Independent Review of Detailed Basement Construction Plan (UPDATED)

in connection with proposed

Pears Building at

Royal Free Hospital

Pond Street

London

NW3 2QG

for

LBH4302DBCP Ver. 2.0

November 2017

LBH WEMBLEY

ENGINEERING

Project No: LBH4302

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Report by:

Digitally signed by Seamus Lefroy-Brooks
DN: cn=Seamus Lefroy-Brooks, o, ou=LBH WEMBLEY, email=seamus@LBHGEO.co.uk, c=GB
Date: 2017.11.23 17:20:00 Z

Seamus R Lefroy-Brooks

BSc(hons) MSc CEng MICE CGeol FGS CEnv FRGS SiLC
RoGEP UK Registered Ground Engineering Adviser

LBH WEMBLEY ENGINEERING
Unit 12 Little Balmer
Buckingham Industrial Park
Buckingham
MK18 1TF

Tel: 01280 812310

email: enquiry@LBHGEO.co.uk

website: www.LBHGEO.co.uk

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Foreword-Guidance Notes

GENERAL

This report has been prepared for a specific client and to meet a specific brief. The preparation of this report may have been affected by limitations of scope, resources or time scale required by the client. Should any part of this report be relied on by a third party, that party does so wholly at its own risk and LBH WEMBLEY disclaims any liability to such parties.

The observations and conclusions described in this report are based solely upon the agreed scope of work. LBH WEMBLEY has not performed any observations, investigations, studies or testing not specifically set out in the agreed scope of work and cannot accept any liability for the existence of any condition, the discovery of which would require performance of services beyond the agreed scope of work.

VALIDITY

Should the purpose for which the report is used, or the proposed use of the site change, this report may no longer be valid and any further use of or reliance upon the report in those circumstances shall be at the client's sole and own risk. The passage of time may result in changes in site conditions, regulatory or other legal provisions, technology or economic conditions which could render the report inaccurate or unreliable. The information and conclusions contained in this report should therefore not be relied upon in the future and any such reliance on the report in the future shall again be at the client's own and sole risk.

THIRD PARTY INFORMATION

The report may present an opinion on the disposition, configuration and composition of soils, strata and any contamination within or near the site based upon information received from third parties. However, no liability can be accepted for any inaccuracies or omissions in that information

1. Introduction

1.1 Project Background

It is proposed to construct a new four storey hospital building on the site of an existing car park building that will include a two-storey basement beneath the full footprint. The new basement levels will be similar to the existing basement levels that are cut into the hillside, but the basements will be extended laterally into the hillside in a southwards direction where they will require around 7m of excavation, and north-westwards where around 4m of excavation outside the footprint of the car park is required.

A draft Detailed Basement Construction Plan submitted by the applicant as part of a Section 106 Agreement was reviewed in January 2017 and that review resulted in numerous recommendations being provided for revisions to the submitted documents.

1.2 Brief

LBH WEMBLEY have now been commissioned to review a revised Detailed Basement Construction Plan.

1.3 Report Structure

The DBCP wording is reproduced in Section 2 of this report and the following Section 3 considers and comments on the evidence that has been identified by the Certifying Engineer for compliance of the various clauses of the DBCP wording in the S106 agreement.

The next section, Section 4, sets out further information required for the plan to be considered as compliant.

1.4 Information Provided

The information submitted by the applicant comprises the following:

1. Detailed Basement Construction Plan by HTS, Revision E1 dated 12th October 2017
2. Details of Appointments (included as Appendix A to Document 1)
3. Second Supplementary Ground Investigation by Soil Consultants, Ref: 10006A/OT/SCW Rev 1 dated 31st August 2017 (included as Appendix B to Document 1).
4. Groundwater Testing Report by OGI, Ref: J17-592-011R-Rev1 dated 21st September 2017: (included as Appendix C to Document 1).
5. Geotechnical Design Report by A-square Studio Engineers, Ref 0261-RPT-002 Rev 1 dated 31st August 2017 (included as Appendix D to Document 1)
6. Structural Engineers Drawings, Specifications & Calculations by HTS, incl. Basement Calculations Ref:1415-4 dated September 2017, Surface Water Discharge & Attenuation Calculations dated May 2016 (included as Appendix E to Document 1)
7. Contiguous Bored Pile Wall Design by Bachy Soletanche, Ref: 37850-CW-DES-RPT Rev 3 dated 27th September 2017 (included as Appendix F to Document 1)
8. Bearing Pile Design by Bachy Soletanche, Ref: 37850-BP-DES-RPT Rev 2 dated 9th October 2017 (included as Appendix G to Document 1)
9. Impact of Tree Removal Technical Note by OGI, Ref: J17-592-014TN-Rev3 dated 10th October 2017 (included as Appendix H to Document 1)

10. Groundwater Collection Strategy by OGI, Ref: J17-592-0007R-Rev2 dated 2nd October 2017 (included as Appendix I to Document 1)
11. Temporary Works S106 Response by Willmott Dixon, including Temporary Works Designs by Toureen Ref: T4874 dated 2016, Tiley & Barret Ref: T4874-C_{01} Rev 1 dated 5th December 2016 and Lucking & Clark Ref:34115 dated March 2017 (included as Appendix J to Document 1)
12. Logistics/Sequence S106 Response by Willmott Dixon (included as Appendix K to Document 1)
13. Construction Management Plan by Willmott Dixon, Revision G dated 7th July 2017 (included as Appendix L to Document 1)
14. Ground Movement Assessment by A-square Studio Engineers, Ref: 0261-RPT-001 Rev 8 dated 11th October 2017 (included as Appendix M to Document 1)
15. Monitoring Action Plan by Willmott Dixon, Ref: G640/MAP/001 Revision N dated 9th October 2017 (included as Appendix K to Document 1)
16. Condition Surveys (included as Appendix O to Document 1)
17. Consultation with Locals (included as Appendix P to Document 1)
18. S106 Certifying Engineer's Review Report by CRH, Ref: 12449, dated 12th October 2017

2. DBCP

The S106 agreement stipulates that “the Council will not approve the Detailed Basement Construction Plan unless the Owner demonstrates by way of certification by a suitably qualified engineer from a recognised relevant professional body to the Council’s reasonable satisfaction that the Development can be constructed safely in light of the ground and water conditions and will control ground movements such that impact on the Neighbouring Properties is limited to “category 0 (negligible)” in accordance with the Eighth Schedule [The Burland Scale] annexed hereto.”

The BCP is defined in the agreement as

> *a plan setting out detailed information relating to the design and construction of the basement forming part of the Development with a view to minimising any or all impacts of the Development on Neighbouring Properties (and in doing so to take into account at all times the findings and the recommendations in the document entitled "Civil & Structural Engineering Team - Internal Memo" dated 9th September 2015 by Historic England at the Ninth Schedule annexed hereto and the water environment and to provide a programme of detailed mitigating measures to be undertaken and put in place by the Owner with the objective of maintaining the structural stability of the Property and Neighbouring Properties as described in all of the following documents (being documents submitted with the Planning Application):*
>
> - *"the Basement Impact Assessment" by ESI dated October 2014;*
> - *"Basement Impact Assessment (Surface Water and Groundwater)" by ESI dated October 2014;*
> - *"Basement Impact Assessment Screening and Scoping Report Land Stability" by Soil Consultants dated 30th January 2015;*
> - *"Geo-environmental and Geotechnical Site Assessment" by RSK dated October 2014;*
> - *letter on BIA review from SDP (plus Appendices 1-7) dated 27.1.15;*
> - *Note on movements associated with excavation by GCG dated January 2015;*
> - *Surface water runoff supplementary information by SDP dated 6th February 2015;*
> - *calculations for storm sewer design by Micro Drainage dated 6.2.15;*
> - *email from Simon Myles on BIA matters dated 12.2.15*
>
> *and to include the following (to be submitted to the Council with the draft plan):*
>
> *(1) detailed ground movement analyses (to include consideration of slope stability) demonstrating that the impacts of any excavation and basement works (to be carried out pursuant to the Planning Permission) on St. Stephen's Church and/or Hampstead Hill School are acceptable such analyses to be informed by:*
>
> > *(i) additional ground investigation to better characterise the soil strength and groundwater regime at the Property and the slopes above the Property;*
> > *(ii) a specific study of the history of ground movements affecting all structures at the Neighbouring Properties; and*
> > *(iii) an analysis of the stability of the existing slopes and all historic excavations at and above the Property having particular regard to evidence of any actual or potential progressive movement.*

(2) a detailed construction methodology and sequence demonstrating how the stability of the buildings, structures and ground at the Neighbouring Properties shall be ensured throughout the Construction Phase and include:

(i) detailed design of the temporary and permanent support measures to be provided to the excavation demonstrating the parameters adopted and quantifying the extent of associated soil movements to be expected.

(ii) detailed design of any drainage measures required to preserve or improve the slopes above the excavation.

(iii) consideration of the impacts of the removal of any trees; and

(iv) consideration of groundwater removal from the excavation and any likely impacts of doing so.

(3) a detailed structural monitoring and contingency plan for the works setting out:

(i)specific location monitoring points;

(ii) monitoring equipment for movement and vibration;

(iii) frequency of monitoring;

(iv) responsibilities for implementation of the monitoring plan and contingency plan;

(v) criteria for assessment of monitoring data and comparison with predicted movements;

(vi) specific contingent actions to be take in response to any exceedance of criteria;

(vii) communication of the monitoring data to interested parties;

(viii) responsibilities for implementation of the contingent actions;

(ix) the resources required to enable implementation of the contingent actions; and

(x) the availability of the required resources.

(4) surface water drainage calculations indicating how the risk of sewer flooding is to be mitigated and to include the following key stages:-

(i) the Owner to appoint an independent suitably certified engineer (qualified in the fields of geotechnical and/or structural engineering) from a recognised relevant professional body having relevant experience of sub-ground level construction commensurate with the Development ("the Basement Design Engineer") AND for details of the appointment to be submitted to the council for written approval in advance (and for the Owner to confirm that any change in Basement Design Engineer during the Construction Phase with the Council in advance of any appointment); and,

(ii) the Basement Design Engineer to formulate the appropriate plan to fulfil the requirements of the Detailed Construction Basement Plan and at all times to ensure the following:-

(a) that the design plans have been undertaken in strict accordance with the terms of this Agreement incorporating proper design and review input into the detailed design phase of the Development and ensuring that appropriately conservative modelling relating to the local ground conditions and local water environment and structural condition of Neighbouring Properties have been incorporated into the final design; and

(b) that the result of these appropriately conservative figures ensure that that the Development will be undertaken without any impact on the structural integrity of the Neighbouring Properties beyond "category 0 (negligible)" with reference to the Burland Category of Damage; and

(c) that the Basement Design Engineer having confirmed that the design plans have been undertaken in strict accordance with this Agreement and includes a letter of professional certification confirming this and that the detailed measures set out in sub-clauses (1) to (7) inclusive below have been incorporated correctly and appropriately and are sufficient in order to achieve the objectives of the Detailed Basement Construction Plan;

(1) reasonable endeavours to access and prepare a detailed structural appraisal and conditions survey of all the Neighbouring Properties to be undertaken by an independent suitably qualified and experienced chartered surveyor (and for details to be offered if this is not undertaken in full or part);

(2) a method statement detailing the proposed method of ensuring the safety and stability of Neighbouring Properties throughout the Construction Phase including temporary works sequence drawings and assumptions with appropriate monitoring control risk assessment contingency measures and any other methodologies associated with the basement and the basement temporary works;

(3) detailed design drawings incorporating conservative modelling relating to the local ground conditions and local water environment and structural condition of Neighbouring Properties prepared by the Basement Design Engineer for all elements of the groundworks and basement authorised by the Planning Permission together with specifications and supporting calculations for both the temporary and permanent basement construction works;

(4) the Basement Design Engineer to be retained at the Property throughout the Construction Phase to inspect approve and undertaking regular monitoring of both permanent and temporary basement construction works throughout their duration and to ensure compliance with the plans and drawings as approved by the building control body;

(5) measures to ensure the on-going maintenance and upkeep of the basement forming part of the Development and any and all associated drainage and/or ground water diversion measures order to maintain structural stability of the Property the Neighbouring Properties and the local water environment (surface and groundwater);

(6) measures to ensure ground water monitoring equipment shall be installed prior to Implementation and retained with monitoring continuing during the Construction Phase and not to terminate monitoring until the issue of the Certificate of Practical Completion (or other time agreed by the Council in writing); and

(7) amelioration and monitoring measures of construction traffic including procedures for co-ordinating vehicular movement with other development taking place in the vicinity and notifying the owners and or occupiers of the residences and businesses in the locality in advance of major operations delivery schedules and amendments to normal traffic arrangements.

(iii) the Owner to appoint a second independent suitably certified engineer (qualified in the fields of geotechnical and/or structural engineering) from a recognised relevant professional body having relevant experience of sub-ground level construction commensurate with the Development ("the Certifying Engineer") AND for details of the appointment of the certifying engineer to be submitted to the council for written approval in advance; and

(iv) for the Certifying Engineer to review the design plans and offer a 2 page review report to the Council confirming that the design plans have been formulated in strict accordance with the terms of this Agreement and have appropriately and correctly incorporated the provisions of sub-clauses (1) to (7) inclusive above and are sufficient to achieve the objectives of the Detailed Basement Construction Plan AND should any omissions, errors or discrepancies be raised by the Certifying Engineer then these to be clearly outlined in the report and thereafter be raised directly with the Basement Design Engineer with a view to addressing these matters in the revised design plans.

(v) only thereafter shall the Owner submit the agreed finalised version of the Detailed Basement Construction Plan to the Council for its written approval with:

(a) a letter of professional certification from the Certifying Engineer confirming that the Detailed Basement Construction Plan is an approved form and has been formulated in strict accordance with the terms and clauses of this Agreement;

(b) evidence that the Owner has meaningfully and actively consulted local interested parties/local residents groups on the provisions of the plan prior to submission of the plan to the Council;

(c) a statement summarising all representations received by the Owner pursuant to the consultation with local interested parties;

(d) evidence that the Owner (in preparing the plan for submission to the Council) has taken account of any representations received pursuant to subclause 2.16(v)(b) hereof and sought to address any issues raised;

(e) confirmation in writing from Members Briefing that the plan is agreed or (in the event of the plan having been referred to the Development Control Committee on the recommendation of Members Briefing) confirmation in writing from the Development Control Committee that the plan is agreed

(vi) The Owner to respond to any further questions and requests for further information about the submitted plan from the Council AND IN THE EVENT that a further technical assessment be required then the Owner agrees to reimburse the Council for any costs expended which requires the instruction of an independent assessment in order to resolve any unresolved issues or technical deficiencies in the Council's consideration of the submitted plan

The BCP provides the Council with the ability to act should the Owner not provide demonstration, in advance, that "*appropriately conservative modelling relating to the local ground conditions and local water environment and structural condition of Neighbouring Properties have been incorporated into the final design"* and that "*the Development will be undertaken without any impact on the structural integrity of the Neighbouring Properties beyond "category 0 (negligible)" with reference to the Burland Category of Damage*".

3. Evidence of DBCP compliance with S.106 Agreement

3.1 Sub-Clause (1) Ground movement and slope stability assessments

There is a requirement for detailed ground movement analyses demonstrating that the impacts of the approved excavation and basement works on St. Stephen's Church and Hampstead Hill School are acceptable (Burland Damage Category 0).

Document 14 (Appendix M) predicts the following ground movements resulting from the works:

St. Stephen's Church

- *Additional vertical settlement affecting the church excluding the tower:* *1mm.*
- *Additional horizontal ground movement affecting the church excluding the tower:* *3mm.*
- *Additional vertical settlement affecting the church tower:* *1mm.*
- *Additional horizontal ground movement affecting the church tower:* *3mm.*

Hampstead Hill School

- *Additional vertical settlement affecting the school:* *1mm.*
- *Additional horizontal ground movement affecting the school:* *4mm.*

St Stephen's Church

The Burland Classification has been used to show that movements to the main body of the church are predicted to result in of Category 0 (Negligible) damage.

The report explains that The Burland Classification idealises any building as a simple beam in bending/shear and horizontal strain and that due to the height of the tower it is not considered that the Classification is valid as the tower has a length to height ratio much less than 1 and so is outside the range of the simple beam idealisation.

The report considers that it is more suitable to consider the total and differential settlements of the tower foundation and any impact these would have on the tilt of the tower. A maximum tilt of 1 in 35000 is predicted as a result of the works which is some two orders of magnitude less than that at which it is asserted that tilting becomes noticeable.

Hampstead Hill School.

The assessment reports that as a result of the calculated deformations, a Category 0 (Negligible) classification is estimated.

3.1.1 Sub-Clause (1) (i) Additional ground investigation

There is a requirement for additional ground investigation to be undertaken to better characterise the soil strength and groundwater regime at the Property and in the slopes above the Property.

Document 3 (Appendix B) reports investigation to gather additional information on soil strength and groundwater. The additional ground investigation has included additional rotary, dynamic percussion and

cable percussion boreholes taken to various depths, pressuremeter testing and the installation of additional standpipes, piezometers and inclinometers. It is noted that over forty boreholes of one sort or another have been completed in relation to the Pears building over the last 3 years.

Document 5 (Appendix D) is a Geotechnical Design Report (GDR) presenting an interpretation of ground investigations and setting out recommendations for the key geotechnical strength and groundwater parameters to be used for the assessment of ground movement and for ground engineering design at the site.

The ground model comprises Made Ground overlying Head Deposits / Affected London Clay, Weathered London Clay, and the Lambeth Group. The underlying Thanet Sand and Chalk Formation are considered to be too deep to influence the situation.

3.1.2 **Sub-Clause (1) (ii) Study of the history of ground movements**

There is a requirement for a specific study of the history of ground movements affecting all structures at the Neighbouring Properties.

Document 14 (Appendix M) provides a specific study of the historical ground movements.

3.1.3 **Sub-Clause (1) (iii) Analysis of the existing slopes and historic excavations**

There is a requirement for an analysis of the stability of the existing slopes and all historic excavations at and above the Property having particular regard to evidence of any actual or potential progressive movement.

Document 14 (Appendix M) provides a movement analysis that broadly accords with the reported historical ground movements.

The GMA analysis suggests movements of the church due to its construction loading (occurring before 1901) of up to 60mm, with additional later movements up to 10mm resulting from past excavation and construction associated with the Royal Free Hospital and car-park.

The predicted historical ground movements have been compared and contrasted against the anecdotal and factual movement evidence and the assessment concludes that these historical movements of the church and school buildings *"may not be related to the existing hospital structures construction and are likely to have been induced by other sources, possibly due to soil desiccation".*

3.2 **Sub-Clause (2) Statement of construction methodology and sequence**

There is a requirement for a detailed construction methodology and sequence demonstrating how the stability of the buildings, structures and ground at the Neighbouring Properties shall be ensured throughout the Construction Phase.

Document 12 (Appendix K) describes a detailed construction methodology and sequence.

3.2.1 Sub-Clause (2) (i) Temporary and permanent support measures and quantification of movement

There is a requirement for detailed design of the temporary and permanent support measures to be provided to the excavation demonstrating the parameters adopted and quantifying the extent of associated soil movements to be expected.

Document 7 (Appendix F) This document is the Bachy Soletanche design report for the contiguous bore pile retaining wall that will be the principal element of the development in regards to preventing movement of the slope upon which the Church and School site.
The design has adopted the parameters provided in the GDR (document 5) and the report includes an assessment of the lateral displacements that will occur at the top of the wall as a result of the wall yielding inwards during excavation of the new basement. In the section of wall of concern, opposite St. Stephen's, the report states that these deflections are *"expected to be less than 10mm*".

3.2.2 Sub-Clause (2) (ii) Design of drainage to preserve or improve slope stability

There is a requirement for detailed design of any drainage measures required to preserve or improve the slopes above the excavation.

Document 10 (Appendix I) provides details of the drainage systems that are proposed to collect near-surface water behind the new retaining wall and to prevent any rise in the groundwater upslope of the wall that could affect St Stephen's Church and Hampstead Hill School.

3.2.3 Sub-Clause (2) (iii) Consideration of the impacts of the removal of any trees

There is a requirement for consideration of the impacts of the removal of any trees.

Document 9 (Appendix H) provides an assessment of the impact that the planned tree removal will have and includes guidance for mitigation measures to reduce the potential impact.

3.2.4 Sub-Clause (2) (iv) Consideration of any excavation de-watering

There is a requirement for consideration of the impacts of groundwater removal from the excavation.

The CE refers to Appendices H & I (Documents 9 and 10) but neither of these address the removal of water from the excavation.

Section 4.4 of Document 1) states the following:
"During the construction, any water entering the basement will be collected and discharged. This system will not drain the ground water but simply collect any water passing through the basement perimeter, hence the ground water collection during construction will have no impact to the surrounding area or properties."

3.3 Sub-Clause (3) Structural monitoring and contingency plan

There is a requirement for a detailed structural monitoring and contingency plan for the works.

Document 15 (Appendix N) is a Monitoring Action Plan.

3.3.1 Sub-Clause (3) (i) Location of monitoring points

There is a requirement for the plan to set out specific monitoring points.

Document 15 (Appendix N) includes specific monitoring points.

3.3.2 Sub-Clause (3) (ii) Monitoring equipment

There is a requirement for the plan to set out specific monitoring equipment for movement and vibration.

Document 15 (Appendix N) includes specific monitoring equipment.

3.3.3 Sub-Clause (3) (iii) Monitoring frequency

There is a requirement for the plan to set out a specific monitoring frequency.

Document 15 (Appendix N) includes a specific monitoring frequency.

3.3.4 Sub-Clause (3) (iv) Responsibility for implementation of the monitoring and contingency plans

There is a requirement for the plan to name a specific person with responsibility for implementing the monitoring and contingency plans.

Document 15 (Appendix N) names the Basement Design Engineer.

3.3.5 Sub-Clause (3) (v) Assessment criteria

There is a requirement for the plan to set out specific assessment criteria.

Document 15 (Appendix N) includes specific assessment criteria.

3.3.6 Sub-Clause (3) (vi) Contingent actions

There is a requirement for the plan to set out specific contingent actions.

Document 15 (Appendix N) sets out a procedure to call a review meeting of an Engineering Review Panel and sets out potential mitigation measures that *"could be put into place following an engineering design panel review"*.

3.3.7 Sub-Clause (3) (vii) Communication

There is a requirement for the plan to allow for specific communication of the monitoring data to interested parties.

Document 15 (Appendix N) includes a system of information sharing.

3.3.8 Sub-Clause (3) (viii) Responsibility for implementation of the contingent actions

There is a requirement for the plan to name a specific person with responsibility for implementing the contingent actions.

Document 15 (Appendix N) names the Basement Design Engineer and the Engineering Review Panel.

3.3.9 Sub-Clause (3) (ix) Resources required to enable implementation of the contingent actions

There is a requirement for the plan to identify the resources required to enable implementation of the contingent actions.

The CE refers to Document 15 (Appendix N) but that document does not appear to identify the resources required.

3.3.10 Sub-Clause (3) (x) Availability of the required resources

There is a requirement for the plan to identify the availability of the resources required to enable implementation of the contingent actions.

The CE refers to Document 15 (Appendix N) but that document does not appear to address the availability of resources required for implementation of contingent actions.

Document 5 (Appendix D) does state that *"Willmott Dixon should have access to an available stockpile of suitable backfill material as an immediate contingency, if required, to backfill the excavation."*

The same document also states: "*Contingency measures (probably backfilling or temporary propping) should be fully designed and ready for quick fabrication and installation if movement trends continue past the red trigger limit and damage to the neighbouring properties is exceeding allowable limits."*

3.4 Sub-Clause (4) Surface water sewer capacity calculations

There is a requirement for calculations indicating how the risk of sewer flooding is to be mitigated.

Document 6 (Appendix E) sets out these calculations.

3.5 Sub-Clause (i) Basement Design Engineer (BDE)

There is a requirement for the Owner to appoint an independent suitably certified engineer (qualified in the fields of geotechnical and/or structural engineering) from a recognised relevant professional body having relevant experience of sub-ground level construction commensurate with the Development ("the Basement Design Engineer") AND for details of the appointment to be submitted to the council for written approval in advance (and for the Owner to confirm that any change in Basement Design Engineer during the Construction Phase with the Council in advance of any appointment).

Document 1 contains a letter from HTS that confirms their appointment as BDE.

3.5.1 Sub-Clause (ii) (a) BDE - Conservative modelling, design plans, design review

There is a requirement for the Basement Design Engineer to ensure that the designs have been undertaken in strict accordance with the terms of this Agreement incorporating proper design and review input into the detailed design phase of the Development and ensuring that appropriately conservative modelling relating to the local ground conditions and local water environment and structural condition of Neighbouring Properties have been incorporated into the final design.

The CE refers to section 1.3 (fig 4) of Document 1 and to Document 2 (Appendix A).

Section 1.3 of Document 1 is a description of the design team.

Fig 4 of Document 1 is a letter from HTS including the following text *"In our professional opinion, we confirm, that best endeavours have been used to ensure that the design of the basement and the Detailed Basement Construction Plan are in accordance with the S106 agreement and appropriate conservative modelling relating to the local ground conditions, water environment and structural condition of neighbouring properties has been incorporated into the final design."*

Document 2 (Appendix A) is a collection of capability statements from the various members of the design team.

3.5.2 Sub-Clause (ii) (b) BDE - Damage impact assessment

There is a requirement for the Basement Design Engineer to ensure that the result of the above appropriately conservative figures ensure that that the Development will be undertaken without any impact on the structural integrity of the Neighbouring Properties beyond "category 0 (negligible)" with reference to the Burland Category of Damage.

The CE refers to section 7 of Document 1 and to Document 14 (Appendix M), which describes the predicted impacts to be "category 0 (negligible)" with reference to the Burland Category of Damage.

3.5.3 Sub-Clause (ii) (c) BDE - Letter of professional certification

There is a requirement for the Basement Design Engineer to issue a letter of professional certification confirming that the design plans have been undertaken in strict accordance with the S106 Agreement **AND** that the detailed measures set out in sub-clauses (1) to (7) inclusive have been incorporated

correctly and appropriately **AND** that these are sufficient to achieve the objectives of the Detailed Basement Construction Plan (ie. that the Development can be constructed safely and that the impact on the Neighbouring Properties will be limited to category 0).

Document 1 (Fig 4) is a letter from HTS confirming that *"best endeavours have been used to ensure that the design of the basement and the Detailed Construction Plan are in accordance with the S106 agreement."*

3.5.3.1 Sub-Clause (ii) (c) (1) BDE - Structural assessment of Neighbouring Properties

There is a requirement for the Basement Design Engineer to confirm that reasonable endeavours have been made to access and prepare a detailed structural appraisal and conditions survey of all the Neighbouring Properties.

Document 16 (Appendix O) includes schedules of condition for neighbouring properties.

3.5.3.2 Sub-Clause (ii) (c) (2) BDE - Method statement for mitigation including assumptions, temporary works sequence, monitoring, contingency actions

There is a requirement for the Basement Design Engineer to confirm that the DBCP incorporates a method statement detailing the proposed method of ensuring the safety and stability of Neighbouring Properties throughout the Construction Phase, including temporary works sequence drawings, and assumptions with appropriate monitoring control risk assessment contingency measures and any other methodologies associated with the basement and the basement temporary works.

Document 13 (Appendix L) is a Construction Management Plan.

3.5.3.3 Sub-Clause (ii) (c) (3) BDE - Detailed Design Drawings

There is a requirement for the Basement Design Engineer to confirm that the DBCP includes detailed design drawings incorporating conservative modelling relating to the local ground conditions and local water environment and structural condition of Neighbouring Properties prepared by the Basement Design Engineer for all elements of the groundworks and basement authorised by the Planning Permission together with specifications and supporting calculations for both the temporary and permanent basement construction works.

Documents 6 and 11 (Appendices E & J) contain detailed design drawings

3.5.3.4 Sub-Clause (ii) (c) (4) BDE - Present on site, responsible for monitoring and approving the temporary and permanent works

There is a requirement for the Basement Design Engineer to be retained at the Property throughout the Construction Phase to inspect approve and undertaking regular monitoring of both permanent and temporary basement construction works throughout their duration and to ensure compliance with the plans and drawings as approved by the building control body.

Document 1 (section 9) states:

"*Heyne Tillett Steel are appointed to carry out regular inspections during the construction of both the basement and the superstructure. The inspections are to commence prior to the demolition of the existing structure and continue throughout the construction process in order to maintain control over the construction process and prevent non-compliances with the design documentation. In addition to this, Heyne Tillett Steel will be reviewing the weekly records of movement monitoring in order to prevent excessive movement and damage caused by the construction of the basement and superstructure to neighbouring structures…"*

3.5.3.5 Sub-Clause (ii) (c) (5) BDE - To ensure maintenance of water diversion and drainage measures affecting stability of the Property and neighbouring properties

There is a requirement for the Basement Design Engineer to confirm that the DBCP includes measures to ensure the on-going maintenance and upkeep of the basement forming part of the Development and any and all associated drainage and/or ground water diversion measures order to maintain structural stability of the Property, the Neighbouring Properties and the local water environment (surface and groundwater).

Document 1 (section 5.2) states:

"*The GCS* [groundwater collection system] *will be designed to have redundancy and be designed maintenance free. The upper land drains will be fully accessible."*

3.5.3.6 Sub-Clause (ii) (c) (6) BDE - To ensure installation and maintenance of water monitoring equipment

There is a requirement for the Basement Design Engineer to confirm that the DBCP includes measures to ensure ground water monitoring equipment shall be installed prior to Implementation and retained with monitoring continuing during the Construction Phase and not to terminate monitoring until the issue of the Certificate of Practical Completion (or other time agreed by the Council in writing).

Document 3 (Appendix B) describes the groundwater monitoring equipment that has been installed.

3.5.3.7 Sub-Clause (ii) (c) (7) BDE - To confirm amelioration and monitoring measures of construction

There is a requirement for the Basement Design Engineer to confirm that the DBCP includes amelioration and monitoring measures of construction traffic including procedures for co-ordinating vehicular movement with other development taking place in the vicinity and notifying the owners and / or occupiers of the residences and businesses in the locality in advance of major operations delivery schedules and amendments to normal traffic arrangements.

Document 13 (Appendix L) includes details of the proposed construction traffic management.

3.6 **Sub-Clause (iii) Certifying Engineer (CE)**

There is a requirement for the Owner to appoint a second independent suitably certified engineer (qualified in the fields of geotechnical and/or structural engineering) from a recognised relevant professional body having relevant experience of sub-ground level construction commensurate with the Development ("the Certifying Engineer") AND for details of the appointment of the certifying engineer to be submitted to the council for written approval in advance

Document 1 refers to CRH as the Certifying Engineer.

3.6.1 **Sub-Clause (iv) CE - Two-page review report confirming (1) to (7)**

There is a requirement for the Certifying Engineer to review the design plans and offer a 2 page review report to the Council confirming that the design plans have been formulated in strict accordance with the terms of this Agreement and have appropriately and correctly incorporated the provisions of sub-clauses (1) to (7) inclusive above and are sufficient to achieve the objectives of the Detailed Basement Construction Plan AND should any omissions, errors or discrepancies be raised by the Certifying Engineer then these to be clearly outlined in the report and thereafter be raised directly with the Basement Design Engineer with a view to addressing these matters in the revised design plans to 2-page review report.

Document 19 is a review report by the CE.

3.6.2 **Sub-Clause (v) (a) CE - Letter of professional certification**

There is a requirement for the Owner to provide a letter of professional certification from the Certifying Engineer confirming that the Detailed Basement Construction Plan is an approved form and has been formulated in strict accordance with the terms and clauses of the S106 Agreement.

Document 19 includes a statement as follows: "*Campbell Reith has reviewed the information submitted in the Willmott Dixon "Detailed Basement Construction Plan" and is satisfied that it is in a form approved by the Basement Design Engineer and Certifying Engineer and has been formulated in accordance with the relevant terms and clauses of the Section 106 Agreement"*

3.6.3 **Sub-Clause (v) (b) Consultation with locals**

There is a requirement for evidence that the Owner has meaningfully and actively consulted local interested parties/local residents groups on the provisions of the plan prior to submission of the plan to the Council.

Document 17 (Appendix P) contains details of these consultations.

3.6.4 **Sub-Clause (v) (c) Statement of locals' representations**

There is a requirement for a statement summarising all representations received by the Owner pursuant to the consultation with local interested parties.

Document 17 (Appendix P) contains details of these representations.

3.6.5 **Sub-Clause (v) (d) Addressing of locals' representations**

There is a requirement for evidence that the Owner (in preparing the plan for submission to the Council) has taken account of any representations received pursuant to sub-clause (v) (b) and has sought to address any issues raised.

Document 17 (Appendix P) contains details of how the representations have been addressed.

3.6.6 **Sub-Clause (v) (e) Agreement of DCC**

There is a requirement for confirmation in writing from Members Briefing that the plan is agreed or (in the event of the plan having been referred to the Development Control Committee on the recommendation of Members Briefing) confirmation in writing from the Development Control Committee that the plan is agreed.

3.7 **Sub-Clause (vi) Resolution of issues**

There is a requirement for the Owner to respond to any further questions and requests for further information about the submitted plan from the Council.

4. Further information required for the plan

The present DBCP has been significantly revised since the previous version and now provides evidence that the proposed development should not affect the neighbouring properties.

However, there is one particular area that requires further attention; a more robust movement monitoring and contingency plan is required than has been presented.

Overall, the monitoring and contingency plan should aim to provide greater assurance that a sufficiently rapid response to exceedances of predetermined trigger levels will actually prevent further movements from reaching limits of unacceptability. The present plan is somewhat unspecific and it is perceived that there is scope for misunderstandings to arise about exactly who is responsible for:

- setting the various trigger levels required (it is accepted that the various numbers cannot yet be provided)
- receiving and reviewing the automated monitoring data (24/7 during excavation activities?)
- implementing the emergency response plan.

The investment that is being made in continuous monitoring is noted, but the benefit of this will be lost if a sufficiently effective emergency response plan is not put in place.

Overall, the plan should aim to provide greater assurance of a rapid response to an amber situation and and of the immediate deployment of sufficient contingent measures to actually stop movements becoming unacceptable.

In conclusion, there remain three sub-clauses of the S106 that not appear to have been adequately addressed as follows:

4.1.1 **Sub-Clause (3) (vi) Specific Contingent actions**

There is a requirement for the plan to set out specific contingent actions.

Document 15 (Appendix N) sets out a procedure to call a review meeting of an Engineering Review Panel and sets out potential mitigation measures that *"could be put into place following an engineering design panel review"*.

This is not considered to constitute a sufficiently robust contingency plan.

4.1.2 **Sub-Clause (3) (ix) Resources required to enable implementation of the contingent actions**

There is a requirement for the plan to identify the resources required to enable implementation of the contingent actions.

The CE refers to Document 15 (Appendix N) but that document does not appear to identify the resources required.

4.1.3 **Sub-Clause (3) (x) Availability of the required resources**

There is a requirement for the plan to identify the availability of the resources required to enable implementation of the contingent actions.

The CE refers to Document 15 (Appendix N) but that document does not appear to address the availability of resources required for implementation of contingent actions.

Document 5 (Appendix D) does state that *"Willmott Dixon should have access to an available stockpile of suitable backfill material as an immediate contingency, if required, to backfill the excavation."*

The same document also states: "*Contingency measures (probably backfilling or temporary propping) should be fully designed and ready for quick fabrication and installation if movement trends continue past the red trigger limit and damage to the neighbouring properties is exceeding allowable limits."*