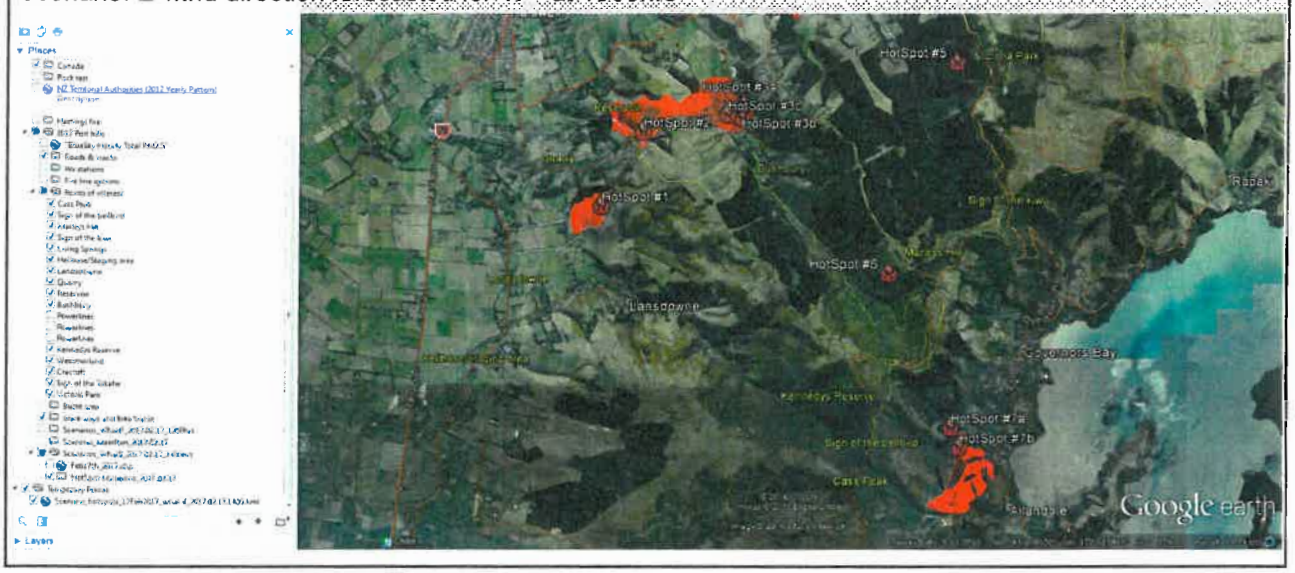
Port Hills Fire Modelling

The use of fire modelling systems or tools gives the Incident Management Teams at medium-large scale wildfires an indication of how the fire is likely to behave over a certain period of time. The models and tools use the known conditions (vegetation types, terrain, fire risk) and weather forecasting.

Redactions

No redactions have been made.

Port Hills Fire Complex
Prometheus Run – REVISED FGM. v2
Scenario: E wind direction forecasted for 17th at 1500hrs



Break out what if scenario

Prometheus Run – REVISED FGM. v2

- 7 areas of concern were highlighted
- What if scenario for the 17th 1500 hrs
- Weather from sugarloaf station (and looked at Motukara), Van wagner selected
- 24 hr run, 15min intervals
- 16th Feb fire area used as fuel patch (no fuel)
- Roads and drive ways included
- Default Grass curing adjusted to 100%
- With a landscape wind patch 90 degrees
- Correct GPS locations

Summary: concern for life and property

- **Hot spots of little concern:**
  - #6 (forest, near Marley's hill)
  - #5 (near Vic park)

Hotspot #5 – little growth

Hotspot #6 – little growth

Hot spots of concern:

A total of 24 structures in direct threat, 12+ potentially at threat

- #1 (old Tai Tapu rd house)
  - 1 home (1 within first hr)
  - + forest along Kennedys bush rd, with potential to threaten homes along Kennedys bush with embers. Also backing fire to threaten house with long drive off old tai tapu rd.
- #2 (the crocodile track)
  - 4 homes and Reservoir.
  - This fire will join up with fire from hoon hay rd, in early hours of the morning on day 18th.
- #3a,b,c (hoon hay rd)
  - 8 homes
- #4 (near carcroft)
  - 3 homes plus a water reservoir at threat
- #7 (near goveners bay)
  - 6 homes at threat, with possible 12 others along Allandale Lane, Governors Bay/Teddington Rd

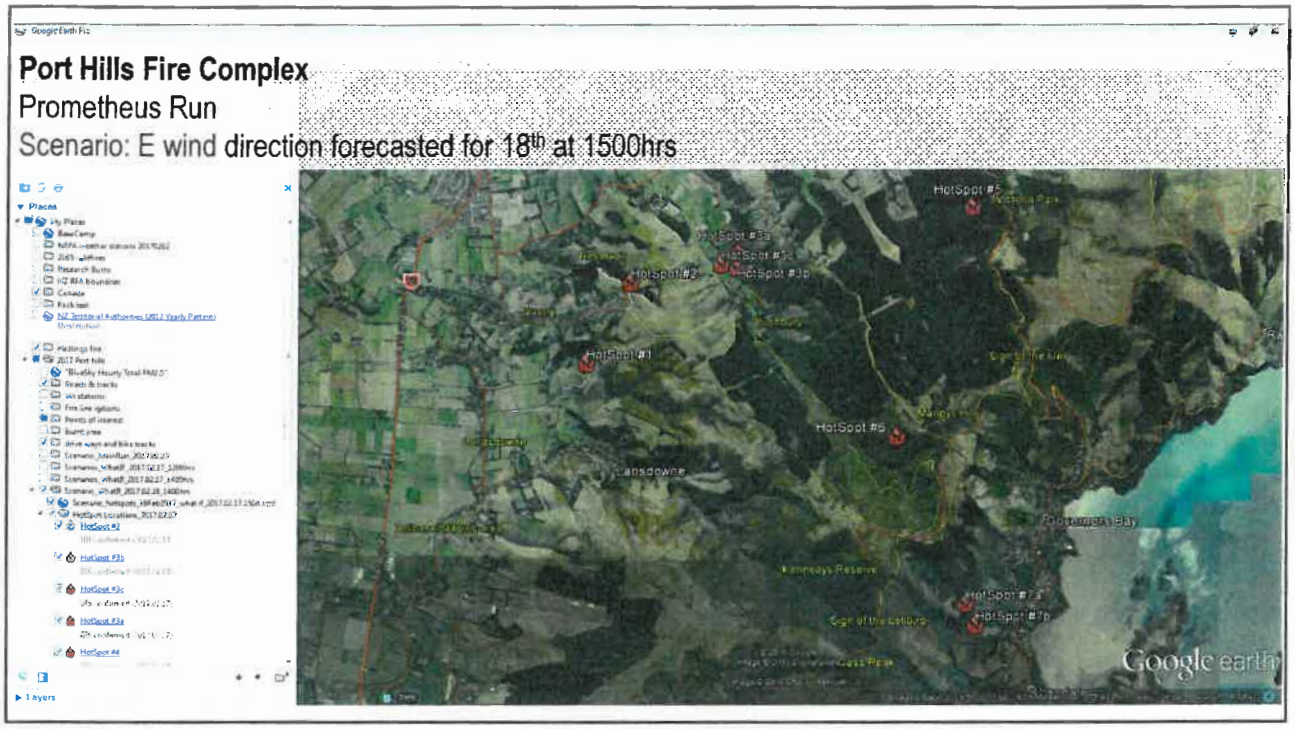
Hotspot 1

Hotspot 2

Hot spots 3a, b, c

Hotspot 4

Hotspot 7a, b



Break out what if scenario

Prometheus Run

- 7 areas of concern were highlighted
- What if scenario for the 18th 1500 hrs
- Weather from Sugarloaf. Van wagner selected. Utilised actual obs and combined with 2 day predicted from CHCH aero FWSYS
- 24 hr run, 15min intervals
- 16th Feb fire area used as fuel patch (no fuel)
- Roads and drive ways included
- Default Grass curing adjusted to 100%
- With a landscape wind patch 90 degrees
- Correct GPS locations

Summary: concern for life and property

No threat to life or property on the 18th

- Actual and forecasted weather (Rainfall, low temps and high humidity) has reduced chance of a fire starting and spreading easily (low FFMCS, ISIs & FWIs).
- The FMG using weather for the 18th showed very little growth or spread (some had 16m perimeter over 24hrs)
- However, note that the DC, and BUI are still very high (as we have only had light rain) and therefore could pose an issue later in the week.

- **Hot spots of little concern:**
  - #1 (old Tai Tapu rd house)
  - #2 (the crocodile track)
  - #3a,b,c (hoon hay rd)
  - #4 (near carcroft)
  - #5 (near Vic park)
  - #6 (forest, near Marley's hill)
  - #7 (near goveners bay)

Hot spots of concern:

- **Nil**

Hotspot #1 – old Tai Tapu rd house

Hotspot #2 – crocodile track

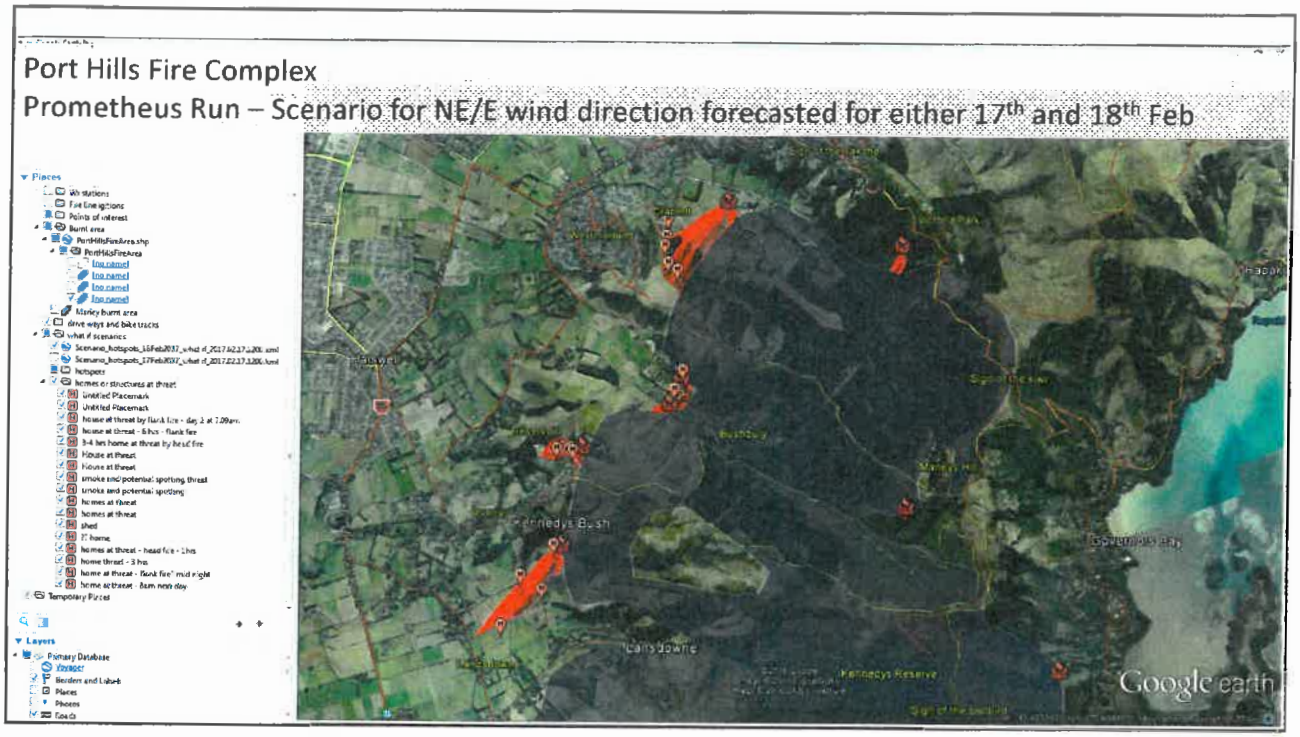
Hotspots #3 a, b,c – hoon hay valley rd

hotspot #4 - Cracroft

Hotspots #5 – Dyers pass rd, forest

hotspot #6 – Worsley Rd, forest

Hotspot #7a, b – Governers Bay



Prometheus – break out what if scenario

- 7 areas of concern were highlighted
- What if scenario for the 17th and 18th at 1500 hrs
- Weather from sugarloaf station, Van wagner selected
- 24 hr run, 15min intervals
- 16th Feb fire area used as fuel patch (no fuel)
- Roads and drive ways included
- Default Grass curing adjusted to 100%

Summary: concern for life and property

Under a NE ENE wind, and weather forecasted for either 17th or 18th:

- **Hot spots of little concern:**
  - #7 (near goveners bay)
  - #6 (forest, near Marley's hill)
  - #5 (near Vic park)
- **Hot spots of concern:**
  - #1 (old Tai Tapu rd house)
    - 2 homes (1 within first hr) + 2 possible from embers
  - #2 (the crocodile track)
    - 4 homes:2 within the first 2 hrs
  - #3a,b,c (hoon hay rd)
    - 3 homes plus shed:2 within the first 1hr
  - #4 (near carcroft)
    - 4 homes: 1 within 3 hrs, flank fire affects others, plus a water reservoir at threat

Prometheus Fire Growth Model Summary

Port Hills Complex

Issued: 1600hrs Saturday, 18 February 2017,
Prepared by: Veronica Clifford, Scion Rural Fire Research

Task: 1330 Hrs, by Nathan Keoghan. Incident Control Point, Selwyn District Council.

Task Description: Run three Scenarios for what if a fire started and spread from a hotspot on the following days, using the hotspots identified on the 17 Feb 2017: #3, #4, #5, #6, #7, #8, and newly identified #9 on 18 Feb.

FGM Scenario: Using the following weather parameters:

Scenario 1 (NE conditions)	Tuesday, 21st Feb, using: Actual Observed wx 10th - 18th Feb up to 3pm. Combined with: (1) 2-day forecast - up to the 20th 2300hrs; (2) Forecasted Daily Wx parameters, to apply a diurnal pattern: • Temp (min & max): 13 - 28 Degrees • Minimum RH: 40% • Rainfall: 0mls • Wind speed (min & Max): 23 – 36 km/h • Wind Dir: 35 (NE)
Scenario 2 (worst case NW conditions)	Tuesday, 21st Feb, using: Actual Observed wx 10th - 18th Feb up to 3pm. Combined with: (1) 2-day forecast - up to the 20th 2300hrs; (2) Forecasted Daily Wx parameters, to apply a diurnal pattern: • Temp (min & max): 17 - 31 Degrees • Minimum RH: 20% • Rainfall: 0mls • Wind speed (min & Max): 26 – 40 km/h • Wind Dir: 330 (NW)
Scenario 3 (Southerly change)	Wednesday, 22nd Feb, using: Actual Observed wx 10th - 18th Feb up to 3pm. Combined with: (1) 2-day forecast - up to the 20th 2300hrs; (2) Forecasted Daily Wx parameters, to apply a diurnal pattern for the 21st: using scenario 1 wx parameters above; (3) Forecasted Daily Wx parameters, to apply a diurnal pattern for the 22nd: • Temp (min & max): 15 – 18 Degrees • Minimum RH: 70% • Rainfall: 0mls • Wind speed (min & Max): 12 – 19 km/h • Wind Dir: 200 (S)

FGM Scenario Calibrations:

Fire Growth Models were calibrated to, and also assume:

- No suppression action taken
- **Duration:** 6 hrs, 30min time intervals
- **Ignition locations:** 7 areas of concern were highlighted
- **Ignition time:** A fire starting and spreading at 1500/1600 hrs (a hotter time of the day, worst case scenario)
- **Ignition date:** see table on page 1

Barriers to ignition:

- The current burn area acting as a non-fuel fire break
- Addition of roads, drive ways and tracks as barriers to spread (10m, 7m, 5m, 2m, 1m, 0.5m)

Fuel types:

- Default vegetation parameters altered: Grass curing of 100%
- Landcover database version 4.1
- No fuel patches were applied outside the current fire extent
- The current fire extent was used to change the underlying fuel types to a non-fuel type.

Weather:

- **Representative Wx Station**: Motukarara RAWS (FWSYS) weather station chosen as the base station, using the underlying historical weather data from the 10th Feb to 18th Feb, and combined with the 2 day and 6-day forecasted data.
- **Method of hourly FFMC Calculation:** Van Wagner was chosen, as hourly weather is available and no chance of rain over the simulation days.

- Note: We are getting conflicting weather reports about either a NE or NW for next week. Looked at both EarthNullschool[1] and Windyty[2] to confirm with the meteorological services.
    - Start to see a NW across the island about 1am Tuesday – EarthNullschool
    - NW on Tuesday 7am – Windyty
    - Wind Change from Wednesday, NW to S in afternoon at 1800hrs – Windyty
    - Swings back to E/NE on Friday – Windyty

[1] https://earth.nullschool.net/
[2] https://www.windytv.com/?-43.523,172.581,5

FGM: Under a NW breakout scenario – Wednesday, 22 Feb 2017

Prometheus Fire Growth Model Summary

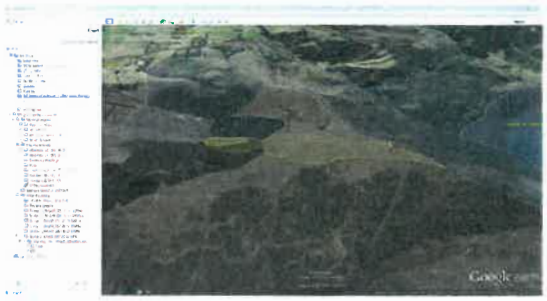
The following Prometheus FGM simulations attempts to model a breakout scenario for the 22nd February 2017, from the time of escape (1600 DST) for a duration 8 hrs

Issued: Tuesday, 21st Feb 2017, 1830 hrs
Forecast: Wednesday 22nd Feb 2017

Scenario calibrations:

- Actual Hourly wx was obtained from the nearest wx stations (Sugarloaf, Motukarara, CHCH Aero, Lyttelton port, Bottle Lake). Representative weather stations:
  - **Sector Charlie:** actual hourly weather observations from CHCH RAWS (MetConncet), combined with 2 day forecast from CHCH aero (FWSYS) and an edit to the daily parameters on 22nd for a NW conditions.
  - Van Wagner method was chosen, because hourly weather was available
- **Duration:** 30min time step intervals
- **POI locations:** hotspot on sector Charlie: -43.633501°; 172.588674°
- Using the current fuel types from LCDB4.1
  - Grass curing default of 60% changed to 100%
  - No fuel patches applied
  - Current port hills fire area applied as a non-fuel type
  - NW landscape wind patch was applied
  - Addition of roads, drive ways and tracks as barriers to spread (10m, 7m, 5m, 2m, 1m, 0.5m)
- Assumption that no suppression taken

FGM: Under a NW breakout scenario



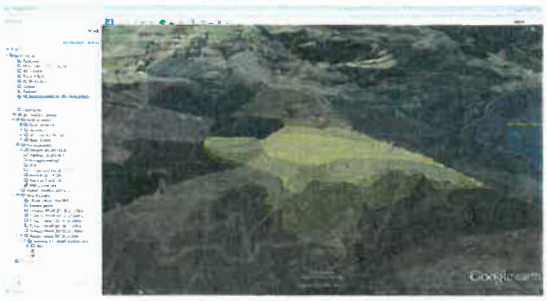
1700hrs, Assets at risk:

- 1st dwelling under threat from a head fire in 3hrs

In the grass fuels that will fuel the fire, & threaten this property

- HFI : 5000 – 9000 kw/m
- HROS: 10 – 85m/min; or 0.6 – 5.1 km/h

FGM: Under a NW breakout scenario



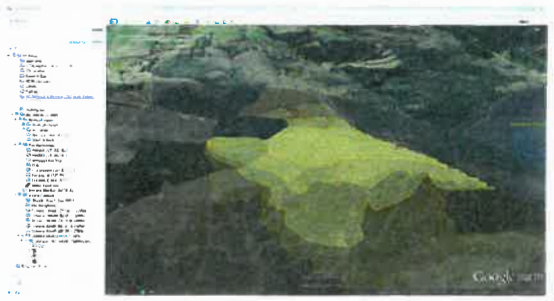
1800 hrs, Assets at risk:

- 2nd dwelling under threat from flank fire in 2 hrs

In the grass fuels that will fuel the fire, & threaten this property

- Flank fire intensity (FFI): ava 900 kw/m
- FROS: 7 – 16m/min; or 0.42 – 0.96 km/h

FGM: Under a NW breakout scenario



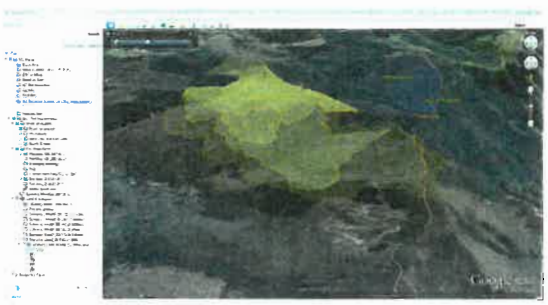
1830 hrs, Assets at risk:

- 3rd dwelling under threat from flank fire in 2.5 hrs

In the grass fuels that will fuel the fire, & threaten this property

- Flank fire intensity (FFI): ava 900 kw/m
- FROS: 7 – 16m/min; or 0.42 – 0.96 km/h

FGM: Under a NW breakout scenario



Assets at risk:

- 1900hrs: Summit road breached.
  - Grass:
    - HROS: 20 – 120m/min; or 1.2 – 7.2 km/h
    - Head fire intensity (HFI): 3000 – 9000 kw/m
  - Gorse/broom:
    - HROS: 20 – 120m/min; or 1.2 – 7.2 km/h
    - HFI: 45,000 – 90,000 kw/m

FGM: Under a NW breakout scenario

Assets at risk:

- 1930hrs: dwelling at threat from flank fire
- 2130hrs: dwelling on Sherwood Rise at threat
- 2230 hrs: further dwellings on Sherwood rise
  - Grass:
    - FROS: 7 – 10m/min; or 0.42 – 0.6 km/h
    - FFI: 800 – 1500 kw/m
  - Gorse/broom:
    - HFROS: 5 – 50m/min; or 0.3 – 3 km/h
    - HF intensity (FFI): 1,500 – 80,000 kw/m