

STRATEGIC BUSHFIRE RISK ASSESSMENT

FOR THE

INVERLEIGH STRUCTURE PLAN



Report prepared by Golden Plains Shire

2018

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EXECUTIVE SUMMARY

Golden Plains Shire Council is preparing the Inverleigh Structure Plan. The Plan identifies six (6) areas for potential residential growth.

This report assesses the bushfire risk associated with residential use in these areas by:

- Identifying the type and level/s of bushfire risk for each of the areas.
- Characterising and evaluating key bushfire risks.
- Identifying mitigation strategies to address the risk to existing, as well as the progressive expansion of the future urban interface, and
- Providing land use and urban design directions for consideration within future structure planning for proposed residential growth areas.

Planning Practice Note 64 – Local Planning for Bushfire Protection was used as a guide when assessing the bushfire risk. This included four main steps:

- Establish the context;
- Identify the risks from bushfire;
- Analyse and evaluate the risks; and
- Translate risk mitigation into planning scheme provisions (DTPLI, 2013)

The proposals for residential growth in Inverleigh are considered to be appropriate from a bushfire risk perspective provided that measures identified in this report are taken to minimise the risk to residents and emergency services. A moderate risk of impact from woodland and grassland fires exists at these sites, however this can be adequately mitigated in the planning and implementation of development.

It is important to note that fire risk in rural residential communities cannot be eliminated and communities may still experience significant impacts and losses on days of Severe, Extreme or Code Red fire danger. Additionally, predicted changes in weather patterns; consistent with climate change modelling predictions, have the potential to result in more high fire danger days and more intense fire events (e.g. 2018 California, Queensland and Greece fires) that are a greater threat to communities.

The planning and design response provides guidance towards achieving bushfire risk mitigation.

The key recommendations and comments from undertaking the risk assessment at each of the potential growth areas are:

- Ensure growth area layout minimises interface between higher threat vegetation and assets and appropriate allotment layout that minimises the number of properties directly exposed to fire on the interface.
- Ensure sufficient separation distances between fire fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes, 173 agreements) or fuel management provisions on private land (e.g. fire prevention notices).

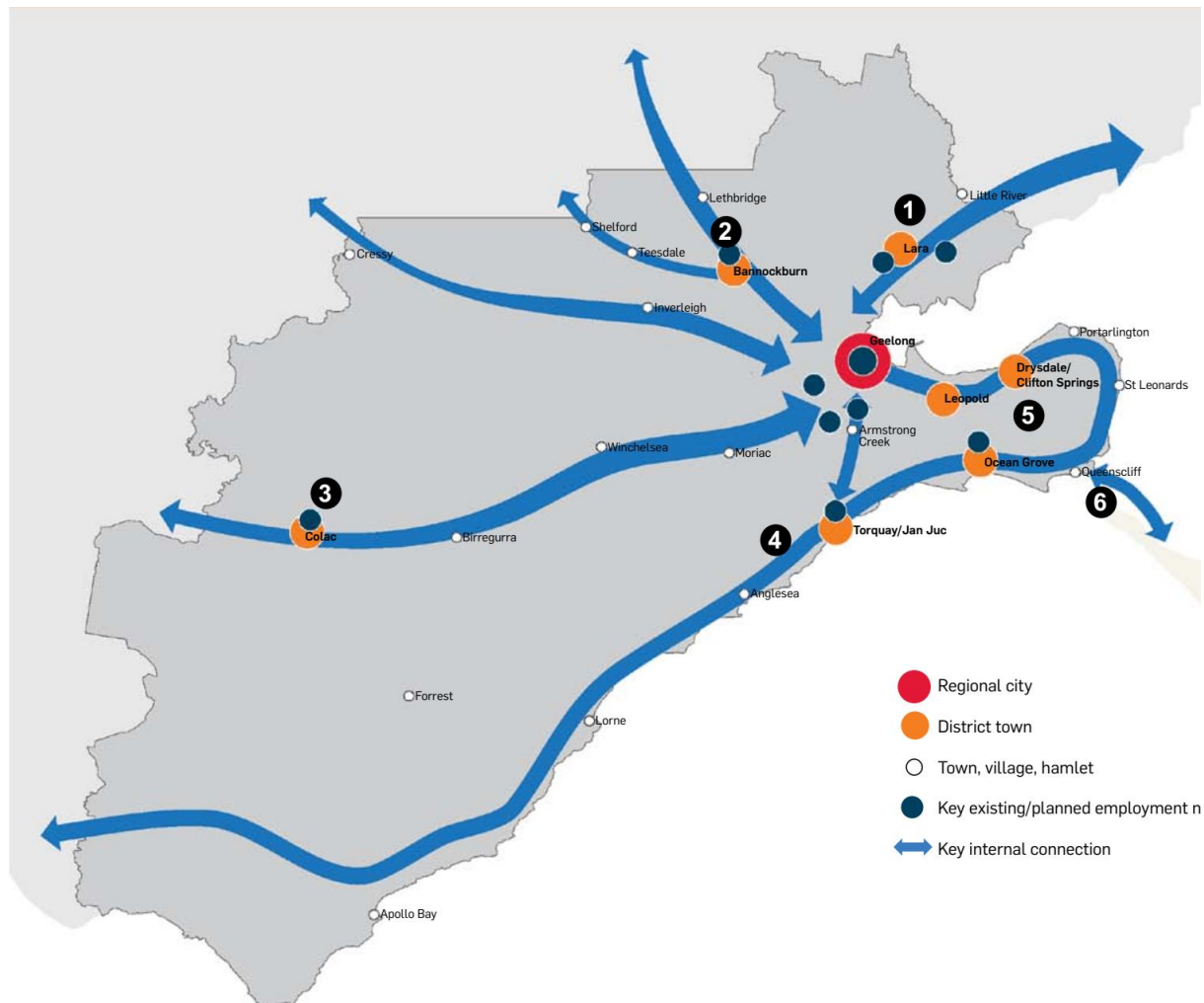
- Ensure properly constructed access and egress to enable access by emergency services and egress by residents
- Ensure water supply (pressure and volume) is sufficient to support firefighting operations
- Ensure any public open space created as part of the development is able to be appropriately accessed to allow management for fire.
- Stage development to minimise exposure and risk through expansion adjacent to existing developed land.

1 INTRODUCTION

Golden Plains Shire Council is preparing the Inverleigh Structure Plan. The Structure Plan provides strategic direction for future development and growth in the township of Inverleigh.

Inverleigh is located in the south east area of Golden Plains Shire and is one of a cluster of townships around Bannockburn providing a rural township alternative to suburban residential development available in the regional city of Geelong.

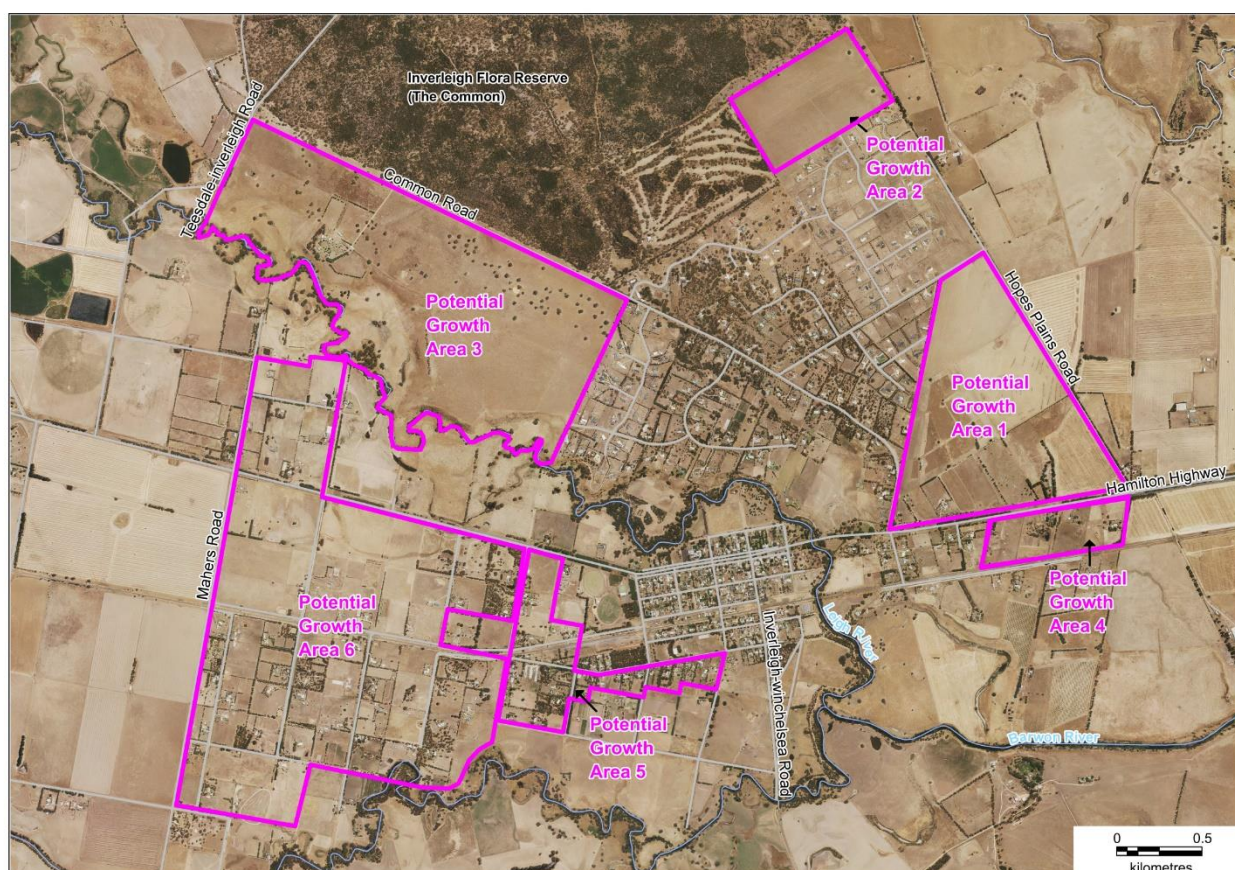
Figure 1: Regional Context Plan



The township of Inverleigh has experienced significant growth in the last 10 years, partly due to the opening of the ring road and the reduced commuter times to Melbourne. The population is currently around 1,200 persons and is expected to double in the next 10-15 years.

A draft Inverleigh Structure Plan 2018 has been prepared and within this, six (6) areas within and on the edge of the Inverleigh township have been identified for potential residential growth. Three areas are located in the north of the township and three areas are located the southern half of the township.

Figure 2: Inverleigh Potential Growth Areas Overview



As part of the formal consultation of a planning scheme amendment to rezone one of the identified growth areas on the northern edge of the township, known as Amendment C74, the Country Fire Authority (CFA) identified bushfire risk as a key issue requiring consideration in the development of the structure plan. Whilst consultation has been undertaken throughout the preparation of the Inverleigh Structure Plan, recent advice from the CFA has indicated their precautionary approach of referring potential strategic bushfire risk areas to panel for consideration.

This bushfire risk assessment project will assist Council to understand and reduce the bushfire risk associated with residential use in these areas by:

- Identifying the type and level/s of bushfire risk for both the northern and southern growth areas identified for Inverleigh;
- Characterising and evaluating key bushfire risks;
- Identifying mitigation strategies to address the risk to existing, as well as the progressive expansion of the future urban interface; and
- Providing land use and urban design directions for consideration within future structure planning for the growth areas.

2 METHODOLOGY

2.1 Study approach

The approach to this study is based on the approach undertaken by Terramatrix Wildfire Management Services in 2014 for the Rural City of Wangaratta. Planning Practice Note 64 - Local Planning for Bushfire Protection (DTPLI, 2013) has also been used to provide guidance about assessing the bushfire risk in relation to land use planning decisions and incorporating risk mitigation measures in future development.

The general approach described in Appendix 1 of Planning Practice Note 64 has been used to structure this bushfire risk assessment for the Inverleigh growth areas. This includes four main steps:

- Establish the context;
- Identify the risks from bushfire;
- Analyse and evaluate the risks; and
- Translate risk mitigation into planning scheme provisions (DTPLI, 2013)

Section 3 “The Context” provides factual information about the study sites and the surrounding landscape. This includes descriptions of the sites, development plans, land use planning controls and bushfire mitigation plans relevant to the growth areas.

Section 4 ‘The Risk from Bushfire’, gives details of the factors that influence fire behaviour and how they contribute to bushfire impact on the community. In the context of describing the risk of bushfire to the identified growth areas and the existing Inverleigh township, the consequence can be defined as loss of life and houses during a bushfire. The likelihood of this consequence can be assessed by considering:

- The probability of weather conditions occurring that could result in a fire of sufficient intensity to destroy homes and claim lives;
- The probability of an ignition on that day;
- The potential for a fire to develop to a level of severity at the study site such that homes are destroyed and lives could be lost;
- The vulnerability of assets to the level of bushfire attack to which they are exposed; and
- The presence and efficacy of risk controls.

In this assessment a description of potential bushfire behaviour was used to examine the potential for a severe fire to impact the study area. The description considered a range of input, some of which were site-specific data analysed at a local scale (such as fuel, vegetation, topography and length of fire run) and others which were assumptions (such as the weather conditions that might occur on the day of the hypothetical fire, and that an ignition could occur).

The description of the bushfire characteristics and potential bushfire scenarios at the study sites was based on:

- Analysis of spatial and other data provided by Golden Plains Shire or obtained from the State Government of Victoria and other government agencies;
- Field inspection and assessment of the study area; and
- The professional judgement of Council's Natural Resource Officer and Community Safety Team Leader (Municipal Fire Prevention Officer)

Section 5 'Analysis and Evaluation' provides a summary of the bushfire risk facing the sites and the proposed residential expansion into them. The professional opinion of Council officers as to the appropriateness of the proposed development on the sites, given the level of bushfire risk. The ability of the development to comply with the requirements of AS 3959-2009 Construction of Buildings in Bushfire Prone Areas (Standards Australia, 2009 (hereafter AS3959) across the sites was considered, as well as the ease with which other appropriate bushfire risk mitigation measures could be implemented.

Section 6 'Planning and Design Response' explains how the bushfire risk mitigation measures could be included in the expansion of Inverleigh. The following design principles were used as a basis for these measures:

- Avoid residential development in higher risk areas and provide appropriate setbacks from classified vegetation;
- Consolidate the township edge to limit grass/bushfire spread into the town area;
- Reduce the impact of bushfire on the new subdivisions and adjacent to existing urban areas by providing appropriate defendable space, promoting fire-safe landscape design within the residential area, and constructing new dwellings to the appropriate BAL construction standard;
- Facilitate effective fire suppression through urban design that meets CFA requirements for access and water supplies; and
- Provide viable evacuation options for residents and visitors.

The Royal Commission (VBRC, 2010) and Clause 13.05 Bushfire of the Victoria Planning Provisions (Golden Plains Planning Scheme) advocate applying the precautionary principle to assessing bushfire risk in new development, and this philosophy has guided the analysis and making of recommendations in this study.

2.2 Document Review

The following documents were reviewed as part of this study:

- *The Inverleigh Structure Plan Review*, 2005
- Regional Bushfire Planning Assessment Grampians Region (DPCD 2012)
- *Golden Plains Shire Municipal Fire Management Plan 2014-17*

3 THE CONTEXT

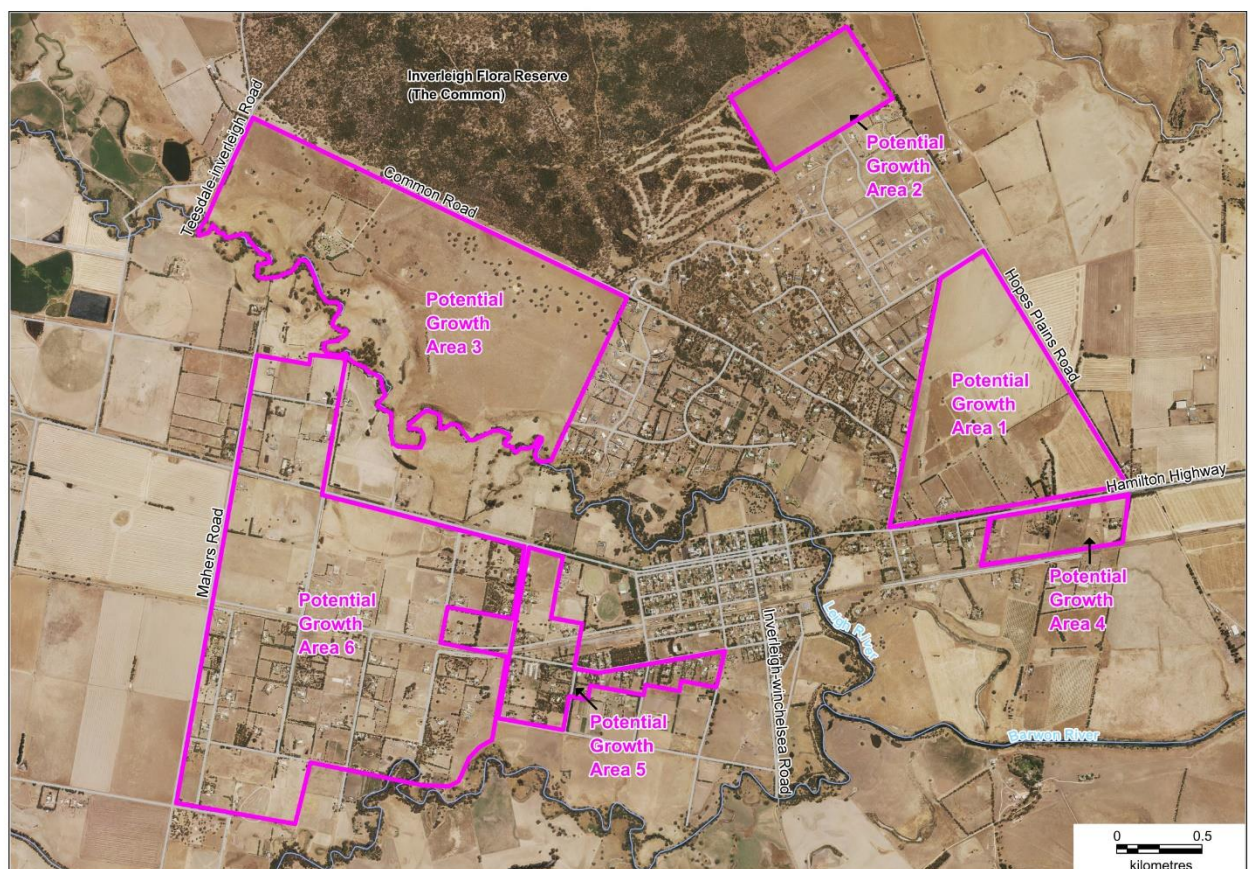
3.1 Site Overview

Inverleigh is a small rural township, located approximately 30km west of Geelong with a population of 1,200 residents. Inverleigh has a role as a meeting place for the Barwon and Leigh rivers as well as for travellers and the wider farming and resident communities. It is the gateway between Geelong and the western district and provides a welcoming place for travellers to stop. Inverleigh provides a low scale retail, service and community role to its residents and surrounding rural community, and offers a small town lifestyle alternative to the nearby towns of Bannockburn and Geelong.

Low density residential growth has occurred predominantly to the north of the town centre on elevated land generally unencumbered by the flooding constraints experienced in and around the town centre. Inverleigh has experienced greater than anticipated growth in recent times, attributable to the Geelong Ring Road enabling better access to the Geelong region and Melbourne. While the popularity of Inverleigh has grown, with many attracted to the low density residential lifestyle, residential growth is constrained by the lack of sewerage and susceptibility to flooding in many areas.

The Inverleigh Structure Plan 2018 is based largely on the previous Inverleigh Structure Plan Review 2005, which provided a township growth boundary and identified future low density residential growth areas, in the north of the township, and also to the south west of the existing township.

Figure 3: Potential Growth Areas



The core township area and the area immediately surrounding this area is significantly constrained by flooding. Beyond this to the north, the township has grown in a rural-residential settlement style

along the northern escarpment of the Leigh River up into the eastern perimeter of the Golf Course. Beyond the Golf Course to the north and west is the Inverleigh Flora Reserve; also known as 'The Common'. This reserve provides the northern town edge. Low density residential growth has been earmarked for the area between the Leigh River escarpment and Inverleigh Flora Reserve. Much of this area has already been developed at 1.0-2.0 hectare lot sizes. A reduction in the minimum lot size is proposed as part of the Inverleigh Structure Plan 2018. Areas yet to be rezoned and developed include the area in the northernmost corner, on Hopes Plains Road adjacent to the Inverleigh Flora Reserve and the Golf Course. This site is currently under review for rezoning to Low Density Residential Zone as part of Planning Scheme Amendment C74. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 2**.

Another site in the northern part of the township is on Common Road and is west of the existing low density residential zoned land along Common Road. The entire site comprises 208 hectares and is opposite the Inverleigh Flora Reserve and the Golf Course. Part of the site has recently been approved to rezone from Farming Zone to Low Density Residential Zone (Amendment C75). Amendment C75 is the first of a series of rezonings proposed opposite the Inverleigh Flora Reserve along Common Road. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 3**.

Also yet to be rezoned is the outer eastern boundary of the township along Hopes Plains Road and bounded to the south by the Hamilton Highway. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 1**.

On the southern side of the township (separated by the Hamilton Highway), a small section on the south eastern edge of the township provides opportunity for infill at a density of 0.4 ha lot sizes. A rezoning of this land is required from Farming Zone to Low Density Residential Zone. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 4**.

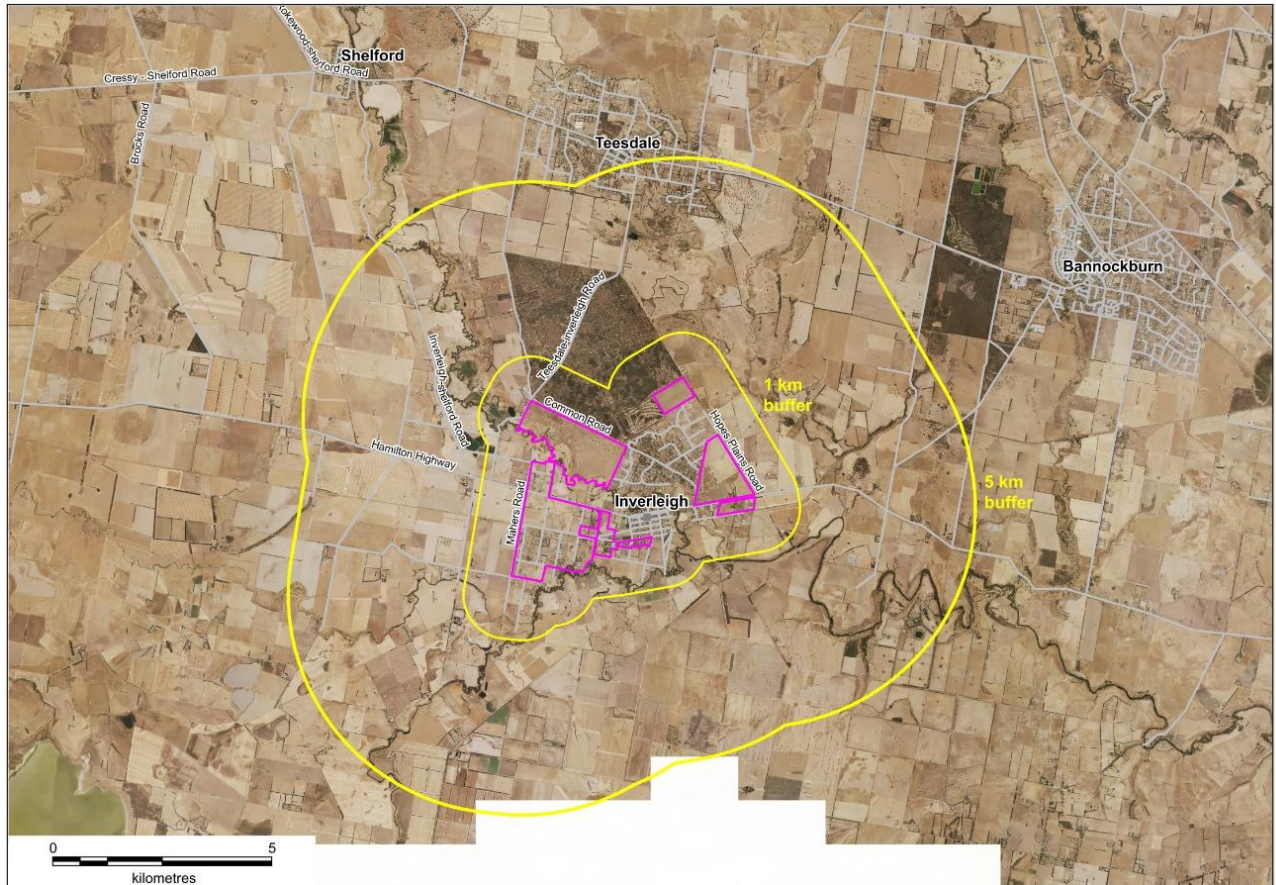
West of the core township area, a new area has been identified for residential growth. The area is between the Inverleigh Cemetery and the Inverleigh Recreation Reserve and stretches south of Victoria Park. The area was previously encumbered by an established broiler farm. The broiler farm has since ceased operation and the surrounding area can be considered for residential purposes, upon expiry of the existing use rights in April 2020. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 5**.

The area west of the core township and south of the Hamilton Highway was previously identified for Low Density Residential development in the Inverleigh Structure Plan 2015. There has been limited appetite for rezoning of this site as it is somewhat constrained by flooding, fragmented ownership and the railway line. The strategic direction for this area in the draft Inverleigh Structure Plan 2018 is to identify this area as a Future Investigation Area. For the purposes of this Strategic Bushfire Risk Assessment, this area is **potential growth area 6**.

3.2 Landscape Context

The broader landscape (1km and 5km) around Inverleigh was considered as per the advice of Planning Note 64 (DTPLI, 2013).

Figure 4: One and 5 kilometre radius around Inverleigh



Dry land agriculture is a major land use in the area surrounding Inverleigh. The floodplain is extensive through the core/ old township and surrounds. Other natural features include the river environs and escarpment as well as Inverleigh Flora Reserve which is a large remnant woodland with an adjoining golf course.

The broader landscape is inherently fire prone, and large bushfires are credible under fire weather conditions.

A 150 m assessment zone, beyond each site boundary was applied to assess the factors that directly contribute to the behaviour and potential impact of a grassfire or bushfire directly affecting each site. The 150 m assessment area is in accord with the Bushfire Management Overlay site assessment process (DTPLI, 2014 and CFA, 2012). Under AS3959 the site assessment area is 100m from the proposed dwelling site. A 150m zone was applied here because it reflects the more thorough of the two methods.

3.3 Existing and Future Uses

The Inverleigh Structure Plan Review 2005 nominates five of the six potential growth areas for low density residential of various lot sizes between 1- 4 hectares.

The areas in the north of the township (potential growth areas 1, 2 and 3), which are not yet developed, are utilised for farming. Broad grassy paddocks with scattered trees are typical. Generally the understorey consists of grass, the length of which depends on the presence or absence of grazing.

The draft Inverleigh Structure Plan 2018 indicates that these areas are planned for greenfield residential development with capacity for 525 lots with an average lot size of 0.4 hectares. Road upgrades and provision of open space, particularly around the river environs would also be expected within the new sites as part of development.

South of the Hamilton Highway, the potential growth areas 4, 5 and 6 have numerous houses scattered through land zoned Farming, which more closely resembles a rural living settlement pattern. These houses are often single storey with large garden surrounds.

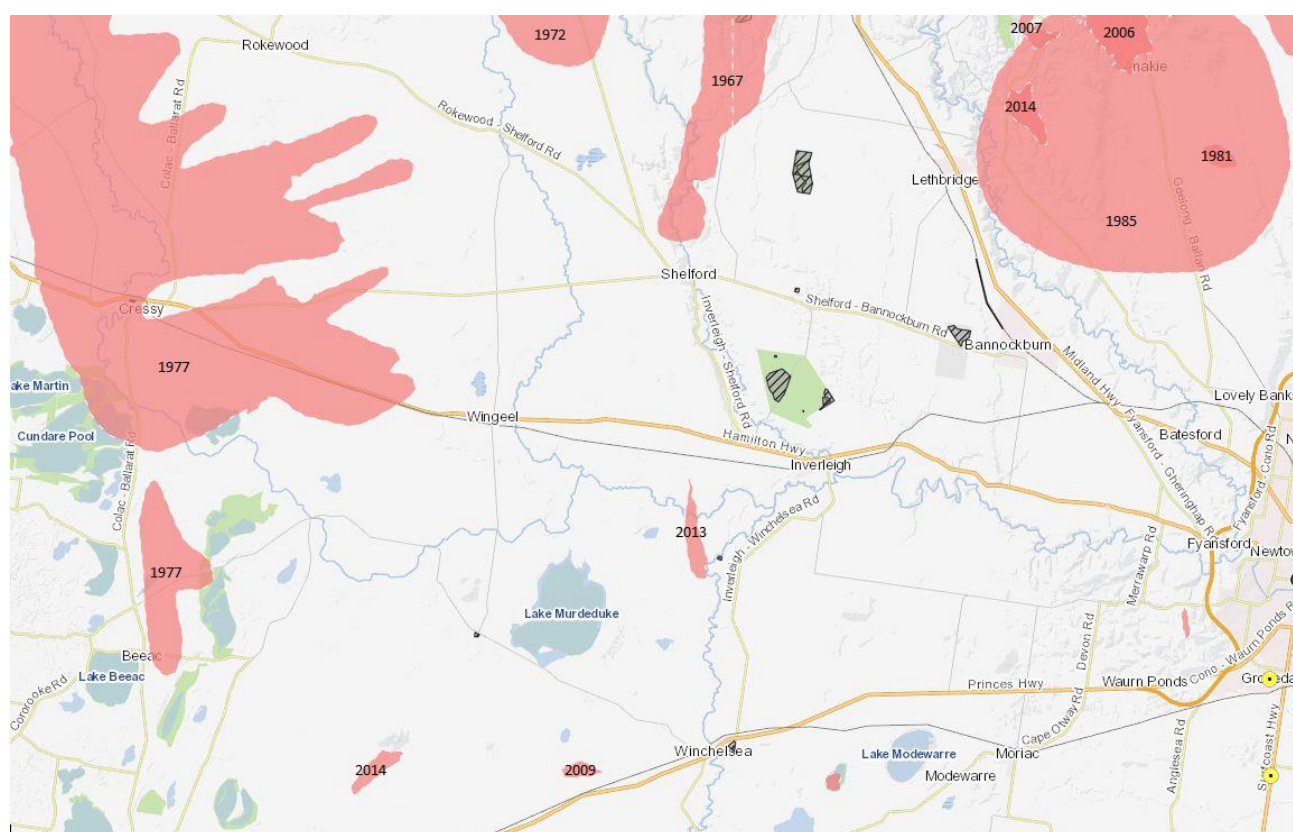
The draft Inverleigh Structure Plan 2018 suggests infill of these areas to a low density residential scale with a minimum lot size of 0.4 hectares.

3.4 Fire History

There is a long history of small fires around the Inverleigh district. Good work by CFA brigades and the community has ensured that any fires have been rapidly attacked and suppressed.

In the current day, rapid suppression by CFA and State firefighting resources, should ensure that ignitions are suppressed. However: Severe, Extreme and Code Red fire danger days could see fires that spread rapidly and are very difficult to suppress, despite the best efforts of crews on the ground.

Figure 5: Fire History around Inverleigh



Note: The above map (Figure 5) does not show the significant fire that burned into the north of Teesdale and Bannockburn in 1969. Source: Emergency Management Common Operating Platform (<https://cop.em.vic.gov.au>), November 2018.

3.5 State Planning Policy Framework (SPPF)

Clause 13.05 of the SPPF deals with bushfire. It has the objective of assisting community resilience to bushfire. ‘Overarching strategies’ to achieve the objective are to prioritise the protection of human life over other policy considerations in planning and decision-making in areas at risk from bushfire, and, where appropriate, to apply the precautionary principle when assessing risk.

Clause 13.05 stipulates development control strategies that only permit new development where:

- The risk to human life, property and community infrastructure from bushfire can be reduced to an acceptable level;
- Bushfire protection measures, including the siting, design and construction of buildings, vegetation management, water supply and access and egress can be readily implemented and managed within the property; and
- The risk to existing residents, property and community infrastructure from bushfire is not increased.

3.6 Regional Bushfire Planning Assessment

The Regional Bushfire Planning Assessment for Grampians Region (DPCD 2012) identifies Inverleigh as having a “cluster of rural-residential lots to the north of the Hamilton Highway are located in

proximity to a bushfire hazard area. Scattered vegetation provides an interface between the settlement and flora and fauna reserve to the north-west”

3.7 Victorian Fire Risk Register

The Victorian Fire Risk Register (VFRR) identifies the Inverleigh township as being at Medium risk of bushfire. The VFRR process utilises a standardised set of questions put to subject experts; CFA and Council, to determine the appropriate risk rating.

3.8 DELWP Fire Operations Plan

The Inverleigh area falls under the Midlands District Fire Management area within the Grampians Region of Forest Fire Management Victoria (FFMVic). Planned burns and works within the district are determined through the Strategic Bushfire management Planning process and Joint Fuel Management Program and carried out by FFMVic staff. Where CFA resources are needed to assist with planned burns, local resources are requested by DELWP.

The only significant area of land under DELWP/PV management in the Inverleigh area is the Inverleigh Flora Reserve. The reserve has had planned burning applied in the reserve in 2006, 2009, 2010 and 2015.

Since this time, planned burns have been replaced by manual works to remove fine fuels. This takes the form of grooming to reduce fine fuel associated with dense Hedge Wattle (*Acacia paradoxa*) stands around the south western and south eastern boundaries.

Figure 6: Planned Burn History in Inverleigh Flora Reserve

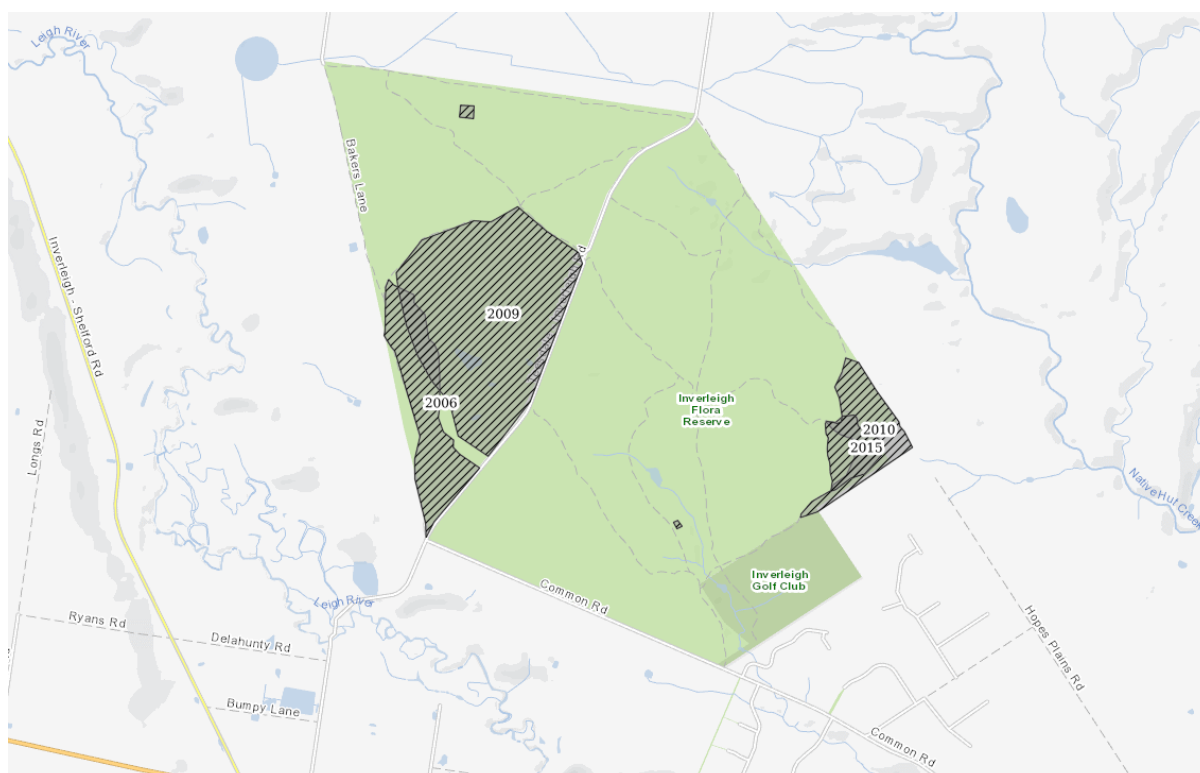
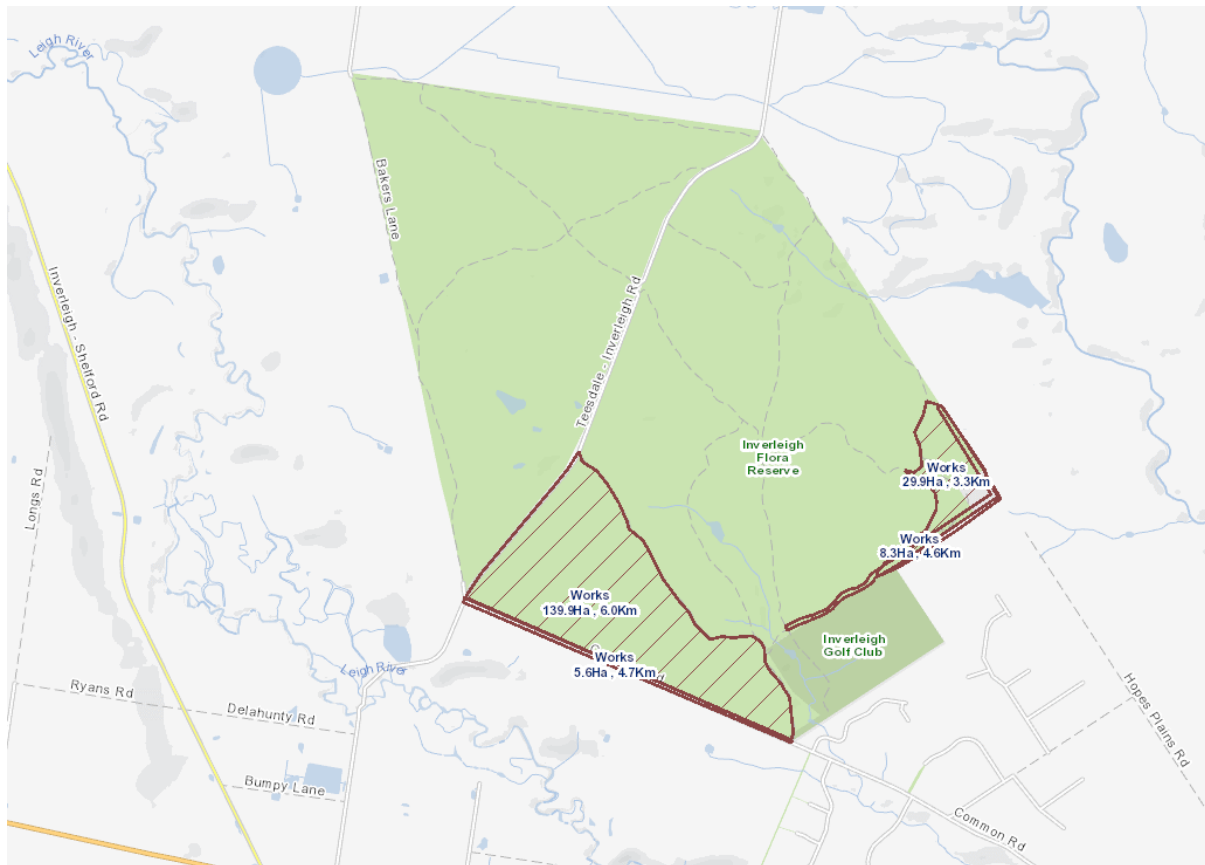


Figure 7: Planned Fuel Management Works in Inverleigh Flora Reserve



3.9 Municipal Fire Management Plan

The Municipal Fire Management Plan 2104-17 Multi agency Bushfire Risk Management Register identifies the Inverleigh township as being at Medium risk of a fast running fire from the northwest, west or south.

The Municipal Fire Management Plan 2104-17 Multi agency Bushfire Work Plan provides a list of treatments for these risks to reduce the risk to the community.

Responsibility for treatments to address risks lie with a variety of agencies as well as the responsibility of private landholders to prepare for fire.

Council

- Fire prevention notice program
- Fire plug installation and maintenance
- Roadside and Reserve slashing program
- Fire access tracks program
- Planning scheme fire prevention requirements
- Building permit fire prevention requirements
- Municipal Fire Management Plan

CFA

- Brigade operational preparedness
- Community Information Guides
- Planned Burning program
- Community safety programs
- Department for Environment, Land, Water and Planning
- Planned burning program
- Reserve track maintenance
- Fuel reduction works program

Vicroads

- Roadside slashing program

Victrack

- Rail corridor fuel management program

3.10 Community Information Guide – Bushfire

CFA have developed a Community Information Guide for Inverleigh. The Guide identifies that Inverleigh is at Medium risk of bushfire and residents should have a plan for fire danger days of Severe, Extreme or Code Red.

<https://www.cfa.vic.gov.au/plan-prepare/community-information-guides>

3.11 Local Fire Suppression Resources

Inverleigh lies within the administrative area of District 15 in the Grampians CFA Region but is operationally managed from the nearer office in Geelong in District 7 in the Barwon-South West CFA Region. The brigade has two tanker appliances and is supported by surrounding brigades as required.

Additional resources including air support are drawn from surround Districts and Regions as required in response to major events.

DELWP Forest Fire Management (FFM) provide fire suppression resources for fires on public land.

DELWP and CFA work in conjunction to address fire across the landscape.

3.12 Access and Egress

Access and egress are vital considerations in developing subdivisions that are resilient to the effects of fire. Access is vital to ensure fire suppression resources can rapidly and safely access an area to undertake suppression operations. Egress is vital as; despite the CFA's best efforts to get residents to plan and leave early, unprepared and panicked residents will flee at the last moment. It is important that they are provided with well-planned and built roads that provide multiple egress options and minimise choke points. Well planned and built roads can provide excellent buffers and provide

additional separation between development and fire fuels. Ideally, subdivisions should have a road as a buffer between development and public open space or native vegetation reserves.

Access and egress roads should be constructed to allow for the rapid and safe use by fire suppression vehicles. Crossings, bridges and culverts should be constructed to provide for 15 tonne CFA tankers and court bowls and turning points should be large enough to allow CFA tankers to turn around as per the CFA guidelines.

In significant fire events, residents tend to self-evacuate; often at the last minute, as they apply the “wait and see” approach to the fire threat. They tend to gather at “milling points” which are generally town centres, recreation reserves, town halls or CFA stations seeking safety, information and the reassurance of the gathered community. It is believed that residents in the potential development areas will self-evacuate to the highly maintained centre of town as they seek protection from the fire and potential sources of information. For residents in the northern development areas, they will need to negotiate the potential choke point at the Common Road/Hamilton Highway intersection when accessing the town centre.

Potential growth areas 1 and 2:

These sites are accessed via Hopes Plains Road, currently a gravel road which will effectively become the eastern town growth boundary. Hopes Plains Road intersects with the Hamilton Highway and upgrade works to the intersection will be required at the expense of developers to support the development of growth areas 1 and 2. Similarly Hopes Plains Road is required to be upgraded to an all-weather seal with 7 metre seal. Financial contributions to the upgrade of Hopes Plains Road will be proportionately applied to developers upon development of their particular land. Inter-connecting roads are shown on the draft Inverleigh Structure Plan 2018 to ensure access is available into existing subdivisions and through to Faulkner Road and Common Road which also links to the Hamilton Highway.

Potential growth area 3

This site, situated on Common Road, is accessed primarily from Common Road, which intersects with the Hamilton Highway. Common Road has a single lane seal for the frontage of the potential growth area 3 and is also frontage to The Common, Flora and Fauna Reserve. Common Road is likely to be utilised as a fire break between The Common and the township in the event of a fire within The Common and a line from which fire fighters can maintain a line of defence between the woodlands of The Common and the current use of the land which is grassy farmland. This road should be upgraded to a 7 metre seal with protected turn lanes at all entry points into residential development.

The Teesdale-Inverleigh Road provides an alternative access to this site from the west. An existing bridge of 5 tonne capacity, called ‘Twin Bridges’ crosses the Leigh River and the Teesdale-Inverleigh Road extends south intersecting with the Hamilton Highway on the western side of Inverleigh. This bridge requires upgrading to allow use by 15 tonne emergency services vehicles.

Potential growth area 4

This area is bound to the north by the Hamilton Highway and the south by the railway line and Peel Road which run in an east-west direction. There are four lots which currently have direct access to the Hamilton Highway. VicRoads would like to limit the number of access points onto the Hamilton Highway both from the southern and northern sides of the Hamilton Highway and suggests that

prior to any subdivision of land abutting the Hamilton Highway, an access management plan should be prepared to the satisfaction of VicRoads. This plan would show the ultimate access arrangements taking into account the proposed form of subdivision.

Potential growth area 5

This site directly abuts the existing core township area to the west. The area is an irregular shape, bounded by the Hamilton Highway to the north and Riverview Road/ Phillips Road to the west. The Inverleigh Recreation Reserve is located in the north east corner of the area and an extension of this Reserve is envisaged in a westerly direction within the potential growth area 5. The southern boundary is stepped along to avoid the floodplain and extends to Jubilee Street (south of Victoria Park). The land is subdivided in a grid pattern with existing local roads (some of which are gravel). The railway line intersects part of this area and local roads run north-south crossing the railway line.

Potential growth area 6

Potential growth area 6 is also known as 'Future Investigation Area' and covers an area currently zoned Farming but characteristically in rural living sized allotments of mostly 4ha sized lots in a grid pattern. Most of the area is located south of the Hamilton Highway, with a small portion north of the Highway in an area unencumbered by flooding and within the Bourkes Road western township boundary.

The southern area is primarily accessed from the Hamilton Highway via Mahers Road, Terrier Road and Gibson Road. These roads must first pass through low lying areas before reaching the majority of the site. Access is also available south of the Highway through the township via McCallum Road. The southern area is split by the railway line into a north and south precinct.

North-south movement is limited by three existing railway level crossing points within the study area. Public Transport Victoria (PTV) current standards for road and rail crossings do not encourage level crossings and the ability to retain level crossings amongst residential growth is uncertain.

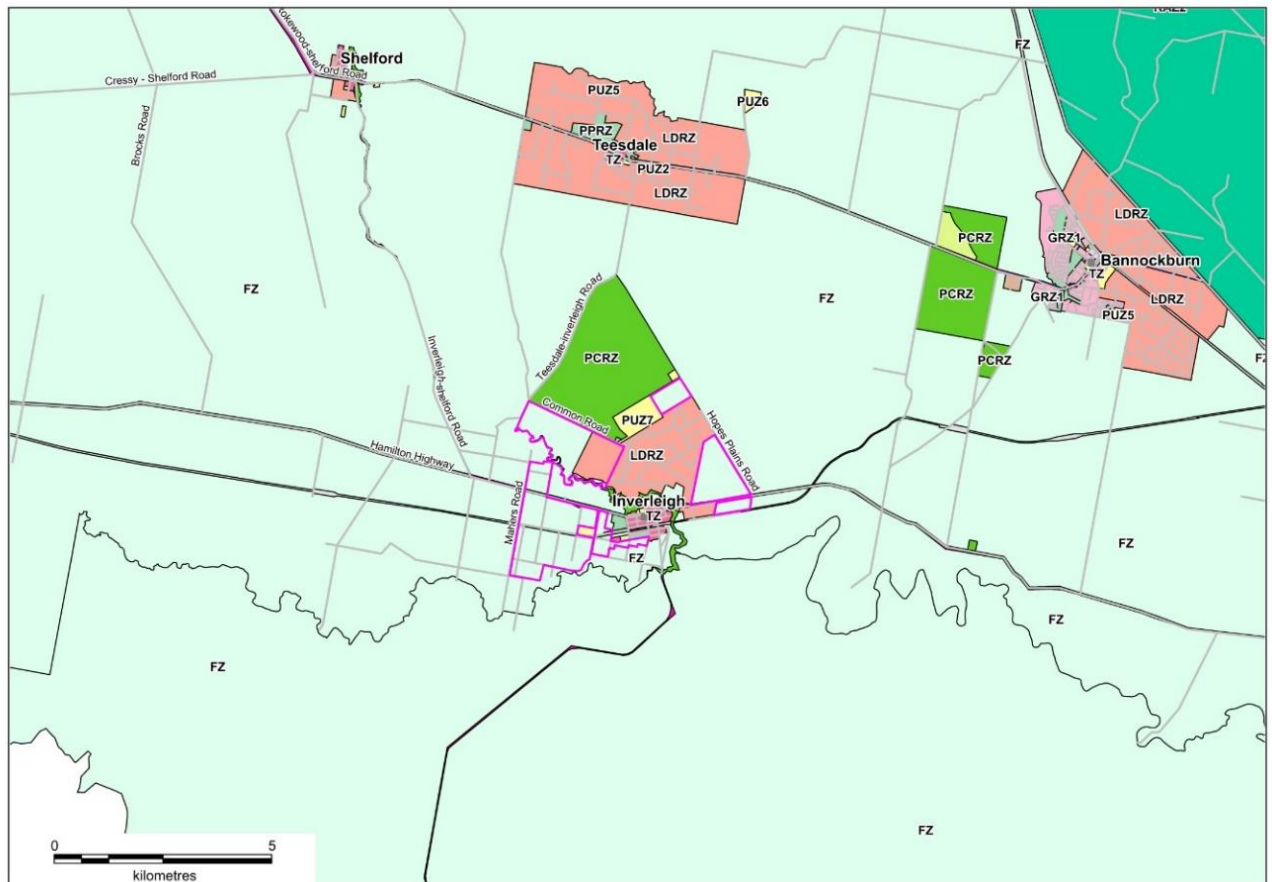
Key intersections to the Hamilton Highway will need to be upgraded to accommodate an increased population in this area. The majority of roads within potential growth area 6 are below current rural residential standards and will require upgrade to service new development.

There is opportunity to increase connectivity between the potential growth area 6 and the town core and opportunity to provide a southern road interface to the railway corridor through subdivision. River Road connects directly to Inverleigh-Winchelsea Road and could potentially provide the area with a strong regional connection south.

3.13 Planning Zones

The land use planning zones within and surrounding the Inverleigh township are shown below.

Figure 8: Planning Zones around Inverleigh



Farming Zone (FZ)

The Farming Zone applies to all the land identified for potential growth. This zone reflects the historic farming use of the land.

The objective of the Farming Zone is to use and retain land for agriculture and a minimum subdivision size of 100 hectares applies (Golden Plains Planning Scheme, 2018).

Land adjacent to the potential growth areas is predominantly in the Farming Zone, specifically, land to the west, north east, east and south of the township is zoned Farming. Typically the land is used for cropping and grazing and a large fast moving grassfire could spread through the Farming Zone and impact on the edges of the township. Most likely risk of a threatening grassfire would be from farmland on the western side of the township. Currently the core township is buffered by the scattered rural living settlement pattern in the south west of the township which has been earmarked as a Future Investigation Area.

Public Conservation and Resource Zone (PCRZ)

PCRZ provides areas for the protection and conservation of the natural environment and natural processes for their historic, scientific, landscape, habitat or cultural values.

A large area of public land managed by Parks Victoria and zoned PCRZ is located on the northern edge of the township. The site is variously known as “The Common”, Inverleigh Nature Conservation Reserve and Inverleigh Flora Reserve. It is comprised of 2 parcels (638.8 ha and 410 ha) totalling in excess of 1000 ha. The Reserve is a remnant woodland supporting the Plains Grassy Woodland Ecological Vegetation Classification. Plains Grassy Woodland is an endangered vegetation type.

Inverleigh Flora Reserve is potential hazard for the township in the event of a fire. The degree of bushfire hazard to the community into the future depends on the management of the site, particularly management of the edges.

The Inverleigh Flora Reserve has been the subject of planned burning in 2006, 2009, 2010 and 2015 and more recently, targeted grooming works to reduce fine fuel associated with dense Hedge Wattle (*Acacia paradoxa*) stands around the south western and south eastern boundaries. A slashed fire break of between 20 to 50 metres width is maintained by Parks Victoria along the Reserve boundary with Common Road on the Reserves south western edge.

Access tracks are maintained annually by Parks Victoria staff and patrols of the area are carried out to try to monitor and control misuse of the Reserve by members of the public.

Access for emergency services should be a key consideration, as should defensible space between the Inverleigh Flora Reserve and residential development. Examples of appropriate management of the interface with vegetated woodland such as the Inverleigh Flora Reserve can be found in the Manna Gum Estate which is adjacent to the Inverleigh Golf Course which is zoned Public Use Zone 7. Management includes large lot sizes, building envelopes which are setback from the fire risk, management of the understorey, access for fire vehicles and on-site water storage.

Public Use Zone 7 (PUZ7)

This zone recognises public land use for public utility and community services and facilities. The zone provides for associated uses consistent with the intent of the public land reservation or purpose. Public Use Zone 7 provides for ‘other public use’, in this case, the use is a golf course. The vegetation within the golf course is grassy woodland. Management of the golf course includes mown fairways and sand scares reducing fuels. The fairways allow some vehicular access through the site.

Examples of appropriate management of the interface with vegetated woodland can be found in the Manna Gum Estate which is adjacent to the Inverleigh Golf Course. Management includes large lot sizes, building envelopes which are setback from the fire risk, management of the understorey, access for fire vehicles and on-site water storage.

Low Density Residential Zone (LDRZ)

This zone provides low-density residential areas where there is an absence of reticulated sewerage. The minimum lot size in Inverleigh has been 1 hectare, however it is envisaged that the minimum lot size will be reduced to 0.4 hectare consistent with the standard State Planning Policy.

Most of the new residential development in the township of Inverleigh has been in the Low Density Residential Zone which is predominantly in the north of the town, around Common Road. Large family houses with large gardens typify the area. A large bushfire from the Inverleigh Flora Reserve may impact this development, particular from ember attack and spot fires which could extend into grassfire through the large gardens and scattered native vegetation.

Township Zone (TZ)

This zone is the primary zone that applies in the core township area or the 'old township' area and is in a traditional grid pattern straddling the Hamilton Highway. The zone provides for residential development and a range of commercial, industrial and other uses in small towns. Community uses can also be located in this zone. The core or 'old' township area is constrained by flooding and a lack of reticulated sewerage which both serve to restrict growth of this part of the township. Lot sizes range from 2000-4000 sqm. Limited growth of this part of the township is anticipated into the future, although infill and redevelopment in the main street is likely as the overall population grows.

The housing density associated with this area and resulting garden areas together with the buffering rural living and rural residential development patterns to the west and north of the township mean a bushfire is likely to have limited penetration in the core township area, other than ember attack and small spot fires.

3.14 Planning Overlays

Bushfire Management Overlay (BMO)

The purpose of this overlay is to protect life and property from bushfire impact by applying a number of development controls. It is implemented in areas where the bushfire risk is high due to hazardous bushfire characteristics such as steep slopes and forests.

The Bushfire Management Overlay applies to the Inverleigh Flora Reserve, the Inverleigh Golf Course and extends approximately 150 metres into private land along Common Road opposite the Inverleigh Flora Reserve and also the adjoining private parcel on Hopes Plains Road which is currently the subject of a rezoning proposal known as C74.

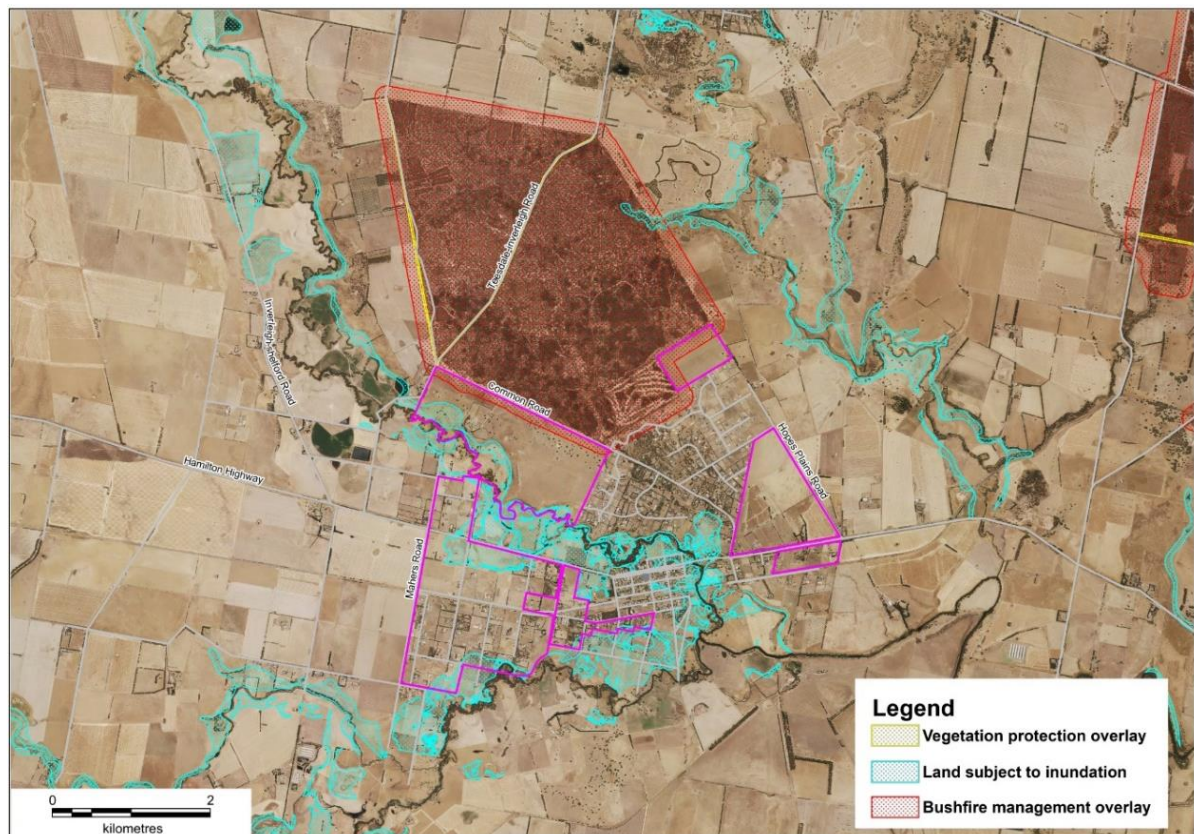
The Bushfire Management Overlay identifies areas where the bushfire hazard warrants bushfire protection measures to be implemented. Development should only be permitted where the risk to life and property from bushfire can be reduced to an acceptable level.

A planning permit is required to construct or carry out works associated with accommodation and a range of other community, commercial and other uses which generally have people in attendance. Planning permit applications must be accompanied by:

- A bushfire hazard site assessment;
- A bushfire hazard landscape assessment;
- A bushfire management statement.

Mandatory conditions are applied to permits issues for subdivision and buildings and works.

Figure 9: Planning Overlays around Inverleigh



Land Subject to Inundation Overlay (LSIO) and Flood Overlay (FO)

The Land Subject to Inundation Overlay and Flood Overlay apply to extensive areas of the Inverleigh township associated with the confluence of the Leigh and Barwon Rivers around the township.

Growth directly around the core township area is restricted by the flood risks in the township.

The Inverleigh Flood Study 2018 was recently completed and revises the mapping of the flood overlays. The new flood data will be introduced into the Golden Plains Planning Scheme under Amendment C80. The new flood data has been utilised in the preparation of the draft Inverleigh Structure Plan 2018.

Vegetation Protection Overlay (VPO)

The Vegetation Protection Overlay (VPO2) applies to the roadside vegetation on the Teesdale-Inverleigh Road where it travels through The Common – Flora and Fauna Reserve. The draft Inverleigh Structure Plan identifies the Teesdale-Inverleigh Road as the north-west boundary of the Inverleigh township.

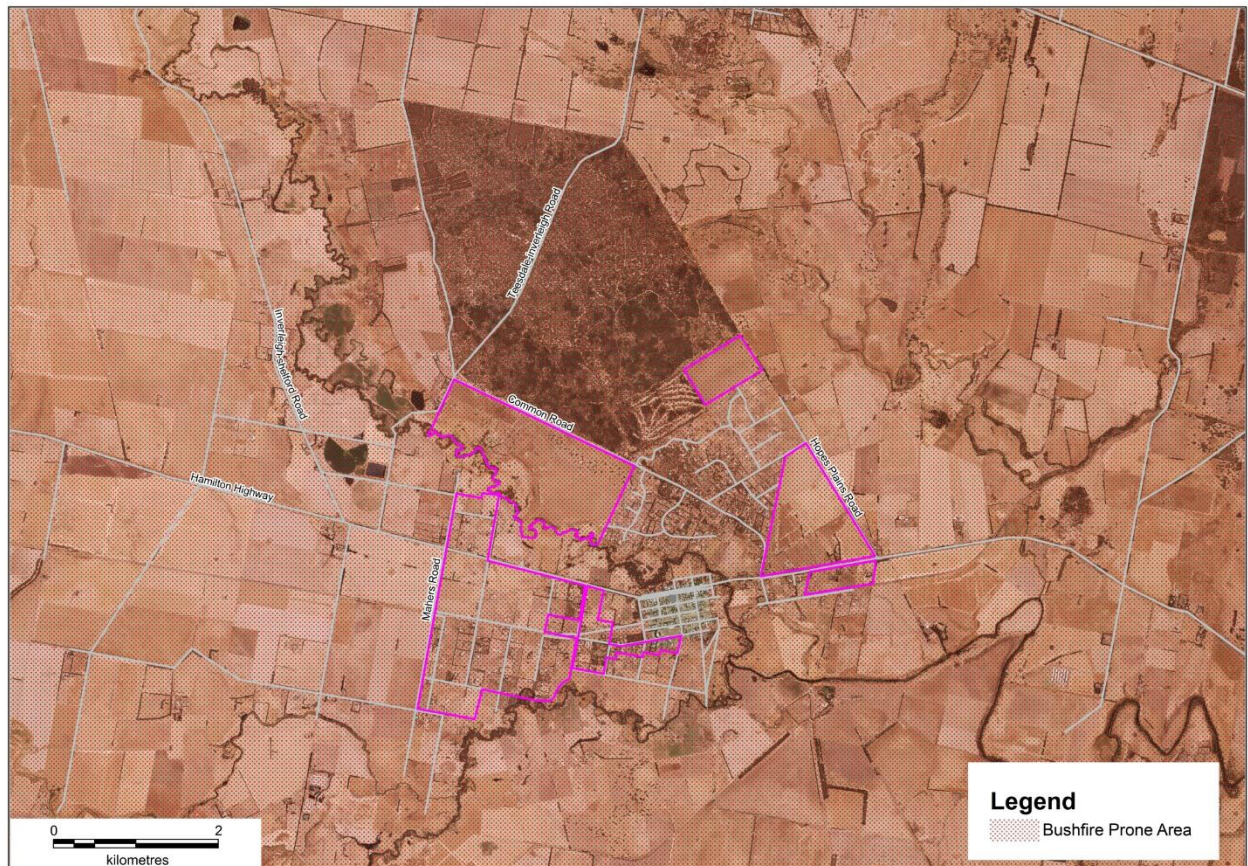
Heritage Overlay (HO)

The Inverleigh Heritage Precinct applies through parts of the central core of the Inverleigh township and protects the heritage places within the township area. Individual sites are also protected by the Heritage Overlay, most of these are located within the core township area. However, the Lulotte homestead and outbuildings are located in potential growth area 3 and are exposed to fire impact.

Bushfire Prone Area (BPA)

The Bushfire Prone Area (BPA) applies to all the potential growth areas and much of the existing township. Therefore, all building permits need to comply with the conditions of the BPA. The BPA does not apply to the developed centre part of town.

Figure 10: Bushfire Prone Area Overlay around Inverleigh



4 THE RISK FROM BUSHFIRE

This section discusses the potential risk of bushfire impact on the township of Inverleigh and the potential growth areas identified in the draft Inverleigh Structure Plan 2018. The three factors (fuel, topography and weather) influencing bushfire behaviour have been characterised for each potential growth area and the broader landscape. Based on these factors, each potential growth area is described in terms of the CFA landscape risk scenario that best fits. This information then informs the description of the potential major bushfire impact scenarios for the potential growth areas.

4.1 Bushfire Behaviour

Fuel

This section analyses the vegetation within and adjacent to the potential growth areas and determines the contribution this fuel would make to fire behaviour. Council's Natural Resource Officer has advised of the vegetation types around and within the Inverleigh township and classified them using the seven broad vegetation classes used within AS3959 (Standards Australia, 2009) to determine the requisite BAL and defensible space distances.

Vegetation type classifications as per AS3959 for each of the potential growth areas have been determined with the 150 buffer required for determining the Bushfire Attack Level (BAL). Determinations have been based on current landscape condition. As most asset impact occurs within 150m of vegetation, it is appropriate to base the assessment on this buffer distance.

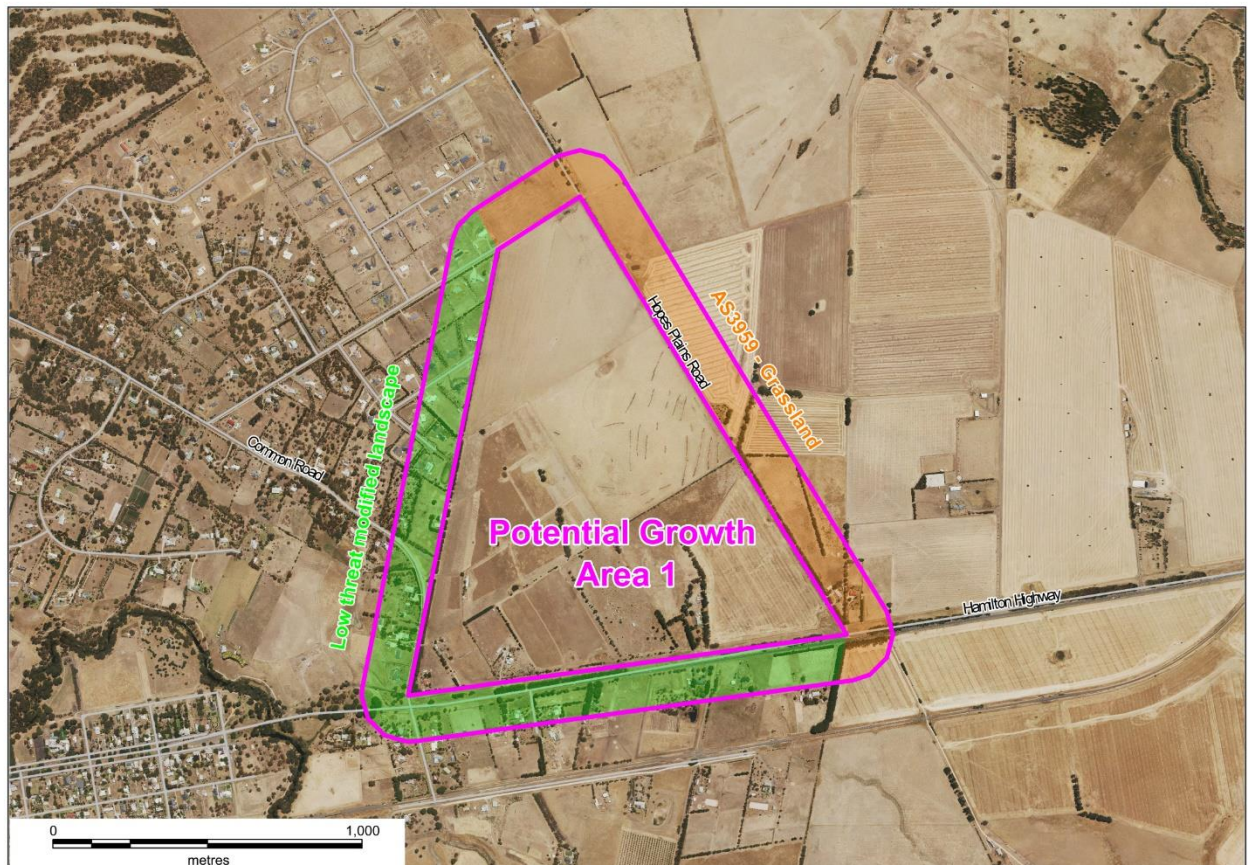
Primary fire fuel in the woodlands will be fine fuels (leaves, twigs, bark, understorey grasses). Primary fire fuels in the grasslands will be pasture grasses and crop.

Where vegetation does not meet the AS3959 standard and are composed of modified landscapes (e.g. maintained household gardens), a classification of "Low threat modified landscape" has been applied.

Potential Growth Area 1: This area is bounded by Grassland on its north east boundary. Primary fire fuels in the grassland will be pasture grass and crop.

Topography is flat. To achieve an exposure of 12.5 kw/m^2 , a minimum fuel separation distance of 19 metres is required. The other boundaries have low threat modified landscape.

Figure 11: Potential Growth Area 1 Fuel Assessment

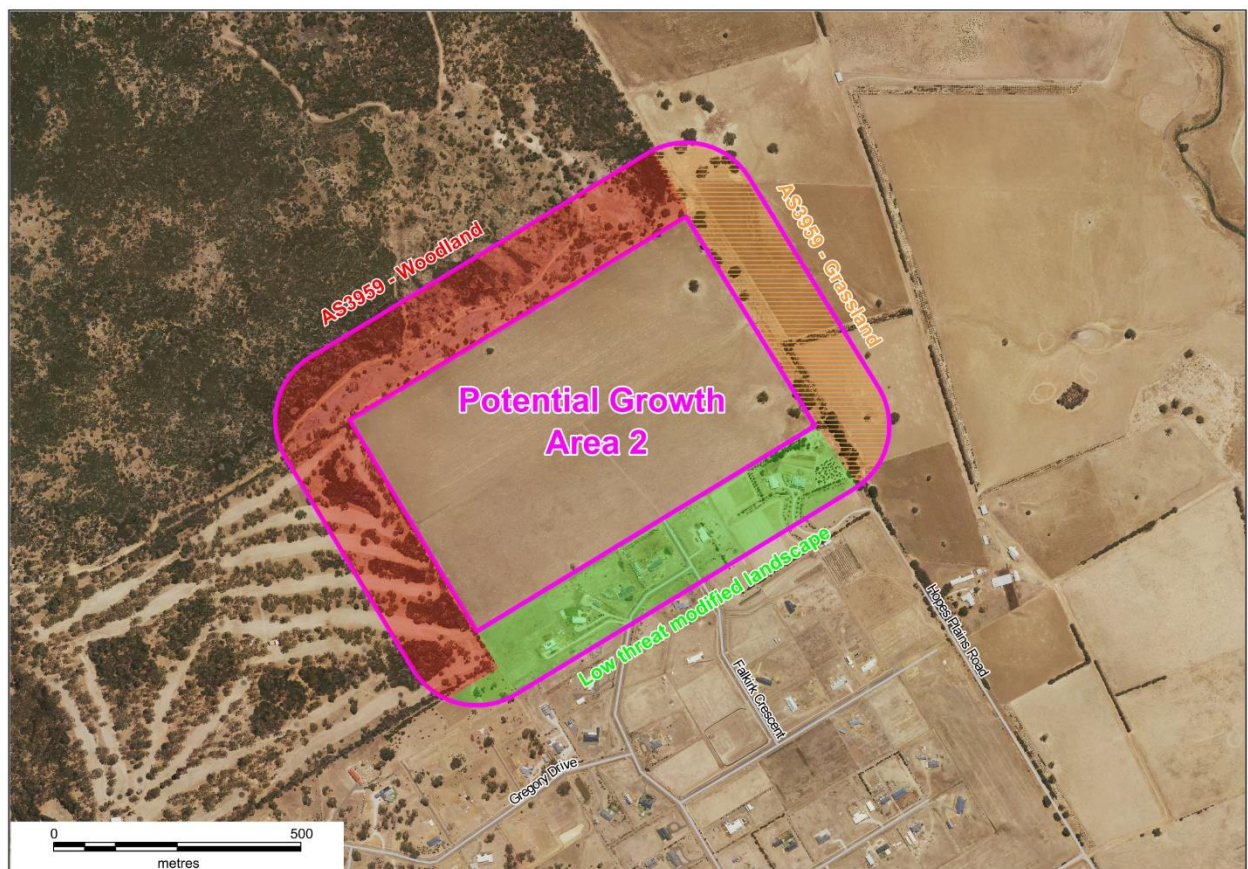


Potential Growth Area 2: This area is bounded by Grassland on its north east boundary, Woodland on its northern and western boundary and low threat modified landscape on its southern boundary. Primary fire fuel in the woodlands will be fine fuels (leaves, twigs, bark, understorey grasses). Primary fire fuels in the grasslands will be pasture grasses and crop.

Topography is flat across the site and within the 150 m buffer. To achieve an exposure of 12.5 kw/m², a minimum fuel separation distance of 33 metres is required adjacent to woodland vegetation and 19 metres adjacent to grassland.

Parks Victoria manage the woodland on the northern boundary and while current excellent fine fuel management works are in place, there is no guarantee that these works will continue. Any allowances for separation distances must rely entirely on the provisions of the planning system (e.g. easements, building envelopes) and existing enforcement mechanisms (e.g. fire prevention notices)

Figure 12: Potential Growth Area 2 Fuel Assessment



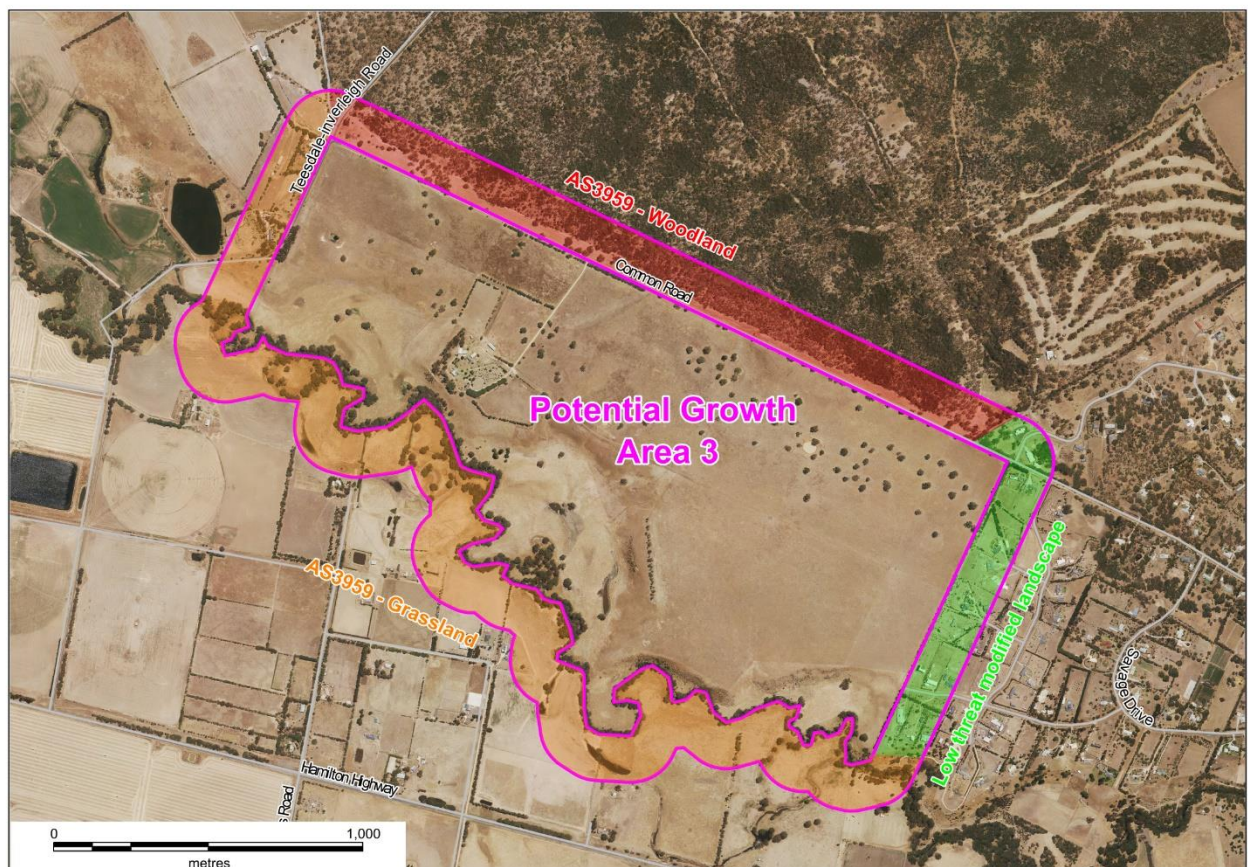
Potential Growth Area 3: This area is bounded by Woodland on its north-east boundary, Grassland on its south-west and north-west boundary and low threat modified landscape on its south-east boundary. Primary fire fuel in the woodlands will be fine fuels (leaves, twigs, bark, understorey grasses). Primary fire fuels in the grasslands will be pasture grasses and crop.

Topography is flat on the north-east, north-west and south-east boundaries while the south-west boundary includes the steep river escarpment which will enhance fire behaviour for any fire running from the south-west and up this slope.

To achieve an exposure of 12.5 kw/m², a minimum fuel separation distance of 33 metres is required adjacent to woodland vegetation and 19 metres adjacent to grassland where the topography is flat. Along the river escarpment, greater separation distances between the grassland and constructed dwellings will need to be applied.

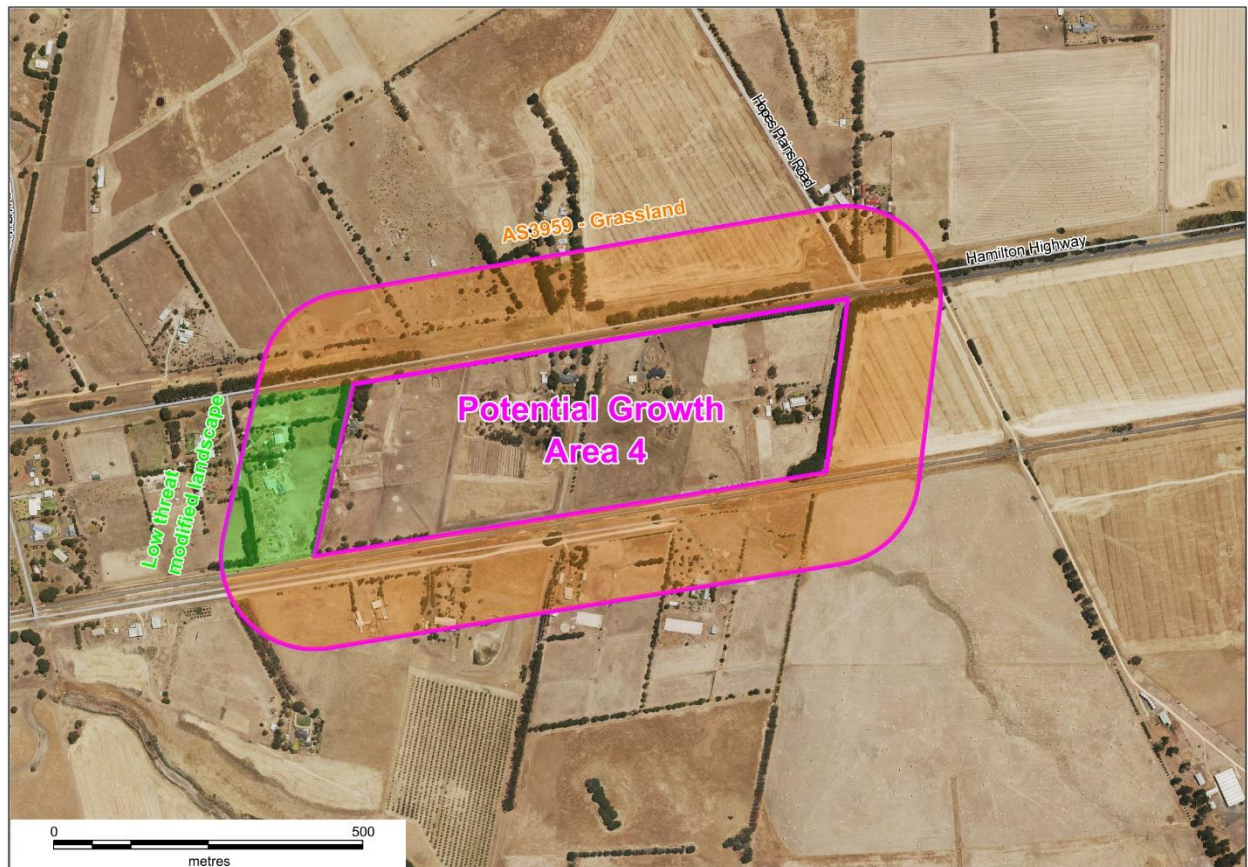
Parks Victoria manage the woodland along the Common Road boundary and while current excellent fine fuel management works are in place, there is no guarantee that these works will continue. Any allowances for separation distances must rely entirely on the provisions of the planning system (e.g. easements, building envelopes) and existing enforcement mechanisms (e.g. fire prevention notices)

Figure 13: Potential Growth Area 3 Fuel Assessment



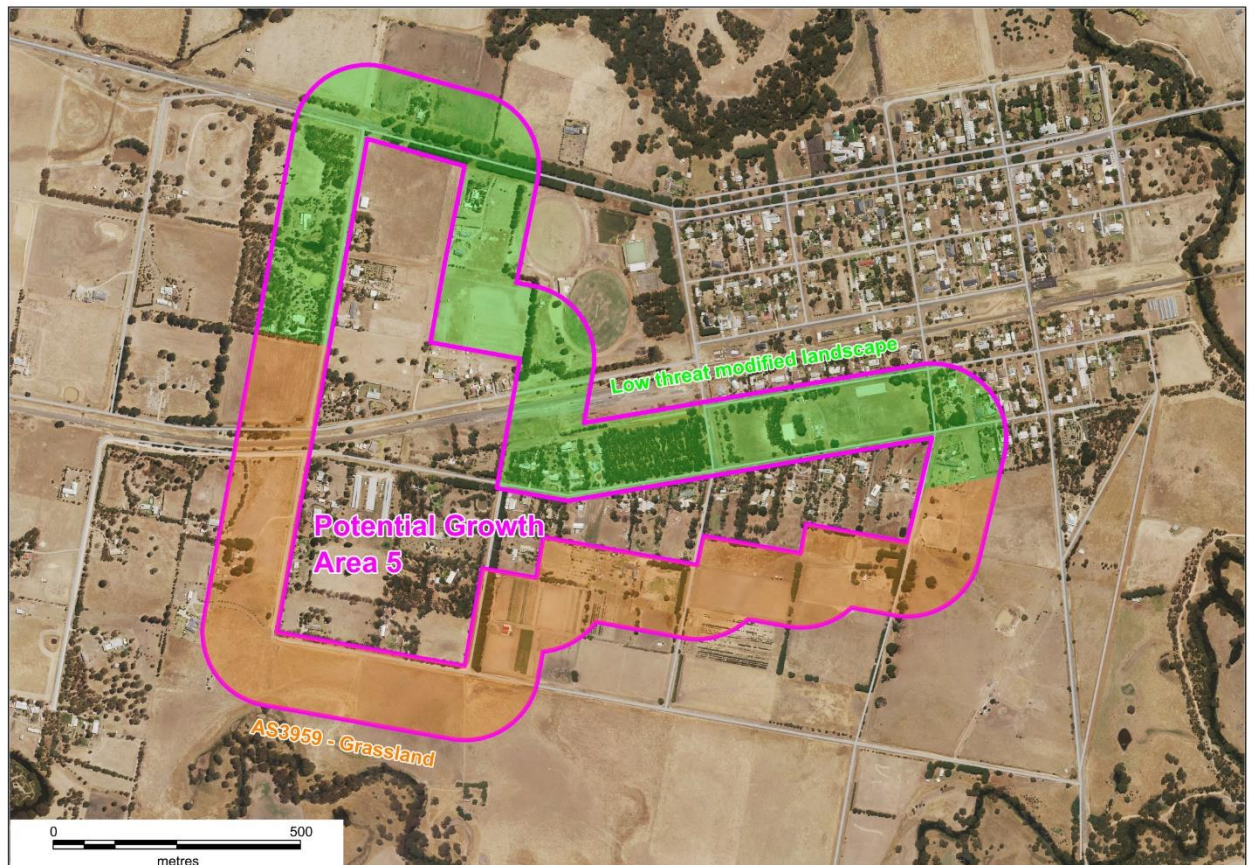
Potential Growth Area 4: This area is bounded by Grassland to the north, south and east with low threat modified vegetation to the west. Primary fire fuels will be pasture grass and crop. Topography is flat. To achieve an exposure of 12.5 kw/m² adjacent to grassland areas, a minimum fuel separation distance of 19 metres is required.

Figure 14: Potential Growth Area 4 Fuel Assessment



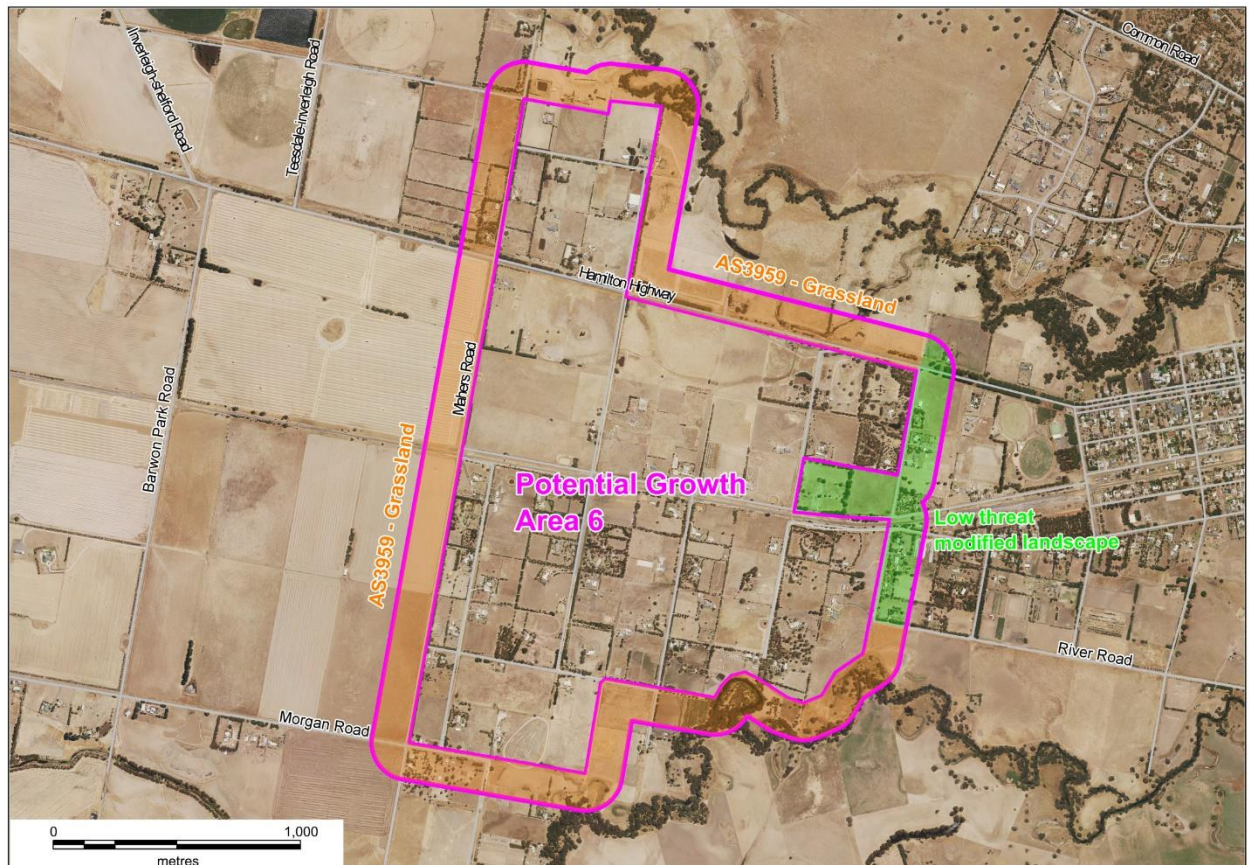
Potential Growth Area 5: This area is bounded by Grassland to the south, south-west and south east. Primary fire fuels will be pasture grass and crop. Parts of the southern boundary have rising escarpments that will require greater separation distances to achieve an exposure of 12.5 kw/m^2 . To achieve an exposure of 12.5 kw/m^2 adjacent to grassland areas, a minimum fuel separation distance of 19 metres is required with great greater separation distances where grassland fuels are downslope (below) from the development. The north, north-east and north-west boundaries contain low threat modified landscape across largely flat topography.

Figure 15: Potential Growth Area 5 Fuel Assessment



Potential Growth Area 6: This area is bounded by Grassland on its north, west and south sides. Primary fire fuels will be pasture grasses and crop. Topography is flat to undulating except where there are short steep rises from the river flats to higher ground. To achieve an exposure of 12.5 kw/m² adjacent to grassland areas, a minimum fuel separation distance of 19 metres is required with greater separation distances where grassland fuels are downslope (below) from the development. The eastern boundary is generally flat topography with low threat modified vegetation.

Figure 16: Potential Growth Area 6 Fuel Assessment



Weather

Bushfire weather conditions are largely determined by temperature, humidity, wind and atmospheric conditions, as well as drought conditions or the amount of rain. Hot, dry and windy days provide ideal conditions for a bushfire. Wind has a significant effect on the rate of spread of a fire, particularly a grassfire.

Inverleigh lies at a confluence of weather patterns with warmer northerly effects spilling off the Great Dividing Range and coastal weather patterns characterised by southerly wind influences.

During the fire season predominant winds for Inverleigh are from the north, west and north-west raising temperature and lowering relative humidity followed by a cooler southerly change late in the day as coastal influences take hold. This change usually takes the form of a gentle (<20kph) coastal sea breeze which lowers temperatures and raises relative humidity thereby reducing fire danger.

The highest risk fire weather for Inverleigh is experienced on days of strong north to north-west winds, high temperatures and low humidity followed by a strong south-west cooler change late in the day. The south-west change is often accompanied by strong winds along the change front and dry storms with lightning strikes.

Inverleigh averages 7 days per annum above 35°C with the peak in occurrence being January and February.

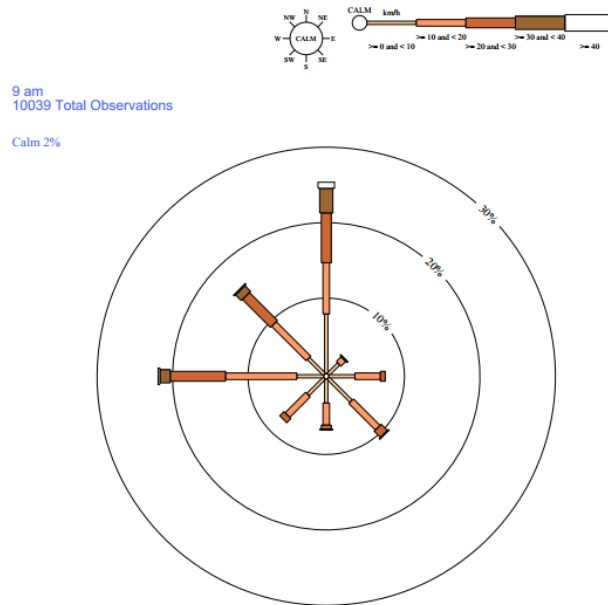


Figure 17: Annual wind rose for 9am at She Oaks weather station

Figure shows the morning northerly influence.

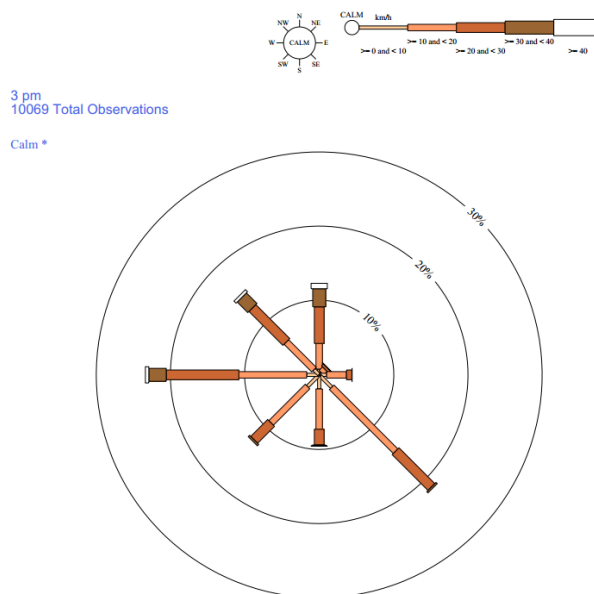


Figure 18: Annual wind rose for 3pm at She Oaks weather station

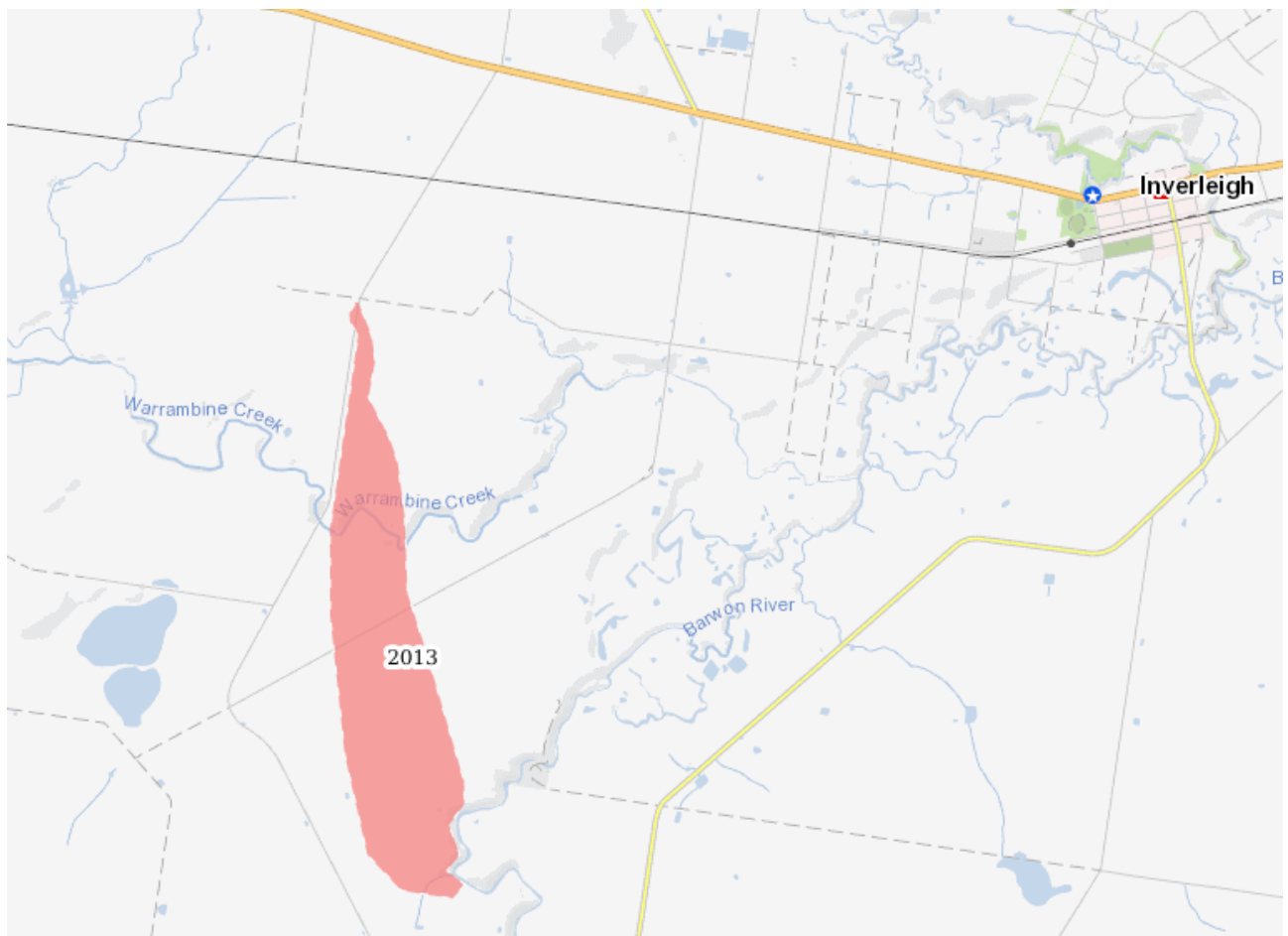
Figure shows south easterly influence as the gentle coastal sea breeze becomes predominant.

Three case studies for fires that have occurred either locally or in areas with similar landscape characteristics have been provided to further illustrate the potential bushfire threats to Inverleigh.

Case Study 1: Manders Road, Inverleigh

The Manders Road fire; south-west of Inverleigh in March 2013 burned under mild temperatures but with a strong north westerly wind (over 50 kph) late in the fire season. The fire burned across mostly flat topography. The primary fire fuels were pasture grasses and stubble crops. The fire burned 342 hectares and travelled 5.5 km in under approximately 2 hours before being brought under control. Fortunately, the projected strong south westerly wind change did not eventuate and a potentially much larger fire that would have ran back towards Inverleigh was averted.

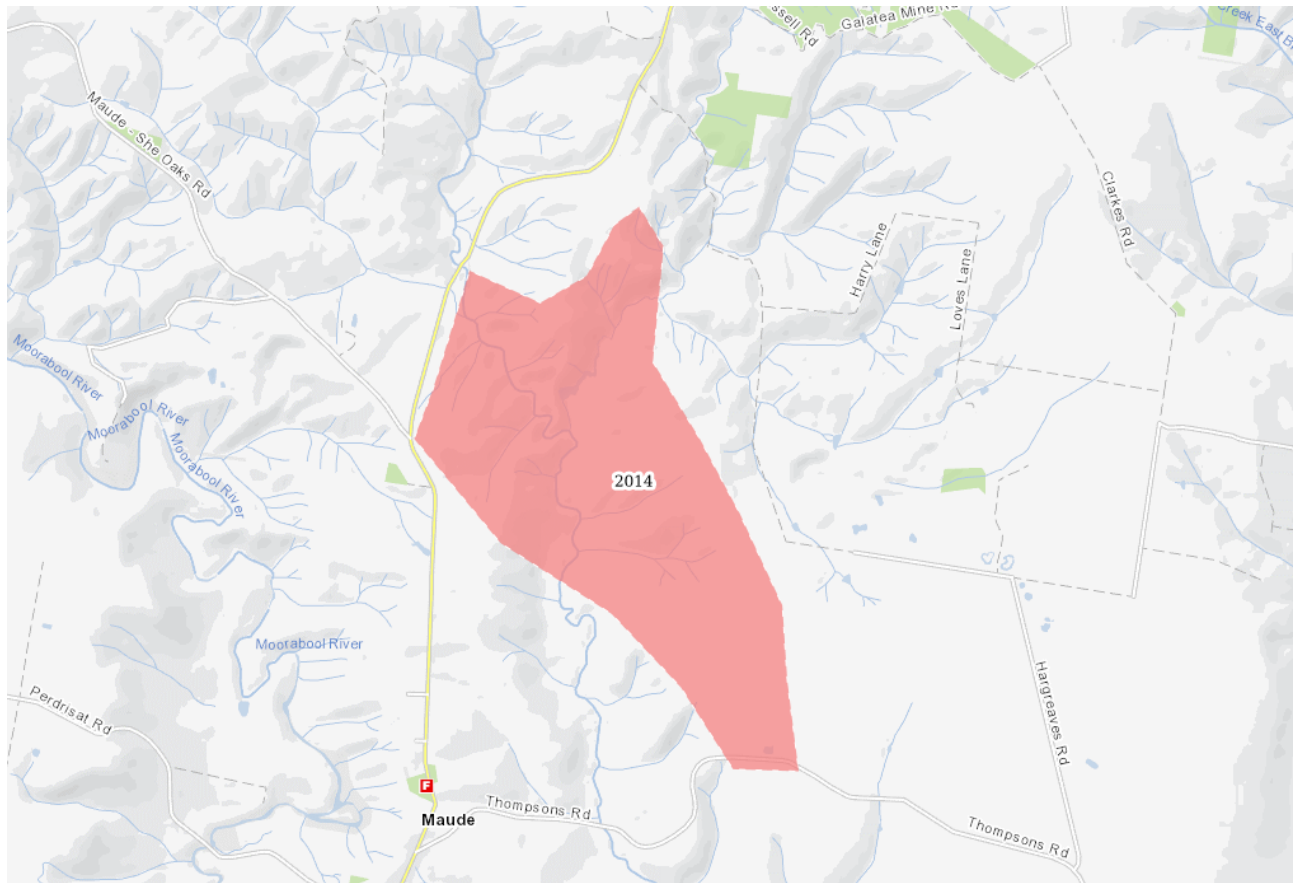
Figure 19: Case Study 1 - Manders Road Fire, Inverleigh, March 2013



Case Study 2: Thompsons Road, Maude

The Thompsons Road fire near the township of Maude in January 2014 burned on a High fire danger day under relatively cool conditions (27°C) and a moderate south-easterly coastal sea breeze of around 20kph. After starting on flat topography, the fire entered the Sutherlands Creek valley where topography enhanced fire behaviour and made access for suppression difficult. The primary fire fuel was paddock grass. The fire burned 266 ha and travelled 3.5 km within approximately 3 hours. No houses were lost.

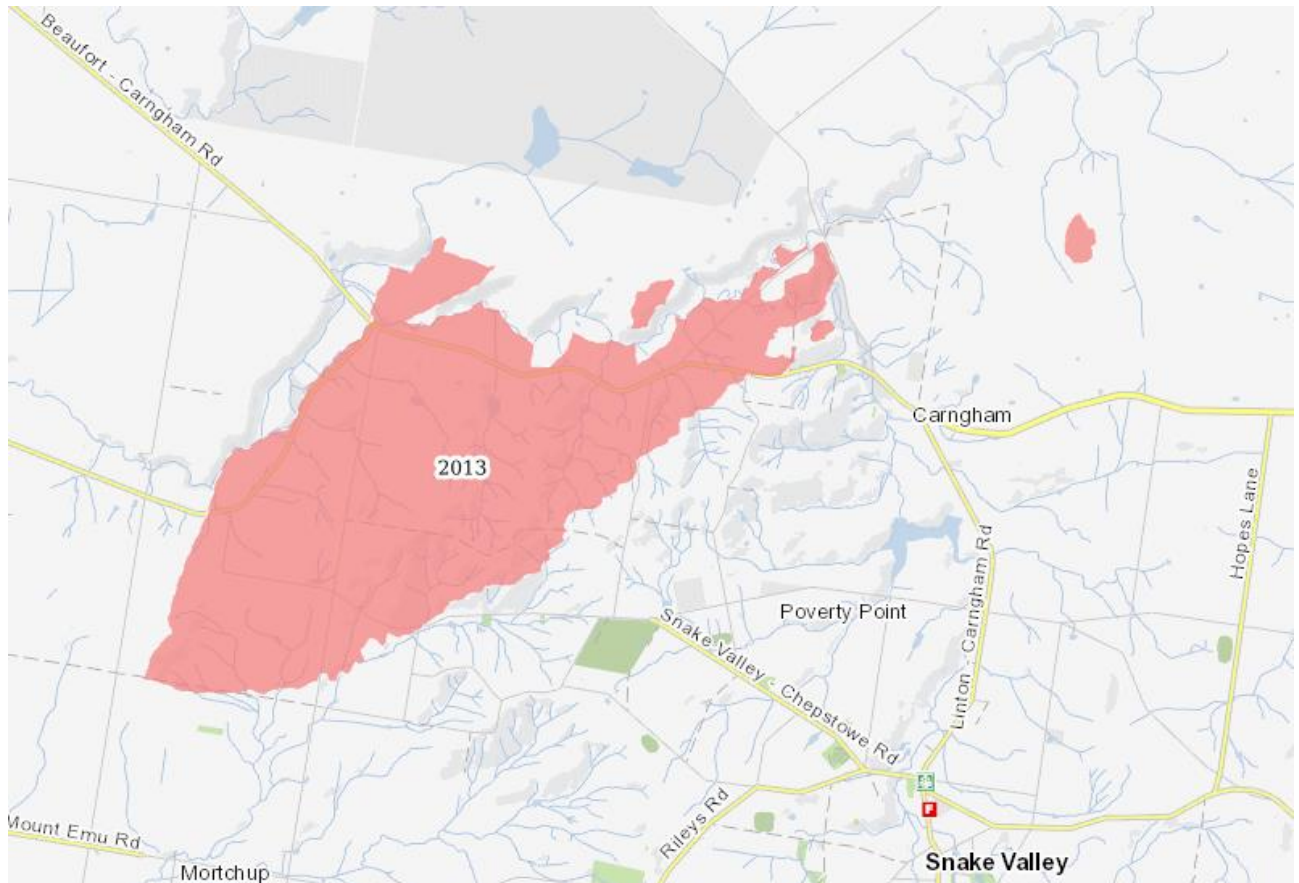
Figure 20: Case Study 2 - Thompsons Road Fire, Maude, January 2014



Case Study 3: Chepstowe

The Chepstowe fire in January 2013 burned across farming land destroying 9 houses. The fire started from a faulty vehicle exhaust and within 4 hours had burned 1300 hectares. The fire ignited in warm conditions (33°C) in the mid-afternoon under a brisk west-south-west wind around 30 kph and travelled 8 km before being stopped. The fire started on relatively flat topography and then entered undulating and partially forested country. The primary fire fuels were pasture grasses and stubble crops.

Figure 21: Case Study 3 - Chepstowe Fire, January 2013

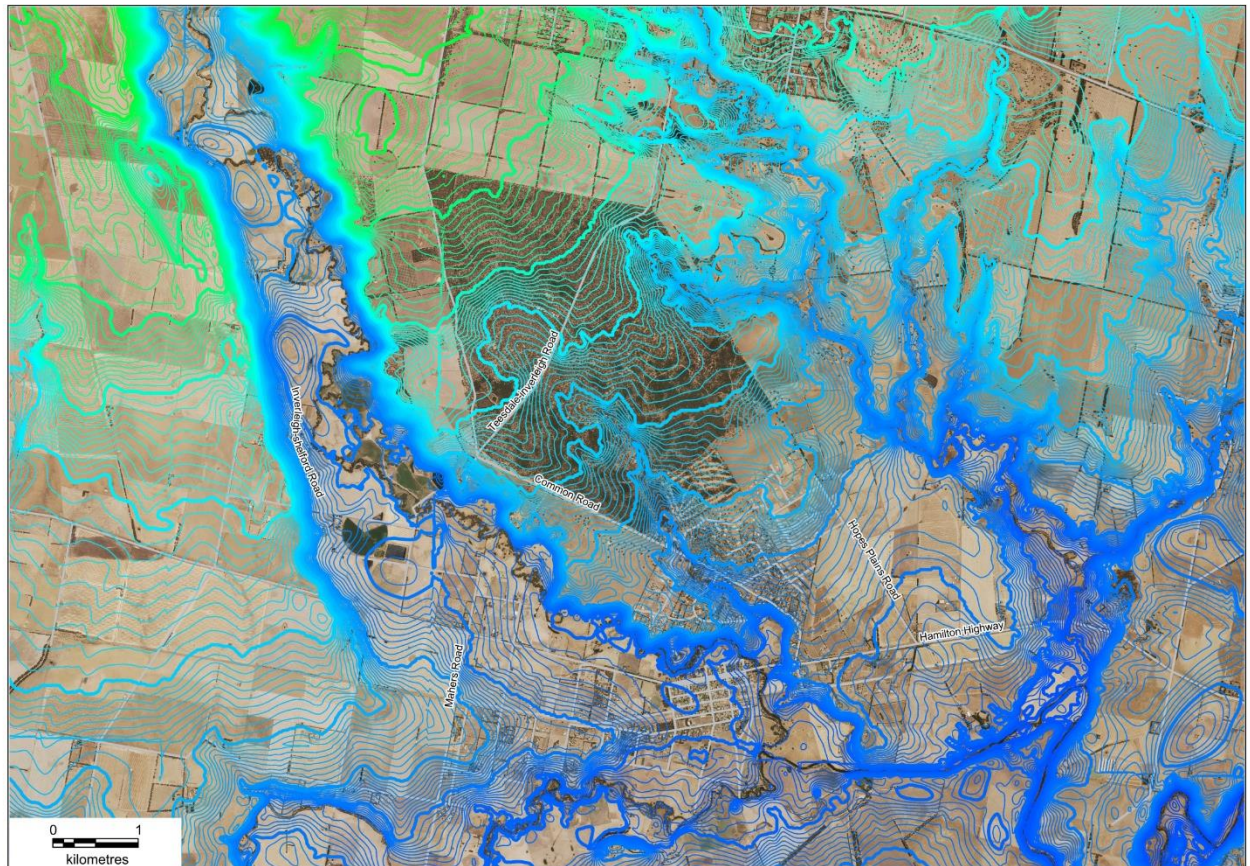


The case studies provided show that within the rural landscape, fires can start and have significant runs before being brought under control even in relatively mild conditions. Therefore, settlement through the north, north-west, west and south-west and south east of the town are potentially under threat.

Topography

The topography within and around Inverleigh is generally flat, except around the escarpment areas along the Leigh River. The reasonably flat landscape around the old township and above the river escarpments means that the topography will have a negligible effect on fire behaviour. The Leigh River escarpment would provide a short fast fire run uphill under a south-westerly wind condition.

Figure 22: Topographical map of Inverleigh



CFA Landscape Scenarios

CFA have described four 'landscape scenarios' representing different risk levels, in the publication *Planning for Bushfire Victoria: Guidelines for Meeting Victoria's Bushfire Planning Requirements* (CFA, 2012)

Figure 23: CFA Landscape Scenarios



These four scenarios range from an extreme risk landscape where development is unlikely to be appropriate to a lower risk, more urbanised site where 'default' bushfire protection measures in the BMO may be able to be modified whilst still providing an acceptable degree of safety.

It is considered that the **potential growth areas 1, 4, 5 and 6** align with the Landscape scenario A.

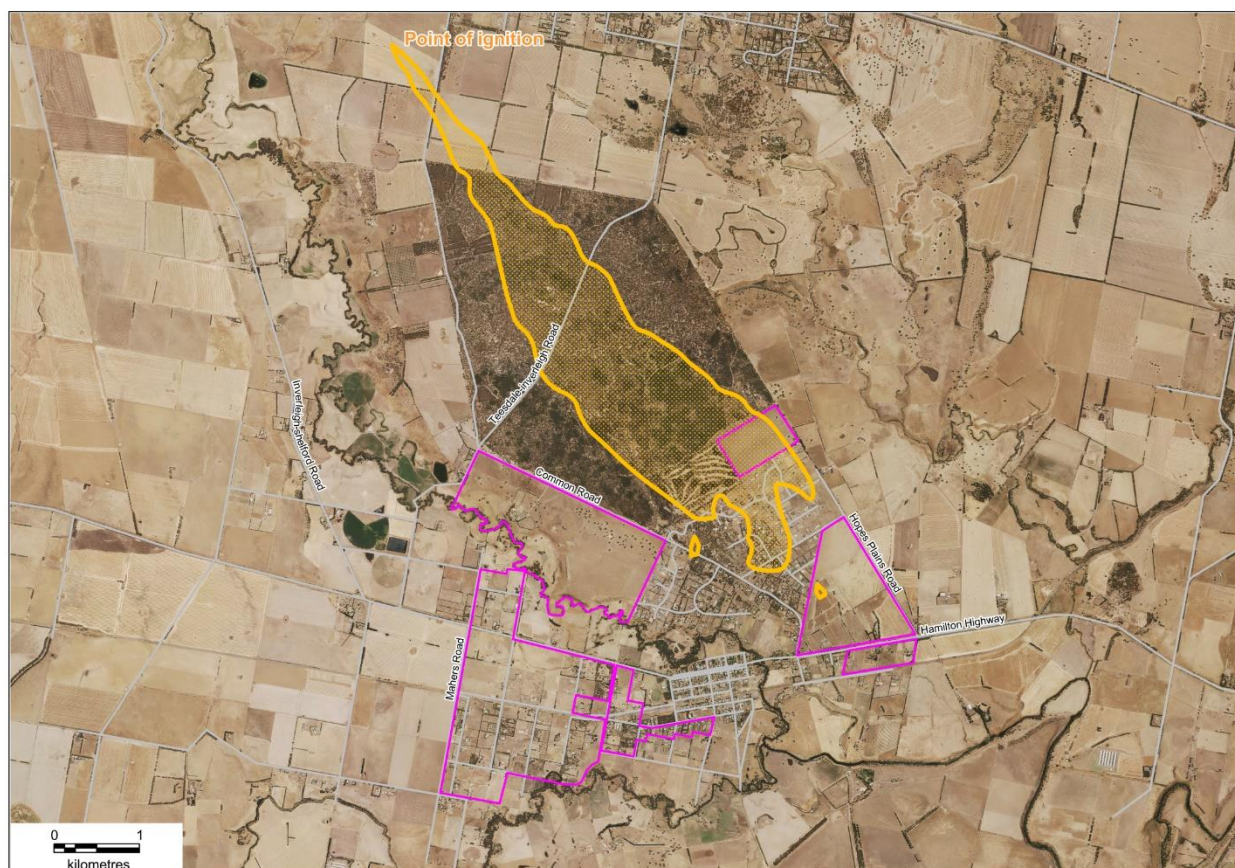
Potential growth areas 2 and 3 align with Landscape Scenario B.

Potential Major Bushfire Scenarios

The highest fire danger days are typified by high temperatures accompanied by low relative humidity and strong, hot north or north westerly winds followed by a strong, cooler west to south west wind change. Such conditions present the greatest threat to the township.

However, the settled boundaries can be threatened from any direction should combined factors of wind, fuel, temperature, humidity, fuel moisture, fire season preparation and combat agency capacity conspire to produce conditions where any given fire cannot be rapidly suppressed before developing into a major fire event.

Figure 24: Scenario 1 - Hot and strong north-west wind, high temperature, low humidity

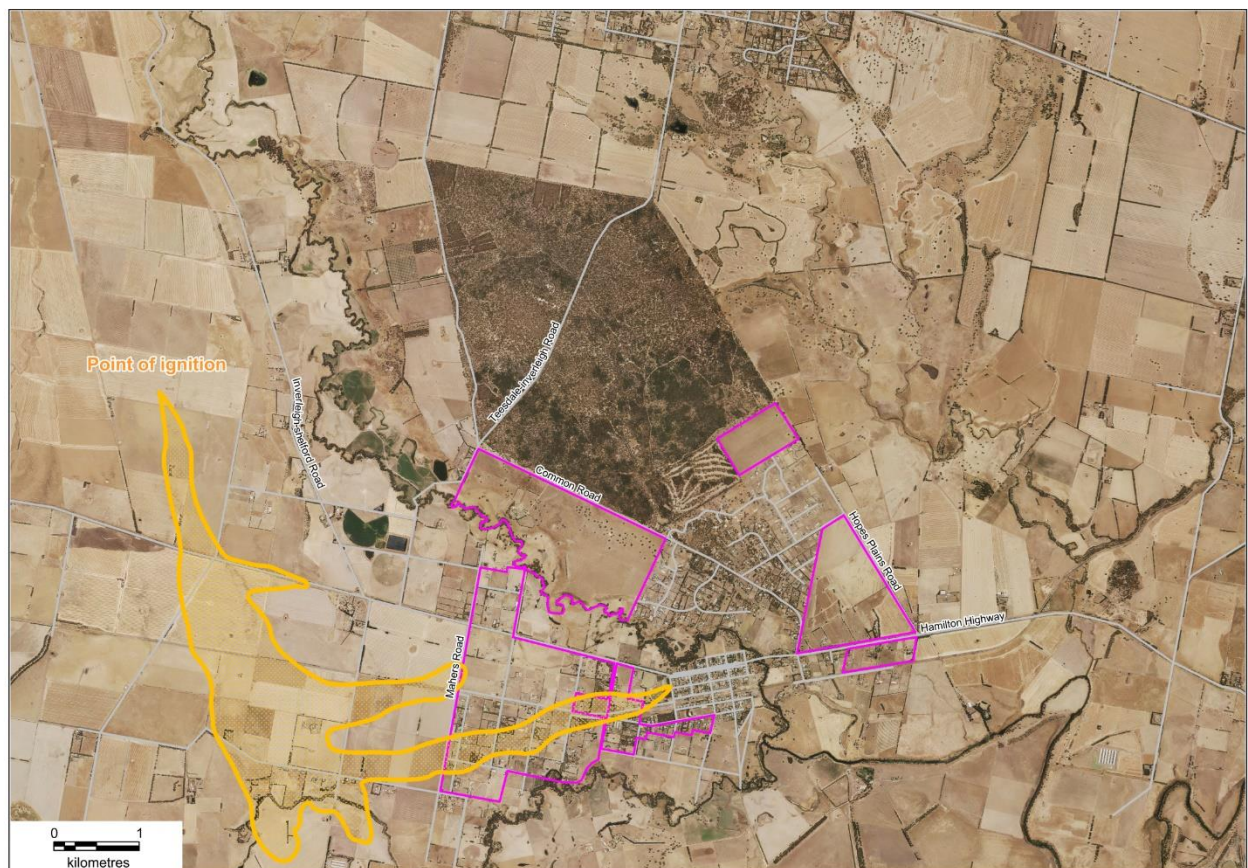


Scenario 1 – Hot and strong north or north-west wind, high temperature, low relative humidity

An ignition under these conditions to the north and north-west of the township; should it not be able to be rapidly controlled in open country, and hence develop into a major running fire that enters the Inverleigh Flora Reserve could impact significantly on **potential growth areas 2 (Hopes Plains) and 3 (Common Road)** as well as established low density residential settlements on Gregory

Drive, River Gum Drive and Faulkner Road. Residents in these areas can expect significant smoke and ember attack as the fire burns through the woodland in the Inverleigh Flora Reserve. Embers will ignite spot fires within the existing residential development which will add to the risk to residents who try to flee at the last minute on access roads. Once the fire enters the residential zone, reduced fuels on well prepared properties should reduce fire behaviour however, limited CFA resources will not be able to access and defend every single structure in this area.

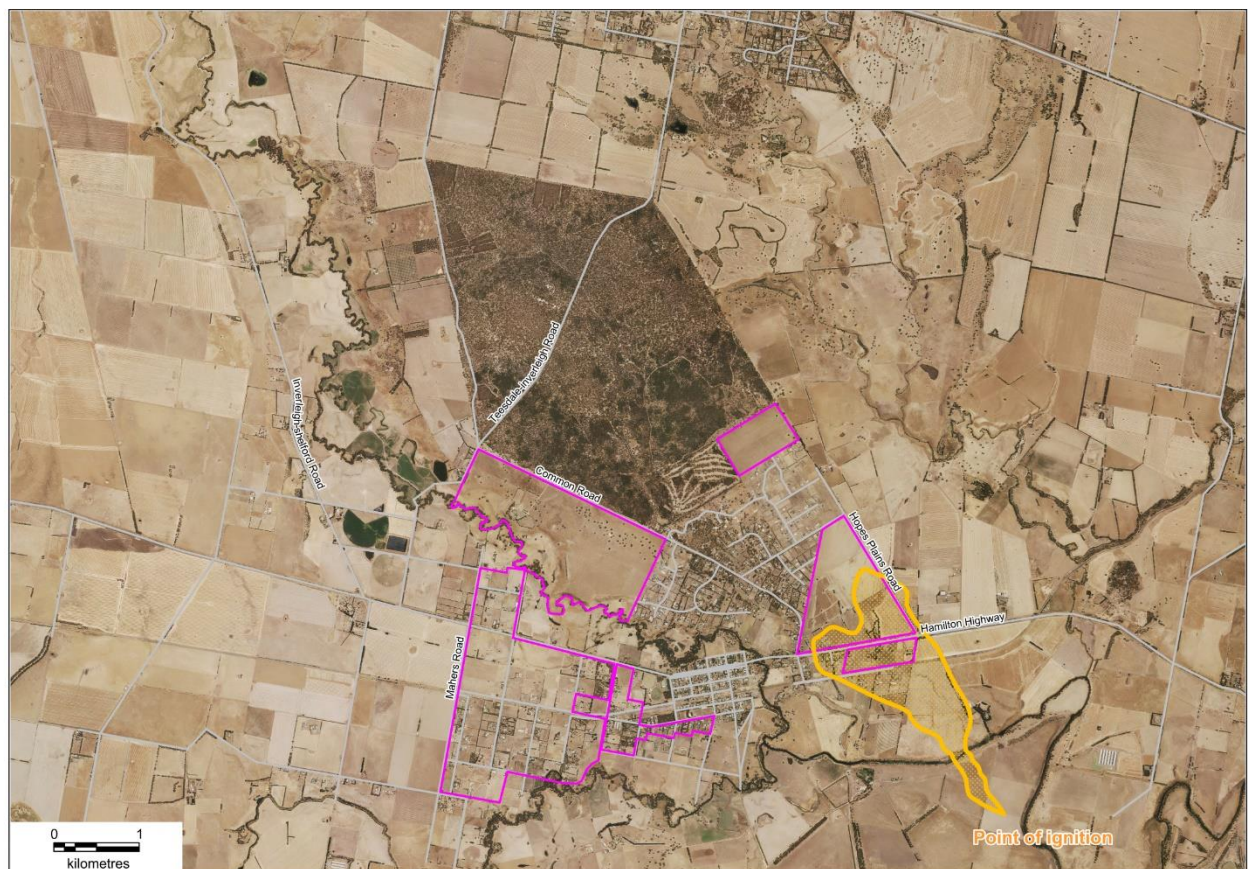
Figure 25: Scenario 2 - Hot and strong north-west wind, high temperature, low relative humidity with strong south-west wind change



Scenario 2 - Hot and strong north or north-west wind, high temperature, low relative humidity with strong south-west wind change

An ignition that occurs to the north-west and west of the township under these conditions; if not rapidly suppressed, could develop into a running grassfire as it burns through farmland crops and paddocks. Such a fire risks running through farmland on the western side of the township and turning to the north-east when the south-west wind change hits in the late afternoon. While the cooler wind change; often with higher relative humidity, can ease fire behaviour, strong winds associated with the change could push the fire into the west and south-west boundary of the town and significantly impact **potential growth area 6 and 3**.

Figure 26: Scenario 3 - Cool and brisk south-east coastal wind, moderate temperature, moderate relative humidity



Scenario 3 – Cool and brisk south-east coastal wind, moderate temperature, moderate relative humidity

An ignition that occurs to the south-east of the town under these conditions; if not rapidly suppressed, could develop into a running grassfire as it burns through farmland crops and paddocks. It could push into the boundaries of **potential growth areas 4, 5 and 6**. If the ignition was on the south side of the Barwon River, it is possible for the fire to jump the river and push into the south side of the town.

The southern side of the township is relatively sheltered from any fire spreading under a northerly influence. However it does have grassland interface on its western and southern boundaries, meaning a more likely impact is from a fire that is spreading towards Inverleigh from these directions as might occur following a southerly wind change.

A fire from the east and north-east is less likely, as easterly winds rarely correlate with fire weather conditions, but in the unlikely event it occurred, the **potential growth areas 1, 2 and 4** may also be impacted. The behaviour of any such fire would be expected to be less extreme than a fire in accordance with the other scenarios.

4.2 Potential Bushfire Impacts

The mechanisms of bushfire attack (ember attack, radiant heat, flame contact, wind damage) are generally well known and recognised and it is considered that there is no need to elucidate further on the detail of these impacts in this document.

Any significant fire in the Inverleigh area will expose the community and assets to impacts from these elements to a varying degree depending on the severity of the fire danger on any given day.

The effects of these impacts can be ameliorated through good township planning, the application of necessary statutory controls (e.g. BAL), community preparedness (e.g. property preparation, Fire Prevention Notices), availability of suppression resources and provision of adequate evacuation options.

5 ANALYSIS AND EVALUATION

All of the proposed growth areas could be impacted by fire whether bushfire from woodlands or grassfire from surrounding paddocks and crops.

Prevailing weather conditions through the summer fire danger period are highly conducive to fire. Extended dry conditions in autumn and to a lesser extent in spring, also provide conditions ideal for fire ignitions. Predicted changes in weather patterns; consistent with climate change modelling predictions, have the potential to result in more high fire danger days and more intense fire events (e.g. 2018 California, Queensland and Greece fires) that are a greater threat to communities.

This risk of fire is far greater on days of Severe, Extreme or Code Red fire danger when the ability of local resources to extinguish or control fires is challenged by the prevailing weather conditions. Under such conditions, a fire can be expected to reach and spread rapidly and impact assets even in well maintained landscapes.

Being a rural landscape, the potential for ignition is high and therefore it can safely be considered that at some point in the future, the township will be threatened by fire.

The area has a history of fire with many small ignitions every year that are rapidly brought under control and cause minimal impact. Several large fires have caused losses and damage more broadly across the district in past decades.

The impact of any fire event will be determined by fuel loads, weather, preparedness and the ability of resources to combat the fire.

Large fires on high fire danger days running into the township after a long build-up through the surrounding landscape have the potential to have significant impact on the town. Small localised fires igniting within close proximity to the town may still impact the town but these fires can be expected to be easier to bring under control and experience fewer losses.

It can be expected that; despite the CFA's efforts, many residents will be either unprepared or under-prepared for fire and seek to evacuate to a safer place. It is considered that many residents will head for the centre of the township. Such evacuation under high stress conditions, leaves significant potential for accidents and losses on a road network that may not have been designed to cope with such a use.

The centre of town should provide suitable refuge in all but the most extreme fire conditions.

Bushfire risk mitigation should direct development away from high risk areas. Where development cannot be directed in such a way, it must be ensured that appropriate and effective risk mitigation measures are in place to reduce this risk to an acceptable level. **It is not possible in rural residential situations to eliminate fire risk entirely.**

Bushfire risk should be reduced to acceptable levels provided the current proposals ensure that:

- Residential development in higher risk areas is avoided and appropriate setbacks from classified vegetation are applied;

- Township edge is consolidated to limit grass/bushfire spread into the town area;
- Appropriate defensible space, building envelopes, access and egress to properties and the development are applied
- New dwellings are constructed to the appropriate BAL construction standard;
- Urban design that meets CFA requirements for access and water supplies is applied;
- Well designed and built access and egress and viable evacuation options for residents and visitors are provided.

6 PLANNING AND DESIGN RESPONSE

Potential Growth Area 1:

- Stage development to minimise exposure and risk through expansion adjacent to existing developed land.
- Ensure fully constructed access onto Hopes Plains Road and Common Road to allow rapid access and egress in case the area is threatened by fire.
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads.
- Undertake improvements to the Common Road/Hamilton Highway intersection to improve road user safety when residents are evacuating from the Common Road area.
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.
- Ensure any public open space created as part of the development is able to be appropriately accessed to allow management for fire.

Potential Growth Area 2:

- Ensure growth area layout minimises interface between higher threat vegetation and assets through the use of vegetation management buffers on private land and/or perimeter roads and appropriate allotment layout that minimises the number of properties directly exposed to fire on the interface.
- Ensure sufficient separation distances between woodland fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes, 173 agreements) or fuel management provisions on private land (e.g. fire prevention notices).
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads
- Ensure fully constructed egress to Hopes Plains Road to the east to allow rapid access and egress in case the area is threatened by fire.
- Use a constructed perimeter road as part of the buffer between the woodland fuels and private property.
- Ensure vehicular access between the Inverleigh Flora Reserve and the constructed road network.
- Ensure the ability of the road network to handle rapid evacuation of most residents under high stress conditions.
- Ensure the road network can provide for responding CFA resources (e.g. weight limits, turning circles, cul-de-sacs).
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.

Potential Growth Area 3:

- Stage development to minimise exposure and risk through expansion adjacent to existing developed land.
- Ensure sufficient separation distances between woodland fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes) or fuel management provisions on private land (e.g. fire prevention notices).
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads and fully constructed egress to Common Road.
- Upgrade the Twin Bridges on the Teesdale-Inverleigh Road to 15 tonne standard for emergency services access.
- Undertake improvements to the Common Road/Hamilton Highway intersection to improve road user safety when residents are evacuating from the Common Road area.
- Ensure the ability of the road network to handle rapid evacuation of most residents under high stress conditions.
- Ensure egress options for residents trying to escape from a fire bearing down on them from the north and north-west.
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.
- Ensure any public open space created as part of the development is able to be appropriately accessed to allow management for fire.

Potential Growth Area 4:

- Ensure sufficient separation distances between grassland fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes) or fuel management provisions on private land (e.g. fire prevention notices).
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads and fully constructed egress to the Hamilton Highway. Consider the ability of the road network to handle rapid evacuation of most residents under high stress conditions.
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.

Potential Growth Area 5:

- Ensure sufficient separation distances between grassland fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes) or fuel management provisions on private land (e.g. fire prevention notices).
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads and fully constructed egress to the Hamilton Highway.

- Ensure the ability of the road network to handle rapid evacuation of most residents under high stress conditions.
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.

Potential Growth Area 6:

- Stage development to minimise exposure and risk through expansion adjacent to existing developed land.
- Ensure sufficient separation distances between grassland fuels and development are established and can be maintained through existing Planning Scheme mechanisms (e.g. easements, building envelopes) or fuel management provisions on private land (e.g. fire prevention notices).
- Ensure well-constructed and laid out access/egress is provided with minimum 7 metre sealed roads and fully constructed egress to the Hamilton Highway.
- Ensure the ability of the road network to handle rapid evacuation of most residents under high stress conditions.
- Ensure water supply (pressure and volume) into the growth area is sufficient to support firefighting operations should they be needed.
- Ensure any public open space created as part of the development is able to be appropriately accessed to allow management for fire.

7 REFERENCES

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