CampbellReith
consulting engineers

9 St. Martins Almshouses

NW1 0BD

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-97
Revision: D2

November 2017

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Author	A Pontes, MEng
Project Partner	E M Brown, BSc MSc CGeol FGS
Project Number	12466-97
Project Name	9 St. Martins Almshouses, NW1 0BD
Planning Reference	2017/4287/P

Contents

Appendix

1.0 NON-TECHNICAL SUMMARY

1.1. CampbellReith was instructed by London Borough of Camden, (LBC) to carry out an audit on the Basement Impact Assessment submitted as part of the Planning Submission documentation for 9 St. Martins Almshouses, NW1 0BD (planning reference 2017/4287/P). The basement is considered to fall within Category B as defined by the Terms of Reference.

1.2. The Audit reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development in accordance with LBC's policies and technical procedures.

1.3. CampbellReith was able to access LBC's Planning Portal and gain access to the latest revision of submitted documentation and reviewed it against an agreed audit check list.

1.4. The BIA and the Structural Methodology Statement were carried out by individuals with suitable qualifications.

1.5. The Design & Access Statement identified that 1 to 9 St. Martins Almshouses are grade II listed buildings.

1.6. The property is a terraced two storeys plus lower ground floor house. The proposal is to deepen the existing lower ground level and the construction of a single storey rear extension with new basement and external lightwell, using underpinning techniques.

1.7. A site specific ground investigation was conducted, with the geology identified as made ground and head deposits overlaying London Clay.

1.8. Groundwater was observed within the depth of the proposed basement excavation; however this has not been interpreted as the true ground water level. Dewatering strategies are proposed and a conservative groundwater level is accounted for in the design which is accepted.

1.9. It is accepted that the cumulative impact on groundwater flows will be minimal.

1.10. The new basement and new underpinned foundations will be founded in London Clay. There are some trees in the vicinities, but the report does not mention any structural defects on the property and heave forces were considered in the design.

1.11. The proposed construction works will have a relatively low impact in the existing trees, which can be largely mitigated through design and precautionary measures.

1.12. Assumptions made in the GMA have been clarified. It is predicted that the most severe likely damage will be category 1 and affect No. 8 St Martins Almhouses. Assuming good control of workmanship and appropriate detailed design this is accepted.

1.13. It has been confirmed that the surface water discharge flow rate to the sewer system is unlike to increase due to the adoption of a green roof, although roof area is increasing slightly.

1.14. The construction methodology involves commonly applied construction techniques for basement construction, and is considered appropriate assuming employment of a suitably experienced contractor and good workmanship. However specific details in relation to the construction adjacent to the neighbouring rear extension are required.

1.15. Further design calculations to account for the neighbouring building surcharge were requested, however it has been confirmed that these foundations are to be underpinned rather than surcharging the basement walls.

1.16. An outline works programme has been provided.

1.17. A movement monitoring strategy is being proposed to include visual inspections and monitoring of fixed points on the property and adjoining properties around the excavation.

1.18. Queries and requests for information are described in Section 4 and summarised in Appendix 2. Having reviewed the supplementary information, it cannot be confirmed that the BIA complies with the requirements of CPG4.

2.0 INTRODUCTION

2.1. CampbellReith was instructed by London Borough of Camden (LBC) in 23/08/2017 to carry out a Category B Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 9 St. Martins Almshouses, Bayham Street, London, NW1 0BD, ref. 2017/4287/P.

2.2. The Audit was carried out in accordance with the Terms of Reference set by LBC. It reviewed the Basement Impact Assessment for potential impact on land stability and local ground and surface water conditions arising from basement development.

2.3. A BIA is required for all planning applications with basements in Camden in general accordance with policies and technical procedures contained within

- Guidance for Subterranean Development (GSD). Issue 01. November 2010. Ove Arup & Partners.
- Camden Planning Guidance (CPG) 4: Basements and Lightwells.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.

2.4. The BIA should demonstrate that schemes:

a) maintain the structural stability of the building and neighbouring properties;

b) avoid adversely affecting drainage and run off or causing other damage to the water environment;

c) avoid cumulative impacts upon structural stability or the water environment in the local area, and;

d) evaluate the impacts of the proposed basement considering the issues of hydrology, hydrogeology and land stability via the process described by the GSD and to make recommendations for the detailed design.

2.5. LBC's Audit Instruction described the planning proposal as "*Demolition of existing rear extension and replacement with new single storey rear ground floor extension; new basement beneath the proposed rear extension including external light well; excavation of existing basement beneath house by additional 800mm; new conservation roof light at roof level; restoration and refurbishment works throughout original property*."

2.6. The Audit Instruction also confirmed the basement proposal involves a listed building.

2.7. CampbellReith accessed LBC's Planning Portal on 25/09/2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment Report (BIA) Parts 1 of 2 and 2 of 2 – Symmetrys Ltd – ref. 2016277/DS rev.A (06/07/2017)
- Arboricultural Impact Assessment – Landmark Trees – ref. MOX/9STM/AIA/01 – 19/04/2017
- Design and Access Statement – Moxon Architects – July 2017
- Historic Building Report – Donald Insall Associates – July 2017
- Existing Floor Plans and Elevations – drawings 599_120rev01, 599_121rev01, 599_122rev01, 599_123rev01, 599_130rev01, 599_131rev01, 599_132rev01, 599_140rev01
- Existing Site Plan – drawing 599_101rev01
- Location Plan – drawing 599_100rev01
- Proposed Floor Plans and Elevations – drawings 599_220rev01, 599_221rev01, 599_222rev01, 599_223rev01, 599_230rev01, 599_231rev01, 599_232rev01, 599_240rev01, 599_241rev01, 599_242rev01, 599_243rev01, 599_244rev01, 599_245rev01
- Proposed Site Plan – drawing 599_201rev01
- 8 St Martins Almshouses (Rear Extension) Structural drawing CA3618/01 rev.B

2.8. Subsequent to the initial audit, supplementary information was submitted in response to queries raised. This revised audit report considers that supplementary information which is presented in Appendix 3:

- 2016277 CampbellReith BIA Audit List Symmetrys Comment 17.10.18.
- Email Symmetrys to Moxon Architects dated 18 October 2017.

3.0 BASEMENT IMPACT ASSESSMENT AUDIT CHECK LIST

Item	Yes/No/NA	Comment
Are BIA Author(s) credentials satisfactory?	Yes	
Is data required by Cl.233 of the GSD presented?	Yes	A works programme is provided in the construction management plan.
Does the description of the proposed development include all aspects of temporary and permanent works which might impact upon geology, hydrogeology and hydrology?	Yes	
Are suitable plan/maps included?	Yes	
Do the plans/maps show the whole of the relevant area of study and do they show it in sufficient detail?	Yes	
Land Stability Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Question 6: One tree will be felled and works will clash with RPA but Arboricultural Impact Assessment establish low impacts resultant from proposed development.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	Question 5: New hardstanding drainage to be clarified.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	
Is a conceptual model presented?	Yes	Section 3.2.1 of the BIA.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	

Item	Yes/No/NA	Comment
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	New hardstanding drainage to be clarified;
Is factual ground investigation data provided?	Yes	
Is monitoring data presented?	Yes	
Is the ground investigation informed by a desk study?	Yes	
Has a site walkover been undertaken?	Yes	
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	
Is a geotechnical interpretation presented?	Yes	
Does the geotechnical interpretation include information on retaining wall design?	Yes	
Are reports on other investigations required by screening and scoping presented?	Yes	
Are the baseline conditions described, based on the GSD?	Yes	
Do the base line conditions consider adjacent or nearby basements?	Yes	
Is an Impact Assessment provided?	Yes	
Are estimates of ground movement and structural impact presented?	Yes	GMA clarified and reissued.
Is the Impact Assessment appropriate to the matters identified by screen and scoping?	Yes	

Item	Yes/No/NA	Comment
Has the need for mitigation been considered and are appropriate mitigation methods incorporated in the scheme?	Yes	A green roof is provided which will provide attenuation of surface water flows.
Has the need for monitoring during construction been considered?	Yes	
Have the residual (after mitigation) impacts been clearly identified?	Yes	
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	No	Revised GMA and building damage assessment presented. However further method statement is required in relation to the underpinning of the neighbouring extension
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	Confirmation of areas to be drained to existing sewer system presented.
Has the scheme avoided cumulative impacts upon structural stability or the water environment in the local area?	Yes	
Does report state that damage to surrounding buildings will be no worse than Burland Category 2?	Yes	
Are non-technical summaries provided?	No	

4.0 DISCUSSION

4.1. The Basement Impact Assessment (BIA) and the Structural Methodology Statement were carried out by a firm of engineering consultants, Symmetrys in conjunction with a firm of geotechnical consultants Ground&Water, and the individuals concerned in its production have suitable qualifications in accordance with CPG4.

4.2. The LBC Instruction to proceed with the audit identified that the basement proposal involves a listed building. The Design & Access Statement identified that Nos 1 to 9 St. Martins Almshouses are grade II listed.

4.3. The property is a terraced two storeys plus lower ground floor house. The proposed development consists of deepening the existing lower ground floor by 0.8m and the construction of a single storey rear extension with new full depth basement, including a new external lightwell, using underpinning techniques.

4.4. A site specific ground investigation was conducted, comprising two trial pits (to investigate existing foundations) and one borehole to a depth of 10mbgl.

4.5. The ground model consists of a layer of Made Ground (0.6-1.2mbgl) and head deposits comprising brown gravelly silty clay (up to 2.3mbgl) overlaying the London Clay.

4.6. In the borehole a ground water strike was observed at 3.1mbgl and, during a return visit, a groundwater level of 2.5mbgl was recorded in the standpipe installed. These results were not considered by the geotechnical consultant to represent the groundwater table and were interpreted as perched water within the top layers. No further repeat monitoring readings were presented. However despite the above a dewatering strategy has been proposed which is accepted.

4.7. It is claimed that the cumulative impact on ground water flows will be minimal given the basement will be formed in impermeable London Clay. This does not take into account the permeable head deposits that overlay this. However it is accepted that the impact on ground water flows is anticipated as being minimal given the shallow depth of ground water recorded above the London Clay. It is recommended that ground water monitoring continues until construction in order to better understand the seasonal variation of ground water.

4.8. Structural calculations for the retaining wall and basement slab have been produced, with the retaining wall being designed for a conservative water level of 1mbgl. The basement slab has been designed to resist heave forces due to the unloading of the clay soil. Subsequent to the initial audit, it has been confirmed that the foundations to the neighbouring rear extension will be underpinned to avoid surcharge loading on the new basement wall.

4.9. The proposed construction works will occur in the vicinity of trees and one tree will be removed. An Arboricultural Impact assessment was conducted and concluded that the impacts of the development are low and the full potential of the impact can be mitigated through design and precautionary measures.

4.10. The basement is adjoining a two storey building (number 8) to the north which does not contain a basement level, a private access on the west and south boundaries, and the property garden on the east boundary.

4.11. A ground movement assessment (GMA) was conducted but it assumes that the excavation is in competent soil while the Site Investigation indicates made ground and head deposits to a depth of up to 2.3mbgl which could lead to increased ground movements. Therefore it is recommended that particular care is taken in providing both temporary and permanent propping to the wall to ensure that movements are kept to a minimum.

4.12. While the original BIA report suggests that the new ground floor extension is to be in timber, the drawings suggest reinforced concrete. The floor construction has been confirmed to be concrete and it is accepted the floor will provide a prop to the retaining wall.

4.13. The revised GMA discusses both vertical and horizontal movements due to underpinning. Predicted movements are within the range to be expected for underpinning provided there is good control of workmanship. The maximum predicted damage category is Burland Category 1, which could potentially occur to No. 8 St Martins Almshouses.

4.14. The area of roof/lightwell area is increasing by the construction of the lightwell and larger extension. The requirement for mitigations measures was identified in Scoping stage (BIA, appendix C, point 3.2.1) but no solutions were proposed to mitigate this increase. It has since been confirmed that a green roof will be provided to the new roof area which will provide attenuation of the flow, which while calculations for this have not been provided, it is accepted that the run off flows are likely to be negligibly effected. However the impact on surface water runoff should be considered further in the detailed design stage.

4.15. A construction methodology is presented which involves sequenced underpinning of existing foundations and a sequenced retaining wall construction, which is common practice and, assuming good workmanship, pose a low likelihood of significant risk of ground movement generally. However underpinning of the neighbouring extension which is founded on pad foundations is proposed, which has not been specifically considered in the structural details. Given the listed status of the row of properties the method statement should be expanded to include the underpinning of the neighbouring extension to demonstrate structural stability can be maintained.

4.16. A works programme covering key phases of work and approximate durations has been included in the construction management plan.

4.17. A movement monitoring strategy is being proposed to include visual inspection and the monitoring of fixed monitoring points on the property and adjoining properties around the perimeter of the proposed excavation. This includes an outline movement monitoring strategy and generic trigger levels, trigger levels should be linked to the predicted movements calculated by the ground movement assessment, in order to prevent damage exceeding category 1. It should be noted that monitoring of the property to be underpinned itself is also required due to its listed building status.

4.18. Queries and requests for information are described in this section and summarised in Appendix 2.

5.0 CONCLUSIONS

5.1. The BIA and the Structural Methodology Statement were carried out by a firm of engineering consultants in conjunction with a firm of geotechnical consultants and the individuals concerned in their production have suitable qualifications in accordance with CPG4.

5.2. The Design & Access Statement identified that houses number 1 to 9 on St. Martins Almshouses are grade II listed.

5.3. The property is a terraced two storeys plus lower ground floor house. The proposal is to deepen the existing lower ground and the construction of a single storey rear extension with new basement and external lightwell. The basement is to be formed using underpinning techniques. It is stated that the foundation to the neighbouring extension will also be underpinned.

5.4. A site specific ground investigation was conducted. The ground model consists of a layer of made ground and head deposits overlaying London Clay.

5.5. Groundwater observations are interpreted as perched water by the geotechnical consultant. Dewatering strategies are proposed and a conservative groundwater level has been taken in the design.

5.6. The new basement slab and underpinned foundations will be founded in London Clay.

5.7. The new rear extension ground floor construction has been clarified as reinforced concrete.

5.8. The GMA has been revised and reissued and is accepted. Category 1 damage is predicted to No. 8 St Martins Almshouses.

5.9. It is accepted that the impact on ground water flows will be minimal, given the shallow depth of perched groundwater. However ground water monitoring is recommended to continue until construction.

5.10. It has been confirmed that the rate of flow of surface water discharge to the existing sewer system is unlikely to increase.

5.11. The construction methodology involves sequenced underpinning of existing foundations and sequenced retaining wall construction, which are common practice and should pose low risk, assuming good workmanship by an experienced contractor. However the method statement is required to be expanded to include the underpinning to the neighbouring extension.

5.12. Structural calculations for the retaining wall and basement slab have been provided, and have been revised to account for a building load surcharge from No. 8.

5.13. An outline works programme has been provided.

5.14. A movement monitoring strategy is being proposed to include visual inspections and monitoring of fixed points on the property and adjoining properties around the excavation. This should be updated prior to construction so that trigger levels match movements as anticipated by the GMA and restrict potential damage to that predicted.

5.15. Queries and requests for information are described in Section 4 and summarised in Appendix 2. Having reviewed the supplementary information, it cannot be confirmed that the BIA complies with the requirements of CPG4.

Appendix 1: Residents' Consultation Comments

None

Appendix 2: Audit Query Tracker

Audit Query Tracker

Query No	Subject	Query	Status	Date closed out
1	Stability	Clarification of new rear extension ground floor form of construction.	Closed - 150mm RC slab confirmed.	30.10.2017
2	Stability	GMA to be revised to account for cumulative movements caused by installation and excavation.	Closed – clarification presented.	07.11.2017
3	Stability	Retaining wall calculations to account for surcharge of neighbouring extension	Closed – neighbouring extension to be underpinned.	07.11.2017
4	Hydrology	Mitigation measure to be proposed (SUDS) due to increased discharge to sewer system	Closed – green roof to be provided.	07.11.2017
5	Stability	Method statement for underpinning pad foundations to the neighbouring extension is required	Open.	

Appendix 3: Supplementary Supporting Documents

From: t.murray@moxonarchitects.com [mailto:t.murray@moxonarchitects.com]
Sent: 20 October 2017 10:24
To: Hazelton, Laura <Laura.Hazelton@camden.gov.uk>
Cc: a.holicska@moxonarchitects.com
Subject: Fwd: 9 St Martins Almshouses_Camden Basement Impact Assessment Audit

Hi Laura

Please see attached responses from our engineer re BIA for 9 St Martins Almshouses.

Please also see comments below from the ground investigation company we used.

Please let me know if you require any additional information.

Regards

Tim
Sent from my iPad

Begin forwarded message:

> From: David Snaith <david.snaith@symmetrys.com>
> Date: 18 October 2017 at 14:26:01 BST
> To: Tim Murray <t.murray@moxonarchitects.com>
> Cc: Holicska Adam <a.holicska@moxonarchitects.com>
> Subject: RE: 9 St Martins Almshouses_Camden Basement Impact Assessment Audit
> Hi Tim
>
> Please find attached the audit checker with Symmetrys comments in red.
>
> I have copied and pasted the Environmentalist's (Ground and Water) response to the point raised by Campbell Reith below:
>
> *We have double checked the calculations. They appear to be ok to us. Cumulative effects, including installation, were not analysed as you are not undertaking any contiguous piling and therefore movements are only expected for the excavation phase.*
>
> *In relation to the use of C580. The stiffness of the wall will render the top 1m of so of the soils present insignificant with respect to movement. Despite being described as Head Deposits the SPTs from 2.00 - 3.00m were 15 - 18 "N" Blow Counts, therefore stiff. Therefore the use of the C580 stiff clay graphs is deemed appropriate. Afgter all they are based on basements in London, which this is also. At the time of issue of our report C760 had only just been issued and i dont think anyone had updated their systems, even Campbell Reith. Seems a bit unfair to judge us on a document which was'nt really available at the time if issue. We have used the best tool available at the time.*
>
> Please let me know if you require anything further.

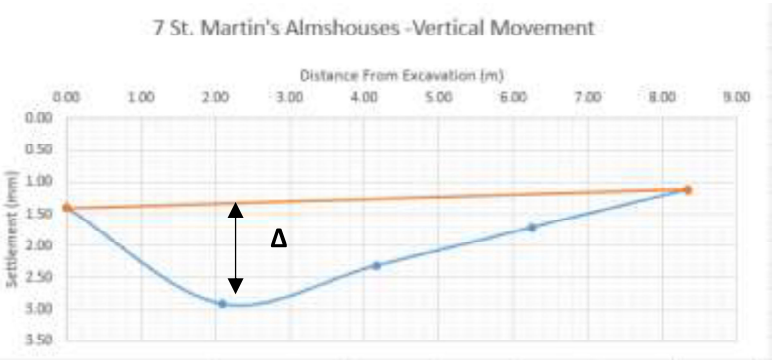
Kind regards,

Dave Snaith
Senior Engineer

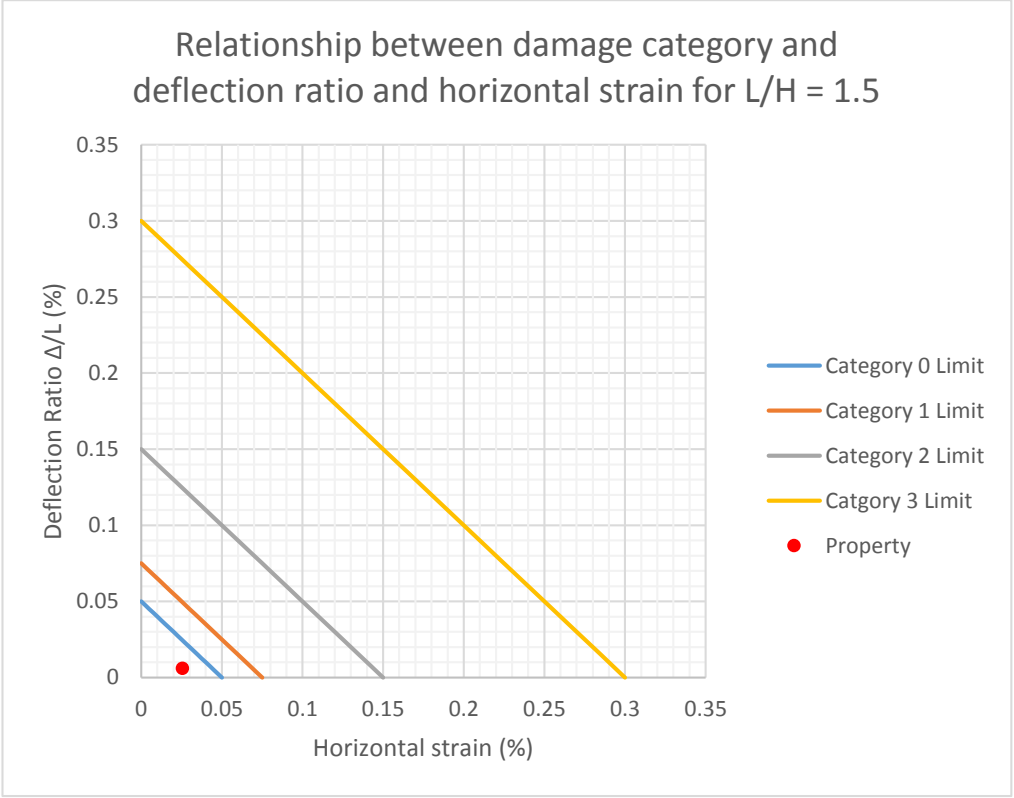
2016277 Campbell Reith BIA Audit List Symmetrys Comments 17.10.18.pdf

APPENDIX H
Ground Movement Assessment Calculations

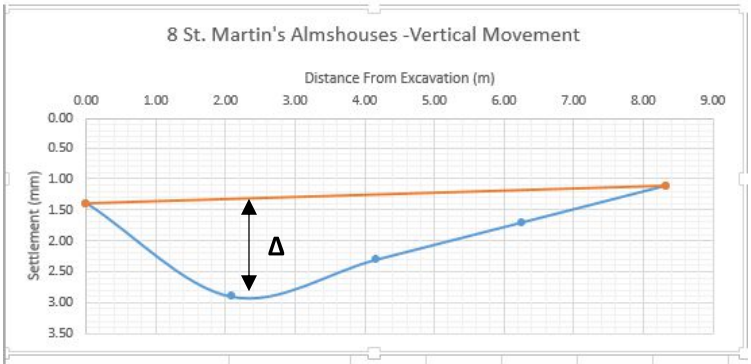
No. 7 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



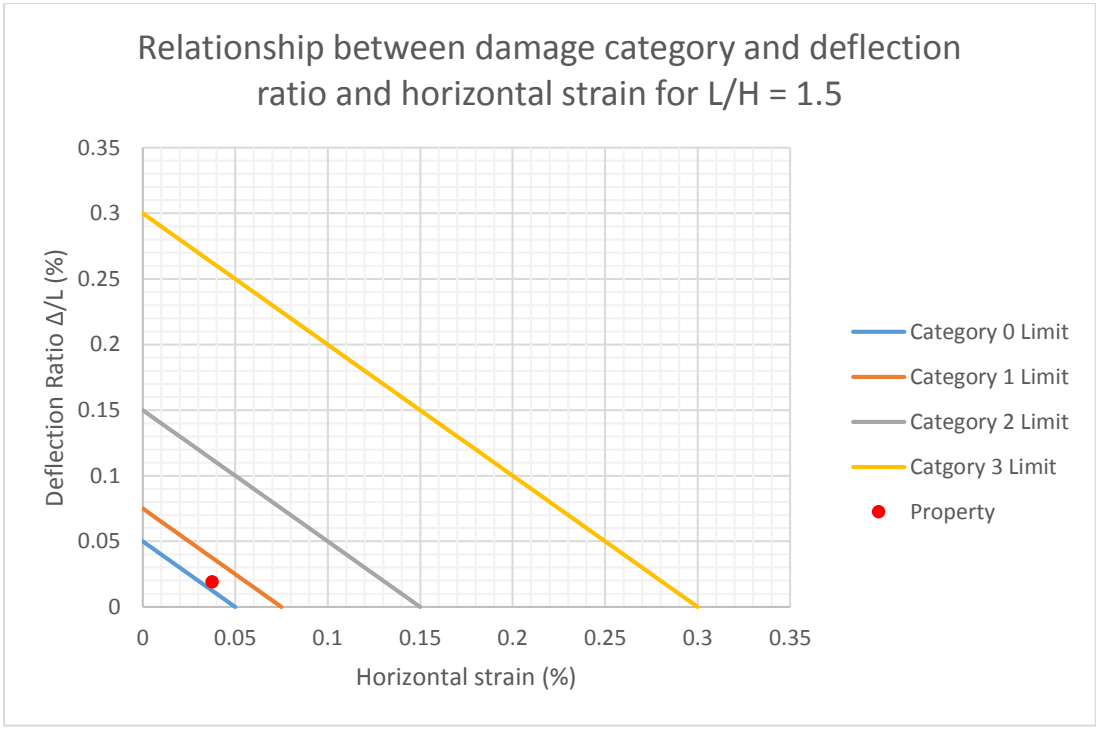
Neighbouring Property 1	No. 8		
	m	mm	
L	8.33	8330	
H	5.00	5000	
L/H	1.67		
Vertical Deflection (Δ)	1.4	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.016807	%	
Horizontal Movement (δh)	3.12	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.03750	%	



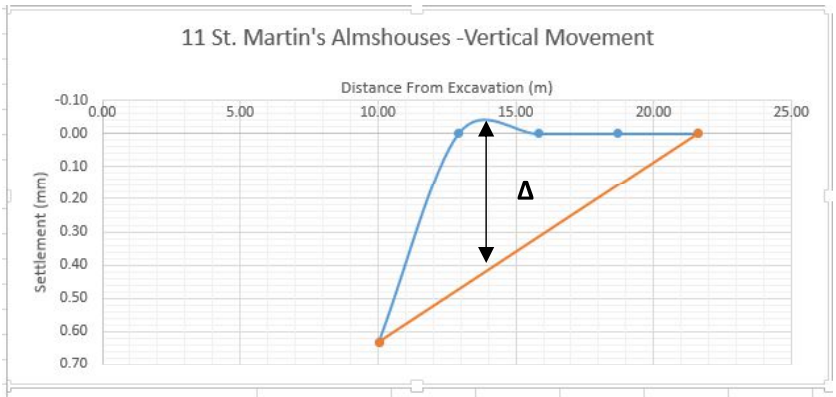
No. 8 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



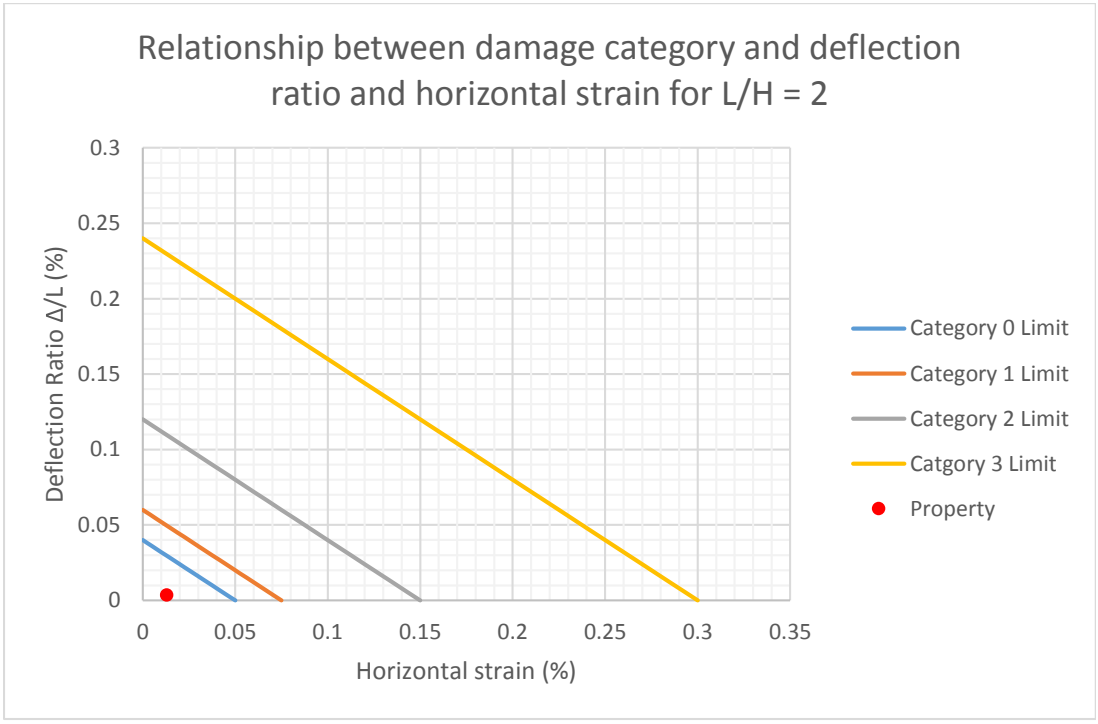
Neighbouring Property 1	No. 8 St Martins		
	m	mm	
L	8.33	8330	
H	5.00	5000	
L/H	1.67		
Vertical Deflection (Δ)	1.6	mm	from graph (max difference between blue and orange line)
Defelction Ratio (Δ/L)	0.019208	%	
Horizontal Movement (δh)	3.12	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (εh) = δh/L	0.03750	%	



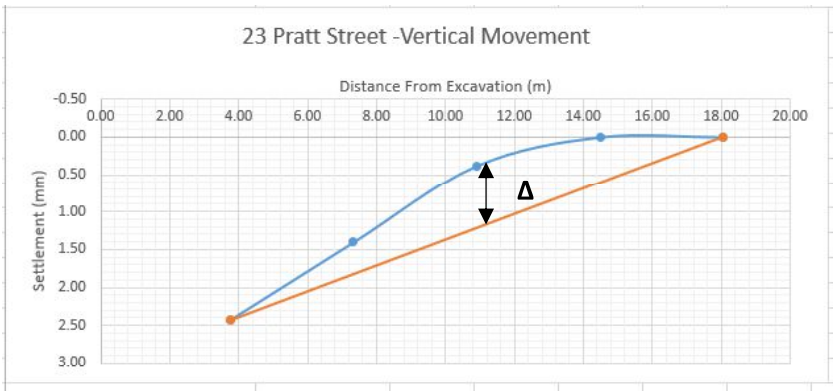
No. 11 St. Martin's Almshouses– Potential Damage Calculations in Stiff Clay



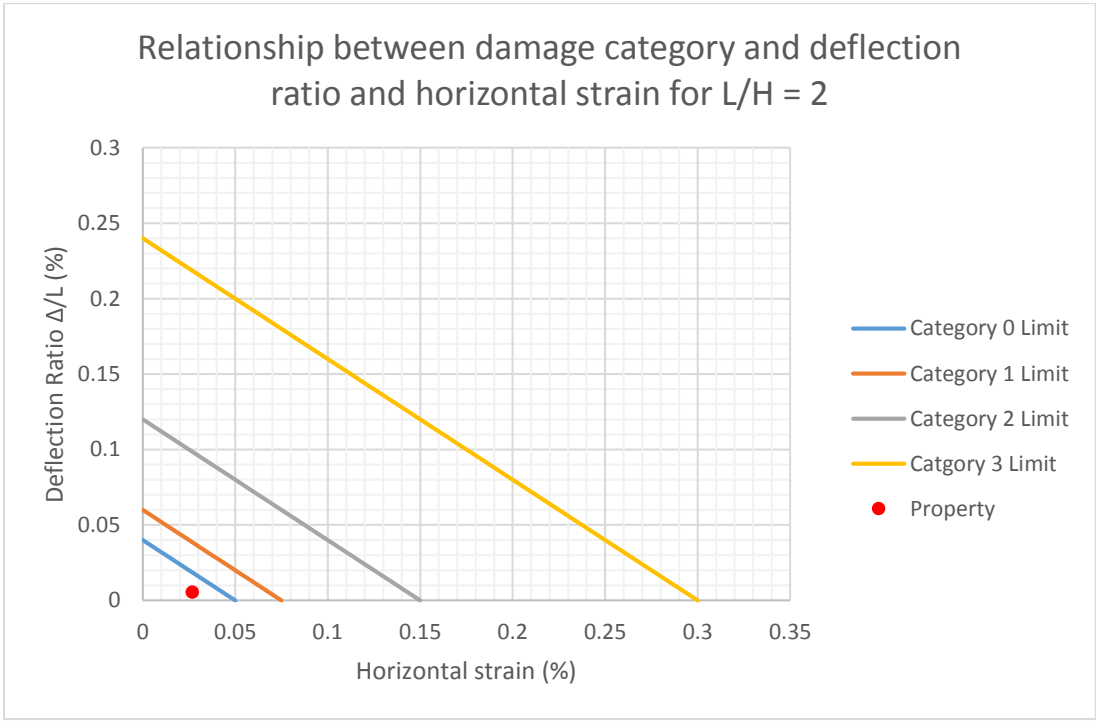
Neighbouring Property 1	No. 11 St Martins		
	m	mm	
L	11.58	11580	
H	5.00	5000	
L/H	2.32		
Vertical Deflection (Δ)	0.42	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.003627	%	
Horizontal Movement (δh)	1.49	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.01286	%	



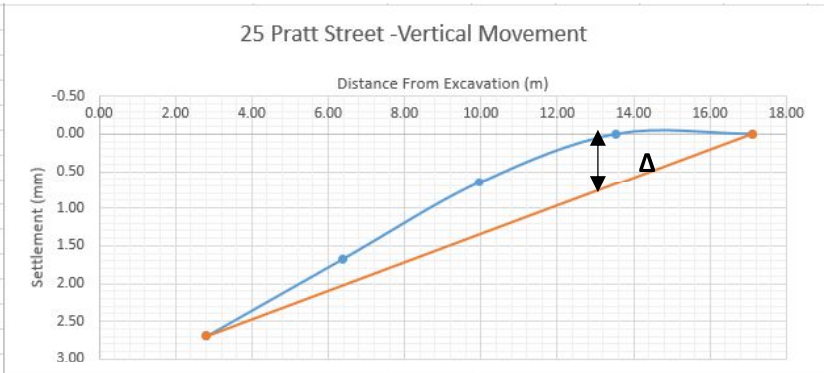
No. 23 Pratt Street – Potential Damage Calculations in Stiff Clay



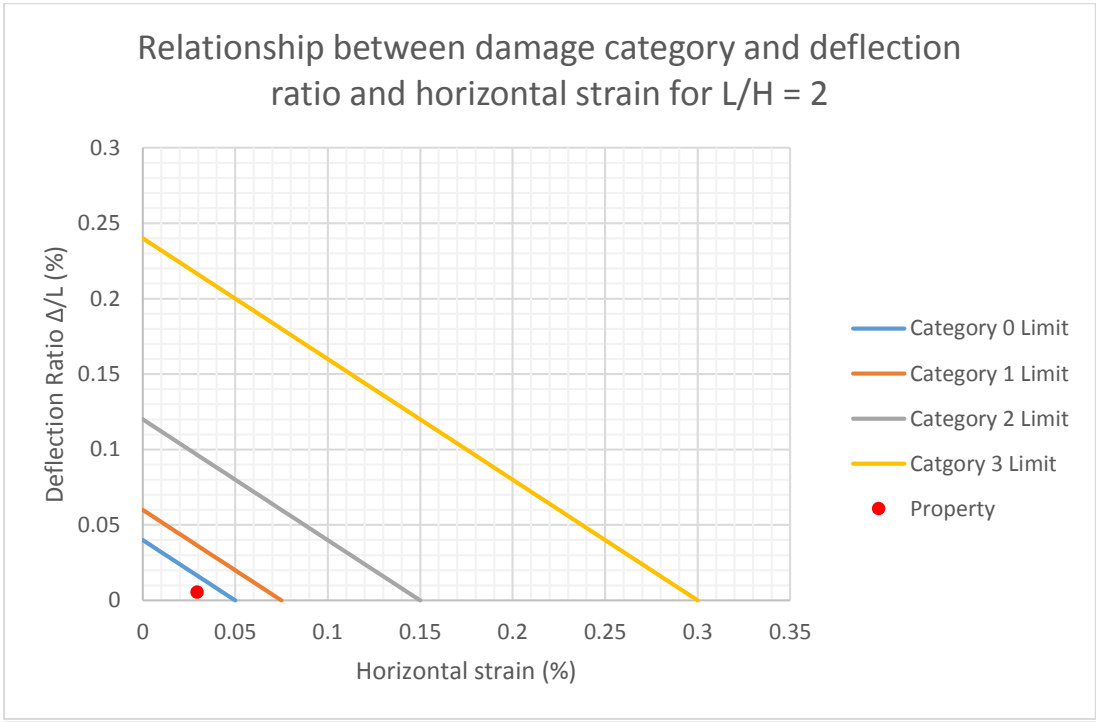
Neighbouring Property 1	No. 23 Pratt Street		
	m	mm	
L	14.31	14310	
H	7.50	7500	
L/H	1.91		
Vertical Deflection (Δ)	0.8	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.005590	%	
Horizontal Movement (δh)	3.84	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.02686	%	

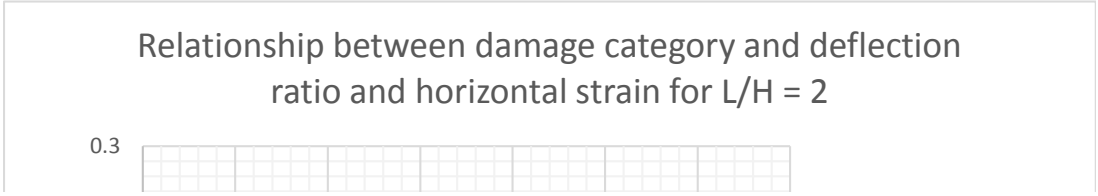


No. 25 Pratt Street – Potential Damage Calculations in Stiff Clay

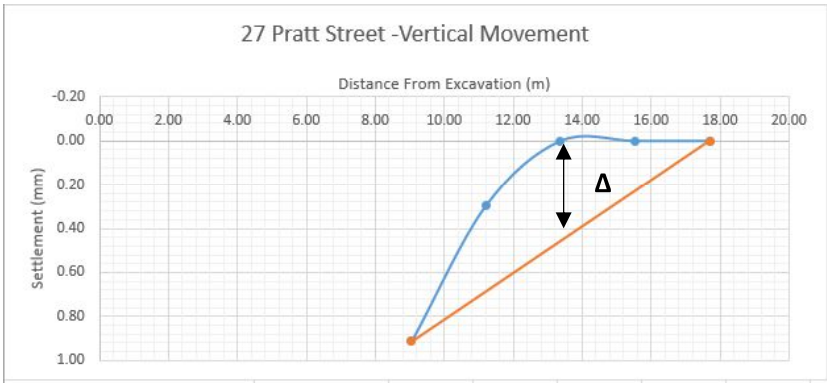


Neighbouring Property 1	No. 25 Pratt Street		
	m	mm	
L	14.31	14310	
H	7.50	7500	
L/H	1.91		
Vertical Deflection (Δ)	0.8	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.005590	%	
Horizontal Movement (δh)	4.20	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.02932	%	

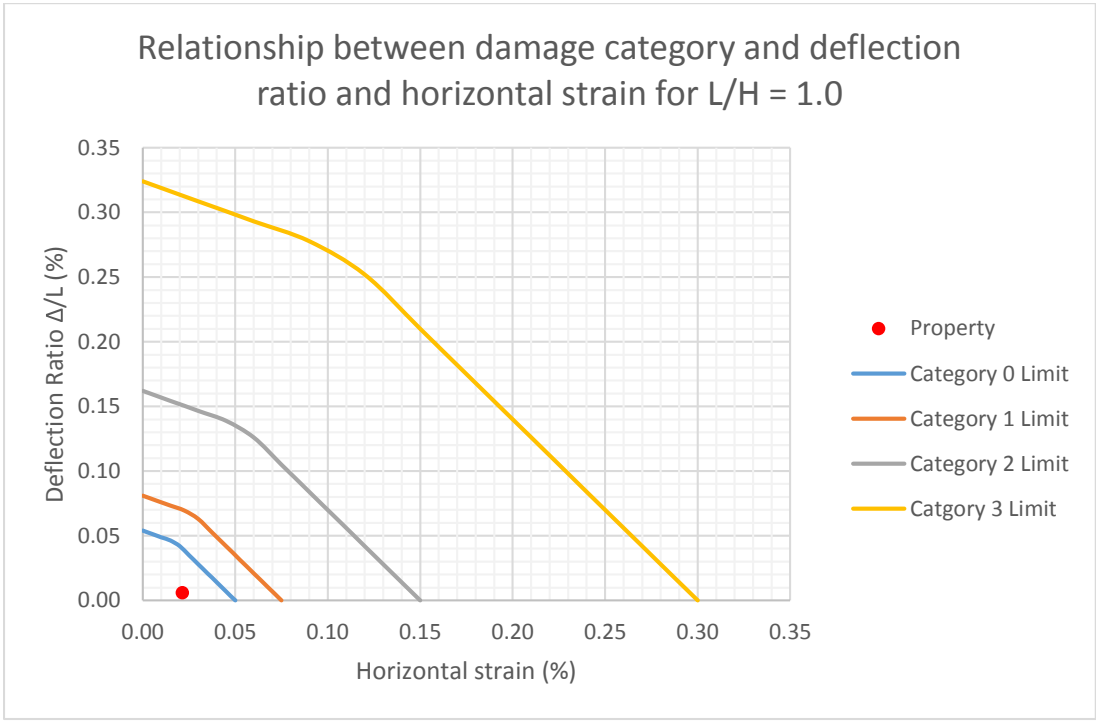




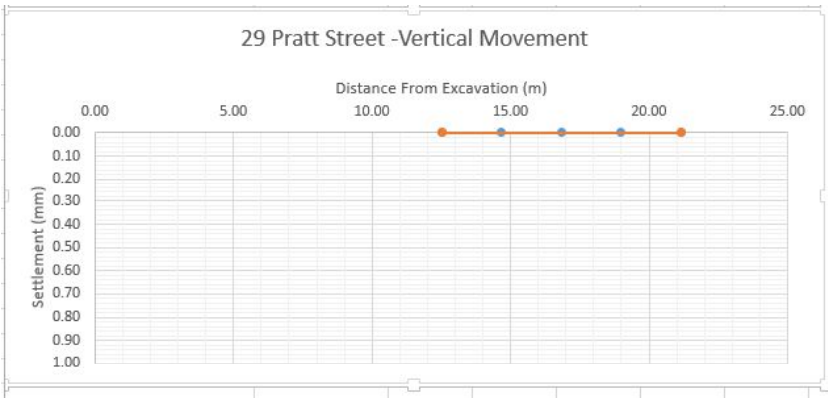
No. 27 Pratt Street – Potential Damage Calculations in Stiff Clay



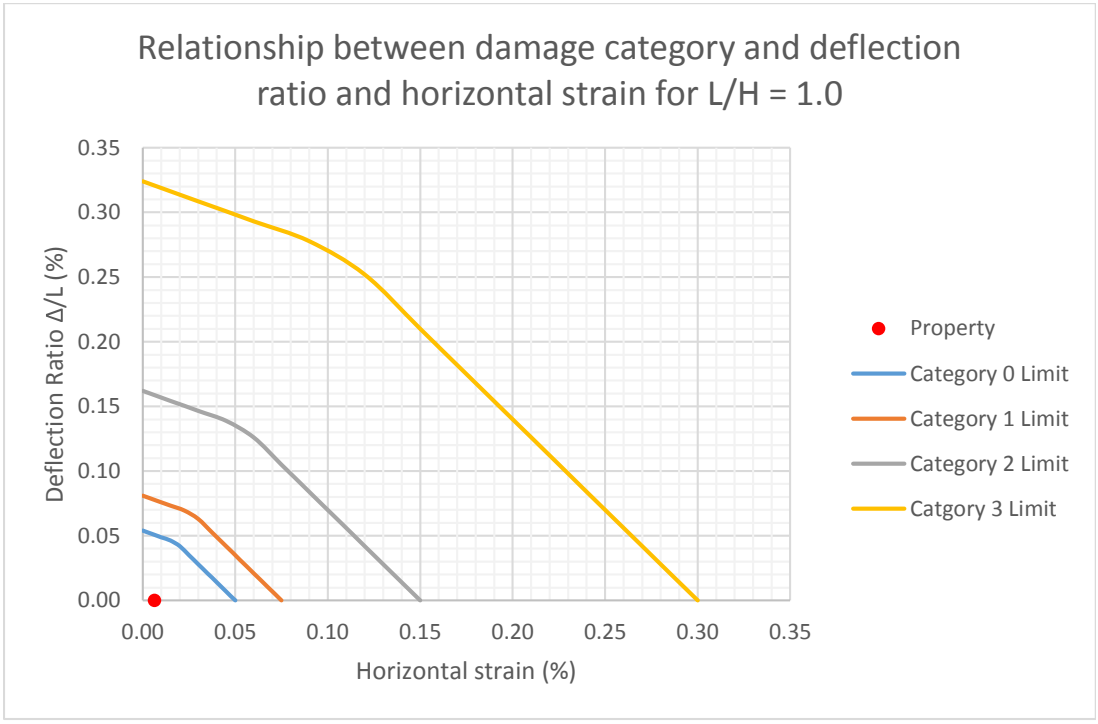
Neighbouring Property 1	No. 27 Pratt Street		
	m	mm	
L	8.64	8640	
H	7.50	7500	
L/H	1.15		
Vertical Deflection (Δ)	0.5	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.005787	%	
Horizontal Movement (δh)	1.86	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.02148	%	



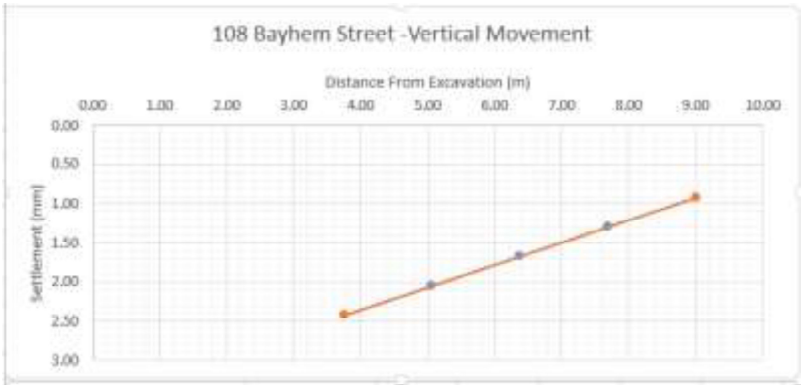
No. 29 Pratt Street – Potential Damage Calculations in Stiff Clay



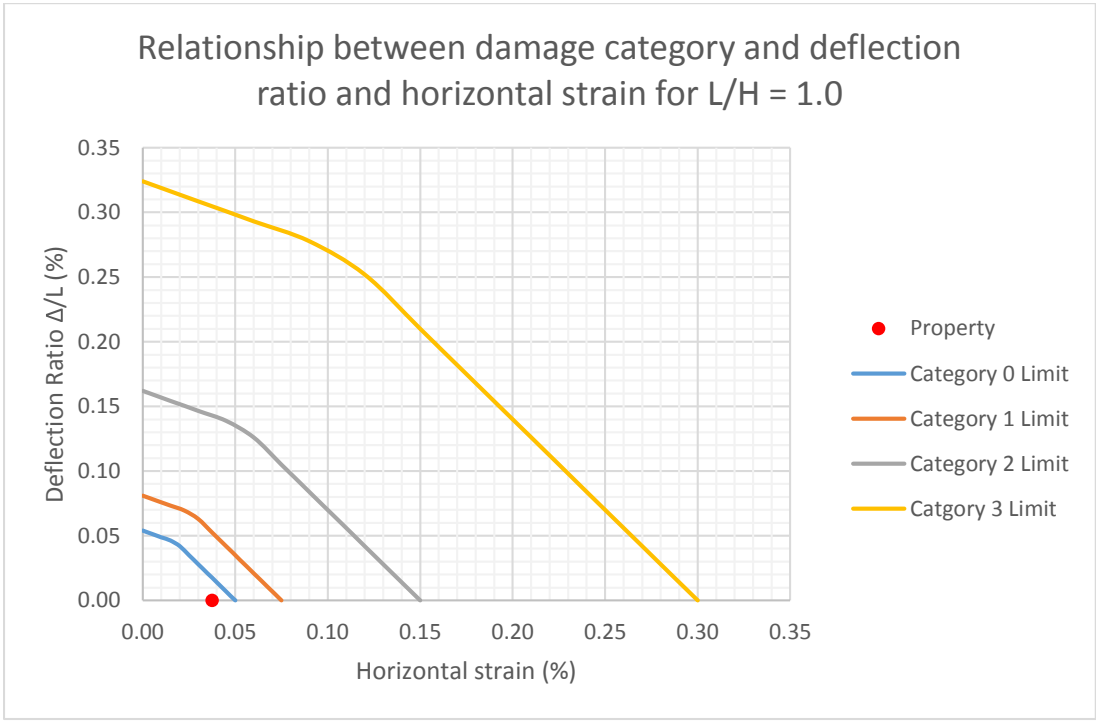
Neighbouring Property 1	No. 29 Pratt Street		
	m	mm	
L	8.64	8640	
H	7.50	7500	
L/H	1.15		
Vertical Deflection (Δ)	0	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.000000	%	
Horizontal Movement (δh)	0.56	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Ɛh) = δh/L	0.00642	%	



No. 108 Bayhem Street – Potential Damage Calculations in Stiff Clay



Neighbouring Property 1	No. 108 Bayhem Street		
	m	mm	
L	5.25	5250	
H	5.00	5000	
L/H	1.05		
Vertical Deflection (Δ)	0	mm	from graph (max difference between blue and orange
Defelction Ratio (Δ/L)	0.000000	%	
Horizontal Movement (δh)	1.97	mm	difference between horizontal movement at nearest and farthest walls
Horzontal Strain (Eh) = δh/L	0.03750	%	



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