprout or re-occur.
- Incorporate AIS Control Plan as program into the General Manager's KPA's to ensure resources are available for Rapid Response Management Interventions.

3) Objective 3: Appropriate means and methods of control

This is to ensure the means and methods of control are appropriate to the species and environment and are implemented in such a way that it minimizes the risk to biodiversity and the environment.

- Implement measures to **prevent** the spreading to neighbouring properties.
- Mechanical and hand tools must be best suited to the work and the size of plants being cleared and in a good working condition.
- Control methods must be appropriate for the species and the environment. As mentioned before, Chemical (Herbicide) control is not recommended due to the leaching possibility of chemicals into the Knysna Estuary.
- Control methods are to be implemented in such a way that it prevents harm to biodiversity and the environment.

4) Implementation of control plan

This is to reach the desirable state and bring the AIS infestation on the property under control by the end of 2023. The desired state for AIS on the property by 2023 is as follow:

a) Category 1b species
    - Removal of selected mature species in initial management units.
    - Follow-up control programme in place for the next 5 years.
    - Complete "initial removal" by December 2019.
    - Each "initial removal" should be followed by quarterly follow-up inspections.
    - Control of seedlings and re-sprouting species (such as *Nephrolepis cordifolia*).

b) Category 1b herbaceous species
    - Less than 5% in overall density for the property.

c) Category 2 species
    - Less than 1% in overall density for property or permit application will be submitted by 30 November 2018 (if needed).

Table 4: Table indicating the Management Unit (MU) priorities.

MU	Area (Sqm)	Comments	Priority
1	±124 175 m^2	Situated in the western side of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	1
2	±67 067 m^2	Situated in the northern side of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	4
3	±90 425 m^2	Situated in the north-western corner of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	3
4	±106 236 m^2	Situated in the centre of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	3
5	±114 234 m^2	Situated on the eastern side of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	3
6	±89 053 m^2	Situated in the centre of Thesen Island. This is predominantly built-up urban area with road side gardens. However, the eastern side of this MU does host more elaborate gardens. Home owners in possession of listed invasive vegetation should be informed.	2
7	±63 126 m^2	Situated in the south-eastern half of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	2
8	±78 876 m^2	Situated on the southern side of Thesen Island. This is predominantly built-up urban area with road side gardens. Home owners in possession of listed invasive vegetation should be informed.	2
9	±144 604 m^2	Situated in the southern corner of Thesen Island. This is a moderately infested MU. Various AIS were identified in the MU. Due to the restoration potential, control operations will be conducted in such a way that the natural vegetation recovery is enhanced. All AIS must be removed appropriately.	1

6 REVIEW

Methods of control are appropriate to the species and environment and are implemented in such a way that it minimises the risk to biodiversity and the environment. Control actions must be taken with caution to cause the least possible harm to biodiversity and the environment (take care not to remove native species or damage them).

Generally the biggest volume of biomass will be produced during the initial clearing phase. If follow-up control is implemented according to the control schedule (Annexure A), biomass will be drastically reduced and can be destroyed (and/or used) on site. It is recommended that where initial clearing is done that no herbicide is used, in order to minimise the risk of leaching to the Knysna Estuary. It is recommended that AIS are destroyed and not "thrown in the trash" ending up on the local dumpsite where the AIS might re-establish.

It is suggested that the AIS Control Plan must be reviewed and updated (if necessary) on a 5-year cycle. The next date for review is November 2023. Maintenance Schedules and map for the entire property must be updated on an annual basis to show work completed versus planned. The AIS Control Budget vs actual costs; and planned vs actual costs must also be captured.

This project can become a good educational project, where TIHOA can inform the homeowners of the listed AIS. Informing them that the possession of listed AIS is a contravention of the National Environmental Management Biodiversity Act (NEMBA). Educating TIHOA homeowners about listed alien invasive species is a step in the right direction that will further inform the public of the listed AIS. It is important that people realise the threat that AIS pose and the current fight against AIS in South Africa. By completing this project, TIHOA becomes part of the benchmark in the Garden Route, setting an example of environmental stewardship for other surrounding estates in Knysna and the rest of the Garden Route. Removing listed AIS will inevitably lead to a more pristine Garden Route.

7 MONITORING

In order for the progress of the plan to be accurately assessed it is important that a timeline is created for the achievement of predetermined levels of each Management Unit. Depending on priority, each MU will start at a different time, the canopy cover reduction of AIS on each MU will start as follow: Will be reduced at the middle of Year 1 by 25% of its initial value and by 50% of the initial value at the end of Year 1. The AIS will be reduced further by 40% by the middle of Year 2, and by a further 5% by the end of Year 2. The final target level for this canopy cover reduction would be 95% and that this would be achieved by the end of Year 2. The achievement of this level is indicative of a successful 5-year control programme, following the property that would be considered "Cleared" and would be subjected only to low-level maintenance clearing for the indefinite future.

Table 5: Table indicating priorities.

WHAT	FREQUENCY	HOW	RESPONSE
How effective are the control methods?	3-6 months after every operation	Survey the cleared areas and look for regrowth. Before and after pictures are very effective. Look out for non-target effects of herbicide application.	If the survey reveals that the control methods are effective, e.g. low levels of re-sprouting, continue following the herbicide mixtures and control methods. If non-target plants are dying off where herbicides were applied, ensure appropriate training for herbicide applicators, demonstrate the off-target effects to herbicide applicators to ensure they are using the correct methods and herbicides. (Gums are difficult to control and re-sprouting often occurs, therefore shorter follow-up interventions may be required). If the results show that the control methods are not effective, adapt by e.g. cutting lower above ground or changing herbicides or timing of herbicide application.
Do the infestation levels decrease?	Annually	Survey the cleared areas and record species, densities, and size. Before and after pictures are very effective.	If the infestation levels are not decreasing, reconsider clearing methods, clearing intervals or consult an expert. If infestation levels are decreasing - continue clearing, you are doing well!
How much herbicides were used?	During every operation (during every phase of each MU) records should be kept.	Keep track of cost and ensure no wastage. Record herbicide usage – see Annexure C	Track usage over time, it will reveal a certain trend in quantities for different infestation levels. Less herbicides should be used when the infestation levels are lower. Record herbicide cost.
Does the indigenous vegetation recover in the cleared areas?	Bi-annually	Survey the cleared areas and look out for indigenous species variety and presence. Before and after pictures are very effective.	If it does – you are doing well, if not, look at clearing methods, clearing intervals or consult an expert
How many jobs were created	After every operation	Timesheets	Job creation figures are useful when asking for landowner assistance from WFW or to demonstrate contributions to jobs and socio-economic conditions
How many person days (PD) were spent per operations	After every operation	Timesheets	Keep track of cost and assist with planning and budgeting. Determine cost per person day (PD)

Annexure A: Control Method and Schedule

The first control operations are referred to as "Initial or follow-up clearing". Regularly scheduled follow-up operations are essential to protect the initial investment. Initial clearing is generally the most costly intervention, there-after the cost per hectare reduces with each control operation. The schedule below is a guideline only. Follow up control should ideally be scheduled every six months and maintenance should be conducted annually. It is strongly recommended to implement a monitoring programme which will amongst other benefits, also assist with correct scheduling of follow-ups.

Stages & treatments

Following best practice described in this document, ensures compliance with NEMBA Section 75 (1) (2) & (3) in that the means and methods of control are appropriate to the species and environment and are implemented in such a way that it minimizes the risk to biodiversity and the environment.

- Control actions must be taken with caution to cause the least possible harm to biodiversity and the environment (take care not to remove native species or damage them for example by using the incorrect herbicide application; or bulldozing).
- Offspring, propagating material and regrowth should be tackled to prevent species from producing offspring, forming seed, regenerate or re-establish.
- Implement measures to prevent the starting of wildfires, including spreading to neighbouring land and to be ready and able to combat fires on the farm should they occur.
- Mechanical and hand tools must be best suited to the work and the size of plants being cleared and in a good working condition.

Initial clearing

- Possible equipment required: Chainsaws, loppers, bow saw, protective clothes, closed shoes (preferably boots), gloves etc..
- Woody species (e.g. Eucalyptus & Acacia spp.): fell and cut, ringbarck correctly to prevent coppicing.

Follow up clearing

- Conduct follow up within six weeks after initial clearing, before plants have the opportunity to produce seeds or at least on a bi-annual basis.
- Woody species (e.g. Eucalyptus & Acacia spp.): fell and cut, ringbarck correctly to prevent coppicing.

Mechanical & manual control methods

- Fell trees with a stem diameter of > 150mm with a chainsaw.
- Cut trees with a stem diameter of < 150mm with a bow saw or silky saw.
- Cut trees and plants with a stem diameter of < 100mm with a lopper.
- Cut as low as possible above ground level, ideally 10 cm or below the last growth point.
- Ensure even cuts.
- Seedlings can be hand-pulled in sandy soil, important to uproot the entire plant, breaking off will cause it to regrow.

Herbicide application

- Herbicide application is not recommended for TIHOA

Control Plan schedule:

Year	Quarter	TSI 001	TSI 002	TSI 003	TSI 004	TSI 005	TSI 006	TSI 007	TSI 008	TSI 009
		1	4	3	3	3	2	2	2	1
2018	1st									
	2nd									
	3rd	Preparing for the AIS clearing operation that will take place over the following 5 years.								
	4th									
2019	1st									
	2nd	25%								25%
	3rd									
	4th	50%					25%	25%	25%	50%
2020	1st									
	2nd			25%	25%	25%	50%	50%	50%	
	3rd									
	4th	70%	25%	50%	50%	50%				70%
2021	1st	90%								90%
	2nd	95%	50%				70%	70%	70%	95%
	3rd						90%	90%	90%	
	4th			70%	70%	70%	95%	95%	95%	
2022	1st			90%	90%	90%				
	2nd		70%	95%	95%	95%				
	3rd		90%							
	4th		95%							
2023	1st									
	2nd									
	3rd									
	4th									

Annexure B: Guidelines for handling invasive plant material after clearing.

The result of clearing AIS infestations generally produces large volumes of plant material that poses a severe fire hazard if not handled correctly. These guidelines are intended to assist landowners to avoid the risk accompanied by the incorrect handling of invasive plant material. Permit application for burning should be in accordance with the District Municipality Air Quality Management By-law (2012) and the National Veld and Forest Act, 1998 (Act No. 101 of 1998).

These volumes of plant material can be disposed of in the following ways:

- Material can be removed from the property and disposed of at one of the appropriate licensed landfill sites any day of the week. For more information contact your local municipality.
- Material can be chipped and the resultant woodchips can be utilized as ground cover or compost material (which is already being done).
- Selling the material as fire/cooking wood.

Important information when considering stack burning (**strongly not recommended for TIHOA**)
The fuel reduction through stack burns is limited from 01st May to 15th October pending a successful open burn permit application. A detailed fire safety management plan must be implemented to compensate for un-burnt stacks after the burning season.

Air Quality Management By-Laws (2012) of the Eden District Municipality should be studied, alternatively, call the Air Quality component of Eden District Municipality at (+27) 044 693 0006.

The preparation of the stacks is important and should be planned and executed correctly from the start to save time and costs of re-doing the stacking.

Stack preparation guidelines (**strongly not recommended for TIHOA**)
The number of stacks created will depend on the size of the area being cut and situational factors (e.g. risk, weather conditions, type of vegetation, firefighting resources etc.). Stacks should not be positioned closer than 100 metres to the urban edge and only one stack at a time should be burnt. The basal diameter of stacks should not be more than 2,5 metres and the distance between stacks should be at least 5 times the basal diameter (i.e. basal diameter @ 2.5m then the distance between stacks should be over 12.5m).

Only branches of less than 70mm diameter should be burnt. Large diameter branches at breast height should not be burnt but left *in situ*. Stack the material with branches facing inwards, making heaps as large as possible. The larger the heap the easier it is to burn.

Annexure C: Fire prevention and preparedness

Formulating a Fire Management Plan (FMP) is not recommended for this property. If no FMP exists nor has approval, Fire Management Guidelines formulated in the Constitution and Management Plan of the local Fire Protection Association will be adopted.

The property manager should implement measures to prevent the starting of veldfires, including spreading to neighbouring land and to be ready and able to combat fires on the farm should they occur.

Should landowners fail to adhere to the provisions of the National Veld and Forest Act, 1998 (Act 101 of 1998), (NVFA) e.g. preparing of a fire break, notifying about their intention to conduct a burn on their land, or meeting the standards, penalties are involved (NVFA, Sec 19).

Furthermore, NVFA Sec 19 (5) states that any owner, occupier or person in control of land on which a fire occurs who fails to take reasonable steps to extinguish the fire, or to keep it to that land, or to prevent it from causing damage to property on neighbouring land, is guilty of an offence. Please note that bringing alien plant infestations under control is an important step towards preventing fires from spreading to neighbouring land as these fires burn up to 10 times hotter than fynbos fires. Fires in alien invested land are very difficult to control, especially under windy and very hot conditions.

It is important to keep the following in mind with fire prevention and preparedness:

1. Prepare and maintain a fire break around the property (not recommended for SNR):
   - It is wide enough and long enough to have a reasonable chance of preventing a veldfire from spreading to or from neighbouring land,
   - It does not cause soil erosion, and
   - It is reasonably free of inflammable material capable of carrying a veldfire across it,

2. Be ready to fight fires by acquiring and maintaining adequate equipment and resources,

3. Ensure relevant fire training is done on an annual basis,

4. In an emergency, certain persons and officials should be given permission to enter land and fight fires,

5. Notify the FPA and neighbouring landowners about fires and take the necessary steps to stop the spread of fires should they occur (for more information see section 18 of The NVFA,

6. The density of IAS in a MU must also be considered when prioritizing firebreaks, as well as the stage of treatment versus the need for ecological burn, so that it does not counter-act the other management actions, but rather compliments it. Where burning is required as an AIS control method, I.e. where it is more cost effective to burn a dense IAS infestation standing than to remove it manually, it must be incorporated into the AIS Plan per MU.

Annexure D: Suitable recommended indigenous plant list

The suitable recommendation of indigenous plant species is based primarily on the two mapped vegetation types, **Southern Cape Dune Fynbos (FFd 11)** and **Cape Estuarine Salt Marshes (AZe2)**. The majority of the property is mapped as **Cape Estuarine Salt Marshes**. Once initial AIS clearing have taken place, the seedbanks of indigenous vegetation prior to the infestation will allow for some indigenous vegetation to return. The following species are recommended for each vegetation type:

(1) Southern Cape Dune Fynbos (FFd11) (Least Threatened)

Important Taxa Tall Shrubs: *Olea exasperata* (d), *Passerina corymbosa*, *Rhus crenata*, *R. glauca*, *R. laevigata*, *R. lucida*. Low Shrubs: *Agathosma ovata* (d), *Metalasia muricata* (d), *Passerina rigida* (d), *Phylica litoralis* (d), *Agathosma apiculata*, *A. stenopetala*, *Anthospermum aethiopicum*, *Aspalathus spinosa* subsp. *spinosa*, *Chironia baccifera*, *Erica fourcadei*, *E. glumiflora*, *E. zeyheriana*, *Felicia echinata*, *Gnidia anthylloides*, *Helichrysum teretifolium*, *Indigofera sulcata*, *Jamesbrittenia microphylla*, *Leucadendron salignum*, *Morella quercifolia*, *Muraltia satureioides*, *M. squarrosa*, *Otholobium bracteolatum*, *Pelargonium betulinum*, *Phylica ericoides*, *Polygala ericaefolia*, *Struthiola parviflora*. Semiparasitic Shrub: *Thesidium fragile*. Geophytic Herbs: *Satyrium princeps* (d). *Cyrtanthus loddigesianus*, *C. obliquus*. Graminoids: *Ischyrolepis eleocharis* (d), *Ehrharta calycina*, *Ficinia dunensis*, *Ischyrolepis leptoclados*, *Pentaschistis heptamera*, *Tetraria cuspidata*, *Thamnochortus cinereus*, *Tribolium obtusifolium*.

Endemic Taxa Low Shrubs: *Aspalathus cliffortiifolia* (possibly extinct), *Erica chloroloma*. Succulent Shrub: *Lampranthus algoensis*. Graminoids: *Pentaschistis barbata* subsp. *orientalis*.

(2) Cape Estuarine Salt Marshes (AZe2) (Least Threatened)

Important Taxa Estuarine water bodies: Graminoids: *Ruppia cirrhosa* (d), *R. maritima* (d), *Zostera capensis* (d). **Tidal salt marshes**: Succulent Shrubs: *Chenolea diffusa* (d), *Sarcocornia perennis* complex (d). Low Shrubs: *Samolus porosus* (d). Herbs: *Cotula filifolia*, *Seidelia pumila*. Geophytic Herbs: *Triglochin bulbosa* complex (d), *Romulea tabularis, Triglochin striata*. Succulent Herbs: *Spergularia media* complex (d), *Plantago crassifolia* complex (d), *Salicornia meyeriana* (d), *Cotula coronopifolia*, *Suaeda inflata*. Graminoids: *Juncus kraussii* subsp. *kraussii* (d), *Spartina maritima* (d), *Sporobolus virginicus* (d), *Puccinellia angusta*, *Schoenoplectus triqueter*, *Stenotaphrum secundatum*. **Supratidal terraces**: Succulent Shrubs: *Disphyma crassifolium* (d), *Sarcocornia capensis* (d), *S. pillansii* (d). Graminoid: *Stenotaphrum secundatum* (d).

Endemic Taxa Tidal salt marshes: Succulent Herbs: *Poecilolepis ficoidea*, *P. maritima*.

Annexure E: Safety, Health and Environment (SHE)

It is the landowner's responsibility to ensure a safe working environment and that the teams working on the property adhere to the minimum safety requirements. This can be achieved by sourcing appropriately trained and experienced teams. The principle of "leave no trace" applies. The landowner should liaise with the contractor to ensure the following minimum SHE requirements are adhered to:

Toilet facilities
- The contractor is responsible for providing a mobile toilet on site for the duration of the work.
- Clean water must be made available in suitable containers for drinking and mixing herbicides.

Team's skills requirements
- Chainsaw operators in possession of valid certificates.
- Herbicide applicators certified.

Work methods and equipment
- Equipment must be suitable for the work and in good working condition.
- Adhere to work methods stipulated in the site specification.

Vehicle and driver
- The driver must be in possession of a valid PrDP.
- The vehicle must be roadworthy.
- Tools must be transported in the trailer, separately from the workers.

Safety precautions
- Certified SHE Rep on site.
- Certified Safety Office on site.
- The SHE Rep must conduct daily safety talks.
- The first aid kit must be on site

COID
- The contractor must be in possession and present proof of a valid certificate of good standing with the Compensation Commissioner.
- Any incidents must be reported to the landowner.
- An indemnity form must be signed stating that the contractors except full liability for any COID related matters and that the landowner will not be held liable should the contractor not comply with minimum standards.
- The contractor deals with COID cases and not the landowner.
- Near misses, incidents and accident register must be kept.

Insurance
- The contractor must be appropriately insured for the vehicle and equipment.
- The contractor must provide proof of third party and liability insurance.
- Sign an agreement whereby the contractor accepts liability for damages in case of negligence.

Storage of fuel and herbicides
- Fuel and herbicides must be left in a shady area, away from the resting/eating area.
- The area must be clearly marked with bunting.
- The bunting must be removed on completion of the job.
- Herbicide mixing and refueling must be conducted on a spill blanket.
- A spade must be on site to cover any accidental spillage.
- A serviced and functional fire extinguisher must be kept at the fuel refilling area.

Preventing fires

- No smoking while working, assign a designated smoking area.
- Remove cigarette butts.
- No smoking during windy conditions.
- Keep 1 fire beater for every team member within reach of the workers.
- No chainsaw work during Code Red days - Fire Danger Indices (FDIs) obtainable from FPA.

Correct PPE are being worn at all times

Item	Supervisor	Machine operator	General workers SHE Rep; 1st Aid Rep; Driver	Specialized herbicide applicator
Sunhat (follow up operations)	✓	✓	✓	✓
Hard hat (when chainsaws are being used)	✓	✓	✓	✓
Hard hat with visor and certified earmuffs (SABS or EU),	x	✓	x	x
T-shirt	✓	✓	✓	✓
Conti suit	✓	✓	✓	✓
FESA approved chainsaw pants (eleven layers) with broad belt or braces	x	✓	x	x
Whistle	✓	✓	x	x
Safety boots	✓	✓	✓	✓
Chainsaw safety boots	x	✓	x	x
Gloves	✓	✓	✓	✓
Chainsaw operators gloves	x	✓	x	x
Safety goggles	✓	✓	✓	✓
Cape (when using a knapsack)	x	x	x	✓
Mask (when applying herbicides)	x	x	x	✓
Rubber gloves (for mixing herbicides)	x	x	x	✓
Rubber apron (for mixing herbicides)	x	x	x	✓
Rain suit (during rainy conditions)	✓	✓	✓	✓

It is recommended that the requirements are stipulated in the work specifications and the contractor accepts accountability in writing.