



17 July 2015

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Our ref: 32/17736

63412

Your ref:

Dear Dominic

Preliminary Review - Failure of Electrical Infrastructure at Ambulance Tasmania Hobart Interim Recommendations

1 Background

This letter documents GHD's preliminary observations, findings and recommendations with regard to a significant power outage that occurred at the Ambulance Tasmania State Operations Centre (SOC) on Sunday, 5 July 2015.

These observations, findings and recommendations are based on GHD's investigations thus far, which included a general familiarisation with the SOC and the electrical infrastructure that services the SOC, interviews conducted on 14 July 2015 and a study of the available technical documentation pertaining to the electrical infrastructure.

2 Preliminary Observations and Findings

With regard to the technical cause(s) of the outage, GHD found the following:

1. The power outage occurred at approximately 00:40 on Sunday, 5 July 2015. It appears that a short circuit had occurred which caused a number of circuit breakers to trip, causing the Essential Services Switchboard within the Brisbane Street building to be disconnected from the mains supply. The mains power supply to the SOC remained unaffected by the short circuit and continued to supply power to the Melville Street building.
2. Neither the cause of the short circuit, nor the exact location of the short circuit could be determined. The evidence does suggest a short circuit downstream of the Essential Services Switchboard may have occurred, possibly at one of the battery backup systems being supplied from the Essential Services Switchboard.
3. The loss of power to the Essential Services Switchboard disrupted electrical supplies to most of the Brisbane Street building, including to the Server Room that services the State Communication Centre. Due to the loss of one of the battery backup systems due to a possible short circuit, half the operator consoles in the State Communication Centre also lost power.

4. The tripping of so many circuit breakers due to a single electrical fault could be considered unusual and would warrant further investigation.

With regard to the adequacy and effectiveness of technical redundancy to mitigate the impact of power failures, GHD found the following:

1. At the supply end, there appears to be a sufficient level of redundancy provided. An emergency diesel generator provides backup power in case the mains power supply fails. In case both the mains supply and the emergency diesel generator fail, a generator connection box is installed to allow a transportable generator set to be connected. This arrangement provides a high level of redundancy of supply to the Main Switchboard from which the Melville Street and Brisbane Street buildings are supplied.
2. At the State Communication Centre end, all of the computer servers running the software applications used by the State Communications Centre have two battery-backed power supplies. This provides a sufficient level of redundancy of supply to the servers.
3. The following systems appear not to be provided with a sufficient level of redundancy of supply:
 - The Essential Services Switchboard in the Brisbane Street building
 - The battery backup systems in the Brisbane Street Server Room are supplied from the same source (being the Essential Services Switchboard), and the battery backup systems have only one incoming power supply each (good practice is to have at least two supplies to each battery backup system)
 - Half the operator consoles at the State Communication Centre are supplied from one battery backup system and the other half of the consoles supplied from the other battery backup system (it may be more appropriate to have two battery-backed supplies to each operator console).
4. In case of a total power blackout or other reason for not being able to use the State Communication Centre, there is a Business Continuity Planning (BCP) centre provided at the Fire Services building next door to the SOC.

With regard to the level of technical rigour required at the time of construction to ensure no single point of failure in the design of the system, GHD found the following:

- There are a number of single points of failure throughout the electrical system. Most of these are not critical for the functioning of the State Communication Centre and would have no adverse effect on business continuity should an electrical fault at any of those points occur.
- At least one significant single point of failure was found to be the Essential Services Switchboard in the Brisbane Street building, from which both the State Communication Centre's battery backup systems are supplied. This point of failure seems not to have been identified during design.

With regard to the extent of routine testing and maintenance of the system, GHD found the following:

1. The emergency generator was installed approximately six weeks prior to the outage and will be maintained under warranty by the generator supplier for several more months. A contract was in place for routine maintenance of the old generator set, and it would be prudent to put a similar contract in place once the new generator set runs out of warranty.

2. At the time of the incident there was no contract in place with a maintenance provider to perform regular thermal imaging of switchboards. It is common practice to conduct thermal (infrared) imaging of switchboards to identify hot connections and other irregularities within switchboards before they cause failure of electrical components.

With regard to the potential for future occurrences of the outage of the electrical infrastructure, GHD found the following:

1. Until all significant single points of failure have been eliminated, the State Operating Centre remains vulnerable to similar power outages occurring in future.
2. With regard to the ability to respond to similar outages in future:
 - At the time of the incident there was no formal contract in place with a maintenance provider for after-hour standby support in case of an emergency with the electrical supply system. For an important facility such as this, it may be appropriate to formalise an agreement with a maintenance provider.
 - There are formal arrangements in place for after-hour ICT support.

With regard to other matters that may have bearing on the ability to deal with similar situations in future, GHD found the following:

1. An electrician was called out to provide electrical technical support, but the electrician attending the site was unfamiliar with the electrical network. In addition, it took him some time before he was able to obtain documentation and drawings describing the electrical network. This hampered progress with troubleshooting, and also delayed the electrician's ability to formulate a restorative response.
2. At the time of the incident there were no spare parts on hand to replace failed electrical components.
3. Recent asset upgrades seem to have been implemented under a "like-for-like" replacement principle. Pre-renewal single points of failure would not have been engineered out using this project delivery methodology.
4. There does not appear to be a framework in place for the delivery of asset upgrades. In particular:
 - There appears to be a lack of rigour in the definition of the SOC's strategic business continuity requirements at the commencement of asset upgrades
 - There appears to be a lack of regular performance review to ensure that the stated strategic requirements are met throughout the design, construction and maintenance phases of project delivery.

3 Preliminary Recommendations

1. Develop a clear understanding of acceptable risk and business continuity principles that need to be followed at all times.
2. Adopt a project delivery framework that would enable:
 - Rigour in the way acceptable risk and the stated business continuity objectives are translated into desired project outcomes, complete with a definition of measurable success criteria that should be achieved for each stage of the project

- Regular performance review at all stages of project delivery to ensure the stated strategic requirements are met throughout the design, construction and maintenance phases of project delivery.
- 3. Perform a risk analysis to determine the minimum acceptable levels of technical redundancy required by all electrical and ICT systems, followed by upgrades (if required) to ensure the acceptable levels or redundancy are provided. This process should include the elimination of single points of failure within the electrical network and ICT infrastructure that may have the potential to cause a similar disruption to operations in the future.
- 4. Implement a formal standby agreement with an electrical maintenance provider, and ensure that all nominated standby personnel of the maintenance provider are inducted with regards to site access procedures, the location of major switchboards, and the location of technical documentation that will be required in troubleshooting and fault rectification.

Note this letter documents GHD's preliminary observations, findings and recommendations. A formal report will be issued prior or on the 31 July 2015.

Should you wish to discuss any of the above topics please do not hesitate to contact me.

Kind Regards
GHD Pty Ltd

Rob Lowther
Manager Tasmania
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OPERATIONAL REVIEW

Ambulance Tasmania

State Operations Centre Power Outage - 5 July 2015

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1. Background

The State Operations Centre (SOC) contains the State Communications Centre (SCC) and is the central hub for Ambulance Tasmania communications statewide. It is situated in Ambulance Tasmania headquarters at 12 Brisbane Street Hobart, Tasmania.

The Centre operates 24 hours a day, seven days a week and provides central call handling and dispatch services for the delivery of ambulance services. Calls are triaged from members of the public, medical services such as hospitals, and other emergency services. Ambulance resources and paramedics are coordinated and dispatched to attend tasks triaged by the Centre.

At 0040 hours on Sunday 5 July 2015, the SCC experienced a significant power failure, eventually affecting operation of the phone system, Computer Aided Dispatch (CAD), Radio communications (including radio paging capability) and lighting.

Essential information technology and communications continued to function with power supplied by one of two Uninterruptable Power Supplies (UPS) until approximately 0150 hours when the remaining UPS unit failed. Immediately prior to the failure and in accordance with normal procedures, staff from the Office of the Chief Information Officer, who were monitoring vital equipment including CAD servers sequentially shutdown equipment to avoid any catastrophic equipment damage.

Attempts were made with limited success to relocate staff to the disaster recovery site located within the Tasmania Fire Control Centre (TFCC) to ensure business continuity.

Two Triple Zero (000) calls were received during the outage period, one of these calls had a delayed response due to the power issue but the delay did not likely contribute to the patient outcome. A number of difficulties were experienced during the delay reconciling current work with available resources and communicating with on road paramedics.

Power was returned at 0225 hours, but it was some time before communications operations were fully functional again. During the intervening period, operation of the Centre reverted to manual processes, and service delivery may have been affected.

Further, the nature of the power failure was unusual and the cause is yet to be determined.

Following the outage the Chief Executive Officer (CEO) of Ambulance Tasmania, implemented an immediate, independent review of both the operations of the Centre during the emergency (Operational Review), and of the technical aspects which led to the failure (Technical Review). The outage resulted in significant media and political interest.

Terms of Reference were drafted and a small team comprising two independent officers and a local senior manager were tasked with the operational review. The team met and began work within days of the outage.

2. Terms of Reference

2.1 Background

A significant outage occurred at the Ambulance Tasmania State Operations Centre (SOC) on Sunday, 5 July 2015.

The SOC contains the State Communication Centre which is responsible for all Triple Zero (000) call handling and dispatch of Ambulance resources state-wide.

2.2 Focus of Investigation

The review team is to consider and report upon:

- The adequacy and effectiveness of the operational response to the event;
- The identification and assessment of any service delivery impacts;
- The level of planning and training in place for staff to respond to the event;
- The adequacy of documentation to support staff to manage the event;
- The extent to which escalation procedures were known, understood and followed;
- The potential for future occurrences;
- The extent to which Business Continuity Plans were in place, current and adhered to; and
- Any other operational matter deemed necessary.

2.3 Outcomes

The review team is to provide a report to the Chief Executive Officer of Ambulance Tasmania by the due date(s). The Report is to include any recommendations identified by the Review Team for service improvements deemed appropriate for consideration by the CEO.

2.4 Reporting Due

1. Preliminary report is due by 17 July 2015.
2. Final Report is due by 31 July 2015.

2.5 Review Team

Assistant Commissioner Jamie Vernon, Director, Control Centres, NSW Ambulance

A/Assistant Commissioner Mark Mewis, Tasmania Police

Superintendent Craig Westlake, Southern Regional Manager, Ambulance Tasmania

It should be noted that this Review is limited to the operational response to the incident, with the technical aspects of the power outage subject to a separate review.

3. Review Team

The Review Team comprised the following appointments

Chair

Assistant Commissioner Jamie Vernon ASM JP

Director, Control Centres, New South Wales Ambulance

Assistant Commissioner Vernon has in excess of 35 years' experience in the provision of ambulance services, patient care and the management of dispatch and control centres. He has been involved in numerous reviews of Control Centres and Business Continuity process and practices.

Acting Assistant Commissioner Mark Mewis APM

Crime and Operations, Tasmania Police

Acting Assistant Commissioner Mewis has nearly 35 years' experience as a member of Tasmania Police across a range of portfolios, including investigations, intelligence management and policy development. He is currently acting in the position of Assistant Commissioner, Crime and Operations which has responsibility for the operational arm of the service, and includes the geographic policing regions as well as the operational support services arm.

In his substantive role, he is the Commander of the Operations Support command which includes responsibility for the police Radio Dispatch Services portfolio.

Regional Manager Craig Westlake

Southern Regional Manager, Ambulance Tasmania

Mr Westlake has in excess of 28 years' experience within the ambulance industry. He holds a Bachelor of Health Science and has worked in both the SA Ambulance Service and Ambulance Tasmania. He has previously had extensive experience in communication centre management as the General Manager Operations and Systems within the SA Ambulance Service and has project managed the ambulance implementation of a multi-agency Computer Aided Dispatch system. In his substantive role, he is the Southern Regional Manager, Ambulance Tasmania.

4. Methodology

The Review Team was briefed by the Chief Executive Officer (CEO) on Tuesday 7 July 2015 and commenced the investigation almost immediately.

The first phase of the review included a review of all relevant documentation available at that time, including:

- Call and dispatch records from the relevant period
- Position descriptions for each of the key roles within the service, and
- Computer network and electrical diagrams.

Following the document review, the team assembled at Ambulance Tasmania Headquarters, Hobart and undertook:

- Familiarisation briefings of the facility, including key electrical infrastructure and computer networks,
- Interviews of key staff members directly involved in the incident
- Interviews of key staff members with knowledge or responsibility related to the incident
- Interviews of union representatives, and
- review of other documents as they became available, or submitted by witnesses.

This part of the review was effectively completed on Friday 10 July 2015.

The team then commenced deliberations on findings, recommendations and preparation of the preliminary report.

6. Timeline of Events – 5 July 2015

| | |
|---------------|-----------------------------------------------------------------------------------------------------------------------------------------|
| 00:40 | Mains power off in State Communications Centre |
| 00:46 | Manager – Technical Services contacted – no response |
| 00:50 | Manager – State Communications Contacted |
| 00:50 | On Call Information Technology resource contacted |
| 00:53 | Manager – State Communications contacted Duty Manager – Communications |
| 01:04 | Electrician contacted |
| 01:10 | Electrician commenced preliminary fault finding over the phone with Manager – State Communications from main distribution board |
| 01:20 | Senior Communications Officer to Tasmania Fire Control Centre |
| 01:31 | Duty Manager – Communications received call from OCIO technician |
| 01:35 | Duty Manager Communications – contacts Telstra |
| 01:35 | Contact Tasmania Fire Service to obtain numbers to divert to |
| 01:37 | Manager – State Communications approved IT technical support to gracefully shut down the Computer Aided Dispatch system |
| Approx. 0140 | Uninterruptable Power Supply power failed |
| 01:50 | Dispatcher sent to Tasmania Fire Control Centre |
| 01:52 | Dispatcher arrived at Tasmania Fire Control Centre |
| 02:18 | Photo of muster sheet sent to staff in Tasmania Fire Control Centre |
| Approx. 02:20 | Power re-established |
| 02:24 | Manager – State Communications instructed IT technical support to restart the process of bringing online Computer Aided Dispatch system |
| Around 02:30 | Dispatcher returned to State Communications Centre |
| 02:31 | Senior Communications Officer returned to State Communications Centre |
| 03:20 | CAD fully resumed |
| 03:24 | Paging system resumed |
| 04:20 | Vehicle Status System – resumed |
| 06:25 | Manager – State Communications advised CEO |

13. Key Recommendations

That the Chief Executive considers the following:

1. The commissioning of an end to end Business Continuity review that delivers a comprehensive business and operational continuity plan. The plan is to encompass all facets and operational capabilities of the SCC. The plan should include a contingency to move to a disaster recovery site. Staff consultation and involvement during this process should be considered paramount.
2. The quick wins as identified in this document should be implemented within 14 days.
3. Once the Business Continuity plan is finalised appropriate training and regular drills should occur.
4. The DR site at the TFCC should be assessed for its suitability and equipped and configured to allow a seamless transition from the normal SCC. The DR site should be configured and documented to a level close to normal operations.
5. The current SCC should be equipped with the necessary tools and equipment to manage any disaster or evacuation event. A “BCP grab bag or box” must contain the necessary equipment, stationary and documents to enable continued operations at any site including a site that has no power or IT infrastructure.
6. Ensuring the Command and Control structure within the SCC particularly as it pertains to events outside of normal operations is well understood, documented and exercised.
7. Ensuring the Command and Control structure and linkages between the Manager - State Communications and the Manager - Technical Services to ensure clarity of roles and responsibilities is well understood and documented.
8. Ensuring a documented after-hours escalation and notification procedure as it relates to infrastructure and business continuity is implemented
9. Requesting a complete review of “as built” diagrams, drawing and technical specifications of all power, IT and communication infrastructure as they relate to the SCC and ensure this is current and available at all times to personal managing an incident affecting the business continuity of the SCC.

14. Quick Wins

1. Equip and configure the DR Site to ensure its operational capability is close to normal operational functions
2. Ensure an evacuation box or bag is available within the SCC
3. Ensure there are sufficient torches available for staff
4. Ensure a BCP Printer is available and powered by a UPS circuit
5. Label all General Power Outlets (GPO)
6. Ensure all workstations are on the same UPS or there is redundancy to the UPS.
7. Train staff in preliminary BCP processes. Orientation of the DR Site is considered the minimum that needs to be undertaken.
8. Install emergency lighting that is fit for purpose in the SCC.
9. Obtain quotes to duplicate fire panel to first floor
10. Consult with Telstra E000 to ensure the Triple Zero (000) diversion process is documented and understood.
11. Review PABX routing to ensure any calls are not jumping from phone to phone and ensure all staff are fully cognisant and trained in the “P phone” (hard phone) operations
12. Develop interim manual operations procedures and ensure all SCC staff and senior managers are trained in their use.
13. Review the entry control system of the SCC to ensure that in the event of power outage staff can maintain access and egress.
14. Ensure appropriate keys are available to all staff to enable access during these types of events.