



Report:

A fire management plan for the proposed residential development on a portion of the farm Vaale Valley 219, Mossel Bay (Hartenbos Landgoed Phase 2)

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Contents

1. Introduction	3
2. Fire management objectives	6
3. Legislative context	7
3.1 National Veld and Forest Fire Act (Act No. 101 of 1998)	7
4. Development and site description	8
5. Wildfire risks to properties	8
6. Wildfire mitigation measures	10
6.1 Firebreaks	13
6.2 Fuel load management	14
6.3 Firescaping	15
6.4 Bulk engineering services fire protection considerations	16
6.5 Fire protection considerations for structures	17
6.6 Awareness programs	19
6.7 Develop a fire reaction strategy	20
6.8 Fire Protection Association	20
7. Preparation, response and procedures during wildfires	24
8. Firefighting equipment requirements	24

Figures

Figure 1: Map showing the location of the development	5
Figure 2: Map showing the development layout	11
Figure 3: Map showing land cover	12
Figure 4: Map showing firebreak ne	22
Figure 5: Positioning of houses and exposure to fire risk	23

Tables

Table 1: Firefighting equipment requirements	24
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1. Introduction

The proposed residential development on a portion of the farm Vaale Valley 219 (Hartenbos Landgoed Phase 2) is located next to the N2 on the coast approximately 23 kilometres from George between Klein Brak River and Hartenbos (Figure 1).

As the frequency, extent, and severity of wildfires are surging across the world, so too are the ecological, social, and economic consequences. Residential losses associated with wildland fire have escalated globally. The escalation of wildland fire losses is typically attributed to housing developments within or adjacent to vegetation, changing climate conditions or an accumulation of hazardous vegetation fuels.

The spatial arrangement of structures significantly influences the likelihood of property loss (destruction or damage). Property loss is more likely in smaller, more isolated housing clusters with low-to-intermediate housing densities. Structures located near the edges of developments, or in housing clusters on steep slopes, are also more susceptible to wildfire damage or destruction.

Wildfires are a natural part of ecosystems in the Southern Cape. In some areas, climate change is expected to exacerbate this trend. Wildfires can cause extensive social, economic, and environmental harm. To reduce this harm, the National Veld and Forest Fire Act (NVFFA) creates various duties and obligations for landowners. Regardless of the legal requirements, however, a proactive approach to the management of wildfires can help reduce the harm, loss of productivity, disruption, and loss of opportunity that inevitably follows in the wake of an uncontrolled fire.

Wildlands are places where there is enough vegetation to sustain a vegetation fire. These areas include nature reserves, vacant land often invaded by woody invasive alien plants, timber plantations, orchards, vineyards, and agricultural land.

The Wildland-Urban Interface is the transition zone between open land that is generally unoccupied and contains flammable vegetation fuels and human settlements, the area where urban development meets wildlands (in town planning this area is sometimes referred to as the “urban edge”), where homes and structures are built among forests, shrubs or grasslands, or where there is a presence of people and permanent infrastructure in the proximity of flammable vegetation.

This is where people live and earn their livelihoods, and it is here where people are exposed to the highest risk of being injured or killed by wildfires, and the property has the greatest potential to be damaged or destroyed by wildfires. As urbanisation spreads and urban populations increase, the buffers between the urban edge and natural areas disappear. Also, more residences are being built within natural areas. As a result, the number of buildings and homes damaged by wildfires is increasing drastically. It is on this interface that wildfires can cause the greatest harm and communities living in the vicinity of it are at greater risk from wildfires.



The majority of wildfires start on the Wildland-Urban Interface and are mostly caused by humans. The risk of wildfires starting from human settlements is exacerbated in South Africa by the number of informal settlements located on the urban edge. Integrated Fire Management strategies must proactively manage the interface and reduce the damage caused to it. Also, it should limit the number of fires that emanate from human settlements abutting on the interface, or from homes and human infrastructure such as roads located within the natural areas.

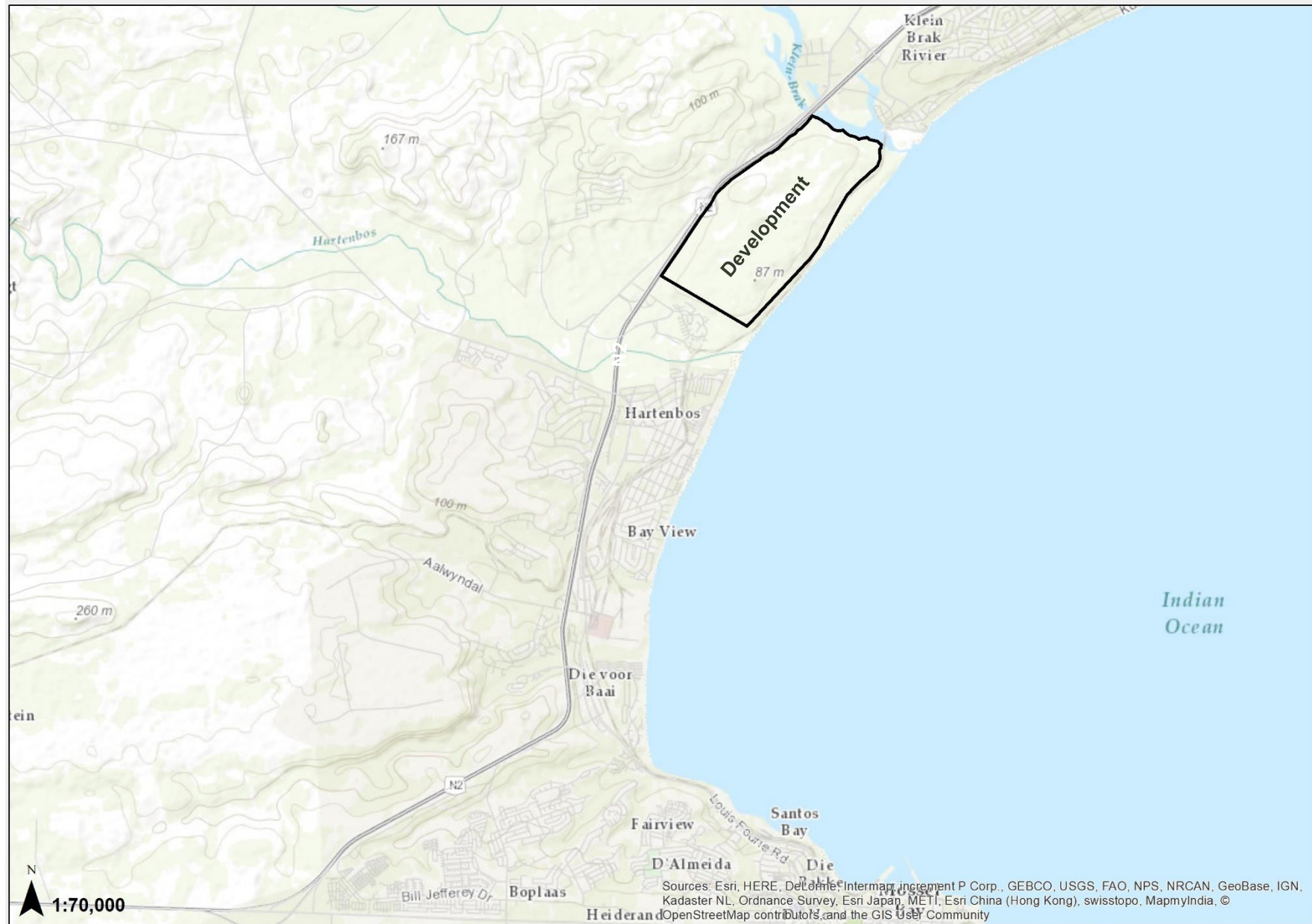


Figure 1: Map showing the location of the development

2. Fire management objectives

The following fire management objectives apply to the property:

- Objective 1: To protect all persons and property, on or immediately adjacent to the development from wildfires
- Objective 2: To comply with the National Veld & Forest Fire Act of 1998, and other relevant acts and municipal bylaws
- Objective 3: To manage vegetation on the property to maintain and improve biodiversity

The protection of life and property is a legislative requirement and the developments primary fire management objective. To achieve Objective 1, the following actions are required:

- Prevent the occurrence of human-induced wildfires that can spread on, from or into the property
- Suppress unplanned wildfires on the property;
- Work cooperatively with neighbours, the Southern Cape Fire Protection Association (SCFPA) and municipal Fire & Rescue services in managing fire on the property
- Standard operating procedures and protocols should be in place for the property to ensure effective response to the occurrence of wildfires and the proactive management of risk mitigation measures
- Smoking should be restricted to residential properties, and outdoor fires are to be lit in braai areas only
- Establishment of strategically enough placed fire hydrants on the property.

To achieve Objective 2, the following actions are required:

- Become and remain a member of the SCFPA
- Reduce fuel load in the wildland section of the property to decrease the risk of run-away fires, and to reduce the potential spread of wildfires on, from or into the property
- Ensure that staff are trained in fighting wildfires and fully equipped with personal protective equipment (gloves, eye protection etc.)
- Necessary firefighting equipment should be obtained as per SCFPA member requirements
- Firebreaks around the perimeter of the property should be prepared and maintained annually in a manner that is least damaging to the environment and aesthetics of the property
- Daily fire danger ratings should be identified and communicated to staff, tenants and visitors to the property. Fire danger ratings can be obtained from the Mossel Bay Fire Department

To achieve Objective 3, the following actions are required:

- Clearing of all invasive alien vegetation growing on the property that creates high fuel loads
- Where necessary, rehabilitation of wildland sections within the property needs to be conducted
- Maintain of a fire regime that mimics as closely as possible the natural regime that shaped the evolution of the biota of the property

3. Legislative context

There is certain pertinent National, Provincial and Local Authority legislation that applies to wildfire management on both private and state property. The most important legislation that will be mentioned in this plan is the National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998). This legislation is not intended to be definitive or exhaustive but serves to highlight key fire-related legislation and responsibilities only.

3.1 National Veld and Forest Fire Act (Act No. 101 of 1998)

The National Veld and Forest Fire Act (NVFFA) is specific to wildland fires and outlines the responsibilities and mandates of both public and private bodies in respect of wildland fires, covering both their ignition and the conditions under which they can spread. The NVFFA is administered by the Department of Agriculture, Forestry and Fisheries (DAFF).

Legally, the NVFFA imposes some duties on individual landowners that are intended to reduce the harm from wildfires.

- You may not start a wildfire (s 18(1)).
- You may only start a fire, including a cooking or braai fire, in a designated area.
- You must have equipment available to fight wildfires (s 17(1)).
- You must have trained personnel available to fight wildfires (s 17(1)).
- You must have a person on the property who keeps a lookout for fires (s 17(2)).
- You must establish a system of firebreaks (s 12).
- You may not burn firebreaks or carry out controlled burns when the Fire Danger Index is high or the FPA has objected to such burning taking place.
- You must manage the fuel load on land under your control. This means that you must remove invasive alien vegetation from the area, as well as other vegetation that creates unwanted fuel loads.

The NVFFA provides for the prevention of wildfires through a national fire danger rating index (FDI). A Fire Danger Rating System gives a broad measure of anticipated wildfire behaviour for a particular fuel type under specific weather conditions. It describes the different elements of wildfire behaviour, the level of difficulty in controlling a wildfire and other significant considerations of fire danger for each of the several classes of fire index values. The fire danger index values are as follow:

- Insignificant: No precautions are needed
- Low: Fires including prescribed burns may be lit, used or maintained in the open air on condition that persons making such fires take reasonable precautions against their spreading
- Moderate: No fires may be allowed in the open air except in designated fireplaces if authorised by the Fire Protection Officer where a Fire Protection Association exists, or elsewhere by the Chief Fire Officer of the local fire service
- High: No fires may be allowed under any circumstances in the open air
- Extreme: No fires may be allowed under any circumstances in the open air. All operations likely to ignite fires must be halted and householders placed on alert

4. Development and site description

Human settlements and urban development are one of two contributing factors that have altered the natural fire cycles in the Cape Floristic Region. Fire frequency has increased as a result of deliberate or accidental fire setting by people, while the influences of wildfire management and suppression have also played a vital role in the alteration in fire frequency. The other contributing factor that has led to large changes in natural fire cycles is the introduction of invasive alien vegetation. Invasive alien plants are fire-adapted and are highly flammable and drastically increase fuel loads within the landscape including agricultural areas leading to wildfires that burn at higher intensities and more frequently. This, in turn, can cause alterations in soil chemistry and composition, kill soil-stored seeds, as well as damage properties and assets on the urban edge.

The proposed development consists of 1265 residential erven (zoned Residential I), five townhouse erven (zoned Residential III that includes 150 Social housing units, a multi-purpose community centre and a $\pm 300\text{m}^2$ split zoned Business II site located on Portion 1302), an open space network and recreation area (zoned Open Space II) and a $\pm 3500\text{m}^2$ split zoned Business II site (located on Portion 1306), a road network and associated infrastructure services on the footprint as indicated on the layout plan (Figure 2). The remainder of the property will be managed as a nature reserve.

Access to the development will be from Main Road 344 through the culvert under the N2 national road, which will be upgraded to four lanes. A second access will be provided to the south along the existing dirt track to Hartenbos Landgoed Phase 1. This road will be upgraded to two lanes and will have a paved/tarred surface.

The project site consists out of approximately 290 hectares of natural vegetation and 246 hectares of agricultural areas (dry lands). The natural vegetation is located on the slopes along the coast and the Klein Brak river and the coast. The agricultural areas are located on the flat areas bordering onto the N2 national road. No fire records exist for the property but the structure and composition of the vegetation indicate that the property has not seen fire for many years (>15 years) (Figure 3).

5. Wildfire risks to properties

Most wildfires are caused by careless or dangerous activities by humans. This can include illegal burning of rubbish or cleared vegetation, use of machines like chainsaws on high fire danger days, harvesting operations, smoking, hot ashes or intentional fire setting. The following three (3) aspects need to be taken into consideration when protecting properties from wildfires:

- Hazard – Any fuel with the potential of causing damage to people, property or the environment
- Vulnerability – The degree of damage a fire can create on a property. This is measured in terms of human life, monetary value or biodiversity. Vulnerability, therefore, depends on how well assets are protected and the ability of assets to recover after a fire
- Risk – The measure of damage expected to suffer as measured by the size of the hazard and the vulnerability of an asset to the fire

Slope dramatically increases the speed at which a fire can move. Each 10 per cent increase in slope, doubles the speed of a bushfire. Conversely, fire is considerably slowed when the headfire is going downhill. When slopes exceeding 15-20° are combined with wind in the direction of the slope, the effect is to push the flames almost parallel to the surface, and the flame front can cover the whole slope, that is, the whole slope becomes one sheet of flame. This can present a hazardous situation for firefighters.

Houses located on hilltops and sides to take advantage of scenic views are very vulnerable if they are upslope of areas with high fuel loads (Figure 5). Houses may also be located on the borders of drainage systems. If the streamline has a steep gradient, these features form gullies, chutes or funnels in which a wildfire can be concentrated, which may be reinforced by wind turbulence exacerbated by the uneven terrain. In these situations, convective heat, as well as radiant heat, can be a source of ignition. Vegetation below these houses should be a specific target for management action, reducing them to low fuel loads.

The proposed development is located on top of a hill with old (>15 years) natural vegetation (fuel load) along the surrounding slopes (Figure 4). Due to the slope, the development should have a wide safe zone (buffers) to protect infrastructure and create access for firefighting. Should a fire start in the old vegetation located on the slopes surrounding the development footprint, it will pose a serious risk to life and infrastructure (Figure 3).

Wind has the most significant impact on a wildfire's behaviour. It is also the most unpredictable factor. Winds supply the fire with additional oxygen, provide even drier potential fuel and push the fire across the landscape at a faster rate. The stronger the wind blows, the faster a fire spread. The fire generates winds of its own that are as much as ten times faster than the ambient wind. Wind can throw embers into the air and create additional fires, called spotting. Wind can also change the direction of the fire, and gusts can raise the fire into the trees, creating a crown fire. Should a fire start in the natural vegetation located on the slopes surrounding the development with a south-easterly wind, it will pose a serious risk to the development (Figure 3).

The Wildland-Urban Interface (WUI) is the area where urban development meets wildlands (vegetation areas) and where homes are built near flammable vegetation. The proposed development has a jagged WUI that makes it very difficult to protect infrastructure against a veld fire from the north. Vegetation strips are also present in between the various development components fragmenting fuel loads and allowing a fire to burn in between structures (Figure 3).

The N2 national road creates a firebreak on the northern boundary of the property, but it is also a source of human-caused fire ignitions (burning cigarettes thrown from cars) that can ignite a fire in the road reserve on the northern boundary of the property. The George-Mossel Bay railway line that cuts through the natural vegetation along the coastline is also a source of human-caused fire ignitions and a fire starting next to the railway line will rapidly burn up the slope threatening development infrastructure on the top of the hill. The Klein Brak River located on the eastern boundary of the property provides a natural firebreak, but the potential exists for human-caused ignitions (burning cigarettes thrown from boats & recreation users at the river mouth). A strip of natural vegetation is located between the western boundary of the property and the Hartenbosbos Landgoed Phase 1,



including the access road coming from the N2. The western boundary is therefore also exposed to human-caused ignitions from the road and Hartenbosbos Landgoed Phase 1 that can potentially create a fire that will burn upslope to erven located on the western boundary of the development (Figure 3).

6. Wildfire mitigation measures

The mitigation and planning measure set out in this section are first to minimise the fire risk to the property and secondly the fire risk of the property to surrounding properties and urban areas. Landowners have a common-law duty to conduct themselves in such a way that they do not cause harm to others. This requires landowners to reduce fuel loads to reasonable levels, establish firebreaks and another part, regardless of the provisions of any legislation, is that they take reasonable measures to prevent the spread of wildfires to adjoining properties.



Figure 2: Map showing the development layout



Figure 3: Map showing land cover

6.1 Firebreaks

A firebreak around the perimeter of the cadastral lines of a property is a legal requirement of all property owners and their lessees as per the National Veld and Forest Fire Act 101 of 1998. The purpose of a firebreak is to provide an area of reduced fuel load which will reduce the intensity of a fire and therefore allow for more effective combatting and to then also serve as a line from which a back burn can be started.

Section 12(1) of the National Veld and Forest Fire Act provides that: "Every owner on whose land a wildfire may start or burn or from whose land it may spread must prepare and maintain a firebreak on his or her side of the boundary between his or her land and any adjoining land. Section 13 provides further that:

An owner 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:

- it is wide enough and long enough to have a reasonable chance of preventing a wildfire from spreading to or from neighbouring land
- it does not cause soil erosion
- it is reasonably free of inflammable material capable of carrying a wildfire across it

Legally landowners can cut firebreaks through indigenous vegetation, but environmental losses must be weighed up against the costs of a court case and claim against the landowner in the event of a runaway wildfire onto their neighbours land. In some instances, indigenous vegetation can be incorporated as a natural firebreak or as a buffer zone in a fire management plan, which is submitted to the Minister for approval. Also, it is possible to either realign a break by agreement or apply for an exemption as detailed above to avoid indigenous vegetation, if appropriate.

Firebreaks should have significantly reduced fuel loads and require regular maintenance to prevent fuel loads (vegetation) from accumulating again. The following aspects must be considered when creating firebreaks along the property boundary:

- Annual maintenance of the firebreak is required to reduce fuel volumes, eliminate weeds and remove dead vegetation
- Firebreaks should be between five (5) and thirty (30) meters wide depending on the inherent fire risk. Firebreaks bordering on grazing areas with minimal fuel loads do not require wide firebreaks and can be narrow (5 meters) and brush cut. Firebreaks bordering on dense stands of invasive alien plants or natural vegetation need wider firebreaks (30 meters)
- All cut material from initial firebreak clearing, logs, stacks and dumped garden material should be removed from the site and disposed of, while only light material cleared during firebreak maintenance must be evenly dispersed at least twenty (20) meters in the veld above the firebreak
- The height of vegetation within the firebreak must be kept as low as possible, and all lower limbs of trees (up to 2 meters off the ground) should be pruned
- Trees located within the firebreak should be thinned out into clumps to ensure breaks in the canopy. Dead trees and branches, as well as dead undergrowth, must be removed

- Most common methods of clearing and maintaining a firebreak include: chainsaw, brush-cutting, slashing and herbicide application
- According to the National Environmental Management: Biodiversity Act, 2004 (Act No. 10 of 2004) the use of bulldozers to create firebreaks is strictly prohibited
- No spark generating equipment should be used to clear or maintain firebreaks (e.g., brush-cutters with blades or chainsaws) on Orange or Red Fire Danger Index (high fire danger) days
- All invasive alien vegetation within firebreaks should be treated with the correct registered herbicide, which must be applied immediately after cutting/felling invasive alien vegetation (failure to do so will compromise the effectiveness of the herbicide). Follow-up treatment of invasive alien vegetation must be planned for and conducted accordingly
- Steep areas in which erosion and negative environmental impacts can occur must be taken into consideration. In these areas, either not all the vegetation should be removed (e.g., brush-cut) or plant low growing, fire-resistant plants with fleshy or watery leaves such as *Carpobrotus edulis* (Sour Fig) and preferably endemic to the area
- Firebreaks should be aligned to avoid known populations of rare and endangered species
- Firebreaks must be aligned to avoid sensitive areas such as wetlands
- Firebreaks should be positioned parallel or at an acute angle to the prevailing wind direction
- Firebreaks should not be constructed with sharp angles or vertically up slopes

The following firebreaks must be established on the property to ensure compliance to the National Veld and Forest Fire Act 101 of 1998 and protect infrastructure (Figure 4):

- A 20-meter firebreak must be created where the property boundary runs along the N2 national road
- A 10-meter firebreak must be created on the outside of the erf boundary that is adjacent to the natural vegetation
- Where erfs are adjacent to natural vegetation the houses must be set back 10-meters from the natural vegetation. Erven that are adjacent to natural vegetation will, therefore, have a 10-meter firebreak on the outside of the erf boundary, and the house must be set back from the erf boundary by 10-meter. The 10-meter setback buffer must be firescaped to further protect the structure against a fire.
- A 10-meter firebreak must be created on the remainder of the property boundary (the remaining property boundary after the 20-meter N2 and 10-meter erf firebreaks have been created)

6.2 Fuel load management

Many ecosystems are prone to fires and have adapted to them, and fires are necessary to maintain the health of these ecosystems. However, fires also pose a threat to human life and infrastructure. This is especially true of areas where significant development has taken place within or adjacent to such fire-prone ecosystems. The management of fires in these areas is often characterised by both uncertainty and conflict, particularly as the conservation of biodiversity and the maintenance of ecosystem health typically requires the judicious use of fire, often using prescribed burning.

Managing fuel loads is an integral part of managing wildfire risk. The nature of the risk will be dependent on the different fuel types and the age of the vegetation. Reducing fuel loads may be desirable in terms of reducing immediate wildfire risk, but it may have other harmful impacts, particularly in the damage it can cause to ecological systems. Maintenance of a fire regime that mimics as closely as possible the natural regime that shaped the evolution of the biota of the development area is critically important. Two broad strategies in achieving this are to firstly reduce the spread of fires that exceed the inherent ecological thresholds, regarding frequency and season, and secondly, to use controlled fires to reduce the incidences of senescence.

In terms of fire frequency, bio-minimum and bio-maximum thresholds have been suggested for the various natural vegetation units. The bio-minimum is an index of the average minimum frequency of when a unit of vegetation should burn to allow the longer maturing species to set enough seed for sufficient post-fire recruitment. The bio-minimum for the project area is 10-15 years. The bio-maximum threshold is the maximum age that a natural vegetation unit should be allowed to reach, to prevent senescence and consequent permanent decline in biodiversity. The bio-maximum for the property is > 15 years. The Hartenbos Strandveld is the dominant natural vegetation type on the property (Vlok 2007). The vegetation has reached the bio-maximum threshold, and a controlled burn should be executed with the assistance of the Mossel Bay Fire Department and Southern Cape Fire Protection Association once the Mossel Bay Fire Department has issued the required burn permit. All invasive alien plants must be removed before the controlled burn is executed to reduce fire intensity.

The season of burn thresholds should be used to identify when concerted efforts should be made to reduce the spread of fires ignited by human causes in the “wrong” season. The fire season threshold for the development area is from December to March and fires outside this threshold must be prevented.

Irregular boundaries formed by features such as gullies, ravines and ridges form “fingers” of vegetation that penetrate the development can provide a conduit for wildfires to travel into the development. These are most commonly a part of the natural drainage system that has obstructed building operations. The vegetation in these areas should be managed (pruned) to reduce fuel loads and maintain them in that condition.

Invasive alien plant species generally increase fuel loads and fire intensities and should, therefore, be controlled.

6.3 Firescaping

Defensible space is an area, typically a width of 10 metres or more, between a property and an approaching wildfire, where the combustible material has been removed or modified. By making changes in the home ignition zone (the area including and immediately surrounding the home), homeowners can substantially reduce the risk of their home becoming fuel for the inevitable fire.

Firescaping specifically refers to landscaping in ways that will reduce the probability of fire catching and spreading through the firescaped area (e.g. a garden). The goal is to develop a landscape with a design and choice of indigenous plants that offer the best defensible, survivable space and enhance the property. The minimum survivable area around a house should be at least 10m around the home. However, if a home sits on top of a slope and is surrounded by dense vegetation, the distance must be increased.

A firescaped property consists out of three planting zones:

- **The low resistance zone:** This is the zone adjacent to the house. It should include well-irrigated fire resistant low-growing ground-covers and lawn, together with non-flammable hard landscaping such as flagstone walks, brick patios, stone retaining walls, gravel and inorganic mulches. Fire retardant small shrubs can also be planted. Avoid planting trees, climbers and medium or large shrubs directly up against buildings as these can become part of a 'fire ladder', carrying flames from plant to plant to a house. Also avoid timber decking, wooden pergolas and archways, and organic mulches.
- **The garden or medium resistance zone:** Within the garden, create 'island beds' 3-5m apart surrounded by lawn, paving or gravel. Choose fire-resistant trees and shrubs, but they should touch each other or create a ladder effect that can deliver fire to the structure. Plant low growing ground-covers between the shrubs.
- **Perimeter or buffer zone:** Plant low growing, fleshy-leaved ground-covers, hedging plants, large aloes and isolated forest trees that are fire-resistant and resprout when damaged by fire. Non-flammable fencing materials must be used.

The clearance of flammable vegetation around buildings has proven to be one of the most critical factors in wildfire survival. It provides a defensible space enabling firefighters or residents to safely defend from and reducing the chance of direct flame contact (reducing the intensity of radiated heat). The following actions can be implemented around existing infrastructure to create a defensible space:

- Lower limbs of trees should be pruned (up to at least 2 - 3m from ground level) to prevent low flames climbing through ladder fuels into the tops of the trees.
- Tree foliage should be thinned out into clumps, so there are breaks in the tree canopy. Topping of trees, however, is discouraged as this creates excessive branching, which in turn increases the risk of fire danger.
- Ground leaf litter and undergrowth should be removed by regular raking or mulching.
- All dead and dry vegetation and litter from gardens as well as hanging dead and dry branches from individual trees and garden refuse should be removed regularly
- All trees, shrubs or grass which is close to, overhanging or touching the structures should be removed.
- All combustible and dry vegetation from under decks, against walls and pillars, should be regularly removed

Figure 4 indicates where firescaping should be implemented on the development

6.4 Bulk engineering services fire protection considerations

The following factors should be considered in the provision of bulk engineering services along or adjacent to assets (buildings, roads, fences, sheds):

- Electrical transmission lines should preferably be underground
- Where overhead lines are provided, short pole spacing should be used
- Trees should be kept well away from overhead lines, and regular inspection of overhead lines must occur.
- Gas cylinders should be kept clear of other combustible materials

- Gas cylinders close to buildings should be positioned such that release valves are directed away from the building and other fuel sources
- LPG gas cylinders should be placed on the leeward side of the built environment
- Mains water supply should ideally be on a ring main system, and the infrastructure should be designed according to the South African National Standard for Community Protection against Fire (SANS 10090:2003)
- Fire hydrants should be clearly marked and placed at strategic points along the access road and internal roads
- Fire hydrants' minimum pressure should be 300kPa and a flow rate of 20 litres per second.
- Clear reflective signage should be implemented to assist responding firefighting agencies in the location of relevant strategic items. These include portions or house numbers, perimeter gates, firefighting equipment store, pedestrian tracks, hydrants, etc. These have many fire control advantages.
- Perimeter fence lines should ideally be made entirely of metal with no wooden components and if electrified for security reasons, the insulator and strainer bobbins should be made of ceramics and not out of plastic.
- Access to the electrified security fence energiser should be readily available to responding officers or the rapid coordination by the estate thereof should be implemented.

6.5 Fire protection considerations for structures

Fire intensity has been found to be the most important determinant of house survival and therefore, is the principle risk factor. Intense fires create high levels of radiant heat and high-velocity turbulent winds. There are three ways a wildfire can ignite a building:

- Spot fires from flying embers
- Radiated heat
- Direct contact with flames

The most common source of ignition in a house is because a burning ember enters and sets fire to something in the house. Burning embers are swirled around at high speed in the fire generated winds and get forced into buildings through holes, ventilation ports and windows which have been cracked by the intense heat. Airborne debris may itself break windows in the case of ,particularly severe winds.

One of the chief sources of ignition in a house is through ingress of burning embers. All buildings are at risk when situated close to fire-prone vegetation. Although brick and concrete masonry walls are inherently non-combustible, many architectural features are vulnerable, such as window openings, exposed timber gable ends, exposed timber roof members, barge boards, fascias and doors and loose roof tiles. Windows glass can fail relatively easily during a fire, allowing high levels of radiant heat to penetrate the interior or allow entry of burning embers, exposing the combustible furnishings (e.g. curtains) to direct heat and ignition sources.

Buildings with combustible external walls, for example, timber type constructions, are also at risk, as are buildings with thatch roofs or other combustible roof cladding such as bituminous-based fibre sheeting or plastic, as might

be found in informal settlements. Adequate fire breaks need to be provided at property boundaries, and gardens clear of dense flammable vegetation (See Section 6.3). Accumulated dead vegetation or other combustible material such as wood-piles is a significant risk factor under buildings constructed on piles (stilts). Wood-piles can generate large amounts of heat over an extended period, adding to the heat load from the wildfire itself (All under-floor areas should be kept clear of combustible materials and vegetation).

PVC gutters and down-pipes are not considered as high-risk items as they would tend to char and melt under high levels of radiant heat and they do not contribute to the fire load as they only burn for as long as they are exposed to flame; they are self-extinguishing, i.e. they stop burning once the flame is removed.

In some areas, access roads separate the development edge from the veld. It is much easier to fight wildfires from such roads than from those set well back into the urban zone and with access roads to houses. Typically, these are found on the steeper slopes where access roads approach the properties from below. Appliances attending fires in these cases must loop round from one road to another to cover relatively short distances, this can use valuable time.

Properties which are difficult to get to, are located up narrow streets and surrounded by thick and highly inflammable vegetation are at particular risk. Firefighters will be reluctant to attend fires in these conditions if they cannot turn the fire trucks around and they are at risk of getting trapped.

The following factors should be considered during the design and construction phase of the development:

- The roof and exterior structure of buildings should be constructed of non-combustible and fire-resistant materials such as tile/slate, aluminium, sheet iron, brick or stone etc.
- Adequate turning space should be provided for within the development's road network and thick and highly flammable vegetation be kept back from the narrow roads
- Openings to the house should be covered with fly-screen wire gauze, especially entry points to the roof and floor cavities. This includes especially under the eaves, roof vents and loose roof tiles
- Homeowners should consider shutters for their windows, or wire fly-screens which could be clipped over windows in the case of an impending fire. The metal gauze reduces the intensity of the radiant energy reaching the window, and thus heat stress on the glass.
- Draft excluders can be fitted onto doors and skylights should be guarded with non-combustible and sturdy covers.
- Thatch as a roofing material should be avoided at all costs. If thatch will be used approved sprayers/sprinklers must be installed on the windward side of the roof structures. Strong prevailing winds inevitably drive wildfires and sprinkler systems on the thatched roofs have historically been installed on the apex or ridge, which has proven to be completely ineffective. Winds drive the water spray away from the roof and expose the windward facing thatch roof to both ember attack and radiant heat
- Thatch roofs can also be treated with a fire retardant which must be environmentally friendly and retreated at the prescribed intervals according to the type of retardant used
- Roof vents, eaves and floor vents should be sealed with wire gauze screening to prevent glowing embers igniting a fire in these areas

- Approved fire-retardant chemicals should be used to treat highly combustible materials such as wood siding, wooden decks and stairs and exterior wood panelling
- Household garden taps should have a 19mm diameter to ensure adequate water flow and should be located away from the house. Tap fittings in the vicinity of the firebreak or within the defensible areas should be metal and hoses should be rubber rather than plastic.
- Additional water storage tanks such as 3000 /5000-liter tanks should be considered and placed near the internal firebreak and/or the defensible space. The tanks should be dedicated as a firefighting water storage facility for the fire season and fitted with the correct couplings to dovetail into the responding firefighting equipment. These tanks must be installed in such a position that it's exterior and interior can be readily inspected, cleaned and maintained.
- A petrol driven pump with all the attachments and associated equipment should be purchased by the estate in the event there is a power cut and / or loss of water pressure. The pump must be able to be utilised in conjunction with the water storage tanks and swimming pools.
- Leaves should be cleared from gutters regularly, or a leafless gutter system should be installed to avoid the accumulation of flammable materials that can be ignited by burning embers
- Loose roof tiles should be secured to prevent glowing embers blowing in under a loose tile
- Storing of combustible fuels and paints in out-buildings should be avoided
- Firefighting equipment (fire beaters, rake hoes, hoses, couplings, petrol driven pump/s etc.) and clothing (as required by the NVFFA) should be stored at a centralised location
- Staff, landowners and tenants should be trained in wildfire suppression with frequent refresher course updates as required by the NVFFA

6.6 Awareness programs

Lack of awareness regarding factors contributing to increased fire risk is probably one of the greatest threats. There is a general lack of awareness of most of the risk factors but chiefly the need to reduce fire intensity through fuel load management and the prevention of ingress of burning embers into buildings. Property owners and occupiers are much more likely to take preventative action once they become aware of the risk factors.

A public awareness program should be implemented, it should focus on the risk factors and the recommended actions for reducing these. Such a program would need to use a variety of means of communication, such as the print media, brochures and training session where possible.

Residents also need to adopt a series of tasks throughout the year, which would result in a much greater level of protection to their houses:

Spring – start of the fire season

- Clear gutters
- Slash long grass and undergrowth
- Remove trash and cuttings from property
- Inspect for and close gaps in houses
- Trim overhanging branches

Summer

- Keep hose and mops handy
- Rehearse family fire drill/ emergency plan
- Mow grass
- Clear gutters
- Rake leaves and litter and remove from properties

Autumn / Winter

- Prune plants
- Undertake general repair and maintenance

6.7 Develop a fire reaction strategy

The estate in partnership with the Mossel Bay Municipal fire department and the Southern Cape Fire Protection Association should develop Fire Reaction Strategy (FRS). An estate FRS will result in better preparation in the event of fires as well as shorten the reaction time for such fires considerably.

6.8 Fire Protection Association

The estate should become a member of the Southern Cape Fire Protection Association (SCFPA). Members of the SCFPA have the following benefits:

- Shared resources between members with regards to fire-fighting equipment which results in being better equipped and resulting in a cost saving for individual members
- Firebreaks are not needed on the cadastral boundaries. Realignments can be negotiated between landowners and exemptions can be applied for by members resulting in a more practical and usable firebreak system. This will result in a cost saving for members by not having to prepare firebreaks on all the cadastral boundaries.
- Increase in the conservation benefit within the landscape due to the minimization of the number of firebreaks. This will reduce potential accelerated soil erosion and disturbance to natural vegetation
- Increased awareness and management of social, environmental and economic risks
- Increased coordination in the event of a fire
- Reduction of fire-related risk by various means such as fuel load management
- Members are automatically affiliated to the Western Cape Umbrella Fire Protection Association which liaise with government institutions
- Assistance in the event of extreme fire conditions through the provision of trained fire fighting teams and management
- Training for new members in basic veld fire fighting
- Provision of a platform with which to raise issues with local and provincial government structures
- Enforcement where necessary in incidences where members and non-members do not comply with legislation
- Members adhering to the rules of the SCFPA will automatically comply with relevant legislation

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- No presumption of negligence in civil claims for damage where fire from the SCFPA member's land causes damage or loss to another person (National Veld and Forest Fire Act, 101 of 1998, Section 34)



Figure 4: Map showing firebreak ne

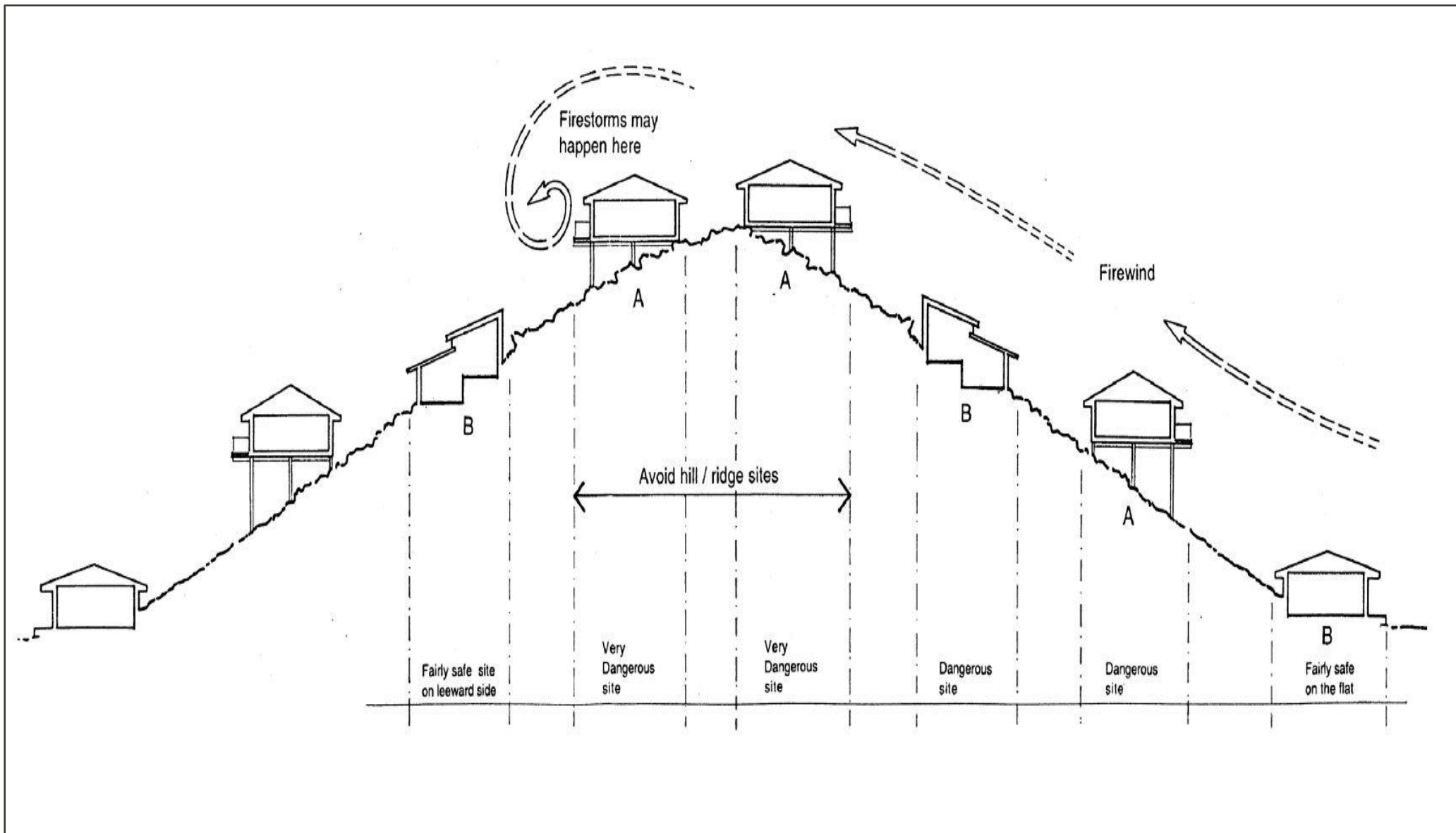


Figure 5: Positioning of houses and exposure to fire risk

7. Preparation, response and procedures during wildfires

Chapter 5 of the National Veld and Forest Fire Act, 1998 (Act No. 101 of 1998) states the following about readiness for firefighting:

- 17. (1) Every owner on whose land a veldfire may start or burn or from whose land it may spread must-
 - (a) have such equipment, protective clothing and trained personnel for extinguishing fires as are-
 - (i) prescribed; or
 - (ii) in the absence of prescribed requirements, reasonably required in the circumstances;
 - (b) ensure that in his or her absence responsible persons are present on or near his or her land who, in the event of fire, will-
 - (i) extinguish the fire or assist in doing so; and
 - (ii) take all reasonable steps to alert the owners of adjoining land and the relevant Fire Protection Association, if any.
- (2) An owner may appoint an agent to do all that he or she is required to do in terms of this Section.”
- 18. (1) Any owner who has reason to believe that a fire on his or her land or the land of an adjoining owner may endanger life, property or the environment, must immediately-
 - (a) take all reasonable steps to notify—
 - (i) the fire protection officer or, failing him or her, any member of the executive committee of the fire protection association, if one exists for the area; and
 - (ii) the owners of adjoining land; and
 - (b) do everything in his or her power to stop the spread of the fire

8. Firefighting equipment requirements

The number of required firefighting equipment is dependent on the size of the property and are indicated in Table 1 below.

Property size (ha)	Fire beaters	15l rucksack pumps	Rake hoes	First aid kits	Cellphones	Trailer pump (>1000l)	Bakkie mounted firefighting unit (water supply & pump)
1-10	3	2	3	1	1	0	0
11-100	5	4	5	1	1	0	0
101-1000	10	5	10	1	1	1	1

Table 1: Firefighting equipment requirements