

*Winner of Actizyme Prize for Best Operator Paper at the WIOA Vic Engineers & Operators Conference, Bendigo, September 2007*

## **IMMEDIATE & LONG TERM IMPACT OF BUSHFIRE ON STORAGE OPERATIONS**



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*2<sup>nd</sup> Annual WIOA NSW Water Industry Engineers & Operators  
Conference*

*Jockey Club - Newcastle*

*8 to 10 April, 2008*

# IMMEDIATE & LONG TERM IMPACT OF BUSHFIRE ON STORAGE OPERATIONS

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## ABSTRACT

Climate change hypothesis', if correct, points towards bushfires becoming increasingly prevalent in Eastern Australia. Consequently it is imperative that rural utilities implement sound bushfire risk management protocols across all aspects of their business operations. Similarly recovery from bush fires is optimised through advanced planning.

This paper identifies a number of short, medium and long-term bushfire risks confronting water authorities with assets in rural areas and suggests treatments for those risks.

Above all else it endeavours to evoke an awareness of the risks and the associated potential for damage to assets, degradation of water quality and mental trauma to staff that is created by bushfire. It also aims to highlight the need for sound advanced preparation for, and management of, future events.

## KEY WORDS

**Wildfire:** Uncontrolled fire moving rapidly through a natural environment.

**Bushfire:** A managed (not necessarily controlled) fire occurring within native vegetation.

**Hygrophobic:** Unable to absorb moisture.

## 1.0 INTRODUCTION:

Southern Rural Water (SRW) operates several large dams and smaller diversion weirs in southern Victoria. Amongst these are two high hazard dams (Lake Glenmaggie and Blue Rock Lake), and a major diversion weir (Cowwarr Weir) located in Gippsland. These sites are critical to water harvesting and delivery for a variety of stakeholders. They provide raw water to Victoria's major power generators, industrial and urban consumers within the Latrobe Valley, Macalister Irrigation District customers and environmental flows to the rivers of the Gippsland Lakes system.

Lake Glenmaggie spans the Macalister River; Blue Rock Dam the Tanjil River and Cowwarr Weir diverts water from the Thomson River.

In December of 2006 these sites were all threatened by fire designated as the Great Divide South Bushfire. Concurrently several staff and the assets at Cowwarr Weir were placed at threat as a consequence of deliberately lit wildfire.

The lessons learned by SRW from the Great Divide South bushfire and the associated wildfire can be utilised to enable water authorities to better prepare for future bushfire or wildfire events and ensure improved risk management of fire threat to capital infrastructure, physical and natural environments and trauma to individuals and the broader organisational community.

## 2.0 DISCUSSION

### 2.1 Climate Change & Storage Management

As storage operators we often view floods as the predominant risk to our structures, but climate change may soon escalate bushfires to a similar level of risk.

The Bureau of Meteorology suggests “Australia and the globe are experiencing rapid climate change. Since the middle of the 20th century, Australian temperatures have, on average, risen by about 1°C with an increase in the frequency of heatwaves and a decrease in the number of frosts and cold days. Rainfall patterns have also changed - Australia’s northwest has seen an increase in rainfall over the last 50 years while much of eastern Australia and the far southwest have experienced a decline.

This change in climate may well result in more intense and variable rainfall followed by long periods of hot dry weather such as has been experienced over the last decade. Potentially this will lead to periods of rapid growth followed by long dry spells that dry vegetable matter quickly and create increased natural dry fuel loads. The oft held belief that previously burnt areas will not be subject to subsequent fire threat may well be challenged in the future as fuel loads will quickly amass again.

The consequential threat to capital infrastructure, physical and natural environments and trauma to individuals and the broader organisational community is immediately apparent.

### 2.2 Case Study of a Wildfire Event – Cowwarr Weir

In December 2006 SRW recognised that the Great Divide South fire had the potential to place several of its sites at risk and consequently rapid action was taken to prepare them for potential onslaught of that fire. All sites were assessed for risk and priorities set for protection of those potentially affected.



Lake Glenmaggie was subsequently assigned a high priority as the infrastructure for that site was located within a natural bush environment. Subsequently, available resources were concentrated on protecting that asset against threat from fire or ember attack. In order to protect the integrity of that site all overground plastic water pipes were either buried or replaced with steel, all building apertures were screened against ember intrusion, fire protection equipment was tested, sprinkler systems were installed on critical buildings and residences, excess dry fuels were cleared from critical infrastructures, spouting was filled with water, personnel fire protection kits were prepared (torches, woollen blankets, fire beaters etc), fire reports were monitored continually and personal and corporate fire plans reviewed and communicated.

Cowwarr Weir and Blue Rock Dam, on the other hand, were classified as low risk as they were located in large cleared areas and surrounded by pasturelands. Consequently minimal resources were assigned to fire protection at those sites. This proved to be a mistake that would later place two staff and a family member at extreme risk and expose the broader organisational community to unnecessary trauma.

On December 19<sup>th</sup> a deliberately lit wildfire (ancillary to the Great Divide South bushfire) broke from nearby bushland and raced at an alarming and unchecked rate across dry farmland towards the Cowwarr Weir. Staff preparing the site against potential fire threat were suddenly forced to flee to the protection of the nearby weather board residence. The fire then spread rapidly to the adjoining garage and immediately placed the residence under dire threat. (Fortunately staff had all completed the DSE "Basic Wildfire Awareness" accreditation and were well skilled to manage the fire threat.)

Concurrently stored mulch heaps and exposed fodder ignited, stored tyres smouldered, and fencing commenced to burn and the fire entered the office/workshop complex. At the height of the firestorm power, phone and water supply failed, daylight was obliterated and windstorms created by the fire battered the area. Consequently the people at threat became uncertain about the ability of the wooden residence to withstand the onslaught of the fire and made plans to evacuate to a safer location. They were able to communicate with their supervisor and emergency services but no direct support was available and, at that time, they believed they were at extreme risk of being engulfed by fire. During lulls in the wind they were able to leave the building and extinguish spot fires threatening it.

At the same time reports were being received at ABC radio that the Cowwarr Weir residence was on fire and two women residents were missing. Consequently the broader communities (both domestic and organisational) were exposed to trauma as they were unable to gain concise information about the destiny of the people. Unfortunately this report continued to receive national airplay for a further 12 hours regardless of the fact that the ABC was contacted and informed about the true situation. Consequently, after the fire front had passed several people placed themselves at extreme (and unnecessary) risk by returning to the site to provide immediate assistance to the supposedly trapped people.

During the event the supervisor was provided with constant updates via mobile phone communication with the effected staff. However logistical problems arose as the event unfolded caused by the unprecedented number of calls being made to the affected staff by concerned third parties. Consequently there was concern that mobile phone batteries would fail.

After several hours the fire front had passed and the affected people emerged to survey the damage and advice emergency services that they were no longer at risk.

Rehabilitation of the physical assets commenced immediately and was still in progress several months later. Throughout the recovery period SRW relied heavily on support and assistance from external utilities.

SRW also elected to invest heavily in risk reduction measures that would protect staff and assets against future bushfire threat.

## 2.3 Lessons Learned from a Bushfire Incident

Knowledge gained from the wildfire at Cowwarr Weir can be summarised as follows:

- The firestorm that struck Cowwarr Weir on December 14<sup>th</sup> enabled SRW to gain considerable learning about potential future events.
- The Cowwarr Weir wildfire event highlighted potential for risk to staff, contractors and physical assets.
- Incident of wildfire/bushfire is emerging as the most prevalent risk for water storage authorities.
- Fire activity cannot be predicted with any accuracy. Consequently similar standards of protection must be applied to comparable sites
- Water authorities who have assets in rural locations must ensure there is a clearly enunciated and communicated fire action plan in place at all times.
- Resources must be invested in preparing rural water locations for the eventuality of Wildfire/ Bushfire attack.
- Water authorities must undertake regular fire reviews and audits at all sites at risk of bushfire.
- Fire plans must be tested and rehearsed regularly.
- It is advantageous to ensure all staff undertake Basic Bushfire Awareness accreditation (Course available at [www.dsetraining.org.au](http://www.dsetraining.org.au))
- Sensible actions will ensure that firestorms can be confronted and managed if required.
- Comprehensive preparation for a firestorm is required if mental and physical trauma is to be avoided.
- Personnel external to the fire can be traumatised by the uncertainty surrounding a fire event (The SRW CE stated after the fire “I never want to have staff placed at such a risk again”)
- It is essential to establish a working relationship with local media to ensure released information is accurate and does not place others at risk.
- Reliable communication with staff is essential. (SRW Headworks staff have been issued with trunk radios, they will be issued with lone worker tracking devices and a procedure developed requiring them to divert their mobiles to a central location during emergency incidents in order to minimise the drain on their mobile phones and allow them to concentrate their energies on the incident.)

## 2.4 The Aftermath of Bushfire

### ***Bushfire Damage to the Natural Environment***

The Macalister River rises in steep hilly and rocky country on the side of Mount Wellington within the Great Dividing Range. The Great Divide South bushfire of 2006 burnt through large portions of the 1891 square kilometre catchment of the Macalister River that feeds Lake Glenmaggie.

This was an extremely “hot” bushfire that burnt most of the vegetation and destroyed much of the native seed stocks of the catchment. Drought had already desiccated the catchment and the heat of the fire burnt the soil so severely that it was later defined as being hygrophobic.

Many months later under-story vegetation had not recovered and many of the mature trees within the catchment were still struggling to regenerate. This meant that rainfall retention within the catchment was dramatically reduced. This has dire consequences for future run-off and the quality of water harvested from the river.

### ***Heavy rainfall in the Catchment***

Several months after the bushfire event, and whilst rehabilitation programs were still occurring, rainfall of approximately 70 mm in 24 hours fell within the Macalister River catchment. Severe mudslides occurred in the village of Licola and during the same period devastating erosion took place in the steeper parts of the catchment.

As a consequence the turbidity of the river shot off the scale and the local urban water supply authority was hampered in its endeavours to supply safe drinking water to its customers. (In fact several towns that had relied on trucked water throughout the drought were now forced to continue that reliance for a different reason.)

Lake Glenmaggie acted as a settlement pool and became critical to the reduction of turbidity for the downstream releases. Consequently SRW worked closely with the local urban water authority to develop strategies that ensured water released from Lake Glenmaggie was of the lowest practicable turbidity.

## **2.5 Floods**

Less than 6 months after the bushfires, and whilst fire rehabilitations were still underway, heavy rainfall fell in both the Thomson (Cowwarr Weir) and Macalister (Lake Glenmaggie) catchments resulting in the biggest floods to occur since European settlement. When the run-off from that rain event commenced receding secondary rainfall again escalated flood levels in the streams.



**Figure 2:** *Flood at Lake Glenmaggie June 2007*

The result was devastating with many dwellings and buildings being destroyed in both the upper and lower catchments. Much of the community infrastructure (roadways, bridges, parks etc) was destroyed and burnt debris and fallen trees arising from the bushfires entered the streams and were carried downstream to the storages.

Consequently Lake Glenmaggie and Cowwarr Weir created an artificial obstruction to the debris travelling downstream. SRW was obliged to employ mechanical means to remove the debris in order to ensure the dams would continue to function as designed. In addition the size, volume and intensity of the debris travelling downstream caused considerable damage to the structures. (Eg. Cowwarr Weir was later dewatered to remove debris from the pool to permit the floodgates to be fully closed without obstruction. The protective log boom was also destroyed by this event.)

Staff were also placed under duress and required to work long hours in order to guarantee that the integrity of both structures were not compromised. They were also confronted with public backlash about releases that impacted on downstream properties. The damage took many months and approximately \$3.5 mill. to repair. This severely tested SRW resources during the recovery period.

Fortunately, assistance from external public utilities (eg. Catchment Management Authority, DSE, City Councils etc) ensured that SRW was able to quickly resume “normal” operations and muster its resources to prepare for future incidents.

The high sediment load has potentially reduced storage capacity and extensive survey will be required to determine the new volume of Lake Glenmaggie.

Stock losses from the upper reaches were high and several were carried into the lake thus necessitating a complex removal or disposal program. Once again SRW found itself heavily reliant on the support and assistance of external utilities during the recovery period.

## **2.6 Future Floods**

The magnitude, frequency and intensity of future floods is indeterminate. However early indications are that flash flooding will be a constant enemy of SRW operations for years to come as the ability of the soil to retain and infiltrate rain events has been dramatically reduced.

This has increased the demand for resources required to monitor and route rainfall events through Lake Glenmaggie, Blue Rock Lake and Cowwarr Weir. Consequently increased staffing is necessary and has been budgeted for to meet future events.

## **3.0 CONCLUSIONS**

Bushfires threaten infrastructure, water quality and organisational capacity to cope. They have dire and long-term consequences that impact on organizations, individuals and natural environments for many years after their passing. If severe enough, they will have a cascading effect on ongoing operations for many years.

Climate change theory suggests that the length and magnitude of dry weather will increase but be interspersed with periods of intense rainfall. This will result in increased fuel loads within the natural environment.

Recovery from any incident invariably requires co-operative actions from a number of associated organizations. Bushfire is no exception to this. Consequently it is essential that partnership arrangements be established and maintained, in advance, with external support organisations and utilities.

As in all incidents, good communications assist in managing that incident. Communications of accurate, timely and succinct information to the media plays a vital role and organisations need to develop strategies for managing this in advance of any such event.

The best defence against the mental traumas and physical impact of bushfire is to develop, review and rehearse bushfire action plans on a regular basis

## **4.0 REFERENCES**

Bureau of Meteorology Australian Climate Variability and Change