



OPERATIONAL REVIEW

Lake Pukaki
Level 3 Vegetation Incident
F3067402
Mount Cook Road
Twizel
29 August 2020

Created by: Operational Efficiency
& Readiness
Fire and Emergency NZ NHQ

*Mā te mōhio ka anga whakamua
Through knowledge we improve*

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1. Executive Summary

In August 2020, near Lake Pukaki, a small group of hunters accidentally started a fire when their gas cooker toppled and ignited some tinder-dry grass that quickly spread into other fuels, including wilding pine trees. Appliances from the Twizel & Otematata brigades responded, and on arrival, were confronted with a large fire spreading rapidly through the vegetation that included wilding pine forest. Knowing they didn't have the capability to attack the fire, the crews rightly opted to form a strategy around evacuating residents and protecting property.

Detailed information from the first arriving Officer to a responding Senior Officer resulted in the immediate response of aircraft and the early assembly of an inter-agency IMT, which was eventually domiciled at the Department of Conservation (DOC) offices in Twizel. The local District Councils become responsible for the management of evacuees by providing the welfare needs of the residents, including people out of Aoraki Mount Cook.

For the first two days, the fire was generally fought from the air, with 22 aircraft (rotary & fixed wing) and approximately 170 ground crews focusing on protecting both dwellings and businesses and critical infrastructure such as components of the national power grid. Other teams suppressed hotspots and mopped up.

The weather changed dramatically from hot and dry to sub-zero temperatures with heavy snowfall. This altered the fire behaviour significantly to the fire fighters' advantage, resulting in a change of tactics.

A Recovery manager was appointed for the incident's duration, which the residents and business owners well received. However, Fire and Emergency had no recovery plan templates to work from, so they had to invent their own. Public meetings were held on regular occasions, and the Minister of Civil Defence visited the operation.

The fire affected approximately 2226 hectares with a perimeter of about 118 kms. The losses included a lodge, rental accommodation, barns & sheds and some forestry assets. Nevertheless, the properties saved included fifteen structures, Iwi heritage site and national power grid assets.

The area was handed back to the local property owners on 18 September. However, Fire and Emergency NZ regularly monitored the burn area for a period afterwards to ensure no further flare-ups.

2. Findings

1. Local knowledge of the area, such as fuel types and conditions, scientific research burns and topography and a thorough size-up and detailed Sitreps from the first arriving crews, allowed the response managers to resource the incident appropriately. Local urban and rural crews worked well together, recognising each other's strengths and capabilities, resulting in sound decisions and skillsets being applied in the appropriate area of expertise. The early

establishment of an ICP and the strategy to focus on evacuations and property protection certainly contributed to a successful conclusion to the incident.

2. During the extreme cold conditions (sub-zero & snowfall), wildfire PPE didn't provide a thermal layer, resulting in firefighters who attended daily briefings in the open and performing extinguishment activities suffering from the effects of the cold. There was a safe@work entry made relating to this issue, with one firefighter experiencing near hypothermia conditions.
3. Without an aircraft tracking and availability system, it was challenging for response managers to effectively manage incoming aircraft and their requirements. This is still done manually, without knowing whose machines are closer or in a ready to respond state, i.e. bucket availability and pilot hours.
4. Identified in recent reviews of the Port Hills, Tasman, Old Dunstan Rd and the International Convention Centre fires, there is a lack of resource tracking and personnel accountability for FENZ personnel, appliances and contractors.
5. The early formation of the multi-agency IMT and its reliable performance contributed to this event's successful running. However, there were issues around a lack of IMT tools such as national templates for setting up recovery or logistical requests and the like. The review team also identified a lack of training for the key IMT roles, leading to a shortage of "ready to respond" personnel. Furthermore, it was also evident that some of the Command Unit operators weren't familiar with large vegetation type fires and what is expected of them. Command Units that are being deployed more often to these events, particularly in an FCP capacity, lack vegetation fire tools such as mapping and fire behaviour software. In addition to this, transferring the incident ground fire mapping information into FENZ mapping systems was problematic and had to be completed manually.
6. Recovery plans were created for individual properties within the fire site, but no template was available for the planning team to produce these. The plans were developed from scratch and were well received by the IMT and residents. These have been adopted for more recent events. Since the fire, the review team found that residents have no dedicated contact recovery specialist for support and information for the ongoing recovery, affecting different people in different ways.
7. The IMT senior management was confused as to the relationship between the IMT and RCC. This has been an ongoing issue and has been identified with several incidents. Also, there was a lack of confidence in the Te Ihu RCC and its ability to stand up 24/7/365 at short notice using regional office personnel. The review team noted that a new system had been implemented during the investigation.
8. There is no national standard for the providers of heavy machinery or its operators to meet. None of the machine operators had the appropriate PPE for this incident resulting in it being sourced and provided by Fire and Emergency. Furthermore, some of the machinery provided couldn't perform all the tasks required of them.

9. While wildfire burns had been completed in the area, the review team found that residents had not been visited by Fire and Emergency personnel for any pre-incident planning, community resilience education or wildfire awareness.

3. Recommendations

1. National guidance needs to be developed around the activation of the Fire and Emergency RCC's. This needs to be accompanied by the appropriate policy & procedures and should include supporting an IMT. Furthermore, it needs to have a training package for the various roles and a process to manage an on-call roster that allows it to operate 24 hours, seven days a week.
2. A national suite of templates to aid RCC & IMT personnel is required. The appointed Recovery Manager had to design and develop a recovery plan as no template exists within Fire and Emergency.
3. A database of IMT individuals (from all agencies) needs to be established, noting people's skillsets and what roles they are trained to perform. The list would ensure the most suitable person is in any given position.
4. Command Units need to be equipped with the appropriate software tools to manage a large vegetation fire. This needs to include mapping capability such as Fire Mapper, which is currently used extensively in such events. The approved package needs to have a training package for Command Unit operators.
5. Fire and Emergency adopt a solution, such as ARENA (currently being trialled), to manage helicopter and fixed-wing aircraft response. This would allow the AAS to resource the incident ground with aircraft with the appropriate capabilities, support systems and ensure the best possible response times.
6. An accountability process is required to aid the IMT or IC's with the location of crews, appliances, and contractors on the incident ground. The system will also ensure accuracy about who has vacated the incident or gone for refreshments, medical attention, rest and relief. This is important, especially if there is a need for the IC to account for everyone in an emergency. The system needs to be able to include both contractors and other agency crews and heavy machinery operators. During this event, the IMT couldn't confirm the exact numbers or locations of people at any given time. It is a common finding at long duration incidents of this magnitude.
7. A dedicated, identifiable Recovery Manager must be appointed as a priority for the affected residents and business owners. This person, or role, needs to continue long after the fire is extinguished and personnel leave the scene, as recovery can often be protracted.
8. Review current PPE at a National level to provide a solution to Te Ihu and Te Kei regional firefighters who are often required to conduct firefighting in a range of weather conditions such

as cold, snow, wet or extremely high temperatures. Often, these conditions can be at the same incident. A solution may include considering thermal garments that can be worn under the current PPE so firefighters can dress up or down to meet conditions and remain safe.

4. Operational Efficiency and Readiness

The purpose of Operational Efficiency and Readiness (OER) is to provide operational assurance advice to the Chief Executive and Deputy Chief Executive Service Delivery to ensure they achieve their responsibilities for the operational efficiency and operational readiness of Fire and Emergency New Zealand (Fire and Emergency).

OER is independent, objective and provides quality operational assurance advice to support continuous improvement regarding the operational efficiency and readiness of Fire and Emergency. OER is required to report quarterly to the Fire and Emergency Audit and Risk Committee and is a function of the Office of the Chief Executive.

5. Purpose of Review

An Operational Review examines how Fire and Emergency responded to substantial, significant or unusual incidents to provide continuous improvement. While it considers the application of policies, procedures and operational instructions (as they applied to the event), its primary focus is to assist Officers and firefighters learning by sharing knowledge and experiences gained through real incidents.

A review focus' on the facts and does not provide conjecture or alternative opinions. The review identifies critical findings to inform Senior Managers to develop corrective actions. It also identifies general findings related to equipment, tactics, or activities that worked well to support organisational learning.

Once completed and approved by the sponsor, all reports are published on the Operational Efficiency webpage for all to read and share.

6. Methodology

The review team use the Incident Cause Analysis Method (ICAM) as a guide to conduct operational reviews. Some of the team members have attained the "Implementing a monitoring, evaluation and reporting program" qualification (AHCBUS607) through Technical and Further Education (TAFE), New South Wales, Australia. The TAFE process may have been utilised as a means of capturing information and data for this review.

The content contained within this report is a real and accurate reflection of the information provided to the team through debriefs, interviews, and data collected through Fire and Emergency reporting systems.

Note, a Fire and Emergency New Zealand login is required to access hyperlinks within this document.

7. Review Requested by

Region Manager Te Ihu, Paul Henderson

8. Review Team

Review Lead:	Trevor Brown
Review Team:	Steve Trigg
Review Team:	Denis Cooper
Peer reviewed	Darryl Papesch

9. Links

ICad Report	F3067402
Media Articles	Stuff fireandemergency

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10. The Event

Day one

On Saturday 29 August 2020, three hunters had hiked onto the Department of Conservation Land, with an overnight stay planned at the Baikie Hut. They awoke on Sunday morning to very windy conditions, and with the wind speed increasing, they opted to walk out for safety reasons.

After walking approximately 4kms back towards their vehicle, they reached the Dusky Trail and Baikie Hut Trail intersection. This location is also in the vicinity of the convergence of the Gladstone and Twizel rivers. They stopped for a hot lunch, utilising a gas cooker.

One hunter headed down to the river to get some water leaving the other two to cook lunch. Being windy, they decided to set up the cooker out of the wind in an area that appears to have been an old creek bed. Placing the cooker on a rock and using their packs to protect it from the wind, they lit the gas cooker.

The cooker had been running for around five minutes when a gust of wind blew the billy over, dislodging the cooker off the rock onto the dry tussock grass, instantly igniting it.

Taking the cooker and their gear, they then attempted to extinguish the fire. Although the fire was slow-moving in the initial stages, it quickly outgrew any attempt by the two hunters to extinguish it.

At 11:25, Comcen received a 111-call reporting strong winds had blown a stove over and started a small fire that was approximately 10 square meters. A first alarm vegetation response of Twizel 907 (TWIZ907), Twizel 9011 (TWIZ9011- tanker), Twizel 6171 (TWIZ6171) and Twizel 6125 (TWIZ6125) were dispatched, and the Principal Rural Fire Officer (PRFO) Mid-South Canterbury (RURALMSC1) was notified and responded. En route, the OIC of TWIZ907 requested more details about the location, which he received via phone. The OIC could see the fire growing in the distance. It was approximately 4 kilometres away at the local airfield's vicinity, so while on the phone to Comcen, he requested TWIZ9026 for incident support and another Tanker OTEM5711 to be added to the response.

At the point of ignition, the weather conditions had peaked over five days, i.e. very High FFMC, 90.5 (fine fuels are very easy to ignite and flammable), Moderate Duff Moisture Code (DMC) & Drought Code (DC) levels (16 & 128 respectively). This indicated light to moderate mop-up needs (not difficult or extended). Extreme Initial Spread Index (ISI) levels (29.9) indicate fires will have an extremely fast Rate of Spread (ROS), Moderate Build Up Index (BUI) levels of 25, fires will be not too difficult to mop-up. Extreme Fire Weather Index (FWI) of 34, fires will exhibit extreme fire intensity and be difficult to control, high Forest Fire Danger, Extreme Grass Fire Danger, Extreme Scrub Danger.

Summary: A fine fuel fire that was easy to ignite (High FFMC) then driven by the high winds (Extreme ISI). The fire was not deep-seated, and mop up was light to moderate work. Unlike the Port Hills and Tasman fire, the lighter fuel was a ferocious fire environment.

Date	Temp (°C)	RH (%)	Wind dir	Wind speed (km/h)	Rain 24h (mm)	FFMC	DMC	DC	ISI	BUI	FWI	Forest FDC	Grass FDC	Scrub FDC
29/08/2020	16.3	23	269	20.9	0.2	90.5	15	126	13.2	22.8	18.5	M	M	E
30/08/2020	17.9	35	250	37.1	0	90.5	16	128	29.9	25	34	H	E	E
31/08/2020	16.1	31	282	30.3	0.01	90.5	18	131	21.2	27	28	M	VH	E
1/09/2020	0.2	99	228	8.8	17.8	15.9	8	96	0	12.9	0	L	L	L
2/09/2020	2.3	75	219	4.5	7.7	18.9	4	83	0	6.9	0	L	L	L

Figure 1. Conditions at the time of the fire

At 11:48, RURALMSC1 requested SouthCom to attach him to the incident and also requested them to respond Omarama and Burkes Pass, requesting ETAs of responded resources. The DPRFO, Mid-South Canterbury 7 (RURALMSC7) added 2 Helicopters by direct phone call to the pilots. He was advised the ETA would be about 40-minutes and was told by the lead pilot that it might be too windy to fly. Based on local knowledge of the area, fire environment, threat to life and property, delays in response from the initial aircraft operators, daylight hours remaining for initial air attack, inaccessibility by ground crews and the fire behaviour described in Sitreps, RURALMSC7 added 12 rotary-wing and two fixed-wing aircraft to the response. As resources were added to the fire, RURALMSC7 informed the local Rural Fire Force Controller (RFFC) and the initial Air Attack Supervisor via text which worked very well from an early planning point.

Further information was passed to TWIZ907 regarding access to Baikie Hut via the Pukaki Downs Homestead. The first arriving crews chose to make access along state highway 8, which unknowingly took them ahead of the front of the fire. As the crew made access to the area of the fire, the OIC observed the fire going into wilding pines with the flames reaching heights of between 100 and 200 meters. After a dynamic risk assessment, it was decided the fire was beyond any of their capabilities, and he made the immediate decision to change tactics. The crew retreated to find a safe position to set up an SFP, and the OIC transmitted a third Alarm and a Sitrep at 11:55 stating '100 - 200M flames, fire moving rapidly east, and well within the forestry block now.'



Figure 2. First arriving crews view of the fire

Given the assessment of the size and ferocity of the fire, they immediately prioritised the safe evacuation of residents in the area while relocating back to an SFP. The RFFC informed the local Pukaki Downs farm manager to evacuate up to 20 residents and logging crews from the Pukaki Downs Farm and Homestead. A Sitrep was transmitted requesting police support with the evacuations. They also enlisted the help of locals to call everyone within the potential pathway of the fire to self-evacuate.

At 12:07, Comcen passed a message regarding the hunters who could not return to the car park due to being cut off from the fire. They were advised to stay within the burnt areas until help could arrive. Hearing this, the OIC and the RFFC decided to use the first arriving helicopter to retrieve the hunters while gathering situational awareness for incoming managers. A Sitrep was passed at 12:28, stating two personnel were boarding the helicopter to rescue stranded hunters.

While returning from collecting the hunters, the RFFC returned to the ICP and formed a plan of attack as the fire was growing extremely fast. There was no requirement for any further information gathering from the helicopter at that point.

On return to the ICP, the OIC of the first arriving appliance assumed the role of Operations. This person established an ICP and SFP for incoming crews and Managers and started to populate incident control boards and accountability of resources. The local RFFC became the air attack supervisor. At that point, an additional three helicopters had arrived. He appointed a lead pilot, and their tactic was to steer the fire around threatened properties. There was a high risk to the pilots from the intense smoke due to wilding pine fuel being abundant. The tactic was to form a circuit as soon as possible to ensure consistent placement of water from the buckets for effective fire attack.

NZ Alpine lavender farm was chosen as the initial ICP due to it being well away from the fire's path. The property had a well-maintained space for appliances and helicopters and was easily accessible to responding crews.

At 12.22, RURALMSC1 requested an IMT to be established due to the size of the fire and current conditions. He then gave a Sitrep stating four helicopters were arranged, ETA 20 minutes, and the Air Attack Supervisor was responding from Mayfield.

At 13:10, a command point (ICP) was established at the lavender farm called 'Lavender Command' but was later relocated to the Department of Conservation office in Twizel.

A Sitrep by RURALMSC1, at 13:55, stated the wind speed was 9KPS, the humidity was 30%, three patients (all status four), one with minor burns to the arms. The fire is threatening two properties, and there are three helicopters in use, with another three incoming. There were also two fixed-wing aircraft and ground crews. The Sitrep continued, Western Flank access via Rhoboro Road, RFO advises this will be a long duration event of at least a couple of days at this stage. Retardant is being uplifted by Aorangi VRFF crews from Washdyke station and responding in approximately 15 minutes. Lastly, it said, we have a heavy-lift helicopter en route, ETA two hours.

15 helicopters and two fixed-wing aircraft were utilised on day one, with 18 helicopters and two fixed-wing aircraft on day 2.

The first days' plan was to ensure all residents were safely evacuated and protect all the properties in immediate danger from the fire using helicopters with buckets and ground crews, including overnight property protection. The protection of Meridian control gate 18 was also a priority because of its significance to the national power grid, all while dealing with extreme weather conditions fuelling a tough to predict wilding pines fire. Welfare for the evacuated residents was established at the Twizel Events Centre.

An IMT was set up on the first day and produced the IAP for the night operations by 17:00. The overall incident objectives of that IAP were 1. Protect life and property, 2. Contain the fire spread, and 3. Protect environmental assets, including power grid control gate 18. The plan included extensive weather forecasting, initiating a recovery plan, and business continuity of the NZ Alpine Lavender farm by protecting then removing the lavender oil stocks.

Day two

The second day of the incident was a concentrated fire attack to contain the fire and protect property. In operations were 22 aircraft and 170 ground crews due to the 15 structures across five different properties and extensive wilding pines in the fire path. Air attack could not occur while the fire was in the wilding pines; therefore, air attack supervisors had to plan around fighting the fire when it moved out of the wilding pines. Furthermore, there were two mass evacuations out of Aoraki Mt Cook. Approximately 140 people (60 cars) in the first round and 23 vehicles in the second.

Having local authorities embedded into the IMT improved the process to establish a welfare sector for affected residents.

Day three

On the third day, the weather had changed. There was rain and up to 50mm of snow on the incident ground. This weather change had a significant effect on reducing the fire's spread as it was not deep-seated. All the aircraft and ground crews were stood down. Heavy machinery continued to establish fire breaks and contingency lines to the West, East and North. A public meeting was held in the townships of Twizel and Aoraki Mt Cook to keep the local people current.

Day four

Day four saw ground crews re-established to work with heavy machinery predominately in Sector Zulu (the residual property zone). Due to extensive work in the planning and early inception of the IMT, access and hand back, plans were arranged for each property. These plans allowed residents to start accessing their properties.

Day five

Work continued on the protection of structures and strengthening fire breaks in all sectors. Meetings with residents continued, including a visit from the Minister of Civil Defence. Public meetings were ongoing in Twizel and Aoraki Mt Cook.

Day six

More work continued protecting properties to ensure the residents were comfortable returning and living within the zone. There was also a changeover of the IMT for the upcoming weekend.

Day seven

An eight-person skeleton IMT worked through the weekend to ensure perimeter security and property protection. The Incident Controller remained on site for continuity of information.

Day nine, ten and eleven

On day nine, there was an IC change, focusing on final mop up and demobilisation of crews and resources.

Losses during the incident included a large lodge, hay barns, sheds, rental accommodation, implement shed, various farm implements, a residential business, forestry assets and a scientific reserve. It was reported that these assets were involved in the fire before the initial crews arrived. The crew's access was cut off, and some values had little or no defensible spaces.

Properties saved included fifteen structures on five properties, significant forestry, Iwi heritage site, and national grid power assets.

A stop message was transmitted at 09:58, 18 September 2020, stating the area was handed over to local property owners with some ongoing monitoring. No permanent fire crews were on-site, and any sign of smoke or flame will be notified via 111. No reported further action was required.

11. Environment Description

The area impacted had a 118km perimeter and covered 2226 hectares (2569 hectares less 343 hectares of unburnt islands with approximately a 60km perimeter). The topography was flat rolling downs extending to steeper slopes in the West. The altitude ranged from 540m to 700m of predominately grass scrub and wilding pine forests. The area included Pukaki Downs Farm (59 hectares), which has several operations, NZ Alpine Lavender Farm, research facilities including Wilding Pine tree control and Pasture management. There was also a Wedding and Accommodation Venue, several large private properties with multiple structures, including some livestock on lifestyle blocks, and Forestry. Meridian Energy has a critical power supply infrastructure, providing power to the National Grid supporting power transmission to the North Island.

Local infrastructure and places of historical importance include power lines along State Highway 80 to Aoraki Mount Cook, SH 80 and SH 8 to popular tourist destinations and a historic Maori rock shelter with rock drawings.

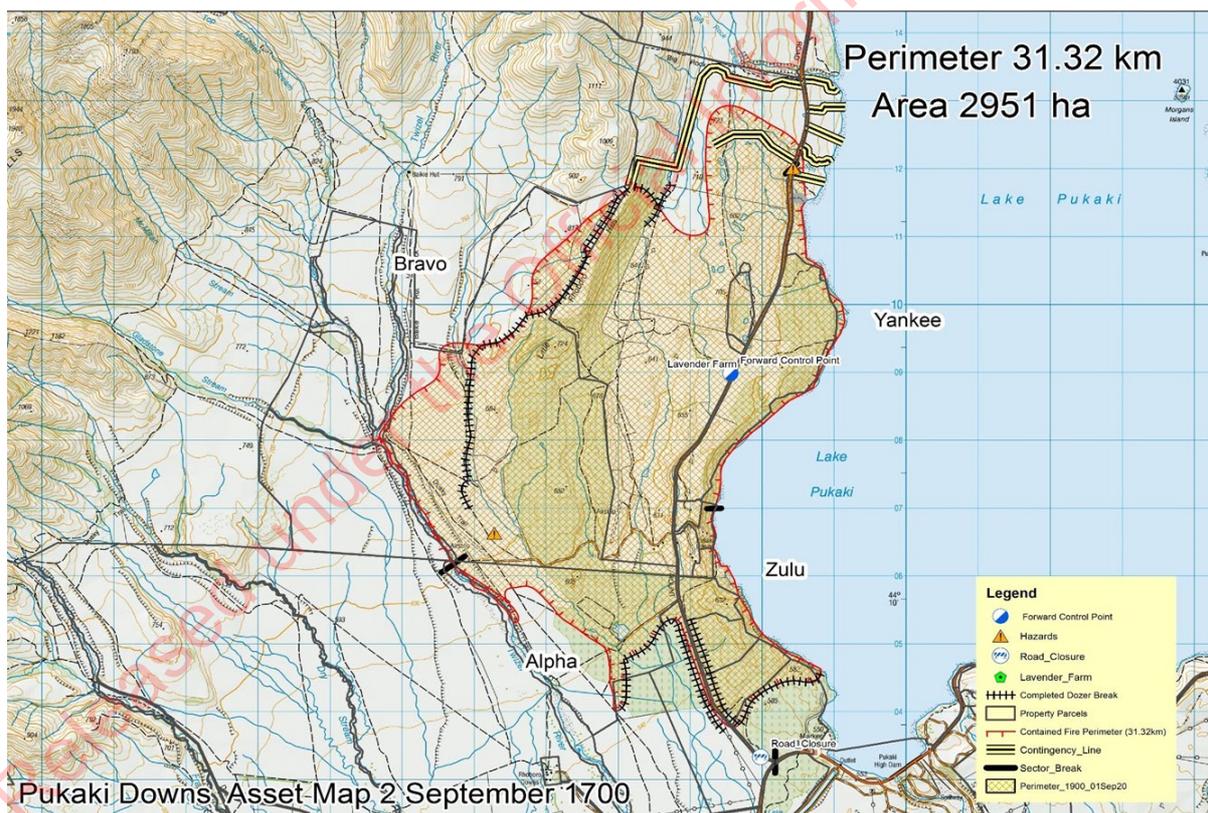


Figure 3. A map showing the Incident perimeter, containment lines and sectors.

12. Review

This section outlines the findings from the operational review investigation based on the investigation's terms of reference and expectations. Generally, the findings are grouped chronologically under the "4Rs" headings Reduction, Readiness, Response and Recovery.

The Operational Review team also considers compliance to relevant Fire and Emergency Operational Instructions and Policy as this supports document review.

12.1 Reduction

12.1.1 Inter-agency and Stakeholder Relationships

Our expectations

That Fire and Emergency engaged with key stakeholders (building owners, landowners, territorial authorities, contractors etc.), key partners and stakeholders that support or are involved with Fire and Emergency to discuss reduction activities. Especially as they relate to fire conditions as the fire risk escalates. This includes public education notifications to ensure the public is informed and aware of the risk.

Our findings

The Mid-South Canterbury Rural Fire District has long-standing relationships with other agencies and stakeholders who all contributed to the incident's successful management and outcome. This was particularly evident with the early evacuation and welfare needs of affected residents. Agencies involved in the IMT were; the Mackenzie District Council, DOC, Earnslaw One Forests, Christchurch City Council, Integrated Consultancy Ltd and the Ashburton District Council. Local DOC personnel worked from home to make space for the IMT in their offices.

It was suggested by those engaged in the IMT that future training for any events should happen at multiple sites and include other agencies for local advice and knowledge for seamless operation of an incident and IMT.

12.1.2 Fire Cause and Determination

Our expectations

That a qualified investigator was assigned to investigate the cause of the fire, furthermore, the investigator completed the report within the expected timeframes.

Our findings

Two experienced specialist fire investigators determined the cause was accidental.

The hunting party has been fully cooperative throughout the investigation and explained their version of events in great detail. Their evidence reflected the findings of the investigators, including the burn pattern indicators.

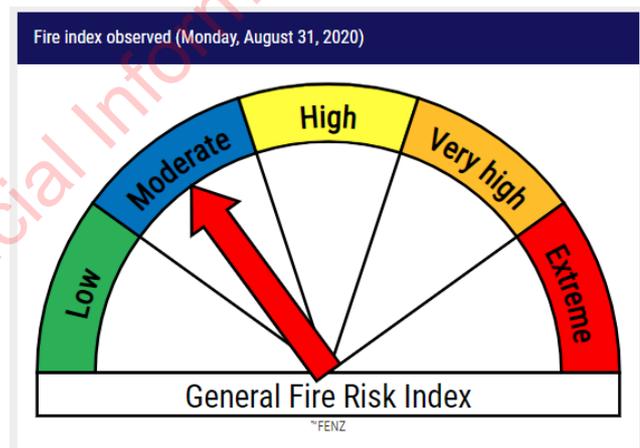
12.1.3 Fire Season Promotion

Our expectations

That public signs were maintained and kept current during the fire season, informing the community and general public of the fire danger. The Fire and Emergency website "Check It's Alright" provided current information about the fire season conditions and permitting information.

Our findings

The fire season at the date of the incident was open, and the Fire index observed was moderate. The fire danger sign located at Twizel was on moderate, and the sign at Burkes Pass entering the high country was on high, this sign is generally left at this level due the nature of the fuel type and weather. It is in a consistent state of drying, with the wind being so close to the Southern Alps. At the point of ignition, the weather conditions peaked over a five-day



period, very High FFMC, 90.5 (fine fuels are very easy to ignite and flammable) Moderate DMC & DC levels (16 & 128 respectively), indicating moderate mop-up needs (not difficult or extended) Extreme ISI levels (29.9), fires will have extremely fast ROS Moderate BUI levels of 25, fires will be not too difficult to mop-up. Extreme FWI of 34 fires will exhibit extreme fire intensity, high Forest Fire Danger, Extreme Grass Fire Danger, Extreme Scrub Danger. Social Media was very active before and after the incident. These included findings and video from a recent fire behaviour research burn and weather and high fire dangers two days before the incident.



Figure 4. Examples of social media posts

12.2 Readiness

12.2.1 Operational Skills Maintenance (OSM) compliance

Our expectations

That all personnel complied with the requirements of either the Operational Skills Maintenance procedures or an equivalent system (e.g. spreadsheet, D4H etc.). Also, they had the appropriate qualifications for the role they performed.

Our findings

The team found that the District Rural fire stations had 114 members with the expired Incident Ground Safety skillsset, although not all of them attended the incident. Furthermore, some urban personnel had expired in the Incident Management OSM task. No other significant OSM tasks were found to be outstanding, and the ones aforementioned did not affect the outcome of the incident.

12.2.2 Pre-incident Planning and Intelligence

Our expectations

Personnel had applied the Operational Planning process identifying sites where significant fire or other risks may indicate the need for a Site Report or Tactical Plan. Furthermore, if in the natural environment, the Fire Plan is current.

We expected to see that Operational Planning contributed to the successful outcome of the fires through:

- a fire management plan that had been reviewed and updated before the fire season and any pre-planning undertaken regarding the fire season had been included,
- the fire plan had been widely promulgated and communicated to forestry and landowners,
- provision for multi-agency interoperability had been discussed and agreed with other agencies, including local, territorial authority, civil defence and forest owners
- Both training and exercises had been conducted leading up to the fire season,

Resources and equipment had been regularly checked and maintained in preparation for the fire season.

Our findings

The team reviewed the Mid-South Canterbury interim fire plan version 5, referred to by the IMT during the incident. It is a comprehensive document of contacts, details of contractors and procedures for the district. Those within the IMT spoke positively of the plan and highlighted how important it is at such an event.

Residents interviewed stated they had not had wildfire awareness information or education from Fire and Emergency. The team found only one property had been visited where a trial evacuation had been undertaken in 2019. None of the properties registered in SMS has been risk scored; hence crews had little knowledge of the properties.

12.2.3 Water Supplies

Our expectations

Crews had knowledge of or access to electronic data or water maps documenting the location of water supplies either reticulated or static for the use of firefighting or decontamination as prescribed in the Schedule of Operational Readiness Standards.

Note, OER does take into account the National Notice 034/2015, "Suspension of non-emergency work on roadways", which has halted hydrant testing.

Our findings

The area affected by the fire was alongside Lake Pukaki, so the water was plentiful. Lake Pukaki is the largest of three roughly parallel alpine lakes running North-South along the Mackenzie Basin's Northern edge on New Zealand's South Island. The lake is fed at its northern end by the braided Tasman River, which has its source in the Tasman and Hooker Glaciers. The local coast guard was deployed for safety if an emergency occurred involving aircraft while dipping into the lake.

Knowledge of all potential private water supplies was limited. A suggestion was made for property owners with hydrants in their water tanks to put a sign up stating a hydrant is available. This will aid in future incidents.

12.3 Response

12.3.1 Initial Mobilisation and Assistance Requests

Our expectations

That the Fire and Emergency Communication Centre and responding appliances meet the performance expectations as stated in the Service Delivery Guidelines. Furthermore, all message requests were processed promptly and transmitted per Land Mobile Radio Communications procedures.

Our findings

Comcen processed the call and responded assets in a timely manner as and when requested. All notifications and requests were actioned appropriately. The Mid-South Canterbury team quickly identified the potential of this incident and responded several resources, including but not limited to Helicopters, Fixed Wing Aircraft, IMT and the Command Unit. They also notified the Mackenzie District Council (MDC) Civil Defence Emergency Management to take care of the evacuation of residents due to the isolation of the community.

Initially, two aircraft were deployed as per standard operating procedure by RURALMSC7. Once the first Sitrep was received from the RFFC on-site via phone describing the fire behaviour and perceived risks to life and property, more aircraft were requested by him, who at that point assumed the role of the Air Division Commander (ADC).

With good knowledge of the local area, topography, fuel type, including information from recent scientific burns of wilding pines and the fire environment, the ADC liaised with RURALMSC1 regarding the decision to increase the numbers of aircraft. Once agreed, and working outwards from the fire location looking at both the closest and most suitable aircraft type for the task (FENZ aviation standard, approved operators only), a total of 15 helicopters and two fixed-wing aircraft were employed on day one, followed by 18 helicopters and two fixed-wing aircraft the second day. Issues with self-response and aircraft operators calling in with their own availability were confusing and challenging for the ADC to manage.

12.3.2 Response Driving and appliance positioning

Our expectations

Officers and drivers adhere to the principles of Driving policy when responding to the incident. Furthermore, when positioning the appliance, firefighter safety is considered by ensuring they are parked away from exposure to fire, including consideration of fire development and possible direction of fire growth, building collapse, power lines, trees, or other potential hazards. Also, as the incident progressed, vehicle positioning was re-evaluated.

Our findings

There were no recorded incidents relating to driving to and from the incident. The response times for the initial appliances met the timely performance expectations from the station and the arrival at the incident. The natural access of state highway 8 took the crews unknowingly ahead of the fire front. This was immediately recognised, and the first arriving crews moved to an SFP. All further arriving resources responded to this position before being deployed.

12.3.3 Size-up, Strategy and Tactics

Our expectations

The first arriving Officer undertook an initial size-up and risk assessment of the incident site in line with the principles outlined in the Command and Control Policy. The size-up would result in comprehensive situational awareness, including hazard identification and the potential for escalation. Furthermore, the information contributed to the formation of an action plan, sound strategy and supporting tactics.

Our findings

First arriving crews took the natural access of SH8, which unknowingly took them in front of the head of the fire. The first arriving OICs size up and risk assessment was superb given the fire's size and ferocity. Recognising their capability, they opted not to attempt any fire attack but to focus on the immediate threat to life and property. This action resulted in the early evacuation of residents from the area of danger. Property lost during the incident was non-savable and was lost before crews arrived. Most of the access points were impassable, and the properties had very little and, in some places, no defensible spaces. The management team commended the adopted strategy.



Figure 5 shows a burnt hedge attached to trellis adjoining a lost property.

12.3.4 Respiratory Protection (BA & APR)

Our expectations

That personnel complied with all aspects of BA and APRs, namely, the Respiratory Protection Equipment policy, Respiratory Protection Equipment reference guide, and the Air Purifying Respirator guide.

Our findings

Urban crews used BA during property protection and extinguishment of the lost properties. However, it was noted that Fire and Emergency do not have any policies or procedures for defensive property protection and the use of respiratory protection. This was a finding of the [Cornish Point review](#) where crews were tasked with property protection duties but had no formal training or policies and procedures to follow.

12.3.6 Firefighting Mediums

Our expectations

That a high level of operational competence was demonstrated in the selection of firefighting medium to achieve the initial strategy and tactics deployed, also, those choices are based on a worst-case scenario or the recognition of fire behaviours. Once a comprehensive size up and assessment of potential hazards had been completed, further review was made of firefighter mediums (water, foam) and application methods (handlines, monitors, aircraft etc).

Our findings

A high level of operational competence was demonstrated across the firefighting operations and Incident Control functions. Due to this incident comprising of volatile fuels and access difficulties, the initial tactics were helicopters using buckets and fixed-wing aircraft applying water, heavy machinery for containment lines, ground crews for property protection, and specialised rural teams brought in for containment mop-up. Given the fire's size, fire environment, fuel types, life, and property threatened, the methods adopted were appropriate for this incident.

Ground crews achieved property protection with pumping appliances, tankers and BA, plus assistance from air attack.

The air attack was achieved as follows:

Initially, two aircraft were deployed as per standard operating procedure by RURALMSC7. After the first Sitrep was received from the RFFC more aircraft were deployed by RURALMSC7 (ADC).

Having detailed knowledge of the area involved, the ADC liaised with RURALMSC1 about increasing the number of aircraft. Once agreed on working outwards from the fire location looking at both the closest and most suitable aircraft type for the task (Fire and Emergency aviation standard, approved operators only), a total of 15 helicopters and two fixed wing aircraft were utilised on day one and 18 helicopters and two fixed-wing aircraft on the second day.

A log was kept of who and when these aircraft were ordered; however, there were some issues with operators self-deploying and contacting multiple Fire and Emergency personnel to offer their services. Balancing local operators' use and their availability due to "civil time", daylight hours added complexity to mounting an effective aerial attack.

Day one

The first experienced, qualified air attack operator to arrive on the scene came via a helicopter from Mayfield, mid-South Canterbury where he was assisting in a "Working Safely Around Aircraft" course.

After the first Sitrep was received, RURALMSC8 assumed the role of Air Attack Supervisor (AAS). It was decided to take a Hugh's 500N that had been chartered for the training course to the fire saving time as it would have been a two-hour drive compared to the 35-minute flight.

At this stage, more than three aircraft had been ordered, so according to Fire and Emergency aircraft standards there must be an AAS appointed. This appointment also applies if we have a mix of aircraft types such as helicopters and fixed wing.

The AAS had an issue with the Hugh's 500N as it did not have a passenger communication link that would allow him to talk directly with the other pilots on the fire ground.

Once he landed at the Lavender farm FCP the AAS changed to a Helicopter Line Super D Squirrel that had been used to rescue the hunters at the Twizel river. It was not bucketing due to no belly

hook attachment, but it did have a dual communication system. Also, this machine was more stable in high winds.

Initially, he flew around the incident with one of the local RFFC's who had been first to arrive and had taken the initiative as air attack and deployed the aircraft into two geographic sectors, North and South. At this stage, the fire had already burnt the house on the lakeside of the road and through the farm buildings.

Lead pilots

The priority was to make sure there was a lead pilot in each Sector. This is critical as there needs to be a circuit for the aircraft to fly. The lead pilot sets the course from the water supply to the fire. A good practice model suggests they can manage about four aircraft.

The AAS assigned a lead pilot in the Southern and Northern sectors. The fixed-wing aircraft circuits were small in the Southern Sector with aircraft turning around quickly. On reflection, it was suggested two more leads pilots would have been preferred due to the complexity of the event. This was put into place the following day.

Communications

A communication plan was implemented to manage the large amount of aircraft. The airwaves can get very congested because the pilots are making calls when they are either "on the dip" "off the dip" or "on the drop" "off the drop".

Two VHF common traffic advisory frequency (CTAF) channels were set up, one in the South Sector and one in the North, as well as the Air Operations channel. This immediately reduced the radio chatter by half. During everyday communications on a fire ground, the pilots are monitoring two to three channels simultaneously.

Since RURALMSC8 flew to the fire, he did not have all his fire kit (just had had his ground kit, not air kit), meaning he did not have my notes, which include the Fire CTAF frequencies.

He adapted and used two CTAF channels instead of Fire CTAF frequencies. This wasn't deemed an issue due to the location of the fire, making it unlikely the aircraft transmissions would travel outside of the Mackenzie Basin.

Southern Sector

Due to high winds on the fire ground, helicopters working in the Southern Sector were having to navigate columns and clouds of smoke moving horizontally. The head fire was here, making the pilots' job very difficult. At one stage, the AAS stopped them using an old quarry as a fill point due to the possibility of smoke collapsing over them while dipping.

The changing wind direction and smoke made it problematic for the pilots. It also made it difficult for the AAS to identify how many aircraft there were on site.

This Sector had the complication of the aircraft having to find clear air in the smoke to drop water around the structures below to protect them.

Northern Sector

The AAS posted the two fixed-wing bombers to the Northern Sector. They were tasked with holding the fire at the base of Little Roxborough hill and North where it was exiting the wilding forest into brown top grass and windrows of pine slash. He was concerned that if the fire reached the hill's slope with the wind behind it, it would run up into DOC land behind.

The AAS was challenged with managing the combination of rotary and fix wing aircraft over both sectors.

Day Two and other observations

Day two saw a second Air Attack supervisor at the incident, allowing a far better oversight of the aircraft, particularly with both rotary and fixed-wing operating in the Northern Sector. Also, with aircraft dipping from Lake Pukaki, it was decided to provide extra safety support in addition to what the Air Attack Platform provided. Two Coast Guard vessels, one each from the Mackenzie and Tekapo branches, were dispatched to provide lookouts at the two key locations where the helicopters were dipping. Using Coast Guard was a sound decision due to the possibility of an aircraft going down in the lake.

Other findings

The number of aircraft on the incident was proportional to the size and complexity of the incident, with a fast-moving intense head fire at the Southern end a fire spreading at the Northern end heading for the DOC land.

The AAS noted that having the fixed wings fly in formation would have removed another complexity to the fire ground, especially for the helicopters working on the same area between fixed wing drops. This lesson identified was successfully put in place soon after at the Lake Oahu fire.

There was some risk of losing momentum when the Pukaki airfield ran out of fuel in the afternoon of day two. The new Pukaki airfield manager did not have the clearance to check the tanks, and the fuel provider not giving a realistic ETA. Fortunately, ground crews still had some fuel in their tanker trailers. The Fire and Emergency airbase manager or air support supervisor should have been kept current on fuel supplies.

It was identified that more ground support staff are needed to assist in the running of the airbase, check fuel reserves and make sure the airbase was functioning. A bigger team could also help manage foam stocks and keep logs of the arriving and departing flights.

There was some difficulty getting a Notam (notice to airman) put in place on time. No incursions into the fire ground by other aircraft were reported.

The AAS tried to contact multiple appliances on day one to direct them towards a structure fire at Pukaki Downs farm. No contact was made, and he could not identify or call them using their call signs as he could not see the name or number from the air. It was suggested call signs on the roof of the pumps, tankers and smoke chaser would fix this issue and provide a level of safety. It was

also recommended some form of identifier on the roof of heavy machinery would be an advantage in areas such as Canterbury, where large numbers of aircraft are used for the fast-moving fires.

12.3.7 Operational Competence

Our expectations

That personnel demonstrated a high level of operational competence across all areas of operations. Furthermore, all Officers and firefighters performed to their level of training, experience, qualifications and role they hold within the organisation.

Our findings

A high level of operational competence was demonstrated across all the firefighting operations, and Incident Control functions. This incident employed a mix of ground firefighting tactics for extinguishment and property protection, helicopters using buckets, fixed-wing aircraft and heavy machinery for containment lines. Since the first arriving crews understood their own capabilities considering what they confronted, the strategy to prioritise people and property was a sound one and set the tone for the entire event.

The AAS had a multitude of aircraft to manage across different sectors in rapidly changing conditions and had to act quickly to issues that arose, such as machines lacking communication technology and fuel supplies.

The IMT used initiative by including other agencies and territorial authorities with specialist knowledge and legislative influences to achieve a very successful outcome, particularly the "people" welfare aspect.

12.3.8 Incident Management Team Structure (IMT)

Our expectations

We expected to find that as the incident escalated, an incident management team is established for an incident of this magnitude as prescribed in the interim Command and Control policy. It is also expected the structure implemented would provide clear lines of communication and would be a significant contributor to the successful conclusion of the event.

Our findings

An IMT was set up early with a fully functioning team established by 1600hrs of day one. People were allocated a position on arrival. An incident action plan (IAP) was produced for the first night shift, and mapping also commenced. An Operations Manager was appointed to manage the overnight shifts and was briefed nightly. The overnight incident action plan was completed daily.

From day two, once positions were allocated, a formal briefing process was followed.

Whilst there were many skilled and experienced IMT personnel involved, there were at times in certain areas where shortages and span of control issues due to a Level Three incident of this type needing more specialist role separation.

IMT personnel noted that having local agencies embedded in the IMT was crucial to the team's success and provided expertise where Fire and Emergency were lacking. A process identifying an individual's capabilities when being appointed to lead or support roles is absent. A system to manage or track people's particular skillset would have helped immensely. The IMT predominately consisted of Rural personnel and partner agencies. Some urban personnel were considered for the roster however were not requested due to the snow reducing the duration the IMT would be required.

The team and the IMT management noted that they missed the opportunity for shadowing and learning IMT roles. Predominantly later in the incident, when things slowed down.

The PRFO requested and tasked a specific person as a dedicated resource to establish an incident control point in the local Department of Conservation office. This position is not often appointed, and the function is carried out by many as and when available, often taking significantly longer to establish.

The IMT consisted of:

- Public Information - This function was led by Mackenzie District Council, which allowed critical and sound local knowledge, support and advice. It was noted that Fire and Emergency should consider this as a standard way of operating, however, lead the function. A lack of support in this area from the Fire and Emergency NHQ communications team was noted, and it was suggested there should be specialised training at the Region level for this role. There should also be templates for managing information and media. Messaging to the public was via, Mackenzie District Council website, Facebook page, newspapers, and TV news broadcasts. Communication with the residents was in person, such as by phone, text and email. Many believed Fire and Emergency should have led this, and the national communication team should be available rather than waiting for editing support from Fire and Emergency NHQ.
- Community Liaison - A database of affected landowners was established by utilising internal information and local networks. By 0900 hrs on day two, a personal connection was made. The first residents meeting was at 1100 hrs on day two, less than 24 hours after ignition. Four of the five directly impacted residents attended. Conversations focused on their immediate needs. They were provided access, under escort from Fire and Emergency, to their properties that afternoon. Resident meetings were held daily from day two until day five to keep them informed of fire suppression activities and then the focus on recovery. Beyond this, communication was daily via group text and or emails.
- Planning/Intelligence - The management team within Mid-South Canterbury are all very aware and familiar with the fire environment and the risk in the Mackenzie Basin and the area affected by this event. Site-specific weather reports provided by Meteorology Solutions Ltd. were critical and proved

reasonably accurate. The fire behavior spreadsheet was excellent, and the team noted that it could be formally adopted by Fire and Emergency and consider creating an app version. Grass curing figures for local RAWs stations (Pukaki and Glentanner) did not accurately reflect the situation.

- Mapping – Fire and Emergency internal mapping abilities and programs were limited and the computers are not powerful enough to prevent repetitive crashes. Infrequent users also meant they were struggling to produce maps quickly; subsequently, this was outsourced to DOC. A dedicated GIS specialist for accurate daily mapping and offline capability would have been helpful and was recommended by management. The mapping of correct data is a safety-critical function. Transferring incident ground fire mapping information into Fire and Emergency mapping systems was problematic and had to be completed manually. The use of the 'Fire Mapper' system has been recommended by the management and other fire behaviour specialists from previous incidents. QR codes were temperamental, mapping data often inaccurate, and critical identifying features omitted, including only one escape route identified in Zulu Sector, which was a safety concern. A process for using and creating QR codes needs to be developed and people trained. Also, dropbox accounts (or something similar) should be developed ahead of time, and a cache of appropriate computers be allocated for incidents.
- Incident Action Plans – An initial IAP was produced as soon as possible on day one of the event and every operational period following. The initial plan focused on protection for crews, property and occupants and allowed for the likelihood of fire to spread overnight (which it did by approx. 1000 hectares). By day two, there was better intel and fire behaviour information, more staff and better planning. It was noted by some that an IAP should be provided one per crew or per vehicle.
- Resourcing - Resource tracking was minimal due to no National tool being available to manage it. It was suggested that a tally or barcode system similar to the current urban system be duplicated for use. Additionally, it was questioned whether a mobility project using GPS could potentially solve this, but being cellular-based, it may not necessarily be accurate or able to capture the data required. However, there is a need to ensure the initial response resources are accounted for. Whilst information was loosely captured, it, unfortunately, left the incident with the initial responding team as they were unclear on whom to deliver it to. The dissolution of ICP at the NZ Alpine Lavender Farm and it's being relocated at the DOC offices in Twizel resulted in a substantial delay in reaching those who required it. It was suggested a spreadsheet or similar for the Command Unit staff to populate would have helped. There was a good use of tracking cards (T-cards) at the SFP as the incident progressed. However, Sector Supervisors had to be reminded to keep passing information up the line. Some movement information between Sectors was not reported back to the ICP on time either. There was a gap in information sharing between SFP and ICP when it came to resource tracking. This problem has been identified in other reviews such as the Tasman Fires;
Recommendation 10 Fire and Emergency New Zealand should develop systems and standard operating procedures to support a national resource ordering, tracking and availability system, including developing a cadre of trained staging area managers.

and the New Zealand International Convention Centre (ICC) fire;

Recommendation 4 Fire and Emergency New Zealand should reinforce current operational doctrine, training and exercises to ensure that crew accountability is placed front and centre of command considerations.

- Logistics - Logistics personnel were doing both logistics and resource check-in at the SFP and also resource planning at the IMT. This was a lot of work for a small team, so a dedicated Resources Unit Leader and Resource Planning person within the IMT Planning team is a must for an event of this magnitude. There was a reduction in DOC personnel in the Logistics function after the 01/09/20 morning snow. Command Unit operators were not familiar with rural resource unit roles. Local knowledge proved a helpful resource when it came to accommodation and catering. There is no Fire and Emergency template or any guidance; therefore, the team were required to design their own on the day, which was the case with many other areas.

12.3.9 Incident Ground Facilities and Cordons

Our expectations

That appropriate incident ground facilities, including cordons, were in place to suit the size and complexity of the event as prescribed in the Command and Control Technical Manual and/or the Coordinated Incident Management System (CIMS) manual.

Our findings

The initial ICP was located at the NZ Alpine Lavender Farm, until being relocated at the DOC building in Twizel. The Lavender Farm then became the SFP.

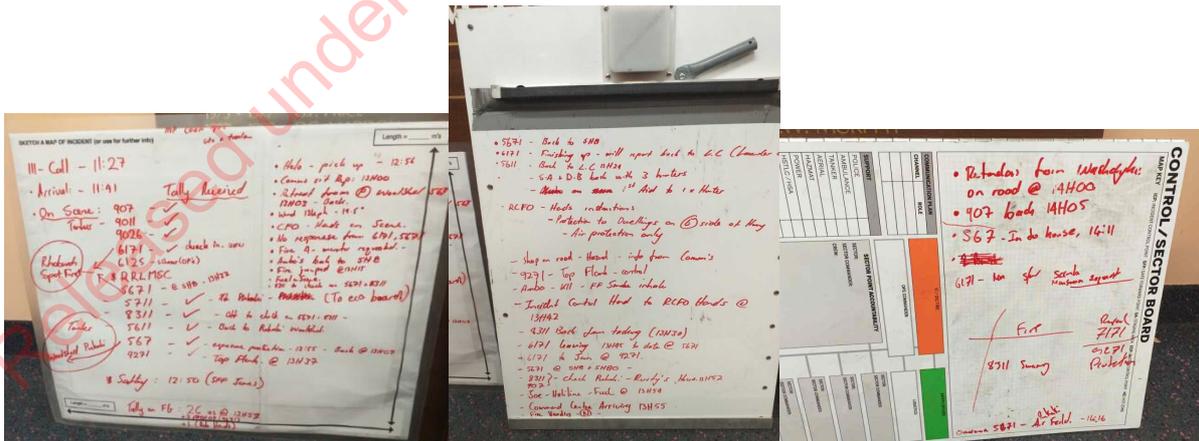
The Command Unit team felt concerned heading to the NZ Alpine Lavender Farm with fires burning on both sides of the road, and at one point, the fire was coming towards them when they briefly evacuated to Peter's Point. They deliberated if the corner of SH80 and SH8 would have been a better location and could have aided in traffic management or road closure. After some consideration, it was decided the fire behaviour was indicating that the wind could have driven over SH8. Considering how short and condensed the grass was at the NZ Alpine Lavender Farm, it was the best option available. The only other possible location would have been Peter's Point; however, this was 6-7kms further up the road, so it was discounted. NZ Alpine Lavender Farm also had space to land helicopters.



Figure 6. State Highway 80 access to the initial ICP was restricted but not unpassable.

The Command Unit operators at the SFP struggled to utilise all of its tools with the Wi-Fi modem and the satellite dish not functioning correctly, possibly due to smoke interference. Space in both the Command Unit and at the DOC ICP was at times minimal.

First arriving crews struggled with the available incident boards to collate information, but they did transfer their information into the Command Unit when it arrived. Crews told the review team that they struggled to work in the Command Unit because of little training and knowledge of its operations. The incident boards provided to urban crews are not sufficient for this size of an event.



Figures 7, 8 and 9. Board utilised by crews to gather information at the initial ICP



Figure 10, Crews receiving a morning briefing

Operational briefings were conducted at the SFP each morning, typically at 0700hrs. They were good, clear briefings, but some minor issues arose due to teams arriving after the briefing and relying on second-hand piecemeal information, which became a safety issue. Also, they missed other information such as fuel supply locations and accommodation arrangements

While some teams felt night operations gave good clear briefings, others felt a lack of a detailed briefing for the night crew such as, no safety brief outlining hazards or emergency evacuation signals or what to do if the fire should take hold. This was concerning as they often worked in isolation.

12.3.10 Incident Ground Communications

Our expectations

That the IC or his/her delegate implemented an effective communications plan as prescribed in the Command and Control Technical Manual and or Coordinated Incident Management System (CIMS) manual. The plan reflected the reporting lines of the IMT and contributed to the overall safety and effective management of the incident.

Our findings

Communication was via both VHF and UHF IGC radios, although the first responding crews had issues with line of sight, so there was a heavy reliance on Land Mobile Radio (LMRs). This made it challenging to task crews efficiently as they needed to return to the Command Unit to be re-tasked each time as communication was ineffective. It was challenging for welfare and crew location checks and Sitreps via the Command Unit to Comcen and then onto the leadership team. A command repeater was set up on Mt Mary, which ensured all a communication link. This highlighted the need to set up a repeater as soon as possible and that all appliances should have a tactical radio in them, which currently is not the case.

A Communication Manager was appointed; however, it was noted may have been located at the wrong place or required as an incident ground focused role.

12.3.11 Senior Officer Notification and Response

Our expectations

That notifications of an escalating incident made to the on-call Senior Officer(s) and subsequent senior officers reflected the Regions Notifications and Response Policy. Furthermore, upon arrival, the Senior Officer gained situational awareness prior to taking control and assesses the strategy and tactics initially implemented.

Our findings

Appropriate notifications were made to the on-call Senior Officers, and their response was timely.

There was considerable confusion over the role of the RCC with an IMT in place. The IMT felt they did not require the RCC, based on not needing any out of region resources and not having multiple incidents with the Te Ihu Region. The review team noted that this was a common issue with other RCC and IMT operating at incidents, for example, [Old Dunstand Rd review](#) & [Flagstaff Dunedin review](#).

The team identified that the RCC roster included personnel not familiar with it, such as FRMOs, VSOs and Response Managers. Also, the lack of regular training, working outside normal hours, pay and conditions and overall responsibility of the RCC all contributed to its inability to sustain its operations to an appropriate level.

12.3.12 Contractor Management

Our expectations

That the action plan identified all contractors who attended the incident. The contractors arrived with, or are provided with the appropriate PPE and received a safety briefing. Furthermore, they are trained and qualified for the tasks expected of them.

Our findings

The lack of an aircraft tracking and availability system made it very difficult for response managers to manage incoming aircraft and their requirements. Also, due to there being no national standard for heavy machinery operators, none had the appropriate PPE. Moreover, some had to be managed to allow for their machines lack of capability.

12.3.13 Safety, Health, and Wellbeing

Our expectations

That all Fire and Emergency personnel comply with the Health and Safety at Work Act 2015. Furthermore, a Safety Officer is appointed in compliance with Operational Safety policy, ensuring the Safe Person Concept and LACES were appropriately applied. A thorough risk analysis was conducted, monitored and reviewed throughout the incident. All hazards and control measures will be recorded on the Incident Ground Hazard Assessment form and transferred to a Hazard Assessment Board to manage if available.

Furthermore, any injuries or near misses to firefighters or members of the public were appropriately recorded, the fatigue and welfare of firefighters was properly managed, and safety, health and wellbeing was managed throughout the incident.

Our findings

The first arriving crews quickly identified the risk of direct attack in the early stages of the incident.

A Safety Advisor and a Safety Officer were appointed from day two. However, there was a need for additional Safety Officers due to the size and multiple sectors. Safety resources were stretched at times. A Safety Officer was not explicitly allocated to the Air Division, a high-risk environment with many aircraft working. The Senior Officer and the extended team identified risks based on local knowledge and the fire environment. A Hazard and Risk Assessment was carried out and mitigation steps communicated to personnel on the fire ground. This assessment was reviewed as conditions changed. There was a lack of urgency in reporting near misses and injuries to the Safety Officer. They mainly were reported after the fact, usually via hearsay.

Some Safety Officer handovers lacked detail, and their span of control was exceeded. They often performed multiple roles simultaneously, such as Thermal Operations.

Sector Supervisors had to act in Safety Advisor/Officer roles when building daily risk assessments and IAP information. This did work but was not ideal. Dedicated Safety Officers/Advisors would have alleviated the issue. The low number of near misses and safe@work cards completed supports the efforts of all involved, however as aforementioned, some reporting was late, and some firefighters were unaware of the system.

The team found that the travel to and from the incident was an issue and contributed to firefighter fatigue. Also, provisions for returning night shift personnel home was an issue due to excessive working hours. Inclement weather conditions made it difficult for firefighters at the daily briefings while standing in the open and when firefighting due to insufficient PPE.

Night shift crews working to protect properties noted no hot food or drinks were provided when working in these icy conditions.

The inconsistent payment to urban and rural volunteers is still an issue. Management lacked clear guideline and policies when making decisions regarding volunteer availability.

12.3.15 Personal Protective Equipment (PPE)

Our expectations

That the appropriate level of PPE was worn by personnel for the tasks performed by them, as prescribed in the Uniform and PPE policy. Furthermore, the PPE performed to the level expected and if not, was impounded and reported accordingly.

Our findings

None of the heavy machinery operators arrived with the appropriate PPE, so Fire and Emergency had to supply it. There is no national guidance available for managers regarding what PPE is required by external providers and who will provide it.

Day 3 welcomed rain and up to 50mm of snow on the incident ground. These weather conditions placed operational crews at risk of hypothermia, with temperatures reaching sub-zero wind chill. The wildfire PPE does not provide a thermal layer.

This was also a finding in the [Flagstaff](#) and the [Old Dunstan Road](#) reviews. The review team found the national Safety, Health and Wellbeing team had no knowledge or seen evidence of these situations. The OER National Manager has since rectified this.

12.4 Recovery

12.4.2 Injuries to Fire and Emergency Personnel

Our expectations

That all incident-related injuries, near miss, hazardous substance exposure or psychological harm events to Fire and Emergency Personnel entered the Safe@Work site is followed up with the appropriate investigations or actions.

Our findings

The review team were told of a lack of timely reporting to the Safety Officer regarding near misses and injuries on the incident ground. They were typically reported after the fact and usually via word of mouth, so the opportunity to have them registered in the kiosk was overlooked. More dedicated Safety Officers/Advisors to build capability for the role would have alleviated the issue.

The team only found two Safe@Work entries for this incident. One was a near miss for unsuitable PPE during icy conditions after the snowfall, and the other was a firefighter feeling unwell. The latter was assessed for heat stress by ambulance at the incident but was not transported to the hospital.

The team was also made aware of the following incidents:

- Hunter's minor burn
- Cold conditions for all because of snow
- Smoke inhalation
- Blisters on feet due to boots and lots of walking (unsure if ill-fitting or design issues), this was not reported immediately to Medical when should have been
- An aircrew member pouring foam into a helicopter bucket had foam splashed onto their face

12.4.4 Incident Debrief

Our expectations

The hot debrief facilitated at the end of the incident covered main points relating to the incident. Furthermore, the formal debrief (if completed) was structured enabling all those in key roles at the incident to provide input. All issues created a corrective action point to be managed locally or via the appropriate process.

Our findings

The debrief was held on 29 September 2020 at the Twizel Events Centre and was attended by 34 Fire and Emergency personnel, contractors and partner agencies. A debrief report was produced using the debrief and the after-action review. The report was very well received by those involved in the incident, and the review team used the information contained in the report.

12.4.5 Recovery Plan

Our expectations

A recovery plan was designed and implemented to facilitate safe owner/occupier access to the site, enabling them to check the property, recover critical assets, remove pets/animals and re-establish essential services. Depending on the incident, it may include the process of reinstating the site back to its original state.

Furthermore, recovery became part of the IMT and Fire and Emergency planning cell, contributing to recovery operations within their mandate and capability.

Our findings

Recovery plans were established for individual properties within the affected area, but no template was available to the planning team. The plan was formulated from scratch and positively commented on by the incident management and residents. It has been adopted in other incidents since.

The plan included a three-stage process; handing back occupation and responsibilities to the affected parties, entry into their property, and living in the property. All sites had been extensively visited, repaired and patrolled and checked to ensure the people's safety. Local brigades were briefed on the recovery plan.

Work carried out during the event ensured that the effect of this incident was minimised. Heavy machinery operators paid due care and attention to minimise mess and leave a tidy site. The property owners appreciated this.

Other tasks managed by the recovery unit included:

- Working with the power company to re-establish the supply
- Removed corrugated iron from burnt dwellings (a hazard in strong wind)
- Repair damage to Pukaki Downs internal tracks
- Re-established water tables on the Northern boundary
- Tidied up driveways to residential properties
- Felled all dangerous trees within two tree lengths of homes or driveways

- Re-established fire breaks adjacent to State Highway 80 to ensure properties could manage these in the future
- Removed fuel on the Western fire break adjacent to State Highway 80
- Assessed fencing repairs
- Working with Ministry for Primary Industries, Environment Canterbury and Mackenzie District Council regarding removing the affected and non-affected trees (burnt tree removal discussion paper)

The recovery plan was well executed with multi-agency input throughout the entire process. Each agency contributed to the plan within their areas of expertise: Council relating to rebuilding, structure inspections, and District Plan compliance. Environment Canterbury for the discharge of contaminants or wilding tree work. Fire and Emergency for site safety and future risk mitigation.

Interviewed landowners were very optimistic about the support from the Fire and Emergency recovery team. However, some had ongoing inquiries due to some private residences and businesses taking longer to recover losses. It was identified that a contactable Fire and Emergency Recovery Advisor would have assisted in the process.

13. Conclusion

The fire occurred in an area that was familiar to local management and crews. The ignition started within dry grass fire and quickly moved to forest fuels, including native Matahari and wilding pines. This presented an immense challenge to first arriving crews. They quickly realised the fire was beyond their capabilities and made the early decision to focus on evacuations and to provide helpful information to responding managers. The information gathered was directly related to the significant aerial attack response and the fast response of the IMT. Although crews were not experienced or equipped to deal with an incident of this size, they performed a superb job and should be commended. Management implemented the initial aerial attack based on Sitreps received from the fire ground. The overall strategy that focused on property protection was effective and contributed to saving an estimated value of \$30 million in properties.

A practical and more efficient way of responding aircraft is required and would have supported the Air Division Commander in responding a large amount of resource. At the time of the incident the person responsible for managing aircraft doesn't have access to machine availability or distances they need to travel from their current location to the incident ground. This affects the prioritising of tasks needed to be performed, such as property protection or reducing fire travel.

There is confusion from the IMT about the role of the RCC as all of the resources were being managed from with the Region. Furthermore, the RCC lacked the personnel to keep it operating for a prolonged period. The review team noted that a new system to manage personnel had been implemented during the review investigation.

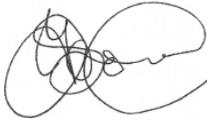
Fire and Emergency lack tools and templates to support incidents of this size, particularly at the IMT level. The pioneering of recovery plans at the scene certainly assisted in planning early access for people onto their properties was positively commented on by them. The affected community did suggest that if they had more knowledge of wildfire behaviours, it would have contributed to them to better protect their homes and businesses, which they believe would have resulted in less property loss.

Released under the Official Information Act 1982

14. Review Authorisation

This report has been authorised by Operational Efficiency and Readiness:

Everything in this statement is true to the best of my knowledge and belief, and I made the statement knowing that it might be admitted as evidence for the purposes of the standard committal or at a committal hearing and that I could be prosecuted for perjury if the statement is.

<p>Trevor Brown Assistant National Commander National Operational Efficiency Manager</p> 	<p>Paul Henderson Region Manager Te Ihu Review Sponsor</p> 
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Approved for Publishing



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