

The Grove, Highgate Pool Construction Structural Engineering Report for Planning (CMS)

An architectural cutaway diagram showing a multi-level building structure with a central curved section and a large rectangular pool area in the foreground. The diagram illustrates the structural layout, including walls, floors, and stairs, with some areas highlighted in light blue to represent water or specific structural components.

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PROJECT NO.	2124		
PROJECT NAME	The Grove		
PROJECT ADDRESS	5 The Grove, London, N6 6JU		
DOCUMENT TITLE	Structural Report for Planning (CMS) - Pool Construction		
DOCUMENT REV.	P2		
DATE	16.09.21		
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REVISION HISTORY

Rev.	Date	Issue Purpose	Prepared	Checked	Authorised
P1	27.08.21	For Planning	HMV	TG	AH
P2	16.09.21	For Planning	HMV	TG	AH

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1. INTRODUCTION

Constructure Ltd were appointed in March 2021 for structural advice on the proposed refurbishment and landscaping alterations to No. 5, The Grove, Highgate. This report has been produced to accompany the Planning Application submission by 31/44 Architects, describing the scope and nature of the structural works. It details the outline approach that will be taken to safeguard the integrity of adjacent buildings and retaining walls.

Local ground conditions have been assessed with targeted site investigations, scoped to ensure site conditions are well known. This assists to reliably inform the structural design and construction sequence.

2. THE SITE

The site is located in Highgate, with Hampstead Heath lying to the west/southwest. The property is accessed directly off The Grove with a gravel parking area to the front. To the rear of the property are the expansive grounds of Witanhurst Mansion and ancillary buildings.

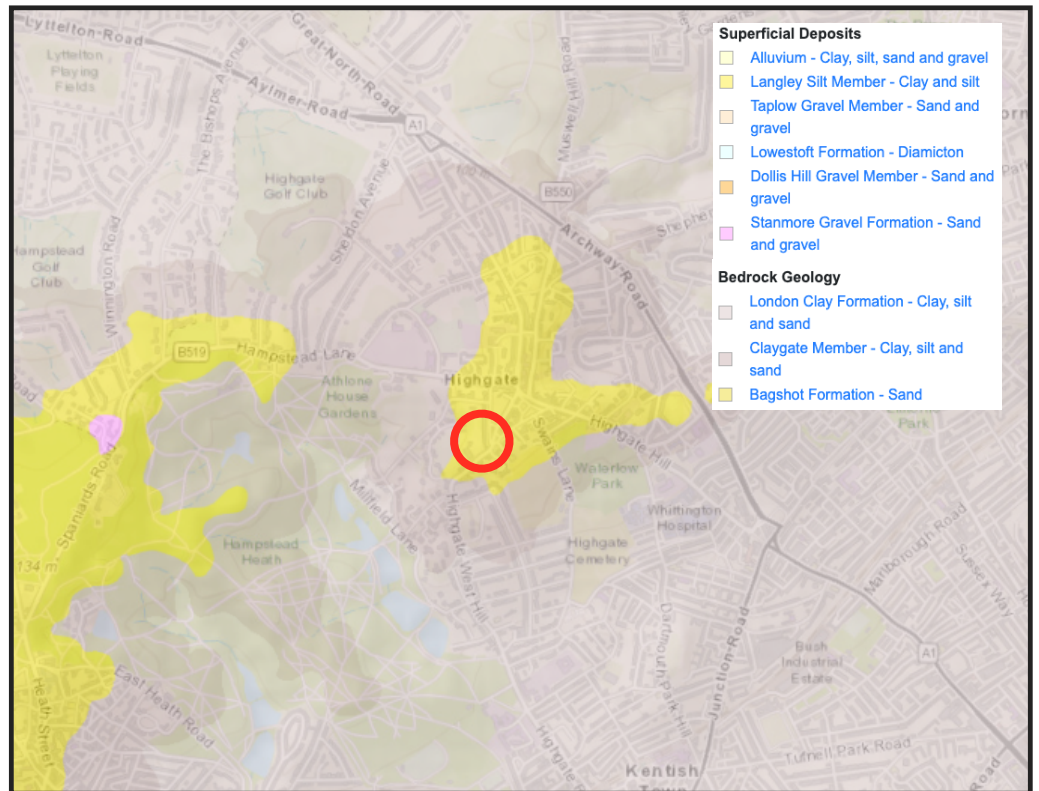
2.1. THE EXISTING BUILDING & GARDEN

The property is a Grade II listed building, originally constructed in 1688 and then rebuilt in 1933. To the rear of the building is a large 'L' shaped garden split in to two main areas. The upper terrace garden is approximately 15m x 30m and is separated from the lower garden (approximately 30m x 40m) with a high masonry retaining wall. Adjacent to the retaining wall is a small pool house. A number of existing trees are located typically around the perimeter of the garden.

The pool building is seen to be in a good and sound condition, with no signs of structural distress or disrepair, and as such in its current condition and form is fully suitable for refurbishment/extension.

2.2. LOCAL GEOLOGY AND HYDROLOGY

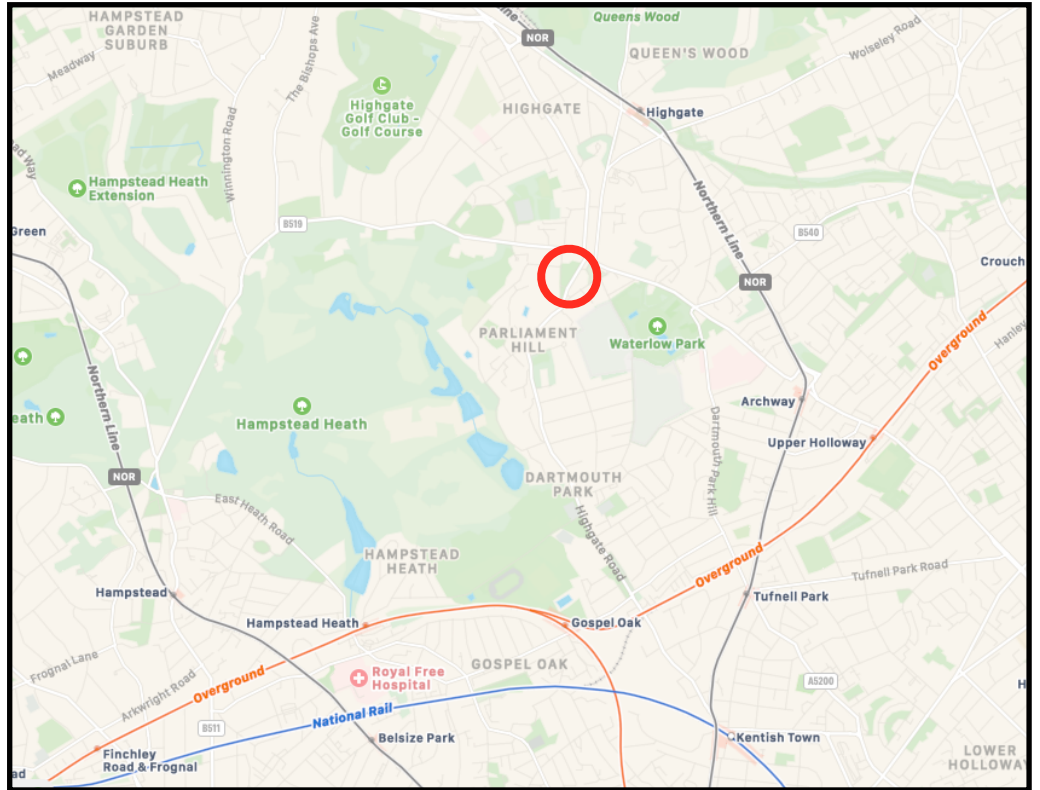
From geological maps for the area [Figure 1], the ground conditions (which have been confirmed through targeted site investigations) are known to comprise a layer of Made Ground overlaying the Bagshot Formation which extends to approximately 15m below street level. The targeted investigations encountered the Claygate Member below this depth.



[FIGURE 1] LOCAL GEOLOGICAL MAP

2.3. LONDON UNDERGROUND

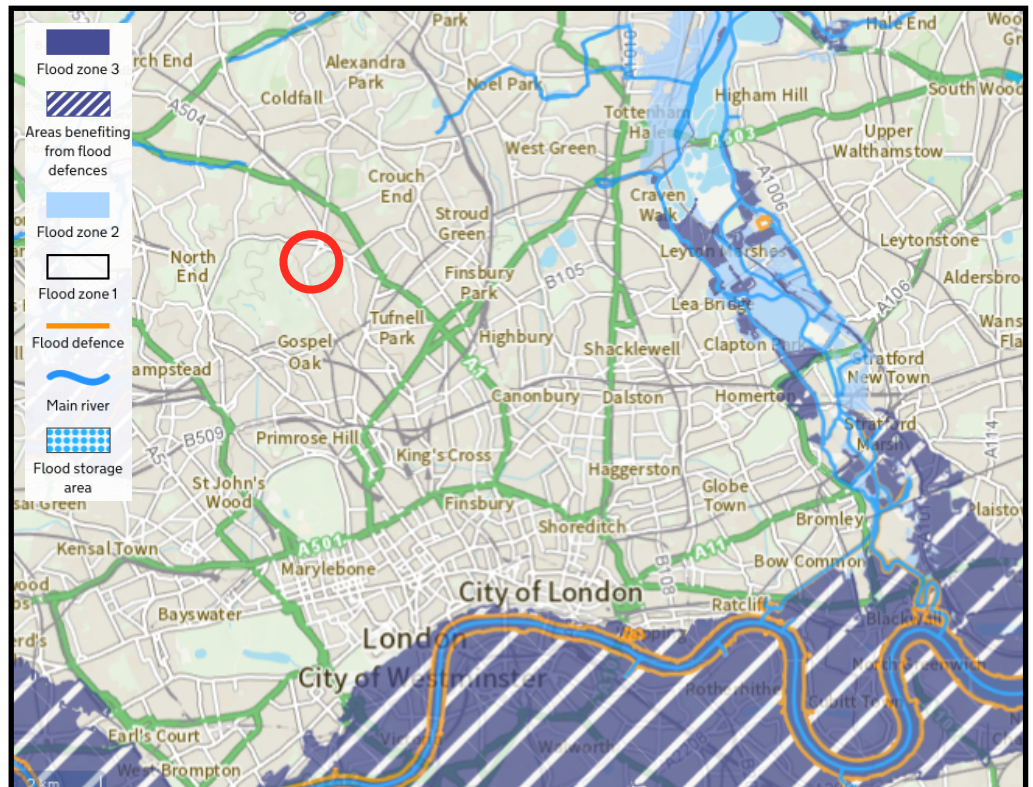
From the map with underground lines overlaid [Figure 2] it can be seen that the site is sufficiently far from London Underground infrastructure, with the closest line being the Northern Line, approximately 830m away from the front boundary to the north east. Therefore, no consultation with the London Underground Asset Protection team is considered to be necessary.



[FIGURE 2] LOCAL TRANSPORT TUNNELS

2.4. FLOOD RISK

From the extract of the Environment Agency's Flood Risk map [Figure 3] it can be seen that the site lies within Flood Zone 1. Flood Risk Assessment and Hydrological Reports are not required as part of this application.



[FIGURE 3] ENVIRONMENT AGENCY FLOOD RISK MAP SHOWING SITE

2.5. EXISTING UTILITIES AND UNDERGROUND SERVICES

Existing services including sewers and drainage runs will be identified prior to commencing the works. The pool construction is to be carried out centrally in the lower garden, therefore it is unlikely that the existing services will be greatly affected by the works. Where minor alterations/extensions are made to the pool house, services will be adjusted to suit.

3. INVESTIGATION WORKS

3.1. SITE INVESTIGATION

A site investigation was carried out in June 2021 by GEA Ltd (report ref: J21179A, dated August 2021) to investigate the following:

- Existing pool house foundations; depth and configuration
- Soil conditions underlying the site; depth of made ground, plasticity of underlying strata, depth to Claygate Member etc.

- Water conditions sub-surface; potential for perched groundwater, high water table etc.
- Stability of excavations
- Composition of ground underlying site; possible contamination etc.

Prior to the site investigation works being carried out, a detailed desk study was undertaken, so as to assess the likely risks for the site, and to allow the scope to be targeted based on any particular risk items flagged.

The site works were carried out week commencing 28th June 2021 and included the following:

- 1 No. 20m deep borehole in the front garden
- 2 No. boreholes in the rear garden to approximately 7m below ground level
- Trial pits at a number of locations around the building and pool house (8 no. total)
- Installation of standpipes in each borehole to monitor groundwater

For detailed results and site plan showing investigation locations, refer to the GEA report.

3.1.1. CONTAMINATION TESTING

Contamination testing has been carried out during the site investigation works, and the results of these tests are recorded in the Site Investigation report. High levels of lead were found within the test samples however the conclusion is that there would be no adverse risks to end users, adjacent sites and groundwater however this must be considered by the Contractor to protect the health of site workers carrying out the excavation and construction works.

3.1.2. GROUNDWATER

Groundwater was encountered in each of the three boreholes undertaken at the site. The deep borehole at the front of the site encountered water at a depth of 12m below ground level. The 2 boreholes to the rear of the site found water at approximately 6mbgl. The difference in groundwater levels loosely correlates with the difference in ground level from the front to the rear of the property.

3.1.3. STABILITY OF EXCAVATIONS

Excavations in Made Ground are likely to be unstable and so will require temporary support. Excavations within the Sandy Gravels are expected to be relatively unstable in the short term so any excavation deeper than 1.2m and requiring entry by site personnel will require shoring for safety.

3.2. BASEMENT IMPACT ASSESSMENT

As part of the GEA report, a BIA has been carried out. The report concludes that the proposed development is unlikely to result in any specific land or slope stability issues.

4. DESCRIPTION OF WORKS

This planning application covers the construction of the new pool in the lower garden at the rear of the property. Additionally, minor structural changes will be carried out to the pool house and other areas of landscaping throughout the rear garden.

5. DETAILED PROPOSALS AND DESIGN CONSIDERATIONS

5.1. CONSTRUCTION SEQUENCE OF PROPOSED POOL

Prior to any works commencing on site, Party Wall Awards will need to be agreed with the neighbouring properties. Refer to Section 5.2 for details.

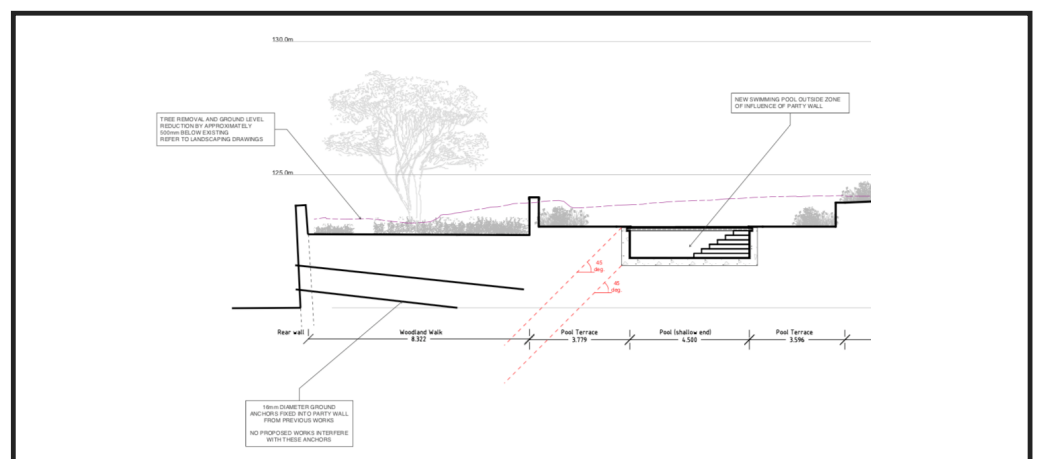
The new pool will be constructed using a combination of the following:

- Open excavation with sides battered back
- Reinforced concrete slabs and liner walls
- Tension piles to resist uplift

Within our report (section 6) we have indicated a proposed sequence of works for the pool. It is proposed to form the pool in an open excavation with battered sides, minimising the extent of the temporary works during the key construction stages. The final temporary works design and sequencing will be determined and detail designed by the groundworks contractor, with review of principals by ourselves to ensure compliance with the permanent works design.

5.1.1. BOUNDARY STRUCTURES

The main works within the rear garden are sufficiently far enough from all boundary structures. Figure 4 below indicatively shows the relationship of the proposed pool to the rear boundary wall with Witanhurst. As a result, underpinning will not be required on any of the party fence wall lines of the adjacent properties.



[FIGURE 4] PROPOSED SECTION THROUGH POOL AND REAR BOUNDARY WALL

5.1.2. HEAVE PROTECTION

The results of the site investigation have shown that Claygate Member is present at a depth of around 15m below ground. It is possible that the ground at depth could heave as

a result of removal of overburden, and therefore the swimming pool shell will need to be designed to resist the long term uplift affects of heave.

5.1.3. WATER PRESSURE AND CONTROL

Initial assessments show that for a conservative assumption of ground water at 1m below ground level, the dead load of the proposed pool structure (empty) is not sufficient to resist uplift pressure in the permanent condition and therefore tension piles will be necessary.

Significant inflows of groundwater into shallow excavations are unlikely, however seepages may be encountered from localised perched water tables. As a result, localised water pumping may be required.

5.1.4. HIGHWAYS

The proposed works are to be carried out in the rear garden and are therefore a sufficient distance from all nearby highways. An AIP is not considered to be required for these works.

5.2. PARTY WALL MATTERS

The proposed development may fall within the scope of the Party Wall Act 1996. Procedures under the Act will be dealt with in full by the Employer's Party Wall Surveyor. The Party Wall Surveyor will prepare and serve necessary notices under the provisions of the Act and agree Party Wall Awards in the event of disputes.

5.3. DESIGN CODES

The following design codes will be followed during the detailed design stage:

The Building Regulations 2010 - Approved Document A

- BS 648 - Weights of building materials
- BS 5950:1 - Structural use of steelwork in building
- BS 5268 - Structural use of timber
- BS 5628-1:2005 - Code of practise for the use of masonry
- BS 6399:1 - Loadings for buildings (Dead and imposed loads)
- BS 6399:2 - Loadings for buildings (Wind loads)
- BS 8000:Section 2.2:1990 - Workmanship on building sites
- BS 8002 - Earth retaining structures
- BS 8004 - Foundations
- BS 8102 - Protection of structures against water from the ground
- BS 8110:1 - Structural use of Concrete

6. SEQUENCE OF LOWER GROUND EXTENSION CONSTRUCTION

Prior to construction works commencing, the site is to be surveyed to confirm the extent of any site services beneath the garden. The pool house is in close proximity to the proposed pool and there may be buried services located nearby. Party wall awards will need to be agreed and where necessary relevant information covering the works that are notifiable under the Act is to be provided.

Once the site has been setup with hoardings and sheeting as necessary, the removal of vegetation and trees can be carried out in accordance with the landscape designer's drawings.

The pool is to be constructed in an open excavation with the sides battered back as appropriate to the ground conditions. The Contractor will need to remove spoil through the building due to site access being from the front of the property only. Alternatively an agreement may be made with Witanhurst to allow a conveyor to remove spoil to the rear over the party wall. A conveyor belt will likely be required and details of this will be set out in a CTMP produced by the Contractor. All spoil is to be removed in accordance with the relevant standards with WAC testing (refer to GEA report for further details).

Once the excavation is complete, the pool foundations can be formed. Given the potential affects of heave and hydrostatic pressures on the base of the pool, a piled foundation (screw piles or micro piles) will likely be necessary. The piles will be designed to resist tension. A temporary piling mat (designed by the Contractor) is to be installed at ground level to provide sufficiently level and firm ground.

The pool shell (base and walls) can then be formed in accordance with the permanent works design. Local shoring and propping may be required at pool formation level to allow for services and sumps at a lower depth (to be confirmed as part of the detailed design).

Once the walls are cast, struck and cured sufficiently, the ground can be backfilled as required. This should be carried out in 150mm well compacted layers of hardcore to ensure that future settlement of the ground is minimal. Refer to Appendix A for proposed details of the RC shell.

A detailed construction method statement is to be provided by the contractor. All temporary works are the responsibility of the contractor. Detailed drawings, method statements and risk assessments are to be issued to the permanent works engineer for review/comment.

7. TEMPORARY WORKS

Temporary works design and coordination must be carried out by a suitably qualified and experienced specialist and full design details, including drawings and calculations, must be submitted to the structural engineer for comment. This specialist will be appointed by the Contractor who will be responsible for the design, erection and maintenance of all temporary works to ensure the stability of excavations and adjacent structures at all times.

8. POTENTIAL IMPACT UPON ADJOINING PROPERTIES AND LOCAL ENVIRONMENT

The proposed construction method is considered appropriate to limit the amount of potential ground movement and so minimises the effects of settlement and movement of adjacent structures to ensure that it will not be problematic.

Along with this, the appointed Contractor shall undertake the works using good practice in accordance with the structural design, following all the agreed methods of construction and required temporary works.

In reality the only excavation in proximity to any boundary/party structures is near the base of the retaining wall of the rear garden of number 6 The Grove. The excavations are of adequate distance from the foot of this wall not to be of concern.

The design of the works has taken consideration of the environmental forces as well as the response of the structural elements as their collective whole, and is being carefully designed to have the the required stiffnesses to remain within acceptable deflection constraints. The coordination of sequencing, and the checking of compliance of temporary works will minimise potential for movement.

This overall approach considers all of the potential risks, and ensures that the excavation and construction of the proposed works will not affect the structural integrity of the existing pool house or neighbouring structures.

8.1. TREES

There are a number of trees located around the rear garden. Refer to the landscape designer's drawings for details of trees to be removed/retained. The pool shell is situated away from any possible root protection zones of all retained trees and is therefore not considered to be an issue.

8.2. DRAINAGE

The new pool construction is not expected to increase discharge in to the sewer. There is an existing pool located within the garden which which will likely have a similar rate of discharge as the proposed new pool. If possible, the rising main for the existing pool should be re-used.

The existing site conditions allow the rainwater to drain naturally into the underlying Bagshot Formation. The proposed works are likely to have minimal impact on this with the current site conditions generally remaining the same. Where hard surfaces are proposed, to limit surface water run-off, permeable paving is to be installed.

The proposed pool construction is to be founded within the Bagshot Formation, the conclusions of the hydrogeological assessment carried out by GEA conclude that the proposed works will not close a pathway, or create a cut-off, and should not therefore have any noticeable affect on ground water flow.

8.3. NOISE, DUST AND VIBRATION

All demolition and construction works will be carried out by a competent and qualified contractor, who will be required to accord with the Considerate Constructors Scheme, and take all necessary measures to minimise the short term disturbances in terms of noise, vibration and dust which might impact on the local environment and the neighbouring residents and businesses.

The following measures and actions will be implemented:

Noise – Neighbours will be notified in advance of noisy activity, in particular where these are on or near boundary structures.

Vibration – While the use of percussive, powered machinery upon hard construction materials in many situations will likely give rise to inevitable vibration, wherever possible and in accordance with CCS Code, unnecessary vibration will be avoided and mitigated.

Dust – External activity shall be contained as best as possible using suitable hoardings and sheeting.

Materials stored externally would be covered or contained to avoid wind and weather disturbance to granular and particulate materials. Structural concrete will be typically mixed off-site and delivered, but where small quantities of mortar are to be site mixed, this can be done in an enclosed area to limit cement dust from becoming airborne.

Deliveries of materials shall be covered where potential for dust is prevalent. Waste skips and excavated soils are to be covered whenever practicable.

For activities that generate dust, surface wetting-down, and water misting will be used to suppress dusting. Rotary cutters will use water as a dust suppressant.

9. SUMMARY

During construction of the pool, as assessed within the ground movement analysis, no significant adverse movement is expected.

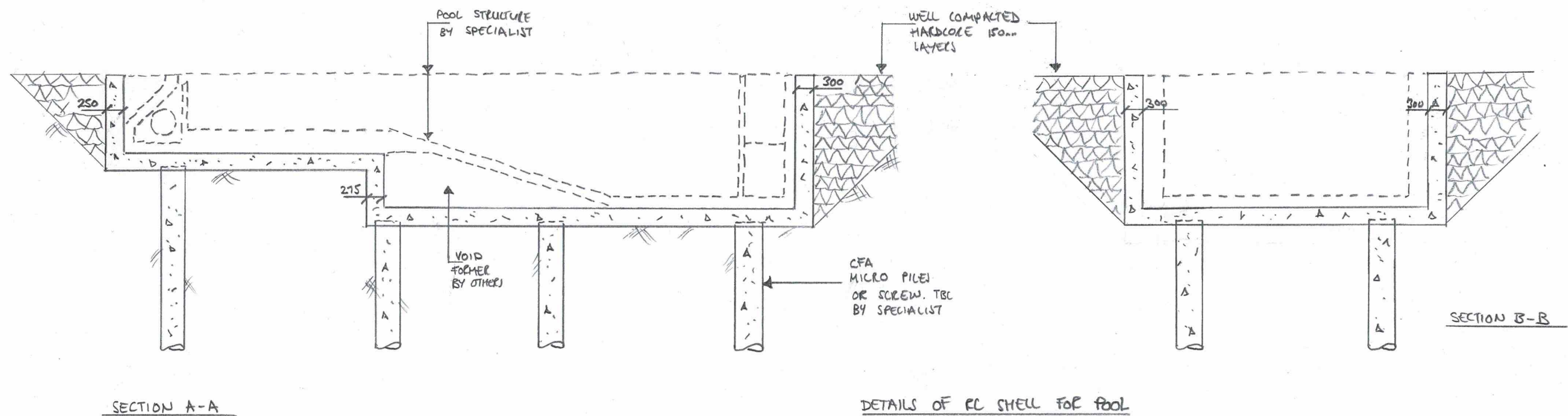
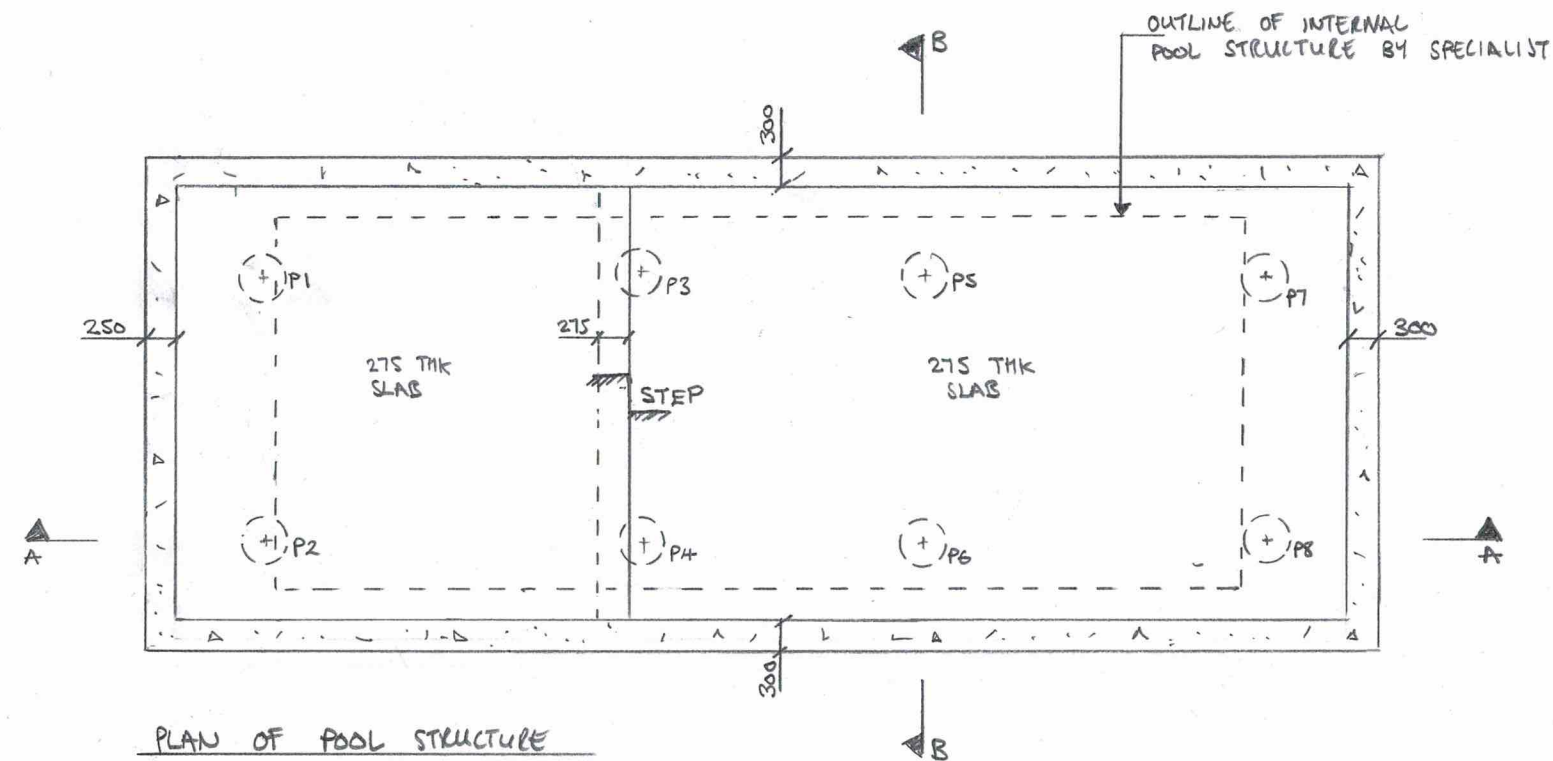
Environmental impacts have been assessed, and the response to geotechnical and hydrological aspects have been considered. The proposals are deemed to not have any adverse impact in this respect.

Once complete, the new structure will provide a robust and secure support without detriment to the overall stability of the adjacent structures or adjoining properties.

APPENDICES.

APPENDIX A – STRUCTURAL SKETCHES

Sketch 2124-SK-100 showing proposed pool shell construction



DETAILS OF RC SHELL FOR POOL

Project No. 2124	Sheet SK-100	Revision	
Date 25.8.21	Engineer T.G	Checked	Project THE GLOVE

APPENDIX B – GROUND INVESTIGATION & HYDROGEOLOGICAL REPORTS

Refer to separate document for GEA report (ref: J21179A)