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Little River Education House
PRK 3667 BLDG 001 EQ2

Detailed Engineering Evaluation
Qualitative Report

Version FINAL

4421 Akaroa Road, Little River

INFRASTRUCTURE | MINING & INDUSTRY | DEFENCE | PROPERTY & BUILDINGS | ENVIRONMENT

Little River Education House
PRK 3667 BLDG 001 EQ2

Detailed Engineering Evaluation
Qualitative Report
Version FINAL

4421 Akaroa Road, Little River

Christchurch City Council

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Reviewed By
Alex Baylis

Date
14th November 2013

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Little River Education House

PRK 3667 BLDG 001 EQ2

Detailed Engineering Evaluation

Qualitative Report - SUMMARY

Version FINAL

4421 Akaroa Road, Little River

Background

This is a summary of the Qualitative report for the building structure, and is based in part on the Detailed Engineering Evaluation Procedure document (draft) issued by the Structural Advisory Group on 19 July 2011 and visual inspections on 24th May 2012.

Building Description

The building is a single level timber framed structure, with a roof consisting of lightweight metal cladding on timber boards and rafters, with a main pitch of approximately thirty degrees. External wall construction consists of weather boards on timber stud. The original structure was lined internally with scrim and sarking; plasterboard was used in the subsequent lean-to extension. Internal stud wall finishes also reflect these differences. The floor consists of tongue and groove, likely supported on timber joists and bearers on internal timber piles, with the external walls supported by concrete perimeter wall footings. Two brick chimney stacks are located internally.

Key Damage Observed

No key damage was observed.

Critical Structural Weaknesses

No critical structural weaknesses were identified in the structure, however the brick chimney stacks have potential for a significant effect on structural performance due to their high relative mass and height.

Indicative Building Strength (from IEP and CSW assessment)

Based on the information available, and using the NZSEE Initial Evaluation Procedure, the original capacity of the building has been assessed to be in the order of 15% NBS and post-earthquake capacity also in the order of 15% NBS. The buildings post-earthquake capacity excluding the hazard arising from the chimney stacks is in the order of 22% NBS.

The building has been assessed to have a seismic capacity in the order of 15% NBS and is therefore potentially Earthquake Prone.

Recommendations

It is recommended that:

- A quantitative assessment of the building be undertaken to determine the seismic capacity and to develop potential strengthening concepts.
- The building has been assessed as being potentially Earthquake Prone. As a result, it is recommended that the Little River Education House is unoccupied pending further detailed assessment and strengthening if required, as per Christchurch City Council's policy regarding occupancy of potentially Earthquake Prone buildings.
- It is strongly recommended that both URM clay brick chimney stacks be removed down to foundation level as an immediate measure. Carrying out chimney removal as an operation prior and separate to detailed assessment and possible strengthening is a beneficial precaution for alleviating the structure of mass that would otherwise apply significant detrimental seismic load to the building
- As part of the detailed assessment, a full pile purvey is recommended as internal laundry piles appeared to be supported on timber packers.

1. Background

GHD has been engaged by the Christchurch City Council (CCC) to undertake a detailed engineering evaluation of the Little River Education House

This report is a Qualitative Assessment of the building structure, and is based in part 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).

At the time of this report, no intrusive site investigation, detailed analysis, or modelling of the building structure had been carried out. Construction drawings were made available, and these have been considered in our evaluation of the building. The building description below is based on a review of the drawings and our visual inspections.

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 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

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.

2.2.1 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.

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.

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.

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.

3. Earthquake Resistance Standards

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 1 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 1 NZSEE Risk Classifications Extracted from table 2.2 of the NZSEE 2006 AISPBE

Table 1 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. 0.2% in the next year). It is noted that the current seismic risk in Christchurch results in a 6% risk of exceedance in the next year.

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

Table 1 %NBS compared to relative risk of failure

4. Building Description

4.1 General

The Little River Education House is located at 4421 Akaroa Road, Little River, Christchurch. Resident estimates the original building was constructed in 1905, with a lean-to extension added at the rear circa 1950's.

The building is a single level timber framed structure, with a roof consisting of lightweight metal cladding on timber boards and rafters, with a main pitch of approximately thirty degrees. External wall construction consists of weather boards on timber stud. The original structure was lined internally with scrim and sarking; plasterboard was used in the subsequent lean-to extension. Internal stud wall finishes also reflect these differences. The floor consists of tongue and groove, likely supported on timber joists and bearers on internal timber piles, with the external walls supported by concrete perimeter wall footings. Two brick chimney stacks are located internally.

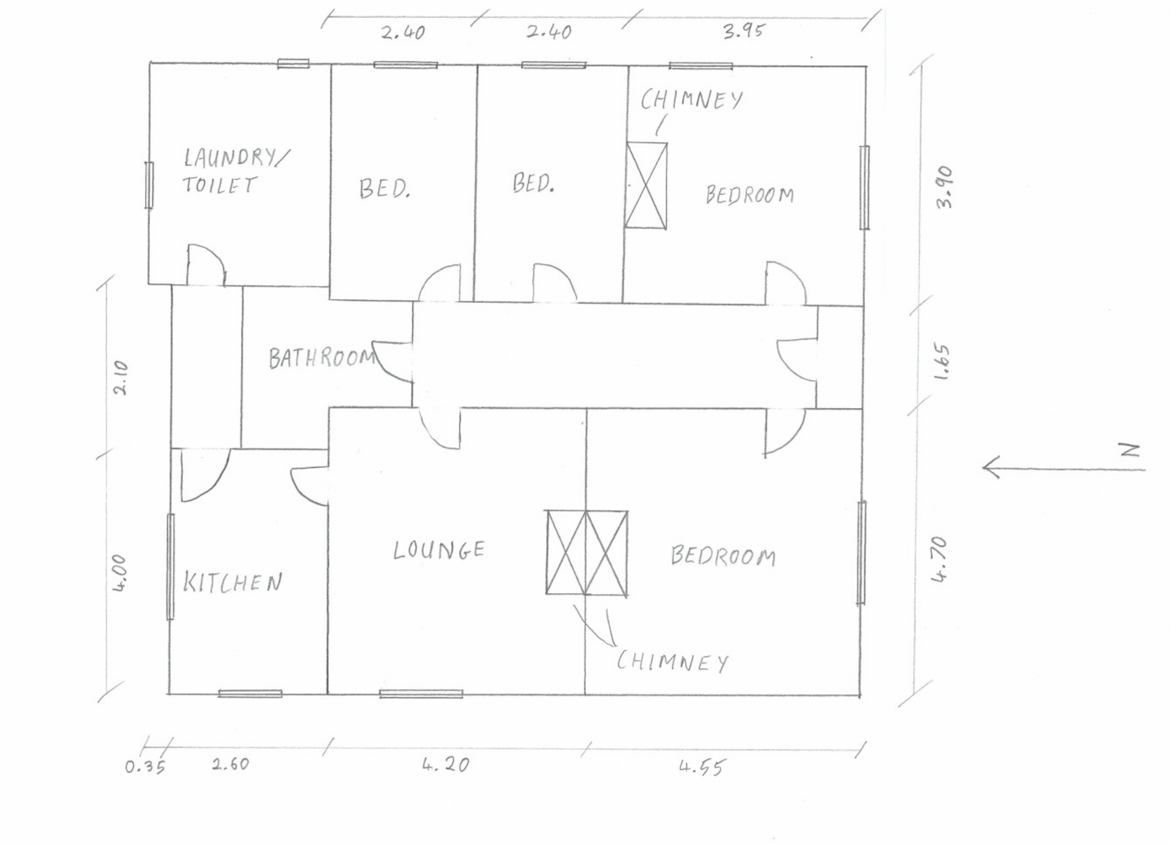


Figure 2 Plan sketch showing general layout

The building is approximately 12m in length by 10m in width and has an apex height of 4.85m. The building footprint is approximately 125m^2. The site is relatively flat at approximately 30m above mean sea level. Opuahou Stream is situated approximately 90m to the west.

Plans or drawings were not available for this building.

4.2 Gravity Load Resisting System

Gravity loads are resisted by the timber framed structure. Roof loads are carried by timber roof rafters onto timber framed walls, which transfer the loads to the floor level. External walls are supported on a perimeter concrete wall foundation and internal walls, along with floors, are supported by timber joists and bearers on timber piles. The brick chimney stacks may also carry some gravity loads.

Inspection of the lean-to sub-floor showed pile construction in this area to be sub-standard. Piles did not appear to be founded properly in the sub-strata but instead were supported on timber packers which rested on the soil surface.

4.3 Lateral Load Resisting System

Lateral loads acting at roof level are carried by the nearest timber framed walls. Some diaphragm action will be achieved by the roof structure (timber sarking) and ceiling linings. These walls transfer the load either directly, or indirectly via floor diaphragm action, to the edge concrete wall foundation. The piles which support internal walls and floor probably add resistance to the lateral loads by cantilever action. Roof stability is provided by the timber boarding on rafters which form in-plane panels to transfer roof load demand to eaves level.

5. Assessment

An inspection of the building was undertaken on the 24th May 2012. Both the interior and exterior of the building were inspected. The main structural components of the roof of the building were viewed through the roof space access panel. Surveying of the roof space from the access panel was limited due to the location of the panel. Only piles of the lean-to extension were accessible, these piled foundations were able to be viewed through the sub-floor access panel but visible structural elements were restricted to the vicinity of the access point.

The inspection consisted of scrutinising the building to determine the structural systems and likely behaviour of the building during an earthquake. The site was assessed for damage, including examination of the ground conditions, checking for damage in areas where damage would be expected for the type of structure and noting general damage observed throughout the building in both structural and non-structural elements.

The %NBS score determined for this building has been based on the IEP procedure described by the NZSEE and based on the information obtained from visual observation of the building.

6. Damage Assessment

6.1 Surrounding Buildings

There is a garage in close proximity to the house but no damage was observed to this structure.

6.2 Residual Displacements and General Observations

No residual displacements of the structure were noticed during our inspection of the building. However it should be noted that some differential settlement has occurred, most likely caused by piles settling with consolidating founding soils under loading for more than 100 years. Similarly the structure has not been well maintained, leading to water damage and cracking to plaster. There appears to be no earthquake damage.

6.3 Ground Damage

There was no evidence of ground damage on the property or surrounding neighbours land.

7. Critical Structural Weakness

7.1 Short Columns

No short columns are present in the structure.

7.2 Lift Shaft

The building does not contain a lift shaft.

7.3 Roof

No critical structural weaknesses were observed in the roof structure. Roof in plane bracing will be provided by timber boarding fixed to rafters. A ceiling diaphragm was also present in the form of plastered sarking.

7.4 Staircases

The building does not contain a staircase.

7.5 Site Characteristics

Following the geotechnical appraisal it was found that the site has a minor potential for liquefaction, slope failure and rockfall. For the purposes of the IEP assessment of the building and the determination of the %NBS score, the effects of soil liquefaction on the performance of the building has been assessed as a 'insignificant' site characteristic in accordance with the NZSEE guidelines.

7.6 Brick Chimney Stacks

Though not considered a critical structural weakness, the brick chimney stacks have potential for a significant effect on structural performance due to their high relative mass and height. The factor 'F', in section 3.6 of the cera forms, has been used to penalise the structure's IEP score by 30% due to these URM items.

8. Geotechnical Consideration

8.1 Site Description

The site is situated ~2.5km northeast of the settlement of Little River, Banks Peninsular, south of Christchurch. It is relatively flat at approximately 30m above mean sea level. The site is ~90m east of Opuahou Stream, 3.5km northeast of Lake Forsyth and 11km north of the coast at Birdlings Flat.

8.2 Published Information on Ground Conditions

8.2.1 Published Geology

The geological map of the area[1] indicates that the site is situated on the boundary of the following geological units:

- Holocene alluvial soils, comprising “grey river alluvium beneath plains or low-level river terraces (Q1a)”; and,
- Pleistocene Aeolian soils, comprising “yellow-brown windblown silt on Banks Peninsula, greater than 3m thick and commonly in multiple layers (mQe)”, known colloquially as *Port Hills Loess*.

8.2.2 Environment Canterbury Logs

Information from Environment Canterbury (ECan) indicates that no boreholes are located within 200m of the site. However, two boreholes with lithographic logs are located 600m west of the site (see Table 2).

These logs indicate the area to be underlain by layers of silt (some containing minor gravel and sand), overlying strong basaltic bedrock at 4 to 5m.

Table 2 ECan Borehole Summary

Bore Name	Log Depth	Groundwater	Distance & Direction from Site
N36/0135	5.6m	-	600m W
N36/0136	4.3m	-	600m W

The boreholes were sunk geotechnical purposes. However, it is not clear if the logs have been written by the well driller or a geotechnical professional or to a standard. In addition strength data is not recorded.

[1] Forsyth P.J., Barrell D.J.A., & Jongens R. (compilers), 2008: *Geology of the Christchurch Area*. Institute of Geological and Nuclear Sciences 1:250,000 Geological Map 16. Lower Hutt. Institute of Geological and Nuclear Sciences Limited.

8.2.3 EQC Geotechnical Investigations

The Earthquake Commission has not undertaken geotechnical testing in the area of the subject site.

8.2.4 Land Zoning

Canterbury Earthquake Recovery Authority (CERA) has indicated the site is situated within the Green Zone, indicating that repair and rebuild may take place.

Land in the CERA green zone has been divided into three technical categories. These categories describe how the land in expected to perform in future earthquakes.

The site is indicated as being technical category "N/A – Port Hills and Banks Peninsula"[2].

No technical category has been assigned as the geology of Banks Peninsula differs vastly from the Canterbury Plains.

8.2.5 Post February Aerial Photography

No post-earthquake aerial photography is available for the subject site, as it is outside the greater Christchurch urban area.

8.2.6 Summary of Ground Conditions

From the information presented above, the ground conditions underlying the site are anticipated to comprise layers of silt (likely Loess) overlying basaltic bedrock at shallow depth.

8.3 Seismicity

8.3.1 Nearby Faults

There are many faults in the Canterbury region, however only those considered most likely to have an adverse effect on the site are detailed below.

Table 3 Summary of Known Active Faults[3][4]

Known Active Fault	Distance from Site	Direction from Site	Max Likely Magnitude	Avg Recurrence Interval
Alpine Fault	150 km	NW	~8.3	~300 years
Greendale (2010) Fault	42 km	NW	7.1	~15,000 years
Hope Fault	130 km	N	7.2~7.5	120~200 years
Kelly Fault	140 km	NW	7.2	~150 years

[2] CERA Landcheck website, http://cera.govt.nz/my-property

[3] Stirling, M.W, McVerry, G.H, and Berryman K.R. (2002) A New Seismic Hazard Model for New Zealand, Bulletin of the Seismological Society of America, Vol. 92 No. 5, pp 1878-1903, June 2002.

[4] GNS Active Faults Database

Porters Pass Fault	90 km	NW	7.0	~1100 years

8.3.2 Ground Shaking Hazard

This seismic activity has produced earthquakes of Magnitude-6.3 with peak ground accelerations (PGA) up to twice the acceleration due to gravity (2g) in some parts of the city. This has resulted in widespread liquefaction throughout Christchurch.

New Zealand Standard NZS 1170.5:2004 quantifies the Seismic Hazard factor for Christchurch as 0.30, being in a moderate to high earthquake zone. This value has been provisionally upgraded recently (from 0.22) to reflect the seismicity hazard observed in the earthquakes since 4 September 2010.

In addition, anticipation of silt and loess overlying strong basaltic bedrock at shallow depth, and a 475-year PGA (peak ground acceleration) of ~0.4 (Stirling et al, 2002[4]), ground shaking potential is likely to be low to moderate.

8.4 Slope Failure and/or Rockfall Potential

The site is located within 50m of the base of the hillside. Hence, there is potential that the site would be inundated should the slope above become unstable. However, the hills typically comprise relatively strong bedrock with relatively thin, stable, overlying loess. As a result, the slope failure and rockfall potential is considered relatively low.

8.5 Liquefaction Potential

Due to the presence of silt underlying the site, there is the potential for liquefaction to occur. However, bedrock is shallow, and hence this potential is considered relatively low.

8.6 Recommendations

A soil class of **C** (in accordance with NZS 1170.5:2004) should be adopted for the site.

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that intrusive investigation be conducted.

8.7 Conclusions & Summary

This assessment is based on a review of the geology and existing ground investigation information, and observations from the Christchurch earthquakes since 4 September 2010.

The site appears to be situated on 4 to 5m of silt (loess) overlying basaltic bedrock. Associated with this the site has a low liquefaction potential.

A soil class of **C** (in accordance with NZS 1170.5:2004) should be adopted for the site.

Should a more comprehensive liquefaction and/or ground condition assessment be required, it is recommended that intrusive investigation be conducted.

9. Survey

No level or verticality surveys have been undertaken for this building at this stage as indicated by Christchurch City Council guidelines.

10. Initial Capacity Assessment

10.1 % NBS Assessment

The building has had its capacity assessed using the Initial Evaluation Procedure based on the information available. The building's capacity excluding critical structural weaknesses and identified weaknesses is given as a percentage of new building standard and is in the order of 22 NBS%. Once these weaknesses are accounted this figure drops to 15 NBS%. These capacities are subject to confirmation by a more detailed quantitative analysis.

Following an IEP assessment, the building has been assessed as achieving 15% New Building Standard (NBS). Under the New Zealand Society for Earthquake Engineering (NZSEE) guidelines the building is considered Earthquake Prone as it achieves less than 33% NBS. This score has not been adjusted by considering damage to the structure as none was observed.

10.2 Seismic Parameters

The seismic design parameters based on current design requirements from NZS 1170:2002 and the NZBC clause B1 for this building are:

- Site soil class: C NZS 1170.5:2004, Clause 3.1.3, Shallow Soil
- Site hazard factor, Z = 0.3, NZBC, Clause B1 Structure, Amendment 11 effective from 1 August 2011
- Return period factor R_u = 1.0, NZS 1170.5:2004, Table 3.5, Importance level 2 structure with a 50 year design life.

An increased Z factor of 0.3 for Christchurch has been used in line with requirements from the Department of Building and Housing resulting in a reduced % NBS score.

10.3 Expected Structural Ductility Factor

A structural ductility factor of 2.0 has been assumed based on the structural system observed and the date of construction.

10.4 Discussion of Results

The results obtained from the initial IEP assessment are consistent with those expected for a building of this age and construction type. The materials and method of construction matches those standard at the estimated time of construction. Loadings from current design standards would far exceed the likely capacity of structures from this era. This is compounded further by the increase in the hazard factor for Christchurch to 0.3, it would be expected that the building would achieve a significantly reduced NBS% when compared to newer buildings. When a reduction of structural performance due to the brick chimney stacks is included it is reasonable to expect the building to be classed as potentially Earthquake Prone.

10.5 Occupancy

The building has been assessed as being potentially Earthquake Prone based on the type of construction, the assumed date of construction and the presence of brick chimney stacks. As a result, it is recommended that the Little River Education House is unoccupied pending further detailed assessment and strengthening if required, as per Christchurch City Council's policy regarding occupancy of potentially Earthquake Prone buildings.

11. Initial Conclusions

The building has been assessed to have a seismic capacity in the order of 15% NBS and is therefore potentially Earthquake Prone.

12. Recommendations

Due to the age, construction type and presence of brick chimney stacks, it has been assessed a potentially Earthquake Prone. As a result, we recommend that Little River Education House is unoccupied pending further detailed assessment of the structure and if necessary, strengthening options explored.

It is strongly recommended that both URM clay brick chimney stacks be removed down to foundation level as an immediate measure. Carrying out chimney removal as an operation prior and separate to detailed assessment and possible strengthening is a beneficial precaution for alleviating the structure of mass that would otherwise apply significant detrimental seismic load to the building

As part of the detailed assessment, a full pile purvey is recommended as internal laundry piles appeared to be supported on timber packers.

13. Limitations

13.1 General

This report has been prepared subject to the following limitations:

- No intrusive structural investigations have been undertaken.
- No intrusive geotechnical investigations have been undertaken.
- Visual inspections of the sub-floor space were limited to the vicinity of the access manhole and as a result the entirety of the subfloor space could not be inspected.
- Visual inspections of the roof space were limited to the vicinity of the access hatch and due to its non-central location, the entirety of the roof space could not be inspected visually.
- No level or verticality surveys have been undertaken.
- No material testing has been undertaken.
- No calculations, other than those included as part of the IEP in the CERA Building Evaluation Report, have been undertaken. No modelling of the building for structural analysis purposes has been performed.

It is noted that this report has been prepared at the request of Christchurch City Council and is intended to be used for their purposes only. GHD accepts no responsibility for any other party or person who relies on the information contained in this reportrite a specific limitations section.

13.2 Geotechnical Limitations

This report presents the results of a geotechnical appraisal prepared for the purpose of this commission, and for prepared solely for the use of Christchurch City Council and their advisors. The data and advice provided herein relate only to the project and structures described herein and must be reviewed by a competent geotechnical engineer before being used for any other purpose. GHD Limited (GHD) accepts no responsibility for other use of the data.

The advice tendered in this report is based on a visual geotechnical appraisal. No subsurface investigations have been conducted. An assessment of the topographical land features have been made based on this information. It is emphasised that Geotechnical conditions may vary substantially across the site from where observations have been made. Subsurface conditions, including groundwater levels can change in a limited distance or time. In evaluation of this report cognisance should be taken of the limitations of this type of investigation.

An understanding of the geotechnical site conditions depends on the integration of many pieces of information, some regional, some site specific, some structure specific and some experienced based. Hence this report should not be altered, amended or abbreviated, issued in part and issued incomplete in any way without prior checking and approval by GHD. GHD accepts no responsibility for any circumstances, which arise from the issue of the report, which have been modified in any way as outlined above.

Appendix A

Photographs

Photograph 1 East elevation.

Photograph 2 View of the building from the Northwest.

Photograph 3 Timber boards at roof level.

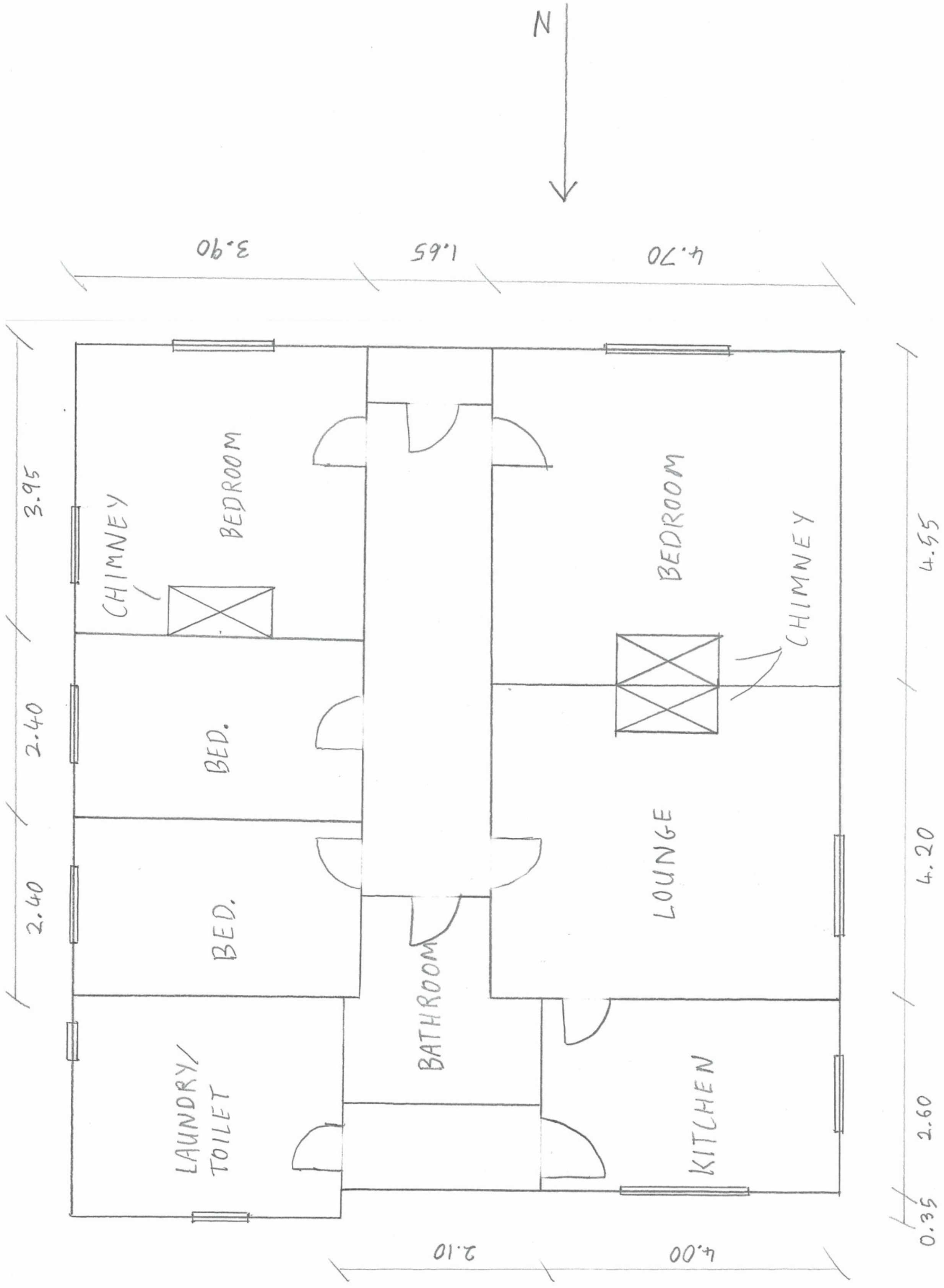
Photograph 4 Water damage in ceiling

Photograph 5 Dilapidation in ceiling plaster and sarking .

Photograph 6 Piles supported on timber packers

Appendix B

Building Plans / Sketches


N
3.90
1.65
4.70
3.95
2.40
2.40
4.55
4.20
2.60
0.35
2.10
4.00
CHIMNEY
BEDROOM
BEDROOM
CHIMNEY
BED.
BED.
LOUNGE
BATHROOM
LAUNDRY/
TOILET
KITCHEN

Appendix C

CERA Building Evaluation Form

GHD

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Document Status

Rev No.	Author	Reviewer		Approved for Issue		
		Name	Signature	Name	Signature	Date
Final	Paul Clarke	Alex Baylis	Alex Baylis	D Bridgman	D Bridgman	14 Nov 2013