Improving environmental and human health monitoring during natural disasters: EPA Victoria's Flood Recovery Vehicles Project

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Key Points

- EPA Victoria has a newly uplifted flood response capability across regional and metropolitan Victoria.
- The capability and equipment requirements for real-time screening and monitoring of pollution was developed, and funding obtained for specialist vehicles and associated technical and safety equipment.
- EPA field staff across the state were trained to respond, test and monitor water quality impacts using the new capability.
- EPA can now provide science advice rapidly to critical emergency services and the wider community to minimise harmful impacts to public health and the environment.

Abstract

During widespread floods affecting Victoria during 2022-2023, EPA was tasked with measuring risks to public and environmental health across the state. Stemming from a shortage of real-time environmental data available during the floods, EPA recognised they could deliver an enriched service if they had greater regional science capabilities. The State of Victoria provided funds to deliver the program.

EPA delivered a state-wide science capability uplift in Victoria's regions. The team reviewed best-practice scientific equipment to monitor and screen the environment rapidly to inform the community of environmental risks to human health and environmental risks. They procured an array of equipment and custom designed vehicles to act as mobile laboratories capable of navigating safely through emergencies.

The project enhanced the way EPA Victoria conduct in-field screening for air, water, and soil contaminants to rapidly understand environmental impacts following natural disasters and other major pollution events. The project delivered a fleet of emergency response 4x4 vehicles (mobile laboratories) with fit-for-purpose screening and monitoring equipment at 7 regional locations across Victoria. Training was delivered to over 135 field staff - providing greater coordination between science and regional units whilst improving and implementing field safety and equipment practices.

EPA Victoria are now able to rapidly deploy trained staff into emergencies with the ability to screen and monitor the environment for impacts of major emergencies. The new enhanced capability allows EPA to deliver timely public communications backed by scientific evidence.

Keywords

Flood Monitoring, Emergency Response, Science Uplift

Introduction

Environment Protection Authority Victoria (EPA) is a technical support agency for emergency management in Victoria. During a major pollution event EPA:

- provide technical and scientific information and advice to emergency and recovery services.
- provide sampling and monitoring during emergency events.
- deploy incident air monitoring equipment at emergency services' request.
- report and give advice on the environmental impacts and health risks associated with pollution and waste (such as smoke, and poor water quality).

During the 2022-2023 floods large areas of Victoria were heavily impacted by floodwaters. EPA was part of the multi-agency response to the flood emergency and responded across the state, requiring many EPA resources over many months. Once the flood waters receded and the emergency finished, EPA put forward a plan to uplift scientific capability in the regions allowing for a rapid response to future emergencies.

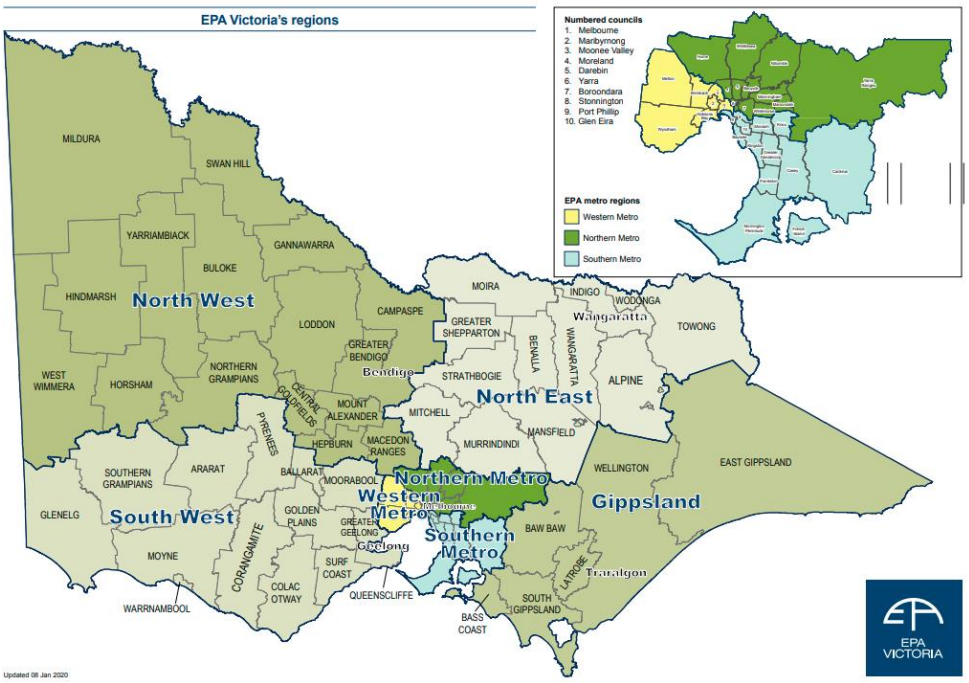

Figure 1. EPA Victoria's regional office locations

The Flood Recovery Vehicles Project delivered 8 custom designed vehicles with the ability to rapidly monitor environmental and human impacts from a range of natural and man-made disasters whilst keeping a focus on staff safety. A vehicle was to be maintained in each of EPA's 7 regional locations (Figure 1) with the 8th remaining with EPA's Water Sciences Team based in Melbourne. Staff from every EPA office was to be trained in how to use the monitoring equipment and response vehicles, collect samples, and maintain staff safety whilst deployed to incidents.

Methods

Custom service bodies were designed which would be capable of carrying all scientific equipment required, provide power to instrumentation, allow clean and secure working benches to utilise the equipment and safely store potentially hazardous samples whilst keeping staff safe from contamination in the vehicle.

Four-wheel drive dual cab utilities were chosen (Ford Ranger) with suitable modifications for accessing remote emergency incidents such as enhanced suspension, all-terrain tyres, bullbar, amber hazard lights, heavy duty towbars (Figure 2).

Figure 2. EPA's specialised emergency response monitoring vehicle

Based off EPA's existing emergency monitoring equipment and a review of new and best practice approaches the team identified a range of instruments that were capable of rapidly monitoring water, sediments, air and gases in situ (Figure 3). These instruments were:

YSI ProDSS water meter – measurement of pH, temperature, electrical conductivity, salinity, turbidity, dissolved oxygen

Advanced water quality test strips – measurement of pH, alkalinity, ammonia, nitrate, nitrite, phosphate, lead, iron, copper, nickel, chlorine, aluminium, arsenic, cyanide, and zinc.

TECTA microbial water quality monitoring device – measurement of *E. coli* and enterococci bacteria within 4-24 hours.

Drain inspection camera – for recording photos and videos in hard-to-reach drains to monitor extent of water pollution.

Thermal Imaging Camera – for viewing and recording the extent of water pollution on the surface (such as oil) in low light or dispersed plumes. Also capable of measuring temperature from fires/chemical reactions both above and below ground.

GasTec Pump, MiniRAE and MultiRAE gas/air monitoring devices – allows the measurement of volatile organic compounds, oxygen, carbon monoxide, hydrogen sulphide, lower explosive limits, hydrogen fluoride and ozone in the atmosphere around emergency incidents and when collecting hazardous samples from the environment.

Sampling equipment for the safe collection of hazardous samples and storage – sampling poles, fridge/freezer, trowels, bottles, jars, bags

Personal Protective Equipment (PPE) and Decontamination – a full PPE kit was supplied to safely collect samples and decontaminate staff and equipment after entering a hazardous environment as well as waste management.

Figure 3. EPA's new monitoring equipment capability

Training of staff across EPA's regional offices was an important part of the project. The project team attended all 7 regional office locations and the EPA Science office to carry our training of over 135 personnel and deliver the vehicles and equipment.

Conclusions

Since commissioning the equipment and training field staff, the new capability has been used for pollution response across all regions and improved the state's response to pollution events and natural disasters and ability to provide public health advice from pollution. EPA Victoria are now able to rapidly deploy trained staff into emergencies with the ability to screen and monitor the environment for impacts of major emergencies. The new enhanced capability allows EPA to deliver timely public communications backed by scientific evidence.

Acknowledgments

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