

Relocation of Disaster Recovery (DR) Facility

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Contents

1. Introduction	3
2. Background Situation	3
3. WEL Network's Approach	5
4. Required Attributes.....	6
5. Choosing the Site.....	6
6. Project Steps	7
7. Project Cost.....	9
8. Summary	9

1. Introduction

WEL Networks is a Lifelines Utility under The Civil Defence Emergency Management Act 2002 and therefore has certain obligations.

The Act requires agencies, including Lifeline Utilities, to be able functioning to the fullest possible extent during and after an emergency. The Act reinforces the view that it is not an option to be unprepared.

The fundamentals of preparedness are being able to cater for the 4 Rs

- **Reduction** - Activities that reduce the degree of long-term risk
- **Readiness** - Activities that develop operational capabilities for responding to an emergency.
- **Response** - Activities taken immediately before, during or directly after an emergency that can save lives, minimize property damage, or improve recovery.
- **Recovery** - Activities that stabilize the affected community and assure that life support systems are operational and longer term actions for rehabilitation and restoration. This restoration needs to have a Reduction focus.

Part of WELs preparedness towards meeting these obligations is having a Disaster Recovery (DR) facility where critical network operations can continue during and after an event where the uses of the main business sites are affected. In particular, the System Control Centre (Syscon).

WEL has had a DR facility for many years catering for the 4 Rs for Syscon and the backup of business and operational IT system servers but did not cater for management control or continuity of other business functions. The present building has also been identified as a seismic risk by not meeting the requirements of Importance Level Category 4 (IL4).

This paper identifies the approach taken by WEL Networks to relocate the DR facility to a more suitable location. A location chosen carefully to make allowance for communication paths, proximity to the existing main corporate office operational facility at Maui Street (close enough for easy relocation of staff but far enough away to minimise likely influence by the extent of the disaster). The relocation project also involves providing a greater level of functionality to better meet the obligations under The Act as well as provide for a higher level of overall business continuity.

2. Background Situation

Lifelines Utilities are the essential infrastructure and services that support the life of our community – utility services such as water, wastewater and stormwater, electricity, gas, telecommunications, and transportation networks.

Because of their importance to the nation, section 60 of the Act requires that every Lifeline Utility must:

- A. Ensure that it is able to function to the fullest possible extent, even though this may be at a reduced level, during and after an emergency.

- B. Have plans for such continuity that can be made available to the Director (of MCDEM) if requested.
- C. Participate in the development of the National Strategy and CDEM Plans (where requested).
- D. Provide technical advice on CDEM issues, where reasonably requested by CDEM Groups or the Director.

Under a seismic or weather related event we need to consider how our buildings would perform and are classified in terms of the building code importance levels (IL) and compare these with our obligations under the CDEM Act.

Table 3.2 AS/NZS 1170.0:2002

Importance level category	Intended function
1	Structures presenting low degree of hazard to life and other property such as farm buildings, fences
2	Normal structures such as domestic dwellings, commercial and car park buildings etc
3	Structures with a high number of people in them or valuable to the community such as schools, airport terminals, railway stations, meeting places which have a capacity for 300+ people, indoor stadiums with 5000+ people capacity, theatres
4	Structures with special post disaster functions – eg essential services - medical, fire, police, utilities etc.
5	Structures whose failure poses catastrophic risk – eg hydro dams

Importance Level Category IL4 for an Electricity Network DR site is appropriate.

Structural Requirements for Importance Level 4 Structures

- Ultimate Limit State (ULS):
 - Building designed for 1/2500 year return period shaking
 - Earthquake design forces 80% greater than for ‘ordinary’ IL2 building
- Serviceability Limit State (SLS):
 - Essential components to remain operational under 1/500 year return period shaking
 - Only nominal damage to structure, non- structural elements and contents; all services within the building functioning

Buildings that house or support major utility control centres, operations rooms and key equipment (e.g. telephone exchanges, electricity switchgear) for Lifeline Utilities that serve the community are clearly structures with special post-disaster functions of Importance Level IL4.

it is not acceptable for an IL4 emergency facility to be below strength, it should either be re-designated IL2 and its emergency use transferred to another building, or it should be strengthened to full compliance, so that it is available to fulfil its function when required. Furthermore, it is important to also give consideration to buildings which may be compromised by neighbouring buildings and blocked access ways.

3. WEL Network's Approach

WEL Networks manages and operates its electricity network with resilience in mind.

Resilience is - The intrinsic ability of a system to adjust its functioning prior to, during, or following changes and disturbances, so that it can sustain required operations under both expected and unexpected conditions.

- A system is not resilient just because it is robust or has redundancy
- A resilient system accepts that failure is inevitable and focuses instead on early discovery and fast recovery but not necessarily by re-establishment of the failed system
- Complex risk analysis is essential rather than analysis of isolated parts of the infrastructure, or analysis of single risks.

With resilience in mind we make individual risk based decisions which also ensure we meet our obligations under the CDEM act. Essential systems including those used by Syscon allow us to maximise and prioritise the restoration supply by automated, alternate switching and utilisation of our network design philosophies to minimise the disruption to supply caused by single or multiple events.

Although WEL currently has a programme in place to assess and upgrade all of its major network substations and switching stations to comply with performance expectations of IL4 category it operates its corporate office and day to day business out of buildings which meet the requirements of IL2 Importance Level Category. This makes it imperative that an IL4 DR facility is established.

A section on the second floor of the former WEL Networks building in Hamilton CBD is the present DR location providing a backup control centre as well as backup servers for SCADA and the corporate business, It is also a major SCADA communications site it is essential for the operation and as the building is in a CBD office location it is regarded as an expensive option for a DR site which remains uninhabited most of the time. Advice has also been received that the building has a seismic classification suitable for level IL2 importance classification which makes it unsuitable for a DR centre which would have an importance level IL4.

Part of WELs preparedness towards meeting its obligations is by redeveloping its DR facilities where critical network operations can continue during and after an event as well as providing for short and long term business continuity where an Importance Level Category IL4 is appropriate.

Learning's from the Canterbury earthquakes and storms were incorporated into the planning of the facility including a management command centre with space to think and take in the bigger picture and all this at an acceptable cost.

4. Required Attributes

A DR site should have the following attributes

- Adequate and diverse road access in the event of a natural disaster
- Located for easy and secure connection into existing communications systems, e.g. with fibre and radio diversity
- Secure power supply N-1 or better and backup by generator and UPS
- Adequate space for deployment of additional staff (up to 20), adequate facilities for extended occupancy, toilets, kitchen and water tank
- Clear of neighboring structures which may create a fall risk
- Building structure adequate for Level 4 importance
- Close enough for ease of access & far enough away to avoid common mode issues
- Secure site with guaranteed access by WEL
- Cost within reasonable expectations

5. Choosing the Site

8 site options were considered using the attributes above in an evaluation matrix completed by 4 stakeholders then discussed with a wider selection of staff. Where a required attribute could not be immediately met the ease and cost of meeting the requirement was also evaluated.

It became evident early on that all sites require considerable expenditure to bring up to adequate requirements.

The Pros and Cons of the top three scoring options were further evaluated with a preferred site chosen as a vacated substation building situated 2.5km from the present WEL main corporate office and operational building and considered suitable for DR requirements for the following reasons.

- Close enough, 2.5km
 - Although this was also seen as a possible negative as it could be considered too close to the main business headquarters for natural disaster diversity
- Easy site and building access via a main road with alternative routes
- Large yard for extra space if required
- Existing substation site already under WEL lease and control
- Secure power supply with diversity from different feeders, substations and GXPs
- Building structure considered suitable from a seismic perspective after strengthening to IL4 category. Single storey reinforced concrete block construction.

- Building layout and size suitable for purpose. The chosen site was part of an operational zone substation with the proposed DR building situated at one end allowing it to be fenced off as a separate non electrical competency restricted area.
- Has existing multiple fibre and radio communications paths
- Within the range of budget expectations

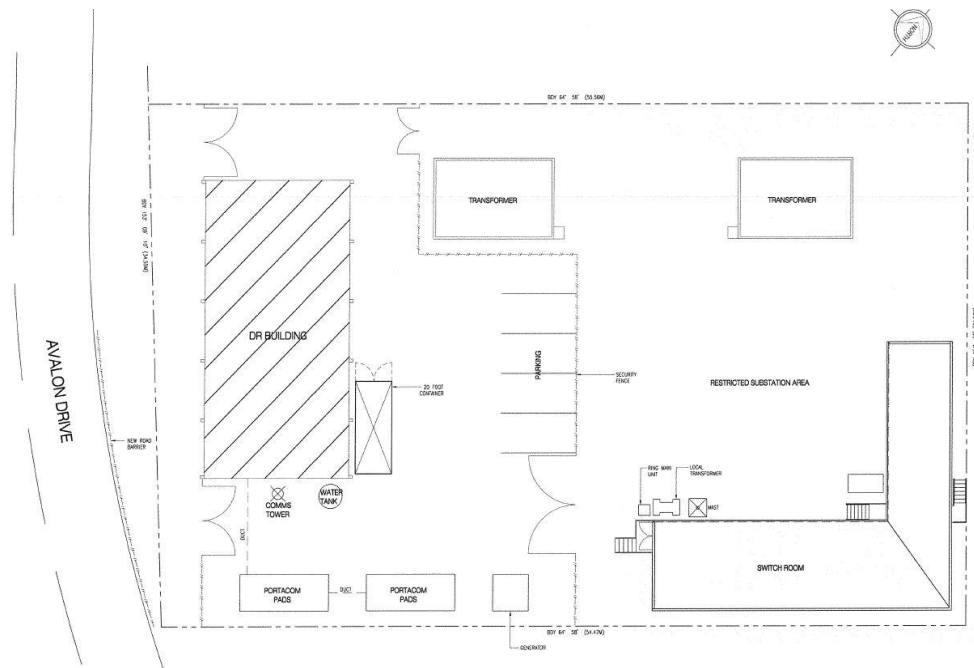


Figure 1; Site Layout

One of the drawbacks of the site was that the building had been used for several years for storage of network spares and still contained some operational equipment including

- Local service transformer and ring main unit
- Various panels including communications and ac and dc power supplies
- It also contained a decommissioned 1970s 11kV switchboard

This however turned out to be a positive with the building tidied up and put to a more productive use.

6. Project Steps

The steps taken to provide the operations DR facility were

1. Business case and budget approval
2. Council consents
3. The disused substation building was decommissioned of operational communications cabinets and cleared of stored equipment
4. Rationalisation of electrical supplies including RMU, transformer and diversity across feeders and substation bus
5. 2m security fence constructed dividing the DR area from the operational substation with space allowance for parking and extra portable buildings if required (portaloos)

6. DR building strengthened to IL4 including steel beams and roof bracing (\$40k)
7. DR building refurbished including new joinery, carpet and hard floor covering, air conditioning, multiple power and data outlets distributed around the building, all wiring on open cable racks for ease of access, security access control and fire systems, emergency lighting, fixed benches,
8. Toilets, washroom and kitchen with microwave, fridge, cook top, jug, toaster and emergency rations
9. Separate rooms for network control room (Syscon), dispatch, incident control and support office facilities
 - Syscon with 2 Operator stations, corporate PCs, RT radios, IP phone, copper landline phones, printers, faxes, separate cell air conditioning



Figure 2; System Control Room

- Fault Dispatch area with work stations, RT radios, printers, phones and room for expansion if required
- Incident Control Room for Incident Controller and Management Team with tables, white boards, OHPs, TV, radio, phones, hard copy of critical DR documents and drawings, maps and multiple data and power outlets



Figure 3; Incident Control Room

10. Emergency water tank for roof runoff non-potable water
11. 100kVA Generator with 24 hr fuel supply and control and monitoring gear
12. Communications panel and 20kVA UPS in main building communications room
13. Server Room installed in fully lined 6m shipping container including
 - 4 x server panels, data circuits, dual redundant air-conditioning, plug in power supplies and 4 x 2kVA UPSs.
 - All equipment seismically secured
 - 6m (20') container with the ability to be picked up and trucked to an alternative communications node site



Figure 4; Server Container & Control Building

14. WEL owned communications fibres installed with IP switches and routers linked to corporate and SCADA LANs
15. Ultrafast Fibre connection as well as copper phone line
16. Priority services for Syscon & Dispatch
17. Set up other business functions as required using laptops, cell phones and other mobile devices
18. Decommissioning and migration from old DR Site
19. The migration of communications nodes including FEPs for the SCADA system from the old DR site is an important stage which may take over a year to achieve

7. Project Cost

Total project cost without IT and server upgrade costs \$650k

8. Summary

The Disaster Recovery Site Relocation Project has taken two years to get to this stage. It began with the concept of just relocating the alternate Syscon and server backup functions from the unsuitable old DR to a new location. This grew through a number of different ideas

and innovations to incorporate a fully operational DR and Business Continuity Centre capable of catering for over 20 people for a sustained period of months rather than the original hours or days.

As at 31st March 2014 the new DR site has been partially commissioned to the point where it can be used by Syscon as a fully operational site provided the main corporate building and old DR site are operational. Many of the services are yet to be made independent of the main corporate building and this will happen progressively over the next 12 months when new SCADA servers and communications equipment are purchased and commissioned at the new site. The old DR site in the CBD is still operational.

WEL has had planned DR exercises utilizing the new facility which worked well as shakedown preparation for the real thing.

We believe that with this DR facility is going a long way towards WEL achieving its goal to meet its obligations as a Lifelines Utility as well as meeting its needs in providing a safe superior service to its customers.