IN THE MATTER	of the Resource Management Act 1991
AND	
IN THE MATTER	Residential apartment addition (one additional storey) to the top of an existing commercial building in the Business B Environment Area at 1-3 Dawson Street, New Plymouth

---

STATEMENT OF EVIDENCE OF KEITH MURRAY PRESTON

(EXISTING BUILDING LOCATION CONFIRMATION AND DESIGN VISUALISATION) ON BEHALF OF REGINA PROPERTIES LIMITED

4 AUGUST 2021

INTRODUCTION

QUALIFICATIONS AND EXPERIENCE

1. My name is Keith Murray Preston. I hold a degree in Surveying from Otago University (2008), I am a Licensed Cadastral Surveyor (Pursuant to Part 3 of the Cadastral Survey Act 2002), and I am a voting member of the Survey and Spatial New Zealand/ Tātai Whenua.

2. I have been working in the survey and spatial industry since 2006, have been employed by BTW Company Ltd since 2015 and am currently Survey Manager and an Associate.

3. I confirm that I have read the Code of Conduct for expert witnesses contained in the 2014 Environment Court Practice Note and that I agree to comply with it. I confirm I have considered all the material facts that I am aware of that might alter or detract from the opinions I express. In particular, unless I state otherwise, this evidence is within my sphere of expertise, and I have not omitted to consider material facts known to me that might alter or detract from the opinions I express.

ROLE

4. I was engaged by the Applicant to prepare a survey dataset of the existing buildings at 122, 122A and 122B St Aubyn Street, and the Richmond Estate complex for shading analysis and to provide visualisation images of the proposed building from the submitters' properties. The following evidence outlines the survey process undertaken for the consent application and the visual simulations produced by myself to support the landscape and visual assessment undertaken by Mr Bain.

SURVEY

5. The survey capture of the existing buildings comprises the external structures of the buildings including but not limited to: windows, eves, ridge lines, gutters, walls, stairways, balconies, balustrades, ground levels and fence lines.

6. The capture was undertaken using multiple survey data capture methods while adopting good survey practices. The methodology was provided to Council's peer reviewer Stefan Kiss (Taylor Patrick Ltd) prior to the capture who confirmed the approach to be acceptable. Mr Kiss is also a licensed cadastral surveyor.

7. Following the capture of the existing buildings, the data was processed and checked prior to delivering a point cloud and a building information model (BIM) to Boon Architects (Boon) as a recap file (.recap) and revit file (.rvt).

8. I completed a check of the point cloud file and the BIM prior to supplying this information to Boon and Taylor Patrick as per the survey summary sheet attached as Annexure A.

9. An independent audit was carried out by Mr Kiss on behalf of Council who concluded the associated point cloud to be an accurate representation of the existing features on site at 1-3 Dawson Street as attached at Annexure B.

VISUAL IMAGES

10. Prior to carrying out the visualisation exercise with Mr Richard Bain (Blue Marble), Boon supplied me with an Industry Foundation Classes (IFC file) of the design model. An IFC file is a model file created in the IFC format, which is an open file format used by BIM programs. It contains a model of a building or facility, including spatial elements, materials, and shapes. This was then positioned in real world coordinates for position and height for display purposes. This data was overlaid with existing topographic information held by BTW to ensure the design information was relative to physical features onsite when completing the visualisations.

11. I then visited most of the submitter properties with Richard Bain, with our Mixed Reality device. Mixed reality (MR) is the merging of real and virtual worlds to produce a new environment where physical and digital objects co-exist and interact in real time. This was done by positioning the design model (Virtual World) in the real world by adjusting it manually to align with existing physical elements previously surveyed by BTW. Once the positioning was confirmed, the design model was switched on in the device and screen shots were taken from each viewpoint. These photos were then supplied to Mr Bain to inform his visual assessment.

12. I checked each screen shot provided to Mr Bain by combining the point cloud and design model and viewing in Leica TruView software. In the software, I navigated to the same location at the submitter properties and took a screen shot of the point cloud and design model. It was evident that the properties further away from the model (White,

Hey and Sharrock) had a rotational error that Mr Bain accepted as the images supplied support his physical observations from the submitters' properties.

Keith Preston

4 August 2021

Annexure A

Survey Summary Job No 190983 dated 11/06/2021

SURVEY SUMMARY SHEET

Job No: 190983	**Project:** 1 Dawson St
Location: New Plymouth	**Date**: 11/06/2021

Survey Purpose: Survey and 3d laser scan capture of buildings

Client Contact: Boons

Surveyors: N Cooper, M Harrison

Coordinate System: Taranaki 2000

Level Datum: Taranaki 1970

Origin of data: LINZ, 12d Calcs using adoptions from DP 521079 and DP 19148.

Setout data: Not Applicable

Equip Used: Trimble R10, Trimble SX10, Leica P40

Old Survey Marks Used: RM II SO 13123 (Used for site calibration), SS 5 SO 7186 and AKD1/ C Caverhill (Horiz and Vert), IS 1 DP 377183, IS II SO 13301, SS 103 SO 7186 (Horiz checks).

Note. Heights were converted using the LINZ online conversion (with input coordinates from Taranaki Circuit 2000) from New Zealand Vertical Datum 2016 to Taranaki 1970 as 3 order or better vertical marks.

Methodology and Checks:

A Trimble Base was setup near 1 Dawson St with a "HERE" position. 30 epoch RTK observations were taken to the survey marks listed above. The 5th order mark RM II SO 13123 was used for a site calibration with checks as follows:

RM II SO 13123			
	mE	**mN**	**Z**
OB	385903.778	808634.383	17.22
CAL	NA	NA	NA
DIFF	NA	NA	NA

SS 5 SO 7186			
	mE	**mN**	**Z**
OB	386273.693	808765.655	10.35
LINZ	386273.673	808765.641	10.345
DIFF	0.02	0.014	0.005

AKD1/ C Caverhill			
	mE	**mN**	**Z**
OB	385743.092	807846.262	65.818
LINZ	385743.095	807846.276	65.837
DIFF	-0.003	-0.014	-0.019

IS II SO 13301

	mE	mN	Z
OB	386075.551	808734.166	12.901
adopt	386075.55	808734.163	
DIFF	0.001	0.003	

IS 1 DP 377813			
	mE	mN	Z
OB	386054.267	808791.054	9.501
adopt	386054.263	808791.05	
DIFF	0.004	0.004	

SS 103 SO 7186			
	mE	mN	Z
OB	385885.776	808718.15	14.125
LINZ	385885.79	808718.17	
DIFF	-0.014	-0.02	

New survey nails were placed and observed also for use in a control network by RTK observations. See survey control plan 190983-02. 7 scans were carried out at various locations using the control network marks as reference points for registering the point cloud data in the office.

A theodolite was setup with via a resection between observations to IS 1 DP 377813, (101), ST6, IB I DP 19148, T2 and ST 1 with the following residuals proving the GNSS observations reliable.

Standard Error of Station		
Easting	Northing	Elevation
0.003 m	0.003 m	0.002 m

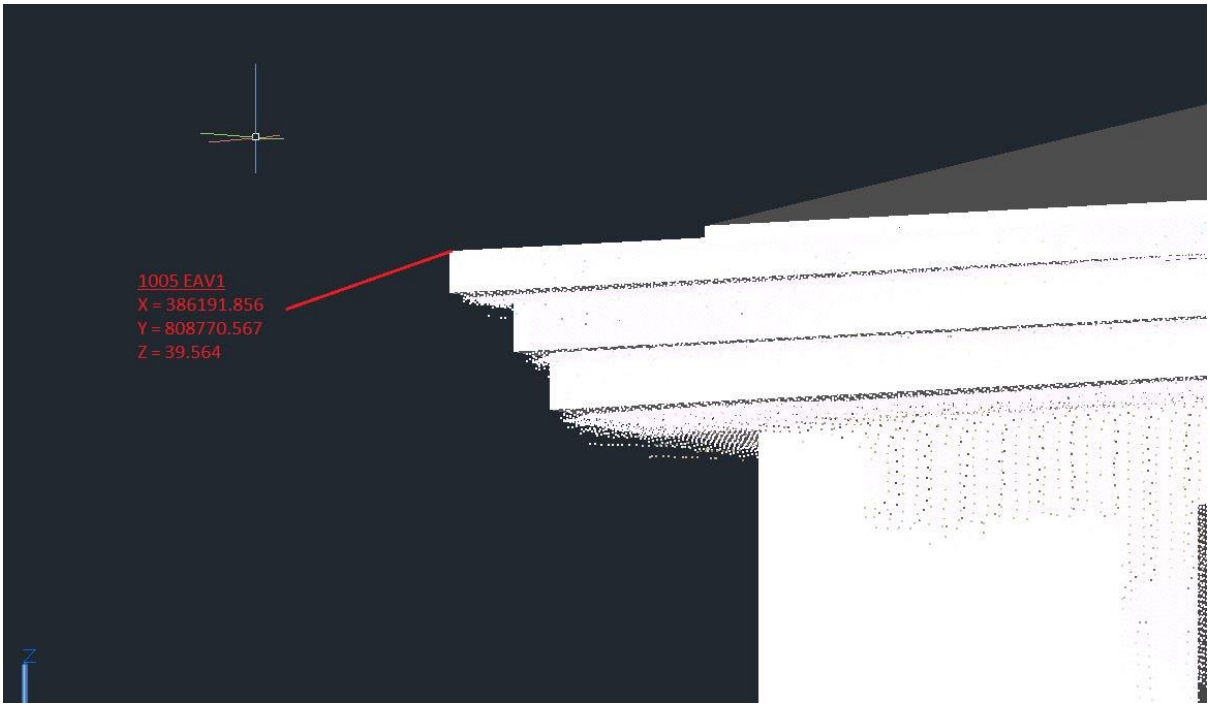
Observation	Azimuth	DAzimuth	H. Distance	DEast	DNorth	V. Distance	DV. Distance
RSCTN1-101 (T1)	254°30'40"	-3.158 sec	59.825 m	0.002 m	0.001 m	0.706 m	-0.011 m
RSCTN1-101 (T2)	254°30'42"	-1.406 sec	59.823 m	0.000 m	0.000 m	0.705 m	-0.010 m
RSCTN1-ST6 (T3)	254°48'11"	5.045 sec	78.163 m	0.009 m	0.001 m	0.992 m	-0.013 m
RSCTN1-ST6 (T4)	254°48'03"	-2.672 sec	78.167 m	0.012 m	0.004 m	0.993 m	-0.014 m
RSCTN1-102 (T5)	249°45'27"	20.128 sec	30.990 m	0.004 m	-0.002 m	-0.671 m	-0.001 m
RSCTN1-102 (T6)	249°45'27"	20.158 sec	30.989 m	0.004 m	-0.002 m	-0.672 m	0.001 m
RSCTN1-T2 (T7)	107°06'41"	-32.251 sec	56.311 m	0.001 m	-0.010 m	-0.689 m	0.011 m
RSCTN1-T2 (T8)	107°06'43"	-30.190 sec	56.311 m	0.001 m	-0.009 m	-0.690 m	0.012 m
RSCTN1-ST1 (T9)	88°21'47"	34.793 sec	46.407 m	-0.018 m	0.007 m	-1.481 m	0.002 m
RSCTN1-ST1 (T10)	88°21'50"	38.666 sec	46.406 m	-0.017 m	0.008 m	-1.482 m	0.004 m

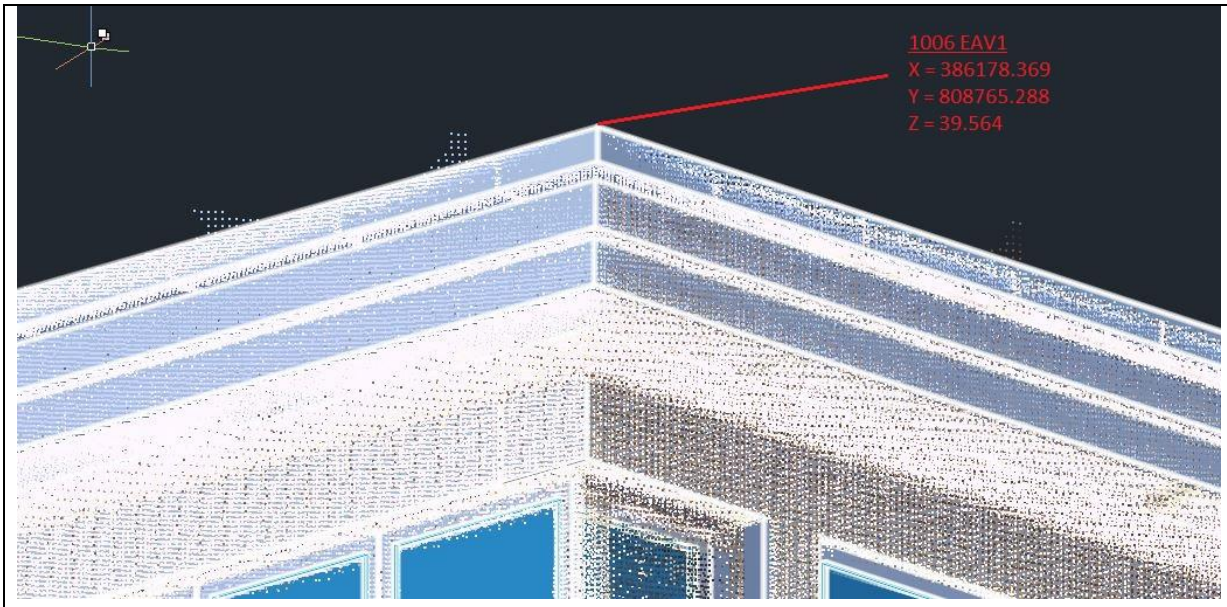
From here, observations were made to the surrounding buildings to be adopted as checks.

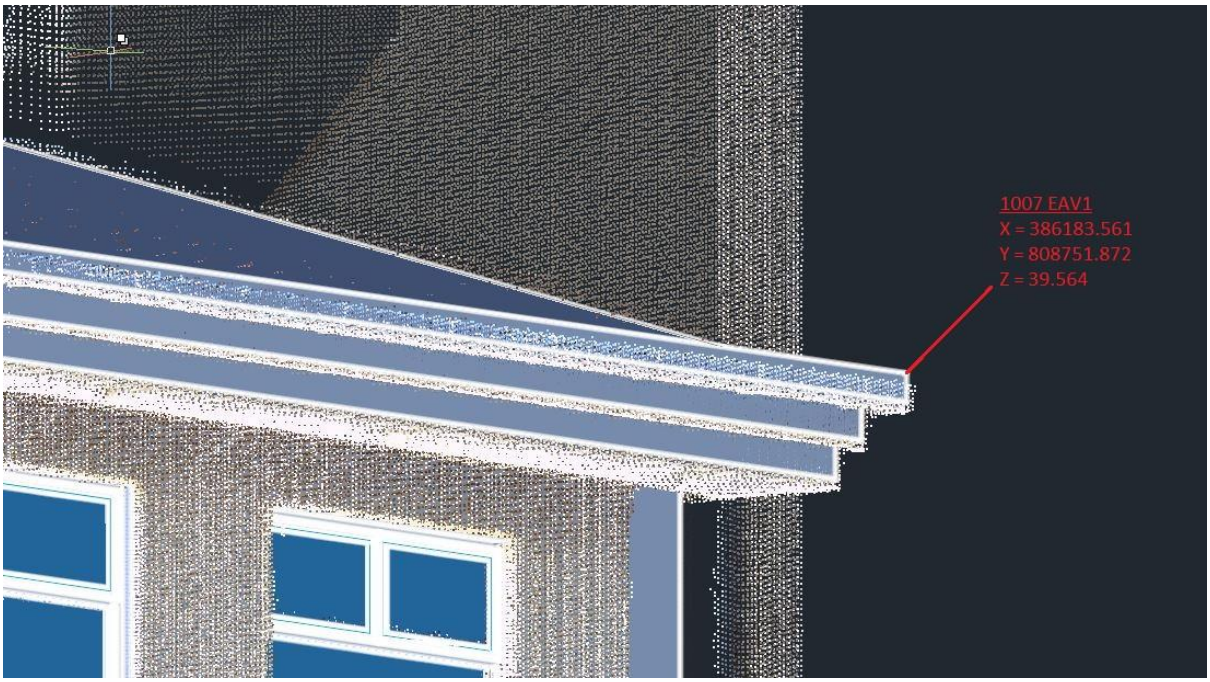
These points are:

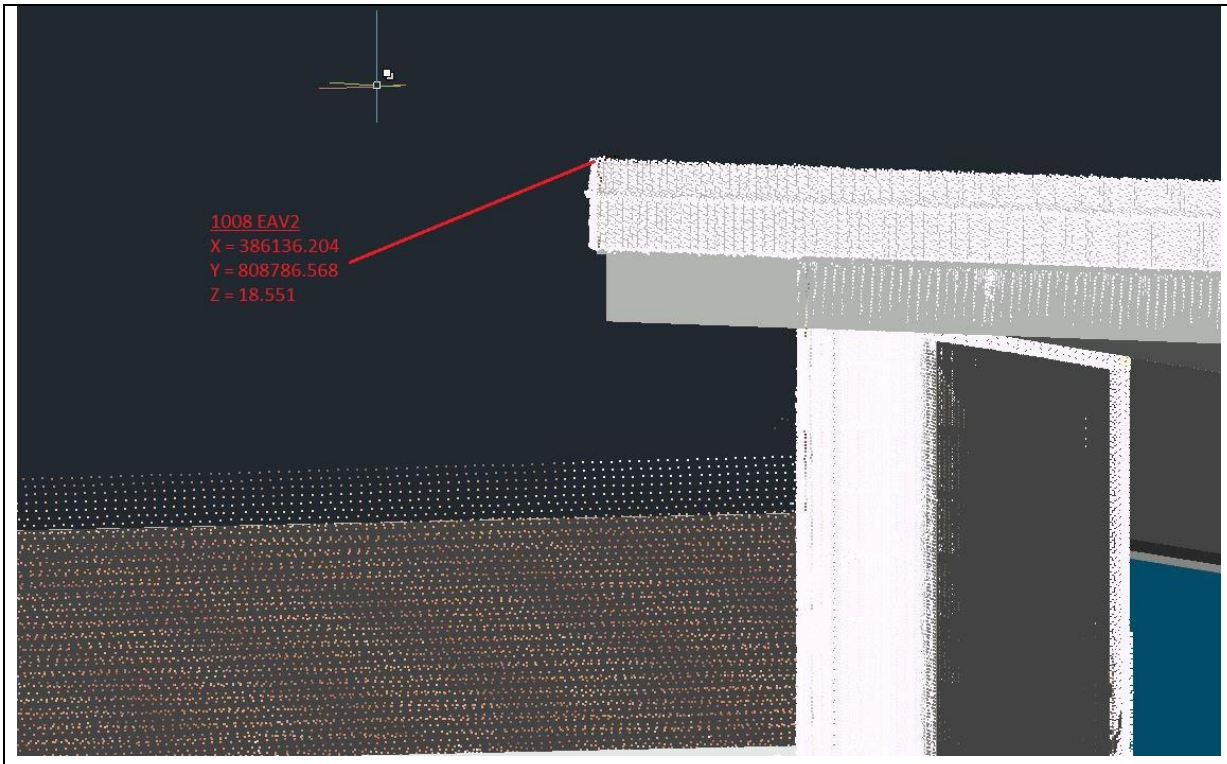
1005	386191.833	808770.542	39.546	EAV1
1006	386178.403	808765.271	39.565	EAV1
1007	386183.581	808751.841	39.528	EAV1
1008	386136.212	808786.585	18.562	EAV2
1009	386125.285	808783.253	17.869	EAV2
1010	386121.339	808787.49	17.748	GUTTER1
1011	386112.954	808785.863	18.39	GUTTER1
1012	386103.306	808786.609	20.725	BALLISTRADE1
1013	386107.369	808788.195	20.739	BALLISTRADE1
1014	386108.157	808788.465	20.741	BALLISTRADE1
1015	386108.27	808788.471	20.744	BALLISTRADE1
1016	386108.657	808788.422	20.735	BALLISTRADE1

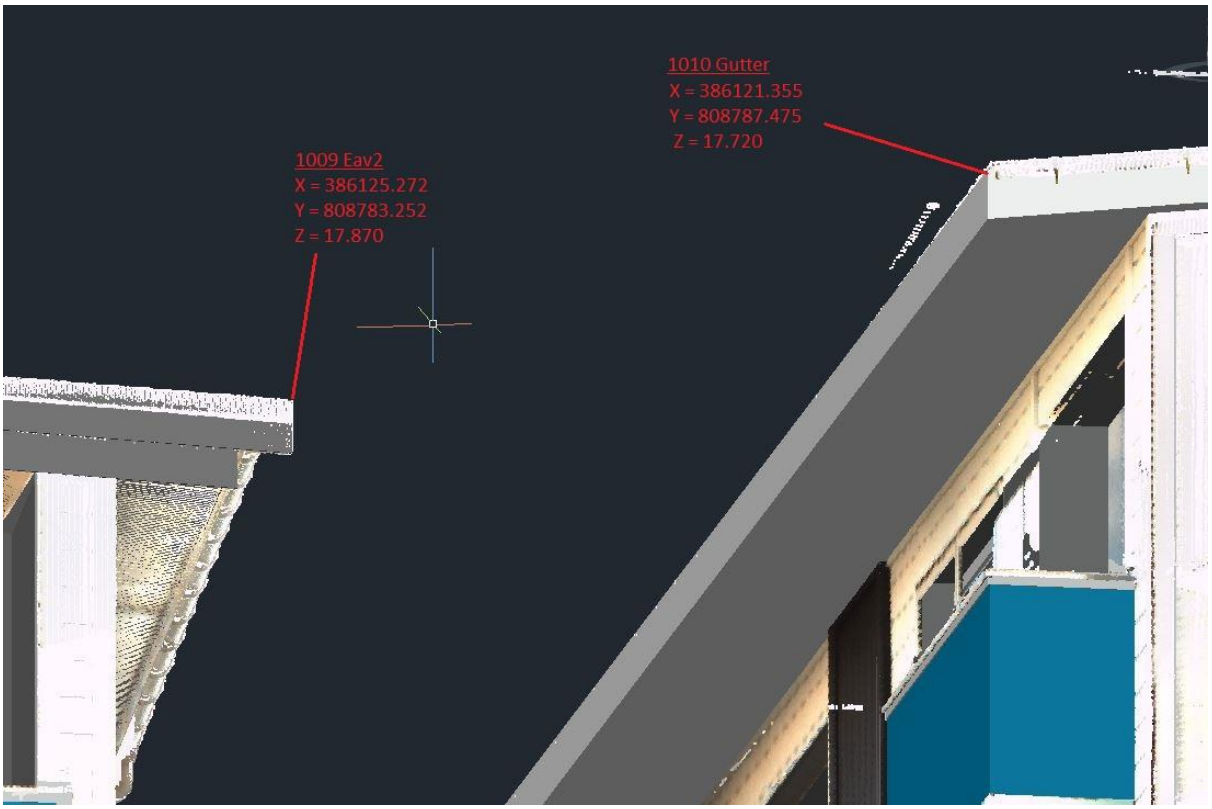
Attached is a file of the surrounding building fixes as reference (190983 Surrounding building fixes.csv) with a few snips below of these locations and a plan (190983-03 Control and Checks)




1006 EAV1
X = 386178.369
Y = 808765.288
Z = 39.564


1007 EAV1
X = 386183.561
Y = 808751.872
Z = 39.564





Checks from the theodolite (Theo) verse the point cloud and building information model (BIM) showed the following acceptable differences:

1005-EAV1			
Theo	386191.833	808770.542	39.546
Point cloud	386191.824	808770.556	39.533
BIM	386191.856	808770.567	39.564
max diff	-0.023	-0.025	-0.018

1006-EAV 1			
Theo	386178.403	808765.271	39.565
Point cloud	386178.382	808765.284	39.552
BIM	386178.369	808765.288	39.594
max diff	0.034	-0.013	-0.029

1007-EAV1			
Theo	386183.581	808751.841	39.528
Point cloud	386183.566	808751.85	39.512
BIM	386183.561	808751.872	39.564
max diff	0.02	-0.031	-0.036

1008-EAV2			
Theo	386136.212	808786.585	18.562
Point cloud	386136.208	808786.58	18.556
BIM	386136.204	808786.568	18.551
max diff	0.008	0.017	0.011

1009-EAV2			
Theo	386125.285	808783.253	17.869
Point cloud	386125.273	808783.253	17.867
BIM	386125.272	808783.252	17.87
max diff	0.013	0.001	-0.001

1010-GUTTER 1			
Theo	386121.339	808787.49	17.748
Point cloud	386121.333	808787.492	17.743
BIM	386121.355	808787.475	17.72
max diff	-0.016	0.015	0.028

Comments:

Fixed Control

1	807846.276	385743.095	65.837	C CAVERHILL
3	808791.05	386054.263	9.499	IS 1 DP377183
4	808734.163	386075.55	12.901	IS II SO 13301
5	808762.82	386130.503	12.016	NAIL 5 DP 521079
7	808634.383	385903.778	17.22	RM II SO 13123
8	808718.163	385885.786	14.125	SS 103 SO 7186
9	808765.655	386273.693	10.348	SS 5 SO 7186
10	808808.358	386158.284	7.325	ST1 (NAIL)
11	808787.378	386108.213	19.7	ST3 (NAIL)
12	808779.066	386090.236	19.73	ST4 (NAIL)
13	808786.536	386036.493	9.782	ST6 (NAIL)
14	808784.236	386178.713	10.388	ST8 (NAIL)
15	808773.566	386152.514	10.332	ST9 (NAIL)
16	808756.157	386117.21	13.917	T11 (NAIL)
17	808790.447	386165.733	8.125	T2 (NAIL)

Attached is the control file CSV (190983 CNTRL) and a plan for reference 190983-03 Control and Checks

Setout Not Applicable

Day file Synergy12d://BTW12D/190983/11 Surveying/Scanning/20210603NC.job

Checks See above

Prepared: N Cooper

Reviewed: K Preston

Annexure B
NPDC 1 to 3 Dawson Street BTW Survey Peer Review 22 July 2021






NPDC
1 to 3 Dawson Street
BTW Survey Peer Review
22 July 2021

TAYLOR PATRICK
SURVEYING PLANNING DESIGN

Huatoki Business Centre, 17a Brougham Street, PO Box 8258, New Plymouth
Tel 06 758,1021 – Mob 021 543,693 – www.taylorpatrick.co.nz

Table of Contents

Revision History

Rev 1	23/07/2021	S Kiss	Reviewed and Report Finalised
Rev 0	22/07/2021	J Lucas	Issued for Comment

1.0 Background

This project involves reviewing the BTW survey of 1-3 Dawson Street.

2.0 Scope of Work

The specific scope of work as determined by NPDC is:

- Audit Survey Report
- Audit Ground Contour Topo
- Audit Selected Points in BIM

3.0 Survey Methods

3.1 Coordinate System and Datum's

All surveying carried out on this project is in terms of Taranaki 2000. Taranaki 2000 is formally defined in the LINZ standard LINZ25002 (Standard for New Zealand Geodetic Datum 2000 Projections)

Vertical datum is in terms of Taranaki Vertical Datum 1970 (TVD1970).

3.2 Survey Control

Survey control of the BTW survey was supplied by BTW and this was independently measured. The 5th order mark RM II SO 13123 was used as the site calibration as per the BTW survey.

SS 5 SO 7186, AKD1/C Caverhill, IS II SO 13301, IS 1 DP 377813, IB I DP 19148 and SS 103 SO 7186 have been connected to as well as the various nails used in the BTW scan survey.

See 4.0 Survey Observations for reporting on these marks.

3.3 Survey Work carried out

All survey work has been carried out under the direction of Luke Balchin - NPDC. Daily HSE toolbox meetings are carried out prior to any work commencing.

All survey control marks along with other survey marks in the area, have been surveyed using RTK GPS (Leica GS 14/16 equipment). All survey control points are surveyed for a minimum of 30 seconds, then the pole is rotated 180° and another 30 seconds of observations are recorded.

Four Total Station resection setups were used to take reflector-less measurements to eaves and positions on the buildings to audit the point cloud supplied by BTW.

4.0 Survey Observations

This survey was carried out on Thursday 15 July 2021.

4.1 Survey Control Mark Results

The below tables show the differences between the Taylor Patrick GPS observations, the supplied BTW coordinates and Published LINZ (or adopted) coordinates.

SS 5 SO 7186			
	mN	mE	Z
Observed	808765.657	386273.695	10.362
BTW Observed	808765.641	386273.673	10.345
LINZ	808765.655	386273.693	10.350
Diff to BTW	0.016	0.021	0.016
Diff to LINZ	0.002	0.001	0.011

AKD1/ C Caverhill			
	mN	mE	Z
Observed	807846.267	385743.096	65.836
BTW Observed	807846.262	385743.092	65.818
LINZ	807846.276	385743.095	65.837
Diff to BTW	0.005	0.004	0.018
Diff to LINZ	-0.009	0.001	-0.001

IS II SO 13301			
	mN	mE	Z
Observed	808734.170	386075.553	12.913
BTW Observed	808734.166	386075.551	12.901
Adopted	808734.160	386075.547	NA
Diff to BTW	0.004	0.002	0.012
Diff to LINZ	0.010	0.006	NA

IS 1 DP 377813			
	mN	mE	Z
Observed	808791.060	386054.265	9.515
BTW Observed	808791.054	386054.267	9.501
Adopted	808791.055	386054.255	NA
Diff to BTW	0.006	-0.002	0.014
Diff to LINZ	0.005	0.010	NA

SS 103 SO 7186			
	Mn	Me	Z
Observed	808718.179	385885.779	14.162
BTW Observed	808718.150	385885.776	14.125
Adopted	808718.170	385885.790	NA
Diff to BTW	0.029	0.003	0.037
Diff to LINZ	0.008	-0.011	NA

IB I DP 19148			
	Mn	Me	Z
Observed	808796.312	386082.850	8.136
Adopted	808796.303	386082.839	NA
Diff to Adopted	0.008	0.011	NA

Nail 5 DP 521079			
	Mn	Me	Z
Observed	808762.833	386130.505	12.020
BTW Observed	808762.820	386130.503	12.016
Adopted	808762.808	386130.504	
Diff to BTW	0.013	0.002	0.004
Diff to Adopted	0.025	0.001	NA

ST1(Nail) BTW			
	Mn	Me	Z
Observed	808808.363	386158.303	7.324
BTW Observed	808808.358	386158.284	7.325
Diff to BTW	0.005	0.019	-0.001

ST6(Nail) BTW			
	Mn	Me	Z
Observed	808786.547	386036.490	9.797
BTW Observed	808786.536	386036.493	9.782
Diff to BTW	0.011	-0.003	0.015

ST8(Nail) BTW			
	Mn	Me	Z
Observed	808784.233	386178.731	10.408
BTW Observed	808784.236	386178.713	10.388
Diff to BTW	-0.003	0.018	0.020

ST9(Nail) BTW			
	Mn	Me	Z
Observed	808773.581	386152.524	10.347
BTW Observed	808773.566	386152.514	10.332
Diff to BTW	0.015	0.010	0.015

T11(Nail) BTW			
	Mn	Me	Z
Observed	808756.171	386117.210	13.958
BTW Observed	808756.157	386117.210	13.917
Diff to BTW	0.014	-0.001	0.041

T2(Nail) BTW			
	Mn	Me	Z
Observed	808790.472	386165.728	8.125
BTW Observed	808790.447	386165.733	8.125
Diff to BTW	0.024	-0.005	-0.001

As can be seen from the above results, the coordinates of the control marks observed agree with the BTW supplied coordinates with the only significant difference on site being in the Z value of the nail T11. The BTW Z value is 0.041m below the Taylor Patrick GPS measurement. An independent Total Station measurement was taken of this nail which had a Z value of 13.950m, 0.031m above the BTW value.

4.2 Ground Topo Results

The floor level of the basement was surveyed with a reflector-less total station to give a level of 9.00m. This compares perfectly with the BTW level of 9.00m.

A number of topographic points were observed, and a selection of the comparison results are shown below.

2021 – Sump			
	Mn	Me	Z
Observed	808778.288	386084.141	8.711
BTW	808778.267	386084.188	8.670
Diff to BTW	0.021	-0.046	0.041

2022 – MH			
	Mn	Me	Z
Observed	808794.543	386063.528	8.656
BTW	808794.532	386063.541	8.670
Diff to BTW	0.011	-0.014	-0.015

3018 – MH			
	Mn	Me	Z
Observed	808756.671	386072.645	11.551
BTW	808756.680	386072.689	11.570
Diff to BTW	-0.009	-0.044	-0.019

3015 - SH			
	mN	mE	Z
Observed	808752.368	386103.417	13.465
BTW	808752.424	386103.411	13.453
Diff to BTW	-0.056	0.006	0.012

2017 - SH			
	mN	mE	Z
Observed	808789.395	386105.849	8.836
BTW	808789.329	386105.815	8.861
Diff to BTW	0.066	0.034	-0.025

4.3 Point Cloud Results

The below tables show the differences between a selection of Taylor Patrick reflector-less total station observations of building features, the BTW supplied observations and the point cloud coordinates from the supplied BTW Survey Report.

1005-EAVE1			
	mN	mE	Z
Observed	808770.540	386191.816	39.543
BTW Observed	808770.542	386191.833	39.546
Point Cloud	808770.556	386191.824	39.533
Diff to BTW	-0.002	-0.017	-0.003
Diff to Point Cloud	-0.016	-0.008	0.010

1006-EAVE1			
	mN	mE	Z
Observed	808765.275	386178.387	39.565
BTW Observed	808765.271	386178.403	39.565
Point Cloud	808765.284	386178.382	39.552
Diff to BTW	0.004	-0.016	0.000
Diff to Point Cloud	-0.009	0.005	0.013

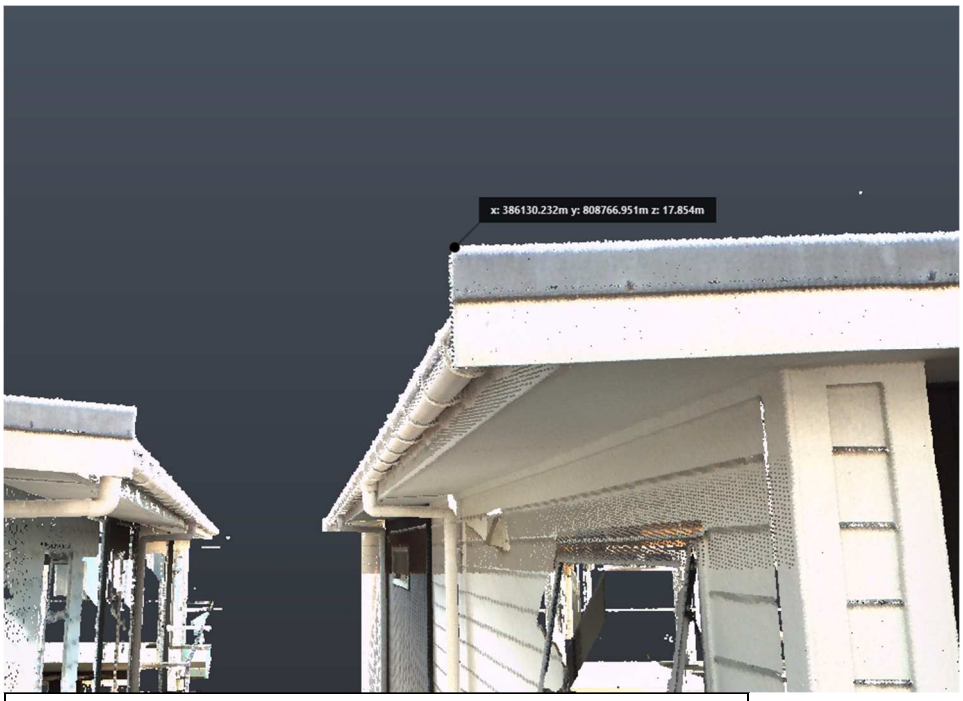
1007-EAVE1			
	mN	mE	Z
Observed	808751.847	386183.557	39.530
BTW Observed	808751.841	386183.581	39.528
Point Cloud	808751.850	386183.566	39.512
Diff to BTW	0.006	-0.024	0.002
Diff to Point Cloud	-0.003	-0.009	0.018

1008-EAVE2			
	mN	mE	Z
Observed	808786.587	386136.194	18.561
BTW Observed	808786.585	386136.212	18.562
Point Cloud	808786.580	386136.208	18.556
Diff to BTW	0.002	-0.018	-0.001
Diff to Point Cloud	0.007	-0.014	0.005

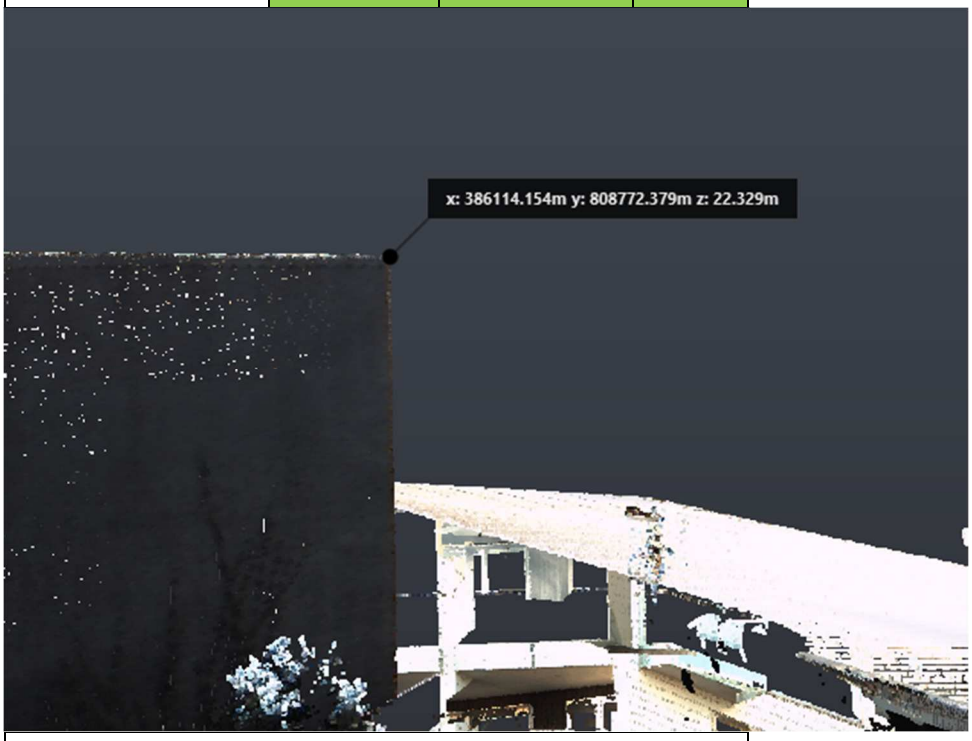
1009-EAVE2			
	mN	mE	Z
Observed	808783.261	386125.273	17.872
BTW Observed	808783.253	386125.285	17.869
Point Cloud	808783.253	386125.273	17.867
Diff to BTW	0.008	-0.012	0.003
Diff to Point Cloud	0.008	0.000	0.005

A selection of independent points were also observed to compare directly with the point cloud.

4009 - Eave			
	mN	mE	Z
Observed	808760.653	386134.807	19.005
Point Cloud	808760.652	386134.805	18.992
Diff to Point Cloud	0.001	0.002	0.013



3038 - Eave			
	mN	mE	Z
Observed	808766.935	386130.236	17.863
Point Cloud	808766.951	386130.232	17.854
Diff to Point Cloud	-0.016	0.004	0.009



3031 - Building Top			
	mN	mE	Z
Observed	808772.354	386114.164	22.341
Point Cloud	808772.379	386114.154	22.329
Diff to Point Cloud	-0.025	0.010	0.011

5.0 Conclusion

Overall, we believe that the BTW survey and associated point cloud to be an accurate representation of the existing features on site at 1-3 Dawson Street.

Appendix A – QA Points Plan