Fire Management Plan ATKV ERF 3122

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Fire Management Plan ATKV ERF 3122, February 2011 updated June 2016

This document serves to satisfy the mandate as set by Mr. Wikus van der Walt of Ecobound CC. Environmental Agency with regards to the ATKV property – Erf No 3122 at Hartenbos. The mandate includes the mitigation and management of fire risk to the proposed development and the adjoining residential area, an effective management regime for the sustained environmental wellbeing and retention of the ecologically sensitive Coastal Renosterveld vegetation constituting the majority of the public open spaces and lastly for the Fire management plan to be accepted and ratified by the Mossel Bay Municipal Fire Department.

The 2016 update (Requested by Jackie von Maltitz (GIBB) incorporates findings and suggestions form the botanical report for the site (Helme, 2016). The layout of suggested firebreaks has been adjusted to be relevant to the botanical findings and for the latest proposed layout of the development (Annexure 1). The term “high risk” has been substituted for “high hazard”. This is simply used to identify the area where possible threats might originate from in the future. The proposed layout of the fire belts and the block burning will be adequate for the protection of the development. It is important to note that both Helme (2016) and the authors of this report stress that all the areas must be burned for proper ecological functioning and for fuel load management. This is to be done in I block burning operation as described in the report. We have proposed that the entire area be divided into three blocks; these will be burned in rotations (one block every four years, thus allowing for a 12 year interval for each block). The ecological corridors must be treated in a similar manner.

Contents

List of Tables

List of Figures

List of Annexures

1. Introduction

This plan will serve as a guide to current and future owners of the property on the effective management of fire as a risk and an ecological management tool. It will give guidance on the placement of firebreaks and fire hydrants and the effective protection of residential units against the risk of fire damage.

1.1 Setting and Location

Erf No. 3122 (Hereafter referred to as “the property”) was previously utilised as agricultural land. The property is situated on the western edge of the Hartenbos Heuwels residential area. Hartenbos Heuwels forms part of the Mossel Bay municipal area which in turn is part of the Eden district municipality in the Southern Cape.

The property rests on a plateau in the hilly landscape west of the N2 Freeway that passes through the Hartenbos area. Although the property itself is relatively flat, the area bordering it forms a gentle downward slope with a network of valleys draining away from the plateau. To the east and south there are shallow valleys that become deeper as it progresses into the adjoining area. The area surrounding the property is owned by the Mossel Bay municipality.

The primary vegetation type within the property is Brandwag Fynbos Renoster Thicket (Helme, 2016). Renosterveld forms part of the Fynbos biome and it is an endangered vegetation type. Renosterveld is a fire driven ecosystem. This implies that the vegetation relies on a natural fire cycle for rejuvenation and continued survival.

1.2 Fire History

The most recent fire to affect the site occurred on 26 December 2009 (Figure 1). It entered the property from a South Westerly direction and was reported to have been started by a camp fire.

In the Southern Cape the different land uses form a complex mosaic in the landscape within the contrasting topography, creating varying degrees of fire hazard in the region, particularly as a result of lack of concerted fuel reduction measures. As a result fire hazards have increased dramatically and it was reported that there had

been a substantial increase in wildfire frequency and area burned. These fires resulted in great losses. (de Ronde, 2000)

Taking this into account it is necessary to identify potential areas of high fire risk and take mitigating steps. A development as proposed on Erf No. 3122 would be at risk of wildfires as it will be situated within a fire risk area.

Figure 1: Remnants of 2009 fire

1.3 Regional Weather

According to the Koppen classification (Thwaites, 1987), the climate of the Southern Cape region is classified as moderate humid. By implication this indicates that temperatures in this area are below -3 °C (night) and 18°C (day) during the coldest months, while during the warmest months the average temperature is below 22°C. There is not a distinct wet season and rain can be expected throughout the year. Autumn and spring months are associated with the highest rainfall during the year. The weather is largely controlled by the passage of cold fronts (Tyson 1971).

Based on weather data over the five years preceding 2011, the mean annual precipitation for the area is 858.8 millimetres, the average temperature 18.5 °C (with a maximum of 39.7°C) and an average humidity of 56.6% (Weatherunderground, 2011).

Bergwinds are north westerly winds and mainly occur in the winter months from the middle of June to late August. Bergwinds however are not only limited to winter months and increasingly occur throughout the year. These strong winds substantially increase the fire risk by lowering the moisture content of both living and dead fuel material, create high air temperatures and decrease the relative humidity which increases the likelihood of fires igniting and spreading. Bergwinds provide favourable conditions for extreme fire events (Tyson, 1973; Pool *&* de Ronde, 2002). Table 1, Figure 2 and Figure 3 provides a summary of the weather data as discussed.

Table 1: Mossel Bay Weather Data (Weatherunderground, 2011)

MOSSEL BAY WEATHER DATA 2008 TO 2011									
TEMPERATURE (˚C)			**WIND (km/h)**			**HUMIDITY (%)**			**PRECIPITATION (mm)**
Max	Min	Ave	Max sustained	Ave	Max Gust	Max	Min	Ave	Ave per annum
39.7˚C	6˚C	18.5˚C	119.5	11.4	202.3	96	14	56.6	858.8

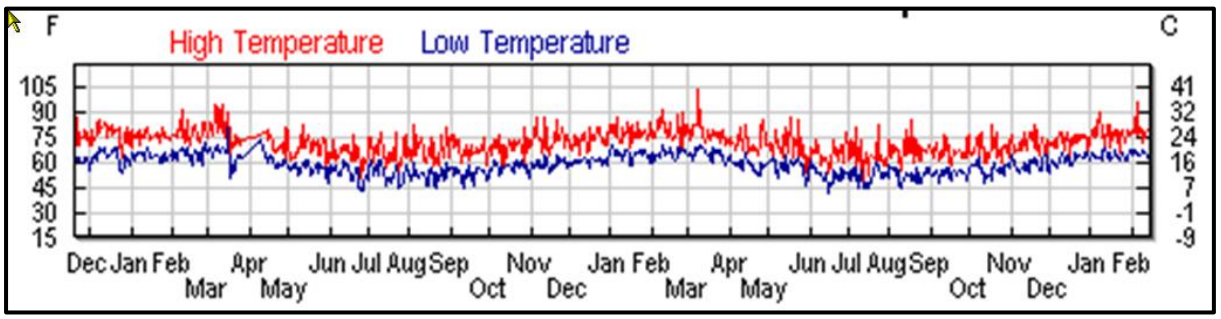

Figure 2: Temperature graph November 2008 to February 2011 (Weatherunderground, 2011)

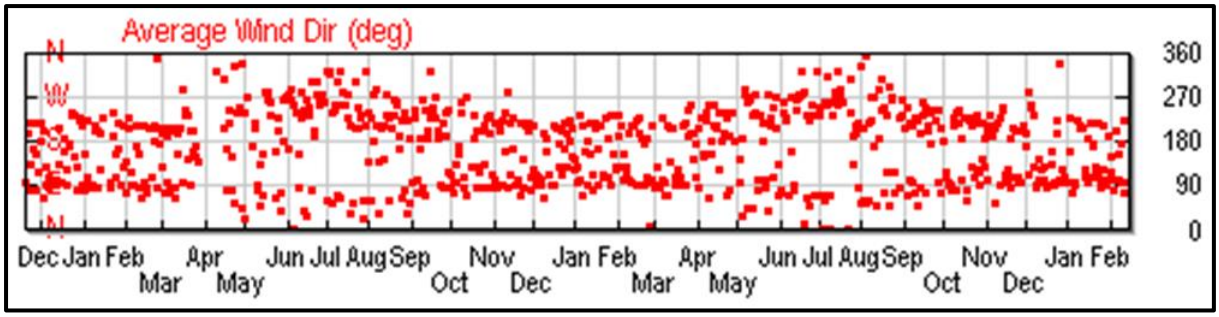

Figure 3: Wind direction plot November 2008 to February 2011. (Weatherunderground, 2011)

1.4 Localised Winds

Because of the topographical location of the property it is constantly exposed to wind. This is due to the absence of tall trees and structures to break the force of the wind. The valleys to the western end of the property needs to be monitored carefully during a fire event since it has the potential to create high speed localised winds blowing up the valleys. These valley winds can cause fires to spot and become uncontrollable.

The average wind speed in the area is ± 11km/h but during periods of strong wind, gusts of up to 200.3km/h have been measured. .

2. Fire Management Objectives

2.1 Protection of Property

In terms of the mandate, this plan will recommend the most suitable approach to protect the infrastructure of the three proposed development zones on the property. The recommendations will include means of minimising the risk of fire not only on the property but also ensuring the protection of neighbouring property and enabling non-liability should fire escape from or through the property. These recommendations and suggestions will be discussed within the protection and prevention sections of this document.

2.2 Protection and maintenance of fire-driven Renosterveld ecosystem

The Fynbos biome (including Renosterveld) maintains biodiversity through a natural periodic burning regime. Frequent burns will however negatively impact the plant communities, ecology and biodiversity of the vegetation on the property (Geldenhuys et al, 2004). It is therefore important to consider the natural fire regime and sensitivity

status of the vegetation when deciding on a management strategy for the property. The objective of ecological fire management is to maintain biodiversity by inclusion or exclusion of fire at a frequency that supports the plant communities' ecological requirements. Figure 4 is an example of the Renosterveld vegetation found on the site.

Figure 4: Renosterveld (2011)

3. High fire hazard and risk zones.

3.1 High hazard zones for fire ignition.

The western front of the property has been identified as the highest hazard area for possible future wildfire threat. There is a community centre and an industrial area to the north western side of the property which may be a likely source of fire. The valleys to the east of the property also pose a moderate risk due to alien weed infestation. This infestation needs to be cleared as a matter of urgency.

The north westerly aspect of a site is usually its most dangerous area because it receives the greatest amount of solar radiation during the day and it is exposed to radiation during the warmest part of the day. This aspect is also exposed to bergwinds. Annexure 1 indicates the location of these risk zones.

3.2 Zones of high value.

The areas of high conservation value on the property (Helme, 2016) should be managed as a high priority by the land owner including prescribed ecological burns. These ecological burns are vital for maintaining and promoting biodiversity in these zones, since the vegetation is part of a fire driven ecosystem.

3.3 Topographical and vegetative concerns

As mentioned, the land adjacent to the property is sloping terrain with valleys. Should a fire start in these areas it will burn intense with a fast uphill spread, since fuel on slopes is preheated by rising hot air. This increases the risk associated with the warm and dry western front of the property. The valleys also pose a high risk to the property as it will funnel and accelerate wind.

Alien invader vegetation in the area will lead to a higher fire hazard on the property. Encroaching invaders in the area increases the fuel load, supplementing it with more woody material and creating a deeper fuel bed for fire to burn in. An added disadvantage in this regard is that exotic woody species burn more intensely than fires in the indigenous flora species and can disturb the natural regeneration process that would have occurred after a normal fire. Therefore, alien vegetation in and next to the property should be managed to ensure that the flammable fuel load is kept to a minimum. Since 2011 when the first fire management plan was drawn up there has been a noticeable increase in the size and density of weeds in the invested areas. This may pose a threat when a weed control programme is initiated as there will be a high available fuel load created when weeds are eradicated. Weed control in this area must ideally be done before development of the areas start to allow burning out of these dry dead woody material. Follow-up weed control can then be done without creating high fuel loads. (Refer to figure 5 taken in 2011 the number of weeds have increased exponentially since then).

4. Fire management regime for Renosterveld.

Coastal Renosterveld is a fire driven ecosystem. This implies that this vegetation type is dependent on fire for its rejuvenation and reestablishment. The natural fire cycle of Fynbos is 8-15 years. Once the property has been developed, planned burning of the Renosterveld has to be carried out in such a way that the fire will not pose a threat to residents on or adjacent to the property. At the same time the burning should be scheduled and carried out under conditions that are conducive to the ecological wellbeing of the vegetation.

Although Fynbos requires a hot burn for maximum ecological results, burning of the Renosterveld on the property should be scheduled to be done on low risk days when the Fire Danger Index (FDI) is between 40-50 points. Low risk days are days with stable weather, moderate temperatures, high relative humidity and sufficient rain (at least 10mm) in the preceding days planned burning.

When burning the Renosterveld it should always be done from an anchor point such as the road, fire belt or alternative safe areas. It is also advisable to burn away from the residential areas rather than towards them in order to reduce the risk posed to residents and property.

It is suggested that planned burning should be carried out every 12 years. The area should ideally be divided into three portions that could be burned with safety on a four year rotation basis. Should the area be divided into thirds, a third of the area will be burned every four years. This is a more costly, complicated and labour intensive method but will result in a more diverse vegetation cover with that will aesthetically be more pleasing to the residents. It is proposed that the conservation corridors proposed by Helme, (2016) also be divided in three portions at 45° with the dominant berg wind direction for burning.

Burning should be done after thorough preparation by competent experienced personnel using the correct equipment to prevent ecological and other damage. After planned burning, the property should be monitored for any signs of invasive weed species re-growth. Should any seedlings be found, it should be controlled when they reach a height of ± 30cm.

5. Alien vegetation as a fire management concern.

All the exotic Acacia species such as wattle, *(Acacia mearnsii),* rooikrans (*Acacia cyclops),* longleaf wattle (*Acacia longifolia)' Hakea spp* and Port Jackson *(Acacia saligna) are* aggressive invaders and commonly found in the area. Their seeds are stimulated to germinate by fire and if germinants are not controlled they could become a serious threat to natural vegetation in a short time. Although the property is relatively weed free, the surrounding municipal land is infested by Acacia species. This is especially noticeable on the eastern boundary and in valleys. A concerted effort must be made to remove these weeds because if it is left, it will eventually spread into the property and increase the fire risk of the area.

Figure 5: Valley with signs of weed infestation (2011).

Fuel load is regarded as one of the most important factors influencing fire behaviour because the total amount of heat energy available for release during a fire is related to the quantity of fuel (Luke & McArthur, 1978). Assuming a constant heat yield the intensity of a fire is directly proportional to the amount of fuel available for

combustion at any given rate of the fire front (Brown & Davis, 1973 in Trollope [2004]). The fuel height and fuel volume are not the only factors that will regulate a fires' rate of spread, but the higher the fuel the higher the flames will be (Trollope, 2004).

Adequate vegetation control measures with follow up programmes should be implemented in the area to control weeds and manage the fuel load (see section 3.3).

6. Cultural and socio-economic site activities in relation to fire.

The property is situated on a rural – urban interface. There is evidence that the property and surrounding area are illegally used for 4x4 and quad bike recreation and serves as a walk through for pedestrians from the local communities. These activities pose an increased fire risk and should be actively managed. Likewise illegal dumping of garden refuge should be monitored and prevented.

7. Fire Prevention Plan

A fire prevention plan aims to establish the preventative measures to be taken to lessen the likelihood of fires starting on a property and thus entails "all measures in fire management & fuel management concerning the land users and the general public, including law enforcement, that may result in the prevention of outbreak of fires or the reduction of fire severity and spread." (Goldammer & de Ronde, 2004, pg 420)

7.1 Pre-Development Burn

It is recommended to do a planned burn of the un-burnt area before the commencement of the development, because there won't be residents to consider. This opportunity can be used to initiate the ecological burning cycle.

7.2 Housing structures

It is recommended that the building structures are built with a mind-set that fire may come into contact with the structure. Houses should therefore preferably be built with brick. If houses are constructed with wood the base of the built structure should

be built with brick and mortar or concrete, with a minimum height of 1 metre it is highly recommended that thatch roofs are not used due to their high fire risk. Legislation states that a thatch roof must have a sprinkler system installed if built in a high risk area. The thatch should also be fire retardant treated.

Should the houses be installed with skylights, a recommendation can also be given in terms of installing shatterproof windows, a further safety mechanism should burning material fall on these in the event of a fire

Wooden porches facing the fire hazard area should be constructed with timber that has been fire retardant treated. Exterior wooden doors should also be fire retardant treated. The same will apply for window shutters as well as wooden fences. Dead leaves and other material that may be windblown under decks should be removed on a regular basis and vegetation growth under decks should be controlled.

Each house facing the fire hazard area, should have a hosepipe that will reach all the boundaries of the property adequately. Each house should have at least one fire extinguisher. Buckets with Sand could also be used to extinguish small patches of fire. Subsequently houses should be built with internal ‘braai’ areas and safety designed fire places. Firewood should be placed well away from buildings or the base of trees.

Fire may often come through the air as burning material and embers travel on the wind. The likely place for them to land is on the roof. Thus property owners should be encouraged to inspect their gutters and remove dead leaves and debris regularly. Another ‘check-point’ would be the eaves of the roof thus ensuring that fire cannot get into the roof timbers. Homes at risk can be fitted with metal screens to prevent this.

7.3 Defensible space/clearance around structures

Recommendations concerning the space around the infrastructure proposed to be built will minimise the risk of damage and help with the defence of the property should a fire occur. Under usual circumstances this space is 8-15 metres (Notten, 2006).

Clearance of natural vegetation around the houses is suggested, with adequate paving of a width of 2 meters or more and lawns around these, reducing the risk and increasing defensible space. A good irrigation system in the garden is also suggested to decrease the potential for convective and radiation heat to cause damage or ignition to the buildings (Teie, 2003).

Flammable material cluttered within or upon the property of the separate units should also be objected to, whilst the same should apply to any trees or shrubs closer than 8 metres to structures (Teie, 2003).

The amount of space around the units will greatly depend on the anticipated fire behaviour. Greater clearance should be given to the houses that are more exposed to flammable vegetation. These clearances should be two times the anticipated flame length, or three times if possible. A recommendation of 15 meters is suggested allowing the delineation buffer proposed by Helme (2016) to be used as a fire break (refer to fire protection map Annexure 1). These buffers should be prepared manually through brush cutting, mowing or slashing and should be maintained at least twice a year to ensure that they will remain effective fire breaks. The clearance around houses built on a slope will also have to be dictated by the steepness of the slope, as fire will naturally move up hill and burn more intensely on steeper slopes. (Teie, 2003).

7.4 Fire- Proofing the Garden

All alien vegetation should be cleared from the property as these will intensify the fire. All leaves, dead branches and piles of garden refuse should be removed on a regular basis and landscapists should avoid using dry bark as mulch around plants and on pathways, use gravel instead (Notten, 2006).

Should trees be planted, at a safe distance from the structures, an open space of at least 3 meters is suggested between the crowns of individual trees, this may prevent or lessen the likelihood of crown fires spreading from tree to tree. Lower branches of the trees should also be pruned to at least 3 meters from the ground, when age allows it. Ladder fuels such as creepers should also be discouraged as these may also encourage crown fires in trees and pose a risk to buildings (Notten, 2006).

A distance of at least 10m surrounding the house should be planted with grass or flowers and small shrubs, but nothing bigger. Cone-shaped shrubs direct fire upwards and should be avoided. In the event that it is not desirable to remove these shrubs, one should prune their lower edges to keep them off the ground (Notten, 2006).

Avoid gardening with flammable plant species. These should rather be replaced with fire-resistant, fleshy leaved plants, whilst groundcover should stay green and growing throughout the fire season. Indigenous plants do not burn with the same intensity as their alien counterparts. However, all plants will burn under the most intense conditions (Notten, 2006).

If the property owner should consider windbreaks or hedges, (although not recommended) these should also rather be indigenous than exotics plants. Windbreaks or hedges may increase fire hazard in terms of added fuel load, but they have the proven beneficial value of catching embers and other burning flying material, thus preventing spotting (Notten, 2006).

7.5 Water sources

Under the section 156(2), chapter 7 of the Constitution of South Africa, the municipality may make and administer by-laws for the effective administration of the matter which it has a right to administer.

Table 2: Legislative requirements

Fire risk Category	Minimum fire hydrant delivery volume measured at peak consumption (litres per minute)	Minimum distance between fire hydrants (meters)
High risk	1980	120
Moderate risk	1150	180
Low risk	900	240

The Eden district municipality fire safety by-law states that: “Every person who develops or redevelops a township must ensure that fire hydrants are plotted on a plan and installed in accordance with minimum delivery volumes and distance frequencies” as indicated in Table 2.

Because of the nature of the vegetation within and around the property, this area is classified as a moderate risk category. Fire hydrants should therefore deliver 1150 litres/minute and be spaced 180 meter apart. The Civil engineering firm responsible for installing the waterworks onsite should determine the hydrant layout in accordance with any relevant legislation. Fittings on the hydrants should correspond to that of the respective firefighting departments.

There is a reservoir on the property and should pools be installed at houses, they can be used as an alternative water source. It is mentioned in the engineering report that storm water catchments should be build. Access roads to these catchments should be built to enable fire trucks to fill up their tanks from these structures. This may become significant should there be an unexplained drop in pressure in the municipal water source.

7.6 Access

Accessibility to the property should enable adequate space in terms of the width of the roads for fire trucks, whilst at the same time enabling enough space for other traffic to pass. This is not only for the protection of the property but also for evacuation. It is therefore recommended that a parking area should be built on the road connecting the different developments on the property.

The shoulders of the roads on the property should be cleared of vegetation growing to its edges. The proposed conservation buffer should be moved to border the roads and will thus take care of this (this was discussed with Nick Helme telephonically). Accessibility and evacuation will be made easier this way. Buffer zones should also be seen as possible locations for control lines in case of planned burning. Houses should be accessible to vehicles. Any obstructions such as tool-sheds or bins preventing fire fighters to get close houses should be avoided (Notten, 2006).

7.7 Public Education & training

It is important that the public are made aware of fire threat to their properties. Property owners should not have open fires on days when the conditions are hot and windy and the humidity is low. A signboard should be displayed visibly at the entrances of the development area, showing that smoking and open fires are

prohibited in the public open areas. A one page document with general safety rules concerning fire risk and hazards should be made available to residents.

8. Fire Protection Plan

The Fire protection plan is used to elaborate on mitigation measures used to protect the property presently keeping the likelihood of future fires in mind, thus it can be explained as “all actions taken to limit the adverse environmental, social, political, cultural and economic effects of wild land fire” (Teie, 2003). For a physical description of the property refer to section 1.1 “Setting and Location”.

8.1 Fire belts (Also read section 7.3)

An owner of the land who is obliged to prepare and maintain a firebreak must ensure that, with due regard to the weather, climate, terrain and vegetation of the area, the following is taken care of in terms of installing the firebreaks (chapter 4 of National Veld and Forest Fire Act 101 of 1998).

It has to be wide enough and long enough to have a reasonable chance of preventing a veld fire from spreading to or from neighbouring land. It does not cause soil erosion and it is reasonably free of flammable material capable of carrying a veld fire across it.

8.1.1 External belts

A fire belt of ±15 meters in width is suggested and should run along all the boundaries of the build-up portion of the property as indicated on the fire protection map in Annexure 1. Figure 6 indicates the effectiveness of external breaks.

Figure 6: External belt that stopped fire in the Swartberg pass.

Adjacent property owners (the municipality) should ensure that vegetation bordering the property is kept at a low height in accordance with the Veld and Forest Fire Act as stated in paragraph 8.1. Erf 3122 borders on natural open veld. This area is therefore classified as an urban-fringe zone. It is the responsibility of the Municipality to maintain fire belts that will protect the property from external fires in a manner which complies with the Veld and Forest Fire Act. This is based on the premise that rates and taxes are paid to the municipality to receive municipal services. Based on this, the municipality should budget and incorporate maintenance of this area (Including fire belts and weeds), into the municipal service working plan.

The optimal preparation method of external belts is to slash vegetation in the fire belt and remove or spread the organic matter. Care should be taken to mitigate the possibility of erosion. The belt should be maintained twice a year - once in January/February and again in July/August. Refer to Annexure 1 for suggested location of fire belts. It is suggested that the conservation areas on Erf 3122 be managed in conjunction with the area east and south east of the property. An agreement should be entered into with the municipality to make this possible. If the area is managed as a unit it will make more sense from conservation as well as a fire protection point of view.

8.1.2 Internal belts

Due to the size of the property only one internal fire break is suggested. The road linking the northern and southern developments will serve this purpose. The road is planned to be 16 meters wide and as suggested in section 7.6 should include parking areas to the side of the road, should a fire tender be parked on the road during a fire.

Additionally an internal belt of 15m should be constructed as indicated in Annexure 1. This belt will be utilised as an ecological buffer strip as proposed by Helme (2016) as previously discussed.

9. Fire Suppression Plan

9.1 Actions in the event of a Fire

In the event of a fire the Eden District Municipality control room should be contacted at 044 279 1415 or toll free at 10177.

In case of a fire all windows should be closed to lower the risk of curtains and blinds catching fire. Wooden garden furniture should be taken inside. Irrigation systems in the garden should be turned on. Residents should be forewarned to watch out for any burning material occurring on their property carried by convection streams or wind from the main fire. These should be doused with a garden hose.

9.2 Emergency contact information

A list of emergency telephone numbers should be given to all residents in the event of a fire (Table 3). Consequently a list of telephone numbers of all neighbouring property owners is also suggested, thus to make neighbours aware of any controlled burns or run-away fires.

Table 3: Emergency contact details

Emergency Contact Numbers	
Police:	**Fire Department / Ambulance Service:**
Emergency: 10111	Emergency: 10177
Da Gamaskop: 044 606 2200	Eden Control Room: 044 279 1415
Kwanonqaba: 044 606 5600	**Municipality:**
Mossel Bay: 044 606 2800	Electrical / Water Faults : 044 606 5000
Brigadier Jantjies (Cluster head): 082 469 3360	Weather Bureau: 082 162
Ops Room Fax: 044 606 2273	

9.3 Evacuation procedure

Evacuation of the property and area in the event of an extreme fire should be done in an orderly fashion. It is suggested that the evacuation be co-ordinated by an authority such as traffic control officer or any other competent official. It is imperative that the authorities ensure that threatened properties are fully evacuated and that no human beings or animals remain in the evacuated area.

10. Conclusion

In order for the proposed development's structures to be protected and the endangered Renosterveld to be sustainably managed, the following steps are required.

1. The property and the surrounding properties must be kept weed free. Weed control activities should be regulated with a weed control plan.
2. External firebreaks ± 15 meters wide must be made on the boundaries of the properties where hazardous vegetation occurs. Agreements should be entered on the matter with the municipality (owner of neighbouring land).
3. The Renosterveld should be burned every 8 – 15 years under safe conditions. Burning to be done by competent personnel only. It is suggested that the area be divided in three blocks and a controlled burn executed in one of these blocks every 4 years.
4. Buildings should be made of fire resistant material and the gardens should be planted with low fire risk vegetation.
5. Fire hydrants should be spaced 180 meters apart and be able to supply water at a rate of 1150 l/min. (There should be vehicle access to the proposed storm water structures and vegetation on the side of the main road should be managed.
6. Citizens in the area should be educated with regards to the fire danger situation.
7. The fire management plan is a working document and should therefore be updated as new items of importance arise or the situation change.
8. As the Municipality is the owner of al bordering properties and are further responsible to maintain the urban fringe, they should be encouraged to participate in the fire management of the property.

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