



Webcam Early Fire Prevention Feasibility Report

ABSTRACT

Climate change is increasing the likelihood of more frequent and severe bushfires. Web based cameras in strategic locations offer the potential to detect fires sooner which enables a more effective response by agencies

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Webcam Early Fire Prevention Feasibility Report

Introduction

Climate change is increasing the likelihood of more frequent and severe bushfires. The 2019/20 fires season was an example of things to come and our need to quickly detect and monitor bushfires has never been greater. Web based cameras in strategic locations are being used in fire prone countries around the world including in Northeast Victoria, see: <http://www.northeastfirecams.com/> and on Mt Elephant in Western Victoria, see: <https://www.facebook.com/Firecam-Mount-Elephant-287240355457384/>. They are widely used in the USA. An example can be seen at: <https://ucsdnews.ucsd.edu/feature/seventy-high-tech-cameras-installed-in-southern-california-provide-eyes-on-fire-prone-areas> or <https://www.marincounty.org/depts/fr/fire-detection-cameras>

This report examines the suitability of using web cameras to detect bushfires, their installation and maintenance costs and issues with their operation and access.

Discussion


The North East Bushfire Camera Network was funded through an Australian Federal Government grant under the Digital Regions Initiative scheme, see: <http://northeastfirecams.com/view/>. The grant was initiated and the system implementation was coordinated by Towong Shire Council in consultation with DELWP, Parks Victoria, CFA and SP Ausnet. The project deployed a bushfire spotting camera network across the Towong Shire to facilitate early detection of fires so as to enable early response planning and resource coordination. The cameras are fixed, single image only, without any pan or zoom capability. An installation has four cameras, each giving a 90° view, as well as an automatic weather station that provides real time local weather. The camera network is linked to the DELWP emergency management centres at Tallangatta and Corryong. I contacted Dave Jenson, District Manager for Upper Murray in Forest, Fire & Operations, DELWP. He told me they had used the NE Cameras to monitor last summer's fires but it would have been useful to be able to zoom in on areas of interest. They weren't used to detect any of the fires. Below is an image from the Mt Mittamatite camera and the readout from the on-site weather station.



Mt. Mittamatite

Conditions as of: 10:14 AM Friday, Mar 19, 2021

Weather Station	Current	Daily Highs	Daily Lows			
Temperature	14.4 °C	15.1 °C 12:00 AM	14.1 °C 3:37 AM			
Humidity	72.0 %	75.0 % 1:43 AM	71.0 % 12:00 AM			
Heat Index	14.4 °C	14.4 °C 12:00 AM				
Wind Chill	12.8 °C		11.1 °C 6:35 AM			
Dew Point	9.4 °C	10.0 °C 12:00 AM	9.4 °C 1:59 AM			
Wet Bulb	10.9 °C		--			
Barometer	1028.0 hPa	1028 hPa 7:34 AM	1025.6 hPa 1:58 AM			
Bar Trend	Rising Slowly					
Solar Radiation	--	0 4:12 AM				
UV Radiation	--	0 4:12 AM				
Wind Speed	16 km/h	27 km/h 1:56 AM				
Wind Direction	ESE 116 °	-- °				
Wind	2 Minute	10 Minute				
Avg Wind Speed	16 km/h	16 km/h				
Wind Gust Speed	--	19 km/h				
Rain	Rate	Hour	Day	Month	Year	Storm
Rain	0.0 mm/h	0.0 mm	0.0 mm	11.8 mm	130.2 mm	0.0 mm

Images Copyright © 2015 Towong Shire Council | [Admin Login](#) | [Web Camera Systems](#) by  ANSO

I contacted the company that installed the NE Camera Network, ANSO Webcamera Systems, see: <http://webcamerasystems.com.au/> I sought information, including pricing, from a company representative, Stewart, but did not receive any information despite assurances it would be provided. I have also contacted Laser Electrical in Horsham as well as Plus IT, John Thomas Electrical, Keatronics and Standby Security, all in Ballarat, but received no written response. I've found is technology providers are unwilling to provide written estimates for camera installations. They are only prepared to verbally discuss probable costs which I have used in this report. Given there are a number of companies in this space and the rapidly changing nature of the technology, their reluctance to commit prices in writing is understandable.

Another company is currently trialling a network of cameras and sensors in the Latrobe Valley is Attentis, see: <https://attentistechnology.com/bushfires-wildfires> This system uses infrared cameras that incorporate weather stations and emissions detectors to detect fires. The system has a limited range and would be suited to high risk, high value locations in and around major cities.

The NSW RFS and NPWS currently use at least 10 cameras to detect fires across eastern NSW. They are PTZ cameras that provide 360° views of the surrounding area. They have a working range of up to 15km and are monitored at central command centres. The NPWS has used this system since 2016 but are currently upgrading their camera system and are planning to move to a "fee for service" model. They have sought tenders from camera technology providers to supply, install, maintain camera systems and also monitor camera feeds. This approach offers the advantage of no upfront cost for

fire management agencies and ensures state of the art technologies are used. The contact person for the project is Andrea Morrison. She can be contacted by phone on 02 6450 5613 or email: Andrea.Morrison@environment.nsw.gov.au

There are number of research projects currently working on similar systems. One is the University of South Australia - Automated Forest Fire Detection and Suppression Framework, see: <https://www.unisa.edu.au/research/Forest-Research-Mount-Gambier/research-projects/automated-forest-fire-detection-and-suppression-framework/>

Another is the ANU-Optus Bushfire Research Centre of Excellence which is undertaking advanced research and development to produce novel hi-tech solutions to predict, detect and extinguish bushfires, see: <https://www.anu.edu.au/news/all-news/anu-optus-bushfire-research-centre-of-excellence>

A third is the Mindaroo Foundation which are partnered with ANU trials and are working toward improving fire detecting through their fire shield project, see: <https://www.mindaroo.org/fire-and-flood-resilience/fire-shield/>

There are a number technology providers already offering a range of technologies. These include: <http://webcamerasystems.com.au/>, <https://roboticscats.com/>, <https://www.fireball.international/>, <https://smokedsystem.com/>, <http://www.alertwildfire.org/centralcoast/index.html?v=7a7f1c0>, <https://www.workingonfire.com.au/> and <https://www.2bsecurity.com/product/long-range-ptz-camera/>

Detecting

Fires

The proposed camera systems don't spot bushfires autonomously; they require a human observer to interpret images as they would if physically present at the camera site. Detecting fires still requires the presence of a trained observer. The automated fire detection systems similar to those mentioned previously were trialled in the Otways by the CSIRO in 2010 and were found not to be as effective as human observers. The potential advantage of the camera system proposed in this report is it allows trained observers to spot fires from an office or even at home. It also allows observers to monitor more than one site at once. These advantages would provide OH&S benefits for observers and provide a higher level of observer coverage at less cost.

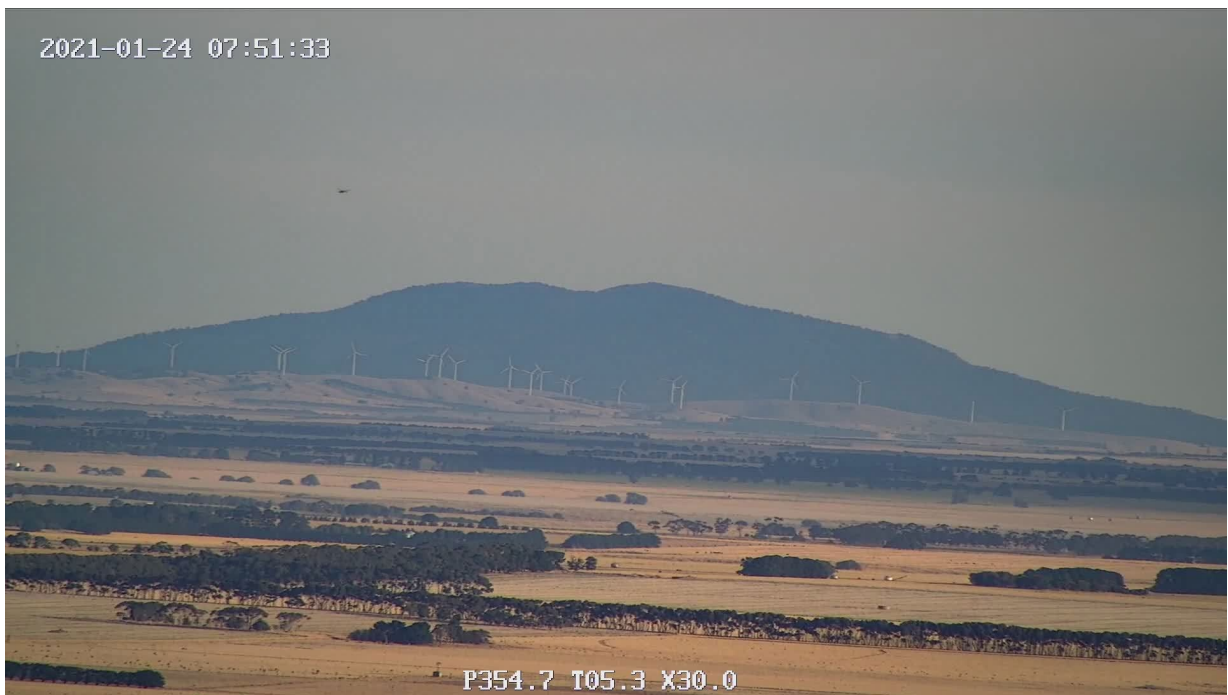
Andrea Morrison from NSW NPWS informed me their existing camera-based systems were working successfully in detecting fires and the reason they are going to expand their use. An expected reduction in operating costs and reduced OH&S risk are seen as advantages in moving away from manned lookouts.

I have spoken with Chris Lang, a local farmer near Lismore, who installed and monitors the Mt Elephant camera. The camera was installed in 2016 and is a remote controlled, 30 power optical and 10 power digital zoom Pan, Tilt, Zoom (PTZ) camera. Its 1080 HD feed and control is via a microwave link to Chris's home around 10 km away. The day I visited Chris it was overcast and hazy but at full magnification on his home you could clearly see a person moving around, the colour and make of a car in his driveway and would easily be able to detect a small camp fire. The Mt Elephant camera hasn't detected a fire as yet but Chris informed me it was a result of not constantly looking at the feed. As soon as a fire is reported in the local area, he monitors it with the camera.

Below are a series of three images at various magnifications by the Mt Elephant camera of Mt Langi Ghiran and the Chalicum Hills Wind Farm. The wind farm is approximately 65km from Mt Elephant. The images give a good indication of the capability of these types of camera.



At 10X optical zoom



At 30X optical zoom



At 30X optical zoom and 20X digital magnification

While there is little practical information on how many CCTV cameras one person can monitor, the key elements from a presentation by J Wood and T Clarke - Practical guidelines for CCTV ergonomics, International Ergonomics Association congress, Elsevier, Amsterdam (2006), state:

- "no more than 9 simultaneously displayed pictures should be observed if pictures show considerable movement and the task primarily involves general surveillance;"
- "no more than 16 simultaneously displayed pictures should be observed if pictures show little movement and the task consists of general surveillance and observation."

DELWP currently has 14 manned lookouts in the Grampians Region so, theoretically, one person could monitor all 14 via web cameras installed on each lookout. Attachment 2 includes a map and list of 76 potential camera sites across the Grampians Region that are an average of 20km apart. Using the above figures for persons monitoring cameras as a guide, between 5 and 8 people could monitor the entire region. It should be noted that at the time of this report, DELWP and CFA's policy is to continue having staffed towers. The introduction of cameras at this point in time would be about trailing, and/or adding value to existing staffed towers. E.g., by covering current blackspots in tower views.

There is potential for the feed from the cameras to be used for other purposes beside spotting fires. These could include site security, promoting tourism, police surveillance and monitoring weather event or animal movements. This means other organisations may be willing to contribute towards installation costs or pay for commercial use of the feed. Telecom and other industry sites (wind farms, agribusinesses, etc) as well as councils and tourism organisations may be willing to fund a number of installations or support operating costs. Even local CFA brigades and individuals may be willing to support some sites. This would reduce the amount of funded needed from by government.

Ownership of the camera system and camera feed would reside with the Victorian Government, probably through either DELWP, CFA or Emergency Management Victoria. Operation and maintenance would be the responsibility of the designated agency. Control of each camera would be by designated personnel of that agency and other organisations as required. Public access to the feed

would be controlled by the appointed operators. Privacy issues would be managed by a default setting for each camera of zero zoom and zero tilt. This should give a long-distance view of the surrounding landscape but not foreground images. Adjustment and screening may be required in built up areas.

Installation

Costs

I have obtained indicative costs from a small number of local web camera suppliers/installers and they range from around \$5,000 to over \$20,000 depending on the site. For example, an existing lookout with power and telephone available would be in the vicinity of \$5,000 installed. A new site in a remote area that requires a 10-metre tower, solar panels, large battery storage and microwave link may well be over \$20,000. The Mt Elephant camera system cost \$600 for the camera, \$500 for the microwave link and \$400 for the solar panel and battery system. Chris Lang installed the system himself but if you were going to hire someone to do the installation it would cost around \$1,000. Total installed cost would be around \$2,500.

Operating

Costs

Again this will depend on the location. A site with existing services would have little or no additional operating costs. A remote site without existing services will require significant battery storage and use of the 5G mobile network. This would cost around \$1,500 per year. If a microwave link was possible this would reduce costs to less than \$500 per year to maintain the battery/solar system.

Annual system maintenance costs would vary on the location of the camera system and number of cameras included in any service contract. An installation contractor suggested an average cost of around \$500 per year.

Conclusion

Web based camera systems offer the potential to provide 24/7 coverage of areas at risk from bushfires. They have a significantly lower installation and operating cost compared to manned lookouts and, if properly monitored, could be just as effective. They are being installed in a number of overseas countries and in other Australian States. The capabilities of web-based cameras are improving rapidly and like all technology at present, any installation will be obsolete almost as soon as it's installed. With research currently underway in Australia that is exploring a range of detection technologies as well as the NSW Parks and Wildlife Service fee for service model being rolled out, it appears to be a good time for DELWP and the CFA to be considering the use of this technology.

One potential benefit of these camera systems is they avoid the OH&S risks of having people work long periods alone in remote and often difficult to access locations. This may well be a significant factor in any decision to widely install these cameras. Many of the current tower operators are approaching retirement and recruiting replacement operators may prove difficult. Using cameras would allow tower operators to continue their role either from a departmental office or their home thereby giving the organization continued access to their local knowledge.

As previously mentioned, one tower camera operator can effectively monitor multiple cameras so as existing operators retire or leave, their role can be absorbed others. The installation of cameras should not be seen as threat to the ongoing role of lookout operators but merely a change in how they do their job. The low cost of camera installations could allow more sites to be added to the current lookout network so there may even be a need for more rather than fewer trained observers.

Recommendations

Given the current amount of research and development happening around bushfire detection in

Australia, it would be advisable for Victorian fire agencies to take a cautious approach to embracing any particular technology or system. As an initial “toe in the water” method of gaining familiarity with using the technology and developing a general awareness of its potential, I recommend a small number of cameras, similar to the example shown in attachment 1, be installed across the Grampians Region in the most strategically important locations. Suggested locations are in the Northern Wimmera at Mt Arapiles, Rainbow or Yannac, at Reeds Lookout in the Grampians and Blue Mount Fire Tower north of Blackwood. A more difficult location would be on Mt William in the Grampians. A camera in this location would give coverage of Halls Gap and the Wannon Valley, as well as the area south of Pomonal. All of which currently have no lookout coverage. Installing a small number of cameras will provide departmental staff with the experience of using such a system without a high financial cost and without any significant disturbance to current detection arrangements. It will enable a smooth transition to whichever technology system is finally adopted.

Attachment 1 – Example of Long-Range Camera System

PTZ-7000 Long range IP PTZ camera



- ✓ Long range IP PTZ camera system
- ✓ Fully operated by IP (Pelco D, Onvif)
- ✓ 750mm or 1000mm with Auto Focus
- ✓ Endless 360 degrees rotation and variable speed
- ✓ wiper and washer optional

PRICE REQUEST

[DESCRIPTION >](#) [OPTIONS >](#) [IMAGE GALLERY >](#)

Description

The PTZ-7000 long range surveillance camera solution is a high spec IP PTZ camera system designed with high precision pan/tilt and a large size optical lens to cover the distance of a long range application like coastal surveillance, harbour control, large area security. The lenses are equipped with autofocus to ease the operation and to be able to control the system at a distance, even with delay on the network connection.

Pan tilt:

The PTZ system is constructed with the heavy duty pan tilt PT-2050. That pan tilt unit supports absolute positioning meaning that the exact position can be readout in realtime and also the pan tilt can be commanded to goto an exact position at a precision of 0.1 degree. The pan tilt are equipped with heaters and has a proven operation temperature of -25°C +65°C

Housing:

The large IP66 camera enclosure are made of aluminum with stainless fittings. The housing are specially made for this PTZ camera system to obtain the best quality and stability in the housing. The housing are made to fit the 750mm or the 1000mm lens. The housing are equipped with heaters and has a operation temperature of -25°C +65°C. The housing can optionally be equipped with a wiper system.

Lens:

The PTZ-7000 surveillance camera system can be ordered with 60X zoom 12,5-750mm or the 60X zoom 16,7-1000mm. Both lenses are equipped with autofocus system for easy operation.

Camera:

The camera in the PTZ-7000 system is a IP camera equipped with a high sensitive 1/1.8" progressive scan 2MP CMOS sensor. The camera change from color to B/W at night time for the best light sensitivity. The resolution of the camera are 1080p.

Long range IP PTZ camera specifications

Material	Aluminum
IP rating	IP66
Color	Gray
Mechanical Size (LxHxW)	-
Weight	Approx 35 Kg
Pan max angle	0-360° with endstops (360° continuous optional)
Tilt max angle	Tilt -45/+45° (Custom angle -/+° option)
Variable Pan speed	0,01 – 12°/sec (64 step)
Variable Tilt speed	0,01 – 8°/sec (64 step)
Self-test	Self-test is ON. (Can be disabled by a command)
Absolute positioning	Yes (QUERY and SET commands for angle set and readout)
Mechanical lash	<0,1°
Presets	100 presets
Preset accuracy	<0,1°
Position repeatability	<0,1°
Motor type	Step motor
Gear type	Worm gear (auto brake)
End-stop adjustable	Mechanical end-stop only by factory
Interface	IP / Ethernet
Protocol	Pelco D protocol / ONVIF support
Address	1-256
Temperature range	-25°C +65°C
Voltage supply	24 VDC
Power consumption	Standby 0,5A, Max 4A

Options



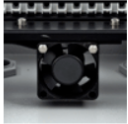
Optional wiper function

Self parking motorized wiper to clear rain and to clean the window. (Option)



Double sunshield

Double sunshield to reduce overheating caused by sun rays.



Internal ventilator

Eliminate hot spot areas in the housing and ventilate the window.



Optional washer sprayer unit

Washer unit can be used to spray water on the window, when the wiper is running to clean the housing. (Option)



Heavy Duty Tripod

Made of aluminum and have a height between 750mm and 1250mm. Tripod made to carry the large system.

Attachment 2

POTENTIAL GRAMPIANS REGION WEB CAMERA INSTALLATION SITES

If the proposed trial of up to four web cameras proves their usefulness in detecting fires then the network could be expanded across the region. Attached is a map showing potential camera locations across the Grampians Region and a list detailing the location of each potential site. The coloured numbers are the approximate camera position. Green numbers are existing DELWP Fire Lookouts. Yellow numbers are the sites currently proposed for the initial trial. Red numbers are potential installation sites for a region wide rollout. The existing camera at Mt Elephant is indicated with a blue cross at the bottom of the map. More and alternate site may be identified as the program develops.

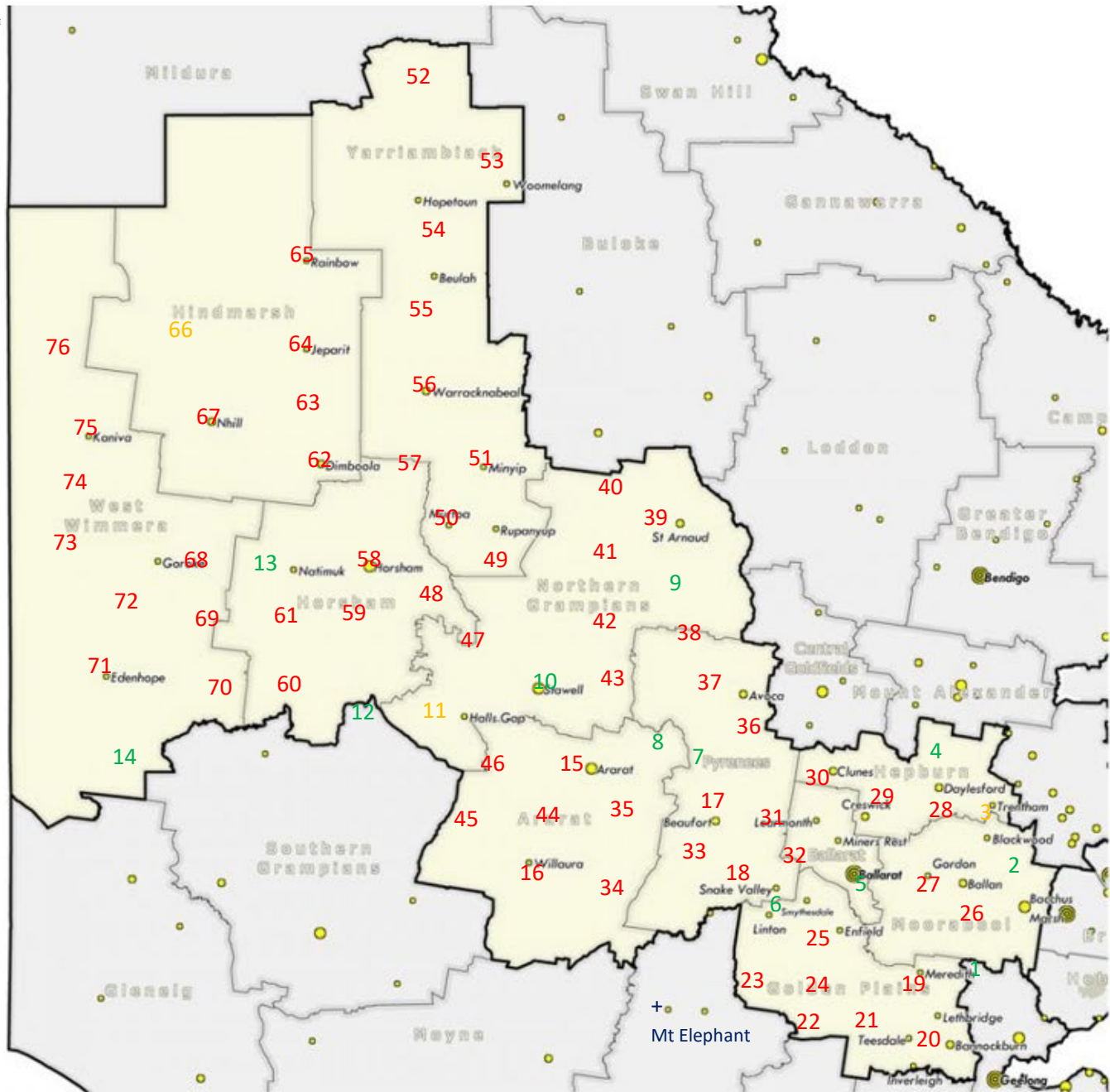
The criteria used for selecting proposed camera site was existing DELWP lookouts and other elevated locations around 20km apart. While this was reasonably possible for the Central Highlands area, the lack of suitable sites in the Wimmera meant most of the camera sites in that area are up to 40km apart. A spacing of 20km gives a detection distance of 10 to 15km which would be well within the capabilities of the proposed cameras. The smaller camera on Mt Elephant has demonstrated fire can potentially be detected at up to 30km.

GRAMPIANS REGION PROPOSED WEB CAMERA SITES

NUMBER	LOCATION	CLOSEST TOWN	COMMENT
1	Mt Anakie	Baccus Marsh	DELWP Fire Tower just outside region, 27km South of Baccus Marsh
2	Mt Blackwood	Ballan	DELWP Fire Tower 12km NE of Ballan
3	Blue Mountain	Blackwood	DELWP Fire Tower 4 km North of Blackwood
4	Mt Franklin	Daylesford	DELWP Fire Tower 9km North of Daylesford
5	Mt Buninyong	Buninyong/Ballarat	DELWP Fire Tower 4km East of Buninyong
6	Cherry Tree Hill	Linton	DELWP Fire Tower 4km NE of Linton
7	Mt Lonarch	Beaufort	DELWP Fire Tower 20km North of Beaufort
8	Ben Nevis	Ararat	DELWP Fire Tower 24km East of Ararat
9	West of England	St Arnaud	DELWP Fire Tower 22km South of St Arnaud
10	Big Hill	Stawell	DELWP Fire Tower 1km East of Stawell
11	Reeds Lookout	Halls Gap	DELWP Fire Tower 6km West of Halls Gap
12	Mt Bepcha	Halls Gap	DELWP Fire Tower just outside region, 33km West of Halls Gap
13	Mt Arapiles	Natimuk	DELWP Fire Tower 10km West of Natimuk
14	Chetwynd	Edenhope	DELWP Fire Tower 26km SE of Edenhope
15	One Tree Hill	Ararat	5km NW of Ararat
16	Bald Hill	Willaura	1km SW of Willaura, GWM Water facility.
17	Camp Hill	Beaufort	0.5km North of Beaufort
18	Mt Emu	Skipton	14km NE of Skipton, small reserve on top of Mt Emu, access?
19	Mt Meredith?	Meredith	6km SE of Meredith
20	Bannock Burn Rec Reserve	Bannock Burn	4km West of Bannock Burn
21	Mt Gow Road	Teesdale	12km West of Teesdale on Cressy - Shelford Rd
22	Colac - Ballarat Road	Cressy	2.5 km NE of Cressy
23	Mt Kinross?	Lismore	Private rocky hill 15 km NE of Lismore, may not be available.

24	Rokewood	Rokewood	Rokewood CFA shed in the centre of town
25	Field Day Hill	Smythesdale	14km SE of Smythesdale, Enfield State Park
26	Yaloak	Ballan	13km South of Ballan on Glenmore Road (Yaloak South Windfarm)
27	Mt Egerton	Ballan	10km West of Ballan on Mcintosh Lane East
28	Leonards Hill	Daylesford	8km South of Daylesford
29	Forest Hill?	Creswick	Private hill 6km NE of Creswick, may not be available
30	Mt Beckworth	Clunes	7km SW of Clune
31	Mt Misery	Learmonth	10km West of Learmonth on Mt Misery. Private property and may not be available.
32	Mt Callender	Ballarat	Telecom facility 25km West of Ballarat on Western Highway
33	Stockyard Hill	Beaufort	18km SW of Beaufort on Stockyard Hill. Private property and may not be available.
34	Mt Weejort	Streatham	15km North of Streatham, small reserve but no formed access.
35	Mt Chalicum	Ararat	22km SE of Ararat on Mt Chalicum wind farm
36	Ben More	Lexton	8km NW of Lexton
37	Mt Avoca	Avoca	11km West of Avoca
38	Moonambel	Avoca	18km NW Avoca on the Moonambel CFA shed
39	St Arnaud	St Arnaud	5km West of St Arnaud, St Arnaud Regional Park
40	Traynors Lagoon	Marnoo	15km NE of Marnoo, Traynors Lagoon CFA shed
41	Mt Bolangum	St Arnaud	22km SW of St Arnaud
42	Morri Morri	Stawell	30km NE of Stawell
43	Joel Joel	Stawell	16km East of Stawell, road reserve at Project Tree Cover site
44	Mt Moornambool	Ararat	17km SW of Ararat, private hill, may not be available.
45	Yarram Park	Willaura	18km NW of Willaura on the Yarram Gap/Moyston Dunkeld Roads intersection
46	Mt William	Halls Gap	17km South of Halls Gap, major telecommunications site
47	Mt Drummond	Stawell	20km NW of Stawell on road reserve at top of Mt Drummond
48	Mt Zero Road	Horsham	Telecom facility on Mt Zero Road, 28 km SE of Horsham
49	Brynterion	Rupanyup	12km South of Rupanyup in the Brynterion State Forest
50	Murtoa	Murtoa	Murtoa silo on East side of town
51	Minyip	Minyip	Minyip silo on west side of town
52	Speed	Speed	Speed silo on West side of town
53	Lascelles	Lascelles	Lascelles silo on West side of town
54	Rosebery	Beulah	13km North of Beulah on Rosbery silo
55	Brim	Beulah	10km South of Beulah on Brim Silo
56	Warracknabeal	Warracknabeal	Warracknabeal silo on East side of town
57	Kellalca	Minyip	18km West of Minyip on the Henty Hwy
58	Horsham	Horsham	Silo on railway near centre of town
59	Wonwondah North	Horsham	Intersection of Henty Highway and NE Wonwondah Rd
60	Toolondo	Balmoral	28km North of Balmoral on Toolondo CFA shed

61	Clear Lake	Natimuk	22km SW of Natimuk on Clear Lake CFA shed
62	Dimboola	Dimboola	Telecom facility on East side of town
63	Antwep	Dimboola	19km North of Dimboola on Antwerp silo
64	Jeparit	Jeparit	Jeparit silo on East side of town
65	Rainbow	Rainbow	Rainbow silo on West side of town
66	Yanac	Nhill	35km NW of Nhill on Yanac silo
67	Nhill	Nhill	Nhill silo in the centre of town
68	Gymbowen	Goroke	12km East of Goroke on Gymbowen silo
69	Bates Lake	Edenhope	27km NE of Edenhope on Wimmera Hwy
70	Douglas	Harrow	18km NE of Harrow on Douglas CFA shed
71	Edenhope	Edenhope	DELWP depot on the west side of Edenhope
72	Ozenkadnook	Goroke	16km SW of Goroke on Ozenkadnook CFA shed
73	Minimay	Goroke	26km West of Goroke on Minimay CFA shed
74	Little Desert	Kaniva	20km south of Kaniva on the Kaniva - Edenhope Road
75	Kaniva	Kaniva	Silo on railway near the centre of town
76	Telopea Downs	Kaniva	30km NW of Kaniva on Telopea Downs CFA shed



Grampians Region

- Legend**
- Small Town (<1k popn)
 - Town (1k-5k popn)
 - District Centre (5k-20k popn)
 - Regional Centre (>20k popn)
 - Melbourne GPO
 - Metropolitan area
 - Local Govt Areas
 - STATE GOVT REGIONS

- 1 – Existing DELWP Fire Lookouts
- 11 – Proposed Trial Camera Sites
- 19 – Possible Future Camera Sites

