Bottle Lake - Office & Mess Room
Qualitative Engineering Evaluation

Reference: 228591
Prepared for:
Christchurch City Council

Functional Location ID: PRK_0158_BLDG_001

Address: 70 Waitikiri Drive, Bottle Lake

Revision: 3
Date: 11 October 2013

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Document Control Record

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Report Title		Qualitative Engineering Evaluation				
Functional Location ID		PRK_0158_BLDG_001	**Project Number**		228591	
File Path		P:\ 228591 - Bottle Lake - Office & Mess Room.docx				
Client		Christchurch City Council	**Client Contact**		Michael Sheffield	
Rev	**Date**	**Revision Details/Status**	**Prepared**	**Author**	**Verifier**	**Approver**
1	4 May 2012	Draft	C. Bong	C. Bong	S. Manning	S. Manning
2	21 December 2012	Final	C. Bong	C. Bong	L. Castillo	L. Castillo
3	**11 October 2013**	Final	C. Bong	C. Bong	L. Castillo	L. Castillo
Current Revision		3				

Approval			
Author Signature		Approver Signature	
Name	Christopher Bong	Name	Luis Castillo
Title	Structural Engineer	Title	Senior Structural Engineer

Contents

Appendices

Executive Summary

This is a summary of the Qualitative Engineering Evaluation for the Bottle Lake - Office & Mess Room building and is based on the Detailed Engineering Evaluation Procedure document issued by the Engineering Advisory Group on 19 July 2011, visual inspections, available structural documentation and summary calculations as appropriate.

Building Details	**Name**	**Bottle Lake - Office & Mess Room**			
Building Location ID	PRK_0158_BLDG_001			**Multiple Building Site**	Y
Building Address	70 Waitikiri Drive, Christchurch			**No. of residential units**	0
Soil Technical Category	NA	**Importance Level**	2	**Approximate Year Built**	1960s
Foot Print (m²)	140	**Storeys above ground**	2	**Storeys below ground**	0
Type of Construction	Lightweight purlins and rafters, lightweight timber framed upper floor, lightly reinforced partially filled concrete block lower floor.				
Qualitative L4 Report Results Summary					
Building Occupied	Y	Currently used as an office / administration building.			
Suitable for Continued Occupancy	Y	Suitable for continued use.			
Key Damage Summary	Y	Refer to summary of building damage Section 3.1 report body.			
Critical Structural Weaknesses (CSW)	N	No critical structural weaknesses were identified.			
Levels Survey Results	Y	Levels survey results are within acceptable limits.			
Building %NBS From Analysis	85%	Based on an analysis of bracing capacity and demand.			
Qualitative L4 Report Recommendations					
Geotechnical Survey Required	N	Geotechnical survey not required due to lack of observed ground damage on site.			
Proceed to L5 Quantitative DEE	N	A quantitative DEE is not required for this structure.			
Approval					
Author Signature		Approver Signature			
Name	Christopher Bong	Name	Luis Castillo		
Title	Structural Engineer	Title	Senior Structural Engineer		

1 Introduction

1.1 General

On 12 March 2012 Aurecon engineers visited the Bottle Lake - Office & Mess Room to undertake a qualitative building damage assessment on behalf of Christchurch City Council. Detailed visual inspections were carried out to assess the damage caused by the earthquakes on 4 September 2010, 22 February 2011, 13 June 2011, 23 December 2011 and related aftershocks.

The scope of work included:

- Assessment of the nature and extent of the building damage.
- Visual assessment of the building strength particularly with respect to safety of occupants if the building is currently occupied.
- Assessment of requirements for detailed engineering evaluation including geotechnical investigation, level survey and any areas where linings and floor coverings need removal to expose structural damage.

This report outlines the results of our Qualitative Assessment of damage to the Bottle Lake - Office & Mess Room and is based on the Detailed Engineering Evaluation Procedure document issued by the Structural Advisory Group on 19 July 2011, visual inspections, available structural documentation and summary calculations as appropriate.

2 Description of the Building

2.1 Building Age and Configuration

The Bottle Lake - Office & Mess Room is a two-storey building with a timber framed upper level and a lightly reinforced partially filled concrete block lower floor. The corrugated iron roof is supported on lightweight timber purlins and rafters.

The approximate floor area of the building is 220 square metres (140 m² for lower floor and 70m² for upper floor). The building is classified as an importance level 2 building according to NZS 1170 Part 0: 2002.

2.2 Building Structural Systems Vertical and Horizontal

Tracing the loads from top to bottom the vertical loads originate from the corrugated iron roof and are transferred via the lightweight timber purlins and rafters onto the light timber framed upper floor walls and subsequently onto the lightly reinforced partially filled concrete masonry walls of the lower floor.

Lateral loads are resisted on the upper floor by the lightweight timber frame walls. On the lower floor loads are resisted by lightly reinforced partially filled concrete masonry walls in each direction.

2.3 Reference Building Type

Overall the Bottle Lake - Office & Mess Room is of fairly light weight construction and the reference building is closest to it is a two story residential structure with heavy ground floor walls. Although the upper level is light weight and ductile the heavy rigid ground floor walls will attract higher loads than a fully timber framed building would.

2.4 Building Foundation System and Soil Conditions

The Bottle Lake - Office & Mess Room is founded on a concrete slab on grade cast at ground level. Original construction drawings were not available but drawings for a small ground floor addition were on file. The addition has a standard concrete edge footing supporting new concrete masonry walls. It is very likely that similar construction has been used for the earlier construction of the rest of the ground floor.

CERA land zone maps indicate that Bottle Lake Forest Park currently sits on “Yet To be Classified Rural & Unmapped Land”, however the land to the immediate south has classed as Technical Category 2 Land. By extrapolation, the land is deemed fit the TC2 soil classification and as such is likely to be subject to minor to moderate land damage in future large earthquakes. The site inspection has shown no obvious ground disturbance or movement have been noted in the immediate vicinity of the office and mess room.

2.5 Available Structural Documentation and Inspection Priorities

As noted above some drawings were available for review. Although these were not original construction documents, due the generic nature of the materials and construction, it was nevertheless possible to understand a significant amount about hidden structural details. Due to the heavy and brittle nature of the lower level concrete masonry construction checking for evidence of in plane failure of ground floor walls was an inspection priority.

2.6 Available Survey Information

A floor level survey was undertaken to establish the level of unevenness across the floors. The results of the survey are presented on the attached sketch in Appendix A. All of the levels were taken on top of the existing floor coverings which may have introduced some margin of error.

The Department of Building and Housing (DBH) published the “Revised Guidance on Repairing and Rebuilding Houses Affected by the Canterbury Earthquake Sequence” in November 2011, which recommends some form of re-levelling or rebuilding of the floor

1. If the slope is greater than 0.5% for any two points more than 2m apart, or
2. If the variation in level over the floor plan is greater than 50mm, or
3. If there is significant cracking of the floor.

It is important to note that these figures are recommendations and are only intended to be applied to residential buildings. However, they provide useful guidance in determining acceptable floor level variations.

The floor levels for the Bottle Lake - Office & Mess Room are considered to be within the recommended tolerances above.

3 Structural Investigation

3.1 Summary of Building Damage

An exterior and interior visual inspection was undertaken. It is of note that the building is currently in use and was occupied at the time the damage assessment was carried out. The signs of damage to the building that were observed on 12 March 2012 were:

- Step crackling in the lightly reinforced partially filled concrete masonry wall on the lower floor on the South Western side of the building;
- Cracking in the mortar joints and in some instances, the concrete block itself at various locations – between wing walls, around window frames, etc.; and
- Cracking in the wall and ceiling linings in the upper and lower floors.

3.2 Record of Intrusive Investigation

The inspection was limited to viewing of damage to visible structural elements. As the building is fairly generic in nature significant understanding of possible hidden structural damage could be inferred from visible damage to non-structural cladding or linings. It was deemed to be unnecessary to carry out any intrusive investigations.

3.3 Damage Discussion

The Bottle Lake - Office & Mess Room has suffered significant but mostly minor damage as a result of recent seismic activity. Apart from the mostly minor damage mentioned above it was observed on the centre of the building east elevation that cracks in the ground floor concrete masonry walls and in the fibre cement cladding above were wider at the top than the bottom. This suggests that the building has subsided to a greater degree at the ends of the building than in the middle.

4 Building Review Summary

4.1 Building Review Statement

Not all of the structural components for this building were assessable. As such, the visual inspection focused also on damage to the non-structural linings and trimming as indicators of displacement damage.

4.2 Critical Structural Weaknesses

No specific critical structural weaknesses were identified as part of the building qualitative assessment.

5 Building Strength (Refer to Appendix C for background information)

5.1 General

The Bottle Lake - Office & Mess Room is a two-storey building with a concrete masonry lower floor and a lightweight timber frame upper floor.

5.2 Initial %NBS Assessment

Because the Bottle Lake - Office & Mess Room is not an optimised engineered structure that was subject to specific engineering design the initial engineering procedure or IEP is not an appropriate method of initial assessment. The approach taken to determine the approximate seismic capacity of this structure was to calculate demand from first principles and then estimate capacity by assuming approximate strengths for existing materials. The size of existing load resisting elements, walls, in each direction on each level was measured and from this an approximate capacity was calculated.

Selected assessment seismic parameters are tabulated in the tables below.

Table 1: Parameters used in the Seismic Assessment

Seismic Parameter	Quantity	Comment/Reference
Site Soil Class	D	NZS 1170.5:2004, Clause 3.1.3, Deep or Soft Soil
Site Hazard Factor, Z	0.30	DBH Info Sheet on Seismicity Changes (Effective 19 May 2011)
Return period Factor, R_u	1.00	NZS 1170.5:2004, Table 3.5, Importance Level 2 Structure with a Design Life of 50 years
Ductility Factor for the lower floor in the Along Direction, μ	1.25	Lightly reinforced, partially filled concrete masonry walls
Ductility Factor for the lower floor in the Across Direction, μ	1.25	Lightly reinforced, partially filled concrete masonry walls
Ductility Factor for the upper floor in the Along Direction, μ	3.00	Lightweight timber frame walls
Ductility Factor for the upper floor the Across Direction, μ	3.00	Lightweight timber frame walls

From this it analysis it has been estimated that for both the upper and lower levels in each direction both longitudinal and transversely sufficient walls exist to meet current new building standards of seismic capacity. Because the analysis does not allow for any strength reduction due to damage or age it is considered appropriate in this case, due to the presence of significant amount of minor damage, to apply a moderate damage strength reduction factor.

A damage reduction factor of 0.85 has been selected. This factor, based on the judgement of the engineer, acknowledges that seismic damage has occurred and that it may be sufficient to affect the performance of the building in future earthquakes. Accordingly the Bottle Lake - Office & Mess Room has been assessed to meet 85%NBS (new building standard).

5.3 Results Discussion

The bracing check is in agreement with the observations of the damage assessment. This is not surprising given that the building has an even distribution of long walls that allow the seismic shear forces to be spread over a large wall area; giving the building good seismic performance and torsional stability.

6 Conclusions and Recommendations

Although a significant amount of minor damage has occurred to the Bottle Lake - Office & Mess Room it is considered that the building is nevertheless **suitable for continued occupancy** in its current use.

Although there is evidence of differential settlement and the land has been assessed as matching TC2 soil conditions, the floor levels were found to be within the acceptable limits of the DBH guidelines.

7 Explanatory Statement

The inspections of the building discussed in this report have been undertaken to assess structural earthquake damage. No analysis has been undertaken to assess the strength of the building or to determine whether or not it complies with the relevant building codes, except to the extent that Aurecon expressly indicates otherwise in the report. Aurecon has not made any assessment of structural stability or building safety in connection with future aftershocks or earthquakes – which have the potential to damage the building and to jeopardise the safety of those either inside or adjacent to the building, except to the extent that Aurecon expressly indicates otherwise in the report.

This report is necessarily limited by the restricted ability to carry out inspections due to potential structural instabilities/safety considerations, and the time available to carry out such inspections. The report does not address defects that are not reasonably discoverable on visual inspection, including defects in inaccessible places and latent defects. Where site inspections were made, they were restricted to external inspections and, where practicable, limited internal visual inspections.

To carry out the structural review, existing building drawings were obtained (where available) from the Christchurch City Council records. We have assumed that the building has been constructed in accordance with the drawings.

While this report may assist the client in assessing whether the building should be repaired, strengthened, or replaced that decision is the sole responsibility of the client.

This review has been prepared by Aurecon at the request of its client and is exclusively for the client's use. It is not possible to make a proper assessment of this review without a clear understanding of the terms of engagement under which it has been prepared, including the scope of the instructions and directions given to and the assumptions made by Aurecon. The report will not address issues which would need to be considered for another party if that party's particular circumstances, requirements and experience were known and, further, may make assumptions about matters of which a third party is not aware. No responsibility or liability to any third party is accepted for any loss or damage whatsoever arising out of the use of or reliance on this report by any third party.

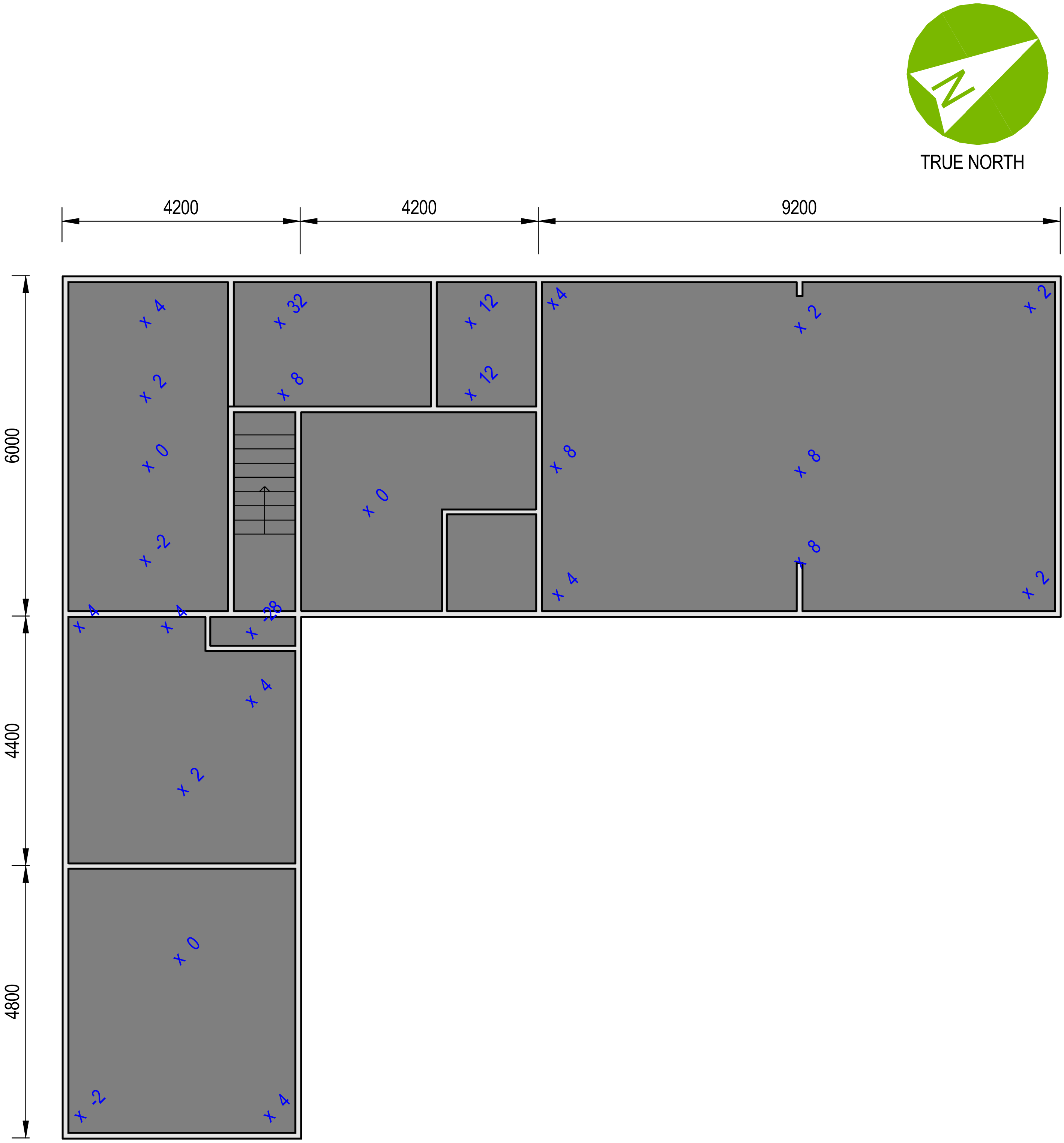
Without limiting any of the above, Aurecon's liability, whether under the law of contract, tort, statute, equity or otherwise, is limited as set out in the terms of the engagement with the client.

Appendices

Appendix A
Photos, Site Map and Level Survey

12 March 2012 – Bottle Lake - Office & Mess Room Site Photographs

North western elevation of the Office and Mess Room.	
Eastern elevation of the Bottle Lake - Office & Mess Room.	
Cracking in plaster board from the interior of the building	



GROUND LEVEL FLOOR LEVELS PLAN

1 : 100

3/12/2012 10:04:49 a.m.

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CLIENT

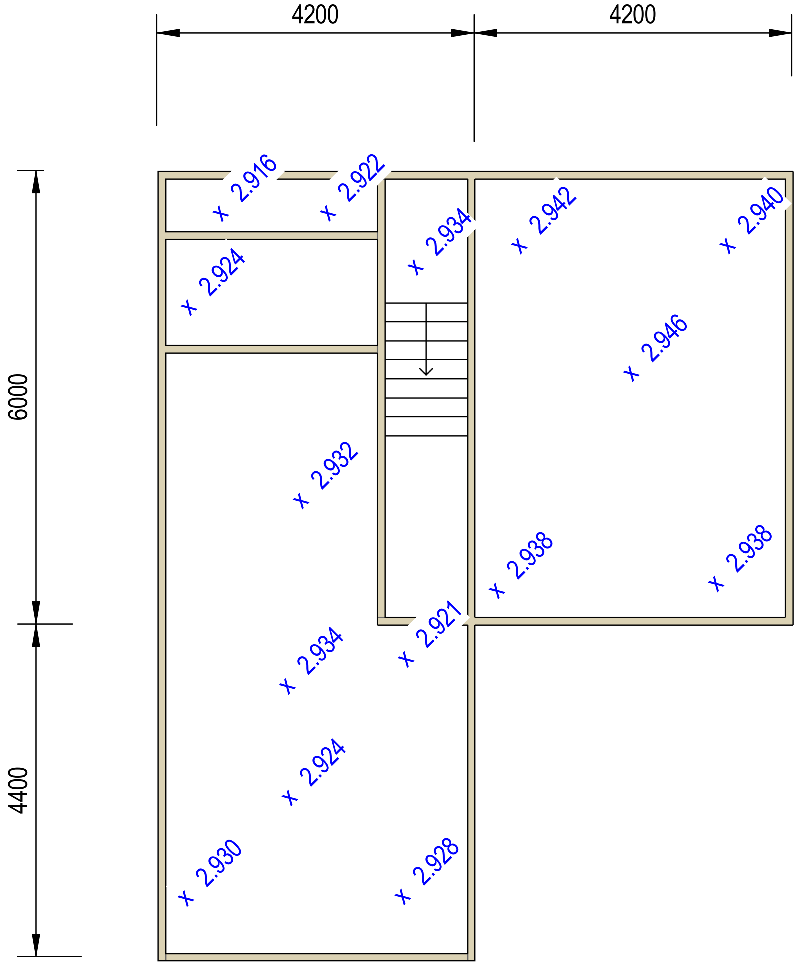
Christchurch City Council

REV	DATE	REVISION DETAILS	APPROVAL
1	15-05-12	LEVEL SURVEY	L.HOWARD

DRAWN: D.LAKE
DESIGNED: L.CASTILLO
CHECKED: Checker
APPROVED: L.HOWARD
DATE

PROJECT: BOTTLE LAKE FORREST CHRISTCHURCH
TITLE: FLOOR LEVELS PLAN

CONSENT
PROJECT No.: 228591
SCALE: 1 : 100
SIZE: A4
DRAWING No.: S-01-00
REV: 1



LEVEL 1 FLOOR LEVELS PLAN

1 : 100

3/12/2012 10:04:49 a.m.

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CLIENT
Christchurch City Council

REV	DATE	REVISION DETAILS	APPROVAL
1	15-05-12	LEVEL SURVEY	L.HOWARD

DRAWN	DESIGNED
D.LAKE	L.CASTILLO

CHECKED: Checker

APPROVED: L.HOWARD DATE

PROJECT: BOTTLE LAKE FORREST CHRISTCHURCH

TITLE: FLOOR LEVELS PLAN

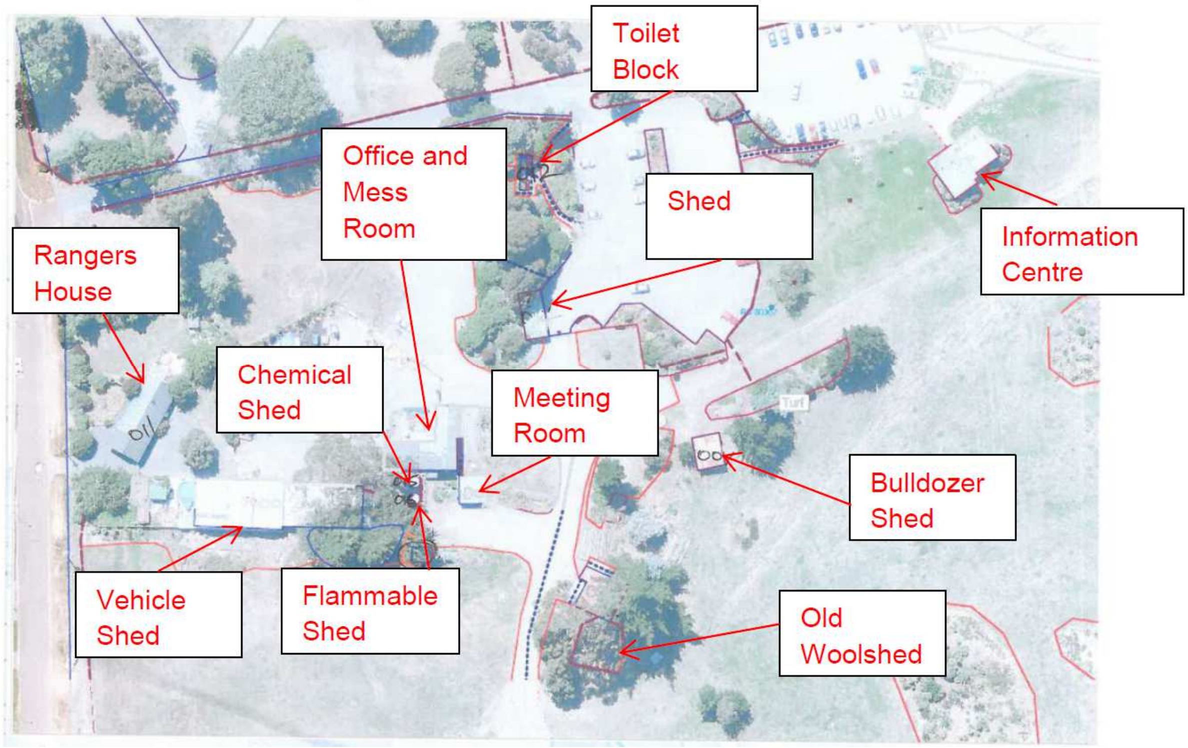
PRELIMINARY
NOT FOR CONSTRUCTION

PROJECT No.: 228591

SCALE: 1 : 100 | SIZE: A4

DRAWING No.: S-01-01 | REV: 1

Cracking in mortar joints above window opening	
Cracking in mortar joints below window opening	



Bottle Lake Forest Site Layout Plan

Appendix B
References

1. Department of Building and Housing (DBH), "Revised Guidance on Repairing and Rebuilding Houses Affected by the Canterbury Earthquake Sequence", November 2011

2. New Zealand Society for Earthquake Engineering (NZSEE), "Assessment and Improvement of the Structural Performance of Buildings in Earthquakes", April 2012

3. Standards New Zealand, "AS/NZS 1170 Part 0, Structural Design Actions: General Principles", 2002

4. Standards New Zealand, "AS/NZS 1170 Part 1, Structural Design Actions: Permanent, imposed and other actions", 2002

5. Standards New Zealand, "NZS 1170 Part 5, Structural Design Actions: Earthquake Actions – New Zealand", 2004

6. Standards New Zealand, "NZS 3101 Part 1, The Design of Concrete Structures", 2006

7. Standards New Zealand, "NZS 3404 Part 1, Steel Structures Standard", 1997

8. Standards New Zealand, "NZS 3603, Timber Structures Standard", 1993

9. Standards New Zealand, "NZS 3604, Timber Framed Structures", 2011

10. Standards New Zealand, "NZS 4229, Concrete Masonry Buildings Not Requiring Specific Engineering Design", 1999

11. Standards New Zealand, "NZS 4230, Design of Reinforced Concrete Masonry Structures", 2004

Appendix C
Strength Assessment Explanation

New Building Standard (NBS)

New building standard (NBS) is the term used with reference to the earthquake standard that would apply to a new building of similar type and use if the building was designed to meet the latest design Codes of Practice. If the strength of a building is less than this level, then its strength is expressed as a percentage of NBS.

Earthquake Prone Buildings

A building can be considered to be earthquake prone if its strength is less than one third of the strength to which an equivalent new building would be designed, that is, less than 33%NBS (as defined by the New Zealand Building Act). If the building strength exceeds 33%NBS but is less than 67%NBS the building is considered at risk.

Christchurch City Council Earthquake Prone Building Policy 2010

The Christchurch City Council (CCC) already had in place an Earthquake Prone Building Policy (EPB Policy) requiring all earthquake-prone buildings to be strengthened within a timeframe varying from 15 to 30 years. The level to which the buildings were required to be strengthened was 33%NBS.

As a result of the 4 September 2010 Canterbury earthquake the CCC raised the level that a building was required to be strengthened to from 33% to 67% NBS but qualified this as a target level and noted that the actual strengthening level for each building will be determined in conjunction with the owners on a building-by-building basis. Factors that will be taken into account by the Council in determining the strengthening level include the cost of strengthening, the use to which the building is put, the level of danger posed by the building, and the extent of damage and repair involved.

Irrespective of strengthening level, the threshold level that triggers a requirement to strengthen is 33%NBS.

As part of any building consent application fire and disabled access provisions will need to be assessed.

Christchurch Seismicity

The level of seismicity within the current New Zealand loading code (AS/NZS 1170) is related to the seismic zone factor. The zone factor varies depending on the location of the building within NZ. Prior to the 22^{nd} February 2011 earthquake the zone factor for Christchurch was 0.22. Following the earthquake the seismic zone factor (level of seismicity) in the Christchurch and surrounding areas has been increased to 0.3. This is a 36% increase.

For this assessment, the building's 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).

The likely 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 buildings 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 C1 below.

Description	Grade	Risk	%NBS	Existing Building Structural Performance	Improvement of Structural Performance	
					Legal Requirement	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 C1: NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE Guidelines

Table C1 below compares the percentage NBS to the relative risk of the building failing in a seismic event with a 10% probability of exceedance in 50 years (i.e. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% probability of exceedance in the next year.

Table C1: Relative Risk of Building Failure In A

Percentage of New Building Standard (%NBS)	Relative Risk (Approximate)
>100	<1 time
80-100	1-2 times
67-80	2-5 times
33-67	5-10 times
20-33	10-25 times
<20	>25 times

Appendix D
Background and Legal Framework

Background

Aurecon has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the building

This report is a Qualitative Assessment of the building structure, and is based on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011.

A qualitative assessment involves inspections of the building and a desktop review of existing structural and geotechnical information, including existing drawings and calculations, if available.

The purpose of the assessment is to determine the likely building performance and damage patterns, to identify any potential 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).

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.

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 anticipated that CERA will adopt the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011. This document sets out a methodology for both qualitative and quantitative assessments.

The qualitative assessment is a desk-top and site inspection assessment. It is based on a thorough visual inspection of the building coupled with a review of available documentation such as drawings and specifications. The quantitative assessment involves analytical calculation of the buildings 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 and amount of damage
- The age and structural type of the building
- Consideration of any critical structural weaknesses
- The extent of any earthquake damage

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.

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.

We anticipate 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.

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.

After the February Earthquake, on 19 May 2011, Compliance Document B1: Structure was amended to include increased seismic design requirements for Canterbury as follows:

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

Appendix E
Standard Reporting Spread Sheet

Detailed Engineering Evaluation Summary Data V1.11

Location

Building Name:	Bottle Lake - Office & Mess Room	Reviewer:	Simon Manning
	Unit / No: 70 / Street: Waitikiri Drive	CPEng No:	132053
Building Address:	70 Waitikiri Drive	Company:	Aurecon
Legal Description:	RS 26529	Company project number:	228591
		Company phone number:	03 375 0761
	Degrees / Min / Sec		
GPS south:	43 / 28 / 7.98	Date of submission:	11/10/2013
GPS east:	172 / 40 / 51.68	Inspection Date:	12/03/2012
		Revision:	3
Building Unique Identifier (CCC):	PRK_0158_BLDG_001	Is there a full report with this summary?	yes

Site

Site slope:	flat	Max retaining height (m):	
Soil type:	mixed	Soil Profile (if available):	
Site Class (to NZS1170.5):	D		
Proximity to waterway (m, if <100m):		If Ground improvement on site, describe:	
Proximity to clifftop (m, if < 100m):			
Proximity to cliff base (m,if <100m):		Approx site elevation (m):	3.30

Building

No. of storeys above ground:	2 (single storey = 1)	Ground floor elevation (Absolute) (m):	3.40
Ground floor split?	no	Ground floor elevation above ground (m):	0.10
Storeys below ground	0		
Foundation type:	raft slab	if Foundation type is other, describe:	
Building height (m):	6.00	height from ground to level of uppermost seismic mass (for IEP only) (m):	6
Floor footprint area (approx):	220		
Age of Building (years):	50	Date of design:	1965-1976
Strengthening present?	no	If so, when (year)?	
		And what load level (%g)?	
Use (ground floor):	commercial	Brief strengthening description:	
Use (upper floors):	commercial		
Use notes (if required):	office and administration building		
Importance level (to NZS1170.5):	IL2		

Gravity Structure

Gravity System:	load bearing walls		
Roof:	timber framed	rafter type, purlin type and cladding	
Floors:	timber	joist depth and spacing (mm)	
Beams:	timber	type	
Columns:	load bearing walls	typical dimensions (mm x mm)	
Walls:	partially filled concrete masonry	thickness (mm)	190

Lateral load resisting structure

Note: Define along and across in detailed report!

Lateral system along:	partially filled CMU	note total length of wall at ground (m):	
Ductility assumed, μ:	1.25	wall thickness (m):	
Period along:	0.40 ##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):		estimate or calculation?	estimated
Lateral system across:	partially filled CMU	note total length of wall at ground (m):	
Ductility assumed, μ:	1.25	wall thickness (m):	
Period across:	0.40 ##### enter height above at H31	estimate or calculation?	estimated
Total deflection (ULS) (mm):		estimate or calculation?	estimated
maximum interstorey deflection (ULS) (mm):		estimate or calculation?	estimated

Separations:

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

Non-structural elements

Stairs:	timber	describe supports	
Wall cladding:	other light	describe	
Roof Cladding:	Metal	describe	
Glazing:	timber frames		
Ceilings:	none		
Services(list):			

Available documentation

Architectural	partial	original designer name/date	City Solutions - 2006 addition
Structural	partial	original designer name/date	City Solutions - 2006 addition
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:		Describe damage:	minor - none
Settlement:	none observed	notes (if applicable):	
Differential settlement:	none observed	notes (if applicable):	
Liquefaction:	none apparent	notes (if applicable):	
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:	15%	Describe how damage ratio arrived at:	
	Describe (summary):			
Across	Damage ratio:	15%		
	Describe (summary):			
Diaphragms	Damage?:	no	Describe:	
CSWs:	Damage?:	no	Describe:	
Pounding:	Damage?:	no	Describe:	
Non-structural:	Damage?:	no	Describe:	

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

Recommendations

	Level of repair/strengthening required:	none	Describe:	
	Building Consent required:	no	Describe:	
	Interim occupancy recommendations:	full occupancy	Describe:	
Along	Assessed %NBS before:	100% ##### %NBS from IEP below	If IEP not used, please detail assessment methodology:	Specific capacity and demand assessment with assumptio
	Assessed %NBS after:	85%		
Across	Assessed %NBS before:	100% ##### %NBS from IEP below		
	Assessed %NBS after:	85%		

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):	1965-1976	h_n from above:	6m
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:		
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		
Note 2: for RC buildings designed between 1976-1984, use 1.2		
Note 3: for buildngs designed prior to 1935 use 0.8, except in Wellington (1.0)		
Final $(\%NBS)_{nom}$:	**0%**	**0%**

2.2 Near Fault Scaling Factor

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

	along	across
Near Fault scaling factor (1/N(T,D), **Factor A**:	#DIV/0!	#DIV/0!

2.3 Hazard Scaling Factor

Hazard factor Z for site from AS1170.5, Table 3.3:

Z_{1992}, from NZS4203:1992

Hazard scaling factor, **Factor B:** #DIV/0!

2.4 Return Period Scaling Factor

Building Importance level (from above): 2

Return Period Scaling factor from Table 3.1, **Factor C**:

2.5 Ductility Scaling Factor

	along	across
Assessed ductility (less than max in Table 3.2)		
Ductility scaling factor: =1 from 1976 onwards; or =kμ, if pre-1976, fromTable 3.3:		
Ductiity Scaling Factor, **Factor D**:	0.00	0.00

2.6 Structural Performance Scaling Factor:

Sp:		
Structural Performance Scaling Factor **Factor E**:	#DIV/0!	#DIV/0!

2.7 Baseline %NBS, (NBS%)$_b$ = (%NBS)$_{nom}$ x A x B x C x D x E **%NBS$_b$:** **#DIV/0!** **#DIV/0!**

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

Height Difference effect D2, from Table to right

Therefore, Factor D: 0

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

3.5. Site Characteristics insignificant 1

3.6. Other factors, Factor F

	Along	Across
For ≤ 3 storeys, max value =2.5, otherwise max valule =1.5, no minimum		
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

3.7. Overall Performance Achievement ratio (PAR) **0.00** **0.00**

4.3 PAR x (%NBS)b: PAR x Baselline %NBS: **#DIV/0!** **#DIV/0!**

4.4 Percentage New Building Standard (%NBS), (before) **#DIV/0!**

Official Use only:

Accepted By

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