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Mt Nebo Residents Association **Bushfire Risk Proposal**

December 2023

*Investment in Preparedness and Prevention saves
millions in Response and Recover*

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1. Executive Summary

Three of the key goals of the Mount Nebo Residents Association (MNRA) are around encouraging good citizenship, co-operating with organisations with similar goals, and cooperating with all levels of government, including submitting constructive proposals in regard to these goals. This project aligns with each of these goals.

Mount Nebo is exposed to bushfire hazard. It is encouraging good citizenship for residents to be well-informed of bushfire risk, specifically as it applies to the Mt Nebo community, in order for residents to be able to take informed action to mitigate risk and protect life and property, in the event of bushfire. In an example of local cooperation, Mount Glorious Community Association (MGCA) commissioned Firesight to do a Bushfire Risk Analysis for the Mt Glorious community and has offered MNRA the opportunity to participate in the bushfire modelling exercise, by extending the study area to include Mt Nebo, at a reduced cost to MNRA.

The most effective way to mitigate the bushfire risk is through a cooperative approach that is clearly communicated. Much of the focus of bushfire impacts is understandably on lives and properties. The World Wide Fund for Nature report into the black summer bushfires found that almost 3 billion animals were killed or displaced and much of this was through loss of habitat.

FireSight will deliver a bushfire risk assessment that is objective, repeatable, transparent and will withstand scrutiny. FireSight will deliver this capability using the best available scientific information, tools, and products to support MNRA to better protect lives, property, and the environment from the negative impacts of bushfires.

The likelihood and impacts of bushfires will be brought together to create a bushfire risk index that enables interventions to be better targeted to areas where they will be most effective.

This reduces cost and risk.

The results facilitate communication within the Mount Nebo residents, and with external stakeholders like Queensland Parks and Wildlife Service (QPWS) and Queensland Fire and Emergency Services (QFES).

1.1 Key outcomes

The following key outcomes will be delivered during the bushfire season covered by this project:

- The Mount Nebo residents will have a deeper understanding of local bushfire risk that will empower them to drive mitigation, prevention, and preparedness.
- The community will have improved bushfire resilience through delivery of a risk assessment methodology that uses best practice simulation-based modelling, including consequence modelling for community natural and cultural assets.
- Communication with stakeholders will be enhanced. An objective risk assessment that is intuitively visualised provides a common picture for landowners, internal and external stakeholders like QFES and QPWS to understand how prevention and preparedness activities build community resilience.

2. Organisation background

2.1 FireSight

Following on from RedEye's exit from the bushfire management space, FireSight has continued to grow and develop this important capability.

FireSight's team and partners have developed deep domain and subject matter expertise delivering numerous asset data management projects and are available to share best practice knowledge, tools and processes.

In their previous roles the FireSight team has developed a world-class bushfire protection technology for asset owners and critical infrastructure operators.

A first-to-market innovation, this technology integrates a science-based approach with relevant high-definition data and powerful technologies including simulation, spatial data mapping, long-term and forecast weather products, analytics, and machine learning.

2.2 FireSight Bushfire Management Capability

In comparison to existing fire mapping and similar legacy products that use a simple static grid calculation the capability:

- Delivers much higher resolution and greater accuracy of bushfire risk assessment including likelihood and consequences of impact.
- Enables the prioritisation of resources to the highest risk areas.
- Better informs risk mitigation planning, enabling more targeted interventions and treatments, reducing cost and risk.
- Facilitates communication with both internal and external stakeholders.

FireSight is a commercial license holder of Phoenix, the simulation technology engine that underpins the analysis and outputs. Phoenix was designed by the University of Melbourne with funding from the Bushfire CRC and the Victorian land management agency (DELWP) and is the primary operational bushfire behaviour prediction tool in use by State Fire Agencies in QLD, NSW, SA, TAS and VIC. It has been designed to capture the complex, landscape scale interactions between the fire, fuels, terrain, and weather that create hazardous phenomena including radiation, embers, flames, and fire induced winds that drive severe fire behaviour.

FireSight's Bushfire Team have more than 35 years' experience in bushfire management and simulation, including establishing the bushfire predictive analytics capability for QFES. Our Bushfire Risk Analyst has further enhanced the value of Phoenix through his PhD (Doctor of Philosophy) studies at University of the Sunshine Coast (USC), on the 'Economic evaluation of prescribed fire as a wildfire risk mitigation tool'. This study has enhanced the innovative analytical methodologies developed by the company director to provide the first landscape scale risk modelling of its kind.

3. Project overview

FireSight will deliver a landscape risk analysis using simulation based gridded ignitions. This will provide a baseline risk assessment. From these gridded ignitions the most dangerous ignition locations will be identified. Several of these dangerous ignition locations will be selected, approximately 10 and individual fires will be simulated. These individual fires will be simulated under four different scenarios, two fuel/vegetation and two weather scenarios. See Table 1 below.

- For each scenario a range of fire metrics will be produced including, House Loss Probability, Fireline Intensity, Bushfire Risk Index and ember density.
- This will provide an indication of the time to impact, likelihood and consequences of a fire impact.

Typical elevated fire weather with drought effected fuel load, arrangement and availability	Typical very elevated fire weather with drought effected fuel load, arrangement and availability
Typical elevated fire weather and typical fuel load, arrangement and availability	Typical very elevated fire weather and typical fuel load, arrangement and availability

Table 1 four simulation scenarios.

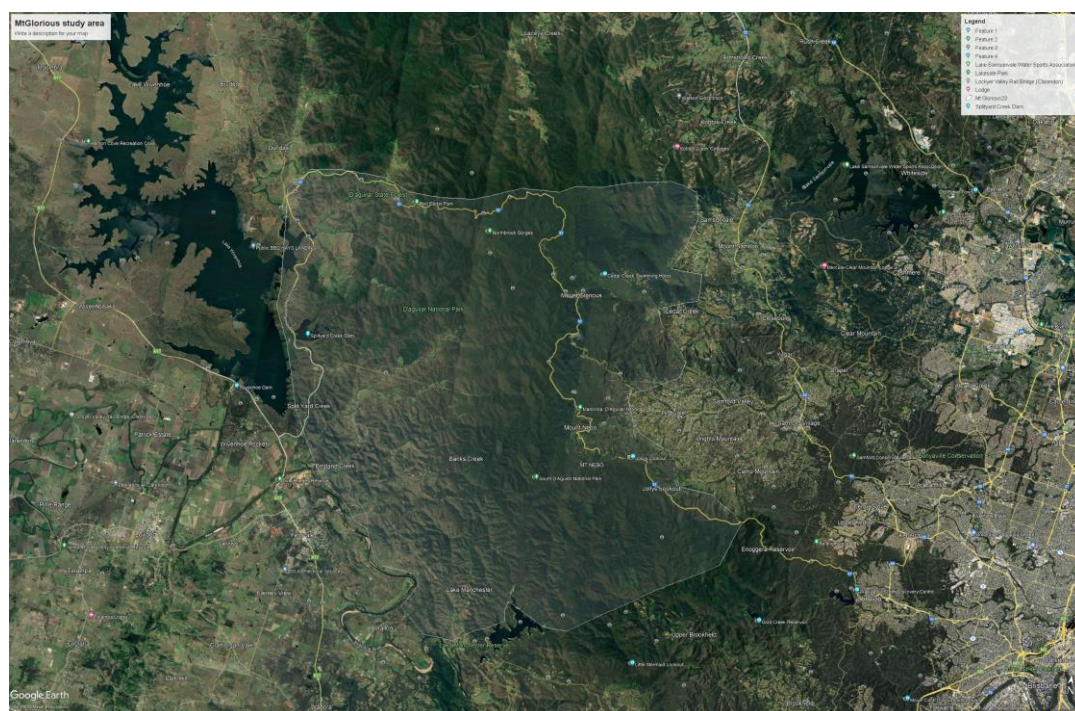


Figure 1 - study area

The premise of the project is to:

- Determine the baseline risk for the study area.
- Analyse the most dangerous ignition locations.

FireSight will be providing outputs in the form of shapefiles that can be used with existing MNRA GIS products.

3.1 Project delivery

The proposed delivery method of simulation-based, ensemble gridded risk analysis has been refined through our experience in delivering similar customer projects, and this methodology will be reused for this project.

In general, the project inputs are as follows:

- Project Area: MNRA and west to the D'Aguilar National Park.
- Timeframe: Bushfire risk assessment results by end 2023
- Fuel: FireSight developed Fuel Map for use as Phoenix data layers, with MNRA input to fuel data as appropriate. Local fuel data will be included to ensure the vegetation mapping is locally refined through a fuel assessment onsite MNRA locations.
- Weather: Historical weather observations based on the Bureau of Meteorology Atmospheric high-resolution Regional Reanalysis for Australia (BARRA) data set, and appropriate Automatic Weather Stations data for the dangerous ignition location analysis.
- Customer Data: MNRA datasets on:
 - fuel data
 - fire history
 - disruptions
 - asset data (location, type, category etc)
 - ecological, heritage and cultural areas (where available)
 - defined built and non-built assets for ongoing financial modelling.

3.2 Technical methodology

The following section describes aspects of the bushfire technical methodology for execution of the project:

Weather selection

The choice of weather streams for MNRA is encompassed by the Bureau of Meteorology Atmospheric high-resolution Regional Reanalysis for Australia (BARRA). Initial analysis of both weather data sources will enable selection of the most appropriate source for the simulation and analysis.

The weather selection is analysed to derive 20 representative days with an 80% Annual Exceedance Probability (AEP). This will provide an indicative weather ensemble that will be used to build fire weather scenarios for analysis of existing and planned future bushfire mitigations.

Phoenix Project Development

Phoenix project files will be constructed as follows:

- Construct Phoenix gridded analysis projects containing the identified weather streams. This includes constructing the ignition grid boundary based on MNRA nominated area boundaries.
- This ignition boundary is used to generate individual ignitions as a grid in Phoenix. The ignition grid (location and time of ignitions) remains constant across all trials.
- The project is a combination of baseline fuels/fuels with each mitigation option and weather streams (1 of 20).
- The methodology for the development and sourcing of vegetation and fuel characteristics has been discussed and agreed prior to use.
- Fuel assessments will be undertaken in the field to provide local vegetation bushfire attributes that will be used as inputs to the simulation scenarios.
- An upper end fire weather day will be selected from historical weather observations in the area that will be used as inputs to the simulation scenarios.
- Fuel analysis will include estimation of drought effected fuels that will be used for the dangerous ignition scenarios.
- Days of very elevated fire weather will be selected from BARRA or the most appropriate AWS that will be used for the dangerous ignition scenarios.

Phoenix Results Generation:

Results from Phoenix will be generated as follows:

- Execute the Phoenix ensemble gridded risk simulations to estimate fire spread on FireSight's cloud compute infrastructure.
- Results will be consolidated and post-processed to produce a series of statistical geospatial files. Each 60m² grid across the study area will contain the range of average values from each individual Phoenix run. These are expressed in each grid as the average minimum, 25th percentile, median, mean, 75th percentile and maximum.
- The results layers for the baseline case, and the change due to the three planned mitigation scenarios will be delivered to MNRA in ESRI Shapefile format, and will include:
 - Fireline intensity (kW/m)
 - Convection (MW)
 - Ember Density (emb/m²)
 - House Loss Probability (%)
 - Built and non-built asset loss consequence
- FireSight processed layer results will include:
 - FireSight's Bushfire Risk Index (BRI)
 - Normalised Frequency of Burn Impact

4. Project scope

The scope of work for this project includes project activities to determine bushfire risk to the Mount Nebo residents.

4.1 Method of delivery

FireSight will deliver the project activities on site at the FireSight office in Brisbane, or remotely as required. These activities will be part of the constant engagement with MNRA that underpins the project success.

The following activities are included in this project:

- Implementation phase: kick-off meeting and project startup
- Review of existing data sets to establish bushfire risk baseline including on site fuel assessments.
- Delivery of results to MNRA onsite, including Q&A/workshop as required.

Where appropriate and agreed with MNRA, additional project activities may be included as a variation to this agreement.

4.2 Scope of works

The following general activities are in scope for this project:

- Project management tasks
 - Scope and milestone management, and reporting
 - Stakeholder management and consultation
 - Project communications
 - Management and control of risk
- Identification, definition, receipt, and transformation of customer input data for modelling:
 - Local fuel load, vegetation types and moisture levels
 - Asset locations, shapefiles, protection zones, preparedness levels, consequence of loss (financial and non-financial) for
 - Built assets owned and operated by customer or included within the project boundary.
 - Cultural and environmental assets identified and managed by customer or included within the project boundary (where other agencies manage)
 - Planned and future developments (built or ecological) that require assessment of bushfire risk and mitigation efficacy.
 - Disruption layers, including.
 - Roads and trails
 - Easements (customer managed, or managed by others)

- Fuel load reduction activities, including.
 - Bushfire Management Plan planned activities
 - Historical activities (burn history, vegetation clearing etc)
 - Planned burns.
- Identification of appropriate weather source data, and derivation of weather ensemble layers for modelling
- Creation of ignition grid for simulation
- Build, test and validation of models incorporating above data.
- Execution of simulation models for baseline and scenarios, and validation of model run success
- Analysis and documentation of outcomes
- Presentation of analysis and outcomes to customer
- Delivery of output artefacts to customer
 - Updated fuel maps for project extent
 - Simulator model outputs as described in Section 3.2 Technical methodology

4.3 Project milestones

The following milestones apply to this proposal:

Milestone	Activity	Date
Initiation	Purchase order/executed contract	On execution
Milestone 1	Kickoff – meeting, project initiation tasks and onsite fuel assessment	Jan 2024
Closeout	Onsite project closeout presentation, final report and Q&A session	July 2024

4.4 Project communication

Progress reports will be communicated monthly, or on demand.

FireSight will report on:

- progress against agreed project milestones
- details of progress towards completion of agreed project activities

4.5 Risk and Issue Reporting

FireSight maintains internal risk and issue registers and will raise risks and issues with MNRA if project timelines, project outcomes or project quality cannot be met.

5. Budget and invoicing

5.1 Budget

FireSight pricing for this project is offered on a fixed-price basis.

FireSight Professional Services element	Estimated Price (AUD)
Delivery of project outcomes	\$ 5,000 ex-GST
Project management and admin costs	\$ 500 ex-GST
Total	\$ 5,500 ex-GST

5.2 Invoice timing and indicative values

The following table provides milestone timing and indicative invoice values.

Stage	Date	Services contribution	Indicative value (ex-GST)
Initiation	Jan 2024	50%	\$2,750
Closeout	July 2024	50%	\$2,750

5.3 Assumptions

Below are the assumptions FireSight has made when pricing this proposal.

- The project area will be MNRA selected areas.
- The ignition centres for the network-initiated fires will be set as 500m grids.
- The resolution of the Phoenix simulations will be at $\leq 60\text{m}^2$
- 20 alternate weather scenarios will be simulated using a range of synoptically typical elevated fire danger days for the localities across the network.
- MNRA staff and data will be made available to FireSight as required to ensure the project schedule is maintained.
- Additional effort or activities will be managed by project variation.
- The proposed project dates and timelines are indicative only and will be finalised with MNRA upon receipt of a valid purchase order.

6. Terms and Conditions

6.1 Payment and Pricing Specific Terms and Conditions

- All prices exclude GST.
- Invoices are payable within 14 days from Invoice Date
- Variations (if applicable) will be invoiced in the month they are agreed.
- Additional consulting services will be priced at \$275.00 per hour.
- Incidental, travel and accommodation costs incurred by FireSight staff as part of project delivery or customer support will be charged at cost price + 10% and invoiced in the month it occurs (if required)
- This proposal is valid for 30 days from the “date issued”. Following this, FireSight reserves the right to modify any content in this proposal.

7. Additional Services

FireSight can provide the following additional services at the request of MNRA:

- Seasonal outlook presentation.