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BASEMENT IMPACT ASSESSMENT ADDENDUM_2

20A FERNCROFT AVENUE

LONDON

NW3 7PH

CLIENT: Mr Elliot Graff
20A Ferncroft Avenue
London, NW3 7PH

JOB NO: P19-461

DATE: 9th April 2020 – Rev 0

Revision History

Revision	Date	Author	Checked	Notes

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EXECUTIVE SUMMARY

This Addendum 2 to Taylor Whalley Spyra Basement Impact Assessment (BIA) dated 12th December 2019 and Taylor Whalley Spyra BIA Addendum dated 12th March 2020 has been prepared in response to additional comments received from Campbell Reith's Basement Impact Assessment updated Audit Query Tracker by email dated 1st April 2020

The Addendum has been provided to cover the request for further information and clarifications as noted in the Audit Query tracker to cover the following,

Clarification required with respect to excavation depth and nature of basement retaining walls, Retaining wall calculations to be revised to reflect recommendations in Hydrogeological assessment, Building Damage Assessment to be reviewed to ensure consistent with anticipated ground movement and Impact of infiltration tank to be considered

The BIA Addendum concludes that after review of all information requested with the Geotechnical Consulting Group updated Ground Movement Assessment statement, and updated Arboricultural Impact Assessment, confirmation of damage to adjoining properties is still Category 1 (Very Slight) in accordance with the Burland Scale and confirming the proposed works are unlikely to have any significant impact on the local hydrogeology and on the surrounding properties.

1.0 INTRODUCTION

1.1 This Addendum to Basement Impact Assessment has been prepared by Simpson Associates as part of the Planning process (ref 2019/6220/P) and in response to Campbell Reith's Basement Impact Assessment updated Audit Query Tracker by email dated 1st April 2020.

1.2 The information contained within this Basement Impact Assessment Addendum is prepared in accordance with London Borough of Camden's Local Plan 2017, Camden Local Planning Policy A5 Basements, Camden Planning Guidance Basements March 2018, London Borough of Camden SFRA URS July 2014 and London Borough of Camden, Camden Geological, Hydrogeological and Hydrological Study.

1.3 The BIA report is authored by Chris Martin who is qualified as MEng, CEng, MIStructE. The attached GCG Hydrogeological Assessment is reviewed by J. A. Davis who is qualified as EuroGeol, CGeol, BSC, MSc, DIC, FGS The GCG Ground Movement Impact Assessment is authored by Dr Apollonia Gasparre who is qualified as Dott Ing, PhD, DIC, CEng, MICE.

1.4 The purpose of this Addendum 2 is to provide additional clarification and further information as noted in Campbell Reith's Basement Impact Assessment Audit Query Tracker items 1 to 4.

1.5 Geotechnical Consulting Group (GCG) has reviewed Campbell Reith's Basement Impact Assessment Audit Query Tracker and has provided the Ground Movement Assessment Statement to provide additional information and clarify relevant points raised.

1.6 Ashley Tree Surveys have updated their Arboricultural Impact Assessment Dated November 2019 (updated April 2020) to confirm the tree T1 to be removed is a minor tree and its removal is not expected to impact water levels in the surrounding soil.

1.7 Simpson have provide a statement confirming the retaining walls are designed for water at 1m below ground level and the effect of this on the calculations issued with Addendum 1 which remain unchained except for the shear resistance.

2.0 CAMPBELL REITH BASEMENT IMPACT ASSESSMENT AUDIT QUERY TRACKER REF NUMBERS:

1. Clarification required with respect to excavation depth and nature of basement retaining walls,

2. Retaining wall calculations to be revised to reflect recommendations in Hydrogeological assessment,

3. Building Damage Assessment to be reviewed to ensure consistent with anticipated ground movement

4. Impact of infiltration tank to be considered

3.0 RESPONSE TO ADDITIONAL INFORMATION REQUESTED BY CAMPBELLREITH BASEMENT IMPACT ASSESSMENT AUDIT

3.1 Item 1
All retaining walls are to be RC reference to MC in the BIA is in error.

3.2 Item 2
The retaining wall calculations are based on a design for a higher water level with the ground water level set 1m below top of retained ground level (refer to Appendix C).

3.3 Item 3
GCG have reviewed the updated Arboricultural impact Assessment which confirms the statement about impact of the trees in the building damage assessment (refer to Appendix A & B).

3.4 Item 4
Ashley Tree Surveys have updated their Arboricultural Impact Assessment Dated November 2019 (updated April 2020) to confirm Tree T1 to be removed current water demand is low due to the poor condition of the tree and its restricted location and removal would have a small effect on the ground and nearby structures (refer to Appendix B).

3.5 Item 5
The SUDs tank is an infiltration tank with initial storage capacity and is noted within the hydrogeological report as part of the SUDS system.

3.6 Items at bottom of Audit Query Tracker (Clarification of GMA)
Geotechnical Consulting Group (GCG) has reviewed these comments and provided the Ground Movement Assessment Statement (refer to Appendix A).

4.0 CONCLUSIONS

4.1 Geotechnical Consulting Group (GCG) have reviewed the additional information within the Addendum 2 Basement Impact Assessment and provided covering email and updated Ground Movement Assessment Statement (refer to Appendix A).

4.2 Ashley Tree Surveys have updated their Arboricultural Impact Assessment Dated November 2019 (updated April 2020) and confirm the removal of the tree will not have any undue effect on adjacent building foundations in the short or long term.

4.3 Simpson have reviewed the retaining wall calculation and provide additional statement for increased ground water level and the effect on the RC retaining walls design calculations output (refer to Appendix C).

4.4 Analysis of the various aspects of construction has been undertaken to demonstrate how the level of sequencing will enable the development to be constructed safely with ground movements within acceptable levels.

4.5 The project as currently envisaged is feasible in terms of the general construction process, structural stability, long term integrity of adjacent buildings and the existing site and surrounding infrastructure.

For and on behalf of

SIMPSON ASSOCIATES

CHRIS MARTIN
MEng, CEng, MIStruct

For and on behalf of

SIMPSON ASSOCIATES

GRAHAM BOSTON

Appendix A

Geotechnical Consulting Group Ground Movement Impact Assessment Clarification Statement Dated 6th April 2020 and Email

20A Ferncroft Avenue Date: 6th April 2020

Clarification of GMA
What settlement assumed?
Section 6.1 indicates 5mm due to underpinning (but section 5.2.1 suggests up to 10mm?)
Section 5.2.1 suggests 1-2mm due to load transfer
Section 5.2.2 suggests 2-3mm due to excavation (max at 1.5-2m behind wall due to ground sagging)
Is this cumulative? How distortion calculated? Do these different causes of settlement cause any sagging/hogging in walls?
What is impact of horizontal movement described in 5.2.2?
Are there any internal walls to consider in No 20 Ferncroft Ave?

In Section 5.2.1 settlements due to underpinning are estimated using linear elastic analyses and experience. The linear elastic analyses show that the settlements due to load transfer are estimated to be 1-2mm. Such movements are negligible , given the conservative nature of this type of analysis. The main source of movements would be due to the construction of the underpinning, which could be 5-10mm. However, as stated in paragraph 8 of section 5.2.1: *"Considering the depth of the proposed underpinning at 20a Ferncroft Avenue and assuming that the works will be carried out with good workmanship and in the dry, the expected settlements could be limited to 5mm"*. This is consistent with the statement in Section 6.1. Section 5.2.1 also includes further discussion on additional movements that could be caused by dewatering, should this be found necessary and should no ground treatment be adopted. The conclusion is that movements would be controlled to be less than 10mm. The assumed 5mm in Section 6.1. are still consistent with this statement.

The pattern of ground movements due to excavation is clearly explained in Section 5.2.2 and shown in Figures 9 and 10, which are referenced in Section 5.2.2. The distortions across the neighbouring houses due to these movements are clearly explained in Section 6.1 : *The potential damage to these structures can be estimated as suggested in CIRIA C760 by looking at the combined effects of the horizontal strains and the deflection ratio, which is the ratio between the maximum distortion of a structure and its length*. The horizontal strains and the distortions across each of the neighbouring houses are then calculated individually. Both the horizontal and the vertical movements described in Section 5.2.2 are considered to estimate horizontal strains and distortions across the houses.

Following CIRIA C760 the strains and distortions are estimated using the total width of the neighbouring houses ignoring their internal walls. This is more conservative than assuming strains and distortions between internal walls.

It should be noted that the movements due to underpinning are limited to settlements of the underpinned walls only (paragraph 7 of 5.2.1), hence these movements do not cumulate to the pattern of movements due to excavation. As stated in Section 6.1. these movements due to underpinning "*could cause cracks to develop at the junctions of this wall*".

Graham Boston

From: Apollonia Gasparre <a.gasparre@gcg.co.uk>
Sent: 06 April 2020 10:26
To: Graham Boston
Cc: Chris Martin; Simon Lane
Subject: Re: 13398-02: 20A Ferncrodt Avenue D1
Attachments: 20A Ferncroft Avenue-reply to auditor 2-GCG.docx

Hi Graham

attached there should be further clarification on the GMA as requested. I have made clear reference to the sections of the report where all answers to the questions are fully explained.

About the infiltration tank, the only further comment to make is : it "will mitigate the current discharge of surface water into the local sewer alleviating the contribution of the site to potential flooding" as stated in section 4.3 of the hydrogeological report.

It seems to me that the arboricultural report confirms the statements about the impact of the trees in the GMA.

I hope this helps .

Regards

Apollonia

_____
From: Graham Boston <Graham.Boston@TWS.UK.COM>
Sent: 03 April 2020 17:35:00
To: Apollonia Gasparre
Cc: Chris Martin; Simon Lane
Subject: FW: 13398-02: 20A Ferncrodt Avenue D1

Hi Apollonia,

Hope you are keeping safe and all is OK,

We have received a few more comments from the audit for clarification.

Could you let me have your comments how best to answer.

The tree report has just been update which I will go through but attach for you info their email and report

Best Regards

GRAHAM BOSTON
Technical Associate

Appendix B

Ashley Tree Surveys Arboricultural Impact Assessment Dated November 2019 (updated April 2020)

Ashley Tree Surveys

BS 5837:2012 Tree Survey
Arboricultural Impact Assessment

Commissioned by Elliot & Anne-Eva Graff

20A Ferncroft Avenue, Hampstead, London, NW3 7PH

November 2019 (Updated April 2020).

Planning Application Checklist	
BS 5837:2012 Tree Survey Tree Constraints Plan (TCP)	✓ ✓
Arboricultural Impact Assessment (AIA)	✓
Tree Protection Plan (TPP) Arboricultural Method Statement (AMS)	✓

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Appendix

1.0 Contact Details

Client:	Mr & Mrs Elliot & Anne-Eva Graff
Architect:	Mr Giles Lovegrove, Coupdeville Architects
Site Details:	20A Ferncroft Avenue, Hampstead, London, NW3 7PH
Date of Site Inspection:	12th November 2019 (Updated 2nd April 2020).
Arboriculturist:	Kate Ashley Dip Arb L4 ABC Tech. Arbor. A. Ashley Tree Surveys email: kateashley8@yahoo.co.uk 07967 013187
Proposal:	Demolition of existing rear extension and basement proposal, plus rear extension.

2.0 Executive Summary

2.1 Four trees were surveyed at 20A Ferncroft Avenue, Hampstead on 12th November 2019. All the trees are located towards the rear of the property and lie in the gardens of 20A and the neighbouring gardens of 20 and 22 Ferncroft Avenue.

2.2 The trees at this site are not protected by any individual Tree Preservation Order. This site lies within the London Borough of Camden Conservation Area.

2.3 The development proposals involve the demolition of the existing rear extension and the creation of a new basement to the property and a new rear extension with a green roof.

2.4 It was observed that there were 3 trees which are close to the intended development, all these 3 trees are Category 'C'. One tree (T1) will require removal and this tree (T1-Cherry), lies in the gardens of 20A Ferncroft Avenue, Hampstead. T1 exhibits poor form and its roots lie within the area intended for the new basement. It is proposed that this tree be removed and for a replacement tree to be planted further from the house.

2.5 T1 Cherry is noted to be a minor tree which is semi-mature and having a reduced vitality and small tree canopy and its removal is not expected to impact water levels in the surrounding soil.

2.6 The other 3 trees will not be affected as demonstrated in the enclosed TCP (Appendix 3). It should be particularly noted that the neighbours Category 'B' multi-stem mature sycamore (T4) which has a canopy extending into the garden, is well away from the construction zone.

3.0 Instruction & Purpose of the Report

3.1 This report was commissioned by Mr & Mrs Elliot and Anne-Eva Graff to assist with the proposed development (describe) at 20A Ferncroft Avenue, Hampstead, London, NW3 7PH. I have been asked to prepare the following surveys and assessments:

3.2 **Tree Condition Survey** - limited to trees that are located on or immediately adjacent to areas where the development is being proposed. The Tree Condition Survey consists of a visit to the site to undertake a detailed inspection of the tree's health and structure to determine their safe useful life expectancy (SULE), and then to categorise them in accordance to *"BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations"*. The results of the tree condition survey are provided in **Appendix 2**

3.3 **Arboricultural Impact Assessment (AIA**) – to include all trees in the gardens of Fairfield, as well as trees in the neighbouring gardens where appropriate. Data from the Tree Condition Survey has been used to prepare a Tree Constraints Plan (TCP)- see **Appendix 3**. The Tree Constraints Plan also shows the impact of this development and the mitigating measures used to assist the proposal, indicating the location of protective fencing

4.0 Scope of the Report – Methodology & Limitations

4.1 The tree survey comprised of a ground-based visual tree inspection only and where a further more detailed or aerial inspection is required this is indicated with the recommendations.

4.2 The report details all trees over 85mm at 1.5m above ground level. Tree stem diameters are measured (or where inaccessible estimated), to the nearest 50mm. For this survey, it was not possible to obtain direct access to all the tree stems so best estimates have been used in these cases.

4.3 Tree heights were measured using a Suunto clinometer, but where it has not been possible to accurately measure, it is estimated to the nearest 1m. Tree canopies have been measured or estimated if access was not possible or un-necessary.

4.4 The position of the trees stems is shown in the submitted Tree Constraints Plan (TCP) – **Appendix 3** - which provides information concerning the condition and quality of the tree stock via colour coding, as well as showing the extent of the Root Protection Areas (RPA's) and also indicates the extent of the tree canopies. The TCP should assist the planning process by demonstrating the impact of the proposals on the existing tree stock.

4.5 The soil type was not assessed during this visit. No tissue samples were taken nor any other internal investigation of the trees were undertaken during this tree survey.

4.6 This is not a Duty of Care Survey and will not assess a tree's safety. If concerns for tree safety exist, necessary further more detailed inspections should be carried out by an arboricultural professional.

5.0 Site Description & Location of Trees at Site

5.1 The survey site is comprised of the rear gardens of 20A Ferncroft Avenue, Hampstead, London NW3 7PH. The house is in a residential street in Hampstead and in the London Borough of Camden.

5.2 The report details all trees over 85mm at 1.5m above ground level. For this survey, it was not possible to obtain direct access to all the tree stems as 2 of the trees were in the gardens of neighbours and so good estimates to the DBH have been provided.

5.3 It was noted that there were a total of 4 trees which have been numbered and with their data recorded in the Tree Condition Survey – See **Appendix 2**
The trees are shown in TCP – **Appendix 3**

5.5 This garden is noted for being fairly narrow however extending to the North and there are some nearby trees which provide useful screening and interest. A valuable tree for the garden is the T2 silver birch which although having a slightly leaning stem, measures 15m and has a good tree canopy.

5.6 The Category 'B' sycamore T4 is also a neighbours tree and this large multi-stem tree has a canopy which extends into the garden by some 4m and an RPA which extends into the garden by some 6.3m. The tree has an extensive canopy but has been subject to regular tree work which now affects its form.

6.0 Tree Quality Assessment

6.1 The table of data in **Appendix 2** along with the Tree Constraints Plan submitted plan show the condition of the trees according *to "BS 5837:2012 Trees in relation to design, demolition and construction – Recommendations".*

4 individual trees on this site have been surveyed for planning purposes & categorized according to BS 5837:2012. It was found that there were:

1 Category 'B' Trees
3 Category ' C' Trees

6.2 **CATEGORY 'B' TREE** (Trees of low medium quality with an estimated remaining life expectancy of at least 20 years **(T4)**

The only medium quality tree in the survey is the mature sycamore at the rear of the garden, this tree is multi-stem and has an extensive canopy but has been subject to tree work in the past. This tree is not located near the construction and will not be impacted.

T4 sycamore – located in neighbours garden with extensive canopy

T4 tree is a large multi-stem mature tree which has been subject to tree work

6.3 **CATEGORY 'C' TREE** (Trees of low quality with an estimated remaining life expectancy of at least 10 years **(T1, T2, T3)**

T1 Cherry with pronounced leaning stem due to proximity to T2 birch

T1 Cherry is positioned close to fence and between 2 garden storage sheds

This Category 'C' cherry (T1) is the owners tree, it suffers from having both a constricted canopy and also from its compromised planting position. The tree is out-competed by the adjacent and dominant T2 silver birch which has an extensive canopy. T1 can be shown to be leaning to the south to gain canopy space. The stem of T1 is also positioned between 2 storage sheds meaning that its planting area and drainage is not ideal. This tree is to be removed and a replacement tree further down the garden is proposed.

T2 Silver birch with extensive canopy – this is the neighbours tree (No. 20 Ferncroft)

T2 Silver birch with slightly leaning stem and additional leader now developing

The above Category 'C' T2 silver birch is the neighbours tree (20 Ferncroft) and this tree was noted to have a slightly leaning form stem until 2m which then straightens. The stem has also developed a new small "leader" which is gaining dominance and is growing a new secondary canopy from this leader. T2 has an extensive canopy and provides good screening, privacy and seasonal interest.

T3 Cherry is a small decorative tree located close to opposite fence – the tree has slight leaning form – leans to north.

7.0 Arboricultural Impact Assessment (AIA)

7.1 The Arboricultural Impact Assessment (AIA) considers how the proposed development is likely to affect the treescape at 20A Ferncroft Avenue, Hampstead, from both an environmental and also an amenity viewpoint

7.2 There are a wide range of construction activities which have the ability to cause some "Potential Development Impact", which can include:

- *Demolition of the existing dwelling and buildings*
- *Construction of the new proposed dwelling and footprints relative to RPA's*
- *Amendments and upgrades to areas of hard-standing (driveways, turning areas)*
- *Installation of services*
- *Landscaping*

7.3 The proposed extension demolition and basement proposal has been designed with efforts taken to ensure the safe retention of the high quality trees on the site, with protective measures being proposed around all the retained trees. The Tree Constraints Plan (TCP) – **Appendix 3** shows the extent of the RPA's of all the trees. Ideally there should be no encroachment into the RPA's of retained trees unless it is unfeasible to avoid. In such instances, specialist ground protection and installation will be adopted.

7.4 Adoption of a Tree Protection Plan (TPP) s critical to ensuring the protection of retained trees. Tree protection measures and fencing, should be retained throughout the entire project. Location of fencing are shown in **Appendix 3** and consists of both permanent fencing.

7.5 The proposed basement will extend further into the garden and will directly affect the T1 Cherry as its canopy and RPA are inside the intended basement area. It was noted however that T1 is lacking in vitality, it has a restricted rooting area and compromised drainage (due to its proximity to garden sheds on either side of its stem) and reduced light levels. It is proposed that this tree be removed and for a replacement tree to be planted further away from the house.

7.6 The impact of tree removal close to the dwellings of 20A Ferncroft and its neighbour 20 Ferncroft , needs to also be considered due to the risk of "heave". The removal of a large tree close to a house can sometimes be problematic as the tree, when it was in place, would have removed water from its surrounding soil. A deciduous tree will need most of its water in the spring and summer as it is growing new leaves, adding extension growth and undertaking photosynthesis. If a large tree is suddenly removed, the soil water will no longer be absorbed by the trees' roots and the soil can start to swell resulting in "heave". In the case of the T1 Cherry however, there is little risk of "heave" as T1 is not a large tree but is a minor semi-mature Cherry. T1 has low vitality, a reduced canopy and appears in decline. It is outcompeted by the dominant T2 Silver Birch which has twice its canopy size and will have far greater water requirement. T1 Cherry by contrast was noted to have a far smaller canopy, which implies less leaves, less growth and therefore less water uptake. Any excess water in the soil as a result of the T1 removal will be immediately utilised by the dominant T2 Birch which appears to be a thriving.

7.7 The T2 Silver Birch is owned by the neighbours of 20 Ferncroft and as demonstrated in **Appendix 3**, there will be no disturbance to its RPA through the demolition, excavation or new basement construction. There is a risk of soil compaction to the RPA of T2, however this is being addressed by the installation of tree protection fencing to fully protect its RPA. T3 and T4 will similarly be set behind tree protection fencing to avoid root damage and soil compaction.

8.0 Tree Protection Plan

8.1 The tree protection fences are designed to be a substantial protective barrier, which once installed will be difficult to move. The fencing guards against impact damage to tree stems and branches of any trees which are being retained, as well as protecting the rooting environment from soil compaction. These measures are to ensure that the soil structure does not become compromised during construction operations. The specification on fencing is provided below.

8.2 It is important that the Tree protection fencing is installed before any construction activity is started and before any materials arrive on-site. Once erected the fencing should not be altered or moved without prior consent from the arborist or by approval from the Local Authority.

8.3 Care should be taken on the site to ensure that no materials, machinery, chemicals or fuel are stored inside CEZ's for the duration of the development. Areas must be allocated for materials storage, minimizing the need for on-site storage by having phased deliveries throughout the project.

8.4 Materials which might contaminate the soil should be carried out 15m away from RPA's, the effect of gradient on the movement of potentially harmful liquid spillages towards RPA's should also be considered. Materials mixing should only take place on a bund with an impermeable membrane on a scraped base to ensure that there is no possibility of materials escaping the bunded area.

9.0 Specifications for protective fencing and signage

BS 5837:2012 states that all *"Barriers should be fit for the purpose of excluding construction activity and should be appropriate to the degree of proximity of work taking place around the retained tree(s)"*

There is a default specification of barriers (Fig1) which is recommended and these are designed to be permanent barriers and positioned as per the TPP. In most instances this takes the form of welded 'Heras' panels, secured onto a scaffolding framework, which is then braced and secured into the ground. The panels should should be difficult to move and should form permanent rigid structures. Should site conditions mean this default fencing is impossible to install, then an alterative fencing can be suggested by the retained arboriculturist, to be approved by the local planning authority.

The protective fencing should also be accompanied by clear all-weather signage fixed securely to the barriers, examples of which are shown in Fig 2.

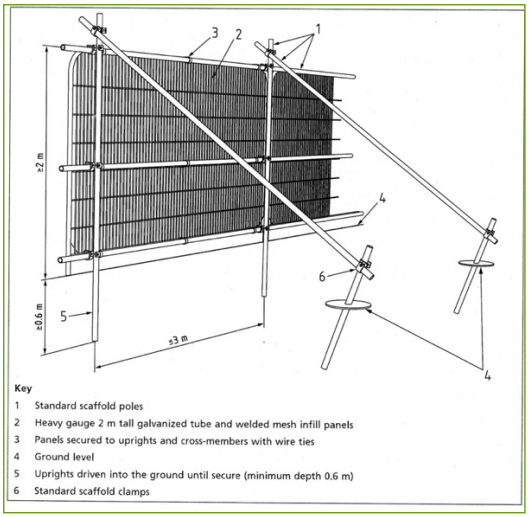

Fig 1 Shows the default specification of protective barriers (taken from BS 5837)

Fig 2 Shows examples of the all-weather signage to be attached to protective barriers.

10.0 Legal Constraints

10.1 There are no trees at this site which are are subject to specific statutory controls

10.2 The trees in the survey site are not protected by any individual Tree Preservation Orders however site lies in the London Borough of Camden Conservation Area.

10.3 Statutory Wildlife Obligations: The Wildlife & Countryside Act 1981 (Amended) provides statutory protection to birds, bats and other species that inhabit trees. All tree work operations are covered by these provisions and advice from an ecologist should be obtained before undertaking any works that might constitute an offence.

11.0 Conclusions

11.1 The survey site is comprised of the rear gardens of 20A Ferncroft Avenue, Hampstead, London NW3 7PH. The house is in a residential street in Hampstead and in the London Borough of Camden.

11.2 4 trees on this site have been surveyed and it was found that there were:
1 Category 'B' Trees - Sycamore
3 Category ' C' Trees – Silver birch, Cherry

11.3 The proposed basement will extend further into the garden and will directly affect the T1 Category 'C' Cherry, its canopy and RPA are inside the intended basement area, T1 was noted to having low vitality and being canopy constricted. This tree is to be removed and replaced with a new tree further away from the house. T1 removal is not expected to impact water levels in the surrounding soil as this is a minor tree with low vitality and its water uptake is likely to be low given its reduced tree canopy.

11.4 There will be no impact on the Category 'B' sycamore at this site and all other retained trees are to be protected with tree protection fencing. This fencing should be installed prior to any work commencing on-site.

APPENDIX

APPENDIX 1 - KEY TO BS 5837 TREE SURVEY DATA

APPENDIX 2 - ARBORICULTURAL TREE SURVEY DATA

APPENDIX 3 - TREE CONSTRAINTS PLAN (TCP) & TP FENCING

APPENDIX 4 - ADDITIONAL TREE IMAGES

APPENDIX 1 – KEY TO BS 5837:2012 TREE SURVEY

T / G	Tree or Group numbers which follow on the enclosed plan
Species	Common name followed by botanical name (Latin) in brackets
DBH:	The Diameter at Breast Height which measures the girth of the stem (in mm) measured at 1.5m from ground level
Height (H):	Approximate height of tree canopy, measured in meters
First Branch (FB):	Approximate height of the first significant branch and its cardinal directional
Canopy Spread (CS):	Approximate Canopy spread measured in metres, shown as compass points N,E,S,W
AGE CLASS:	Y : Young (less than 15 years old and 1/3 fully grown) SM : Semi-mature tree (1/3 to 2/3 full height tree) EM : Early Mature (2/3 to virtually full height tree) M : Mature – fully grown tree LM : Late Mature – fully grown tree possibly with declining vigor OM : Over mature – fully grown tree with declining vigor, but having historical or ecological value VET : Veteran tree, usually very old and having significant biological, cultural or aesthetic value
SULE:	Refers to the remaining **Safe Useful Life Expectancy** and is the estimated number of years the tree will continue to make a safe and useful contribution to its environment. SULE is recorded as <10 years, 10+, 20+ or 40+ years
RPA:	The **Root Protection Area**, the radius measured in metres, and area in metres squared. The RPA of a single tree tree is equal to a circle with a radius of 12 x stem diameter and is used to accurately site specialist protective fencing.

Key to BS Tree Categories:

Category A: High quality trees – with estimated remaining life expectancy of at least 40 years

Category B: Moderate quality trees – with estimated remaining life expectancy of at least 20 years

Category C: Low quality trees – with estimated remaining life expectancy of at least 10 years or stem diameter below 150mm

Category U: Dead or dying trees, (infected by pathogens), or trees which are actively suppressing superior quality

APPENDIX 2 –ARBORICULTURAL TREE SURVEY DATA

(SEE TABLE BELOW)

TREE or Group or Hedge	**Species Common Name** If tree offsite, record estimated measurements using '#'	**DBH at 1.5m** recorded in mm	Canopy **HEIGHT** in metres + **FIRST BRANCH** in m from ground level with cardinal direction	**Branch Spread** **N E S W** Recorded in m	**Age** **Y SM EM M LM OM Vet**	**SULE** **<10 10+ 20+ 40+**	**General Observations**	**Structural Form** **Good Fair Poor Dead**	**Physiological Form** **Good Fair Poor Dead**	**BS 5837 RC** **A B C U**	**BS 5837 RPA Radius** recorded in m and m²	**Recommended Works**
T1	Japanese Flowering Cherry	235	H 8m FB 1.5/N	N 2.2 E 2.0 S 4.0 W 2.0	SM	10+	*5.3m from rear of house* 0.25 from boundary fence Tree with low vitality which has developed pronounced lean, leans heavily to South due to competition from dominant T2 silver birch. New sub-stem developed at 1m to N, included bark observed at union Cherry has restricted rooting area and compromised drainage due to proximity to garden sheds on either side of stem.	POOR	FAIR	C	R = 2.70	Recommend removal and replacement planting

TREE or Group or Hedge	**Species Common Name** If tree offsite, record estimated measurements using '#'	**DBH at 1.5m** recorded in mm	Canopy **HEIGHT** in metres + **FIRST BRANCH** in m from ground level with cardinal direction	**Branch Spread** **N E S W** Recorded in m	**Age** **Y SM EM M LM OM Vet**	**SULE** **<10 10+ 20+ 40+**	**General Observations**	**Structural Form** **Good Fair Poor Dead**	**Physiological Form** **Good Fair Poor Dead**	**BS 5837 RC** **A B C U**	**BS 5837 RPA Radius** recorded in m and m²	**Recommended Works**
T2	Silver Birch	280	H 15m 1m/N	N 4.5 E 4.0 S 4.0 W 3.0	EM	20+	*9.8m from rear of house* 1.0 from boundary fence Birch with good vitality and extensive canopy however has leaning form, leans to S. Strong extension growth noted. Tree outcompetes T1 Cherry. Sub-dominant leader noted at 1m to N which also affects its form. Union of sub-stem to main stem might cause issues at future time.	FAIR	GOOD	B/ C	R = 3.30	NEIGHBOURS BOUNDARY TREE
T3	Japanese Flowering Cherry	95	H 3.5m 1.0m/S	N 1.5 E 1.5 S 1.5 W 1.5	SM	10+	*9.8m from rear of house* 1.0 from RHS boundary fence Small ornamental cherry with leaning form.	POOR	FAIR	C	R = 1.20	

T4	Sycamore	5x stems	H 18m FB 2m/S	N 4.0 E 4.0 S 4.0 W 4.0	EM	40+	*9.8m from rear of house* 1.0 from RHS boundary fence Mature multi-stem tree which offers amenity value and located at the rear right hand corner of the garden. Canopy extends into garden of 20A by approx. 4m. Evidence of tree work to maintain canopy, canopy has now regrown	FAIR	FAIR	B	R = 6.30	NEIGHBOURS MATURE TREE

APPENDIX 3 – TREE CONTRAINTS PLAN (TCP)

SEE ATTACHED PDF SHOWING TREE CONSTRAINTS PLAN (TCP) SHOWING LOCATION OF TREE PROTECTION FENCING

APPENDIX 4 – ADDITIONAL SITE IMAGES

Front garden of 20 A Ferncroft Avenue

Rear views of existing extension of 20A Ferncroft Ave

View from the house showing boundary trees

View from the rear of the garden showing boundary trees

T1 Cherry with compromised rooting area and leaning form

T2 Silver Birch with extensive canopy shown on right and T1 Birch to its left

T4 Category B Sycamore at rear of garden

T2 Birch which has an additional sub-stem

Appendix C

SIMPSON Retaining Wall Calculations Summary dated 9th April 2020.

Job No	Description	Calc No:	1
P18-461	20a FERNCROFT AVENUE	Date:	09.04.2020
		By:	AT
		Checked:	-

REPLY TO QUERY No1

The 3.0m to 3.5m described as the depth of the basement in our report is referring to the vertical distance from the ground floor to the bottom of the base of the wall foundations.

The top level of the drive way is 50.780m; the top of the concrete wall for the basement underpinning the existing walls is below the ground level. Therefore the effective height of the concrete wall from the top of the wall base is 2375mm circa, and the loading from the soil above is considered as an additional surcharge.

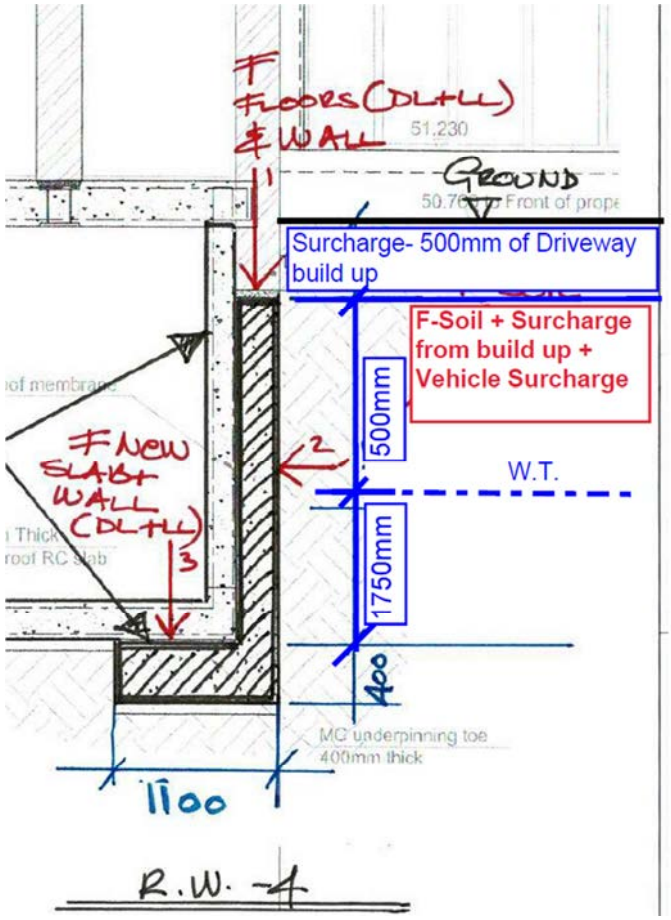

Image: extract of sketch showing loading applied to retaining walls revised March 2020.

As shown in the above sketch the all retaining the soil next to the garage is loaded with a surcharge equivalent to 500mm of retained soil.

REPLY TO QUERY No2

For the purpose of this response I have taken retaining wall No 1 as an example:

In our original report we looked at a retained water level of 910mm, in the second revision we looked at a retained water level of 1375 which is 1m bgl. The difference in horizontal force applied is approximately 7kN applied relatively close to the base.

The wall in its permanent state will be propped both at the bottom and top by the concrete floors. With a retained level of 910mm the maximum moments obtained by the analysis performed were 15.3kNm on the lever arm and 30.7kNm at the stem. With a retained water level of 1375mm the maximum moments obtained 15.6kNm / 31.6kNm.

When designing the reinforcement for the wall the minimum rebar required for the depth of the wall is 368mm^2/m.
The required reinforcement for the wall retaining 910mm of water is 152mm^2 for the lever arm and 304mm^2/m at the stem.
The required reinforcement for the wall retaining 1375mm of water is 155mm^2/m for the lever arm and 314mm^2 at the stem.
Therefore for both cases the minimum required reinforcement will be 368mm^2/m.

Job No	Description	Calc No:	2
P18-461	20a FERNCROFT AVENUE	Date:	09.04.2020
		By:	AT
		Checked:	-

The utilisation ratios in our report are obtained using the provided and minimum required rebar therefore there will be no change in the flexural reinforcement utilisations of the two scenarios.

We have slightly changed our required shear reinforcement and modified the utilisations accordingly.

Overturning is not checked when propped both top and bottom.

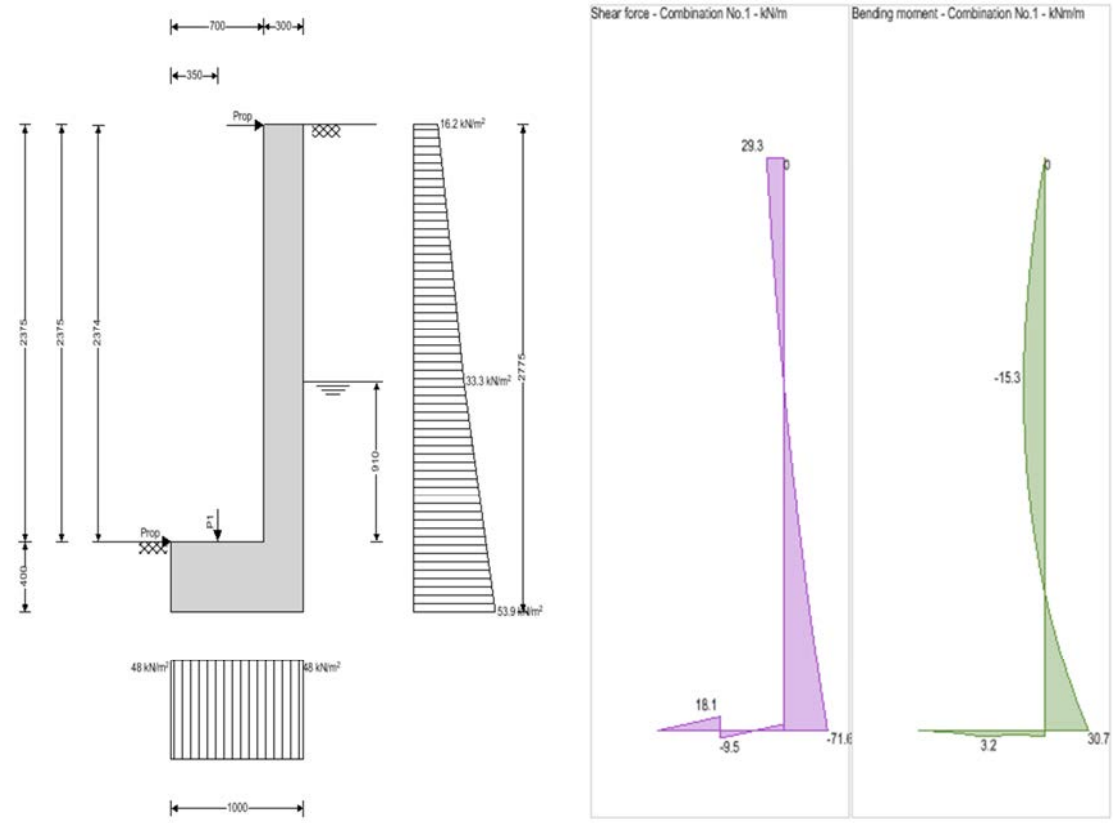

*Image: Diagram of retaining wall with **910mm** of water and relative shear and bending moment diagrams*

Job No	Description	Calc No:	3
P18-461	20a FERNCROFT AVENUE	Date:	09.04.2020
		By:	AT
		Checked:	-

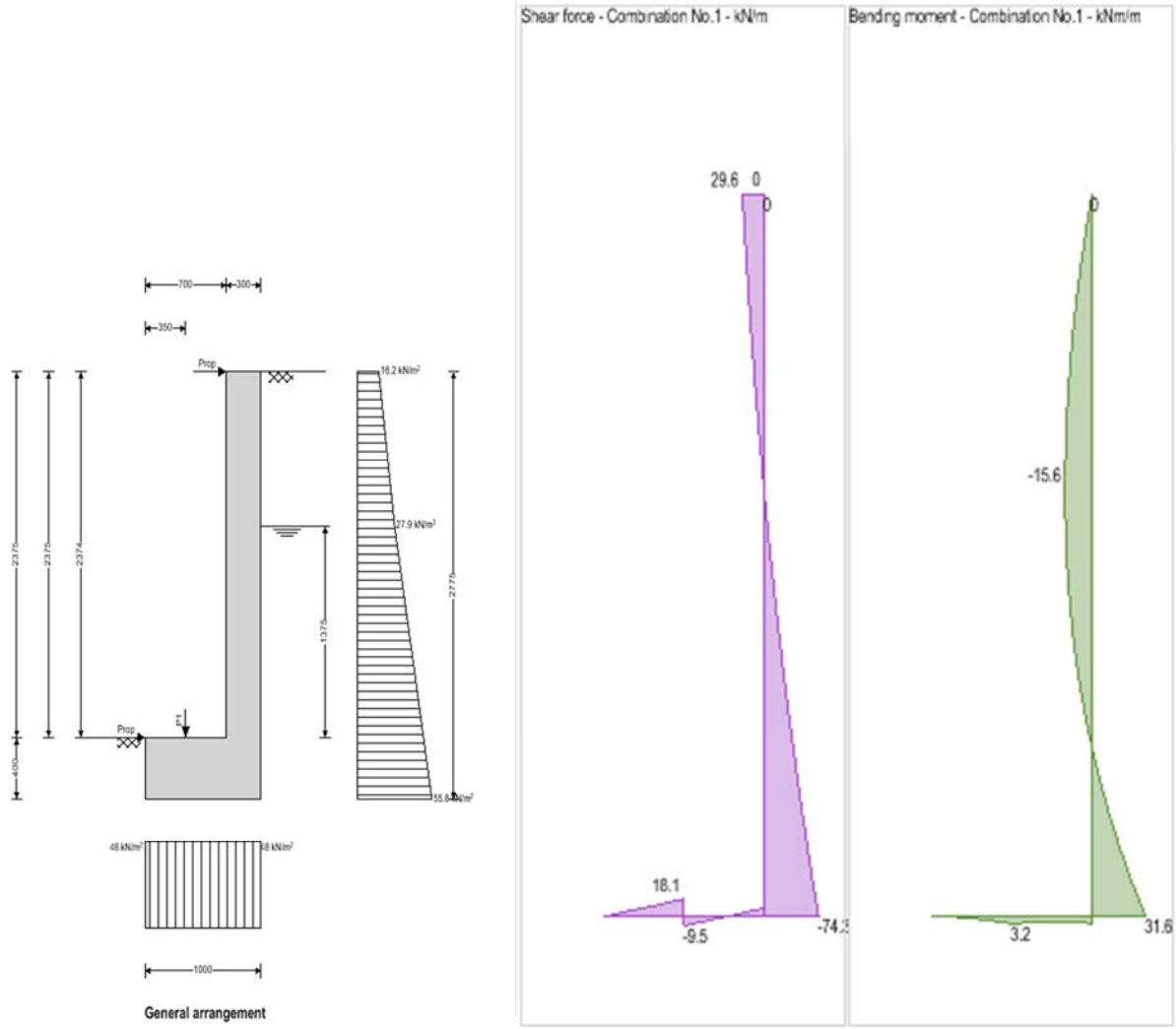

*Image: Diagram of retaining wall with **1375mm** of water (1m bgl) and relative shear and bending moment diagrams*

Appendix D

Campbell Reith's Basement Impact Assessment updated Audit Query Tracker noting Items of Clarification of GMA items

Query No	Subject	Query	Status	Date closed out
1	Stability	Clarification required with respect to excavation depth and nature of basement retaining walls.	Structural calculations and sketches, and GMA, refer to RC walls. Assumed reference to mass concrete in original BIA is error. To be confirmed. Depth of basement described as 3.00 to 3.50m in BIA addendum and GMA. Structural calculations give retained wall heights of max 2.375m but allow for surcharge from retained soil above.	24/03/20
2	Stability	Retaining wall calculations to be revised to reflect recommendations in hydrogeological assessment.	Open - BIA addendum states walls to be designed for water at 1m bgl but structural calculations unchanged with exception of shear resistance.	
3	Stability	Building damage assessment to be reviewed to ensure consistent with anticipated ground movements.	Open - Clarification required as described below	
4	Stability	Consideration to be given to impact of tree removal.	Open – it is stated in GMA that current water demand of tree to be removed is low due to poor condition, therefore impact of removal will be small. To be confirmed by arboriculturalist.	
5	Hydrogeology / Hydrology	Impact of infiltration tank to be considered.	Open - Reference made in addendum to attenuation tank. Clarification required.	

Clarification of GMA
What settlement assumed?
Section 6.1 indicates 5mm due to underpinning (but section 5.2.1 suggests up to 10mm?)
Section 5.2.1 suggests 1-2mm due to load transfer
Section 5.2.2 suggests 2-3mm due to excavation (max at 1.5-2m behind wall due to ground sagging)
Is this cumulative? How distortion calculated? Do these different causes of settlement cause any sagging/hogging in walls?
What is impact of horizontal movement described in 5.2.2?
Are there any internal walls to consider in No 20 Ferncroft Ave?