GOVERNMENT OF WESTERN AUSTRALIA

DFES
Department of Fire & Emergency Services

STRATEGIC INTELLIGENCE OUTLOOK

OCTOBER TO DECEMBER 2018

DATE: 12/10/2018

Contents

01

Introduction and Key Assessments

Introduction

This is the inaugural Strategic Intelligence Outlook (SIO) produced by the Intelligence and Hazard Planning Branch (IHPB). It is intended that Strategic Intelligence Outlooks will be released quarterly. The purpose of this SIO is to provide an analysis of DFES hazards and their impact on the community of Western Australia during the period from October to December 2018. The SIO analyses past climate conditions, recent environmental conditions and their influence on each hazard throughout the state. The SIO provides an interpretation of forecasting and modelling products produced by the Bureau of Meteorology (BoM), the Department of Water and Environmental Regulation (DWER) and DFES. The SIO is intended to support evidence based planning and decision making in emergency management.

One of the key aspects of the document is to provide indicators that can be monitored for change by IHPB and be communicated via the Weekly Intelligence Brief (WIB). These indicators will be monitored to provide improved threat warnings and triggers for state and regional preparedness. This will enable changes to be observed and understood as they develop. The SIO will analyse indicators for flood, cyclone, storm and bushfire. It will also assess risks associated with other hazards (such as heatwave) as required.

The IHPB communicates its assessments with 'Words of Estimative Probability', written in bold throughout the document and these words are linked to a percentage of probability (defined in a table located in the back of the document). It is important to remember that assessments are based on the best information available at the time of release. The WIB will provide updated assessments as indicators demonstrate changes in conditions.

DFES acknowledges the contributions of the BoM, DWER, Main Roads WA, the Forest Products Commission (FPC), Department of Primary Industries and Regional Development (DPIRD), Geoscience Australia (GA) and the contributing DFES Regions.

We invite feedback so that we continue to improve our products and services. Our contact details are provided here.

Key Assessments – Western Australia October to December 2018

- Tropical cyclones and lows are **likely** to impact the state. It is **likely** this may occur towards the end of the reporting period, however this risk becomes **probable** between January and March 2019.
- The northern bushfire season will **probably** continue into November and **possibly** December.
- It is **probable** that bushfire risk in southern regions will develop earlier than the seasonal average.
- It is **unlikely** that forecast late spring rainfall will reduce bushfire risk in the southern regions.
- The southern regions are **likely** to experience a longer than average fire season.
- The Midwest Gascoyne will **likely** be the first southern region to encounter increased bushfire risk.
- Harvesting operations will **possibly** reduce the availability and deployability of fire and natural hazard response personnel in rural and agricultural areas throughout the reporting period.
- It is **likely** that there will be an above average demand for resources and response capability during the 2018-19 Southern Bushfire Season. Therefore fatigue, resource management and capability planning must be considered.
- Based on forecast conditions and the BoM Severe Weather Outlook nationally, it is **possible** that there will be limited interstate capacity to assist in WA.
- It is **possible** that that the risk for bushfire will be concurrent across all southern Australian jurisdictions.
- It is **likely**, that WA resources will be required for interstate assistance, however, it is **possible** that forecast conditions in this state will constrain resource availability.

02

Cyclone Hazard

Cyclone Hazard

CYCLONE OUTLOOK FOR AUSTRALIA

The BoM Severe Weather Outlook for 2018-19 indicates that fewer than average tropical cyclones are expected in the Australian region over the November to April period. This is due to the possible formation of El Niño in the Pacific Ocean and near average ocean temperatures to the north and west of Australia. On average 10 - 13 tropical cyclones form in the Australian region with four typically impacting the coastline; however, an El Niño event usually reduces the total number of crossings.

CYCLONE OUTLOOK FOR WESTERN AUSTRALIA

The tropical cyclone season in Western Australia occurs from November to April. Records indicate that tropical cyclones can occur outside traditional timeframes. The earliest recorded tropical cyclone occurred on 19 November (1910) and the latest occurred on 21 May (1988). On average five tropical cyclones occur in WA each year, with two crossing the coast and one being of severe intensity.

Forecasting location and intensity of tropical cyclones prior to development is difficult. Tropical cyclones will usually impact the Kimberley and Pilbara Regions early in the season and risk extends further south along the west coast later in the season.

The North West of Western Australia (NWWA) typically produces more tropical cyclones than anywhere else in Australia and is the most frequently impacted region in Australia.

Tropical cyclone forecasting by the BoM is divided into two regions that cover Western Australia, the western region (the entire state) and the more focussed north western sub-region. For the western region the BoM is forecasting:

*The region will likely experience a below average number of tropical cyclones, with 56% fewer than average. The likelihood of more cyclones than average is at 44%. Typically between about 15% and 40% of tropical cyclones in the Western region affect coastal areas. Outlook accuracy for the Western region is **low**.*

For the north-western subregion the BoM is forecasting:

*A 41% chance of more tropical cyclones than average and a 59% chance of fewer tropical cyclones than average. Typically, five cyclones form in or pass through this area each season. Around 40% of tropical cyclones, or their associated tropical lows, affect coastal areas of the north western sub-region. Outlook accuracy for this region is **moderate**.*

CYCLONE IMPACT ON WA

The **likely** impacts from the northern wet season or a tropical cyclone will include damage to buildings, flooding, storm surge and catchment saturation. It is **probable** that these impacts may be exacerbated by a subsequent tropical cyclone or low occurring in close succession. The occurrence of this situation will **likely** increase resource and capability demands and limit the effectiveness of recovery efforts.

STRUCTURAL VULNERABILITY IN WESTERN AUSTRALIA

Exposed structures and infrastructure are susceptible to impact from cyclones. This includes wind hazard and water ingress. Wind hazard includes flying debris and structural failure resultant from winds. Water ingress results from wind driven rain entering structures through construction, renovation or construction vulnerabilities. In terms of domestic structures, vulnerability is derived from the building codes used to determine construction standards. Structures built prior to 1980 are significantly more vulnerable to cyclone impact then those built to later standards, see table 1 on page 9.

KEY INDICATORS FOR TROPICAL CYCLONE DEVELOPMENT

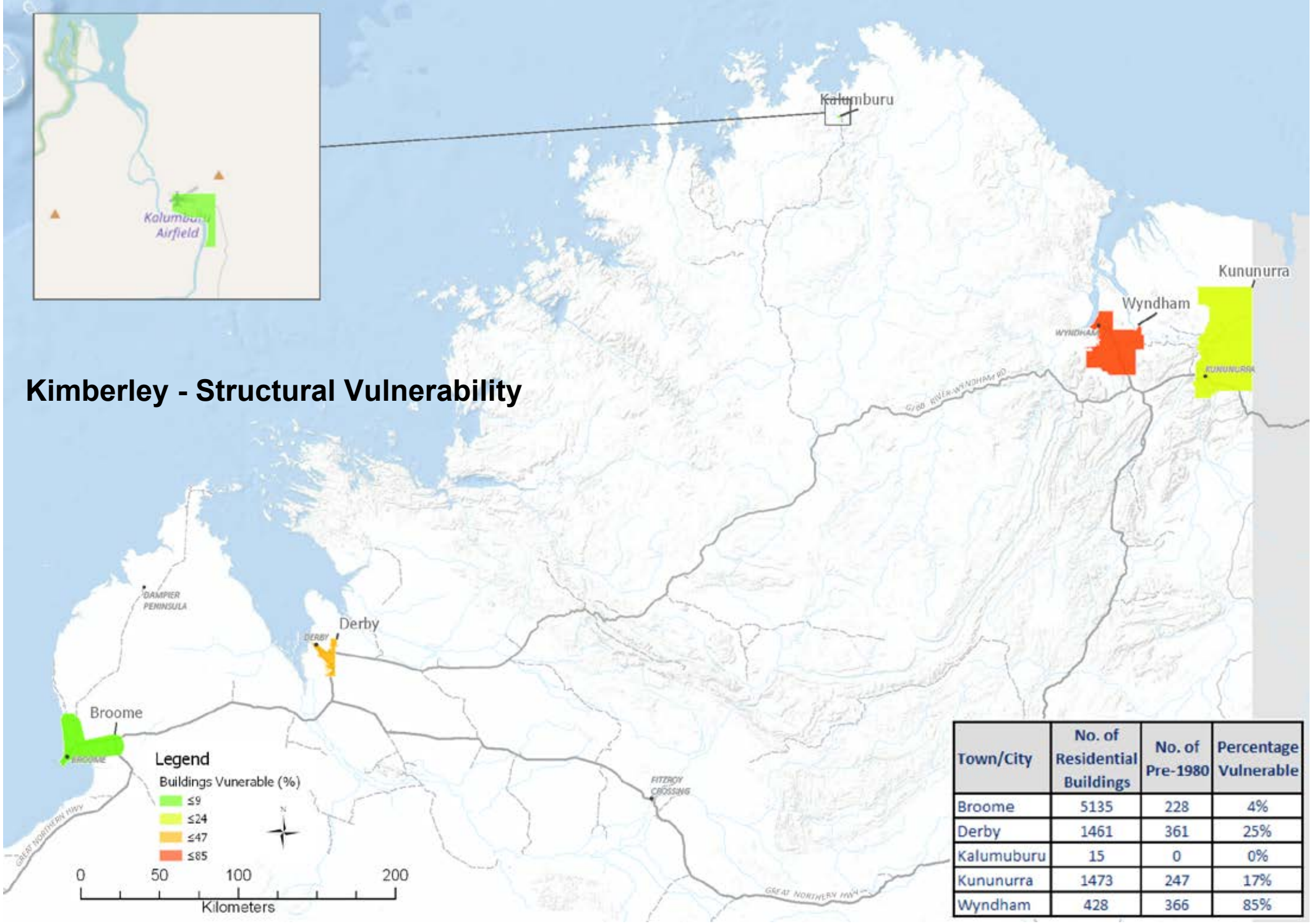
The following indicators will be monitored by the IHPB and updated in the WIB:

Event or Monitored Indices	Indicator
Increase (temperature and spread) of north west Sea Surface Temperature (SST)	An SST of above 26.5°c is an indicator of the ability for a TC to propagate and sustain in tropical north-west Australia
The development of areas of low pressure in the north-western subregion	Formation and detection of a low pressure system can indicate an onward formation of a cyclone

Table 1. Structural Vulnerability in Cyclone Prone Locations in Western Australia

Region	Town/City	No. of Residential Buildings	No. of Pre-1980	Percentage Vulnerable
Kimberley (p10)	Wyndham	428	366	85%
	Kununurra	1473	247	17%
	Kalumuburu	15	0	0%
	Derby	1461	361	25%
	Broome	5135	228	4%
Pilbara (p11)	Point Samson, Cossack, Wickham and Roebourne	974	431	44%
	Karratha	6714	1308	19%
	Dampier	424	407	95%
	Onslow	473	69	14%
	Exmouth	1196	449	37%
Midwest-Gascoyne (p12)	Coral Bay	9	8	89%
	Carnarvon	1851	1007	54%
	Denham	455	75	16%
	Kalbarri	1251	198	16%
	Geraldton	14,938	6076	41%

Kimberley - Structural Vulnerability



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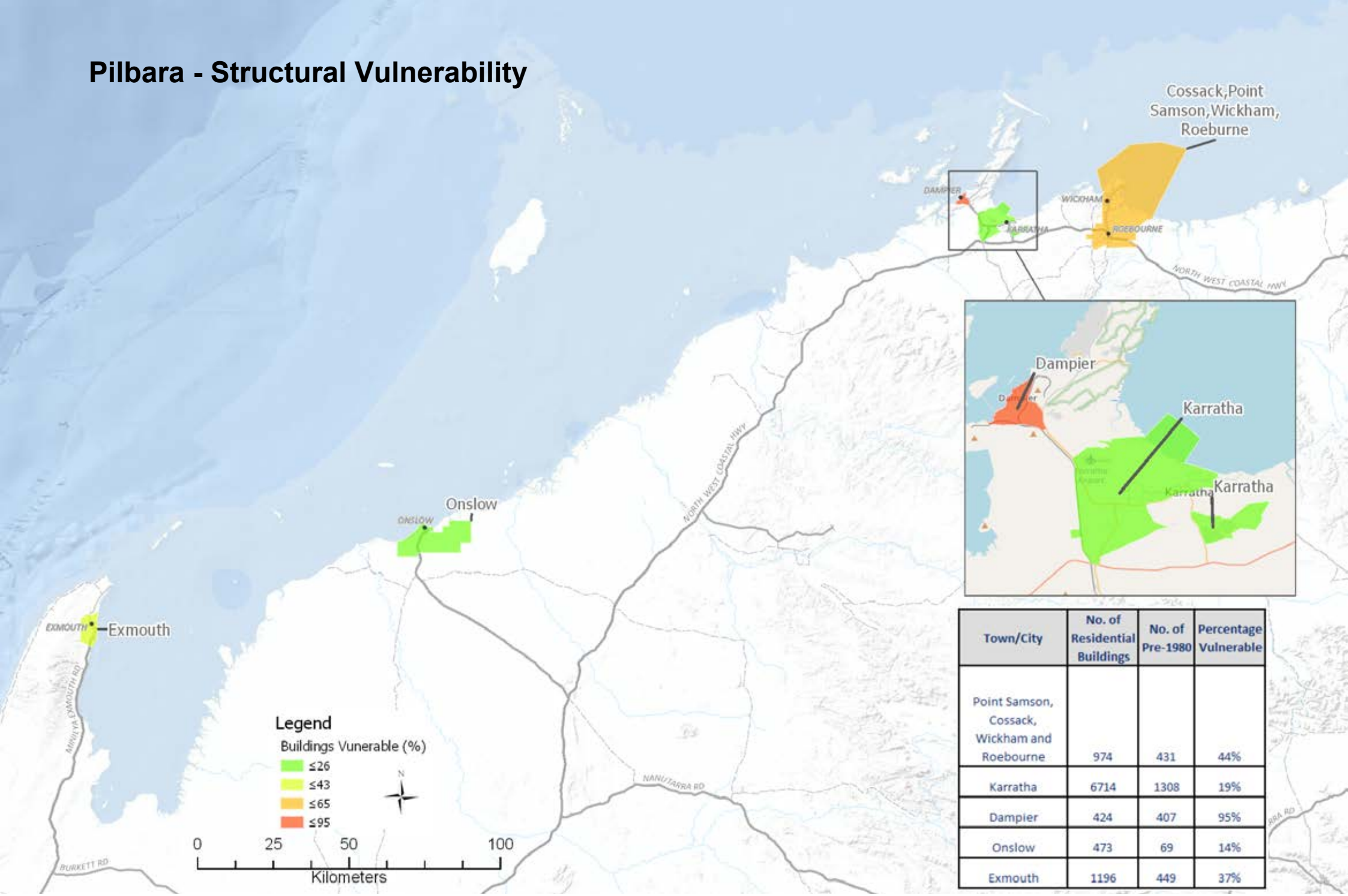
Pilbara - Structural Vulnerability



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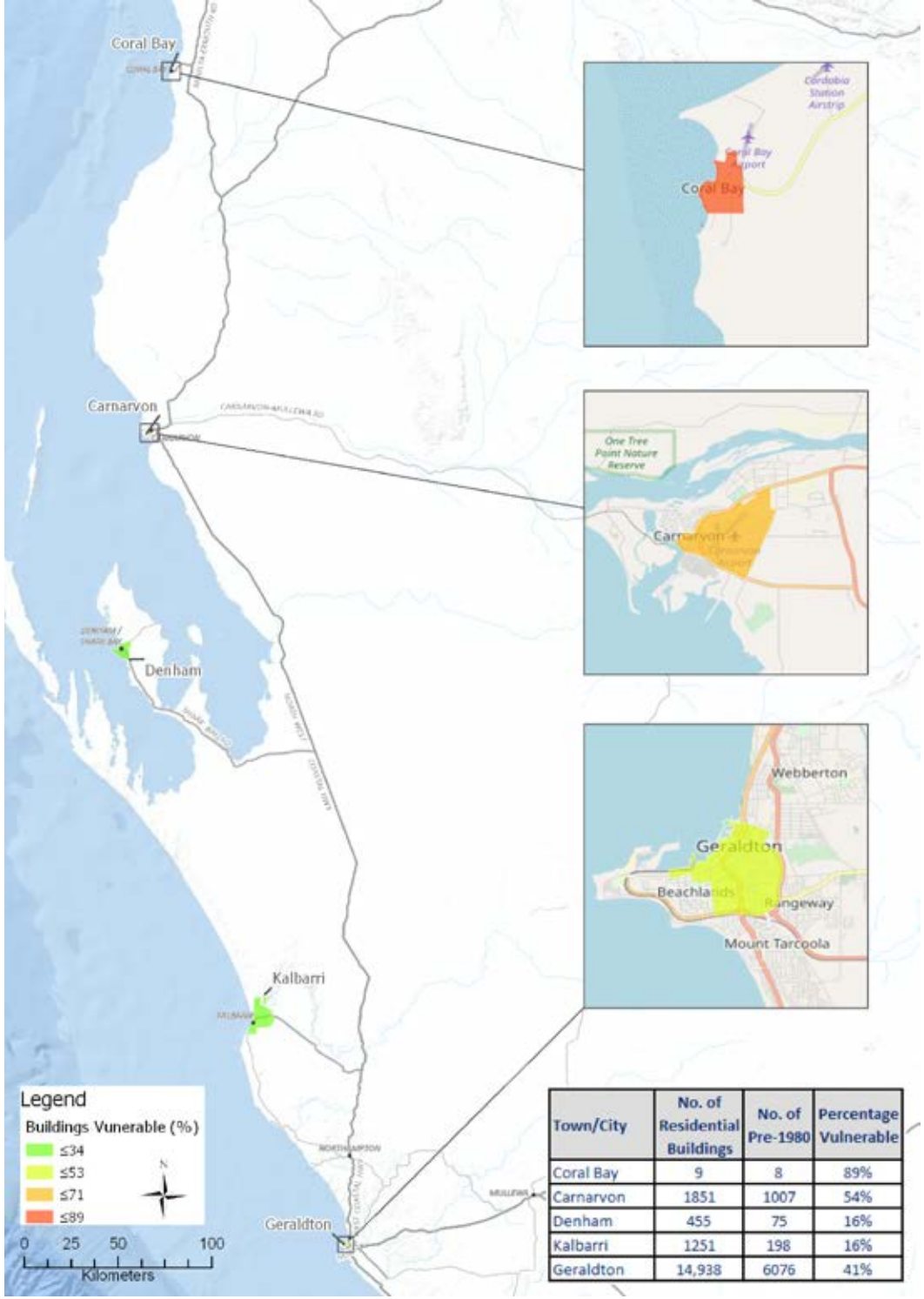
Midwest-Gascoyne - Structural Vulnerability



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03

Bushfire Hazard

Bushfire Hazard

ANTECEDENT CONDITIONS

Despite the perception of increased winter rainfall over the Perth metropolitan area and much of the South West Land Division (SWLD), actual rainfall has been generally poor for late winter in South West Western Australia (SWWA). While August recorded close to average and in some cases above average rainfall, this was corrected by a drier than normal September. The BoM have stated that it was the fourth driest on record and the driest in 80 years since 1939.

Across the Gascoyne, Goldfields, and Eucla BoM Districts, no site received more than 10mm of rainfall in September. During September, 12 sites in SWWA had their lowest rainfall on record, while almost another 40 had their driest in 20 years. While soil moisture did increase when rainfall was received, overall rainfall for winter throughout SWWA was classified by the BoM as below average.

These below average conditions are also combined with longer term rainfall deficits that have occurred in the South Coastal District and adjacent parts of the Great Southern Region. As a result of these below average conditions, analysis shows signs of decreased Root Zone Soil Moisture across the SWWA. For example the area west of a line from Geraldton to Esperance is showing 'average to below' or 'very below average' moisture content. This is in contrast to this time last year which showed soil moisture was either 'average or above', to 'very much above, average'.

CLIMATE DRIVERS AND FORECAST

The release of the BoM's forecast for the October – December 2018 period indicates an overall trend to below average rainfall in the SWLD and an increase in average to generally above average temperatures for the period. Modelling indicates that the Indian Ocean Dipole (IOD) is currently sustaining a move towards the positive threshold; meaning reduced rainfall for the south west of the state and a later start to the northern wet season.

CURRENT CONDITIONS

The indicators of fuel and ground moisture (such as SDI and KBDI) demonstrate acceleration in values through most of the monitored sites in the SWLD. Grass curing is still well below the threshold for concern in the SWLD. If the forecast conditions for rainfall and temperature prevail throughout October, curing is **likely** to rapidly increase in line with corresponding increases in KBDI and SDI. The following locations and indicators are of note for KBDI and SDI:

- The current SDI values for Albany and Collie are above the mean value.
- The current SDI measurements significantly exceed the mean value in Bickley, Bridgetown, Dwellingup, Harvey, Jacup, Jarrahwood, Manjimup, Northam, RAAF Pearce, Shannon, Wandering and Witchcliffe.
- The current KBDI measurements are well above the mean value in Badgingarra, Bridgetown, Jacup, RAAF Pearce and Wandering.

IMPACT ON FIRE CONDITIONS

The majority of indicators are yet to reach traditional threat thresholds. However, they demonstrate a sharp increase over the 10-year average and will **probably** reach threat thresholds sooner than normal. If this trend continues (as forecast conditions indicate) then bushfire risk will increase and the opportunity to conduct safe, secure and successful burns will **probably** end earlier than in past seasons. If increased isolated rainfall were to occur, it is **probable** that even with a decrease in localised fire monitoring indicators, the risk would still remain widespread in the SWLD.

04

Flood Hazard

Flood Hazard

ANTECEDENT FLOOD CONDITIONS

IHPB (in conjunction with BoM and DWER) are monitoring levels of soil moisture across all catchments. As a result of average to near average rainfall, the majority of the at-risk or monitored catchments in Western Australia are yet to pose a flood risk. Even a catchment that is quite dry could still respond to a high level of sustained, though isolated rainfall. This could trigger a flash flood or set the preconditions for further rainfall to cause catchment flooding.

The onset of a later than usual tropical low or tropical cyclone may provide sufficient initial wetness to result in significant flooding risk to northern catchments if another low or cyclone forms in the wake of that initial event. This can provide a **likely** constraint to regional and intrastate resupply, evacuation and affect other stakeholders that rely on ground transport. IHPB notes that flooding is the costliest of all the natural disasters that impact Western Australia, in terms of both human life and property, therefore catchments will be monitored for change and flood potential in the WIB.

Current Western Australian Catchment Flood Status

WA CATCHMENT FLOOD MONITORING	CATCHMENT CONDITION	FLOOD POTENTIAL
Blackwood River	Dry	Medium
Preston River	Medium	Medium
Collie River	Medium	Medium
Harvey River	Medium	Medium
Murray River	Medium	Medium
Canning River	Medium	Nil
Swan River	Medium	Nil
Avon River	Dry	Nil
Moore River	Dry	Nil
Yarra Yarra Lakes	Dry	Nil
Irwin River	Dry	Nil
Greenough River	Dry	Nil
Wooramel River	Dry	Nil
Murchison River	Dry	Nil
Gascoyne River	Dry	Nil

WA CATCHMENT FLOOD MONITORING	CATCHMENT CONDITION	FLOOD POTENTIAL
Lyndon-Minilya	Dry	Nil
Onslow Coastal	Dry	Nil
Pilbara Coastal Rivers	Dry	Nil
Ashburton River	Dry	Nil
Fortescue River	Dry	Nil
De Grey River	Dry	Nil
Sturt Creek	Dry	Nil
Salt Lakes	Dry	Nil
Sandy Desert	Dry	Nil
Warburton	Dry	Nil
East Kimberley District	Dry	Nil
North Kimberley District	Dry	Nil
West Kimberley District	Dry	Nil
Fitzroy River	Dry	Nil
Ord River	Dry	Nil

CATCHMENT CONDITION	FLOOD POTENTIAL
Wet, Medium, Dry	High, Medium, Nil

This table does not provide an assessment of flash flooding risk.

05

Regional Updates

Metropolitan Bushfire Hazard – Metro North and South Coastal, North East and South East Regions

KEY ASSESSMENTS

- It is **likely** that key indicators – including SDI and KBDI – will continue to rise during October and November, despite any downward correction due to rain. Therefore, bushfire risk will **likely** be realised earlier than in previous seasons.

- It is **certain** that the established Rural Urban Interface (RUI) areas of the northern, southern and eastern fringes of the metropolitan area hold the most bushfire risk from October to December.

- Development and expansion within new areas of the RUI around Two Rocks, Alkimos, Bullsbrook, Westfield, the Swan Valley, Wellard, Baldivis, Whitby, Lakelands, Ravenswood and Mandurah's southern suburbs also **certainly** form areas of increased bushfire risk.

- Deliberately lit fires **certainly** constitute the majority of fire ignitions for bushfire in the metropolitan area.

- While inputs such as fuel load and weather conditions will influence bushfire risk, fires are **probably** less seasonally influneced in the metropolitan area and adjacent fringes due to deliberate ignitions.

INTELLIGENCE ANALYSIS

The continuation of the urban sprawl of the Perth metropolitan area (as discussed above) is the prevailing characteristic of bushfire risk and impact across the four DFES metropolitan regions. The concentration of deliberate ignitions, accidental ignitions and discarded cigarettes, means that fires may occur without the same environmental pre-conditions required in other regions.

The dry September period, coming off the back of average rainfall of the previous two months, has influenced the entire Perth metropolitan area. Records indicate that RAAF Pearce had its driest September in 49 years; similarly Jandakot had their driest in 44 years and a number of locations in the Perth Hills their driest for at least 30 years. This was combined with temperatures that were slightly above average with a warmer end to the month than normal.

The factors combine to **probably** increase bushfire risk in areas of established RUI risk along the Perth coastal plain, into the Perth Hills and especially in established urban growth corridors to the north, south and south eastern fringes. However, the risk also increases in newer developing RUI areas such as Two Rocks, Alkimos, Bullsbrook, Westfield, the Swan Valley, Wellard, Baldivis, Whitby, Lakelands, Ravenswood and Mandurah's southern suburbs. IHPB also notes that within the RUI there is moderate alignment to areas of **probably** advanced fuel age and an increased risk of deliberate fire ignitions.

Bushfires of greater consequence can **possibly** occur in smaller areas of bushland with high fuel load in urbanised areas, due to the impact of bushfires on surrounding high density residential areas. This is again mirrored in those areas on the urban fringe and in areas adjacent to undeveloped land, especially in the south and south east of the city. If fires (or other hazards) manifest in the RUI or urbanised areas, it is **likely** that first responders will encounter residents that are unprepared to deal with the hazard or respond appropriately to public information.

While analysis of the critical factors in bushfire occurrence in the SWLD for 2017-18 indicated that lightning was less critical to ignition than deliberate intervention; lightning ignitions often produce larger fires. This is critical in assessing the risk from lightning ignitions occurring in the Darling Escarpment.

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by IHPB and will be updated in the WIB:

Event or Monitored Indices	Reason
KBDI above 70 for seven or more consecutive days	Indicates conditions are approaching HTP thresholds
KBDI above 100 for seven or more consecutive days	Indicates conditions have exceeded threshold of probable correction based on rainfall
SDI above 500 for seven or more consecutive days	Indicates SDI is approaching 600 which is the upper limit for prescribed burning
Atmospheric Instability	Lightning initiated bushfire

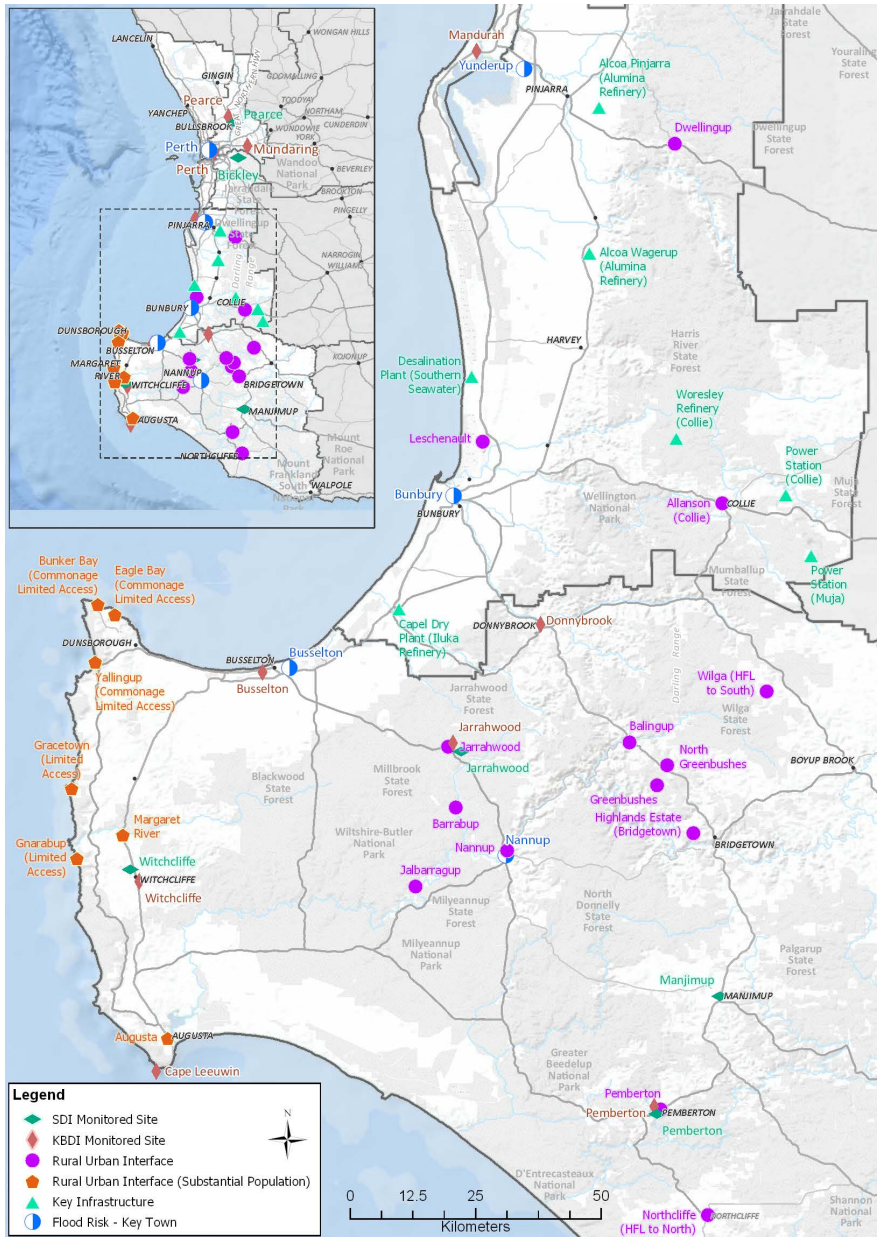
Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
RAAF Pearce	Mandurah
Bickley	Mundaring
	Perth Metro
	RAAF Pearce

METROPOLITAN FLOOD HAZARD

Despite the average to below average rainfall across SWWA, a number of catchments in the metropolitan area have retained enough moisture to still present a **probable** average level of wetness. These include the Swan, Canning, and Murray Rivers.

LOCATIONS OF FLOOD RISK IN THE METROPOLITAN AREA

Swan River – Perth The Swan River supports significant agriculture and viticulture on its upper plains as well as high-volume traffic links, which means that a large flood event could have significant economic impacts on transport routes, market gardens and vineyards. Large areas of residential development would be inundated during a major flood event. Warning services offer 24 hour warning of flooding at Walyunga and Barrack Street. An indication of flooding could be rising water levels of the Yenyenning lakes. A typical event trigger would be one or more wet winters producing a high base flow proceeded by a big winter system or an ex-tropical cyclone/low that brings heavy rain.


Mandurah
Yunderup
Alcoa Pinjarra (Alumina Refinery)
Dwellingup
Alcoa Wagerup (Alumina Refinery)
Desalination Plant (Southern Seawater)
Leschenault
Bunbury
Worsley Refinery (Collie)
Power Station (Collie)
Allanson (Collie)
Power Station (Muja)
Capel Dry Plant (Iluka Refinery)
Donnybrook
Busselton
Bunker Bay (Commonage Limited Access)
Eagle Bay (Commonage Limited Access)
Yallingup (Commonage Limited Access)
Gracetown (Limited Access)
Gnarabup (Limited Access)
Margaret River
Witchcliffe
Augusta
Cape Leeuwin
Wilga (HFL to South)
Jarrahwood
Balingup
North Greenbushes
Greenbushes
Highlands Estate (Bridgetown)
Barrabup
Nannup
Jalbarragup
Manjimup
Pemberton
Northcliffe (HFL to North)
Legend
SDI Monitored Site
KBDI Monitored Site
Rural Urban Interface
Rural Urban Interface (Substantial Population)
Key Infrastructure
Flood Risk - Key Town
0 12.5 25 50
Kilometers

Lower South West and South West Hazards

KEY ASSESSMENT:

- Based on current and antecedent conditions across both regions, it is **probable** that bushfire risk will occur four to six weeks earlier than average.

- High value hardwood and softwood plantations are located adjacent to older age fuels, **certainly** increasing the opportunity for bushfire to cause significant financial damage.

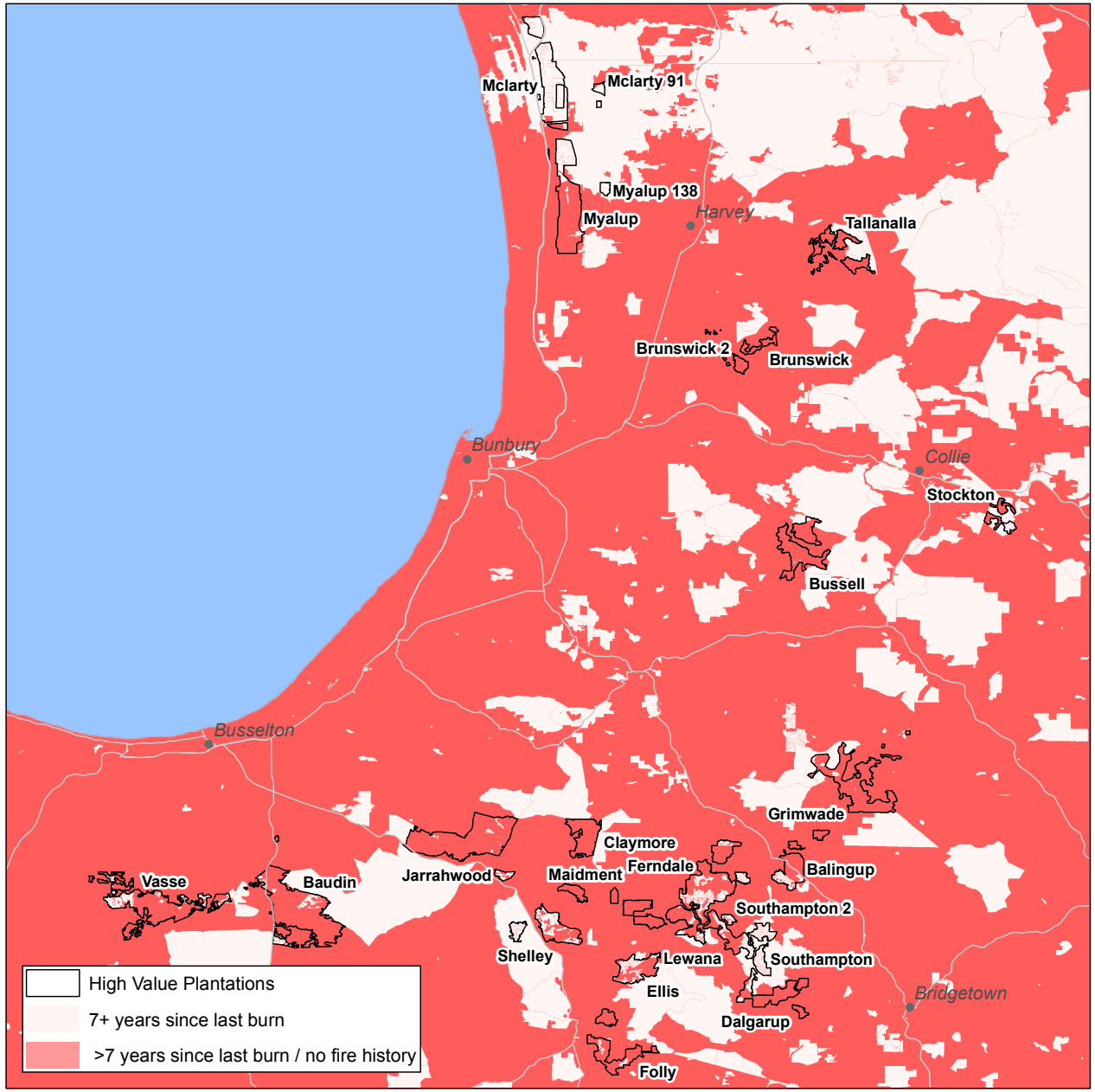
INTELLIGENCE ANALYSIS

The average winter rainfalls that have characterised the lead up to the HTP remain the dominant feature for the development of bushfire risk in the Lower South West and South West DFES Regions. Like other regions within the SWLD, average to above rainfall was experienced across the two regions over the start of winter, but dropped to well below average for September. Many locations within the regions – such as Cowaramup and Manjimup – experienced their driest September for 20 years. Therefore, significant rainfall in early winter has allowed for a **probable** increase in fuel availability and therefore bushfire risk, with below average September rainfall allowing that fuel to begin drying out.

Mixed land use within the two regions makes it a complex area to successfully suppress fires. Regional engagement indicates that despite mitigation and fuel reduction efforts the nature of land use means that there are significant areas of RUI that are **certainly** influenced by high fuel load. Risk is increased as a result of the potential for isolation of townsites or properties due to complex restricted access requirements. While this is true for established towns throughout the regions, it is particularly applicable to new developments in Margaret River, Busselton, Dunsborough, Australind, Leschenault, Binningup, Dalyellup, Capel and Stirling Estate. Intensification of development in these new estates in areas of previously mixed land use provides a further **probable** complication to response and suppression efforts in the RUI. The regional road network would **certainly** constrain options for community evacuation and resource deployment.

REGIONAL HIGH VALUE ASSETS OR RISKS

The two regions contain all of the FPC's 20 highest value plantations which are deemed to require comprehensive fire management plans. These softwood plantations are critical to the state for ongoing softwood harvesting and amount to 30,500 hectares of plantation. Plantations that are most critical are those in the 7 – 20 years of age category, which is 40% of the plantations in the two regions. In order to aid preparation and response planning, attached images indicate the location of these plantations as they relate to high fuel age areas in the two regions. It is certain that due to the nature of these plantations that external fire would cause significant damage to the state's economic interests.


Mclarty
Mclarty 91
Myalup 138
Myalup
Harvey
Tallanalla
Brunswick 2
Brunswick
Bunbury
Collie
Stockton
Bussell
Busselton
Grimwade
Claymore
Ferndale
Balingup
Maidment
Jarrahwood
Vasse
Baudin
Southampton 2
Shelley
Lewana
Southampton
Ellis
Bridgetown
Dalgarup
Folly
High Value Plantations
7+ years since last burn
>7 years since last burn / no fire history

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by IHPB and will be updated in the WIB:

Event or Monitored Indices	Reason
SDI approaching 600 - especially areas adjacent to high value FPC plantations	This indicates that conditions are approaching the cessation of burning and increased risk to forested areas and plantation. SDI of 700 is upper limit for Southern Jarrah forest and some Karri forest types
KBDI sustained above 100 for more than seven consecutive days	Indicates conditions have exceeded threshold of probable correction based on rainfall
Atmospheric Instability	Lightning initiated bushfire

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
Witchcliffe	Busselton
Pemberton	Cape Leeuwin
Jarrahwood	Donnybrook
Manjimup	Jarrahwood
	Pemberton
	Witchcliffe

LOWER SOUTH WEST AND SOUTH WEST FLOOD HAZARD

The dry conditions of September, combined with the relatively dry start to October mean that the preconditions for flood are not as evident as previous years. However, there is significantly more variation across the two regions than analysis of rainfall would indicate, with some areas retaining high levels of Root Zone Soil Moisture such as Nannup, while other locations such as Pemberton, are still at almost complete Root Zone Soil saturation.

If some locations retain their high levels of moisture it is **possible** that localised inundation could remain a threat if they are influenced by singular widespread significant rainfall events throughout October to December. Catchments retaining moisture include the Preston, Collie, Harvey and Murray Rivers. As a result of their condition these rivers have a residual flood potential.

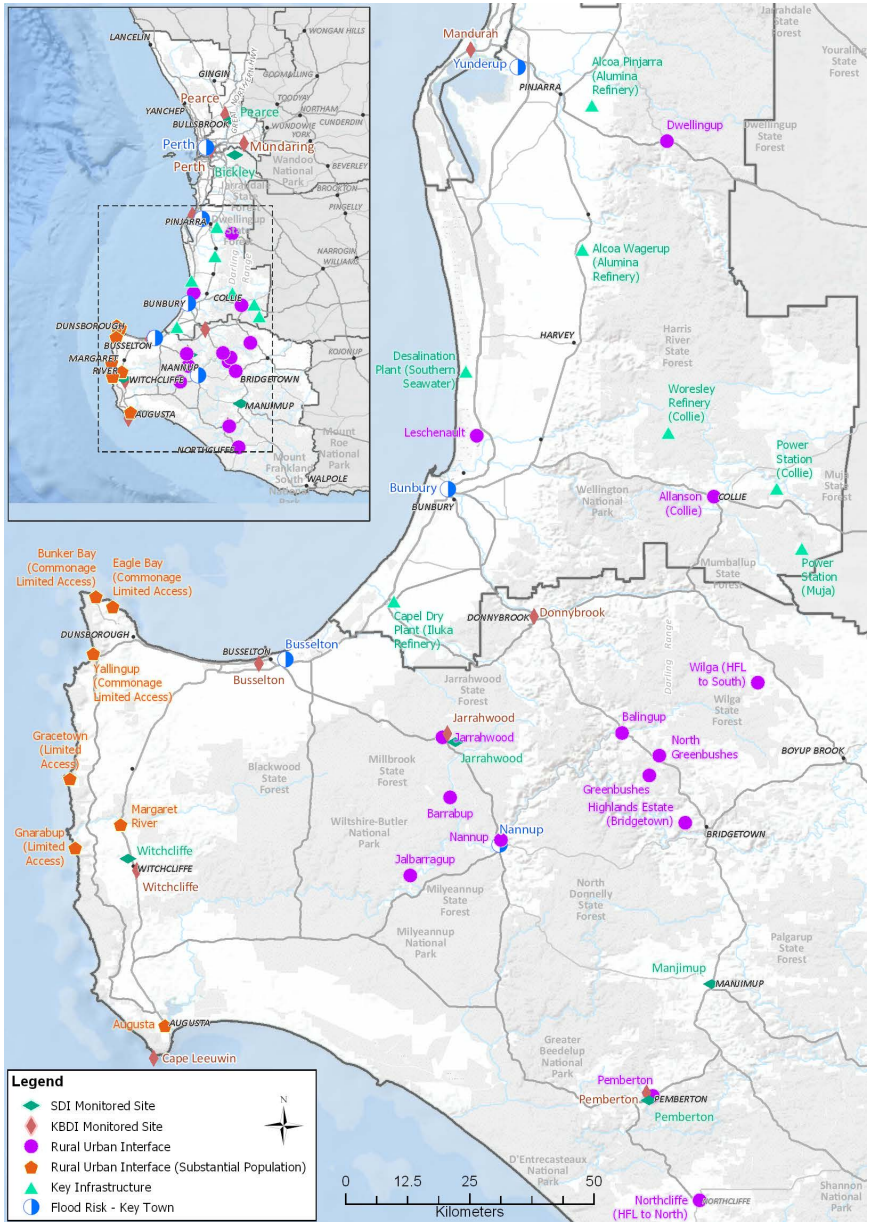
LOCATIONS OF FLOOD RISK IN THE LOWER SOUTH WEST AND SOUTH WEST

Blackwood River – Nannup . The Blackwood River flows through Nannup and its extensive history of flooding underlines the risk posed to the community. A 12-hour lead time could be provided to Nannup prior to a flood event. A low or ex-tropical cyclone could bring extreme falls to the catchment as could a single or multiple wet winters that results in a high base flow followed by a large weather system.

Murray River – Yunderup The Murray River poses a significant risk to Yunderup. Even a modest flood event could put key transport links at risk and isolate a large number of homes and communities. A flood could also inundate and isolate a large number of properties in Yunderup which means evacuation should be an early planning consideration. Increased numbers of vulnerable people may also be at risk in some localities due to isolation in relatively small flood events. Pinjarra and Ravenswood could have 12 and 18 hours respective warning prior to the Murray River flooding. An indicator for a flood could be a large winter system following one or more wet winters that resulted in high base water flow or an ex-tropical cyclone/low that produces extreme rain falls. Evacuation and recovery areas could also be dispersed to mixed land use areas (rural, semi-rural and urbanised areas) being affected by flood waters.

Preston River – Bunbury Bunbury is the second largest city in WA and is near the mouth of the Preston River. High tides require mechanical pumping, storm water causes drainage issues and extreme events may also overflow the multiple levees protecting Bunbury's main areas. Flash flooding also poses a risk, which is partly why some areas (including residential have been designed to be inundated during a flood. Donnybrook's predictions could allow for a 6 hour warning in the case of a flood just as Boyanup Bridge's predictions could allow for a 12 hour warning. There are three typical event triggers that could occur in isolation or in combination with each other. These are; a wet winter or extreme summer event resulting in very high Preston River flow, an extreme local (flash flood) event causing overloading of stormwater system or a large ocean surge **possibly** from a sub-tropical or tropical low.

Vasse River – Busselton The Vasse River poses a significant risk to the community in Busselton due to its extensive flooding and storm surge inundation history. This is compounded by stormwater drainage issues and the low lying nature of the town which provides minimal height relief. There are three typical event triggers that could occur in isolation or in combination with each other. A significant rainfall event (or wet winter) resulting in a high base flow, followed by a large winter system. An ex-tropical cyclone/low causing extreme rainfall on the region. Storm surge or upstream catchment flooding. Each of these would have a significant impact on Busselton's large community and tourism, mining and agricultural industries.


Mandurah
Yunderup
PINJARRA
Alcoa Pinjarra (Alumina Refinery)
Dwellingup
Alcoa Wagerup (Alumina Refinery)
HARVEY
Desalination Plant (Southern Seawater)
Woresley Refinery (Collie)
Leschenault
Power Station (Collie)
Bunbury
BUNBURY
Allanson (Collie)
COLLIE
Power Station (Muja)
Bunker Bay (Commonage Limited Access)
Eagle Bay (Commonage Limited Access)
DUNSBOROUGH
Capel Dry Plant (Iluka Refinery)
DONNYBROOK
Donnybrook
BUSSELTON
Busselton
Yallingup (Commonage Limited Access)
Wilga (HFL to South)
Jarrahwood
Balingup
North Greenbushes
BOYUP BROOK
Gracetown (Limited Access)
Greenbushes
Highlands Estate (Bridgetown)
BRIDGETOWN
Margaret River
Barrabup
Nannup
Gnarabup (Limited Access)
Witchcliffe
WITCHCLIFFE
Jalbarragup
Manjimup
MANJIMUP
Augusta
AUGUSTA
Cape Leeuwin
Pemberton
PEMBERTON
Northcliffe (HFL to North)
NORTHCLIFFE
Legend
SDI Monitored Site
KBDI Monitored Site
Rural Urban Interface
Rural Urban Interface (Substantial Population)
Key Infrastructure
Flood Risk - Key Town
0
12.5
25
50
Kilometers

Upper Great Southern and Great Southern Hazards

KEY ASSESSMENTS

- Bushfire risk will **certainly** be influenced by harvest activities; however, peak bushfire risk will **probably** not be reached until into the January to March 2019 period.

- Harvesting operations will **possibly** reduce the availability and deployability of fire and natural hazard response personnel in rural and agricultural areas.

- Both regions are **certainly** vulnerable to lightning initiated ignitions as a result of atmospheric instability.

INTELLIGENCE ANALYSIS

The current 'average' to 'below average' rainfall is the main influence on fire conditions within these regions. The two regions are sensitive to the fluctuations of rainfall and the impact it has on the normal agricultural and pastoral activities. Unlike other regions that currently have a sustained drying trend, the two regions show high soil and fuel moisture content in the south and the progressive drying of soil and fuels in the north and north east of the regions.

This drying pattern will potentially influence the onset of the harvest in the two regions and this will be reflected in the manifestation of bushfire risk along the outer edges of the two regions earlier in the October to December period.

This is especially the case when harvest activities provide an ignition source to dry fuels in those areas. The rate of drying of crops and pasture indicates an earlier start to the harvest, however, at the time of release this is yet to be confirmed but will remain a key indicator for the region.

The higher levels of soil moisture along the southern parts of the Great Southern Region means that the increase in conditions that lead to Bushfire Risk is **likely** to develop in the next reporting period (January to March), or **possibly** in the very late stages of this focus period. The one notable exception to this is the South Coastal District that has experienced an extended rainfall deficit that will **probably** influence bushfire risk in those parts earlier than in adjacent areas.

Like other agricultural areas in SWWA, the two regions have dispersed communities throughout three distinct zones ranging from forested areas along the western parts of the region, the broad acre cropping and grazing areas of the wheat belt and scrub and woodland east of the rabbit proof fence. The large distance between communities requires significant road movement that increases the around harvesting times therefore increasing the risk of road traffic accidents.

As a result of harvest being the community focus in the two regions, fires that develop may rapidly require external assistance from adjacent regions, likewise the later onset of bushfire risk in January to March may also **likely** require additional external assistance.

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by IHPB and will be updated in the WIB:

Event or Monitored Indices	Reason
KBDI rising above 70 in other fuel types and areas of RUI for seven or more consecutive days	Indicates conditions are approaching high risk thresholds
KBDI sustained above 100 for more than seven consecutive days	Indicates conditions have exceeded threshold of probable correction based on rainfall
Atmospheric Instability	Lightning initiated bushfire

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
Wandering	Albany
Boddington	Esperance
Darkan	Ravensthorpe
	Hyden
	Lake Grace

GREAT SOUTHERN FLOOD HAZARD

There is a significantly reduced potential for flood in the two southern regions as catchments have soil moisture that is below the hazard potential threshold for concern. However, there are smaller areas in the south west of the regions that may be susceptible to flash flooding with the right trigger event.

Midwest Gascoyne Hazards

KEY ASSESSMENTS

- The Midwest Gascoyne will **probably** reach bushfire risk earlier than average.
- Bushfire risk will **certainly** increase during harvest activities, with harvest **probably** occurring prior to other regions in the SWLD.
- Harvesting operations will **possibly** reduce the availability and deployability of fire and natural hazard response personnel in rural and agricultural areas.
- Flood Risk is **unlikely** to be realised before the onset of a tropical low or ex-tropical cyclone.

INTELLIGENCE ANALYSIS

The bushfire risk in the Midwest Gascoyne has been influenced by the substantial rainfall deficit that has shaped the lead up to the HTP in the southern regions. This has included 'below average' or 'very below average' rainfall for the region with some parts of the northern coastal area experiencing the lowest rain on record for the last nine months. This has meant that an area that has traditionally been the first to undergo harvest and experience increased bushfire risk, will **probably** enter a period of increased bushfire risk earlier than normal. This will be the case if temperatures continue to increase above the mean and rainfall continues to be below average.

The IHPB is monitoring a number of sites across the region and they provide a clear demonstration that bushfire risk will be reached earlier than normal:

- Badgingarra KBDI values are currently double the mean for this time of year.
- Mount Magnet is almost within the 90th percentile for KBDI.
- Kalbarri remains on the mean; however, this is due to a minor downward correction based on late September rainfall, otherwise it would be well above the mean value for this time of year.
- Geraldton remains the only location that has KBDI values below the mean.

REGIONAL HIGH VALUE ASSETS OR RISKS

The regional road and rail network, especially rail utilised for post-harvest grain delivery to ports, constitutes the bulk of the regional essential infrastructure outside of the towns and populations centres. While other infrastructure remains vital to the community, mobility through regional roads and rail supports emergency response and agricultural activity increasing community resillience. The Great Northern Highway carries the bulk of the intrastate supply north and is critical for regional access, risk increases during harvesting and mustering operations.

Hazards that impact the ability to move throughout the region, through the loss of road infrastructure such as bridges and culverts, will have a detrimental effect on the region to respond to and recover from hazards. Therefore, preparation based on the expectation of a usual season will **certainly** increase community resilience and account for changes in forecast or increased hazard triggers from the influence of out-of-area cyclones.

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by IHPB and will be updated in the WIB:

Event or Monitored Indices	Reason
KBDI rising above 70 in other fuel types and areas of RUI for seven or more consecutive days	Indicates conditions are approaching high risk thresholds
KBDI sustained above 100 for more than seven consecutive days	Indicates conditions have exceeded threshold of probable correction based on rainfall
Atmospheric Instability	Lightning initiated bushfire

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
N/A	Badgingarra
	Mount Magnet
	Kalbarri
	Geraldton

MIDWEST GASCOYNE FLOOD HAZARD

The Midwest Gascoyne is not immune to the impact of floods. Two rivers, being the Gascoyne and Greenough are the main cause of those impacts. Pre-conditions for a flood are not currently evident in the region due to almost no Root Zone Soil Moisture in the majority of the two catchments.

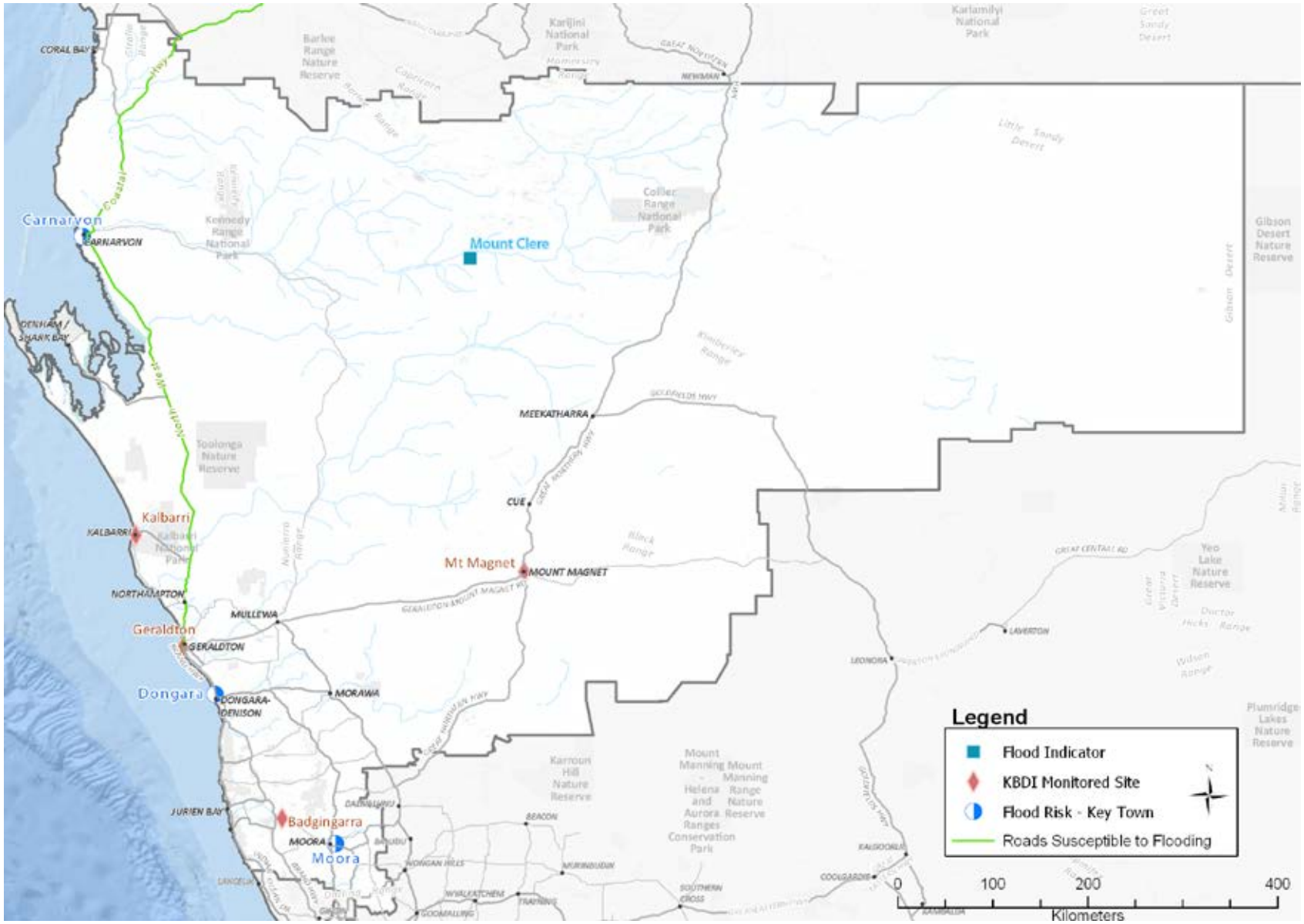
The Gascoyne is vulnerable to flooding caused by ex-tropical lows or cyclones. When rain falls in the eastern end of the catchment, this causes significant flooding in the lower reaches of the system. The general indicators for flooding is widespread rainfall west of Mount Clere that could provide early warning to locations downstream.

LOCATIONS OF FLOOD RISK IN THE MIDWEST GASCOYNE REGION

Gascoyne River – Carnarvon Carnarvon has a significant community and agricultural industry and is situated on the floodplains of the Gascoyne River. This river has the capacity for extreme flows after significant rainfall events. In the event of significant rainfall, warning services could provide a 24 hour warning at the 9 Mile Bridge before flooding occurs. The most likely cause of flooding would be a tropical low/cyclone. A major Levee was constructed post the 2010/2011 floods although it has not yet faced a significant flood.

Irwin River – Dongara The Irwin River has a significant history of flooding which puts the large community of Dongara at risk. A prediction of 12 hours warning could be provided for the Dongara area in the case of a flood. The most likely cause of a flood would be an ex-tropical low/cyclone bringing extreme rainfalls to the region.

Moore River – Moora The majority of Moora's significant community is situated on the Moore River's floodplain which affects large portions of the town with out-of-bank flooding. In the case of an extreme flood, evacuation should be considered. A trigger for a flood could be a wet winter or multiple wet winters resulting in a high base flow followed by a large winter system or an ex tropical cyclone/ low bringing extreme falls to catchment.


Carnarvon
Mount Clere
Kalbarri
Mt Magnet
Geraldton
Dongara
Badgingarra
Moora
MEEKATHARRA
CUE
MULLEWA
MORAWA
NORTHAMPTON
JURIEN BAY
Legend
Flood Indicator
KBDI Monitored Site
Flood Risk - Key Town
Roads Susceptible to Flooding
0
100
200
400
Kilometers

Pilbara Hazard

KEY ASSESSMENTS

- The bushfire season will **probably** be prolonged into late November and **possibly** into December based on current and forecast conditions.

- The Pilbara region will **probably** be impacted by cyclones in the early part of the next reporting period.

INTELLIGENCE ANALYSIS

Bushfire Hazard. The Pilbara is a highly resilient region that by the nature of its topography, industry and community is exposed to numerous hazard types. In normal years the Pilbara usually transitions from their fire season into the northern wet around late October to November. The current conditions that are influencing the bushfire risk will **probably** have a prolonged influence on the operational posture of the Pilbara Region. The forecast late onset of the northern wet season will **likely** allow those conditions to provide a latent threat to communities such as Tom Price, Paraburdoo, Onslow, Roebourne, Wickham, Exmouth, Nullagine and Marble Bar. As the transition of seasons occur, the increased thunderstorm activity will **probably** increase numbers of landscape fires in the remaining available fuels.

Cyclone and Flood Threat. As a result of the forecast delay in the wet season and cyclones, the Pilbara region will **possibly** not be impacted by cyclones during this reporting period. Cyclones or tropical lows that have formed in waters north of Darwin, may provide sufficient rainfall to trigger catchment moisture increases and raise the flood risk prior to the onset of cyclones formed in Western Australian waters.

Given the forecast late start to the northern wet season and cyclone impacts, it is **possible** there is a reduction in time between events. This requires response and recovery to be conducted quickly to ensure that community members, regional response arrangements and infrastructure is resilient to withstand recurrent cyclones or tropical lows that may rapidly impact the regions shortly thereafter.

Regional High Value Assets or Risks. There is mixed topography and land use in the Pilbara this includes mineral resource exploitation, dispersed pastoral leases and Remote Aboriginal Communities. The network of roads and associated infrastructure is critical to response, recovery and resilience in the region. Reporting from partner agencies indicate that the network is at operational capability at the time of release. However, if there is a delay in rainfall from either the northern wet season or cyclone impact, it is **probable** that regional communities could become complacent and rely on unsealed roads that are vulnerable to rainfall impacts.

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by IHPB and will be updated in the WIB:

Indicator	Reason
Widespread rainfall totals of above 20 mm over 24 hour period	Indicates break in dry season and sufficient rain to moisten soils and fuel to end fire hazard
Increase (temperature and spread) of Seas Surface Temperature (SST) NWWA and WWA	An SST of above 26.5° is an indicator of the ability for TC to propagate and sustain in tropical north west Australia
The development of areas of low pressure in the north western subregion	Formation and detection of a low pressure systems can indicate an onward formation of a cyclone

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
N/A	Karratha
	Port Hedland
	Newman
	Tom Price
	Exmouth

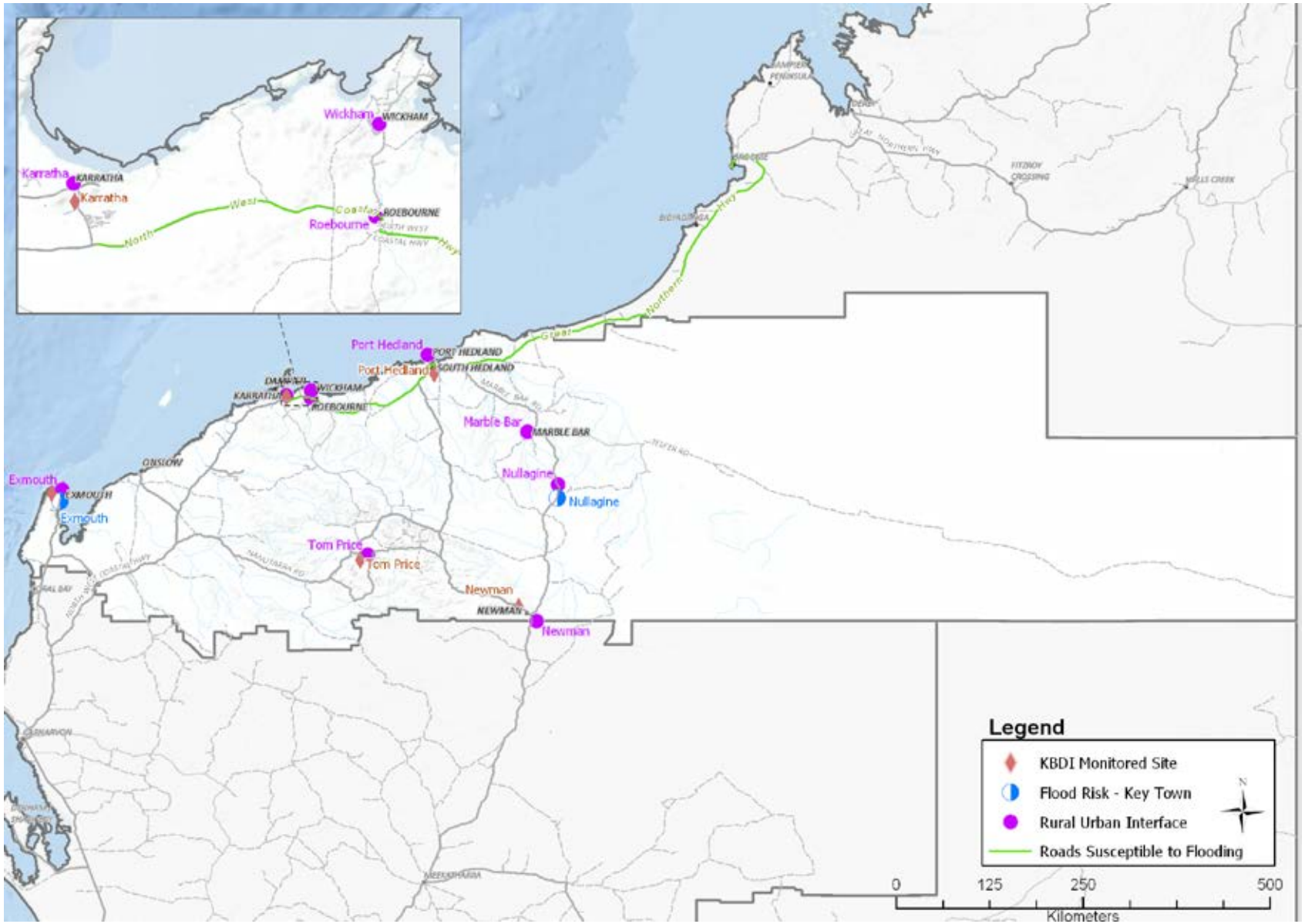
PILBARA FLOOD HAZARD

The Pilbara is primarily vulnerable to flooding due to the impact of tropical cyclones, tropical lows and seasonal rainfall throughout the region's catchments. While specific warning is provided in each of the catchments, the Fortescue River has some specific indicators. In the Fortescue catchment, areas approximately east of the Roebourne-Wittenoom Rd do not drain into the Fortescue River further west, which connects to the ocean. There is a natural dam and associated wetland complex which prevents surface flows joining the western river.

LOCATIONS OF FLOOD RISK IN THE PILBARA REGION

Cape Range Creeks – Exmouth The Cape Ranges has a substantial risk of flooding from its 12 tributaries. Most of the surrounding roads cross creek beds with no bridges. Only a small amount of rain is required to trigger a flash flood. Vehicles frequently cross creeks when flooded and as a result are often lost due to the water movement. A flood would have a considerable impact due to the creeks close proximity to Learmonth's RAAF base which contains infrastructure, vehicles and technology as well as the ability to provide assistance to the community. A flood event also has the potential of isolating the town from the airport and external access which would inhibit evacuation. A potential indicator of flooding could be from either a tropical low/cyclone crossing or very heavy falls from wet season thunderstorms.

Nullagine River – Nullagine The town of Nullagine is surrounded by and situated on, the banks of the Nullagine River which poses a significant risk of flooding. A possible indicator of flooding in the Nullagine could be either a tropical low/cyclone crossing the Pilbara Coast, or very heavy falls from wet season thunderstorms. A flood would have a considerable impact on the community due to the river dividing the town and isolating it into three possible sections. General or severe weather warnings for that area could be a precursor to a flood in which case the community should evacuate to the adjacent bank.


Wickham
WICKHAM
Karratha
KARRATHA
Karratha
Roebourne
ROEBOURNE
Port Hedland
PORT HEDLAND
Port Hedland
SOUTH HEDLAND
Marble Bar
MARBLE BAR
Nullagine
Nullagine
Exmouth
EXMOUTH
Exmouth
Tom Price
Tom Price
Newman
NEWMAN
Newman
ONSLOW
Legend
KBDI Monitored Site
Flood Risk - Key Town
Rural Urban Interface
Roads Susceptible to Flooding
N
0
125
250
500
Kilometers

Kimberley Hazard

KEY ASSESSMENTS

- The Kimberley fire season will **certainly** be extended later than normal into November and **probably** December.
- Based on current conditions and the forecast late northern wet season start, substantial flooding events will **likely** occur in the next reporting period.
- Wyndham, followed by Derby, are **certainly** the most vulnerable population centres to structural damage from severe wind.

INTELLIGENCE ANALYSIS

Bushfire Hazard. The Kimberley region has numerous hazard types, from fire in the dry season to the impact of flood and severe wind as a result of tropical cyclone impact. While fire will not be the primary focus of this product, the IHPB is aware of the extant conditions that provide enduring bushfire risk in the region.

The development of the northern wet season usually provides the necessary break that fire fighters require to end the bushfire hazard in the region. However, the forecast late onset of northern wet season rains, combined with high levels of curing in the region means that the fire season will **certainly** be extended late into November, or **probably** even early December.

Cyclone and Flood Hazard. A review of the Root Zone Soil Moisture across the Kimberley indicates that the vast majority of the catchments remain at close to zero percent moisture. This means that it will take a significant rainfall, in either a singular large or multiple smaller events, to create sufficient preconditions for flooding. The forecast for later onset of the northern wet season means that substantial flooding events will are **unlikely** to occur this reporting period. Tropical cyclones formed in the Arafura Sea north of Darwin, could provide the necessary moisture for sustained flooding impacts.

The level of confidence in the BoM update for the tropical cyclone season is moderate, meaning that preparation for typical events in the tropical north, should not be delayed due to the assessment of cyclone development and impact.

REGIONAL HIGH VALUE ASSETS OR RISKS

The road network in the Kimberley along with the associated infrastructure is a high value community asset within the region. Parts of the road network were damaged in the area around Broome and Roebuck Plains during the 2017-18 northern wet season. Main Roads WA expect to have a fully serviceable network by the onset of the wet season. Some roadworks will **possibly** remain in the Kimberley network and these will be susceptible to the influence of tropical rainfall, a specific example includes the highway into Wyndham. Despite this expectation, there remains areas of risk that develop as the road network becomes susceptible to rainfall and constrain regional resupply, this includes:

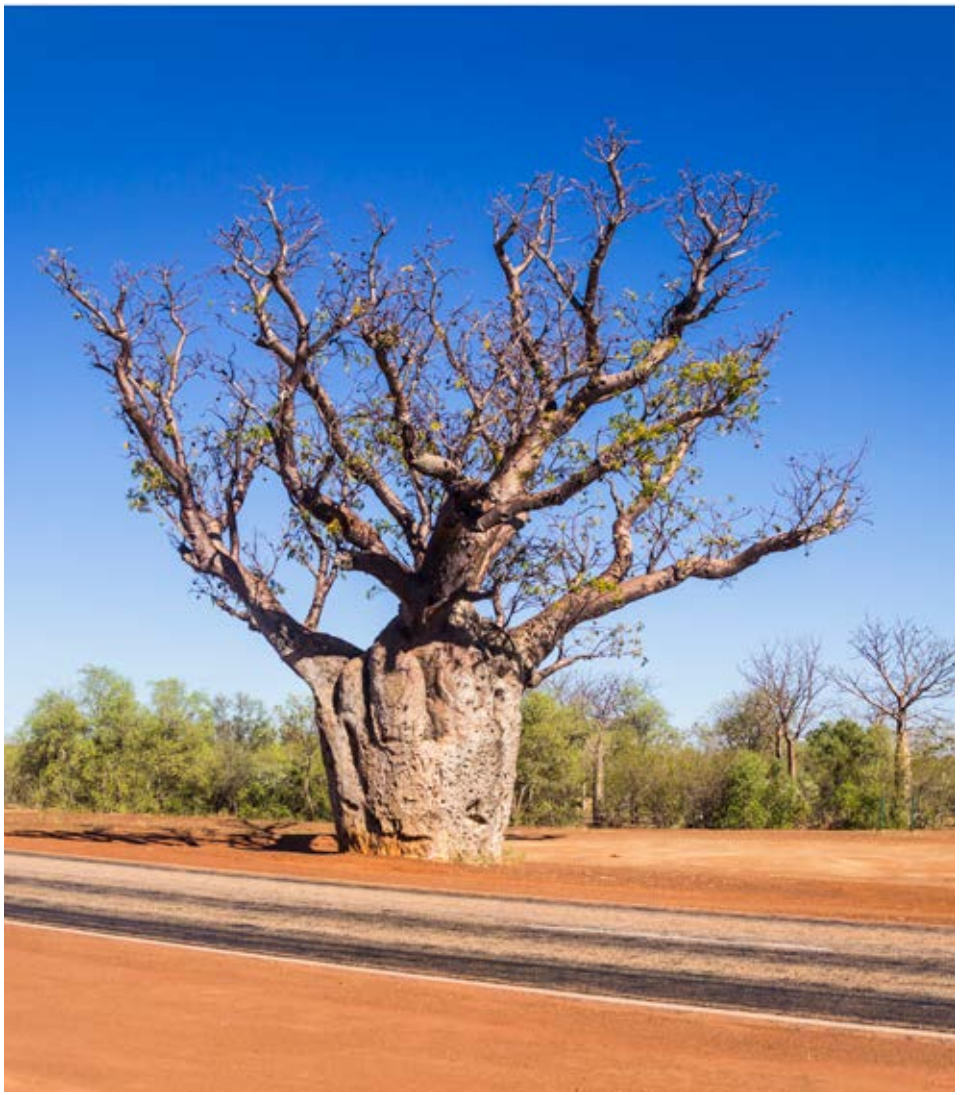
- Great Northern Highway at Dunham River – north/south in the western Kimberley.
- Tanami and Duncan Highways – restrict resupply into the Remote Aboriginal Communities such as Balgo, Billaluna and Ringers Soak.

KEY INDICATORS AND MONITORING INDICES

The following are key indicators being monitored by the IHPB and will be updated in the WIB:

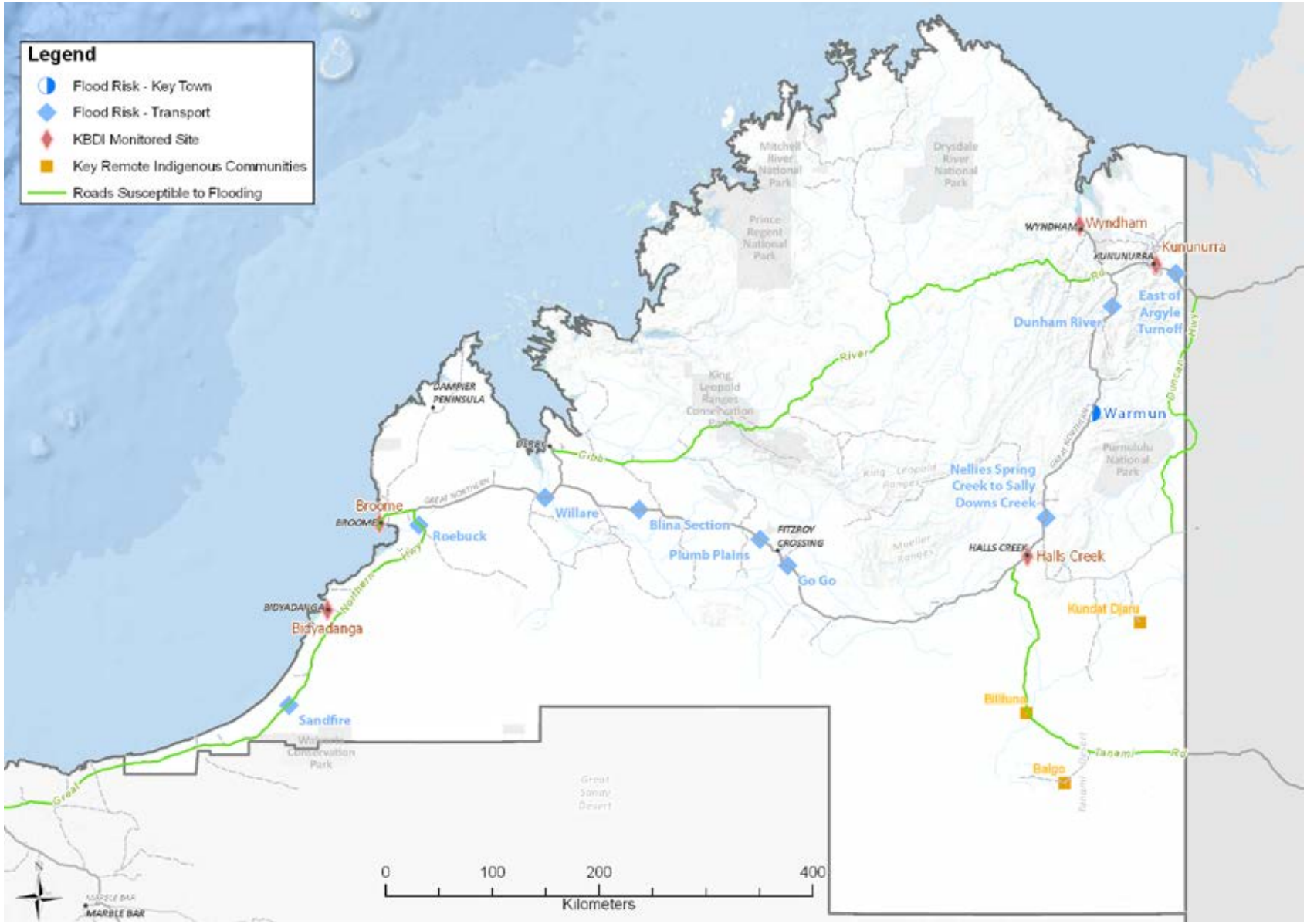
Indicator	Reason
Widespread rainfall totals of above 20 mm over 24 hour period	Indicates break in dry season and sufficient rain to moisten soils and fuel to end fire hazard
Increase (temperature and spread) of Seas Surface Temperature (SST) NWWA and WWA	An SST of above 26.5° is an indicator of the ability for TC to propagate and sustain in tropical north west Australia
The development of areas of low pressure in the north western subregion	Formation and detection of a low pressure systems can indicate an onward formation of a cyclone

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
N/A	Monitored until wet season commences:
	Broome
	Bidyadanga
	Halls Creek
	Kununurra
	Wyndham



LOCATIONS OF FLOOD RISK IN THE KIMBERLEY

Turkey Creek – Warmun. Warmun's properties and communal areas are prone to flash floods from Turkey Creek. Very little warning of a flood can be given due to the river flowing through the centre of the town, historical events have had as little as 20 minutes between initial rain and the river reaching properties. General or severe weather warnings should be considered as potential precursors to flooding. Any heavy rainfall in the catchment could trigger a flood whether from a monsoon, cyclone, thunderstorm or tropical low. The community has an inactive flash flood warning system which could provide some flood risk mitigation if sufficiently funded.


Legend
Flood Risk - Key Town
Flood Risk - Transport
KBDI Monitored Site
Key Remote Indigenous Communities
Roads Susceptible to Flooding
Wyndham
Kununurra
East of Argyle Turnoff
Dunham River
Warmun
Nellies Spring Creek to Sally Downs Creek
Halls Creek
Kundat Djaru
Billiluna
Balgo
Broome
Roebuck
Willare
Blina Section
Plumb Plains
Go Go
Bidyadanga
Sandfire
DAMPIER PENINSULA
FITZROY CROSSING
MARBLE BAR
0
100
200
400
Kilometers

Goldfields-Midlands Hazard

KEY ASSESSMENTS

- It is **likely** that key indicators – including SDI and KBDI – will continue to rise during October and November, despite any downward correction due to rain. Therefore, bushfire risk will **likely** be realised earlier than in previous seasons.
- It is **certain** that the established Rural Urban Interface (RUI) areas hold the most bushfire risk from October to December.
- Development and expansion within new areas of the RUI around Northam, Toodyay, Bakers Hill, York and Irishtown suburbs also **certainly** form areas of increased bushfire risk.
- Bushfire risk will **certainly** be influenced by harvest activities; however, peak bushfire risk will **probably** not be reached until into the January to March 2019 period.
- Harvesting operations will **possibly** reduce the availability and deployability of fire and natural hazard response personnel in rural and agricultural areas throughout this reporting period.
- The region is **certainly** vulnerable to lightning initiated ignitions as a result of atmospheric instability.

INTELLIGENCE ANALYSIS

The Goldfields-Midlands is a large region with diverse topography, mixed land use and dispersed population centres. Agriculture is a mainstay of economic activity and a significant contributor to bushfire risk in the region. The current 'average' to 'below average' rainfall is the other main influence on fire conditions within the region, which is also sensitive to the fluctuations of rainfall and the impact it has on the normal agricultural and pastoral activities.

The region has undergone a noticeable sustained drying pattern over the last three months and this will **probably** influence the onset of the harvest, which will be reflected in the manifestation of bushfire risk along the outer edges of the region earlier in the October to December period. This is especially the case when harvest activities provide an ignition source to dry fuels in those areas. Like other pastoral regions, the rate of drying of crops and pasture indicates an earlier start to the harvest, however, at the time of release this is yet to be confirmed but will remain a key indicator for the region.

Goldfields-Midlands also has key areas of exposure – especially to bushfire – that lead to larger regional and state vulnerabilities in the event of incident. The first area of exposure is the Great Eastern Highway that is vulnerable to closure in the event of road traffic accidents and bushfire impacts. While these closures are usually short duration, they can impact road transport and regional mobility. The other main area of exposure is the Perth to Kalgoorlie Pipeline and, in particular, the chlorine pumping stations.

As a result of harvest being the community focus, fires that develop may rapidly require external assistance from adjacent DFES regions, likewise the later onset of bushfire risk in January to March may also **likely** require additional external assistance.

KEY INDICATORS AND MONITORING INDICATORS

The following are key indicators and locations being monitored by IHPB:

Event or Monitored Indicators	Reason
KBDI above 70 for seven or more consecutive days	Indicates conditions are approaching HTP thresholds
KBDI above 100 for seven or more consecutive days	Indicates conditions have exceeded threshold of probable correction based on rainfall
Atmospheric Instability	Lightning initiated bushfire

Soil Dryness Index (SDI)	Keetch-Byram Drought Index (KBDI)
Dalwallinu	Dalwallinu
Norseman	Eucla
Northam	Forrest
	Leonora
	Merredin
	Norseman

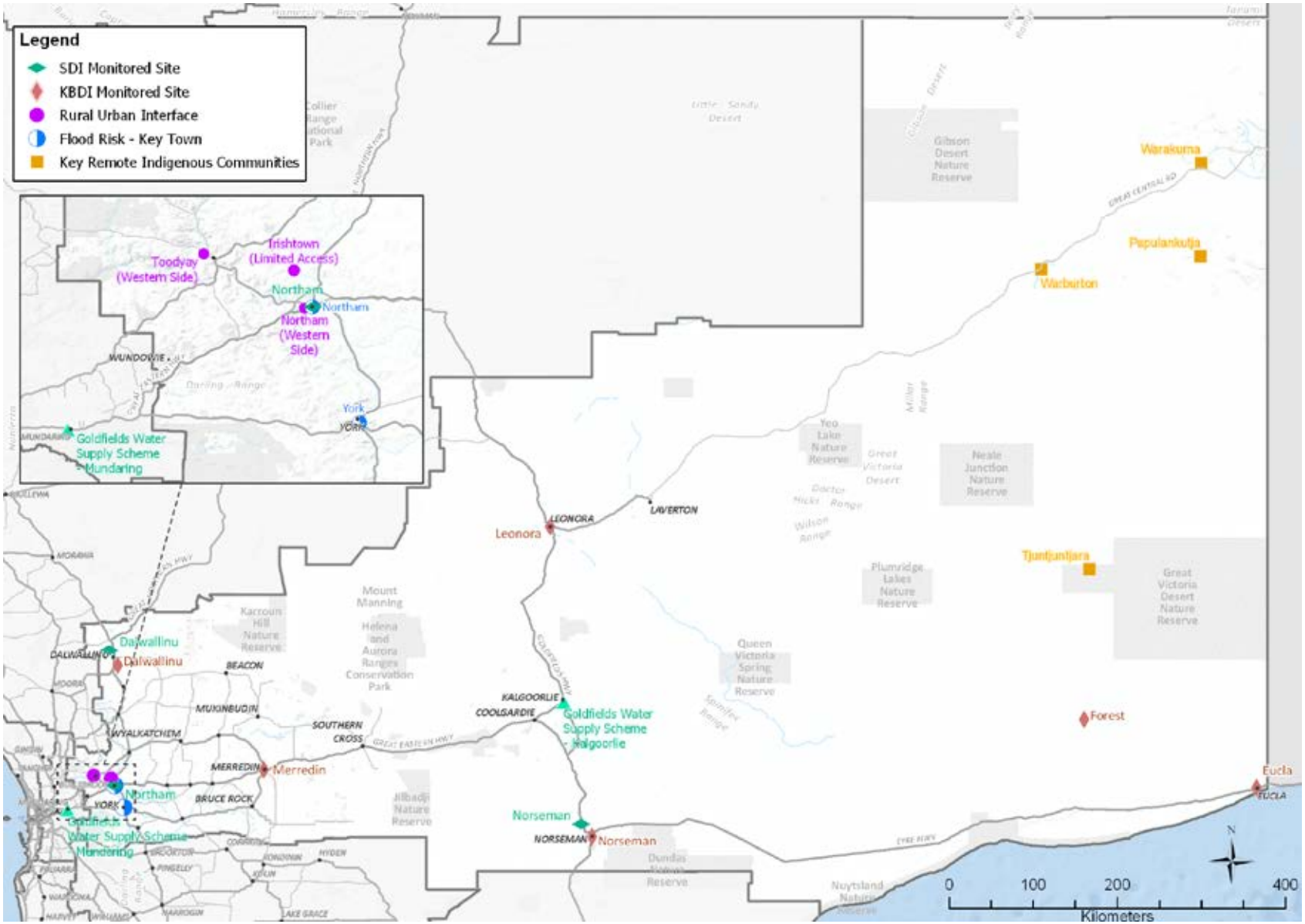
GOLDFIELDS/MIDLANDS FLOOD HAZARD

While the region contains area of flood risk in locations such as Northam and York, the presence of the large Avon and Swan River Catchments makes it an essential area for providing indicators and early warning for flooding on the Swan Coastal Plain. Currently the Swan River Catchment is still providing evidence of increased soil moisture, however, it is not considered a flood risk. Widespread rainfall or the onset of an ex-tropical low will **certainly** increase flood risk.

LOCATIONS OF FLOOD RISK IN THE GOLDFIELDS/MIDLANDS AREA

Avon River – Northam. Northam is situated on the bank of the Avon River which inundates parts of the town and presents a considerable risk of flooding. Northam's community of 11,000 people could be provided with approximately 12 hours warning prior to the Avon River flooding. A large winter system proceeding a large base flow (caused by a wet winter) could indicate that the Avon River is about to flood. Another indicator would be an ex-tropical cyclone/low bringing extreme rain to the Avon catchment.

Avon River – York. York is also situated on the bank of the Avon River, resulting in parts of the town being exposed to inundation by flooding. In the case of a flood event, a warning could be issued an estimated 12 hours prior. Trigger events include a wet winter (or even multiple wet winters) that have resulted in high base flows, which are then topped up by a significant rainfall event. However, singular significant events such as an ex-tropical cyclone or low also have the ability to trigger flooding events without incumbent moisture.


Legend
SDI Monitored Site
KBDI Monitored Site
Rural Urban Interface
Flood Risk - Key Town
Key Remote Indigenous Communities
Toodyay (Western Side)
Irishtown (Limited Access)
Northam
Northam (Western Side)
Goldfields Water Supply Scheme - Mundaring
Leonora
Laverton
Warakuna
Papulankutja
Wiluna
Tjuntjuntjara
Forest
Goldfields Water Supply Scheme - Kalgoorlie
Norseman
Merredin
Dalwallinu
Eucla
0
100
200
400
Kilometers

06

Operational, Health & Safety Messages

Operational, Health & Safety Messages

FATIGUE – CHECK ME, CHECK YOU!

The consequences of heat illness and fatigue within an emergency services organisation can result in adverse effects on the health status of responders attending the incident, an increased risk of accidents, reduced individual decision making ability and influence the organisational capability to respond in a prolonged incident.

Fatigued people are often unaware that they are not functioning as well as they would be if they were not fatigued and this can make it difficult to recognise increasing fatigue levels in yourself. We need each other.

DFES has developed a Fatigue Management education package which is designed to help you and your team stay safe! The pack-age includes posters, a check me check you card and a short video. The package is accessible via the DFES E-Academy.

HEAT RELATED ILLNESS – DON'T LET HEAT STRESS BRING YOU DOWN!

Heat related illness can result in serious injury.

The BoM has forecasted an increased risk of hot weather conditions for the 2018/19 fire season, we need to be ready. Everyone needs to understand the signs, symptoms and health risks of heat related illness.

Do Something Now! Immediate controls must be implemented to reduce the risk of injury. An online video is available at Don't Let Heat Stress Bring You Down.

DEHYDRATION – STAY HYDRATED!

Situational awareness is key to staying safe while attending an emergency and being aware of the conditions and circumstances that can contribute to an increased likelihood of becoming de-hydrated which will assist you to manage this hazard. The following factors contribute to the risk of dehydration:

- Undertaking physical work
- Undertaking prolonged strenuous work
- Working for lengthy periods of time
- Working in hot and/or humid conditions, being focused on the task and forgetting to drink on a frequent basis
- Exposure to radiant heat i.e. solar radiation or fire front
- Wearing PPC

Recognising the signs and symptoms

Dehydration can present a wide array of signs and symptoms but it is important to note that dehydration can very quickly progress from being a mild, easily managed case to one that is a severe medical emergency. Therefore, recognising the early signs of mild dehydration and quickly acting on these by maintaining or increasing fluid intake is the best approach to managing it effectively.

LACES

No one ever plans to be lost, disoriented or injured therefore it is vital to continually monitor the environment to identify the hazards and assess the risks as they apply to the tasks being carried out.

On an incident ground, it is important to utilise LACES (Lookouts, Awareness, Communication, Escape Routes, and Safety Zones) as a guide to help maintain situational awareness and mitigate the risks that may be faced.

DFES personnel and volunteers use the acronym LACES to assist in maintaining personal safety at all times LACES Save your life – Check safety first.

OPS CIRCULAR 72/2018 STATE DUTY ROSTER EOI

Expressions of Interest (EOI) are sought from DFES Staff and Volunteers for consideration of inclusion on the State Duty Roster (SDR) to assist the community during times of need and provide support to DFES state-wide response.

The SDR includes a number of positions to support DFES' all hazards approach to incident and emergency management. This EOI is for people to fill both operational and non-operational roles in support of the SDR. At this stage, all positions should be considered vacant.

EMPLOYMENT OF TASK FORCES-STRIKE TEAMS

DFES have implemented a standard operating procedure for developing, administering and mobilising operational resources across Western Australia and beyond.

It is well appreciated the timely formation and deployment of Strike Teams, Task Forces or additional resources increases operational efficiency at fire and other emergency incidents.

The procedure as developed is consistent to providing a consistent and repetitive process, based upon AFAC and acceptable industry standards which is compatible to all hazards DFES may respond to.

It is an expectation resources committed by DFES to operational incidents are appropriately supported, identifiable and equipped to complete the functional tasks required of them, the procedure established ensures this process can be achieved

CONSTRUCTING AND MAINTAINING FIREBREAKS

The DFES Rural Fire Division has recently released a new guide on constructing and maintaining fire-breaks. The guide aims to provide land managers with advice on constructing and maintaining fire-breaks on the rural-urban interface, farms, pastoral leases and reserves. It contains best practice guidance on fire-break siting and design, environmental and heritage protection, the effectiveness of different types of low fuel breaks and surface water management.

Electronic copies can be accessed from the Bushfire Technical Services Intranet site or from the DFES website. For more information or to access printed copies of the guide please contact Bushfire Technical Services at environment@dfes.wa.gov.au.

07

Acronyms and Glossary

Acronyms and Glossary

BoM	Bureau of Meteorology	Commonwealth weather forecasting and climatology service. Primary source of weather advice and threat warning to DFES.
BGU	Brigade, group or Unit	The combat elements of the services that make up DFES's Operations Command.
DPIRD	Department of Primary Industries and Regional Development	The Department ensures that primary industries and regions are key contributors to the Government's agenda for economic growth and diversification, job creation, strong communities and better places
DWER	Department of Water and Environmental Regulation	The Western Australia government agency responsible for hydrological and environmental policy. This includes flood management.
FPC	Forest Products Commission	The government agency responsible for the sustainable management and development of Western Australia's forest products industry.
HTP	High Threat Period	The period mandated in DFES doctrine of the highest threat to the state between and each year.
IHPB	Intelligence and Hazard Planning Branch	The intelligence collection and analysis arm of DFES that produces intelligence products and assessments to support the organisation.
IOD	Indian Ocean Dipole	Defined by the difference in sea surface temperature between the western Indian Ocean and the eastern Indian Ocean south of Indonesia.
KBDI	Keetch-Byran Drought Index	A numerical value reflecting the dryness of the top layer of soils, deep forest litter, logs and living vegetation. Not used for the forested areas of the south west.
NWWA	North West Western Australia	Geographical area used to describe sea area adjacent to the Kimberley and Pilbara coasts.
RUI	Rural Urban Interface	Defined as the line, area or zone where structures and other human development adjoin or overlap with undeveloped bushland.
SDI	Soil Dryness Index	A measure of rainfall over a 24-hour period (usually to 0900 hrs) required to saturate the top layer of soil within a forested area.
SST	Sea Surface Temperature	The temperature of the ocean at its surface, measured in °c. A temperature of 26.5°c is required for a cyclone to form.

SWLD	South West Land Division	One of the five cadastral land divisions of Western Australia encompassing the populated south west of the state.
SWWA	South West Western Australia	Geographical area used to describe the land of the immediate bottom south west corner of Western Australia.
WAPOL	Western Australia Police	The law enforcement agency for Western Australia. The Commissioner of Police also fulfils the role of State Controller.
WWA	West Western Australia	Geographical area used to describe the western coast and land area of Western Australia, predominantly the coastline north of Perth to Shark Bay.
	El Niño	El Niño refers to the extensive warming of the central and eastern tropical Pacific Ocean which leads to a major shift in weather patterns across the Pacific.
	Root Zone Soil Moisture	Root Zone Soil Moisture is the sum of water in the Upper and Lower soil layers and represents the percentage of available water content in the top 1 m of the soil profile.

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Product Information

Assessment Information

Intelligence and Hazard Planning Branch uses Words of Estimative Probability to express our confidence in the assessments used in this document. The Words of Estimative Probability are also expressed as a percentage of accuracy in the table below for a numerical equivalence. It should be noted that the Words of Estimative Probability are highlighted in bold throughout DFES Intelligence Products.

Levels of Confidence for Words of Estimative Probability

CERTAIN	PROBABLE	LIKELY	POSSIBLE	UNLIKELY
95% or greater	75% or greater	50% or greater	15% or greater	Less than 15%

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Questions and Feedback

For questions please contact the on call State Intelligence Officer (via the State Duty Roster). To provide feedback please contact intelligence@dfes.wa.gov.au or Superintendent Intelligence and Hazard Planning Branch on (08) 9395 9929.

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