RPS Health, Safety and Environment

Ref: FLC1578/002L

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Dear Holly,

Desk Study Assessment of Groundwater at Athlone House, Hampstead Lane, London N6 and the potential for proposed development to impact local trees

Introduction

RPS Health, Safety & Environment (RPS HSE) was requested by RPS Planning Transport & Environment (RPS PTE) to undertake a desk based hydrogeological assessment of the site known as Athlone House, Hampstead Lane, London.

The following reports have been made available for review in the course of this desk study assessment:

1. Supplementary Planning Report, Athlone House, Hampstead Lane N6, RPS Planning Transport & Environment, March 2004
2. Landscape Management Plan, Athlone House, Hampstead Lane N6, Catherine Bickmore Associates, March 2004
3. Report on Groundwater for Athlone House, Hampstead Lane N6, LBH Wembley, September 2003
4. Protection of Trees, Athlone House, Hampstead Lane, Whitbybird Engineers, March 2004
5. Athlone House Basement Excavation Study, Whitbybird Engineers, February 2004
6. Drawings: 627-11.01B and 627-10.03B from David Chipperfield Architects (proposed site layout)

Additionally, RPS HSE sought a copy of the following report direct from LBH Wembley:

7. Site Investigation Report, Athlone House, Hampstead Lane, London N6, LBH Wembley, June 2002

Background

The site is understood to comprise 4.9 hectares of former hospital buildings and surrounding grounds. The grounds include landscaped areas of wildlife interest including a range of trees and an ornamental pond towards the south-east.

RPS HSE understands that the project will invlove the partial redevelopment of Athlone House. Simplistically, the redevelopment will comprise refurbishment works to Athlone House itself in addition to more significant redevelopment works in the east of the site comprising the construction of Apartment Buildings A, B and C.

Apartment Buildings A, B and C will involve excavation and incorporation of a continuous basement level connecting the three sections to each other. Other aspects of the development will include some additional hardstanding associated with new access arrangements which will be off-set by the reintroduction of areas of soft ground in the position of existing buildings that are to be demolished as part of the redevelopment.

Objectives

This desk study aims to provide clarity of understanding in respect of groundwater at the site and the implications of the development project on the local groundwater regime. Concern has been raised in respect of the potential impacts on local groundwater specifically with regard to the trees that are to be retained post-development completion.

This desk study is based on the information that has been made available to RPS HSE for review and has involved consultation of published guidance and environmental data (geological maps etc). Of primary relevance to this desk study is the Site Investigation Report produced by LBH Wembley in 2002. Whilst this report provides some factual data on the local geology and hydrogeology at the site it should be noted that this investigation was not undertaken with the principal aim of defining the groundwater regime and the potential impacts to groundwater of the proposed development.

Ground Conditions

The 2002 site investigation by LBH Wembley defined the geological succession at the site to comprise:

- Made Ground (clayey sand and gravel with brick and concrete; maximum depth 3.80m bgl (below ground level)
- Claygate Member (silty sandy clay with occasional layers and pockets of fine silt and sand; maximum thickness 5.10m)
- London Clay (stiff fissured clay weathered in upper transition zones; total depth unproven)

The Environment Agency has classified the Claygate Member as a Minor Aquifer. These formations will seldom produce large quantities of water for abstraction though they are important both for local supplies and in supplying base flow to rivers. The underlying London Clay is classified as a Non-Aquifer.

RPS has confirmed the geological succession with published geological data of the BGS (British Geological Survey).

Of specific relevance to the near-surface groundwater regime are the more permeable pockets and layers of silt and sand in the Claygate Member. Whilst the clays of the Claygate Member are likely to have very low permeability in respect of groundwater the more silty and sandy layers will form the principal pathway route for groundwater associated with this geological unit.

In respect of the proposed development, groundwater is therefore more likely to be impacted where these more permeable pockets and layers are intersected or obstructed by foundations and / or basement levels of the proposed development.

The site investigation data presented for review by LBH Wembley suggests that there are no clear, distinct and continuous permeable layers within the Claygate Member locally. Borehole and trial pit logs suggest the presence the more subtle bands of clays and silts with higher content of sand.

Groundwater was reported by LBH Wembley during the site investigation at 7.10m bgl in BH1 (105.8m OD); 7.60m bgl in BH2 (104.6m OD although calculated by LBH Wembley as 108.4m OD) and 4.10-5.00m bgl in BH3 (107.2-106.3m OD). Further groundwater monitoring by LBH Wembley in September 2003 indicated groundwater at 109.1m OD (BH1) and 109.4m OD (BH2).

This data must be viewed with some caution as it does not comprise comprehensive long-term groundwater monitoring and the site investigation itself was not specifically designed to make a detailed assessment of groundwater (no groundwater data is available for positions down-hydraulic gradient of the proposed development). Further, it should also be considered that groundwater monitoring by LBH Wembley in September 2003 whilst identifying groundwater to be present at the shallowest ever recorded at the site, both of the installed monitoring wells appeared to be blocked a short depth below the recorded groundwater level. RPS HSE considers that it may be possible that these were false groundwater levels given by recent rainwater sitting on fine sediments that had accumulated in the monitoring wells.

Environmental Setting

The site is located to the north east of open park land in north west London comprising Hampstead Heath, Parliament Hill and Highgate Ponds. Athlone House is positioned on the south side of the B519.

Ordnance Survey maps for the area, indicate that Athlone House is located almost at a topographical peak with respect to its local surrounds. Only a small built-up area located to the east of the site is indicated by the Ordnance Survey to be at a higher elevation.

Open land including Hampstead Heath to the west, south-west and south of Athlone House has a general decline south-eastwards towards central London in a gentle valley. Athlone House is topographically up-gradient from this open land. On the northern side of the B519 is residential property. Beyond this approximately 0.5km to the north-west is further open land comprising a golf course. This area, however, is also below the topographical level of Athlone House.

The site itself includes a range of trees that have been the subject of further assessment in the context of the proposed development in the Landscape Management Plan by Catherine Bickmore Associates and the Protection of Trees report by Whitbybird Engineers. Whilst these reports have provided detail and specification on the retention and protection of trees during and after the proposed development, neither of these reports appears to have considered the specific potential effects on trees due to potentially modified groundwater as a result of the development.

Hydrogeology

As stated previously, the Minor Aquifer status of the Claygate Member generally relates to the water bearing pockets and layers of silts and sands that allow the transmission of groundwater through the geological unit.

Recharge of these sections of the Minor Aquifer is generally only possible where the more permeable layers outcrop and are exposed to rainwater infiltration at the ground surface. Should rainwater infiltrate the more permeable sections of the geological unit, it may then travel as confined groundwater within the permeable sections until it links with other groundwater or alternatively exits the geological formation at a second outcrop down hydraulic gradient from the point of entry i.e. as a spring.

Due to the topographical location of Athlone House generally above surrounding areas, there is likely to be very limited opportunity for groundwater to travel beneath the site from surrounding up gradient areas. The only area of land up topographical gradient of Athlone House is the built-up area towards the east. It is likely that there is limited potential for rainwater to contribute to local groundwater here due to the extent of hardstanding and limited soft ground suitable for rainwater infiltration. Any groundwater originating in this higher area of land would also have the potential to migrate in other directions to that of Athlone House.

There is potential for groundwater recharge to take place at the Athlone House site itself given the extent of soft ground present across the property. However, consultation of the borehole and trial pits logs of the LBH Wembley Site Investigation report does not indicate any distinct or identifiable permeable layers of the Claygate Member outcropping at the site. Potential for groundwater recharge should therefore be considered to be limited.

Local Hydrology

Local hydrology includes the presence of a pond in the southern part of the site comprising part of the lowest lying section of the site. It is unclear whether this pond will be retained in the completed development however a number of observations were made of this feature previously by LBH Wembley.

The pond was identified to be concrete lined and fed by a pipe providing recharge from a mains source. LBH Wembley suggested that the pond may mark the location of a natural spring line that was formally installed as a man-made pond. This is a reasonable assumption and would fit well with the theory that at this local topographical level there is little opportunity for near surface groundwater recharge in the Claygate Member. The spring line may therefore have only

previously existed at times of consistent and heavy rainfall only to remain dry for much of the year. Establishment of this pond as an ornamental feature therefore necessitated measures to artificially introduce and retain water.

In the wider vicinity a series of local water features are present associated with the Highgate Ponds. Published BGS geological maps indicate that these features are located on the London Clay formation, a Non-Aquifer, which extends for much of the length of the gentle valley associated with the Highgate Ponds in the direction of central London to the south east. It is likely that a proportion of the baseflow of these surface waters is contributed by the saturated permeable horizons of the overlying Claygate Member as they outcrop over the London Clay.

Impacts Upon Trees

Direct physical impacts to trees as a result of the development and minimisation and management of these issues has been covered in the Landscape Management Plan Report by Catherine Bickmore Associates and the Protection of Trees Report by Whitbybird Engineers.

In addition to the issues covered in both of these reports there is potential for alteration of the local groundwater environment to impact upon trees retained at the site.

From the information provided to RPS HSE, it is understood that the development will involve the loss of some trees as a result of the positioning of new buildings.

There is some potential for alterations in the site groundwater regime to affect trees on site. Specifically, this relates to the trees located to the south of the proposed Apartment Buildings A, B and C.

The proposed Apartment Buildings incorporate basements to a maximum extent understood to be approximately 5m. Given the incline of the site indicated in the LBH Wembley site investigation report, the basement level on the downhill side of this section of the development will be some 2m less.

LBH Wembley previously indicated that the development would likely result in local groundwater flowing around the basement structure and that this could be assisted via the incorporation of dedicated drainage.

RPS HSE considers this likely to be a robust and suitable solution in maintaining the near-surface hydrogeological regime to the immediate south of the proposed Apartment Builldings. Limited design details of the proposed development are currently available. However, an

appropriate method in achieving a preferential drainage path would be for site won crushed concrete (with fines removed) to be used as a continuous drainage medium around the perimeter and under the base of the proposed structure in a similar fashion to a traditional French drain. This granular drainage layer should be "keyed in" to the Claygate Member both up and down-hydraulic gradient and retain a minimum thickness of 0.5m around the development structure. The use of crushed concrete materials should be managed as part of the site Construction Environmental Management Plan (CEMP).

Details of the design of any drainage blanket should be established in conjunction with the finalised foundation design details, However, any such design should provide for the most effective way of transporting groundwater from up-hydraulic gradient of the Apartment Buildings to a position down-hydraulic gradient and away from these structures.

Whilst the incorporation of the drainage layer is likely to assist in maintaining site hydrogeological conditions it is not possible to comment with 100% certainty that no subsequent damage will occur to the trees as a result of subtle changes to the groundwater regime. It should however, be considered that existing trees at the site have remained established over time with some considerable degree of hardstanding and building coverage, albeit with less significant basement structures. It should also be considered that groundwater, when encountered at the site has generally been at depths of 4.10m to 7.60m bgl (excluding LBH Wembley monitoring in 2003) and that no continuous and extensive water-bearing horizons have been identified that would be compromised by the proposed development.

Conclusions and Recommendations

The site is located on a Minor Aquifer. Whilst an assessment of groundwater has been made, robust long-term monitoring data is not available.

Information reviewed as part of this desk study suggests that the site is of limited importance with respect to the transmission of groundwater in the wider vicinity. This is on the basis that there is limited land mass offering recharge capability up-hydraulic gradient from the site and the site itself does not comprise any significant outcrops of highly permeable strata.

Incorporation of a continuous drainage blanket layer around and beneath the proposed basement levels of the development should limit the impact of the development on the down-gradient hydrogeological regime. This should minimise potential impacts on trees at the site as a result of modified groundwater conditions. This will also compensate for any potential impact on the down-gradient hydrological features such as the Highgate Ponds.

As a further measure, groundwater monitoring should be conducted before, during and after the development construction as part of the CEMP. Any further unaccounted for adverse impacts on the groundwater regime should be identified by such monitoring and in the unlikely event that further measures are required to address such a situation, decisions may be made with a full understanding of the site and groundwater conditions. Groundwater monitoring should also make provision for consultation with the Environmental Regulators.

RPS HSE considers that provided the recommendations outlined in this desk study are adhered to then potential risks in respect of groundwater at the site may be overcome in full. RPS HSE would be happy to provide a detailed proposal for a CEMP, groundwater monitoring program and review of drainage blanket design upon request.

Yours sincerely
For RPS Health, Safety & Environment

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