City Care Milton Street Depot – Truck Shelter Detailed Engineering Evaluation BU 1141-004 EQ2 Qualitative Report

Prepared for Christchurch City Council (CCC)

By Beca Carter Hollings & Ferner Ltd (Beca)

17 December 2013

Revision History

Revision Nº	Prepared By	Description	Date
A	Laura Chen	Draft for CCC review	27 April 2012
B	Laura Chen	Draft for CCC review with minor changes: ▪ Building description ▪ Occupancy according to CCC guideline	7 June 2012
C	Laura Chen	Draft for CCC review – minor changes	22 June 2012
D	Laura Chen	Final	17 December 2013

Document Acceptance

Action	Name	Signed	Date
Prepared by	Laura Chen		17 December 2013
Reviewed by	Jonathan Barnett		17 December 2013
Approved by	David Whittaker		17 December 2013
on behalf of	Beca Carter Hollings & Ferner Ltd		

City Care Milton Street Depot – Truck Shelter BU 1141-004 EQ2

Detailed Engineering Evaluation Qualitative Report – SUMMARY

Version 1

Address

245 Milton Street
Sydenham
Christchurch

Background

This is a summary of the Qualitative report for the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

The Truck Shelter is located at the City Care Milton St Depot at 245 Milton Street, Sydenham, Christchurch. The two separate shelters comprise steel cantilever frames with timber purlins and longitudinal steel cross bracing. They were originally constructed sometime between 1982 and 1988. No structural drawings were available and no calculations were carried out.

Key Damage Observed

Visual inspection on 1 February 2012 indicates no damage was observed as a result of the recent earthquakes.

Critical Structural Weaknesses (CSW)

The following potential Critical Structural Weaknesses have been identified:

- Site characteristics, due to liquefaction occurring on the Milton St site.

Indicative Building Strength (from Initial Evaluation Procedure and CSW assessment)

The building has been assessed to have a seismic capacity of 40%*NBS* using the NZSEE Initial Evaluation Procedure (IEP) and is therefore classified as potentially Earthquake Risk and Seismic Grade C.

Recommendations

- In accordance with CCC guidance/policy document 'Guidance for Engineers 2' dated 10 May 2012, no restrictions are required to the occupancy of the building.
- Further efforts are made to obtain structural drawings.
- A level survey could be carried out to determine the extent of settlement of the building for insurance purposes.
- Optional further investigations of the structural system may be carried out as part of a quantitative analysis of the building if there is any concern about the existing *%NBS* estimate.
- Repairs that would bring the building back to an "as new" condition are typically entitled under typical replacement insurance policies. We suggest you consult with your insurance advisor as to how you wish to proceed.

Table of Contents

Appendices

1 Background

Beca Carter Hollings & Ferner Ltd (Beca) has been engaged by the Christchurch City Council (CCC) to undertake a qualitative Detailed Engineering Evaluation of the Truck Shelter located at the City Care, Milton Street Depot at 245 Milton Street, Sydenham, Christchurch.

This report is a Qualitative Assessment of the building structure, and is based on the document 'Guidance on Detailed Engineering Evaluation of Earthquake Affected Non-residential Buildings in Canterbury – Part 2 Evaluation Procedure' (draft) issued by the Engineering Advisory Group (EAG) on 19 July 2011.

A qualitative assessment involves inspections of the building, a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available, and an assessment of the level of seismic capacity against current code using the Initial Evaluation Procedure (IEP).

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potentially Critical Structural Weaknesses or collapse hazards, and to make an initial assessment of the likely building strength in terms of percentage of New Building Standard (*%NBS*).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. The building description below is based only on our visual inspections as drawings were not available.

The format and content of this report follows a template provided by CCC, which is based on the EAG document.

2 Compliance

This section contains a brief summary of the requirements of the various statutes and authorities that control activities in relation to buildings in Christchurch at present.

2.1 Canterbury Earthquake Recovery Authority (CERA)

CERA was established on 28 March 2011 to take control of the recovery of Christchurch using powers established by the Canterbury Earthquake Recovery Act enacted on 18 April 2011. This act gives the Chief Executive Officer of CERA wide powers in relation to building safety, demolition and repair. Two relevant sections are:

Section 38 – Works

This section outlines a process in which the chief executive can give notice that a building is to be demolished and if the owner does not carry out the demolition, the chief executive can commission the demolition and recover the costs from the owner or by placing a charge on the owners' land.

Section 51 – Requiring Structural Survey

This section enables the chief executive to require a building owner, insurer or mortgagee carry out a full structural survey before the building is re-occupied.

We understand that CERA will require a detailed engineering evaluation to be carried out for all buildings (other than those exempt from the Earthquake Prone Building definition in the Building

Act). It is understood that CERA is adopting the Detailed Engineering Evaluation Procedure document (draft) issued by the Engineering Advisory Group on 19 July 2011, which sets out a methodology for both qualitative and quantitative assessments. We understand this report will be used in response to CERA Section 51.

The qualitative assessment includes a thorough visual inspection of the building coupled with a desktop review of available documentation such as drawings, specifications and IEP's. The quantitative assessment involves analytical calculation of the building's strength and may require non-destructive or destructive material testing, geotechnical testing and intrusive investigation.

It is anticipated that factors determining the extent of evaluation and strengthening level required will include:

- The importance level and occupancy of the building
- The placard status that was assigned during the state of emergency following the 22 February 2011 earthquake
- The age and structural type of the building
- Consideration of any Critical Structural Weaknesses
- The extent of any earthquake damage

2.2 Building Act

Several sections of the Building Act are relevant when considering structural requirements:

Section 112 – Alterations

This section requires that an existing building complies with the relevant sections of the Building Code to at least the extent that it did prior to any alteration. This effectively means that a building cannot be weakened as a result of an alteration (including partial demolition).

Section 115 – Change of Use

This section requires that the territorial authority (in this case Christchurch City Council (CCC)) be satisfied that the building with a new use complies with the relevant sections of the Building Code 'as near as is reasonably practicable'. Regarding seismic capacity 'as near as reasonably practicable' has previously been interpreted by CCC as achieving a minimum of 67%*NBS* however where practical achieving 100%*NBS* is desirable. The New Zealand Society for Earthquake Engineering (NZSEE) recommend a minimum of 67%*NBS*.

Section 121 – Dangerous Buildings

The definition of dangerous building in the Act was extended by the Canterbury Earthquake (Building Act) Order 2010, and it now defines a building as dangerous if:

- In the ordinary course of events (excluding the occurrence of an earthquake), the building is likely to cause injury or death or damage to other property; or
- In the event of fire, injury or death to any persons in the building or on other property is likely because of fire hazard or the occupancy of the building; or
- There is a risk that the building could collapse or otherwise cause injury or death as a result of earthquake shaking that is less than a 'moderate earthquake' (refer to Section 122 below); or
- There is a risk that that other property could collapse or otherwise cause injury or death; or
- A territorial authority has not been able to undertake an inspection to determine whether the building is dangerous.

Section 122 – Earthquake Prone Buildings

This section defines a building as earthquake prone if its ultimate capacity would be exceeded in a ‘moderate earthquake’ and it would be likely to collapse causing injury or death, or damage to other property. A moderate earthquake is defined by the building regulations as one that would generate ground shaking 33% of the shaking used to design an equivalent new building.

Section 124 – Powers of Territorial Authorities

This section gives the territorial authority the power to require strengthening work within specified timeframes or to close and prevent occupancy to any building defined as dangerous or earthquake prone.

Section 131 – Earthquake Prone Building Policy

This section requires the territorial authority to adopt a specific policy for earthquake prone, dangerous and insanitary buildings.

2.3 Christchurch City Council Policy

Christchurch City Council adopted their Earthquake Prone, Dangerous and Insanitary Building Policy in 2006. This policy was amended immediately following the Darfield Earthquake of the 4th September 2010.

The 2010 amendment includes the following:

- A process for identifying, categorising and prioritising Earthquake Prone Buildings, commencing on 1 July 2012;
- A strengthening target level of 67% of a new building for buildings that are Earthquake Prone;
- A timeframe of 15-30 years for Earthquake Prone Buildings to be strengthened; and,
- Repair works for buildings damaged by earthquakes will be required to comply with the above.

The council has stated their willingness to consider retrofit proposals on a case by case basis, considering the economic impact of such a retrofit.

It is understood that any building with a capacity of less than 33%*NBS* (including consideration of Critical Structural Weaknesses) will need to be strengthened to a target of 67%*NBS* of new building standard as recommended by the Policy.

If strengthening works are undertaken, a building consent will be required. A requirement of the consent will require upgrade of the building to comply ‘as near as is reasonably practicable’ with:

- The accessibility requirements of the Building Code.
- The fire requirements of the Building Code. This is likely to require a fire report to be submitted with the building consent application.

2.4 Building Code

The building code outlines performance standards for buildings and the Building Act requires that all new buildings comply with this code. Compliance Documents published by The Department of Building and Housing can be used to demonstrate compliance with the Building Code.

On 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

a. Hazard Factor increased from 0.22 to 0.3 (36% increase in the basic seismic design load)

b. Serviceability Return Period Factor increased from 0.25 to 0.33 (80% increase in the serviceability design loads when combined with the Hazard Factor increase)

The increase in the above factors has resulted in a reduction in the level of compliance of an existing building relative to a new building despite the capacity of the existing building not changing.

3 Earthquake Resistance Standards

For this assessment, the building's Ultimate Limit State earthquake resistance is compared with the current New Zealand Building Code requirements for a new building constructed on the site. This is expressed as a percentage of new building standard (*%NBS*). The new building standard load requirements have been determined in accordance with the current earthquake loading standard (NZS 1170.5:2004 Structural design actions - Earthquake actions - New Zealand).

No consideration has been given at this stage to checking the level of compliance against the increased Serviceability Limit State requirements.

The likely ultimate capacity of this building has been derived in accordance with the New Zealand Society for Earthquake Engineering (NZSEE) guidelines 'Assessment and Improvement of the Structural Performance of Buildings in Earthquakes' (AISPBE), 2006. These guidelines provide an Initial Evaluation Procedure that assesses a building's capacity based on a comparison of loading codes from when the building was designed and currently. It is a quick high-level procedure that can be used when undertaking a Qualitative analysis of a building. The guidelines also provide guidance on calculating a modified Ultimate Limit State capacity of the building which is much more accurate and can be used when undertaking a Quantitative analysis.

The New Zealand Society for Earthquake Engineering has proposed a way for classifying earthquake risk for existing buildings in terms of *%NBS* and this is shown in Figure 3.1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance: Legal Requirement	Improvement of Structural Performance: NZSEE Recommendation
Low Risk Building	A or B	Low	Above 67	Acceptable (improvement may be desirable)	The Building Act sets no required level of structural improvement (unless change in use) This is for each TA to decide. Improvement is not limited to 34%NBS.	100%NBS desirable. Improvement should achieve at least 67%NBS
Moderate Risk Building	B or C	Moderate	34 to 66	Acceptable legally. Improvement recommended		Not recommended. Acceptable only in exceptional circumstances
High Risk Building	D or E	High	33 or lower	Unacceptable (Improvement	Unacceptable	Unacceptable

Figure 3.1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table 3.1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% risk of exceedance in 50 years (i.e. on average 0.2% in any year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

Table 3.1: *%NBS* compared to relative risk of failure

Building Grade	Percentage of New Building Standard (*%NBS*)	Approx. Risk Relative to a New Building
A+	>100	<1
A	80-100	1-2 times
B	67-80	2-5 times
C	33-67	5-10 times
D	20-33	10-25 times
E	<20	>25 times

4 Building Description

4.1 General

Summary information about the building is given in the following table. No drawings of the structure were available, therefore the building information is assumed from visual inspections only.

Table 4.1: Building Summary Information

Item	Details	Comment
Building name	City Care Milton Street Depot – Truck Shelter	
Street Address	245 Milton Street Sydenham Christchurch	
Age	Constructed sometime between 1982 and 1988	From aerial photographs only
Description	Two separate single storey shelter facilities	
Building Footprint / Floor Area	Approx. 350m^2 and 150m^2	Roof area of each shelter
No. of storeys / basements	1 storey / no basement	
Occupancy / use	Vehicle shelter	Importance Level 2
Construction	Steel frames with timber framing and corrugated roof sheeting	
Gravity load resisting system	Steel roof sheeting onto timber purlins supported on cantilevered steel portal frames	No drawings available
Seismic load resisting system	Cantilevered steel portal frames transversely and steel cross bracing longitudinally at the end bays. Steel cross bracing in the roof transfers the horizontal loads to the bracing	No drawings available. Both shelters have one bay of bracing at either end

Item	Details	Comment
Foundation system	Unknown, but likely be shallow foundations	No drawings available
Stair system	N/A	
Other notable features		
External works		
Construction information	None available	
Likely design standard	NZS 4203:1976	Inferred from age of building
Heritage status	No heritage status	
Other		

4.2 Structural 'Hot-spots'

Not structural 'hot-spots' were identified.

5 Site Investigations

5.1 Previous Assessments

It is understood that Opus International Consultants undertook rapid assessments of the buildings on the Milton Street Depot site, however it is unknown if they assessed the truck shelter in particular and we do not have copies of the reports prepared.

5.2 Level 4 Damage Inspection

Beca carried out a visual inspection of the Truck Shelters on 1 February 2012.

6 Damage Assessment

6.1 Damage Summary

The table below provides a summary of damaged that we observed on our inspection visit. Refer to Appendix A for photographs.

Table 6.1: Damage Summary

Damage type	Unknown	Minor	Moderate	Major	Comment
settlement of foundations	✓				None observed during visual inspection. Level survey may be required to confirm
tilt of building	✓				None observed during visual inspection. Verticality survey may be required to confirm
liquefaction	✓				None observed during visual inspection.

Damage type	Unknown	Minor	Moderate	Major	Comment
					Contacts on site stated it had occurred in areas throughout the site. However the extent is unknown.
settlement of external ground		✓			None observed during visual inspection
lateral spreading / ground cracks		✓			None observed during visual inspection
frame		✓			None observed during visual inspection
concrete walls					Not Applicable
cracking to concrete floors					Not Applicable
bracing		✓			None observed during visual inspection
precast flooring seating					Not Applicable
stairs					Not Applicable
cladding /envelope		✓			None observed during visual inspection
internal fit out					Not Applicable
building services					Not Applicable
adjacent buildings					Not Applicable
other					

6.2 Surrounding Buildings

There are no adjacent buildings which are close enough that they may affect the Truck Shelter during an earthquake.

6.3 Residual Displacements and General Observations

No evidence of permanent settlement or displacements were observed during our visual inspection, however a global settlement survey may be reveal movement that could be described as damage under an insurance entitlement.

6.4 Implications of Damage

The structures have suffered no visible structural damage and therefore we believe diminished the structural capacity of the structures have not been affected.

7 Generic Issues

None of the generic issues referred to in Appendix A of the EAG guideline document have been identified as applicable to the Truck Shelter structures.

8 Critical Structural Weaknesses

8.1 Site Characteristics

Liquefaction occurred on the Milton Street site, and as the foundations are unknown, a significant site characteristic factor of 0.7 was used to assess the *%NBS* in the IEP of the building.

9 Geotechnical Consideration

No geotechnical information was available for this site. During the inspection, any damage to the surrounding pavement was noted and any affect to the structure was considered.

10 Survey

No level or verticality surveys were carried out as there was no evidence of settlement or displacement observed during the inspection. CCC may wish to undertake a level survey as part of insurance entitlement considerations.

11 Initial Capacity Assessment

11.1 *%NBS* Assessment

The building has had its seismic capacity assessed using the Initial Evaluation Procedure based on the information available. The building's capacity is expressed as a percentage of new building standard (*%NBS*) and are in the order of that shown below in Table 11.1. These capacities are subject to confirmation by a quantitative analysis which is more detailed. The post-damage capacity is considered to be the same as the original capacity.

Table 11.1: Indicative Building Capacities

System	Direction	Seismic Performance in *%NBS*	Notes
Cantilevered steel portal frames	Transverse	53%	Using the NZSEE IEP, IL2, Z = 0.3. Frames likely to be wind governed
Steel cross bracing	Longitudinal	40%	Using the NZSEE IEP, IL2, Z = 0.3.

11.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS1170:2002 and the NZBC clause B1 for this building are:

- Site soil class: D – NZS 1170.5:2004, Clause 3.1.3, Soft Soil (assumed)
- Site hazard factor, Z = 0.3 – NZBC, Clause B1 Structure, Amendment 11 effective from 19 May 2011
- Return period factor Ru = 1 – NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.

- Near fault factor N(T,D) = 1 – NZS 1170.5:2004, Clause 3.1.6, Distance more than 20 km from fault line.

11.3 Expected Structural Ductility Factor

Each of the Truck Shelter structures has the same ductility factors. The lateral load resisting system in the transverse direction is cantilevered steel portal frames and has been assumed to have limited ductility with a ductility factor of 2.0 for the IEP. The longitudinal direction lateral load resisting system is steel cross bracing at each end bay and has assumed to be nominally ductile with a ductility factor of 1.25 for the IEP.

11.4 Discussion of results

Based on the IEP results, the Truck Shelters are considered potentially earthquake risk as the IEP result is less than 67*%NBS*. This assessment is qualitative and based on the NZSEE IEP only. Some assumptions have been made, such as the ductility based on the age and construction of the building.

12 Initial Conclusions

- The buildings have been assessed to have a seismic capacity of 40*%NBS* and is therefore potentially earthquake risk.
- A Critical Structural Weaknesses has been identified.

13 Recommendations

13.1 Occupancy

In accordance with CCC guidance notes to engineers dated 10 May 2012, no restrictions are recommended to the occupancy of these structures as a result of our qualitative assessment.

13.2 Further Investigations, Survey or Geotechnical Work

It is recommended that:

- A level survey could be carried out to determine the extent of any settlement of the building for insurance purposes.
- Further investigations of the structural system should be carried out and a quantitative *%NBS* analysis of the building completed.

13.3 Damage Reinstatement

Repairs that would bring the building back to an “as new” condition are typically entitled under typical replacement insurance policies. We suggest you consult with your insurance advisor as to how you wish to proceed.

14 Design Features Report

No repairs are necessary therefore no additional load paths will be created.

15 Limitations

The following limitations apply to this engagement:

- Beca and its employees and agents are not able to give any warranty or guarantee that all defects, damage, conditions or qualities have been identified.
- Inspections are primarily limited to visible structural components. Appropriate locations for invasive inspection, if required, will be based on damage patterns observed in visible elements, and review of the construction drawings and structural system. As such, there will be concealed structural elements that will not be directly inspected.
- The inspections are limited to building structural components only.
- Inspection of building services, pipework, pavement, and fire safety systems is excluded from the scope of this report.
- Inspection of the glazing system, linings, carpets, claddings, finishes, suspended ceilings, partitions, tenant fit-out, or the general water tightness envelope is excluded from the scope of this report.
- The preliminary assessment of the lateral load capacity of the building is limited by the completeness and accuracy of the drawings provided. Assumptions have been made in respect of the geotechnical conditions at the site and any aspects or material properties not clear on the drawings. Where these assumptions are considered material to the outcome further investigations may be recommended. It is noted the assessment has not been exhaustive, our analysis and calculations has focussed on representative areas only to determine the level of provision made. At this stage we have not undertaken any checks of the gravity system, wind load capacity, or foundations.
- The information in this report provides a snapshot of building damage at the time the detailed inspection was carried out. Additional inspections required as a result of significant aftershocks are outside the scope of this work.

This report is of defined scope and is for reliance by CCC only, and only for this commission. Beca should be consulted where any question regarding the interpretation or completeness of our inspection or reporting arises.

Appendix A

Photographs

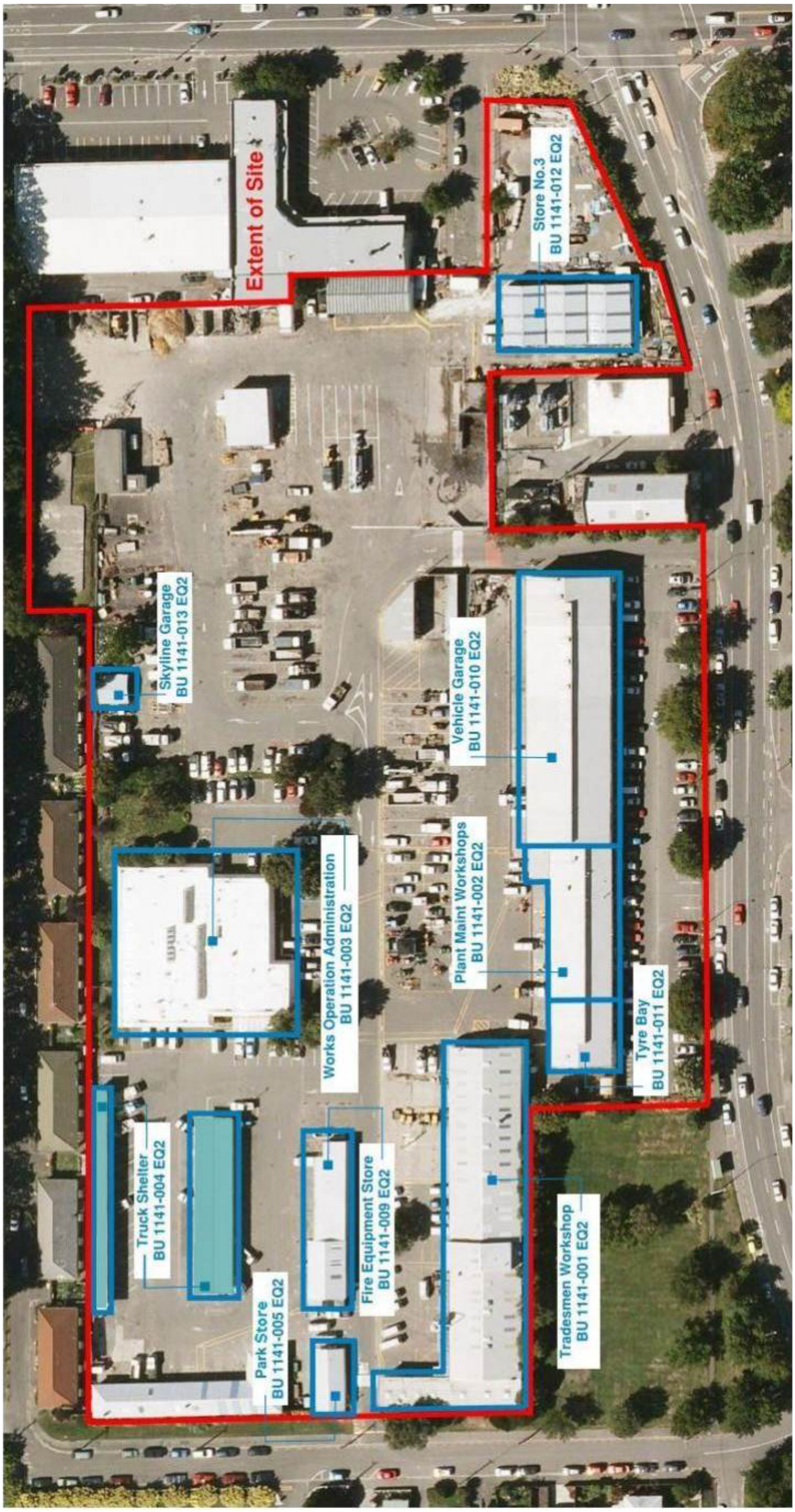

Figure 1A: Site Layout

Photo 1: Northern Shelter

Photo 2: Southern Shelter

Appendix B

CERA DEE Summary Data

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Milton St Depot - Truck Shelter	Reviewer:	David Whittaker
	Unit / No: 245 / Street: Milton Street	CPEng No:	123089
Building Address:	245 Milton Street	Company:	Beca
Legal Description:		Company project number:	5323355
		Company phone number:	03 3663521
	Degrees / Min / Sec		
GPS south:		Date of submission:	27/04/2012
GPS east:		Inspection Date:	1/02/2012
		Revision:	
Building Unique Identifier (CCC):	BU 1141-004 EQ2	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	0
Soil type:		Soil Profile (if available):	unknown
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	unknown
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	

Building

No. of storeys above ground:	1	single storey = 1	
		Ground floor elevation (Absolute) (m):	
Ground floor split?	no	Ground floor elevation above ground (m):	0.00
Storeys below ground	0		
Foundation type:	strip footings	if Foundation type is other, describe:	Unknown but assumed
Building height (m):	3.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	3
Floor footprint area (approx):	500		
Age of Building (years):	27	Date of design:	1976-1992
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	other (specify)	Brief strengthening description:	
Use (upper floors):			
Use notes (if required):	truck shelter		
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	frame system		
Roof:	timber framed	rafter type, purlin type and cladding	Steel, timber and metal
Floors:			none
Beams:			
Columns:	structural steel	typical dimensions (mm x mm)	approx 200UE
Walls:	non-load bearing		0

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	other (note)		describe system	Steel cross bracing between frames
Ductility assumed, μ:	1.25			
Period along:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	
Lateral system across:	other (note)		describe system	Steel cantilever frame
Ductility assumed, μ:	2.00			
Period across:	0.40	0.00	estimate or calculation?	estimated
Total deflection (ULS) (mm):			estimate or calculation?	
maximum interstorey deflection (ULS) (mm):			estimate or calculation?	

Separations:

north (mm):		leave blank if not relevant
east (mm):		
south (mm):		
west (mm):		

Non-structural elements

Stairs:	other (specify)	describe	none
Wall cladding:	profiled metal	describe	corrugated iron
Roof Cladding:	Other (specify)	describe	corrugated iron
Glazing:	other (specify)		none
Ceilings:	none		none
Services(list):	none		

Available documentation

Architectural	none	original designer name/date	
Structural	none	original designer name/date	
Mechanical	none	original designer name/date	
Electrical	none	original designer name/date	
Geotech report	none	original designer name/date	

Damage

Site: (refer DEE Table 4-2)

Site performance:	Slight	Describe damage:	
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	0-2 m²/100m³	notes (if applicable):	some did occur but extent unknown
Lateral Spread:	none apparent	notes (if applicable):	
Differential lateral spread:	none apparent	notes (if applicable):	
Ground cracks:	none apparent	notes (if applicable):	
Damage to area:	none apparent	notes (if applicable):	

Building:

	Current Placard Status:	green		
Along	Damage ratio:	0%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	0%		
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	none
CSWs:	Damage?:	no	Describe:	none
Pounding:	Damage?:		Describe:	N/A
Non-structural:	Damage?:	no	Describe:	none

$$Damage\_Ratio = \frac{(\%NBS\,(before) - \%NBS\,(after))}{\%NBS\,(before)}$$

Recommendations

	Level of repair/strengthening required:	none	Describe:	
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before:	40%	40% %NBS from IEP below	If IEP not used, please detail assessment methodology:
	Assessed %NBS after:	40%		
Across	Assessed %NBS before:	53%	53% %NBS from IEP below	
	Assessed %NBS after:	53%		

IEP **Use of this method is not mandatory - more detailed analysis may give a different answer, which would take precedence. Do not fill in fields if not using IEP.**

Period of design of building (from above): 1976-1992

h_n from above: 3m

Seismic Zone, if designed between 1965 and 1992: B

not required for this age of building

not required for this age of building

	along	across
Period (from above):	0.4	0.4
(%NBS)nom from Fig 3.3:	16.0%	16.0%

Note:1 for specifically design public buildings, to the code of the day: pre-1965 = 1.25; 1965-1976, Zone A =1.33; 1965-1976, Zone B = 1.2; all else 1.0	1.00
Note 2: for RC buildings designed between 1976-1984, use 1.2	1.0
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)	1.0

	along	across
Final $(\%NBS)_{nom}$:	**16%**	**16%**

2.2 Near Fault Scaling Factor

Near Fault scaling factor, from NZS1170.5, cl 3.1.6: 1.00

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	1	1

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:	0.30
Z_{1992}, from NZS4203:1992	0.8
Hazard scaling factor, **Factor B:**	3.333333333

2.4 Return Period Scaling Factor

Building Importance level (from above):	2
Return Period Scaling factor from Table 3.1, **Factor C**:	1.00

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)	1.25	2.00
Ductility scaling factor: =1 from 1976 onwards; or $=k_\mu$, if pre-1976, fromTable 3.3:	1.14	1.57
Ductiity Scaling Factor, **Factor D**:	1.00	1.00

2.6 Structural Performance Scaling Factor:

	along	across
Sp:	0.925	0.700
Structural Performance Scaling Factor **Factor E**:	1.081081081	1.428571429

2.7 Baseline %NBS, $(NBS\%)_b = (\%NBS)_{nom}$ x A x B x C x D x E

	along	across
$\%NBS_b$:	**58%**	**76%**

Global Critical Structural Weaknesses: (refer to NZSEE IEP Table 3.4)

3.1. Plan Irregularity, factor A:	insignificant	1
3.2. Vertical irregularity, Factor B:	insignificant	1
3.3. Short columns, Factor C:	insignificant	1
3.4. Pounding potential Pounding effect D1, from Table to right		1.0
Height Difference effect D2, from Table to right		1.0
Therefore, Factor D:		1
3.5. Site Characteristics	significant	0.7

Table for selection of D1	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Alignment of floors within 20% of H	**0.7**	**0.8**	**1**
Alignment of floors not within 20% of H	**0.4**	**0.7**	**0.8**

Table for Selection of D2	Severe	Significant	Insignificant/none
Separation	0<sep<.005H	.005<sep<.01H	Sep>.01H
Height difference > 4 storeys	0.4	0.7	1
Height difference 2 to 4 storeys	0.7	0.9	1
Height difference < 2 storeys	1	1	1

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum	1.0	1.0
Rationale for choice of F factor, if not 1		

Detail Critical Structural Weaknesses: (refer to DEE Procedure section 6)

List any: Refer also section 6.3.1 of DEE for discussion of F factor modification for other critical structural weaknesses

	along	across
3.7. Overall Performance Achievement ratio (PAR)	**0.70**	**0.70**
4.3 PAR x (%NBS)b: PAR x Baselline %NBS:	**40%**	**53%**
4.4 Percentage New Building Standard (%NBS), (before)		**40%**

Official Use only:

Accepted By

Date: