Rangitikei District Council

DETAILED SEISMIC ASSESSMENT

ASSESTS BUILDING
46 HIGH STREET, MARTON

18 FEBRUARY 2022

CONFIDENTIAL

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DETAILED SEISMIC ASSESSMENT

ASSETS BUILDING
46 HIGH STREET, MARTON

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REV	DATE	DETAILS
DRAFT	12/11/2021	For client information and comment
FINAL	18/02/2022	Updated report following condition assessment

	NAME	DATE	SIGNATURE
Prepared by:	André Ferreira	11 November 2021	
Reviewed by:	Rudi van Schalkwyk	12 November 2021	
Approved by:	Robert Jeans	12 November 2021	

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EXECUTIVE SUMMARY

WSP has been engaged by *Rangitikei District City Council* (*RDC*) to complete a Detailed Seismic Assessment (DSA) of the "*Assets*" building at 46 High Street, Marton. Our assessment has been completed in accordance with the MBIE document "*The Seismic Assessment of Existing Buildings – Technical Guidelines of Engineering Assessments*", July 2017 (the 'Red Book').

The DSA has been instructed following the requirement of RDC to have detailed seismic assessments undertaken of council operated buildings, as to comply with current building codes and standards.

The Assets Building is currently used as office space providing ancillary support to the surrounding Admin, Finance and Civil Defence Buildings located at 46 High Street, Marton.

It is our understating that the Assets Building is not currently serving as an Emergency Operations Centre (EOC) and is therefore considered to be an Importance Level 2 **(IL2)** structure, in accordance with the joint Australian/New Zealand standard Structural Design Actions Part 0, AS/NZS 1170.0:2002. It has hence been assessed for actions from a seismic event causing 1-in-500 year (ULS) ground shaking.

The design and construction date of the building is unknown however it is estimated to have been built during the 1950's. It is a single-storey building constructed from light timber framed walls (with external masonry veneer) which support the timber trussed roof (with lightweight steel sheeting). Walls and roof are supported on perimeter concrete footings, while the interior timber floor is elevated and supported on piles.

Building alterations to the interior were carried out during 2006 and resulted in most of the internal walls being re-lined with gypsum plasterboard (Gib). Two walls were identified to have been removed.

The results of the DSA find the building's *Earthquake Rating* to be **15%*NBS* (IL2)** when assessed in accordance with the Guidelines. Therefore, this is a **grade E building** following the New Zealand Society for Earthquake Engineering (NZSEE) grading scheme. **Grade E** buildings represent a risk to occupants 25 times greater than expected for a new building, indicating a **very high life-safety risk** exposure. However, this is due to a secondary element so can be relatively easily remediated, please see the table and remediation options on the next page.

A building with an *Earthquake Rating* less than 34%NBS when assessed in accordance with the Seismic Assessment Guidelines (the 'Red book') fulfils one of the requirements for the Territorial Authority to consider it to be an Earthquake-Prone Building (EPB) in terms of the Building Act 2004. A building rating less than 67%NBS is considered as an Earthquake-risk Building by the NZSEE. The act requires all seismic strengthening work to be completed within 7.5 years for EPB rated buildings and 15 years for buildings rated above the EPB threshold. The priority classification of the Assets Building is to the discretion of the Territorial Authority.

The assessment identified the following structural weaknesses in the building:

Structural Component/System	Seismic Score (%NBS – IL2)	Structural Weakness Type	Mode of Failure
Ceiling diaphragm	100%		
Timber walls bracing capacity (across) – Block A	100%		
Timber walls bracing capacity (along) – Block A	83%	SW	Shear capacity
Timber walls bracing capacity (across) – Block B	76%	SW	Shear capacity
Timber walls bracing capacity (along) – Block B	87%	SW	Shear capacity
Bottom plate shear capacity (out-of-plane) – Block A	100%		
Bottom plate shear capacity (out-of-plane) – Block B	71%	SW	Shear capacity
Perimeter concrete footing pull-out capacity	100%		
Timber walls out-of-plane flexural capacity	100%		
URM out-of-plane flexural capacity	15%	CSW (SNSS)	Flexural capacity

Based on the outcomes of our assessment, we recommend strengthening the building to achieve a seismic rating 67%*NBS* (IL2).

The assessment shows that the performance of the building is limited by the out-of-plane flexural capacity of the masonry wall at the BBQ storage area. This score can significantly be improved by installing a new ceiling diaphragm and steel mullions. Alternatively, the wall may be replaced with a “like-for-like” timber frame wall. The storage room is not occupied by persons and can therefore be considered as ‘Secondary Structural and Non-Structural’ (SSNS) elements. SNSS elements do not affect the overall operational performance rating of the building. Therefore, it does not compromise the overall building structure, but as an individual part of the building could cause damage to property or pose a significant life safety hazard. It is left to the discretion of the client to decide if strengthening, isolation or removal of SNSS elements are required. The critical structural weakness (CSW) listed above is not considered to inform the overall performance rating of the primary lateral and gravity load resisting system.

In conclusion, the CSW is deemed to be a SSNS element and accordingly left to the discretion of the client to decide if strengthening, removal or isolation of the elements are required.

A technical summary of the DSA is presented in Appendix A.

1 PROJECT BACKGROUND

1.1 INTRODUCTION

WSP has been engaged by *Rangitikei District Council* (RDC) to complete a Detailed Seismic Assessment (DSA) of the "*Assets Building*" at 46 High Street, Marton. This report summarises the inputs, methodology and findings of the assessment.

The DSA has been instructed following RDC's requirement to have detailed seismic assessments undertaken of council operated buildings, as to comply with current building codes and standards

1.2 DSA SCOPE AND PURPOSE

A DSA is one of two forms of *Engineering Assessment* (the other being an ISA) permitted by the Earthquake Prone Building Methodology of the Ministry of Business, Innovation and Employment to determine a building's *Earthquake Rating* (see Section 1.3) as part of the system for managing earthquake earthquake-prone buildings.

In July 2017 the latest revision of the "The Seismic Assessment of Existing Buildings – Technical Guidelines for Engineering Assessments" was issued. This is a document managed jointly by the Ministry of Business, Innovation and Employment, the Earthquake Commission, the New Zealand Society for Earthquake Engineering, the New Zealand Structural Engineering Society and the New Zealand Geotechnical Society. The part of the technical guidelines covering concrete buildings is Section C5. This section is also known to the industry as the "C5 Red Book".

In November 2018 an updated revision to the technical guidelines Section C5 was issued. This is known to the industry as the revised guidelines or the "C5 Yellow Book". The C5 Yellow Book included substantial updates to the main body of the guidelines for the assessment of the primary structure for concrete buildings and included updates to several of the appendices, including the precast floor section (now appendix C5E), of the guidelines. The updates to the guidelines included lessons learned from the recent University research and the 2016 Kaikoura Earthquake as well as findings from the MBIE "Statistics House" Investigation.

A DSA aims to achieve an understanding of the likely behaviour of a building in earthquakes by:

- Quantifying the strength and deformation capacities of the various structural elements, and;
- Checking the building's structural integrity against the loads/deformations (demands) that would be used for the design of a similar building on the same site, to the latest building codes and standards.

A building with an *Earthquake Rating* less than 34%NBS fulfils one of the requirements for the Territorial Authority to consider it to be an Earthquake-Prone Building (EPB) in terms of the Building Act 2004. For concrete buildings, the C5 Red Book must be utilised when determining the earthquake-prone status. A building rating less than 67%NBS is considered as an Earthquake-risk Building by the New Zealand Society of Earthquake Engineering (NZSEE).

Table 1 shows the grading system developed by the NZSEE for communicating the relative risk of a building compared to a that of a similar new building on the same site, based on the *Earthquake Rating* determined by a DSA.

Table 1: NZSEE grading system and relative risk description.

Percentage of New Building Standard (*%NBS*)	Alpha rating	Approx. risk relative to a new building	Life-safety risk description
>100 A+	A+	Less than or comparable to	Low risk
80-100	A	1-2 times greater	Low risk
67-79	B	2-5 times greater	Low to Medium risk
34-66	C	5-10 times greater	Medium risk
20 to <34	D	10-25 times greater	High risk
<20	E	25 times greater	Very high risk

1.3 %NBS CALCULATION

The *%NBS Earthquake Rating* for a building is found by a DSA from the following equation:

%NBS = Ultimate capacity (seismic) x 100% / ULS seismic demand

The Ultimate capacity (seismic) of a building is taken as the minimum of:

- The probable capacity of the primary lateral structure of the building, including the impact of geotechnical issues, or;
- The probable capacity of structural elements, the failure of which could lead to a significant life safety hazard, or;
- The capacity of any Severe Structural Weaknesses (refer Section 1.4), or;
- The probable capacity of Secondary Structure and Non-Structural (SSNS) elements.

The items above are only considered should failure result in a significant life safety hazard. This is generally considered as failures that would result in collapse of all or part of a building and that would reasonably affect a number of people.

1.4 STRUCTURAL WEAKNESSES

A structural weakness (SW) is an aspect of the building structure and/or the foundation soils that scores below 100%*NBS* and the failure of which would be considered a significant life safety hazard.

The critical structural weakness (CSW) is the lowest scoring SW of a building. The %*NBS* of the CSW will be the %*NBS* of the building.

Severe structural weaknesses (SSW's) are a predefined list of SW's in the Guidelines that are not readily amenable to reliable assessment using usual methods. The Guidelines require the calculated probable capacity of these elements/systems to be halved.

2 SOURCES OF BUILDING DATA

The following documents and information were used in the assessment of the Assets Building.

2.1 DRAWING, CALCULATIONS & REPORTS

Drawings:

- WARWICK Drw. 1 of 7 (24/05/2006): Existing Floor Plan
- WARWICK Drw. 2 of 7 (24/05/2006): Proposed Floor Plan
- WARWICK Drw. 3 of 7 (24/05/2006): Existing Cross Section
- WARWICK Drw. 4 of 7 (24/05/2006): Cross Section
- WARWICK Drw. 5 of 7 (21/06/2006): Floor Plan
- WARWICK Drw. 6 of 7 (26/06/2006): Jamb Sill Flashing
- WARWICK Drw. 7 of 7 (26/06/2006): Cross Section – Curtain Wall
- RDC Assets Department Building Alterations, Aug 2005: Elevations and internal walls layout

Reports:

- RDC Building Assessments: Earthquake, Fire & Ventilation: MWH Report no. Z1504904 *dated* 26 June 2008
- RDC Detailed Seismic Assessments, Admin & Assets Building: GHD Report no. 51/37736/ *dated* October 2018

2.2 SITE GEOTECHNICAL INFORMATION

a) Site sub-soil Class

In the absence of a geotechnical report, conservatively a classification of site subsoil class D has been assumed, and a natural site period of 0.4 seconds has been used to develop a spectral response curve for this site in Marton.

b) Liquefaction

No known faults are mapped within 10 km of the site and the site is assumed to have a 'low' liquefaction induced ground damage potential. Based on page 8 of "Update of hazard Information for 2015 Lifelines Risk & Responsibilities Report" published by GNS Science in the "*GNS Science Consultancy Report 2016/40 May 2016*"

c) Soil bearing capacity

Bearing capacity has been assumed to have 'Good ground' conditions to NZS:3604.

d) Bounding properties

The building does not have any other immediate buildings adjacent to it.

3 SITE AND BUILDING DECRIPTION

3.1 SITE

The building is located at 46 High Street, Marton.

Figure 1: Site layout

3.2 BUIILDING SIZE AND USAGE

The building's construction possibly took place during the 1950's and consists of lightweight timber framed walls (with exterior masonry veneer) supporting timber trusses with lightweight steel cladding. The building is 38.3 m long and 8.5 m wide, with Block A having a floor area of approximately 80m^2 and Block B covering approximately 207m^2 (Total = 290m^2). Currently the building is used as office space, providing administrative support to the surrounding council operated buildings (Civil defence, Finance & Admin Building) located at 46 High Street.

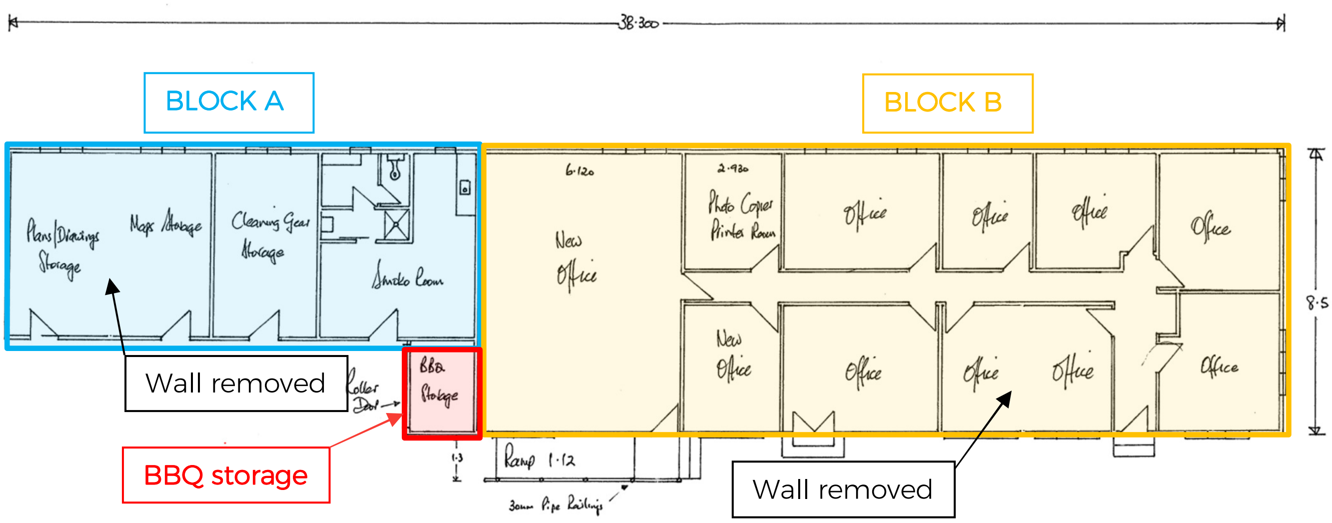

Figure 2: Ground Floor Plan – Wall layout

3.3 PHOTOGRAPHIC DETAIL

The following photos present the exterior and interior aspects of the building.

Figure 3: Front elevation indicating masonry veneer and covered walkway

Figure 4: Office with new Gib lining and internal wall removed

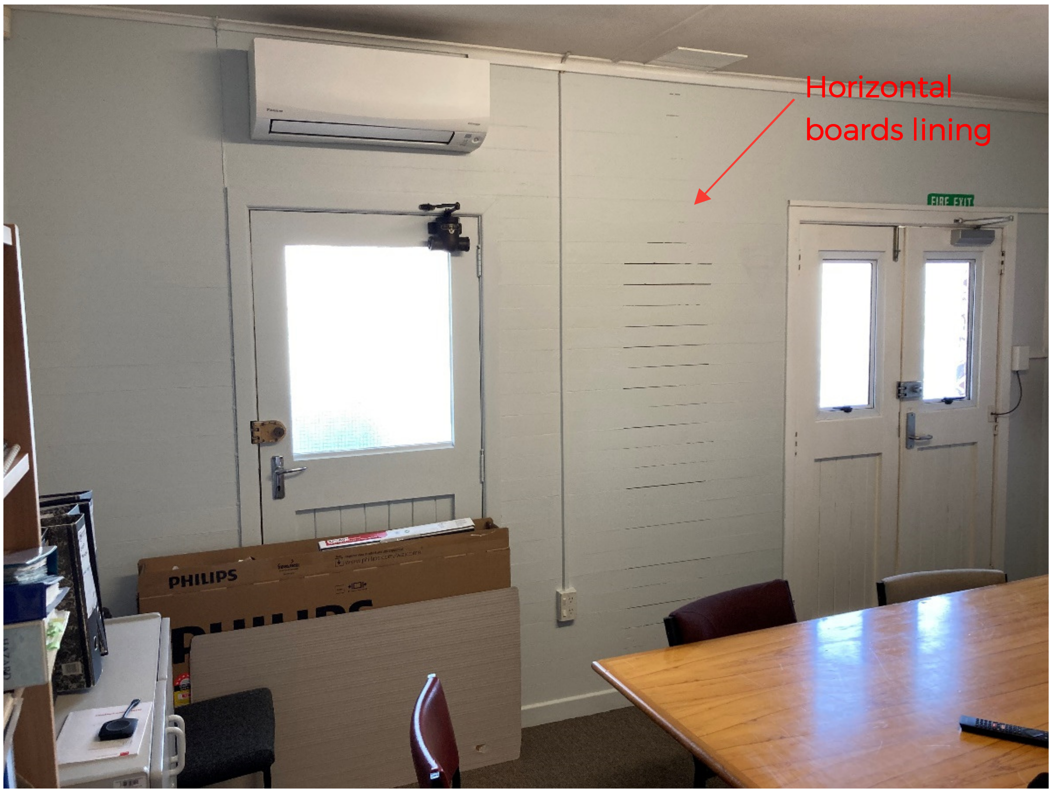

Figure 5: Original horizontal sheathing (Rata Room)

Figure 6: Roof construction

3.4 STRUCTURAL SYSTEMS

Roof & Ceiling Diaphragm:

The gravity and lateral load resisting system comprises of lightweight timber frame wall construction as can be seen in Figure 7. Seismic loads are transferred via the ceiling diaphragm into the bracing walls (plasterboard linings to walls) and down into the perimeter footing. BRANZ report no. 134 notes that roof bracing is not a requirement where structural ceiling diaphragms are directly connected to trusses/rafters (in accordance with NZS3604 clause 13.5). It is therefore accepted that the ceiling diaphragm in the Assets Building is sufficiently connected to meet the requirements.

Foundations:

While the external stud walls (with masonry veneer) are supported on a concrete perimeter footing, the internal stud walls are supported on a suspended timber floor which is supported by timber piles (refer to Figure 8). Observations from earthquake damage in Christchurch have showed that buildings with perimeter foundations and internal piled floors have shown good performance. This is partly due to the internal floor acting as a diaphragm (BRANZ report no. 141). It is also noted that lightweight timber structures have shown good performance during earthquakes due to low mass and the ability to deform via the connections (serviceability might not be achieved, but no significant life safety hazard).

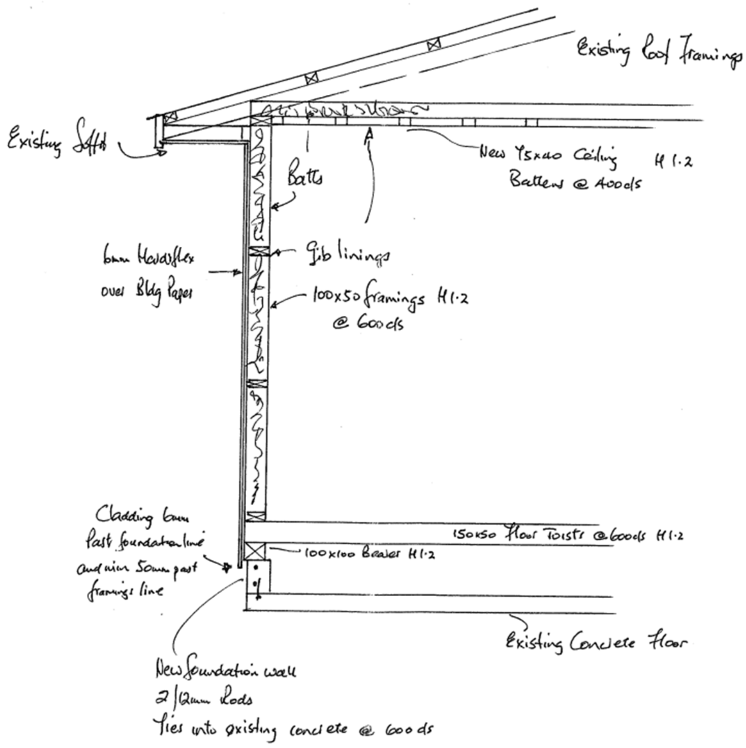

Figure 7: Typical section (across)

External wall construction:

The external wall construction is susceptible to out-of-plane failures and especially vulnerable as the steel ties connecting the exterior veneer to the timber frame can be weakened by corrosion. ~~The condition of the ties were not investigated and assumed to be in a good condition~~. Cavity ties have been investigated (WSP site investigation memorandum dated 02 February 2022) and found to be in good condition i.e., no signs of corrosion.

The veneers may be regarded as secondary non-structural elements (SSNS) in which the intention is to determine whether the element has the potential of causing damage to adjacent property or have a significant life safety hazard. It is not an assessment of the risk of damage to the element itself or the effect that such damage would have on the subsequent operation of the Building.

Should part of the veneer become detached from the timber framed walls, it may block emergency escape routes and cause tripping hazards, cause injury to persons or cause damage to vehicles.

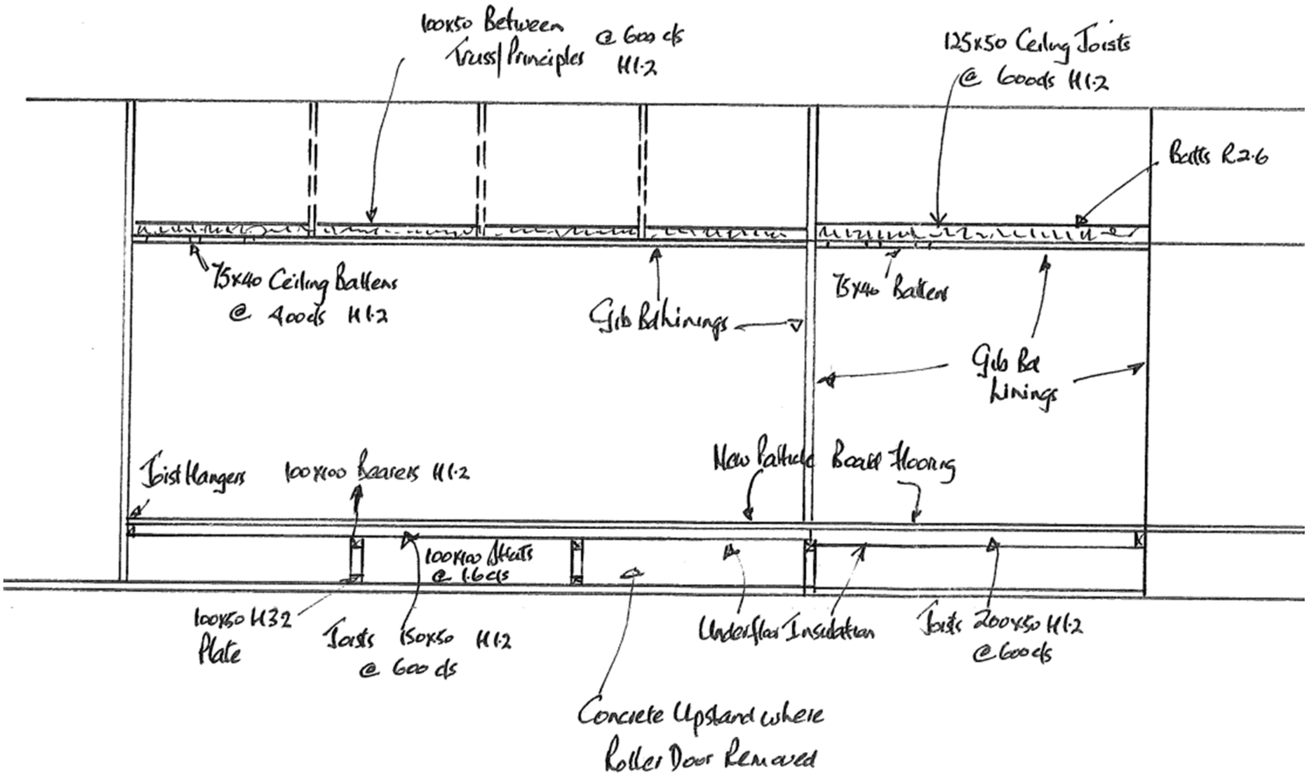

Figure 8: Typical section (along)

Timber bracing walls:

On-site investigation confirmed that bracing walls have been re-lined with plasterboard during the 2006 alterations. In some areas, the original horizontal boards have not been replaced, therefore dependable strengths for this type of sheathing have been used in determining bracing capacity of the walls. Bracing wall layouts are shown for Block A and Block B in Figure 9 & 10 respectively.

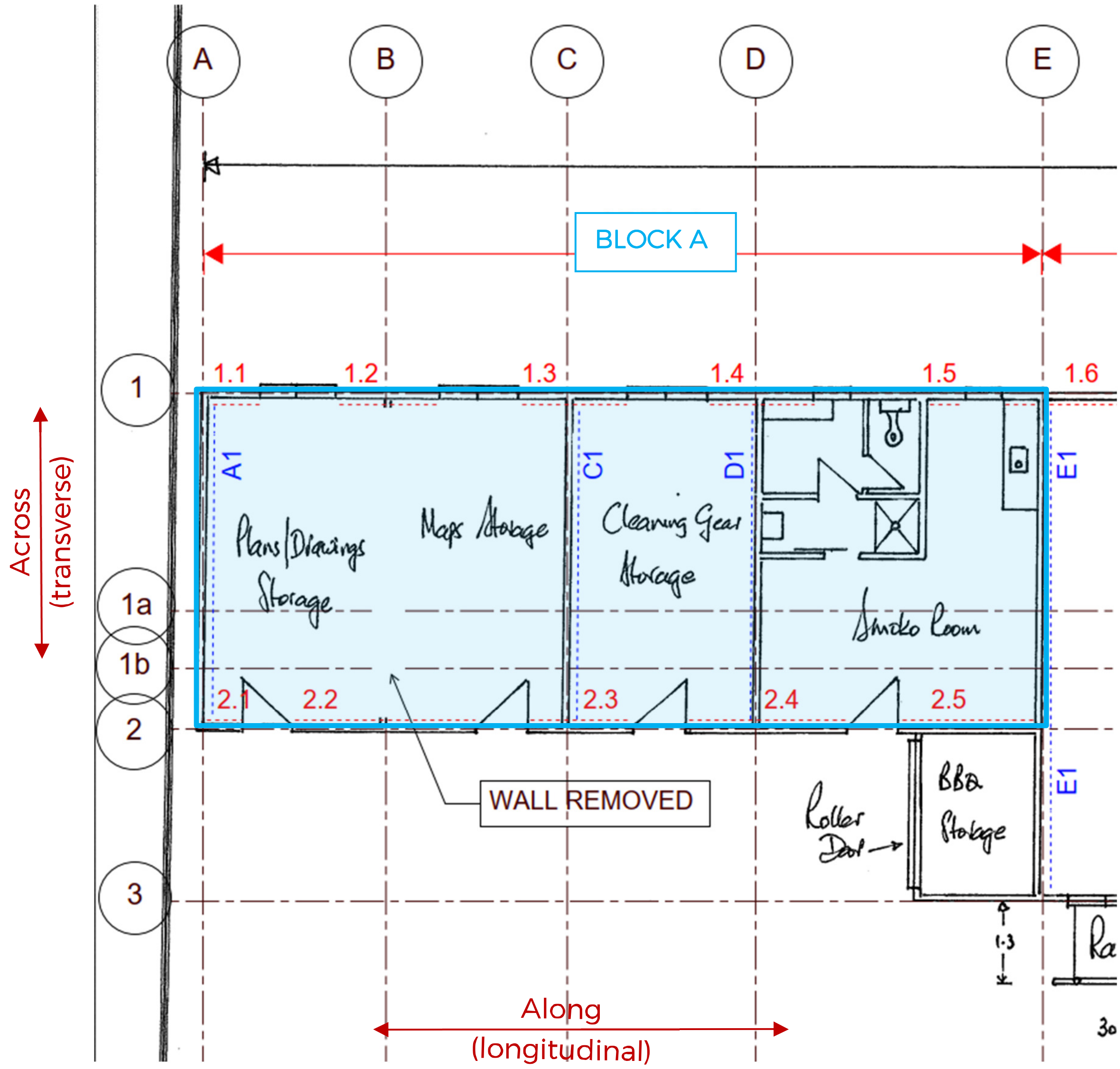

Figure 9: Block A bracing wall layout

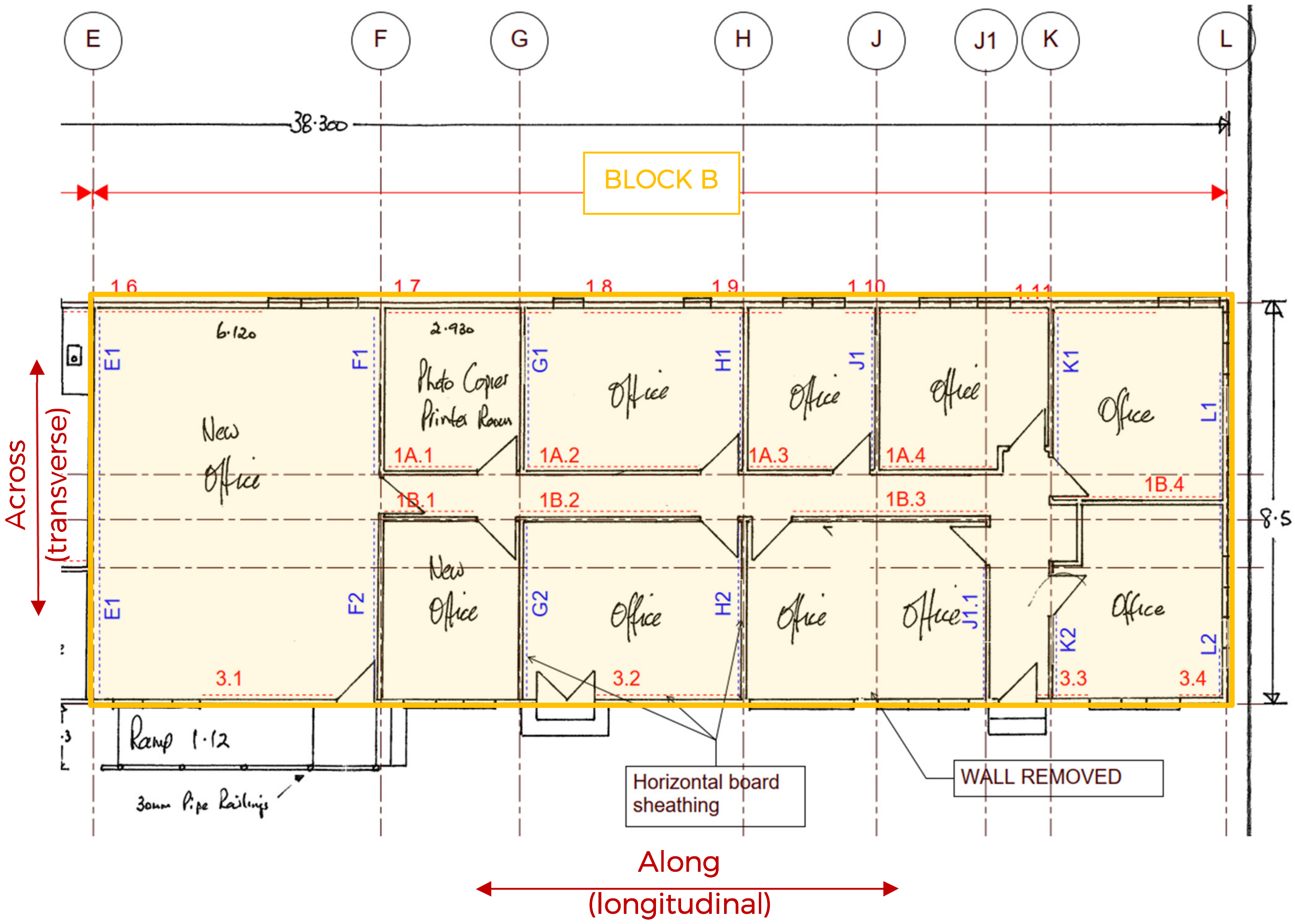

Figure 10: Block B bracing wall layout

4 ASSESSMENT INPUTS

4.1 MATERIAL PROPERTIES

Lower bound material properties have been assumed and are presented below.

Table 4-1: Probable strength parameters for clay brick

Description	Values
Medium hard clay brick compressive strength, f'_h	26 MPa
Medium hard clay brick tensile strength, f'_{bt}	4.2 MPa

Table 4-2: Probable material strength for timber framing

Description	Values
Radiate pine (m/c ≤: 16%):	
Bending	17.7 MPa
Compression parallel to grain	20.9 MPa
Compression perpendicular to grain	8.9 MPa
Tension parallel to grain	10.6 MPa

Table 4-3: Probable material strength for existing timber framed wall bracing systems

Description	Values
Gypsum plasterboard fixed one side	2.5 kN/m (50 BU's/m)
Gypsum plasterboard fixed both sides	3.0 kN/m (60 BU's/m)
Horizontal board sheathing	1.0 kN/m (20 BU's/m)

4.2 SEISMIC LOADING

In accordance with the Guidelines, the building has been subject to Ultimate Limit State (ULS) seismic demands that would be used to design a similar new building on the same site.

The current usage of the building means it is Importance Level 2 in accordance with the joint Australian/New Zealand standard Structural Design Actions Part 0, AS/NZS 1170.0:2002. A new building on this site would typically have a design life of 50 years.

The design life and importance level mean ULS demands results from a seismic event causing 1-in-500 year ground shaking.

The seismic loading parameters for the assessment are presented in Table 4-4.

Table 4-4: Seismic loading parameters

Parameter	Value	Remarks
Site sub-soil category	D	Assumed
Site hazard factor, Z	0.30	Marton
Return period factor, R_u	1.0	1-in-500 year ground shaking
Near fault factor, N(T,D)	1.0	APE > 1/250
Site period	0.4 sec	
Ductility factor, μ	3.5	For timber bracing walls
Ductility factor, μ	1.0	For URM out-of-plane demands
Structural performance factor, S_p	0.7	
Annual probability of exceedance	1/500	ULS

4.3 ANALYSIS METHDOLOGY

The single storey Building was assessed using a force-based approach (equivalent static method). The primary lateral load resisting system is provided by timber framed walls with plasterboard sheathing. Hence, bracing capacity of the structure in orthogonal directions was determined using *Gib EzyBrace* software in accordance with seismic demands obtained from NZS3604:2011. Additionally, seismic demands obtained from NZS3604:2011 were compared with those from NZS1170.5, and resulted in values of similar magnitude.

The Building's seismic performance was assessed in accordance with Part C8 and C9 of the "*The Seismic Assessment of Existing Buildings – Technical Guidelines of Engineering Assessments*". *Part C9 of* the assessment guidelines propose using a structural ductility factor, μ = 3.5 for timber framed buildings and a structural performance factor S_p = 0.5, however a more conservation S_p = 0.7 was used.

Bracing walls (bracing lines) were found to be generally in accordance with NZS3604:2011 and adequate load paths are present in the building to transmit seismic forces. Two bracing walls have been removed, but did not influence the bracing capacity of the structure significantly.

5 ASSESSMENT RESULTS

5.1 TABULATED FINDINGS

Table 5.1 lists the %NBS rating for all structural elements assessed.

Table 5.1: Assessment results for individual components and/or systems.

Structural Component/System	Seismic Score (%NBS – IL2)	Structural Weakness Type	Mode of Failure
Ceiling diaphragm	100%		
Timber walls bracing capacity (across) – Block A	100%		
Timber walls bracing capacity (along) – Block A	83%	SW	Shear capacity
Timber walls bracing capacity (across) – Block B	76%	SW	Shear capacity
Timber walls bracing capacity (along) – Block B	87%	SW	Shear capacity
Bottom plate shear capacity (out-of-plane) – Block A	100%		
Bottom plate shear capacity (out-of-plane) – Block B	71%	SW	Shear capacity
Perimeter concrete footing pull-out capacity	100%		
Timber walls out-of-plane flexural capacity	100%		
URM out-of-plane flexural capacity	15%	CSW (SNSS)	Flexural capacity

5.2 COMMENTARY ON SEISMIC RISKS

The results of the DSA find the building's *Earthquake Rating* to be **15%*NBS* (IL2)**. Therefore, this is a **grade E building** following the NZSEE grading scheme.

NZSEE guidelines state the relative risk of a grade E building compared to that of a similar new building on the same site is **25 times**. This indicates a **Very high life-safety risk exposure**.

The assessment shows that the governing performance rating is obtained from secondary structural and non-structural elements (SNSS). It should therefore be brought into consideration whether the element has the potential of causing damage to adjacent property or will result in a significant life safety hazard. SNSS elements do not affect the overall operational performance rating of the building and is left to the discretion of the client to decide if strengthening, removal or isolation of the elements are required.

~~As noted previously in this report, it has been assumed that the masonry veneers are adequately connected to the timber frame walls without having the cavity tie's tensile capacity compromised due to corrosion. Realistically, the cavity ties are likely to be corroded. An intrusive investigation will be required to check for signs of corrosion, which will be readily be evident.~~

As confirmed by site investigation and noted previously in this report, the masonry veneers are adequately connected to the timber frame walls without having the cavity tie's tensile capacity compromised due to corrosion.

5.3 RECOMMENDATIONS

Strengthening of the secondary structural and non-structural elements (SNSS) (i.e. BBQ storage URM walls) can be carried out to achieve a recommended minimum 67%NBS. An alternative is to remove the URM walls and replace it with timber frame walls similar to the rest of the building – resulting in a like-for-like replacement.

~~It is also recommended to undertake a condition assessment of the cavity ties connecting the masonry veneers to the timber frame walls. Upon conclusion of the condition of the ties, a better understanding of the expected performance level of these SNSS elements can be achieved. As noted in a previous DSA conducted by GHD (October 2018), Helifix ties may be used to reinstate the SNSS element to an acceptable seismic performance level.~~

6 SEISMIC RETROFIT OPTIONS

6.1 GENERAL APPROACH

Seismic retrofit options for the structural weaknesses identified in the report are described below. These options include, but are not limited to the following:

<u>BBQ Storage area</u>:

- Replace URM walls in with lightweight timber frame walls (like-for-like replacement)
- Strengthening URM walls with steel posts and provide ceiling diaphragm

Masonry Veneer along perimeter:

- After a condition assessment of the veneer ties has been undertaken, Helifix ties (or similar) may be installed to the entire perimeter of the building.

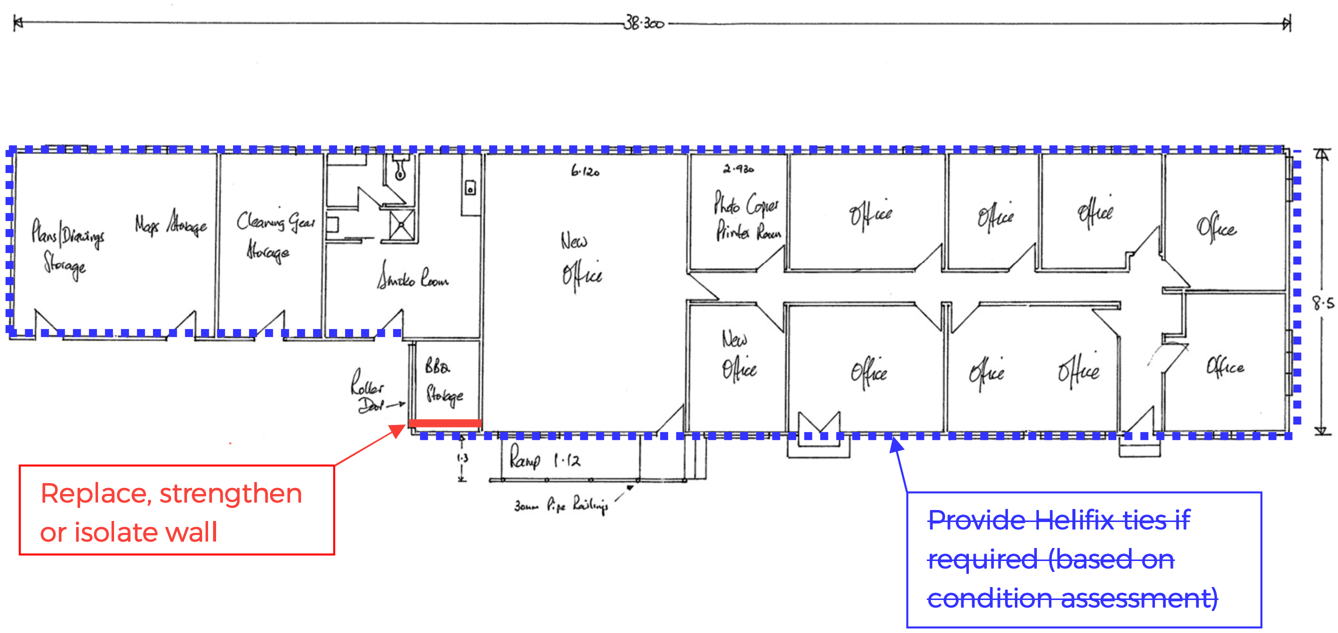

Figure 11: Seismic strengthening options

7 LIMITATIONS

This report ('Report') has been prepared by WSP New Zealand Limited ('WSP') exclusively for Rangitikei District Council ('Client') in relation to conducting a Detailed Seismic Assessment ('Purpose') and in accordance with the Short Form Agreement with PNCC dated **13 September 2021**. ('Agreement'). The findings in this Report are based on and are subject to the assumptions specified in the Report and that of WSP's Offer of Services dated **31 August 2021**. WSP accepts no liability whatsoever for any use or reliance on this Report, in whole or in part, for any purpose other than the Purpose or for any use or reliance on this Report by any third party.

In preparing this Report, WSP has relied upon data, surveys, analyses, designs, plans and other information ('Client Data') provided by or on behalf of the Client. Except as otherwise stated in this Report, WSP has not verified the accuracy or completeness of the Client Data. To the extent that the statements, opinions, facts, information, conclusions and/or recommendations in this Report are based in whole or part on the Client Data, those conclusions are contingent upon the accuracy and completeness of the Client Data. WSP will not be liable for any incorrect conclusions or findings in the Report should any Client Data be incorrect or have been concealed, withheld, misrepresented or otherwise not fully disclosed to WSP.

APPENDIX A – TECHNICAL SUMMARY

1. Building Information	
Building Name/ Description	RDC Assets Building
Street Address	46 High Street Road, Marton
Territorial Authority	Rangitikei District Council
No. of Storeys	1
Area of Typical Floor (approx.)	±290m²
Year of Design (approx.)	Original construction, circa 1950's; Alterations, circa 2006.
NZ Standards designed to	Unknown
Structural System including Foundations	Lightweight timber truss roof with ceiling diaphragm that transfers seismic loads to timber frame bracing walls (internal and external in orthogonal directions). External walls have 110 mm thk masonry veneer (wall ties possibly corroded). External concrete perimeter footing. Internal suspended timber floor of bearer beams/joists and piles.
Does the building comprise a shared structural form or shares structural elements with any other adjacent titles?	No
Key features of ground profile and identified geo-hazards	Level ground. No hazards.
Previous strengthening and/ or significant alteration	Alterations to internal walls circa 2006: Walls removed and re-lined with Gib plasterboard.
Heritage Issues/ Status	None.
Other Relevant Information	n/a

2. Assessment Information	
Consulting Practice	WSP New Zealand Ltd.
CPEng Responsible, including: • Name • CPEng number • A statement of suitable skills and experience in the seismic assessment of existing buildings[1]	Rudi van Schalkwyk (CPEng 1166463) - Senior Structural Engineer. Rudi has 14 years of combined consulting and construction experience and have designed a range of structures across multiple occupancies. He has undertaken numerous detailed seismic assessments across a wide range of engineering projects.
Documentation reviewed, including: • date/ version of drawings/ calculations[2] • previous seismic assessments	Drawings: — WARWICK Drw. 1 of 7 (24/05/2006): Existing Floor Plan — WARWICK Drw. 2 of 7 (24/05/2006): Proposed Floor Plan — WARWICK Drw. 3 of 7 (24/05/2006): Existing Cross Section — WARWICK Drw. 4 of 7 (24/05/2006): Cross Section — WARWICK Drw. 5 of 7 (21/06/2006): Floor Plan — WARWICK Drw. 6 of 7 (26/06/2006): Jamb Sill Flashing — WARWICK Drw. 7 of 7 (26/06/2006): Cross Section – Curtain Wall — RDC Assets Department Building Alterations, Aug 2005: Elevations and internal walls layout Reports: — RDC Building Assessments: Earthquake, Fire & Ventilation: MWH Report no. Z1504904 *dated* 26 June 2008 — RDC Detailed Seismic Assessments, Admin & Assets Building: GHD Report no. 51/37736/ *dated* October 2018
Geotechnical Report(s)	None
Date(s) Building Inspected and extent of inspection	03 November 2021: Visual inspection of building (internal and external).
Description of any structural testing	None

[1] This should include reference to the engineer's Practice Field being in Structural Engineering, and commentary on experience in seismic assessment and recent relevant training

[2] Or justification of assumptions if no drawings were able to be obtained

undertaken and results summary	
Previous Assessment Reports	- RDC Building Assessments: Earthquake, Fire & Ventilation: MWH Report no. Z1504904 dated 26 June 2008 - RDC Detailed Seismic Assessments, Admin & Assets Building: GHD Report no. 51/37736/ dated October 2018
Other Relevant Information	n/a

3. Summary of Engineering Assessment Methodology and Key Parameters Used	
Occupancy Type(s) and Importance Level	Offices for general use [occupancy Type B] Importance level 2 Approximately 20 persons
Site Subsoil Class	D
Summary of how Part C was applied, including: • the analysis methodology(s) used from C2 • other sections of Part C applied	- Force-based assessment following the equivalent static analysis for the primary lateral structure per Part C2 of the guidelines. - Part C8: Unreinforced Masonry Buildings - Part C9: Timber Buildings
Other Relevant Information	n/a

4. Assessment Outcomes	
Assessment Status (Draft or Final)	Final
Assessed %*NBS* Rating	15 %NBS (IL2)
Seismic Grade and Relative Risk (from Table A3.1)	Grade E building compared to that of a similar new building on the same site is 25 times. This indicates a very high life-safety risk exposure
Comment on the nature of Secondary Structural and Non-structural elements/ parts identified and assessed	Performance rating of building based on SNSS elements identified as URM walls at BBQ storage area. The SNSS elements do not reflect the primary load resisting system's capacity, therefore does not reflect the true performance rating of the building – the Building's rating may be accepted as 71%NBS (next lowest scoring element).
Describe the Governing Critical Structural Weakness	Out-of-of-plane flexural capacity of unreinforced masonry wall
If the results of this DSA are being used for earthquake prone decision purposes, and elements rating <34%NBS have been identified (including Parts)[3]:	**Engineering Statement of Structural Weaknesses and Location** • Out-of-plane flexural capacity of URM walls exceeded (SNSS element).
Recommendations	As per the purpose of this DSA and described in this report: • Strengthening of the URM walls to achieve a recommended minimum 67%NBS • Alternatively, replacement (like-for-like) or isolation or the URM walls.

[3] If a building comprises a shared structural form or shares structural elements with other adjacent titles, information about the extent to which the low scoring elements affect, or do not affect the structure.