

# STORM RECOVERY POST 2011 & 2012 VICTORIA – LOCAL GOVERNMENT’S EXPERIENCE FROM THE NORTH AND NORTH-WEST REGIONS

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## Introduction

The theme of the conference is “Of Utes and Flooding Rains”. Utes remind the author of Deniliquin (where else?) and the Edward River, an anabranch of the Murray to which a number of Victorian rivers discharge. Flooding rains are behind why this paper has been written. During the period 2010 to 2011 three major storms culminated (during January 2011) in a 90 kilometre long by 55 kilometre wide body of floodwater that moved inexorably down the Loddon Valley to the Murray River.

This paper is confined principally to addressing how one of the councils in the region, Mount Alexander Shire Council, dealt with recovery of particularly its road and associated drains, flood ways and bridge infrastructure after the three storm events experienced between September 2010 and January 2011, and a fourth experienced during the recovery phase in February 2012. The paper also touches upon flooding of the Loddon and Campaspe river plains.

The emergency responses to these storms deserve a separate paper in themselves, and were the subject of a series of submissions by local councils in the region to the Victorian Government’s “Towards a More Disaster Resilient and Safer Victoria” Green Paper (2011).

During May 2011 a National Partnership Agreement (NPA) for Victorian flood reconstruction and recovery was established by the Commonwealth of Australia and the State of Victoria. Its objective was to “...contribute to the reconstruction and recovery of communities affected by the 2011 floods in Victoria.” (NPA 2011). High level arrangements were established to assist in achieving this aim. An Australian Government Reconstruction Inspectorate was established to oversee the reconstruction activity and ensure that value for money was achieved. Two task Forces were set up under this Agreement; the Commonwealth one located in the Department of Regional Australia, Regional Development and Local Government; and the Victorian Recovery Cabinet Taskforce chaired by the Premier of Victoria. (NPA 2011 – p.7).

The case study here, being Mount Alexander Shire, is situated within the upper and middle catchments of the Loddon and Campaspe rivers. It is located in Central Victoria, and some 120 kilometres north-west of Melbourne. It comprises an area of 1530 square kilometres, has 523 kilometres of local sealed roads, 776 kilometres of gravelled local roads, and a total population of 18,300. Towns include those of Castlemaine (population 8,000), Maldon (population 1,600), Newstead (population 490) Campbells Creek and Chewton, as well as a number of hamlet towns such as Guildford, Baringhup, Elphinstone, Harcourt and Metcalfe. It is famous for its rich history of the early gold rushes that occurred from the 1850s, and indeed, Maldon was declared Australia’s first notable historical town.

In comparison to other councils in Victoria, it is one of a group (Whelan M 2010) that has a very small rating base yet is required to maintain a very long network of local public roads. This perhaps led to relatively poor levels of maintenance of its roadside and cross culvert drainage systems, particularly after a period of about 13 years of severe drought conditions.

### **Storm Events to January 2011, and February 2012:**

After the 13 years of drought a series of storm events struck the region over a 17 month period. Although the total rainfall might appear relatively insignificant in quantum compared to some other parts of Australia, the amounts were huge for the region, and overwhelmed the drainage infrastructures in place. The first significant storm occurred on 4 and 5 September 2010. Details of the four events and the specific damage recorded at the time are detailed below:

#### *4, 5 September 2010 Storm:*

- 56 millimetres recorded at Castlemaine
- A number of large culverts severely damaged and repaired
- A number of local roads damaged and repaired

#### *25 – 28 November 2010*

- 142 millimetres recorded at Castlemaine
- 11 households flooded
- 15 Council – owned community buildings severely damaged
- 2 bridges severely damaged
- Repaired culverts damaged again

#### *10 – 15 January 2011*

- 195.6 millimetres recorded at Castlemaine
- On 5 February 2011, a further 101 millimetres of rain recorded at Castlemaine
- 61 households flooded
- 40 farming properties
- 450 kilometres of local roads damaged
- 16 bridges and major culverts damaged
- Repaired culverts damaged again

#### *27, 28 February 2012*

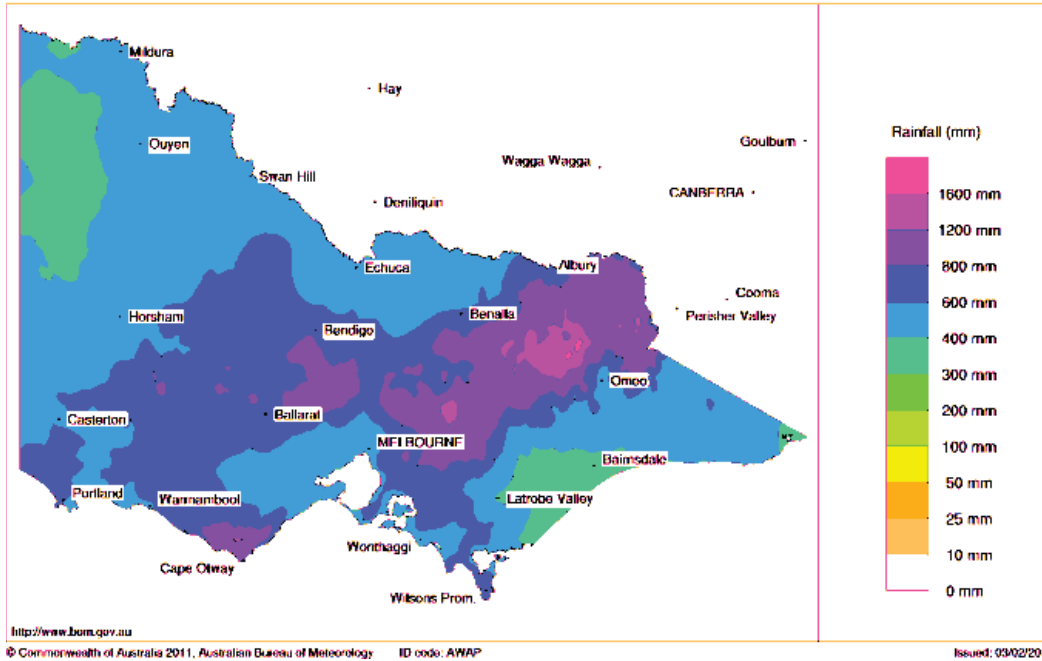
- 156.8 millimetres recorded at Castlemaine; 97.8 millimetres on 28 February.
- 75 millimetres fell within a 90 minute period
- 115 households damaged (11 homes and 6 shops severely flooded)
- 20 local businesses suffered damage
- 11 council-owned community buildings damaged again
- 50 more local roads damaged, a large number of local roads already damaged by the January 2011 storm more extensively damaged, and further damage to a (relatively small) number of rehabilitated roads
- Repaired culverts damaged again

*Rainfall Averages - Castlemaine*

<b>Month</b>	<b>Mean Rain (millimetres)</b>	<b>Median Rain (millimetres)</b>	<b>Mean Rain Days (per month)</b>
Jan	41.0	30.8	6.1
Feb	39.1	19.2	5.1
Mar	34.6	22.6	6.3
Apr	40.7	33.5	8.0
May	57.3	47.2	11.7
Jun	55.2	42.3	14.2
July	60.4	57.7	16.6
Aug	66.7	67.4	15.9
Sept	61.3	50.8	13.3
Oct	60.2	49.2	11.4
Nov	49.5	40.0	8.8
Dec	42.1	35.0	7.5
<b>Annual</b>	<b>607.3</b>	<b>611.0</b>	<b>122.4</b>

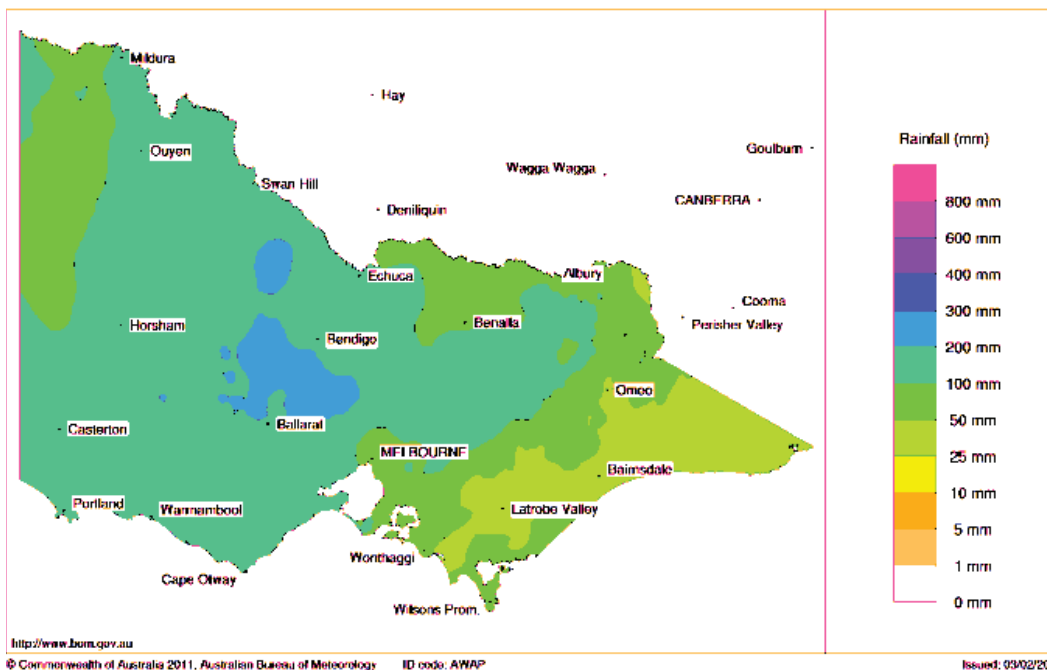
To put the January/February 2011 events into further perspective – especially in relation to events that are experienced in sub-tropical and tropical regions in Australia, the equivalent of nearly half the Castlemaine average annual rainfall fell in just six days.

Victorian Rainfall Totals (mm) 1 August 2010 to 31 January 2011  
Product of the National Climate Centre



Map of rainfall totals 1 August 2010 to 31 January 2011 (Victoria)

Victorian Rainfall Totals (mm) January 2011  
Product of the National Climate Centre



Map of rainfall totals for the month of January 2011 (Victoria)

It should be noted that Mount Alexander Shire is situated 40 kilometres south-east of Bendigo.



**The impact of the January 2011 storm at Kerang in the lower Loddon River catchment**

**(Photo courtesy Gannawarra Shire Council)**

Within two months of the January 2011 storm, initial estimates of restitution of assets were established by Mount Alexander Shire to be in the order of AU\$4 million. This was subsequently substantially amended. After a comprehensive investigation (completed by December 2011), the estimated costs were revised to be AU\$15 million as a result of the first three storm events. Further damage caused by the subsequent February 2012 storm event was estimated at AU\$7.2 million.

The impact of the January 2011 storm was further exacerbated by the two recent previous storm events that had saturated the same catchment during September and November 2010. There had been 100mm to 300 mm of rainfall across the entire catchment. To compare with historic events, the local Laanecoorie Reservoir on the Loddon River has a reasonably long flow gauging history. It had its second highest flow on record in January 2011, being 192,000 ML/day. The highest flow at Laanecoorie was 255,000 ML/day recorded over a century previously in 1909.

### **Funding Assistance by Australian Government:**

Soon after the first storm events during 2010 the Australian Federal Government made funding available to local councils that were within declared disaster areas as a result of the storms. The source of funding was provided through the Commonwealth's Natural Disaster Resource Rehabilitation Assistance funding. The funding was

administered through the States; in Victoria's case through its Department of Treasury and Finance (DTF), with claims processed through the State's road authority, VicRoads.

Mount Alexander Shire Council officers had early discussions with DTF and VicRoads officers in order to establish reporting protocols, and to clarify the interpretations of repair of assets, and "betterment" works.

"Betterment" was defined as

*"the replacement or restoration of an essential public asset (integral and necessary infrastructure that if damaged or lost would severely disrupt the normal functioning of a community and needs to be restored or replaced as a matter of urgency) to a more disaster-resilient standard than its pre-disaster standard."*

All costs directly associated with a betterment project, including the cost of designing and analysing the betterment component of the project, are regarded as eligible expenditure. However, the NPA (2011) requires that, for "betterment" projects to be eligible for reimbursement under the Natural Disaster Relief and Recovery Arrangements, pre-approval must be obtained from the Commonwealth before works are commenced. Such pre-approval was experienced as being well-nigh impossible; decisions still pending many months after applications were submitted.

Nonetheless council officers were advised that assets that could be repaired to the "same disaster resilience" by using different materials as required by today's standards is not defined as "betterment". Nevertheless *"additional costs incurred to increase the functionality of a repaired asset for reasons other than disaster resilience (e.g. adding lanes to a road) are not eligible for NDRRA funding..."* There were robust discussions with VicRoads staff about what could be done to ensure that what was to be repaired could be at a standard that will meet the "same disaster resilience" by using different materials as required by today's standards.

The councils were also advised that additional temporary (fixed term) staff may be employed by councils and Catchment Management Authorities for disaster recovery works provided that they can demonstrate that any spare resources that they might have or can re-allocate from elsewhere within the organisation have been used in relief and/or recovery; their own resources have been exhausted, and that additional temporary (fixed term) staff or contractors are in addition to the aggregate level of staffing within the organisation that was in place prior to the event/s. Further, they must keep records that demonstrate normal recruitment processes, clear position descriptions, and that general ledger reports are in place.

## Recovery Costs Breakdown – Mount Alexander Shire:

The following table of estimated costs were submitted to the State and Federal governments:

Works Classification	Expenditure From September 2010	Estimated Total Expenditure – 2010/2011 & 2011/2012	Estimated Total Expenditure in 2012/13	Totals \$
<b>Emergency Works:</b>				
-Sept. 10	\$20,300	\$20,300	-	<b>20,300</b>
-Nov. 10	\$313,800	\$313,800	-	<b>313,800</b>
-Jan. 11	\$488,000	\$488,000	-	<b>488,000</b>
<b>Asset Restoration Works – Local Roads:</b>				
-Gravel Rd	\$780,100	\$2,622,100	\$2,669,900	<b>5,292,000</b>
-Sealed Rd	\$167,500	\$852,500	\$1,122,500	<b>1,975,000</b>
-Bridges	\$-	\$310,000	\$995,000	<b>1,305,000</b>
-Rd Drains	\$297,300	\$2,027,300	\$2,322,700	<b>4,350,000</b>
-Supervision	\$92,200	\$314,700	\$355,300	<b>\$670,000</b>
<b>Asset Restoration Works – Other Council Assets:</b>				
-Trails & Paths	\$16,900	\$121,900	\$25,000	<b>146,900</b>
Buildings/Access & Reserves/Parks	\$292,500	\$322,500	\$120,000	<b>442,500</b>
<b>TOTALS</b>	<b>\$2,468,000</b>	<b>\$7,393,100</b>	<b>\$7,610,400</b>	<b>15,003,500</b>

<b>Works Classification</b>	<b>Expenditure to June 2012</b>	<b>Estimated Total Expenditure in 2012/13</b>	<b>Totals \$</b>
<b>February 2012 Emergency Works:</b>			
-Feb. 12	\$877,170	\$132,636	1,009,806
<b>Asset Restoration Works – Local Roads:</b>			
-Gravel Rd	\$964,924	\$1,940,124	<b>2,905,048</b>
-Sealed Rd	\$212,010	\$708,955	<b>920,965</b>
-Bridges	\$-	\$200,000	<b>200,000</b>
-Rd Drains	\$883,685	\$1,023,902	<b>1,907,587</b>
-Supervision	\$33,297	\$128,703	<b>\$162,000</b>
<b>Asset Restoration Works – Other Council Assets:</b>			
-Trails & Paths	\$5,136	\$19,458	<b>24,954</b>
Buildings/Access & Reserves/Parks	\$12,175	\$57,825	<b>70,000</b>
<b>TOTALS</b>	<b>\$2,988,397</b>	<b>\$4,211,603</b>	<b>7,200,000</b>

Close attention was paid to the regular submission of claims to ensure that the Council's cash flows were not too adversely impacted upon. The Department of Treasury and Finance did make regular advanced payments in recognition of these concerns.

The Council itself purchased most of the materials used under the Schedule of Rates contract.



## Neighbouring Councils Approaches to Recovery Works:

During 2011 the following approaches to storm recovery by neighbouring and other councils were documented by Mount Alexander Shire:

Council	Initial approach to infrastructure recovery, and projected expenditures and timeframes to achieve recovery
Hepburn Shire Council  (upper catchments)	Separate project team established to deal with flood recovery. Off-site dedicated flood recovery office with 'General Manager Flood Recovery' reporting direct to CEO. 10 staff works by external contractors. Estimated damage \$10 million.
Central Goldfields Shire Council  (upper & middle catchments)	At time had just advertised for a Project Manager reporting to Director with in-house infrastructure team assembled to assist. Initially works undertaken by contractors used by the Council for road works. Plan to supplement staff using consultants for normal Council duties. Initial estimate of damage was \$20 million.
Campaspe Shire Council  (lower catchment of Campaspe River)	Appointed in-house Project Managers; recruited additional outdoor and indoor staff specific to flood recovery. Purchased additional plant and equipment plus plant hire to undertake works. Initial estimate was \$9 million. Confident at the time that two year recovery time frame would be met.
Loddon Shire Council  (lower catchment of Loddon River)	Advertised for 3 project managers; obtained two. They report to Director. Purchased a large amount of plant to undertake recovery works. Hired 30 extra outdoor staff as "backfill positions". Bridge and sealing works to be undertaken by external contract. Initial estimate \$26 million. Confident at the time that the 2 year recovery timeframe would be met.
Gannawarra Shire Council  (lower Loddon River catchment)	Appointed external project manager to co-ordinate with in-house design engineer; both reporting to Director. All repairs being undertaken by external contractors. Initial estimate of damage \$25 million.
Mildura Rural City Council  (lower Murray River catchment)	In house "asset management team" used to manage the flood recovery. The team reports to the General Manager – Infrastructure. All repair works to be undertaken by external contractors. Aimed to complete the estimated \$12 million of flood damage by mid-2012. There was \$8.5 million estimated damage to drainage that may not be covered by Commonwealth and State government funding.
Swan Hill Shire Council  (lower Loddon catchment at Murray river.	Appointed project manager within the engineering department reporting to the Director. External contractors used. Initial estimate of damage was \$6 million. Most recovery completed by August 2011

Since the above documentation, some of the Councils modified their approaches. A workshop is planned amongst Victorian practitioners to further document what was done, identify what proved to be better practice, and what should be avoided. It is hoped that the workshop results will be available for the presentation of this paper at the Deniliquin Flood Conference.

During March 2011 Engineers Australia and IPWEA (Vic) organised a flood workshop at Echuca. As a result a summary document was produced that was aimed principally in response to the Victorian government Green Paper (2011). Unfortunately little of experiences and knowledge was shared at the workshop by those who were dealing with infrastructure recovery from the January storm. Further co-operation was limited. Indeed it was observed that there was intense competition to secure suitably equipped and experienced contractors.

### **Mount Alexander Shire's Approach to Recovery Works:**

In response to the September and November 2010 storm events, the Council used both its own resources and those of local contractors that were engaged at the time by the Council for various scheduled works.

The January 2011 storm caused so much further damage the event convinced the Council's officers to organise and call tenders for works identified to that point in time. The model that they followed was strongly influenced by what Murrindindi Shire Council did in order to recover its road infrastructure damaged by the 2009 bushfire disaster.

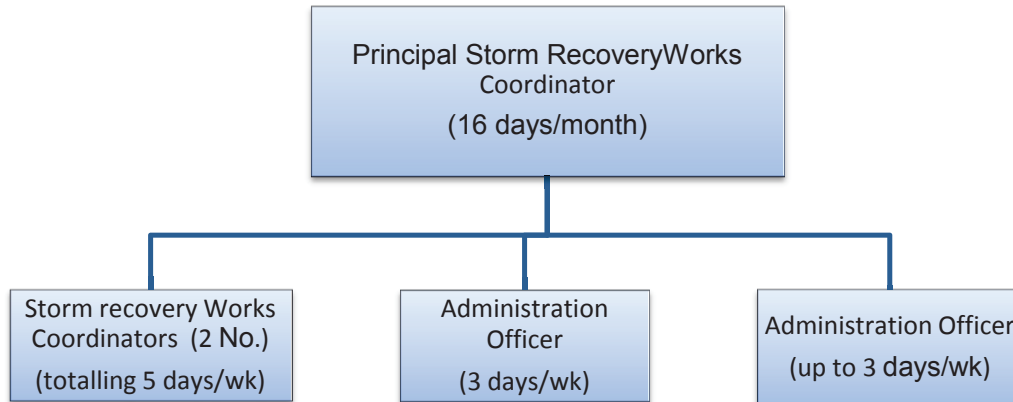
Mount Alexander Shire let a Schedule of Rates contract for recovery works. Six contractors were appointed by the Shire during July 2011. This was well prior to finalisation of the investigation of damage, although some of the investigative work had been completed. The Council had indicated in its tender acceptance that two of the contractors would be given preference for works. The responsible manager commenced these two during August 2011 plus one other.

The Council attempted to run the contract using its in-house supervisors and an in-house manager. This proved to be problematic due to the time requirements of their expected normal duties. No fixed term relief staff were engaged which was allowed to be funded under the funding guidelines. Also, by the end of 2011 a number of key staff had resigned. These included the Director of Infrastructure and Planning, the Manager Infrastructure, and the Works Superintendent.

By November 2011 the three contractors had delivered works only to the value of approximately AU\$1.2 million. It became obvious that the use of in-house staff to co-ordinate the contractors was an unsatisfactory arrangement.

By this time, and to overcome the issues identified, Council's new Director Infrastructure and Environment reviewed the council's approach. As a result, from 1 February 2012 the Council accepted the engagement of a team of flood recovery consulting engineers from its panel of consultants and backed up with external administrative support, to co-ordinate works.

The structure below was put into place



The following broad descriptions were adopted for the above personnel structure:

*Principal Storm Works Recovery Coordinator* – This position undertook overall responsibility for all storm recovery works including preparation and co-ordination of:

1. recovery works program (including contractor management);
2. a procurement strategy and co-ordination of procurement;
3. flood works progress reports to the Executive Management Team (EMT) (to include, but not be limited to, works completed, works scheduled, claims status);
4. a communications strategy (community information) inclusive of follow up upon enquiries and complaints.

*Storm Works Recovery Co-ordinators* – responsible for the coordination of storm event recovery works (including contractor management and documenting and assessing the quality of works performed).

*Administration Officers* – responsible for providing support to the storm recovery Works Co-ordinators including the processing of contractor invoices, materials ordering, work confirmation and variation correspondence, filing, processing and tracking of claims, as well as website updates, media releases, and community liaison.

In early February 2012 this co-ordination team introduced some significant changes – particularly by introducing a process where each project was required to be jointly scoped by a co-ordinator and the relevant contractor, and the contractor was required to submit an estimate for approval prior to works being undertaken. Any proposed variations were required to be highlighted by the contractor as they occurred for checking and approval by the relevant co-ordinator.

The use of external persons to assist the Council in storm recovery works was eligible to be, and was funded under the Natural Disaster Recovery funding guidelines.

Flood recovery works were prioritised as follows (consistent with VicRoads priorities):

Priority 1\* - Bridges and major culvert repair/replacement;

Priority 2 - Reinstatement of gullies threatening the integrity of roads;

Priority 3 - Road dig-outs;

Priority 4 - Reinstatement of floodway signage and delineators;

Priority 5 - Scour repairs, particularly downstream of the bigger culverts;

Priority 6 - Reinstatement of flood ways;

Priority 7 - Restoration of road drainage systems and minor culverts;

Priority 8 – Damaged road shoulders reinstatements and road re-sheets.

\*Because of the extent of damage and the sheer numbers of 125 bridges and major culverts that required closer investigation it was decided to hold over these works except for those that required obvious and urgent repairs.

From a practical and works optimisation point of view, contractors attended to the drainage repair requirements of a whole road length, so as to maximise efficiency of approach. Contractors based their operations at Metcalfe, Chewton, Walmer and Castlemaine.

Innovative solutions were trialled during the recovery works. Trials were conducted to stabilise the approaches and discharge points of road culverts, bridges, fords and flood ways particularly in the fragile granite country that is common to the Metcalfe, Maldon and Baringhup areas of the Shire. The use of geofabrics was integral to these trials. There was rip rap trialling of ford crossings. Re-sheeting trialled a mix of scoured materials salvaged from the road beds with the Guildford pit – sourced gravels, with varying degrees of success. The use of the ARRB principles outlined in its *“Unsealed Road Maintenance Manual”* (ARRB 2009) for shape and width was scrupulously adhered to as part of the recovery works. The results have been testament to these principles of good practice.

Re-sheets of damaged gravel roads were addressed towards the end of the program. The timing of the re-sheets happened to coincide with the late Winter/Spring period of July – November. Damage was caused to some of the sealed local road network as a result of the re-sheeting activities during these wetter months, and separate tenders were sought to have the repairs of these pavements undertaken. The repairs were carried out during March and April 2013.

A total of 507 quite detailed inspections of various segments of the local road network were ultimately documented. All were written up and costed (hours, plant and materials). Practically all of the Shire’s local roads and their drainage systems were inspected and assessed, as well as their general pavement state, and an assessment made about what damage may be attributed to storm/flood damage. The data was recorded upon Excel spread sheets, and where applicable, photographs taken.

These notes formed the basis of allocation of works to the six contractors. Works were allocated to contractors for repairs based on public safety, work type and location and capability. The notes became quite invaluable, because they were also used to undertake joint scoping between the co-ordinators and the contractors. Once the contractors submitted their estimates, comparisons could be made about the original

assessments of damage and what was scoped prior to works commencing. Where significant discrepancies were noticed, they were discussed amongst the co-ordinating engineers and with the individual contractors to establish reasons that might explain the discrepancies. It was found that most discrepancies could be attributed to either the extent of further damage caused by the February 2012 storm, or the degree of damage first recorded being of either a lesser or greater extent.

A regular newsletter was produced, as well as website updates distributed to local communities, throughout the emergencies and recovery periods. It was found to be important to be pro-active in informing communities about what was able to be done under the recovery effort. It was evident also that a number of road assets were severely damaged due to actions and inactions by community members, either through ignorance or lack of understanding. Examples included inadequate or non-existent driveway crossovers, eroding gullies, rubbish placed in streams, siltation of gullies and streams by poor land practices, opposition to cleaning out of roadside drains of vegetation and the like.

It was also recognised by the Shire that within particular urban areas, there were some significant deficiencies inherent in stormwater drainage systems. Ten catchments were identified that required detailed investigation. Using internal funds the Council engaged consultants to investigate and report upon these projects. The Council is now receiving funding assistance from other levels of government in order to instigate the resultant reports' recommendations.

All contractors and the co-ordinating engineers made it a practice to discuss with and listen to local community members what they saw and how they thought issues could be addressed. Most of the information was not only practical, but invaluable in gaining an understanding of what happened, and how local runoff behaved.

### **Summary of Mount Alexander Shire Recovery Works – Quanta**

Since 1 February 2012, the following was completed by the end of June 2013:

- Over 1,050,000 square metres or 26% of the Shire's unsealed road network that was damaged by the four storm events have been repaired/re-sheeted.
- 920 small culverts have been repaired, unblocked of silt, or replaced.
- 187 larger (i.e. 750 millimetre diameter or larger) culverts were repaired or replaced.
- 100 flood ways and fords have been repaired.
- 12,025 tonnes of spalls have been used to stabilise culvert and road drainage systems.
- 15,000 square metres of sealed road pavements have been repaired as a result of the storms and recovery works.
- 25 bridge abutments and major culverts have been repaired; and five large culverts and bridges have had major rehabilitation and reconstruction works completed.

### **What worked at Mount Alexander Shire; what did not:**

During the peak of the works the three consulting engineers had difficulty in coping with the volume of inspections, scoping, quality control, tracking of materials used, and contract administration requirements, despite increasing hours allocated to do so. Issues relating to specific instances of roadside vegetation damage, traffic control, the

quality and tracking of re-sheeting materials and pit operations, and delays in supply of precast concrete products also had to be addressed during this time. Further issues arose where some discrepancies between contractors' scoping estimates and invoices received were found. Reasons identified were poor record keeping by some of the contractors, delays at the Council-controlled gravel pit, precast concrete product supply delays, load limited bridges causing longer haulage routes, and other (bushfire recovery) bridge works delays (under Council control), and separately a bridge on an arterial road under VicRoads control causing significantly extended haulage routes.

The use of just one gravel pit, being the Council-owned and operated pit at Guildford, caused some unique problems of truck activity and noise affecting the nearby town. Letters were distributed explaining the heavy truck traffic, as up to 25 trucks and dogs were operating up to six loads each per day at the peak. Monitoring of commencement times had to be strictly enforced. The standard of the gravel extracted deteriorated, because there was not enough time to properly blend it at the pit.

Commonality in approach regionally was not evident.

The following is a summary of useful observations about the storm recovery experiences at Mount Alexander Shire:

- Undertaking fairly detailed and careful assessment of damage - particularly to some of the less obvious damage to infrastructure – was invaluable during subsequent recovery works;
- Establishing as early as possible with VicRoads staff, interpretations and a good understanding of what is regarded as “betterment”, and what is thought to be a reasonable and fair approach to rehabilitation using professional engineering judgement reduced the need to query claims;
- Lengthy delays by governments to decide upon funding “betterment” projects, and by authorities (e.g. Catchment Management Authority) in the provision of permits to the local council to undertake works on waterways caused delay to works;
- The frustration caused, where professional engineering judgement pointed to undertake improvement works that would overcome deficiencies in existing infrastructure, and so judged as “betterment” and may not be eligible for funding – certainly not within required delivery timeframes;
- Where a Council decides to award to a panel of contractors to undertake recovery works using a Schedule of Rates contract, there is a need to ensure that the list of required plant and their rates in the documentation is well – detailed and broad so as to cover as many situations as possible that require more specialised plant. The inherent flexibility of a Schedule of Rates contract approach proved to be important in achieving the expenditure of \$20 million over a sixteen month period. The schedule of rates contract being awarded to a number of contractors gave the local council an ability to engage some of the smaller more local contractors to undertake the recovery works, and therefore to increase emergency works local skills base. There was opportunity afforded as well in the latter part of the recovery period to call quotations and tenders for specific culvert works, bridge works and road patching works, which also provided checks and comparisons about costs of works being undertaken under the Schedule of Rates contract.



- There was identified a clear need for the Council to engage, or have available a team of experienced engineers and administrative staff to co-ordinate the recovery effort;
- There was a need to establish a robust and measurable system that can be used to monitor and control works being undertaken through a Schedule of Rates contract;
- Establishing early with the Council's finance and infrastructure staff processes and programs to track not only the work performed, but the expenditure, so that required audit trails can be satisfied for all levels of government;
- Close liaison between the recovery team and particularly Council field staff is essential to achieve the desired outcomes;
- Selection of experienced, proactive, and co-operative contractors with a high degree of flexibility in approach to recovery, and willingness to apply innovative solutions is a critical factor;
- It would have been more effective to have had at least one experienced Technical Officer, or "Clerk of Works" - type person to keep an eye on materials delivery, delivery of gravel from the Council pit, and general surveillance, especially during the period when 15 crews were on the go;
- Having regular meetings with the relevant Council Director, and providing monthly detailed reports to the Council's Executive Management Team, as well as media release articles and Council web-site updates; and
- Regularly keeping detailed records and photographic updates of the rehabilitation works undertaken.

## **Conclusion**

The recovery needs of its damaged infrastructure that Mount Alexander Shire discovered when it experienced four major storm events over a seventeen month period, each storm event regarded as being of such significance that attracted disaster recovery funding from the State and Commonwealth governments, stretched its management and supervisory staff. By using a small group of skilled and experienced external consulting engineers and other personnel, and by the engagement of six contractors through a flexible schedule of rates contract, the restitution of particularly its local road and bridge network was able to be expedited thoroughly and quickly. Regular maintenance of local road drainage systems and cross culverts, particularly during dry periods, is a local government imperative in coping with large storm events.

Mount Alexander Shire's unique experience in dealing with four major storm events highlighted the suffering experienced by its local communities, and the clear need for sustained and flexible aid and assistance arrangements by State and Commonwealth governments and their agencies throughout not just the emergency periods, but the recovery. The longer term resilience of restitution works are perhaps unduly restricted by the strict guidelines that are currently set.

A series of post-restitution workshop of recovery practitioners to document the invaluable knowledge and experience gained in regional Victoria, NSW and Queensland since 2010 is advocated.

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