CampbellReith
consulting engineers

63 Hillfield Road, London, NW6 1QB

Basement Impact Assessment Audit

For

London Borough of Camden

Project Number: 12466-96

Revision: F1

June 2018

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Project Name	63 Hillfield Road
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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 63 Hillfield Road, London NW6 1QB (planning reference 2017/4326/P). The basement is considered to fall within Category C 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 proposed development involves the deepening of the existing cellar at 63 Hillfield Road into a full-height, single storey basement (depth of new foundations will be 1.3m to 2.3m deeper than existing, and approximately 2.95m below ground level) and the construction of a new two-storey property in the rear garden. The new building will have a full-footprint semi-basement, where the basement will be a full storey below ground level at the northern boundary (excavation depths of new building to maximum c3m).

1.5. The BIA has been prepared by Gabriel GeoConsulting with supporting documents prepared by Vorbild Architecture and Green Structural Engineering. The authors' qualifications are in accordance with CPG guidelines for all sections.

1.6. A desk study has been presented, broadly in accordance with aspects recommended by LBC guidance.

1.7. A site investigation has confirmed the underlying ground conditions to comprise Made Ground over the London Clay. The London Clay is classified as unproductive strata. There will be no impact to the wider hydrogeological environment.

1.8. Interpretative geotechnical information is presented. Insitu shear strength (cu) values proposed for the basis of the stiffness (Eu) values used in the PDISP model, were originally inconsistent with the factual data provided and the interpreted Cu values quoted in other parts of the report. However, in the revised submissions the assigned parameters are accepted.

1.9. In the original BIA, recommended bearing capacities were exceeded by the structural engineer's bearing pressure requirements. In the revised submissions, bearing pressures have been reduced within the range of a reasonably conservative design bearing capacity.

1.10. Typically the depth of foundations will avoid the effects of seasonal shrink swell movements. Recommendations are made to mitigate the risk of shrink swell movements in accordance with best practice.

1.11. Sufficient temporary works sequencing and propping information is provided to demonstrate the feasibility of the scheme. Transitional underpins are recommended for neighbouring properties, to be agreed under the Party Wall award, as applicable.

1.12. A ground movement assessment (GMA) has been undertaken which assesses that damage to neighbours will be within Category 0 (Negligible). The basis of the assessment is generally accepted and considered representative of likely movements / impacts, considering the depth and methodology of the proposed development, and assuming good workmanship.

1.13. An outline structural movement monitoring strategy is presented which is considered appropriate to control construction and keep damage impacts within a maximum of Category 1 (Very Slight).

1.14. It is accepted that the site area is defined as being of low risk of flooding from surface waters. Adjacent areas are defined as having a medium risk. Hillfield Road is noted to have flooded in 2002. Appropriate flood mitigation measures are proposed.

1.15. The site is within a Critical Drainage Area. In the original BIA, SUDS options were discussed and recommended but none were proposed. In the revised submissions, a SUDS assessment is proposed to attenuate peak flows in accordance with best practice. The development will have no impact to the wider hydrological environment.

1.16. Non-technical summaries have been provided.

1.17. Queries and matters that required further clarification are discussed in Section 4 and summarised in Appendix 2. Considering the revised submissions, the BIA meets the requirements of CPG Basements.

2.0 INTRODUCTION

2.1. CampbellReith was originally instructed by London Borough of Camden (LBC) on 30 August 2017 to carry out a Category C Audit on the Basement Impact Assessment (BIA) submitted as part of the Planning Submission documentation for 63 Hillfield Road, London NW6 1QB, Camden Reference 2017/4326/P. Following an initial review and discussion with the Applicant's Engineer, revised submissions have been presented and an instruction to continue with the audit was received on 15 March 2018.

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): Basements.
- Camden Development Policy (DP) 27: Basements and Lightwells.
- Camden Development Policy (DP) 23: Water.
- The Local Plan (2017): A5 Basements.

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; and,

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

and 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 Planning Portal described the planning proposal as: "Erection of new two storey (plus basement) building fronting Achilles Road comprising 2 units (1x2-bed; 1x3-bed) (Class C3) with front lightwell; Conversion of existing building from 2 to 4 flats (2 x 2-bed; 2 x 1-bed); erection of single storey rear/side infill extension and first floor rear extension; rear dormer; enlargement

of existing basement level and front lightwell; creation of new access off Agamemmnon Road; hard and soft landscaping works.".

LBC's Planning Portal confirmed that the site is not a Listed Building nor is it within a Conservation area.

2.6. CampbellReith accessed LBC's Planning Portal on 17 September 2017 and gained access to the following relevant documents for audit purposes:

- Basement Impact Assessment (Retrofit and New Build) dated August 2017 (ref 18630/R3) by Gabriel GeoConsulting Limited.
- Planning Statement dated 27 July 2017 by VORBILD Architecture.
- Proposed and Existing Drawings dated 26 July 2017 (ref 0775) by VORBILD Architecture.
- Arboricultural Impact Assessment dated 26 July 2017 (ref 170726-1.1-63HR-AIA-LF) by Treework Environmental Practice.
- BRE Daylight & Sunlight Study within the development dated 19 June 2017 by Right of Light Consulting.
- BRE Daylight & Sunlight Study – Neighbouring Properties dated 18 July 2017 by Right of Light Consulting.
- Comments and objections to the proposed development from local residents.

2.7. CampbellReith were provided with the following relevant documents for audit purposes between December 2017 and March 2018:

- Surface Water Drainage Statement – Sustainable Drainage System dated 24th January 2018 (ref 18630/R4) by Gabriel GeoConsulting Limited.
- Email to CampbellReith dated 10th December 2017 from Gabriel GeoConsulting Limited.
- Letter to Green Structural Engineering Ltd dated 8th December 2017 from Gabriel GeoConsulting Limited.
- Engineering Method Statement dated 7th December 2017 by Green Structural Engineering Ltd.
- Arboriculture Impact Assessment (ref 170726-2.0-63HR-AIA-LF) dated 8th February 2018 by Treework Environmental Practice.

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	
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 plans/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	BIA report, Section 7.3.
Hydrogeology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report, Section 7.2.
Hydrology Screening: Have appropriate data sources been consulted? Is justification provided for 'No' answers?	Yes	BIA report, Section 7.4.
Is a conceptual model presented?	Yes	BIA report, Section 10.1.
Land Stability Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 8.3
Hydrogeology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 8.2.
Hydrology Scoping Provided? Is scoping consistent with screening outcome?	Yes	BIA report, Section 8.4.

Item	Yes/No/NA	Comment
Is factual ground investigation data provided?	Yes	BIA report, Section 9 and Appendix F.
Is monitoring data presented?	Yes	Groundwater monitoring presented in BIA report, Section 9.11 and 9.12 and Appendix F.
Is the ground investigation informed by a desk study?	Yes	BIA report.
Has a site walkover been undertaken?	Yes	Site inspection on 3rd May 2017.
Is the presence/absence of adjacent or nearby basements confirmed?	Yes	BIA report, Section 10.2. 65 Hillfield Road has an existing basement; the investigation indicates that it is unlikely to be deeper than 2 to 2.35m below the ground floor level. 61 has a cellar which has been sealed off and is not in use. 59 Achilles Road does not have a basement. 57 has a basement level.
Is a geotechnical interpretation presented?	Yes	BIA report, Section 9 and 10.
Does the geotechnical interpretation include information on retaining wall design?	Yes	BIA report, Section 10.4; Structural Engineer's reprt.
Are reports on other investigations required by screening and scoping presented?	Yes	Arboricultural Impact Assessment, GMA / Damage Category Assessment, SUDS Assessment.
Are 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	BIA report, Section 10.
Are estimates of ground movement and structural impact presented?	Yes	
Is the Impact Assessment appropriate to the matters identified by screening 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	BIA Report, Section 10.10. Mitigation including increased depth of retaining wall on the 63/65 boundary wall to allow for arboricultural related issues; appropriate propping and temporary works; proposal for transition underpins with neighbours; flood resistance / resilience measures; drainage attenuation.
Has the need for monitoring during construction been considered?	Yes	BIA Report, Section 10.8. Condition surveys, precise movement monitoring, proposed monitoring locations and trigger levels discussed.
Have the residual (after mitigation) impacts been clearly identified?	Yes	Impacts maintained within acceptable criteria.
Has the scheme demonstrated that the structural stability of the building and neighbouring properties and infrastructure will be maintained?	Yes	
Has the scheme avoided adversely affecting drainage and run-off or causing other damage to the water environment?	Yes	
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 1?	Yes	Damage Impact predicted as Category 0 (Negligible). Monitoring scheme sufficient to control works and maintain a maximum of Category 1 (Very Slight).
Are non-technical summaries provided?	Yes	

4.0 DISCUSSION

4.1. The BIA has been prepared by Gabriel GeoConsulting with supporting documents prepared by Vorbild Architecture and Green Structural Engineering. The authors' qualifications are in accordance with CPG4 guidelines for all sections.

4.2. The BIA indicates that the proposed work can be divided into a 'Retrofit Basement' and a 'New Buidling'. The Retrofit Basement is the extension of the existing cellar at 63 Hillfield Road into a full-height, single storey basement with front and rear lightwells. The proposed finished floor level (FFL) in the basement is no more than 2.80m below the ground floor's FFL throughout the basement. The new basement is the construction of a new two-storey property in the rear garden of 63 Hillfield Road which will have a full-footprint semi-basement with lightwell and external storeroom at its northern end where the basement will be a full storey below ground level. The excavation depths beneath the new building are likely to vary between approximately 2 and 3m. Neither the site nor the surrounding structures are designated as listed buildings and the site does not lie within a conservation area.

4.3. The construction methodology indicates use of reinforced concrete underpinning for the construction of the basement beneath number 63. Underpinning will also be used beneath the Party Wall with 59 Achilles Road. Where the basement / lightwells extend out beyond the footprint of the existing buildings it is proposed that reinforced concrete perimeter walls will be constructed in an underpinning style hit-and-miss sequence.

4.4. The site investigation undertaken on-site identifies the London Clay as the bearing formation for the proposed foundations, underlying Made Ground. Interpretative geotechnical information in accordance with the GSD Appendix G3 is presented. Insitu shear strength (cu) values proposed for the basis of the stiffness (Eu) values used in the PDISP model were originally inconsistent with the factual data provided and the interpreted Cu values quoted in other parts of the report. However, in the revised submissions the assigned parameters are accepted. In the original BIA, recommended bearing capacities were exceeded by the structural engineer's bearing pressure requirements. In the revised submissions, bearing pressures have been reduced within the range of a reasonably conservative design bearing capacity.

4.5. The site investigation and BIA have been informed by a desk study broadly in accordance with the GSD Appendix G1. A services search is reported (BIA Report, Section 10.1.3) as not identifying any utilities or underground infrastructure passing below the site. At detailed design stage, utility asset owners with assets identified as being within the zone of influence of the works (e.g. within the highway) should be contacted to agree protection measures, if applicable.

4.6. No groundwater entries were recorded in the three boreholes and they were all described as 'dry' on completion. Three sets of groundwater level readings taken in May and June 2017 revealed

groundwater levels up to 3.63m below ground level (bgl) in Borehole 3. The BIA states that the recorded levels are unlikely to be representative of the pore pressures in the surrounding ground, which may not have reached equilibrium. Temporary dewatering may be required during construction and this is briefly discussed in the BIA. It is considered prudent for further groundwater monitoring to be undertaken to ensure dewatering requirements are adequately planned to maintain stability to temporary works. However, the London Clay is classified as unproductive strata and there will be no impact on the wider hydrogeological environment.

4.7. Notwithstanding the groundwater data provided to date, the BIA adopts appropriate design groundwater levels for retaining wall design and the basements will be fully waterproofed in order to provide adequate long-term control of moisture ingress.

4.8. The temporary works propping and sequencing is considered adequate to demonstrate that stability can feasibly maintained during the works, assuming good workmanship. Transitional underpins are recommended for neighbouring properties, to be agreed under the Party Wall award, as applicable. Typically the depth of foundations will avoid the effects of seasonal shrink swell movements. Recommendations are made to mitigate the risk of shrink swell movements in accordance with best practice.

4.9. A ground movement assessment (GMA) has been undertaken which assesses that damage to neighbours will be within Category 0 (Negligible). The basis of the assessment is generally accepted and considered representative of likely movements / impacts, considering the depth and methodology of the proposed development, and assuming good workmanship. The damage impact assessment indicates Category 0 damage (Negligible) in regards to all the assessments undertaken.

4.10. The BIA presents an outline structural monitoring methodology, including visual condition surveys, measured survey using total station and crack monitoring, if applicable. Frequency of survey, trigger levels and contingency actions are considered appropriate to control construction and keep damage impacts within a maximum of Category 1 (Very Slight). The final scheme should be agreed under the Party Wall Act.

4.11. Hillfield Road is within Critical Drainage Area (Group 3-010) but is not located within a Local Flood Risk Zone. Comments from local residents indicate existing groundwater / surface water issues affect their properties. The Environment Agency indicates that the risk of flooding from surface water at 63 Hillfield Road ranges from 'Very Low' to 'Low'. Hillfield Road was subject to surface water flooding in 2002 but did not flood during the 1975 event. The Environment Agency records indicate that the nearest groundwater flooding incident was recorded 60m west of the site on the north side of Hillside Road and that the proposed development site is not within an area where LBC have recorded properties as having been affected by historical groundwater flooding. The site investigation also confirms there is very low risk of groundwater flooding, due to the

underlying London Clay. Notwithstanding this, flood resistance measures to protect the basement from local surface water flooding are discussed within the BIA in addition to mitigation measures to protect against sewer surcharging, which are considered appropriate.

4.12. The proposed scheme will increase the proportion of hardstanding at the site. In the original BIA, SUDS options were discussed and recommended but none were proposed. In the revised submissions, a SUDS assessment is proposed to attenuate peak flows in accordance with best practice. The development will have no impact to the wider hydrological environment. A final drainage design and off-site disposal flow rate should be agreed with LBC and Thames Water.

4.13. Providing works are undertaken in accordance with Arboriculture Impact Assessment, and root protection measures are employed, the proposed development should not significantly impact tress on site or adjacent to the site.

4.14. Non-technical summaries are provided.

4.15. Queries and matters that required further clarification are summarised in Appendix 2. These matters have now resolved.

5.0 CONCLUSIONS

5.1. The qualifications of the authors are in accordance with LBC requirements.

5.2. A desk study has been presented, broadly in accordance with aspects recommended by LBC guidance.

5.3. A site investigation has confirmed the underlying ground conditions to comprise Made Ground over the London Clay. There will be no impact to the wider hydrogeological environment.

5.4. Appropriate interpretative geotechnical information is presented.

5.5. Sufficient temporary works sequencing and propping information is provided to demonstrate the feasibility of the scheme. Transitional underpins are recommended for neighbouring properties, to be agreed under the Party Wall award, as applicable.

5.6. A ground movement assessment (GMA) has been undertaken which assesses that damage to neighbours will be within Category 0 (Negligible), assuming good workmanship.

5.7. An outline structural movement monitoring strategy is presented which is considered appropriate to control construction and keep damage impacts within a maximum of Category 1 (Very Slight).

5.8. It is accepted that the site is at low risk of flooding. Appropriate flood mitigation measures are proposed.

5.9. The site is within a Critical Drainage Area. A SUDS assessment is proposed to attenuate peak flows in accordance with best practice, which should be agreed with LBC and Thames Water. The development will have no impact to the wider hydrological environment.

5.10. An outline for structural monitoring is presented, which is to be agreed under the Party Wall Act.

5.11. Queries and matters that required further clarification are discussed in Section 4 and summarised in Appendix 2. Considering the revised submissions, the BIA meets the requirements of CPG Basements.

Appendix 1: Residents' Consultation Comments

Residents' Consultation Comments

Surname	Address	Date	Issue raised	Response
N/A	Director of 59 Achilles Road (Freehold) Ltd	23/8/17	The potential structural threat to surrounding buildings.	5.4 to 5.7
Ryde	33 Achilles Road	30/8/17	Concerns about flooding at the site.	5.8, 5.9
Molteni	55 Achilles Road	31/8/17	Achilles Road already suffers from very poor drains and drainage, and frequent flooding. Concerns that such a construction will very likely disturb the delicate water table under the surface of that end of Achilles Road, that has already caused frequent problems to at least 55 Achilles Road and to 57 Achilles Road, in the form of flooding. A new building can only potentially further damage the infrastructure and the nearby buildings already affected by the water table, as well as cause pollution of the underlying waters.	5.8, 5.9
Pedder	49 Achilles Road	31/8/17	Concerns about flooding and impact on drainage.	5.8, 5.9
42 Residents	Achilles Road Residents Group	1/9/17	Concerns about subsidence, flooding, groundwater levels.	5.4 to 5.9
Beech	22 Achilles Road	2/9/17	Deep excavations (3m+) and/or the digging out of basements in existing, or adjacent to, existing Victorian terraced houses is not appropriate due to the very shallow foundations of buildings 130 years old. Achilles Road has very poor drains and surface drainage. The natural slope from NW to SE on Achilles Road leads to surface water run-off down the road towards Agamemnon Road and the localised flooding of any basement development is a real possibility. Thames Water's infrastructure has failed three times in the last 18 months in Achilles Road and needed extensive short-term repairs, and this construction can only potentially further damage this infrastructure.	5.4 to 5.9
Boole	43 Achilles Road	3/9/17	Concerns about the effect on the structural stability of adjacent properties and drainage.	5.4 to 5.9
Jones	27 Achilles Road	3/9/17	Concerns about increase of flooding if basement excavation goes ahead. Basement at 27 Achilles Road regularly floods as does the basement at 57 Achilles Road (adjacent to proposed development). Concerns about structural	5.4 to 5.9

Surname	Address	Date	Issue raised	Response
			threat to other properties. Concerns about increase in hardstanding impacting drainage.	
Jackson	Fortune Green and West Hampstead Neighbourhood Development Forum	4/9/17	Increase in hardstanding is incompatible with SUDS. Concerns about the effect on the structural stability of adjacent properties. West Hampstead has been identified as being subject to localised flooding from surface water due to local soil conditions and topography and there have been a large number of streets in the Area that have been subject to surface water flooding in the past.	5.8, 5.9
Dexter	57 Achilles Road	6/9/17	The resident states that a District Surveyor from the Metropolitan Borough of Hampstead stated that the reason for the gap in the terrace between 57 and 59 was because the soil was too unstable to be built on because two river tributaries flow beneath it. The flank wall of 57 Achilles Road is reportedly always damp and the small basement has flooded seriously twice, and three times with just minor trickles. There are two pumps. One very large internal pump works with the tanking, while an external pump takes away the external rising water which breaks through the concrete just below the basement door.	5.8, 5.9
Johnson	Flat 3, 59 Achilles Road	6/9/17	Concerns about structural threat to other properties.	5.4 to 5.7
Ryde	59 Achilles Road	6/9/17	Concerns about structural threat to other properties.	5.4 to 5.7

Appendix 2: Audit Query Tracker

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Audit Query Tracker

Query No	Subject	Query	Status/Response	Date closed out
1	Desk Study	Identify underground infrastructure within proposed development's zone of influence	Note only: to be checked during detailed design and liaison with asset owners to be undertaken, as required.	N/A
2	Desk Study	Outline construction programme to be provided.	Closed – outline durations provided	December 2017
3	Stability	Preliminary construction sequences to be provided.	Closed – Engineering Method Statement provided.	December 2017
4	Stability	Ground Movement Assessment and Damage Assessment for all structures within the zone of influence.	Closed – Revised BIA and supporting letter	December 2017
5	Surface Water Flow	Attenuation SUDS assessment and outline drainage strategy to be provided.	Closed – SUDS assessment provided	May 2018

Appendix 3: Supplementary Supporting Documents

Email to CampbellReith dated 10th December 2017 from Gabriel GeoConsulting Limited

Letter to Green Structural Engineering Ltd dated 8th December 2017 from Gabriel GeoConsulting Limited

RE: 12466-96 63 Hillfield Road

Keith Gabriel to: 'Geoff Green', 'GrahamKite@campbellreith.com' 10/12/2017 14:55

Cc: "Michael Schienke", "Julija Sokolenko" , "'Frank Rodrigues'" , "'camdenaudit@campbellreith.com'"

From: "Keith Gabriel" <keithg@gabrielgeo.co.uk>

To: "'Geoff Green'" <Geoff.Green@gseltd.co.uk>, "'GrahamKite@campbellreith.com'" <GrahamKite@campbellreith.com>

Cc: "Michael Schienke" <michael@vorbild.co.uk>, "Julija Sokolenko" <Julija.Sokolenko@gseltd.co.uk>, "'Frank Rodrigues'" <frankrodrigues@btinternet.com>, "'camdenaudit@campbellreith.com'" <camdenaudit@campbellreith.com>

Geoff, Graham

In response to Graham's first two queries, please find attached a letter which presents the findings of revised PDISP analyses and damage category assessment for the retrofit basement. The changes made to the PDISP analyses (as per the brief comments in blue alongside the original queries below) were:

- The undrained shear strength (cohesion) Cu of the clays at basement formation level has been reduced from 50kPa to 45kPa;
- The bearing pressure on Zone 14 (the only one which previously had a net bearing pressure greater than 100kPa) has been reduced to less than the maximum allowable bearing pressure of 100kPa which was proposed in paragraph 10.4.11 of our BIA (ref: 18630/R3).

The worst case damage category assessment has remained within Category 0.

Best wishes

Keith

Keith Gabriel
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From: Geoff Green [mailto:Geoff.Green@gseltd.co.uk]
Sent: 08 December 2017 13:08
To: 'GrahamKite@campbellreith.com' <GrahamKite@campbellreith.com>
Cc: Keith Gabriel <keithg@gabrielgeo.co.uk>; Michael Schienke <michael@vorbild.co.uk>; Julija Sokolenko <Julija.Sokolenko@gseltd.co.uk>; 'Frank Rodrigues' <frankrodrigues@btinternet.com>; 'camdenaudit@campbellreith.com' <camdenaudit@campbellreith.com>

Subject: 12466-96 63 Hillfield Road

Dear Graham
We received your queries below via Keith Gabriel and would respond as follows.

Hi Keith

FYI we are completing the audit of your BIA. We do have a few questions, mainly in regards to:

- Cu values - the values differ in interpretation from the bearing capacity assessments to the ones used in the PDISP (converting to Eu). - Keith to respond**.** Now aligned, as above.

- Your bearing capacity assessments seem reasonable, however as you note 25mm settlement along party walls will be a problem. The SE's loads are significantly higher than your capacities (depending on your foundation dimension),which would suggest settlement will only become higher. - Keith to respond**.** All net bearing pressures calculated for the PDISP analyses using GSE's load takedown for the retrofit basement are now below the 100kPa recommended maximum.

- The SE's temporary work scheme needs a bit more detailing, and understanding how that ties in with your PDISP would be useful (I know you have described stages, but not sure if the SE's information is coordinated). - please see updated BIA attached.

- You mention that SUDS should be assessed. Agreed, and that assessment needs to go into the BIA. - Keith in discussions with client about getting this done however would prefer it to be a reserved matter to be dealt with in detailed design stage if possible.

- Outline construction programme should be provided. - For the new build development the build time will be approximately 12 weeks for the basement and 16 weeks for the superstructure to complete phase 1 structural works. Phase 2 fit out would be additional time but the programme for this is unknown.

We are preparing the report for issue to LBC but thought some discussion in advance may be helpful. I am out of the office today, but around tomorrow if convenient.

Regards

Graham Kite

Any further queries please let me know.

Kind regards
Geoff Green
Managing Director

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Mr Geoff Green
Green Structural Engineering Ltd
Unit 5
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SW6 2UZ

8th December 2017

Our Ref: 18630/LR1

Dear Geoff,

63 Hillfield Road, West Hampstead, NW6 1QB –
Basement Impact Assessment - Report 18630/R3

As requested by Campbell Reith we have revised the PDISP analyses for the retrofit basement beneath No.63 as follows:

- Reduced the undrained shear strength (cohesion) Cu of the clays at basement formation level from 50kPa to 45kPa;
- Reduced the bearing pressure on Zone 14 (which supports the pier between the windows in the front lightwell) to less than the maximum allowable bearing pressure of 100kPa which was proposed in paragraph 10.4.11 of our BIA (ref: 18630/R3); this was achieved by increasing the width of the Zone 14 from 0.35m to 0.55m, with associated slight reduction to the area of the central basement slab (Zones 12 & 13).

The revised stress changes for Zone 14 were as given in Table 3a; no changes were applicable to Zones 12 and 13 because the floor slab remains subject only to a uniformly distributed pressure change.

Table 3a: Changes in vertical stress for PDISP Zones

ZONE	Net change in vertical pressure (kPa)		
#	Stage 1	Stage 2	Stages 3 and 4
14	96.44	96.44	96.44

The revised soil parameters are given in Table 4a below, and the revised PDISP figures are presented on the attached Figures G1a and G4a to G7a (Figures G2 and G3 have not changed, but are included here for convenience). The revised summary of predicted displacements is in presented in Table 5a below.

Continued…

Table 4a: Soil parameters for PDISP analyses				
Strata	**Level** (m bgl)	**Undrained Shear Strength,** Cu (kPa)	**Short-term, undrained Young's Modulus,** Eu (MPa)	**Long-term, drained Young's Modulus,** E' (MPa)
London Clay	3.0 16.0	45.0 143.0	22.5 71.5	13.5 42.9
Where: Undrained shear strength, Cu assumed as Cu = 45 + 7.5z kPa where z = depth below the top of the stratum (3.0m bgl) Undrained Young's Modulus, Eu = 500 * Cu Drained Young's Modulus, E' = 0.6 Eu				

Table 5a: Summary of predicted displacements				
Location	**Stage 1** **(Figure D4)**	**Stage 2** **(Figure D5)**	**Stage 3** **(Figure D6)**	**Stage 4** **(Figure D7)**
Front lightwell	0 - 2 mm Settlement	2mm Settlement to 0.5mm Heave	2mm Settlement to 0.5mm Heave	3.5mm Settlement to 1.5mm Heave
Front wall of basement (incl. column)	1 - 5mm Settlement	1 - 4mm Settlement	0.5 - 4mm Settlement	1.5 - 7.5mm Settlement
61/63 party wall	1.5 - 4mm Settlement	0 - 4mm Settlement	1 - 4mm Settlement	1 - 6mm Settlement
Rear lightwell	0.5 - 3mm Settlement	0.5 - 2.5mm Settlement	0.5 - 2.5mm Settlement	1 - 4.5mm Settlement
Rear wall of basement	1 - 5mm Settlement	1 - 4mm Settlement	1 - 5mm Settlement	1 - 7.5mm Settlement
63/65 party wall	2 - 5mm Settlement	1 - 4mm Settlement	1 - 5mm Settlement	2.5 – 7.5mm Settlement
Internal columns	2mm Settlement	1mm Settlement to 1.0mm Heave	0 - 1mm Settlement	2mm Settlement to 0.5mm Heave
Central basement slab	1.5 - 3mm Settlement (No slab present)	2mm Settlement to 1mm Heave (No slab present)	3mm Settlement to 1mm Heave	4mm Settlement to 1mm Heave

The damage category assessment for the rear wall of No.65 has been reviewed in light of these revised PDISP analyses (previously presented in paragraphs 10.7.3 to 10.7.9 of the BIA report 18630/R3). The horizontal strain would remain unchanged at $\varepsilon_h = 2.5 \times 10^{-4}$ (0.025%).

The maximum settlement predicted by the PDISP analysis alongside the basement, beneath No.65's rear wall, has remained at 2-2.5mm in Stage 3 and increased to 3.5-4.5mm in Stage 4 (with maximum settlement at the centre of the PDISP zone also increasing by 0.5mm to 7.5mm). The differential between these values (1.5-2mm, also increased by 0.5mm) gives the long-term plastic deformation, which must be combined with the settlement caused by relaxation of the ground alongside the basement in response to excavation of the underpins, which can be estimated using the settlement profile for the worst case (low stiffness) scenario presented in Figure 2.11(b) of CIRIA Report C580. The latter is 0.35% of the excavation depth, which for a 1.0m excavation depth gives a predicted settlement of 3.5mm; that increases to 5.0-5.5mm when combined with the PDISP-predicted 1.5-2mm long-term displacement differential. The maximum predicted deflection, Δ can then be obtained from CIRIA's settlement profiles chart (op cit). For the worst case scenario Δ = 17% of the maximum settlement, hence the maximum Δ = 5.5 x 0.17 = 0.94mm, which represents a deflection ratio, $\Delta/L = 2.35 \times 10^{-4}$ (0.024%).

Using the graphs for L/H = 0.5 as before, these deformations represent a damage category which remains well within the 'negligible' Burland Category 0 (ε_{lim} = <0.05%) as given in CIRIA SP200, Table 3.1, and illustrated in Figure 12a below.

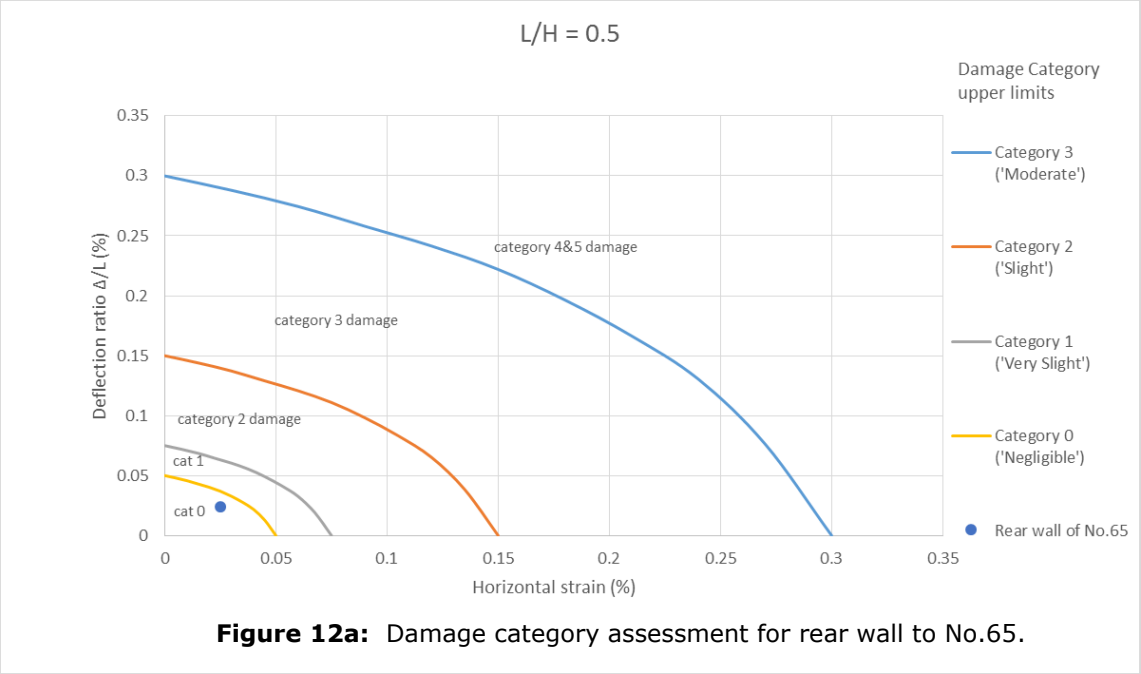

Figure 12a: Damage category assessment for rear wall to No.65.

We trust that this will resolve Campbell Reith's first two queries regarding the submitted BIA.

Yours sincerely

Keith Gabriel
UK Registered Ground Engineering Adviser
for and on behalf of **Gabriel GeoConsulting Ltd**
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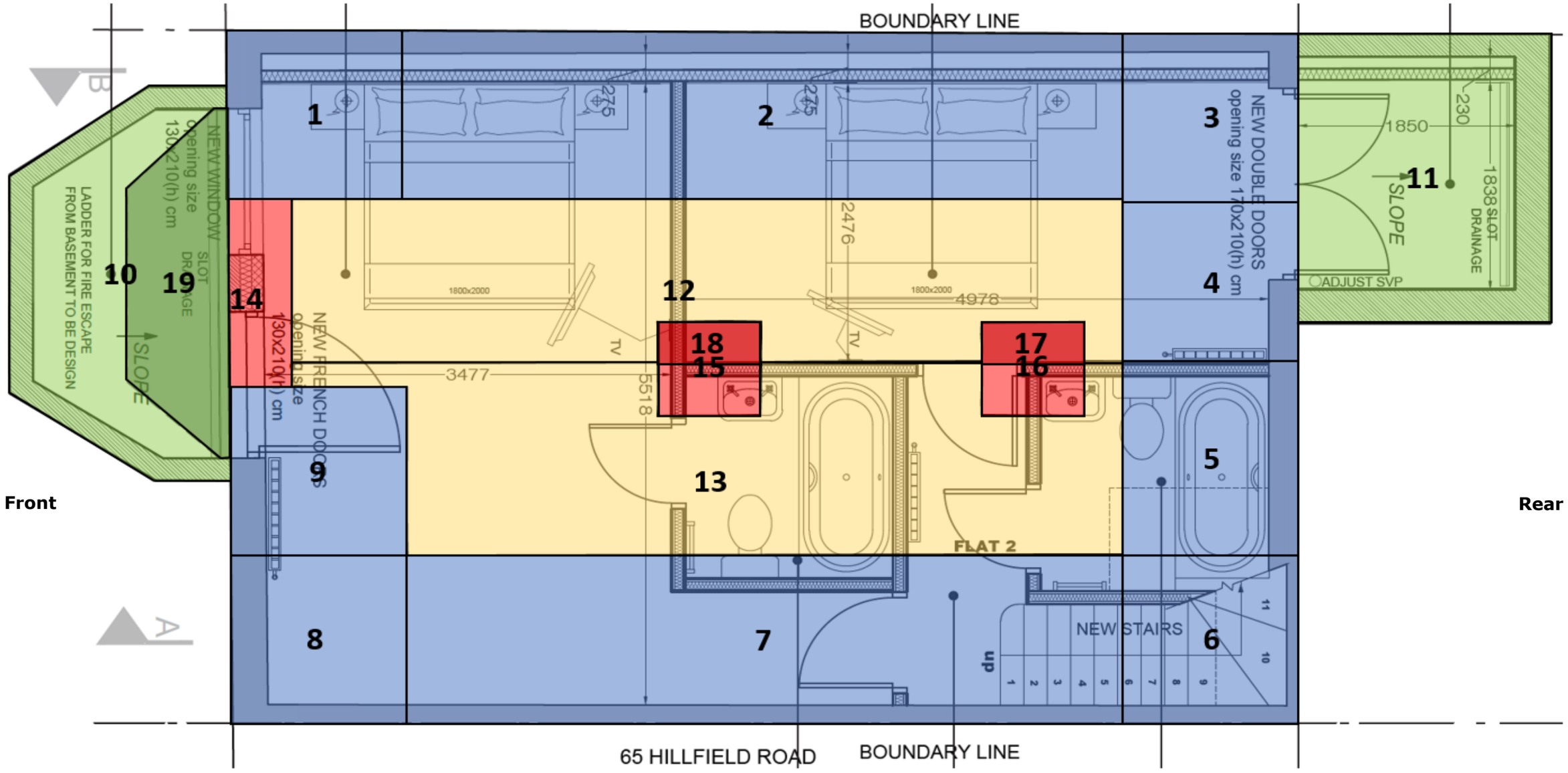
encs: PDISP Figures



Notes:

1. Zones 1-9 (pale blue) are underpins to the existing party walls and front/rear walls.
2. Zones 10 & 11 (pale green) represent the excavations for the proposed front and rear lightwells, which include the retaining walls and slab.
3. Zones 12 & 13 (pale yellow) represent the excavations for the central basement slab, within the underpin bases.
4. Zones 14-16 (pale red) represent the excavations for the proposed columns.
5. Zones 17 & 18 (dark red) are superimposed zones which allow for the increased excavation depth where the existing ground level steps up.
6. Zone 19 (dark green) is a superimposed zone which allows for the reduced excavation and pre-existing stresses from the existing bay/lightwell.

Plan taken from Vorbild Architecture's 'Proposed Basement Plan' (Drg No. A-(13)-011).

Revision 1: Width of Zone 14 increased from 0.35m to 0.55m.

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**Layout of Zones used for PDISP Analyses**			Figure:	**G1a**
18630		Date:	October 2017	Checked: RM	Approved: KRG	Scale :	NTS

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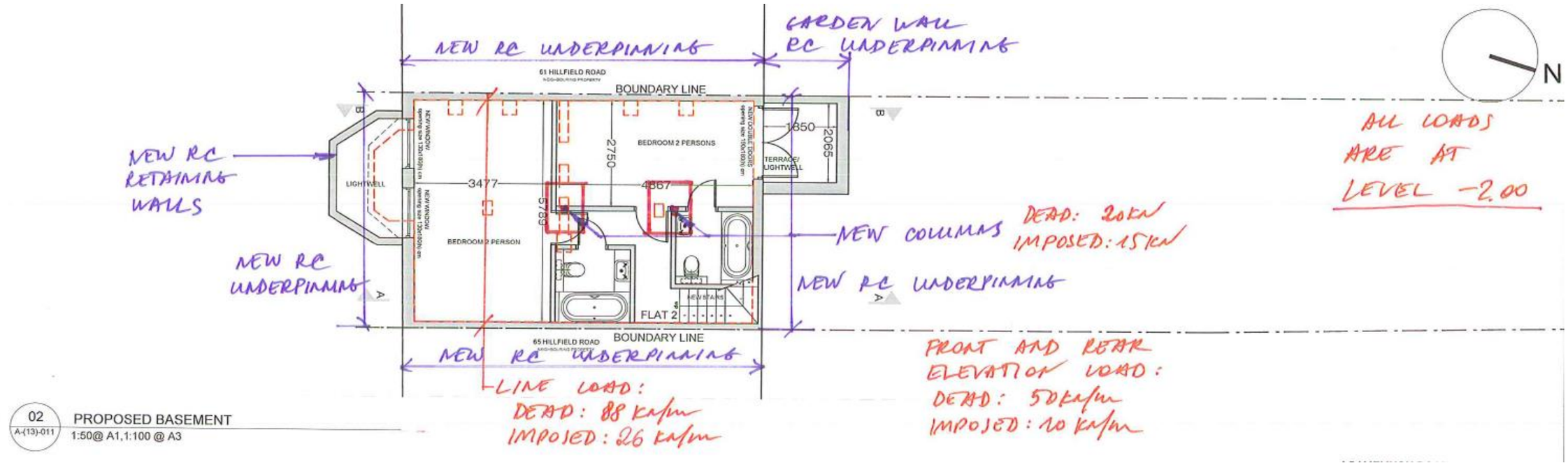

02 A-(13)-011 PROPOSED BASEMENT
1:50@ A1,1:100 @ A3

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**Load Takedown by Green Structural Engineering**			Figure:	**G2**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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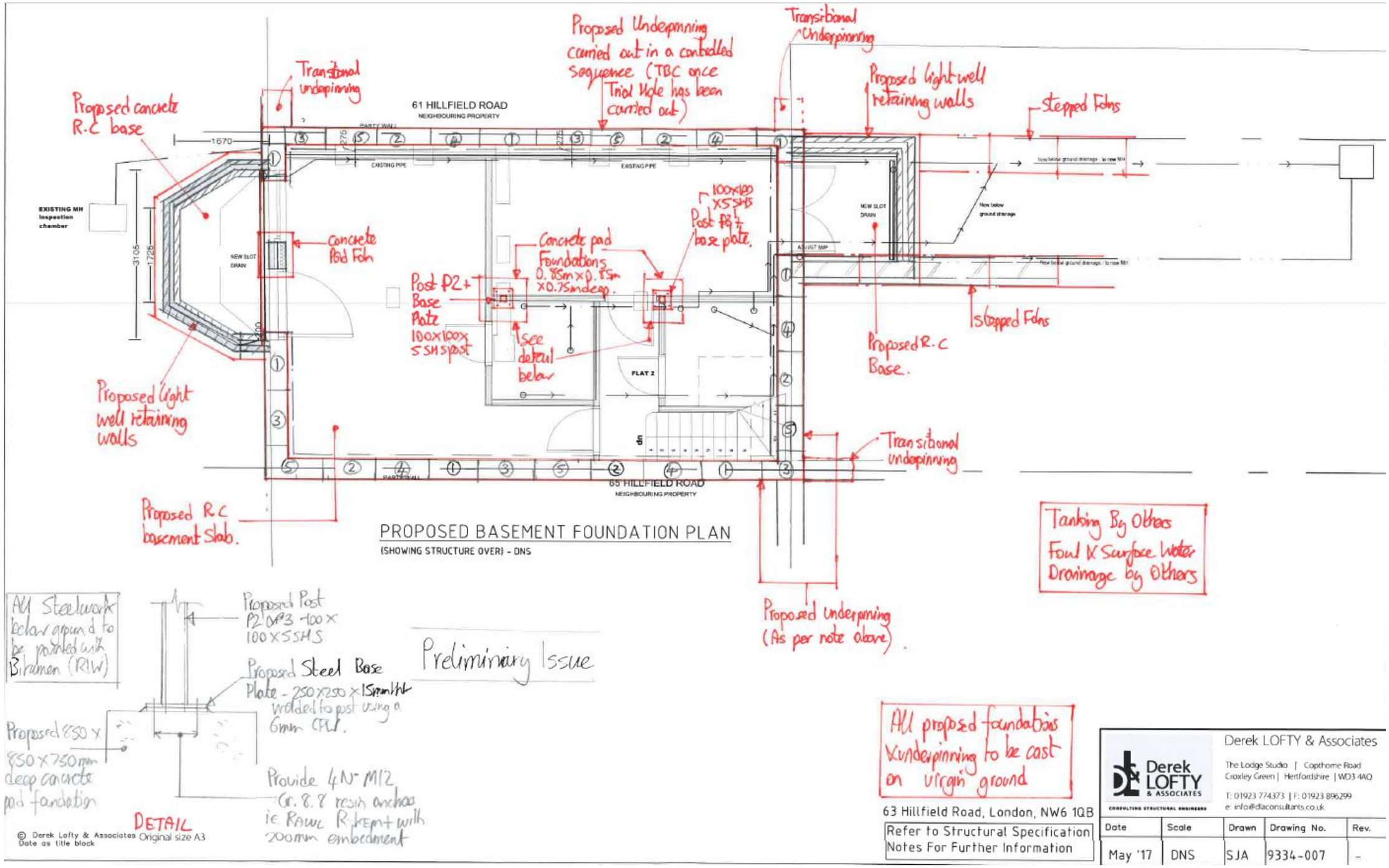

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**Proposed Basement Structure by Derek LOFTY & Associates**			Figure:	**G3**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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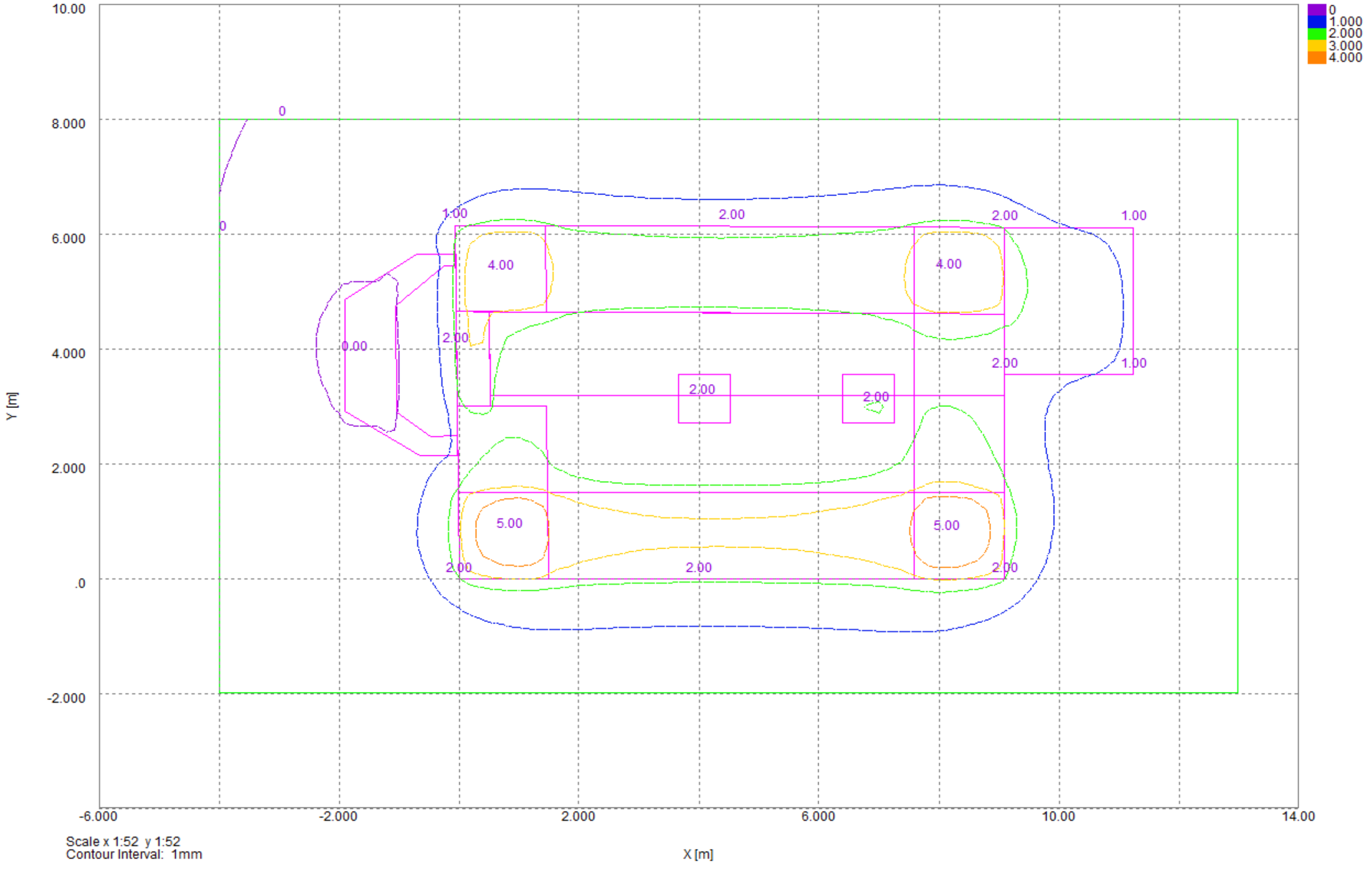
Settlement Contours : Grid 1 at -3.3000m



Scale x 1:52 y 1:52
Contour Interval: 1mm

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**PDISP Output - Contour Plot for Stage 1**			Figure:	**G4a**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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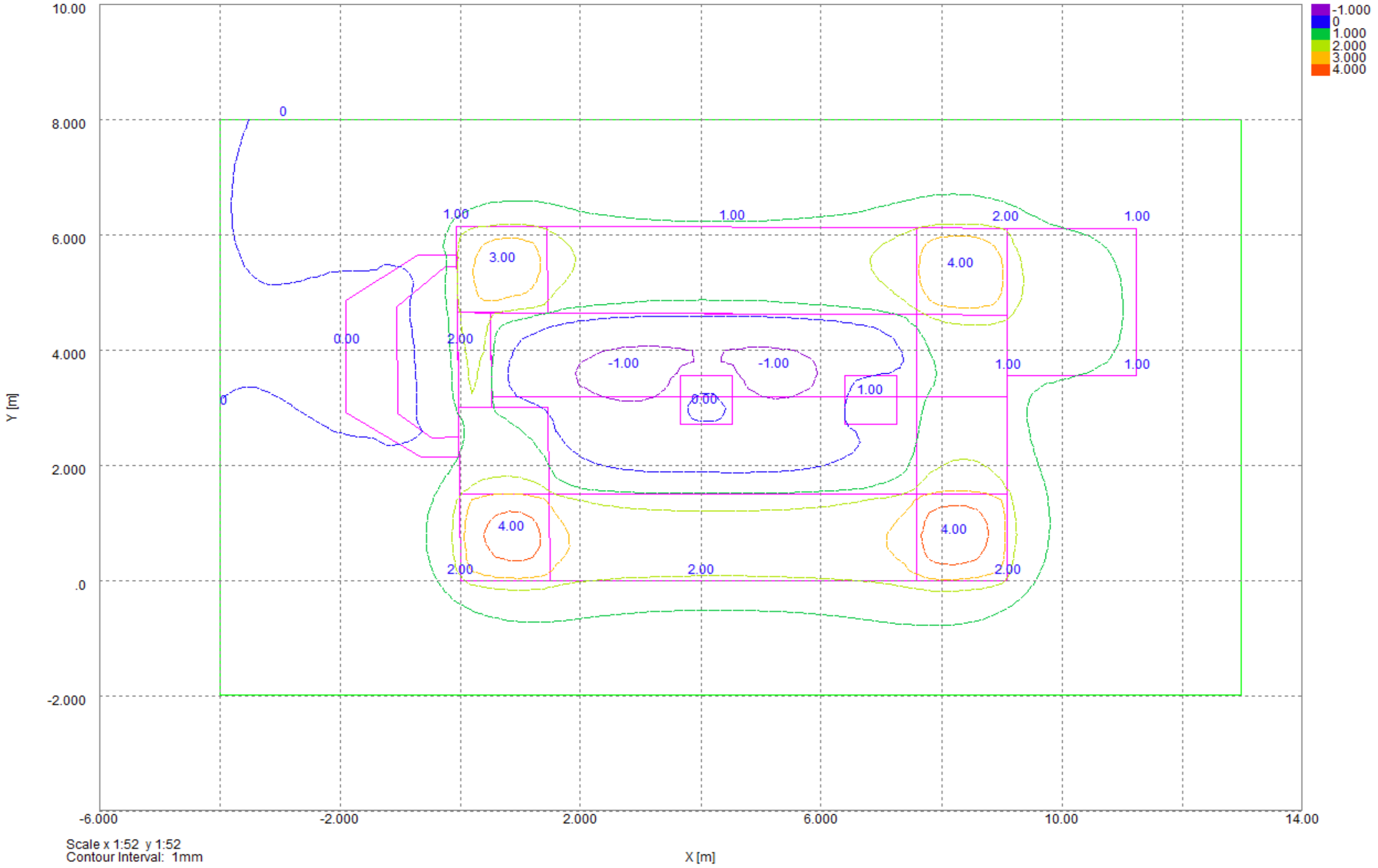
Settlement Contours : Grid 1 at -3.3000m



Scale x 1:52 y 1:52
Contour Interval: 1mm

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**PDISP Output - Contour Plot for Stage 2**			Figure:	**G5a**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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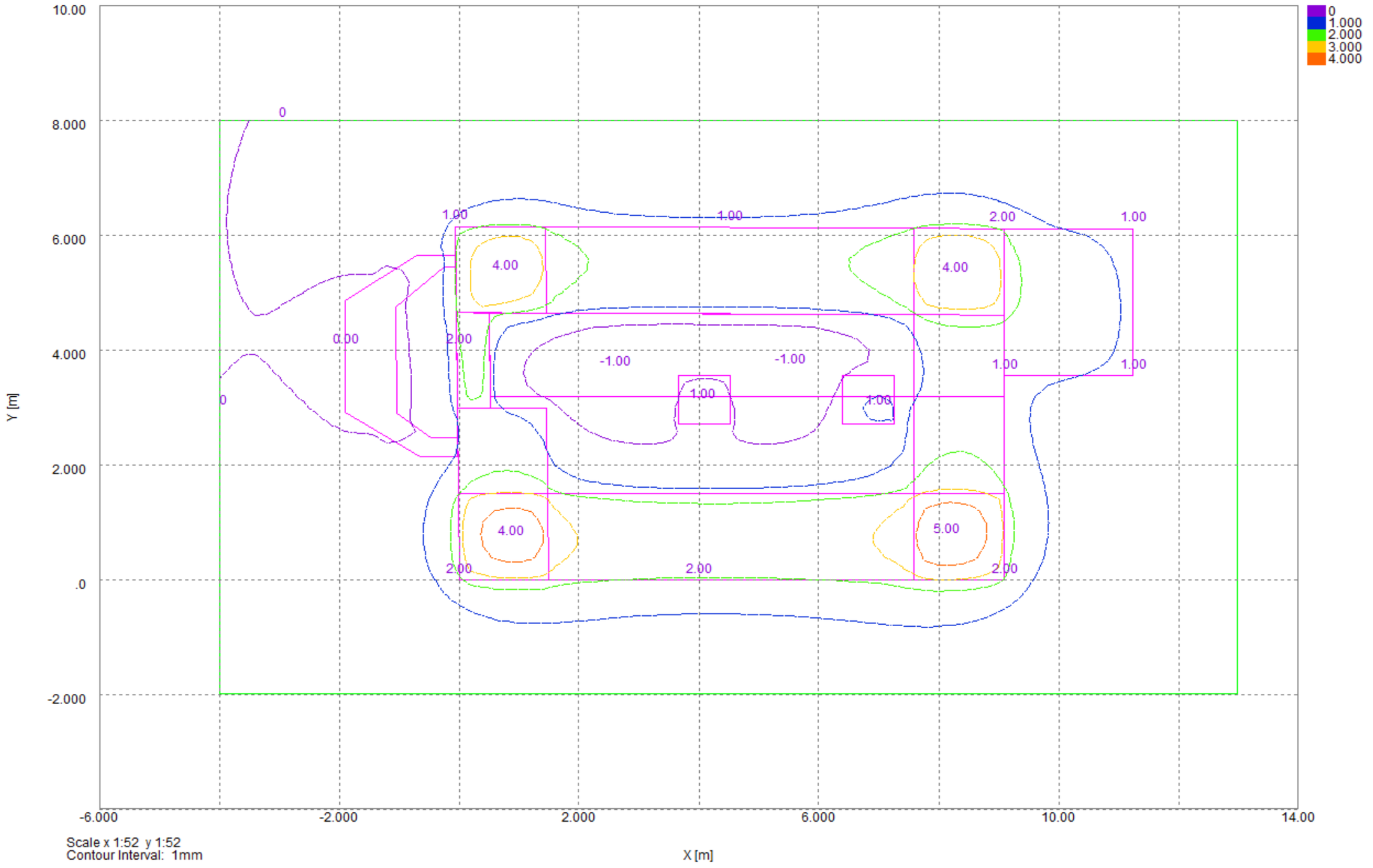
Settlement Contours : Grid 1 at -3.3000m



Scale x 1:52 y 1:52
Contour Interval: 1mm

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**PDISP Output - Contour Plot for Stage 3**			Figure:	**G6a**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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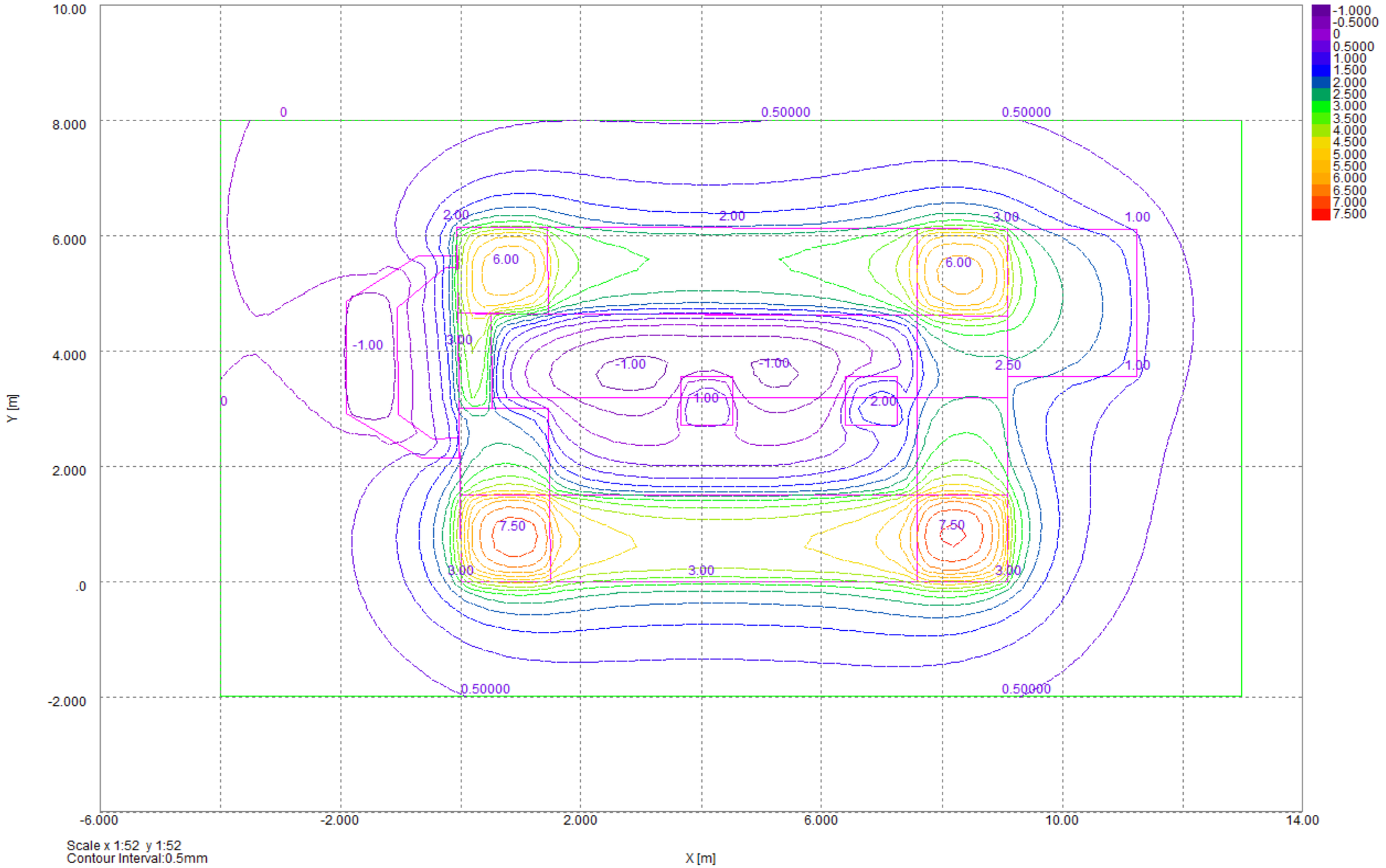
Settlement Contours : Grid 1 at -3.3000m



Scale x 1:52 y 1:52
Contour Interval:0.5mm

Project:	**63 Hillfield Road, London, NW6 1QB**	Title:	**PDISP Output - Contour Plot for Stage 4**			Figure:	**G7a**
18630		Date:	October 2017	Checked:	RM	Approved: KRG	Scale : NTS

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