



Structural Assessment Report



365 Princes Highway, Officer VIC 3809 Prepared for Timbertop East Pty Ltd

Report Date:	19/11/2021
Project Number:	674244
Site Number:	174564
Client:	Timbertop East Pty Ltd
Date of Inspection:	26/10/2021
Time on Site:	10:00 am
Attendees:	James Hudson
Report compiled by:	James Hudson
Report checked by:	Peter Paras

Conditions of Use

This report is based, in general, on a visual inspection of the premises and the documentation provided, unless otherwise noted. Areas not reasonably accessible and not able to be inspected without disturbing the existing structure or finishes have not been inspected, unless noted.

The opinions expressed in this report are based upon a site inspection conducted with reasonable care. Intrax Consulting Group Pty Ltd or its officers will not be liable for any errors, omissions, or misinterpretation of findings.

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Document Revision History

Date	Rev	Author	Checked by	Comments
19/11/2021	A	James Hudson	Peter Paras	Issue

CONTENTS

1	Summary	4
2	Instructions	5
3	Introduction	5
4	Documentation Reviewed	5
5	Review of Aerial Images	6
6	Observations	7
6.1	Structure and site description	7
6.2	Observations	7
7	Discussion	8
7.1	Structural Assessment (Category of Damage)	9
8	Conclusion	9
9	Recommendations	10
9.1	Repointing of chimney tower	10
9.2	Repair of kiln structure	10
9.3	Rectification and propping of kiln structure	10
9.4	Reconstruction of steel frame	10
9.5	Maintenance of footings and surrounds	10
10	Limitations of Report	11
APPENDIX A AERIAL IMAGES		12
APPENDIX B PHOTOGRAPHS		15
APPENDIX C GEOTECHNICAL REPORT		31

1 SUMMARY

Intrax was commissioned by Morgan Development Group in collaboration with Timbertop East Pty Ltd to undertake an assessment of the heritage listed pottery kiln and tower structures located at 365 Princes Highway, Officer, Victoria to provide an opinion on what remedial works will be required.

It is Intrax's opinion that the kiln structure in its current state is not considered structurally sound, posing a high risk to building users. Restricted access has previously been implemented and are to remain until suitable make safe and remedial works are undertaken.

The related chimney tower is considered structurally sound however does contain some structural concerns that will need addressing promptly.

Key structural issues include bulging, separation and displacement of brickwork, erosion of mortar and corrosion of steel frame. Remedial actions will be required to address all of these issues.

2 INSTRUCTIONS

Intrax was engaged by David Morgan of Morgan Development Group in collaboration with Timbertop East Pty Ltd on 16/07/2021 to carry out a structural integrity assessment on the heritage listed pottery kiln located at 365 Princes Highway, Officer VIC 3809 and prepare a report with an opinion on the structural condition of the building.

Intrax's Scope of Works:

1. Site Visit: One non-destructive, visual site inspection of the affected structure and surrounds.
2. 2 x Footing Probes (one of chimney tower and one of structure foundations)
3. 2 x borehole logs with soil moisture testing.
4. Preparation of a condition report to include giving a broad outline of our site findings and documenting noted defects and present condition, as well as providing advice on if kiln structure can be restored without dismantling or if re-build is required.

3 INTRODUCTION

A site visit was carried out by Forensic Engineer, James Hudson of Intrax on 26/10/2021.

4 DOCUMENTATION REVIEWED

The following documentation has been considered for the preparation of this report:

1. Plan of subdivision by Cardinia Shire Council (Edition No. PS 814723U, dated 27/06/19)
2. Plan of subdivision by Cardinia Shire Council (Edition No. PS 835703H, dated 07/02/20)
3. Concept floor plan by TTM Consulting Pty Ltd (Drawing No. 7140507, dated 06/02/17)
4. Planning permit by Cardinia Shire Council (Application No. T170233, dated 14/09/17)

5 REVIEW OF AERIAL IMAGES



Aerial view of the residence by Nearmap, dated 29/04/2021

A review of the aerial imagery from Nearmap indicates that the kiln was part of a much larger pottery facility that was progressively demolished between 2014 and 2018.

Nearmap imagery reviewed is provided in Appendix A.

6 OBSERVATIONS

A visual inspection of the building located at 365 Princes Highway, Officer VIC 3809 was carried out on 26/10/2021. The weather at the time of the inspection was clear. The findings of the site investigation are outlined below.

6.1 STRUCTURE AND SITE DESCRIPTION

The heritage listed structure is a single storey brick pottery kiln and related chimney tower. It is comprised of full masonry walls and roof supported by concrete footings. A steel frame has been erected around kiln structure to provide additional stability and restrain movement.

It is estimated that the structures were constructed in the 1880's.

The structure faces west, parallel to the roadway to both north and south. The general topography around the building presents a slight slope from south to north.

Immediately adjacent to structures, there is a combination of brick paving, concrete paving and unsealed ground. No effort has been made to maintain the surrounds.

In general, the structures are considered to be in fair condition:

- Poor: Inadequate and unsatisfactory condition. Further investigation, remedial work or rectification required urgently.

6.2 OBSERVATIONS

The inspection observations are catalogued as follows. Photographs taken during the inspection are provided in Appendix B. These photographs are referred to as [1], [2], [3] etc, in the subsequent section of the report.

Note that this is a general description of the observations that Intrax deems relevant. It is not intended to be a complete list of building damage and/or defects.

1. Brick wall bulging. [5], [12], [25]
2. Brick separation. [5], [10], [12-15], [22-23], [25-27], [37]
3. Brick displacement. [5], [7-8], [12-15], [22-27], [36-37]
4. Mortar erosion. [5], [9-15], [17-19], [22-23], [25-27], [30], [32], [37], [40]
5. Stepped brickwork cracking. [6], [28-29], [39]
6. Brickwork erosion. [9]. [35]
7. Missing Bricks. [11], [23], [41]
8. Evidence of moisture ingress. [16]
9. Build-up in archway. [20]
10. Vegetation growth compromising mortar. [21], [38]
11. Unstable brickwork. [26]
12. General condition of chimney tower. [31]
13. Damaged brickwork. [41]
14. Makeshift repairs. [42]
15. General interior condition. [43-44]

7 DISCUSSION

Our observations of the site and structures indicates that the structure has suffered significant cracking and deformation, which is not to be unexpected for a building of this age. In Intrax's opinion these issues will require rectification works; this will be further investigated in this section.

There appears to have been significant erosion of mortar across the structure. This can occur when lime based mortars are exposed to wind and rain. In some portions mortar appears to now be completely absent, with bricks sitting directly on each other. In some locations there is evidence of attempted mortar repair, however this appears to have been done with more modern cementitious mortar. This combination of mortars with different properties can result in issues with differential moisture movement and related shrinkage/expansion throughout. This has occurred on both the kiln and chimney tower structures.

Various points on the external brickwork appear to be bulging outwards, resulting in displacement and separation. This is likely attributed to the horizontal outward (thrust) forces that result from the arch style of structure. As the structure has aged and lost strength (possibly related to erosion of mortar) it has no longer had the capacity to resist its own self weight in this structural configuration. Further failure of structure appears to have been avoided through the use of steel framing around kiln. This is only applicable to the kiln structure.

The steel frame which has been installed around the clay brick kiln has served to provide resistance to the horizontal thrust forces resulting from the arching effects.. This frame appears to have prevented further failure of the now eroded mortared brickwork under loading. However the steelwork in question does not appear to have had sufficient corrosion protection, and as such has become significantly rusted/degraded.

Brickwork erosion has been noted in the upper section of the kiln structure at a number of points. This is not to be unexpected in a 100+ year old structure due to the lower quality/strength brickwork.

Observations on site provide Intrax the opinion that differential footing movement has occurred across the property which has played a part in the brick cracking and movement in both structures.

The presence of these adverse moisture conditions is causing differential movement of the footing system. The landscaping conditions are allowing moisture to infiltrate the foundation soils towards the edge of the building envelope, swelling the reactive soils, while the central regions are maintained in a drier soil condition. By the foundation soils being exposed to different moisture conditions, the reactive foundation soil responds differently (expand when wet, contract when drier) causing differential footing movement.

7.1 STRUCTURAL ASSESSMENT (CATEGORY OF DAMAGE)

Based on our observations, it is Intrax's opinion that:

- 1) The brick kiln structure has significantly degraded. The extent of deformation and presence of loose bricks indicates that the structural integrity of the building has been compromised and therefore access should be restricted until further notice. Intrax notes that a make safe in the form of temporary fencing is in place to address this concern.
- 2) The chimney tower cracking and mortar is categorizable as moderate and requires at a minimum re pointing including repair/reinstatement of brickwork in some locations to varying extents to restore structural integrity.
- 3) The loose and eroded bricks in kiln structure represent a high risk and should be removed at earliest possible opportunity.
- 4) The historical lime mortar used in construction has significantly eroded across both structures. Repair/repointing with a similar lime mortar will be required. Across kiln structure re bricking and reconstruction of brickwork may be required to various points given the complete absence of mortar.
- 5) The steel framework around both kiln and chimney structure are significantly eroded and will require complete replacement, but careful consideration must given to the methodology of replacement, such as staging and sequencing, to ensure stability of the structure is maintained.
- 6) Where brickwork is bulging (displacing) outwards will require re construction. Changes in structure as a whole, such as permanent propping of interior to shift away from the arch load pathway configuration may be required to eliminate horizontal forces.

8 CONCLUSION

Intrax's opinion, based on the visual observations made onsite during an inspection undertaken on 26 October 2021, in combination with review of all supplied documentation and related geotechnical investigation, that the damages across these structures can be attributed to erosion of lime mortar, decay of steel framework, general degradation of arch structure strength and differential footing movement, all of which has occurred due to a number of contributing factors.

It is the opinion of Intrax that the damage observed to the structures have impacted their structural soundness. Make safe works have already been implemented and structures will require remedial works to remain in place.

9 RECOMMENDATIONS

9.1 REPOINTING OF CHIMNEY TOWER

This office recommends that chimney tower have its mortar repointed with similar/appropriate lime based mortar. A suitably qualified and experienced tradesperson should be engaged to undertake works.

9.2 REPAIR OF KILN STRUCTURE

Kiln structure will require repointing of mortar with similar/appropriate lime based mortar. Displaced, damaged or bulging sections of brickwork will require deconstruction and re bricking. Section where mortar completely eroded or compromised will require reconstruction. A suitably qualified and experienced tradesperson should be engaged to undertake works.

9.3 RECTIFICATION AND PROPPING OF KILN STRUCTURE

The horizontal thrust created by the kiln structures arched construction is a primary cause of the failure of the structure. Permanent propping of ceiling will alleviate these arching forces by changing the load path and mechanism. It is recommended a structural engineer be engaged to provide appropriate design and installation method to ensure solution is viable long term.

9.4 RECONSTRUCTION OF STEEL FRAME

Steel frame will require replacement with heavy duty galvanised steel sections. Replacement recommended to occur in stages to minimise impact on existing kiln structure. It is recommended a structural engineer be engaged to provide appropriate design and installation method to ensure stability of the structure is maintained.

9.5 MAINTENANCE OF FOOTINGS AND SURROUNDS

Landscaping conditions of the site are to be improved. The surfaces directly adjacent to the structures should be sloped away in accordance with AS2870 with an effective method of capturing and managing surface runoff incorporated. Concrete perimeter pavement should be considered as a cost-effective solution and should be installed with surface drainage at regular intervals around the building to capture surface runoff.

10 LIMITATIONS OF REPORT

Our 26/10/2021 inspection was primarily visual (unless noted otherwise). The findings discussed on this report has been prepared based in our observations during the inspection of the premises at 365 Princes Highway, Officer VIC 3809 (limited to accessible areas) and available documentation to supplement our site investigation.

This report's recommendations are based on the following:

- The findings from this and other investigations.
- Information about the site & its history and proposed site treatment conveyed to us by the client and or their agent.
- Professional judgements using relevant building codes and regulations.

Intrax cannot be made liable of unobserved latent damage in areas where access has not been granted or it has been limited. This report is limited to observations made on site.

Should the information provided to Intrax be inaccurate, including information about previous buildings or extensions, planted or removed trees or past site activities, Intrax will not accept liability for arising damage correlated to undisclosed information.

Alterations made to the building after this report may render it unsuitable. Intrax reserves the right to charge extra fees if more testing or report amendments are necessary.

Unless otherwise stated, the following matters are excluded from the assessment: termite attack on timber, safety and condition of electrical services and wiring, any plumbing works including water services, sewer, roof and gas plumbing, any subsurface or hidden aspects and fire health regulations & requirements.

This report represents our findings on the specific matters discussed. Structural integrity (or otherwise) conclusions are not to be deduced of areas not covered in the report.

Interpretations of this report outside of the limitations above should not be made. Intrax takes no responsibility if this report is altered, misinterpreted or not reproduced in full.

This report is not to be used as evidence in Administrative Tribunals (VCAT, NCAT, QCAT, SACAT). Should an Expert Witness Report be required, contact our office for a fee estimation. Expert witness reports are more demanding and will incur additional fees.

We trust the preceding is suitable for your consideration. Should you need any clarification, please do not hesitate to contact us.

Regards,



James R Hudson

B.Eng. (Civil) / B.A.

Forensic Engineer

Intrax Consulting Group Pty Ltd



APPENDIX A

AERIAL IMAGES

Aerials	Observation
	Aerial 1 Image provided by Nearmap Capture dated 1/09/2021
	Aerial 2 Image provided by Nearmap Capture dated 4/09/2018

Aerials	Observation
	Aerial 3 Image provided by Nearmap Capture dated 14/05/2014



APPENDIX B

PHOTOGRAPHS

Photographs	Observation
	Photograph 1 Observation: Front (west) elevation.
	Photograph 2 Observation: Rear (east) elevation.
	Photograph 3 Observation: Left-hand side (north). elevation

Photographs	Observation
	Photograph 4 Observation: Right-hand side (south) elevation.
	Photograph 5 Observation: Brick wall bulging. Brick displacement and separation Eroded mortar. Location: Front (west) elevation.
	Photograph 6 Observation: Stepped brickwork cracking. Location: Front (west) elevation.

Photographs	Observation
	Photograph 7 Observation: Brick displacement. Location: Front (west) elevation.
	Photograph 8 Observation: Brick displacement. Location: Front (west) elevation.
	Photograph 9 Observation: Brick cracking. Mortar and brickwork erosion. Location: Front entrance west elevation.

Photographs	Observation
	Photograph 10 Observation: Brick separation. Mortar erosion. Location: Front (west) elevation.
	Photograph 11 Observation: Missing Bricks. Mortar erosion. Location: Front (west) elevation.
	Photograph 12 Observation: Brick wall bulging. Brick displacement and separation. Mortar erosion. Location: Front (west) elevation.

Photographs	Observation
	Photograph 13 Observation: Brick displacement and separation. Mortar erosion. Location: Front (west) elevation.
	Photograph 14 Observation: Brick displacement and separation. Mortar erosion. Location: Side (south) elevation.
	Photograph 15 Observation: Brick displacement and separation. Mortar erosion. Location: Side (south) elevation.

Photographs	Observation
	Photograph 16 Observation: Evidence of moisture ingress to brickwork. Location: Side (south) elevation.
	Photograph 17 Observation: Mortar erosion. Location: Side (south) elevation.
	Photograph 18 Observation: Mortar and brickwork erosion. Location: Side (south) elevation.

Photographs	Observation
	Photograph 19 Observation: Mortar erosion and brickwork cracking. Location: Side (south) elevation.
	Photograph 20 Observation: Build-up in archway. Location: Side (south) elevation.
	Photograph 21 Observation: Vegetation growth compromising mortar. Location: Side (south) elevation.

Photographs	Observation
	Photograph 22 Observation: Brick displacement and separation. Mortar erosion. Location: Side (south) elevation.
	Photograph 23 Observation: Missing bricks. Brick displacement and separation. Mortar erosion. Location: Side (south) elevation.
	Photograph 24 Observation: Brick displacement. Location: Side (south) elevation.

Photographs	Observation
	Photograph 25 Observation: Brick wall bulging. Brick displacement and separation. Mortar erosion. Location: Rear (east) elevation.
	Photograph 26 Observation: Brickwork cracking and separation. Mortar erosion. Unstable brickwork. Location: Rear (east) elevation.
	Photograph 27 Observation: Brick displacement and separation. Mortar erosion. Location: Rear (east) elevation.

Photographs	Observation
	Photograph 28 Observation: Stepped brickwork cracking Location: Chimney tower.
	Photograph 29 Observation: Stepped brickwork cracking Location: Chimney tower.
	Photograph 30 Observation: Mortar erosion. Location: Chimney tower.

Photographs	Observation
	Photograph 31 Observation: General condition. Location: Chimney tower.
	Photograph 32 Observation: Mortar erosion. Location: Chimney tower.
	Photograph 33 Observation: Stepped brickwork cracking and mortar erosion. Location: Chimney tower.

Photographs	Observation
	Photograph 34 Observation: Mortar erosion. Location: Side (north) elevation.
	Photograph 35 Observation: Brickwork erosion. Location: Side (north) elevation.
	Photograph 36 Observation: Brickwork displacement. Location: Side (north) elevation.

Photographs	Observation
	Photograph 37 Observation: Brick displacement and separation. Mortar erosion. Location: Side (north) elevation.
	Photograph 38 Observation: Vegetation growth compromising mortar. Location: Side (north) elevation.
	Photograph 39 Observation: Stepped brickwork cracking Location: Side (north) elevation.

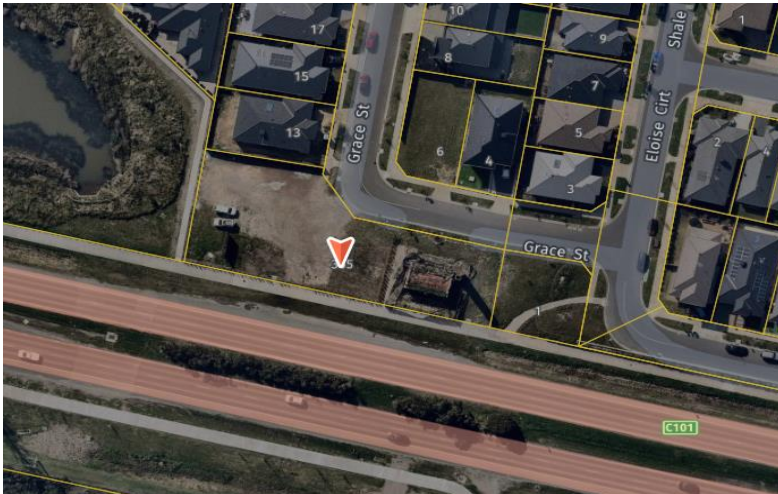
Photographs	Observation
	Photograph 40 Observation: Mortar erosion. Location: Side (north) elevation.
	Photograph 41 Observation: Damaged brickwork. Missing bricks. Location: Side (north) elevation.
	Photograph 42 Observation: Makeshift structural repairs. Location: Side (south) elevation.

Photographs	Observation				
	Photograph 43 <table> <tr> <td>Observation:</td><td>General interior condition.</td></tr> <tr> <td>Location:</td><td>Interior</td></tr> </table>	Observation:	General interior condition.	Location:	Interior
Observation:	General interior condition.				
Location:	Interior				
	Photograph 44 <table> <tr> <td>Observation:</td><td>General interior condition.</td></tr> <tr> <td>Location:</td><td>Interior</td></tr> </table>	Observation:	General interior condition.	Location:	Interior
Observation:	General interior condition.				
Location:	Interior				



APPENDIX C
GEOTECHNICAL REPORT

Site Investigation Report



Date: 10/11/2021
Date of Fieldwork: 26/10/2021
Site Number: 174564
Site Address: No. 365, Princes Highway, Officer, Vic, 3809
Client: James Hicks Potter

Intrax Consulting Engineers Pty Ltd
ABN: 31 106 481 252

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Direct Contact

Any questions or queries regarding this report should be directed to Intrax Consulting Engineers on -03 8371 0100 or email at info@intrax.com.au.

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Document Revision History

Date	Rev	Engineer	Comments
10/11/2021	A	Saroj Niroula	First Edition

1 Introduction

Intrax Consulting Engineers Pty Ltd (Intrax) have been engaged by the client to conduct an investigation of the surface and subsurface conditions at **No. 365, Princes Highway, Officer, Vic, 3809** as depicted on the cover page with a view to reporting on the Boreholes, Footing probes and Moisture testings.

2 Site Investigation

2.1 Site Geology

The available Geological Survey Maps showed the site to be underlain by **Quaternary Aged Alluvial Deposits**. The subsurface profile encountered in the boreholes is considered to be consistent with the geological map indications.

2.2 Field Investigation

TWO (2) boreholes were advanced using a **Mechanical Auger** to the depths indicated on the borehole logs (refer to Appendix B). These boreholes were positioned as indicated on the site plan (refer to Appendix A) along with details of the existing surface conditions such as slope, trees, and existing buildings. Disturbed materials obtained from augering boreholes were logged in accordance with AS1726-2017.

A guide to the existing/natural soil profile consisted of:

FILL – SILT overlying the naturally occurring:

SILT and

CLAY

Full details of the observed subsurface material and conditions have been recorded on the borehole logs and presented in Appendix B.

2.3 Laboratory Testing

Six (6) disturbed samples were collected from BH-1 at the depth of 0.1-0.5m, 0.5-0.7m, 0.7-1.0m, 1.0-1.3m, 1.3-1.7m and 1.7-2.0m below the existing surface level within the silt and clay profile. The collected samples were transferred to Intrax for Moisture Content testing (Please refer Appendix C for test results).

2.4 Footing Probe

Two (2) footing probes were conducted on the tower foundation and on building foundation as requested by the client. Footing probe location is mentioned on site plan on Appendix A and presented on Appendix D.

Should you have any questions regarding this report please do not hesitate to contact the Intrax Site Classification Division on 03 8371 0100.

For and on behalf of Intrax Consulting Engineers Pty Ltd

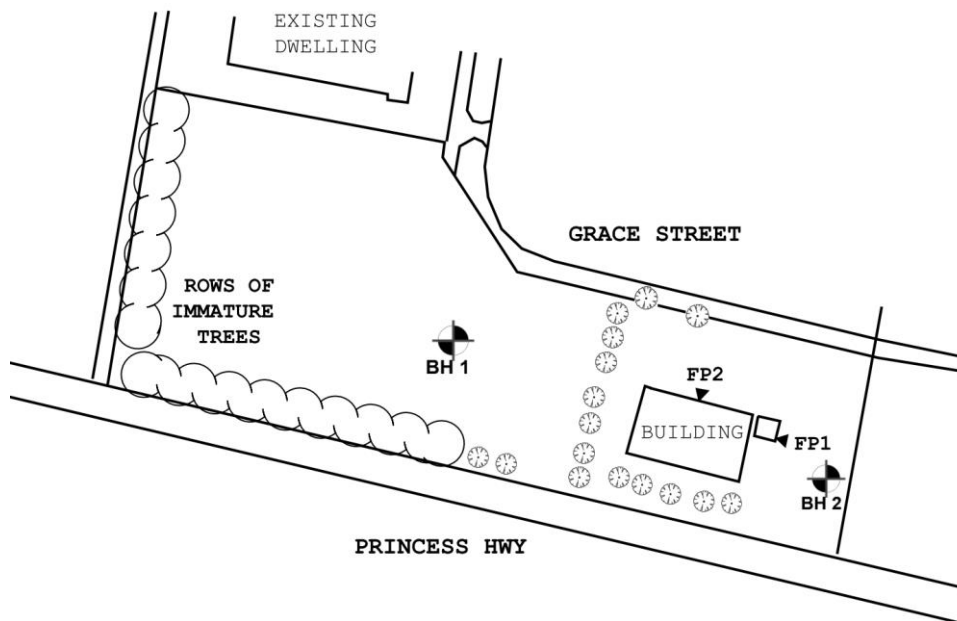
A handwritten signature in black ink, appearing to read "S. Niroula", with a large circular flourish on the left and a horizontal line extending to the right.

Saroj Niroula
B. Eng. (Civil)

Appendix A

Site Plan

Site Plan



NOT TO SCALE

Appendix B

Borehole Logs

Borehole Logs

Site Address:		No. 365, Princes Highway, Officer, Vic, 3809					MECHANICAL AUGER	MECHANICAL AUGER
Horizon	USC	Soil Type	Moisture	Density/ Consistency/ Strength	Plasticity	Description	Borehole 1	Borehole 2
EXISTING SURFACE LEVEL							0	0
UNCONTROLLED FILL	ML	clayey SILT trace sand & gravel	Moist, Near Plastic Limit	Loose - Medium Dense	Low Plasticity	masonry, root material.	0 - 500	0 - 600
A	ML	clayey SILT	Moist, Near Plastic Limit	Soft	Low Plasticity	grey to pale grey, brown, root material.	500 - 900	600 - 800
B	CI	CLAY with silt	Moist, Wet to Near Plastic Limit	Soft up to 1000mm Firm up to 1400mm Stiff from 1400mm	Medium Plasticity	mottled grey, brown, orange.	900 - 2200	800 - 2200
				Intrax ID #:		174564	NO REFUSAL	NO REFUSAL
				Date of Fieldwork		26/10/2021	Groundwater Not Encountered	Groundwater Not Encountered

Appendix C

Laboratory Test Results

Material Test Report

Report Number: PRJ675484 -1
Issue Number: 1
Date Issued: 10/11/2021
Client: C816 Intrax
 Intrax Consulting Engineers Pty Ltd, Victoria
Project Number: PRJ675484
Project Name:
Project Location: S#174564 No. 365, Princes Highway, Officer, Vic, 3809
Work Request: 652
Dates Tested: 08/11/2021 - 08/11/2021
Location: S#174564 No. 365, Princes Highway, Officer, Vic, 3809



Intrax Consulting Engineers Pty Ltd
 Deer Park Laboratory
 21 Radnor Drive Deer Park VIC 3023
 Phone: 0477 6611 753
 Email: darryl.pather@intrax.com.au

Accredited for compliance with ISO/IEC 17025 - Testing




Approved Signatory: Darryl Pather

Laboratory Manager

NATA Accredited Laboratory Number: 19862

Moisture Content AS 1289 2.1.1			
Sample Number	Sample Location	Moisture Content (%)	Material
D21-652A	BH01 , Depth: 0.1-0.5m	27.3 %	Clayey SILT, medium to low plasticity, dark grey, trace sand and gravel, moist
D21-652B	BH01 , Depth: 0.5-0.7m	23.4 %	Clayey SILT, medium to low plasticity, grey, moist
D21-652C	BH01 , Depth: 0.7-1.0m	23.7 %	Silty CLAY, medium plasticity, dark grey mottled black, trace gravel, moist
D21-652D	BH01 , Depth: 1.0-1.3m	22.6 %	Silty CLAY, medium plasticity, grey, moist
D21-652E	BH01 , Depth: 1.3-1.7m	22.8 %	Silty CLAY, medium plasticity, grey, moist
D21-652F	BH01 , Depth: 1.7-2.0m	23.0 %	Silty CLAY, medium plasticity, grey, moist

Appendix D

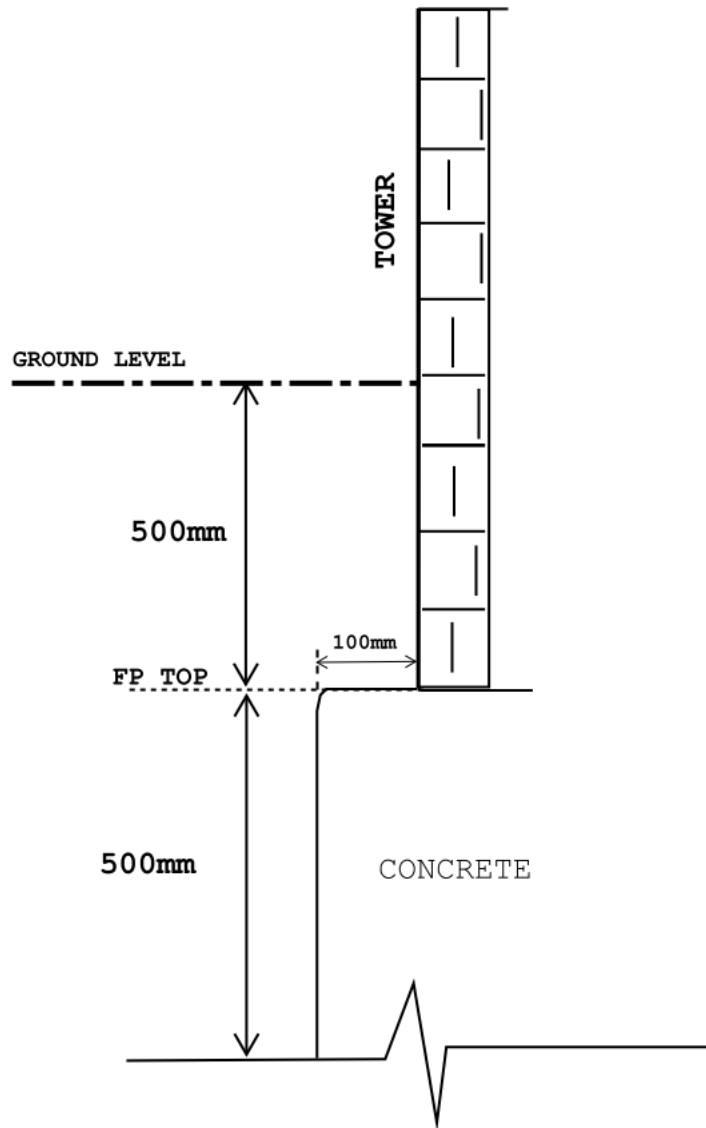
Footing Probe

Footing Probe

Date: 10/11/2021
Date of Fieldwork: 26/10/2021
Site Number: 174564
Site Address: No. 365, Princes Highway, Officer, Vic, 3809
Client: James Hicks Potter

The footing probe information provides a general description of the footing at the specific location indicated. It does not make any warranty that the information is representative of the footing along its length. The contractor must verify that footing along its length to their satisfaction prior to works commencement and notify Intrax Consulting Engineers should the information vary in any respect. Intrax Consulting Engineers Pty Ltd will not be held responsible for any variations to the footing conditions from the detail provided at the location of the probe.

Footing Probe 1

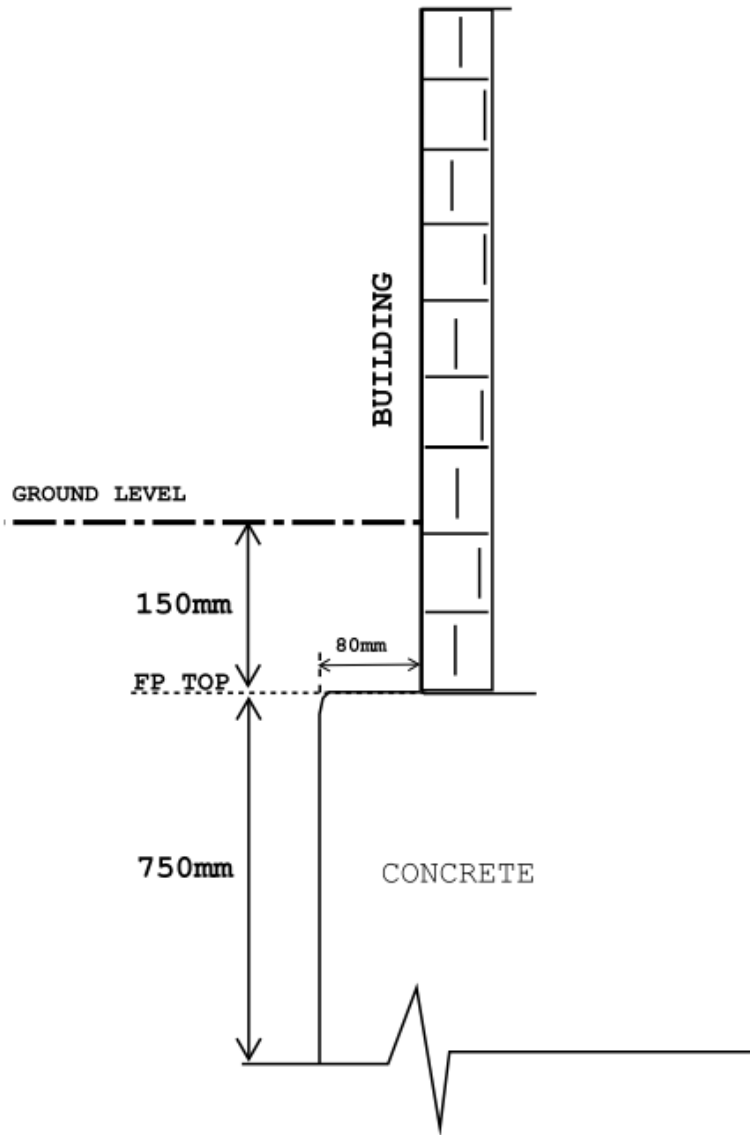


**FOOTING PROBE STOPPED DUE TO DEPTH
FP BOTTOM NOT FOUND**

Photos



Footing Probe 2



**FOOTING PROBE STOPPED DUE TO DEPTH
FP BOTTOM NOT FOUND**

Photos

