Natural Hazards Research Australia

Call for Expressions of Interest

T9-A3: Fire plumes in the atmospheric boundary layer

Expressions of interest due **5pm AEST, 3 October 2025**
to **research@naturalhazards.com.au**

Australian Government

naturalhazards.com.au
Australia's leading research centre for natural hazard resilience and disaster risk reduction

Overview

Natural Hazards Research Australia (hereafter the Centre) is seeking Expressions of Interest from project teams for the following project:

T9-A3 – Fire plumes in the atmospheric boundary layer

Project description	The aim of this project is to develop a forecasting tool, driven by high resolution atmospheric modelling, that provides an objective measure of the influence of the above-surface atmospheric layer on fire behaviour. The forecasting tool will have the capability to: 1. Predict likely fire plume structure spatially and temporally across Australia given location and time. 2. Based on (1) above, assess how the profile of atmospheric stability and winds in the lower levels of the atmosphere will affect the surface fire behaviour. 3. Produce forecast (or prediction) maps and meteograms showing when and where conditions are favourable for fires to erode nocturnal inversions and entrain the conditions are favourable for a fire to erode/overcome stable conditions in the atmosphere above it (e.g. a nocturnal inversion) and entrain/recruit the conditions higher in the atmosphere in a way which effects the behaviour at the surface. The tool should be able to be integrated into CSIRO Spark Operational and also be able to augment assessments of fire danger made using the AFDRS. Training in the use of the tool for key operational staff is also a requirement of this project.
Estimated duration	The project duration is estimated to take two to three years
Budget	The budget envelope for this project is $800,000 – $1,200,000 (ex GST) The research team should note that this is a competitive process. Expression of Interest submissions will be assessed on value for money and justification for any funds requested.
Related national research priorities[1]	Operational response and innovation Situational awareness
Related Centre research priorities for 2024-26[2]	Next generation capability Understanding and mitigating risk

1 https://www.naturalhazards.com.au/sites/default/files/2022-05/NatHazResAus ResearchPriorities FA02.pdf

2 https://www.naturalhazards.com.au/sites/default/files/2024-07/NHRA%20ResearchPlan24%E2%80%9326%2004.pdf

Supporting organisations	→ Australasian Fire and Emergency Authorities Council Predictive Services Group (AFAC PSG) → Bureau of Meteorology → Country Fire Authority Victoria → Department of Biodiversity, Conservation and Attractions Western Australia → Department of Energy, Environment and Climate Action Victoria. → Department for Environment and Water South Australia → Department of Fire and Emergency Services Western Australia → Indigenous Desert Alliance → New South Wales Rural Fire Service → Queensland Fire Department → South Australian Country Fire Service
Centre contact	For any questions regarding this Call for EOIs, please email research@naturalhazards.com.au.
Online project briefing	For more information or questions, an online project briefing webinar will be held at **12:00pm AEST on 9 September 2025**
Submission of EOI	EOIs must be prepared using the Centre's EOI submission form and Budget Template. EOIs are to be submitted to research@naturalhazards.com.au by **5:00pm AEST on 3 October 2025**

Statement of Requirements

Background and context

Australia's most impactful bushfires are frequently driven by dynamic fire behaviour resulting from a fire plume interacting with the atmospheric boundary layer. The weather parameters that are used as inputs to fire predictions represent surface conditions. However, the layer of air above the surface (the atmospheric boundary layer) can mix and interact with a fire's plume, thereby enabling the above-surface wind and temperature to influence fire behaviour.

The air structure of the layer above the surface can determine whether fires will 'lie down' and self-extinguish or remain active overnight.

The 'escape' of several large, planned burns, particularly recently in Western Australia, has been attributed to 'mixing down' of wind from above the surface that was significantly stronger than the predicted surface winds and therefore not incorporated into burn risk assessment.

Fire spread predictions in the national fire simulator Spark[3], do not currently include above-surface atmospheric inputs, however its modular design would permit the incorporation of such information.

This concept has been developed in consultation with national and international practitioners to address a gap and an opportunity that has been identified to develop techniques that leverage the information in high-resolution atmospheric models to predict how a fire plume will interact with the atmospheric boundary layer. The research will meet a practitioner need for accurate fire predictions that:

- improve situational awareness and support safe tactical decisions and community messaging during large, intense fires
- improve planning and risk management for large, planned burns including remote burning of spinifex by Indigenous ranger groups.

The project also responds to Recommendation 20 of the New South Wales (NSW) State Coroner's Inquests and Inquiries into the 2019/2020 NSW Bushfire Season[4].

3 Spark: Predicting bushfire spread – CSIRO

4 Inquests and Inquiries into the 2019/2020 NSW Bushfire Season | Communities and Justice

Project description

There is a clear requirement expressed by national and international fire and land management agencies, and documented in the NSW National Coronial Inquiry, for a tool or process that can be applied to predict how a fire plume will interact with the atmospheric boundary layer.

The fire spread models in Spark provide sufficiently accurate guidance under surface-based weather conditions. However, they do not currently provide accurate predictions for high-end events when above-surface fire-atmosphere interaction processes can become significant drivers of fire activity.

As such, the currently available prediction tools do not meet all the needs of operational decision makers in some of the worst and hardest to foresee circumstances.

This project fills a critical gap in fire prediction and fire-risk assessment methods, which do not currently include above-surface processes. These are particularly relevant for large fires, which have the greatest impact to communities and the environment and place the greatest pressure on emergency management resources.

The aim of the project is to develop a forecasting tool, driven by high resolution atmospheric modelling, that provides an objective measure of the influence of the above-surface atmospheric layer on fire behaviour. The forecasting tool will have the capability to:

1. Predict likely fire plume structure spatially and temporally across Australia given location and time.
2. Assess how the profile of atmospheric stability and winds in the lower levels of the atmosphere will affect the surface fire behaviour.
3. Produce forecast (or prediction) maps and meteograms showing when and where conditions are favourable for a fire to erode/overcome stable conditions in the atmosphere above it (e.g. a nocturnal inversion) and entrain/recruit the conditions higher in the atmosphere in a way which effects the behaviour at the surface.

Expected outputs

Core outputs

Outputs are the products and training that are expected to be delivered by this project.

The project will deliver an operationally practical and effective tool that forecasts the key fire plume and above-surface meteorological conditions.

The forecast tool-related project outputs will be:

- sufficiently simple to be easily interpreted by practitioners in fire-weather and fire-prediction operations
- sufficiently complex to capture the essential processes that drive plume – fire behaviour
- sufficiently modular that the forecast tool may be updated to incorporate future advances in scientific knowledge.

The tool should be able to be integrated into CSIRO Spark Operational and also be able to augment assessments of dire Danger made using the AFDRS.

The project will demonstrate the above outputs through an operational trial, accompanied by a roadmap with resourcing requirements, describing a final operational implementation of the tool.

Project deliverables must include training in the use of the tool for meteorologists, fire behaviour analysts, and other operational decision makers who may be specified by the Project Management Committee.

Project outputs will also include:

- A final report – including identification of future research opportunities
- Stakeholder presentations
- Academic publications
- A project plan and plain language statement
- Quarterly progress reports
- Project evaluation report
- Relevant communications outputs including but not limited to presentations and posters

Collaborative Approach

Researchers are expected to undertake the research using a collaborative approach to assist in the translation and transfer of knowledge to end-users and to ensure the project meets their needs. Researchers are encouraged to outline their approach to ensuring effective collaboration which could include embedding researchers within end-user organisations for a period of time.

Anticipated outcomes

The project will build on existing partnerships between the research and practitioner community to deliver operationally relevant outcomes. The project will deliver improved outcomes and risk assessment for prescribed burns and hazard reduction burns as well as improved situational awareness and messaging during bushfires

The project outcomes will support better decision making for protecting communities. Prediction of fire plume structure for a given fire size and intensity may be included in communications to communities and media as well as incident management teams, which will inform evidence-based decision making by community members and de-sensationalise media coverage.

The project will enable improved objective risk management of fire processes at planned burns and wildfires that is nationally and internationally relevant, and the methodology will improve assessments of future fire risk and fire behaviour under novel climate regimes.

The project outcomes will benefit the general community by:

1. improving the accuracy of operational decision making, community warnings and fire spread predictions.
2. safer prescribed burning, with fewer unexpected fire runs
3. improving understanding of plume behaviour and visual cues to benefit the firefighting community by providing real-time awareness of:
    i. changing fire-ground hazards,
    ii. hazards for fire-fighting aircraft.

Quality control and reporting

The project will be overseen and supported by a Project Management Committee (PMC) comprising the Principal Researcher, a Centre representative, and at least one stakeholder representative. Composition of the PMC will be determined in consultation with the Principal Researcher.

Reports

The Centre expects that the outputs delivered by this project will meet the highest scientific standards and will be suitable for publication on the Centre website and in industry newsletters, as well as in high-quality scientific journals.

The successful research organisation/s must co-develop with end-users a project plan and project summary using the Centre's templates. The project summary should explain in plain language what the project is about, what questions it intends to answer and describe the expected practical outputs that will make use of the research findings. The project plan must be approved by the PMC and will become an attachment to the contract.

Reports (and any supporting material) must be submitted to the PMC's satisfaction and will be subject to review by PMC members. The project team will be required to ensure an internal peer review process is undertaken prior to the final report being submitted.

Milestone reporting

The project team must report all milestone deliverables and engagement activities into the Centre's Project Management System. This will include sufficient justification for the completion of milestones to the satisfaction of the PMC and the Centre.

Communication

To further assist with quality assurance, it is expected that:

- regular PMC meetings will be held
- the project team will use a consultative approach, documented in quarterly reports
- the Principal Researcher will give periodic presentations to key stakeholder groups to gain critical feedback on project milestones.

Additional quality control processes may be agreed as part of the project planning process.

Contractual Arrangements

A copy of the Research Services Agreement, the proposed form of contract for the purposes of this project, can be found here

The Centre reserves its rights to make amendments to the form of contract.

This agreement should be reviewed by applicants as part of the EOI submission.

If you would like to request amendments to any of the terms and conditions set out in the proposed form of contract, details of the proposed changes and the reason the changes are requested must be included in the EOI submission form. Requests for any changes will be at the sole discretion of the Centre.

Selection as a shortlisted or preferred provider does not give rise to a contract (express or implied) between the shortlisted or preferred provider and the Centre for the supply of goods or services. No legal relationship will exist between the Centre and the shortlisted or preferred provider until such time as a binding contract in writing is executed by both parties.

In the case of consortiums, the Centre requests that one consortium member be nominated as Lead Research Provider and take responsibility for subcontracting other parties.

Natural Hazards Research Australia

Submitting an expression of interest

Application and review process

The Centre will conduct an independent assessment process for the selection of a research provider to deliver the Research Project. An Assessment Panel will conduct evaluation of the EOIs that are received. Where required, the Panel may conduct interviews, request presentation or referee checks as part of the assessment process.

Following the assessment process the Centre may appoint one or more successful Applicants on NHRA contract terms. Under the NHRA contract, the preferred provider will co-develop a detailed Research Plan with input from key stakeholders.

Key dates

27 August 2025	Call for EOIs opens
9 September 2025	Online project briefing
3 October 2025	Due date for EOIs

Submission Requirements for this EOI

Project teams responding to this EOI are required to submit their response using the Centre's EOI submission form and Budget Template. Submissions must include:

- a statement of capability (max 600 words), including the proposed contributions of each research team member to the project.
- a statement (max 400 words) about the diversity of the project team
- a statement (max 400 words) about the project's inclusion and respect of First Nations peoples, philosophies, cultures, rights and/or knowledges
- an outline (max 1000 words) describing how the project team intends to approach the project, strategies for effective collaboration and an indicative methodology
- an indicative schedule of work and interim milestones/project outputs as described in this document
- a proposed project budget in line with the budget envelope provided, including details of any in kind contribution from research organisation/s – a detailed budget to be provided using the downloadable Budget Template provided on the Centre's website
- a clear statement (max 400 words) describing the outcomes that will be delivered for this project and how they will be used by stakeholders
- a clear statement (max 400 words) describing the outputs that the proposed approach to this project will deliver and how the findings could translate into practice
- a statement (max 500 words) demonstrating the project team's relevant industry and stakeholder engagement
- a risk management statement and confirmation if Ethics approval is required for the project (max 500 words)
- any requested changes to the Centre's proposed form of contract
- up to two-page CVs for each proposed project team member.

Additional information

Frequently asked questions

Additional information provided to individual respondents will also be published on the Centre's website to ensure access to all interested parties. Respondents are encouraged to check the website for any additional information via these published FAQs, prior to the closing date.

Online project briefing

An online webinar scheduled for **12:00pm AEST 9 September 2025** will provide a more detailed briefing of the project and the opportunity for interested parties to pose specific questions.

Registrations for this webinar can be made via the project page on the Centre's website. Once completed, a recording of this webinar will be posted to the website to ensure all interested respondents have access to this information.

Evaluation criteria

After the closing date, the Centre will review submitted EOIs against the evaluation criteria below. The evaluation criteria provide an indication of those matters that should be included in the EOI and supporting material – details are provided in the table below.

The Centre reserves the right not to offer the work, or only allocate a proportion of the available funding, if a proposal does not meet the Centre's needs. The Centre reserves the right to invite any other specific researchers as it sees fit to submit proposals before or after the closing date.

Mandatory evaluation criteria

- **Registered Australian business**: The Respondent holds a valid Australian Business Number (ABN) or Australian Company Number (ACN)
- **Public liability insurance:** The respondent has or will obtain appropriate insurance
- **Specific research and stakeholder engagement capability:** Project science deliverables will require training of operational teams and experience in the development of utilisation pathways for the research outputs which are consistent with their operational needs. Accordingly, to be considered for this project, the project proposal requires demonstrated expertise and/or experience in training Fire Meteorologists, Fire Behaviour Analysts, and other decision makers in complex fire science and supporting them with operational meteorological tools. Submissions to this Expression of Interest must clearly explain how their expertise addresses the project requirements outlined here.

Evaluation criteria	% weighting
Research capability: the capacity and capability to deliver an excellent research project in an Australian environment	20
Project approach: a demonstrated understanding of the project requirements and a proposed project approach and methodology that is appropriate, feasible and robust Relevant outline of a collaborative approach to assist in the translation and transfer of knowledge to end-users and to ensure the project meets their needs.	20
Project outcomes and outputs: demonstrate a high-level understanding of the intentions of the project and how outputs/outcomes translate to practice	20
Industry engagement: strong track record of industry engagement with the ability to support and influence Australian disaster management at a national or state/territory level through interaction with key stakeholders	20
Value for money: value with money refers to an application representing an efficient, effective, economical and ethical use of Centre resources. Consideration of the relevant financial and non-financial costs and benefits of each application including, but not limited to: → the quality of the application and activities represented by the technical assessment → fitness for purpose of the application in contributing to Centre objectives → the potential Research Provider's relevant experience and performance history → whole of life costs (in-kind, other costs, risks, legal risks)	20