8 PILGRIMS LANE NW3 1SL

Review of planning application 2012/5825/P to Camden Council with respect to Camden development Policy DP27 and associated matters.

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Summary

Report summary

1. Planning application 2012/5825/P to the London Borough of Camden (Camden), proposes the construction of a new basement at 8 Pilgrims Lane NW3 1SL. Mr Froment of 10 Pilgrims Lane and Mr Owens of 6 Pilgrims Lane (the Clients) instructed me to advise them of the potential impact of the basement development proposed by the application upon their property. To this end I have examined the application as provided on the Camden website.

2. I have commenced my report with a review of relevant legislation and have made the point that it is solely DP27 that imposes a statutory requirement for designs to limit the risk of damage to neighbouring property to "slight" (category 2). But for the existence of DP27, any amount of damage caused by a development to neighbouring property would be permissible, provided that it did not threaten the health and safety of persons in or about the property. I have also pointed out that the Party Wall etc Act cannot be used as a fail safe remedy for poor planning decisions.

3. When the various application documents are taken together, the picture which emerges is of numerous well meant, specialised and sometimes contradictory presentations that are all inconclusive in that they all leave loose ends with respect to DP27. They all need taking to another stage in order to produce a coherent result that exhibits joined up engineering and satisfies DP27.

4. Each of the adjacent properties have construction features that constitute important sensitivities with respect to the application in terms of structural risk, access to vital service installations and flood risk . They are either not recognised or are accorded passing reference without resolution.

5. The interpretation of ground and water conditions has been separately criticised by Dr Michael de Freitas. Some of his concerns about the implications of the geology and groundwater are the same as those to which he assisted me to draw attention in connection with another Hampstead development. That advice was rejected by planners and developer: groundwater problems, delay, settlement and category 3 moderate damage occurred.

6. It is intended to lower the existing basement level of No 8 Pilgrims Lane by 400mm without underpinning the party wall with No 6. The arrangement proposed is not shown by the drawings provided by Greig-Ling consulting engineers but a report by RKD Consultant dealing with ground movement and building damage provides a description and analysis. A settlement of 1mm is estimated to occur. In fact, to allow for the proposed construction context, the ground would have to be reduced to a depth of about 700mm below existing foundation level. I have made a routine estimate of stability and find that the foundation would fail quite dramatically with a risk of category 4 or greater damage.

7. No information is provided about the method and sequence of construction intended or about the way the excavated sides and/or walls of the basement would be held in place during construction. The RKD report adopts a broad brush approach which avoids awkward detail with statements that this or that will also need to be dealt with. It is explicitly based upon assumption, which term is used at least 13 times in the text in relation to the fundamental scenario of the project, quality of workmanship and design detail. Clearly if RKD did not have plausible information with which to work, it is quite proper that they should state their assumptions. But if, as is the case, they would have otherwise been unable to express their opinions, the reasons for those assumptions (lack of information that could largely be remedied) should also be expressed. That has not been done and the false impression is given that assumptions made are necessary, not just for RKD, but without limitation.

8. Computer analyses have been used as part of the work leading to estimates of building movement. They assume conceptual supports for the walls without considering how those supports and their assumed resistance to movement could be realised. To demonstrate the point I have compared the assumptions made with the system that was designed in some detail for the 9 Downshire Hill scheme that eventually received approval. When the practicalities are considered it seems unlikely that the conceptual system proposed for Pilgrims Lane could be developed into reality.

9. Here and elsewhere I have noted that the application avoids awkward detail. But DP27 is all about those awkward details. It would not exist but for the fact that so many unsuspecting residents have suffered because those details have not been resolved in good time. I consider that the number and importance of unanswered questions concerning the method, sequence and restraint of the excavations and walls during construction fail the requirements of DP27 and place neighbouring property at significant risk of harm.

10. Arup have made a partial basement impact assessment for the scheme. In considering their assessment of the potential impact of the basement on surface water drainage it is difficult to avoid the impression that the author (or perhaps authors in this case) of the BIA might not have been sure who in the design team was supposed to do what. Reference is made initially to potential impacts which were to be mitigated by designs elsewhere in the application: those designs do not exist. Later, the need for further investigation is identified, but that investigation is not reported. Eventually, all reserve disappears with a statement that the surface water drainage risk is negligible.

11. Whether or not this is so, explanations of the SUDS provisions, supposedly within the application, are needed, together with justification of the Arup conclusion. The specific flood risk to No 10 also needs proper consideration.

12. My concluding opinion is that the engineering part of the application has been dealt with in a piecemeal, disjointed and uncoordinated way. It fails utterly to demonstrate how it is proposed to construct the basement in such a way as to protect neighbouring property. Such constructional concepts as have been postulated may be seen to potentially give rise to quite difficult practical issues of temporary support during construction and in one instance potential foundation failure. None of these concepts have been developed to the preliminary stage necessary to demonstrate compliance with the specific requirements of DP27.

13. It has been my experience that basement schemes permitted without proper consideration formerly of PPG14 [9] and now DP27 have a high risk of causing unwarranted damage to neighbouring property. Viewing such situations as a construction professional I believe a major reason for this is that once a scheme has planning consent both designers and contractors understandably become subject to intense pressure with respect to both time and construction cost. Spending large amounts of time and money developing answers to problems that have nothing to do with Building Regulations and only serve to both increase perceived construction cost, and delay commencement is unwelcome from several points of view. None benefit the owners of neighbouring property. On residential schemes this often leads to a temporary works design that does not consider movement as well as stability. Movement and consequent damage are accorded something of a "suck it and see" protocol. Not all schemes are affected in this way but this experience should serve as another example of the need to fully observe the DP27 requirements.

1 Introduction and purpose of report

14. This report is concerned with planning application 2012/5825/P to the London Borough of Camden (Camden), which proposes the construction of a new basement at 8 Pilgrims Lane NW3 1SL. Mr Froment of 10 Pilgrims Lane and Mr Owens of 6 Pilgrims Lane (the Clients) instructed me to advise them of the potential impact of the basement development proposed by the application upon their property.

15. I am Michael Eldred MSc. CEng. FIStructE MICE, Director of Eldred Geotechnics Ltd and a Consultant in the disciplines of Geotechnical, Geoenvironmental, Civil and Structural engineering. The assessment which follows is exclusively of matters falling within these disciplines. They have been considered in the context of Camden's Local Development Framework (LDF) and other relevant statutory requirements.

16. I have referred to a number of documents while preparing this report. Technical publications are listed at the end of the report and are cited in the text according to their listed numbers thus [No]. References to "the application" mean the relevant planning application documents published on the Camden website. I have also referred to the following documents published by Camden. *Development Policy 27*, *Basements and Lightwells* (DP27), *Camden Planning Guidance 4, Basements and Lightwells*, (CPG4), which provides guidance on the implementation of DP27, and Ove Arup & Partners Ltd report to Camden entitled *Camden geological, hydrogeological and hydrological study – Guidance for subterranean development*. I have referred to this as the Arup report. It forms the basis for preparing the basement impact assessments (BIA) that Camden require as part of planning applications for basement development.

17. It is not possible to deal with the issues affecting my instructions without considering relevant geology surface water and groundwater regimes. These are the subjects of a separate letter report dated 28th November 2012 [1] to Mr Froment by Dr Michael DeFreitas, Imperial College Emeritus Reader of Engineering Geology. I have deferred to Dr de Freitas' on these matters, adding only relevant comment from my personal experience

18. All parts of my report have equal importance but at the suggestion of the Clients, some passages have been emphasised by the addition of margin lines.

2 Statutory requirements

2.1 Relevance

19. The potential impact of construction work on neighbouring property is considered by planning legislation, the Building Regulations and the 1996 Party Wall etc Act (PWA). The jurisdiction of the Building Regulations is limited; they do not require anything to be done except for the purpose of securing reasonable standards of health and safety

for persons in or about the buildings. Consequently they cannot be invoked to control anything but potentially very severe impact on neighbouring property. The PWA is concerned with any level of impact upon neighbouring property caused by permitted work. When planning consent is required the Act comes into effect only after consent. That consent has the potential to affect the administration of the Act, and the flow of control from planning legislation to the PWA needs to be considered.

2.2 Planning legislation

20. I am not expert in planning legislation but wish to draw attention here to matters of fact and to comment upon them from the standpoint of a construction professional.

21. Development policies form one tier of the Camden LDF. DP27 states that "The Council will only permit basement and other underground development that *does not* cause harm to the built and natural environment.....We will require developers to *demonstrate* by methodologies appropriate to the site that schemes (a) maintain the structural stability of the building and neighbouring properties;.....". (The italics are mine). CPG4 explains what is meant by harm to the built environment and failure to maintain the structural stability of neighbouring properties.

22. DP27 thus places the onus on developers to demonstrate (give proof or evidence) that a scheme meets Camden's stated requirements before any planning consent can be entertained. Nothing less will do.

23. The importance of this becomes evident when it is realised that it is solely DP27 that imposes a statutory requirement for designs to limit the risk of damage to neighbouring property to "slight"[2]. But for the existence of DP27, any amount of damage caused by a development to neighbouring property would be permissible, provided that it did not threaten the health and safety of persons in or about the property. Furthermore, since compliance with DP27 is solely a planning requirement, such compliance cannot be enforced by any other regulation or statute. If planning permission is granted before an application satisfies DP27, the opportunity to exert that control is lost. Thereafter, limitation of damage by design would be a matter largely controlled by the judgement and consideration of the developer's design and construction team.

24. Compliance with the stated requirements of DP27 before planning consent is granted is thus essential. Granting permission subject to an applicant undertaking work to satisfy DP27 at some later stage would not only be a nonsense, it would also, arguably represent a failure on the part of Camden. Careful consideration of the amount of detail actually required at planning stage is imperative.

2.3 The Party Wall etc Act

25. In terms of impact on neighbouring property, this Act is sometimes seen as a convenient means of picking up the pieces left by a planning determination; a kind of fail-safe measure. Such interpretations are wrong and misleading.

26. In the present context it is important to understand that the Act imposes no limit on the degree of damage that may be considered acceptable. It is rather an instrument intended to give the parties reasonable rights and to allow both settlement of disputes and award of compensation without resort to the Courts. As such it deals with the execution of work and its consequences, not the estimation of risk required by DP27.

27. Situations governed by the Act are prescribed and rules are given that concern the rights of the parties, the manner of executing relevant work, and making awards as between the parties. The powers of party wall surveyors are restricted to administration of the Act. It is for the developer to comply with other statutory requirements. Very importantly, party wall surveyors have no authority to enforce compliance with planning decisions or conditions.

28. There is no doubt that the provisions of the Act may be interpreted to allow party wall surveyors to negotiate and agree on designs and methods that minimise damage to neighbouring property, and that on commercial development negotiations are likely to be taken to a fairly advanced technical level. On residential schemes, once planning permission has been granted, it is sometimes exceedingly difficult to persuade a developer's team that the final design should consider ground and structural movement/damage in anything but a trial and error way. To some extent this, as the Arup report points out, is because residential basements often do not attract the same type of organisation as those involved in commercial work. It is also likely to be because, planning consent obtained, the engineers are concerned only with Building Regulations approval, which is concerned principally with the safety of the developer's project, not movement and damage of neighbouring property.

29. In such cases, the end result can depend upon the attitudes of the party wall surveyors concerned, and here it has to be realised that they have no responsibility for the adequacy of the developer's work and, officially, no control over design apart from refusing to agree that affected parts of the work can start until it is adequate. If Camden has not seen fit to insist on full compliance with DP27 at planning stage, the parties have no satisfactory baseline design from which to start and in some circumstances that can increase the risk of damage to neighbouring property.

3 Compliance requirements for DP27

30. Camden give the first three requirements of DP27 as follows. "We will require developers to demonstrate by methodologies appropriate to the site that schemes (a)

maintain the structural stability of the building and neighbouring properties, (b) avoid adversely affecting drainage and run-off or causing other damage to the water environment and (c) avoid cumulative impact on structural stability or the water environment in the local area".

31. CPG4 and the Arup report provide guidance aimed at helping developers satisfy DP27. They do not supplant the development policy itself but it is relevant that the Arup report uses as its precedent environmental risk management models that require each decision and informing statement to be transparently justified for peer review.

32. Referring to each of the three requirements (a) to (c) above in turn, it is possible to state fairly simply a number of matters about which information is needed to make decisions and for which the information must be reported to permit peer review. The list is not exhaustive.

33. Structural stability of the building and neighbouring property depends upon:

(i). The condition and construction of the buildings and their sensitivity to movement

(ii). How much ground movement will occur in consequence of the basement construction

(iii). How much the basement walls will move

(iv). How much the buildings will move

(v). How much building damage these movements will cause.

34. These effects depend in turn upon:

(vi). The fabric, structure and engineering properties of the ground

(vii). Ground water levels and behaviour

(viii). Method and sequence of construction

(ix). Method and sequence of supporting the sides of the excavation and basement walls temporarily during construction

(x). Resistance of the temporary supports to movement

(xi). Quality of site management and technical supervision.

35. Avoiding adversely affecting drainage and run-off or causing other damage to the water environment depends on:

(xii). The fabric, structure and engineering properties of the ground

(xiii). Ground water levels and behaviour

(xiv). Balancing the characteristics of existing and proposed surface water disposal regimes by sustainable urban drainage system management (SUDS)

36. Avoiding cumulative impact on structural stability or the water environment in the local area depends on:

(xv). Accounting for the presence of any existing nearby subterranean development

(xvi). The potential effect of basement excavation on larger scale slopes and other topographical features in the area

(xvii). The fabric, structure and engineering properties of the ground

(xviii). Ground water levels and behaviour.

37. Items (i) to (xviii) above are required information for any urban basement development. The Basement Impact Assessment (BIA) procedure advocated by the Arup report includes a screening process designed to make applicants aware of features specific to the Camden district that may prompt the need of further work in order to provide that information. The BIA process and my eighteen points (i) to (xviii) thus have the same purpose, but the linkage between the screening questions and those points noted under each of the DP27 requirements might not be obvious to non technical readers. The next section considers first the response of the application to the requirement to provide the information listed under points (i) to (xviii).

4 Response of the application

4.1 Summary of response to information items (i) to (xviii)

38. The following table gives brief comment on the adequacy of information provided by the application. Where necessary, further detail is given in subsequent parts of this section of the report.

Item	Information required	Response
(i)	The condition and construction of the buildings and their sensitivity to movement	A general description of age and type is given; information provided about detail and sensitivity of the houses is inadequate.
(ii)	How much ground movement will occur in consequence of the basement construction	The information provided is not reliable because the way in which the construction will be supported so as to restrain movement to the degree assumed by the assessment is not defined, and because also of the uncertainty about ground conditions [1]
(iii)	How much the basement walls will move	
(iv)	How much the buildings will move	
(v)	How much building damage these movements will cause	
(vi)	The fabric, structure and engineering properties of the ground	The information provided is disputed [1]

Item	Information required	Response
(vii)	Ground water levels and behaviour	The information provided is disputed [1]
(viii)	Method and sequence of construction	A drawing shows the types of construction proposed but the method and sequence of working are not defined.
(ix)	Method and sequence of supporting the sides of the excavation and basement walls temporarily during construction	No information is provided
(x)	Resistance of the temporary supports to movement.	No information is provided.
(xi)	Quality of site management and technical supervision	Various statements are made with the intention of providing reassurance on these matters. Examined closely, though, they have less practical substance and commitment than might at first be supposed. More detail is needed.
(xii)	The fabric, structure and engineering properties of the ground	The information provided is disputed [1]
(xiii)	Ground water levels and behaviour	The information provided is disputed [1]
(xiv)	Balancing the characteristics of existing and proposed surface water disposal regimes by SUDS	The BIA provides information but leaves some points unresolved.
(xv)	Accounting for the presence of any existing nearby subterranean development	No information is provided
(xvi)	The potential effect of basement excavation on larger scale slopes and other topographical features in the area	The BIA item 3.1.3 demonstrates that there are no larger scale slopes and other topographical features in the area that are potentially unstable. Item 3.2.3 also considers impact of the basement excavation on the slopes that do exist. The information provided is satisfactory for the finished construction but the engineering design does not provide for stability during preceding temporary construction stages.
(xvii)	The fabric, structure and engineering properties of the ground	The information provided is disputed [1]
(xviii)	Ground water levels and behaviour	The information provided is disputed [1]

4.2 Formulation of the response

39. There are several application documents that are relevant to the three parts of DP27 considered. When they are viewed collectively, it is very difficult to avoid the impression that the efforts of several well qualified people have been misdirected and uncoordinated to the extent of missing the point of DP27 altogether.

40. Part 7.1 of a combined factual and interpretative ground investigation report by Geotechnical and Environmental associates (GEA) [3] considers ground and wall movement in a general way and refers to the importance of temporary excavation supports as a means of limiting movement. A later similarly combined investigation report by Lister [4] confines consideration of settlement of adjacent structures to a single paragraph on page 19. This however ignores the possibility of limiting movement and instead recommends that all structures within 2m of the proposed basement excavation should be underpinned.

41. These reports are intended to advise and assist the design engineers, in this case Greig Ling Consulting Engineers. But despite their contrasting recommendations they have been simply included in the application without further interpretation or comment, and the Greig-Ling drawings make no reference to either temporary supports or the need or not to underpin neighbouring property. According to the documentation, then, two different Ground investigation specialists have made conflicting recommendations at different times and the design engineers have, without comment, ignored both.

42. RKD Consultant Ltd have made a ground movement assessment report [5] on behalf of Greig-Ling. It is the principal interpretative document relating to structural stability of neighbouring property. Prepared on behalf of Greig-Ling, the report should presumably solve the problems that Greig-Ling cannot and collaterally with Greig-Ling's information, deliver demonstrably justified statements that directly satisfy DP27. It does not do so.

43. Instead, it adopts a broad brush approach which avoids awkward detail with statements that this or that will also need to be dealt with. It is explicitly based upon assumption, which term is used at least 13 times in the text in relation to the fundamental scenario of the project, quality of workmanship and design detail. Clearly if RKD did not have plausible information with which to work, it is quite proper that they should state their assumptions. But if, as is the case, they would have otherwise been unable to express their opinions, the reasons for those assumptions (lack of information that could largely be remedied) should also be expressed. That has not been done and the impression is given that assumptions made are necessary, not just for RKD, but without limitation. As one example, good

workmanship is "necessarily" assumed. It does not have to be and residential basement history in Camden suggests it should not be.

44. The seemingly confident predictions of the RKD report should thus be read with great attention to the professional disclaimers it contains.

45. The RKD report makes no reference to interpretative comment in the ground investigation reports. Its thrust is that expected wall and ground movements may be confidently estimated by analysis, using the ground information reported, and direct reference to published case histories for piled walls in the expectation that temporary supports will be as good as those of the cases considered. There is no information about how that support will be achieved in practice.

46. No good published case histories exist for walls formed by underpinning. Where that type of construction is intended, the report estimates movement using the commercial FREW computer program. I shall return to that but it is important at this point to note that the report states that movement of such walls depends greatly on the quality of workmanship, assumes adequate knowledge of ground and water conditions, workmanship of a high standard, gives diagrams that assume quite stiff temporary supports (stiff meaning that the supports have high resistance to movement when the wall places load upon them) and concludes that wall movement and consequent damage will be negligible. In other words, the conclusion is based upon the very best possible situation. That contravenes all relevant standards of good engineering practice.

47. What the RKD report tells the reader in essence is that if enough is known and everything is done properly, damage to neighbouring property will be negligible. No one disputes that. It is evident from observation of the successful outcome of major engineering projects. It is typically those successful well conceived, researched and controlled projects that form the database to which RKD refer in opining that all will be well. Where is the evidence that the project at 8 Pilgrims Lane will be of that standard? It is not in the application.

48. Arup have made a BIA report [6] for the applicant, Mrs Abiola. Unusually, this does not deal with risk of damage to neighbouring property and is effectively confined to parts (b) and (c) of DP27. It does, however, show that instability of the development property itself could occur in a way that potentially affects neighbouring property. The division of responsibility apparently prevents Arup from considering the potentially cumulative impact of that upon other property. The result seems to be confusion about the form of preventative support required.

49. The relevant documents also include a construction management plan (CMP) by A & I Construction Ltd. This has 146 pages that deal with a largely formalised compendium of predominantly statutory requirements. Management of ground

movement and building stability occupies slightly less than one page. Its subject is the provision of movement monitoring services. Those are important but there is not one word about how the construction that is to be monitored will be managed into adequate existence in the first place, or how follow on management of the consequences of monitoring data will be achieved.

50. The picture which emerges is of numerous well meant, specialised and sometimes contradictory documents that are all inconclusive in that they all leave loose ends with respect to DP27. There are:

(xix). two ground investigation reports with unexplained conflicting advice;

(xx). engineering drawings that provide no practical information about method and sequence of construction or about temporary support of ground supporting neighbouring property;

(xxi). a BIA report that presents a stability issue with potential to affect other property, but has no authority to consider that potential;

(xxii). a ground movement assessment report by RKD that is so based on assumptions that cannot be justified by the available information and is so devoid of information about the means of achieving the practical support required that it has to be viewed as little more than a statement of hope;

(xxiii). a construction management plan that effectively ignores management of the basement construction itself.

51. All of these documents need taking to another stage in order to produce a coherent result that exhibits joined up engineering and satisfies DP27. Here I refer to CIRIA C580 [7] which states with respect to the type of piled wall proposed *"The contractual environment in which embedded retaining walls are designed and constructed is fragmented. It is recommended that a lead designer be appointed to review and oversee all stages of the design and construction process to ensure that the clients' requirements are met. This is essential to ensure consistency and certainty of outcome."* I would add that the need is equally important for any form of subterranean work.

4.3 Sensitivity of neighbouring property

52. No 6 Pilgrims Lane is to the west of No 8 (to the right when viewed from the street) and No 10 is to the east.

53. No 6 is a terraced house, probably of about the same age as No 8. The front main part of the property shares a party wall with No 8, while the rear extension is set to the west so that there is an open area between the building and the boundary with No 8. There is a basement floor below the whole of the house, which is, allowing for ground slope, slightly higher than the existing basement floor of No 8.

54. The basement and ground floors in the front main part are open plan so that the party wall connects only to the front bay and the rear external wall. Each of these is heavily perforated with window openings, meaning that there is very little possibility that they could distribute the effect of party wall settlement across the width of No 6 so as to reduce visible damage. It is rather the case that party wall settlement, should it be underpinned, (that is not intended at present but see 4.6) would tend to concentrate damage in the front and back walls close to the party wall. If the party wall settled by 5mm due to the underpinning process alone as suggested by the RKD report and all of the consequent movement at the rear of the main part of No 6 were to be concentrated in the perforated return wall between the rear extension and the party wall, it is arguable that damage in that wall could reach Category 3 on the Burland scale [2], which would be unacceptable. This assumes good workmanship in controlled conditions and would be due solely to underpinning. It makes no provision for any additional ground movement caused by the basement excavation. My experience, again when acting for adjoining owners, has been that in situations where ground water has caused difficulty, underpin settlement can be significantly more than RKD suggest and that damage can be up to Category 4 (severe).

55. I do not say that the level of damage I have described would or would not occur (the Burland damage assessment method deals only with risk), but rather that there are an obvious building sensitivity and a risk that have not been considered in any way, let alone as they need to be for the purposes of DP27.

56. Another area of sensitivity, which is considered further in sub section 4.6 below, also occurs at the party wall. It seems likely that a sewer serving at least No 6 and possibly other property runs above basement floor level against the party wall, and is surrounded by concrete. In that situation the sewer will effectively be attached to the wall and in the event of the party wall being damaged by settlement it is probable that the sewer too would be damaged.

57. No 10 Pilgrims Lane is a detached modern house which abuts the east flank wall of No 8. Its first floor includes a flying freehold above a car port leading to the rear of No8. This is supported where it abuts No 8 by a beam and two columns of unknown construction. The columns are supported by ground adjacent to the east side of the No 8 basement. Nothing is known of the column foundations and neither of the ground investigations in the application was used to determine their construction.

58. According to a letter from party wall surveyors David Maycox & Co, which is included in the application, the freehold of No10 commences 2m above the level of the entrance hall in No 8. The survey drawings in the application place this freehold line approximately 100mm below the measured underside of the first floor of No 10 above the car port.

59. The boiler room for No 10 is set below the adjacent car port level at the back right hand corner of the house and is accessed from the car port. Its floor level is 0.9m below entrance door threshold level, which is slightly above car port paving level.

60. The principal structural sensitivity of the house is related to the potential for differential movement of the isolated column foundations to cause distortion and possible damage to the flying freehold. It is currently proposed that one column should be underpinned to some undefined depth without altering the second. Underpinning an isolated footing while also separately underpinning the abutting wall of another owner, both without permitting damaging movement is not a straightforward task. The application gives no information either about how it would be achieved or how differential movement between the two column footings would be avoided. It must demonstrate those provisions to satisfy DP27.

61. According to the GEA investigation report, the retaining wall that supports the garden of No 10 is founded about 1m below ground level in No 8. it is proposed that a contiguous piled wall be constructed immediately in front of about 50% of the wall's length. Construction of the piles will alter the ground that supports this part of the wall. Nothing is known of the way in which the existing retaining wall is constructed or of the means by which it achieves stability. In consequence it must be considered sensitive to any disturbance and at risk of damage by differential settlement and/or instability. The requirement of DP27 must be demonstrated.

62. A non structural sensitivity of No 10 relates to the boiler room. The boiler is gas fired and access will be needed for both planned maintenance and in the event of emergency, at any time. According to the Greig-Ling drawings, the contiguous piled wall is intended to be less than a metre from the access door. The application does not consider how the construction would be carried out under these conditions while providing for safe access and avoiding damage to the gas installation. Also, the boiler house is sensitive to flooding. The Architects' drawings show the end of the car port next to the boiler room access blanked off with a wall. I understand that although not included in the Camden schedule of roads at risk of flooding rainwater does gather in this bend of Pilgrims Lane due to run off from the steep slope of Kemplay Road. At present, any overflow into the car port can drain away, but the proposed wall at the lower end could possibly cause water to collect and flood the boiler room.

4.4 Ground and water conditions

63. De Freitas [1] shows that ground and water conditions are not so well known as the application suggests and the uncertainties expressed there are clear. I would however add to paragraphs 2.1 to 2.5 from my own experience when acting for adjoining owners elsewhere in Hampstead. In that case, groundwater levels in boreholes excavated in the Claygate Beds were monitored through 2011, a year of

low rainfall that prompted national concern about potentially impending hydrological drought. Water levels were above a proposed basement level but the scheme engineers and other consultants responsible for the BIA considered that low soil permeability values measured in the boreholes made the risk of groundwater problems occurring insignificant.

64. The conditions now described by Dr de Freitas and to which I have referred above applied also to that situation. Nevertheless, concerns on this account, which were made known to all concerned after consultation with Dr de Freitas were set aside by the developers advisors, and planning permission was granted. During abnormally high rainfall in the early part of this year, shallow groundwater caused difficulty for the project. Continuous pumping was required, and both foundation settlement and damage to adjoining structures were greater than expected by the developer. Category 3 damage occurred in some places.

65. In essence the mass permeability of the shallow ground was much greater than supposed from small scale tests and the failure to account for known geological processes exposed the works and surrounding property to risk from natural events. It would be extremely unwise for planners or the developer's advisors to ignore the inherent risks associated with the geological structure described by Dr de Freitas and the added risk of relying upon either small scale permeability tests or water levels measured during dry periods.

66. Section 7.4 of the BIA [5] refers to undrained and long term ground conditions when considering overall basement stability. The following two paragraphs give a simplistic explanation of these terms in the present context which is intended to assist non technical readers to understand what follows thereafter.

67. When a hole is excavated, the surrounding ground tends to collapse into it, particularly when the sides of the excavation are vertical, but in clay that does not happen immediately. Clay soil has microscopically fine grains and the spaces between them contain water. At first, when the sides tend to fall in, the water exerts suction on the grains to hold them in place. Further away from the hole there is less tendency for collapse and less need for water suction. Further away still the ground is stable and the water exists at normal pressure. So there is a pressure change from very low (suction) at the side of the hole to a higher normal value where the ground is not affected. For reasons that will become evident that is termed the undrained state in which the water suction keeps the soil next to the hole strong enough to stand.

68. The water pressure system in the ground is then rather like a weather map with areas of high and low pressure and, like the weather system, low pressure areas tend to get filled from the high pressure areas around them. In soil, the water drains between the grains to achieve this. As this reduces the suction near the side of the hole, the soil weakens and starts to move inwards and the ground close to the hole starts to settle.

Eventually, the completed pressure change allows soil near the hole to collapse and creates a zone around the hole where the soil strength is reduced. The time taken for this to happen depends on the type of soil. In some stiff unfractured clay the process may take many years. In clean sand or gravel, it happens instantaneously. Nevertheless, it is referred to generally as the long term or drained condition.

69. The BIA points out that excavation of the basement could in the long term create unstable ground extending into No 6 Pilgrims Lane unless the base of the underpinning on that side is securely prevented from moving horizontally. According to the BIA, Greig Ling have been advised to design the basement floor slab to provide that support. That is well and good but it begs the questions (a) how long would it take to reach the stage when the permanent floor slab of the new basement was cast and strong enough to provide the support; (b) to what extent would the drainage of the ground in No 6 have progressed towards its long term weaker state by then and (c) how is the ground in No 6 to be supported meanwhile?

70. Considering the geological history and modified nature to be expected of the Claygate Beds it is by no means certain that a very long time would be required for the conditions to reach the long term state. How much are the cut faces of the 4m deep underpinning excavations likely to swell and move inward before the pins are concreted and the concrete has gained sufficient strength to be propped? Confident assertions might be made about these things but what happens when plans go awry and those responsible have to focus their abilities on problems that were not even thought about for the conceptual design? Monitoring is referred to but usually that is applied to piled walls, not underpinning in progress.

71. These are matters of importance for DP27 but they have not been considered by the application.

4.5 Method and sequence of construction

72. Greig-Ling drawings show outline proposals for the completed structure but give no indication of how and in what sequence it would be achieved.

73. The RKD report makes assumptions about the way some parts of the work would be carried out (assumptions perhaps because no one else has made decisions) and sometimes makes statements bordering on specifications. But there is nothing that can be relied upon as a justified statement of what it is actually proposed to do to in order to create a basement in a way that satisfies DP27.

74. As example part 2.3 of the report and particularly page 4 states what the temporary propping of the construction is required to do and where it might be applied, but stops well short of showing how all of that is to be achieved. Again, the preliminary analyses assume a particular stiffness for the struts that are assumed to temporarily support both the piled wall and the underpinned wall, but offer no information on how

it is proposed to achieve that stiffness in practice. And yet the movement and damage estimates provided are meaningless without that information.

75. To illustrate my concern about this, I draw first upon information provided by Arup in their proposal [8] for the scheme at 9 Downshire Hill that eventually received consent. The support stiffness assumed by Arup had a value of 24 for every metre of the length of wall supported by the struts. The units of that figure are not important for this discussion. The struts were to be placed at 10m intervals along the wall, so that each strut had to have a stiffness of 10x24 = 240. To give the struts themselves the required stiffness (resistance to shortening) they had to be steel tubes 0.6m diameter with 9.5mm thick walls. The struts also had to be anchored so that whatever supported the ends of the struts would not give way and reduce the overall stiffness. That was to be done by fitting and jacking the struts tightly between opposite walls of the basement. Each of the 3 tonne weight props could have been inserted by crane because the site would have been open following demolition of the existing house.

76. Returning to the present scheme, RKD assume a corresponding strut stiffness of 30 for every metre of wall supported. The spacing of the individual struts is not considered but 4m intervals might be reasonable in this case for the piled walls. Individual strut stiffness would then need to be 30x4 = 120 which, in proportion to Downshire Hill would require something like a 0.35m diameter tube with an 8mm thick wall (about 1 tonne per prop) if the struts could be set tightly between opposite walls of the basement. Given the basement arrangement, access conditions and differing forms and speeds of wall construction that is most unlikely. So how is the assumed restraint to be achieved? And if the struts have to be supported other than by opposing walls, how are the ends of the struts to be supported so that they do not move? According to the analyses, the force in struts set horizontally to support each individual underpin would be 3.5Tonnes and would be about 15 Tonnes for struts set at 4m intervals against the piled walls.

77. I have noted that the application avoids awkward detail. But DP27 is all about those awkward details. It would not exist but for the fact that so many unsuspecting residents have suffered because those details have not been resolved in good time. I consider that the number and importance of unanswered questions concerning the method, sequence and restraint of the excavations and walls during construction fail the requirements of DP27 and place neighbouring property at significant risk of harm.

4.6 Computer analysis

78. There are such fundamental omissions from the engineering part of the application that the niceties of computer analysis pale almost to insignificance. Nevertheless it is appropriate to comment on some of the analyses made and to be clear about some aspects of the methods used.

79. The FREW computer program is concerned with the analysis of retaining wall *structures* and estimation of their deflection and movement. That is all; it accounts for ground and water pressures to achieve those ends but it does not model or provide any information at all about ground movement behind or in front of the wall. That is an inherent feature of the program's formulation [9] which is confirmed by CIRIA C580. Settlement and other movement of the surface of the ground retained by a wall is however influenced by the way a wall moves. Helpful attempts have been made to correlate ground movements measured on two well documented projects in London with estimates of wall movement obtained by FREW; RKD use the relationship obtained in their analysis. It is however emphasised [7] that the correlations apply only to specific ground conditions and a particular method of supporting a wall during construction. The reported ground conditions at Pilgrims Lane bear no relation to those to which the correlations apply and, while the application provides no information about the actual method of wall support, it is difficult to see how it could in practice be as stiff as that of the correlated method.

80. This potential source of error only compounds the doubt already thrown upon the analytical results by questionable ground and water assessments and absence of information about construction and support methods. All affect the confidence with which derived contours of ground movement may be regarded.

81. The application proposes to lower the basement floor below the main part of No 8 by 0.4m close to the party wall with No 6. According to the Lister report[4] the existing basement floor is already nearly at the same depth as the party wall footing and the base of the concrete surround to a sewer set against the wall. Page 10 of the RKD report states that the party wall is not to be underpinned when the ground next to it is lowered below its footing level. Instead, it is intended to slope the soil down at 45 degrees from the edge of the footing to the formation level of the lowered floor construction.

82. RKD seem to have concentrated on movement and analysed a situation where the new ground formation level is only 400mm below the existing footing, using the PLAXIS finite element program. They forecast a party wall settlement of only 1mm. Intuitively that seems an unrealistic result. But no input information is provided and beyond noting that without good ground information, often including more properties than routine laboratory tests provide, it is very easy to obtain unrealistic estimates of movement using finite element programs, I am unable to comment on the analysis.

83. Allowing for the new floor thickness together with its base and finish, the excavation depth is actually likely to be about 700mm below the existing footing level, not 400mm. For the footing width suggested by RKD, the soil slope would extend about 1100mm from the centre of the party wall into the lowered basement area. The Architects' basement arrangement would not permit that to happen.

84. Notwithstanding the Architects' drawing, I made a simple stability calculation using the dimensions calculated above and the parametric soil strength values cited in the Arup BIA for their long term stability analysis. The foundation load on the crest of the small slope that would be formed was limited to the weight of the party wall only; roof and floor loads were not considered. The resulting forecast was, as expected and as I have witnessed in similar situations elsewhere, that the slope would fail causing the party wall to settle dramatically and move sideways into No.8. The damage category would be 4 or more (very severe). According to the calculation, the safety factor would be 0.65, whereas about 1.25 to 1.5 might be called for.

85. It is perhaps justifiable to cite an instance of what has happened in extreme circumstances, albeit that the present building arrangement and ground conditions would not be conducive to the same overall level of damage. A builder wished to slightly increase the headroom in the basement of a small end of terrace house and reduced the internal level below the bottom of the wall footings over a period of days. He left site on the final day and returned the next morning to find the house packed into three skips. The slope next to one part of the footing had failed in the night, the failure had become progressive, and on being called out the District Surveyor – it was a long time ago – found the house unsafe and in need of emergency demolition.

86. Engineers design and then use analysis, computerised or not, to justify their decisions. In this case it seems that RKD may have been presented with designs that have not been developed sufficiently to permit meaningful analysis and have misinterpreted the geometry that would have to ensue from the form of some construction proposed but not shown on the design drawings. They have then used computer methods; in some cases without justifying use of correlations that cannot apply to this project and in another without considering the need to check stability as well as movement. Again nothing satisfies the requirements of DP27.

4.7 Surface water disposal (Arup BIA)

87. Items 2 to 4 of the surface water flowchart at 3.1.1 of the BIA refer to three potential impacts of the basement construction and comment on the need of SUDS assessments. Item 3.2.1 then states that SUDS measures to mitigate the increased area of hard surface proposed are to form part of the application separate from the BIA. But those measures do not exist in the application.

88. Item 4.1 refers to the need of further investigation by desk study and review of drainage and landscape proposals. Section 6, covering data review does not refer to surface water disposal at all, and neither does Section 7 – assessment of impacts – which is taken up by discussions of computer modelling of groundwater flow and ground stability.

89. Section 8 – conclusions, then sets aside all previous concerns with a bland statement that the potential surface water impact of the basement is negligible. How was that decision made?

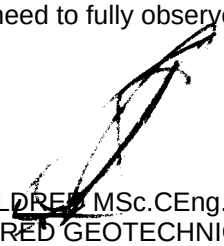
90. It is difficult to avoid the impression that despite the sagacity often associated with the Arup brand, the author (or perhaps authors in this case) of the BIA might not have been sure who in the design team was supposed to do what and lost sight of their own path during computer analysis.

91. Whether or not this was so, explanations of the SUDS provisions, supposedly within the application, are needed, together with justification of the Section 8 conclusion. The specific flood risk to No 10 (see 4.3 above) also needs proper consideration.

5 Concluding opinion

92. The engineering part of the application has been dealt with in a piecemeal, disjointed and uncoordinated way. It fails utterly to demonstrate how it is proposed to construct the basement in such a way as to protect neighbouring property. Such constructional concepts as have been postulated may be seen to potentially give rise to quite difficult practical issues of temporary support during construction and in one instance potential foundation failure. None of these concepts have been developed to the preliminary stage necessary to demonstrate compliance with the specific requirements of DP27.

93. It has been my experience that basement schemes permitted without proper consideration formerly of PPG14 [10] and now DP27 have a high risk of causing unwarranted damage to neighbouring property. Viewing such situations as a construction professional I believe a major reason for this is that once a scheme has planning consent both designers and contractors understandably become subject to intense pressure with respect to both time and construction cost. Spending large amounts of time and money developing answers to problems that have nothing to do with Building Regulations and only serve to both increase perceived construction cost, and delay commencement is unwelcome from several points of view. None benefit the owners of neighbouring property. On residential schemes this often leads to a temporary works design that does not consider movement as well as stability. Movement and consequent damage are accorded something of a "suck it and see" protocol. Not all schemes are affected in this way but this experience should serve as another example of the need to fully observe the DP27 requirements.



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