FIRST STEPS LTD
To Success

TECHNICAL NOTE
The geological and hydrological implications of the eye-witness evidence provided by David Harries who saw the aftermath of the Air Studios flooding by groundwater of July 1991.

Mr Harries' statement

1. Mr Harries' statement is as follows
"During the time of the redevelopment of the very dilapidated Lyndhurst Hall into a world class Recording Studio I was employed directly by Air Studios, a subsidiary of the joint owners, Chrysalis PLC and the Japanese company Pioneer as Project Director.

There was considerable rain during the night of 30 July 1991, the same night as the famous "Pavarotti in The Park" concert. This heavy rain resulted in the instantaneous swelling of the underground watercourse discovered below the centre of the building known as Lyndhurst Hall, Lyndhurst Road, Hampstead.

The resultant underground torrent washed away much of the soil surrounding the foundations of the building known then as "The Cottage" leaving it looking the next morning as though it was standing on brick pillars! In addition, the contractor had planned a concrete pour for that same morning for the proposed slab to the main building's basement however this had to be delayed because of the flooding to that area.
In order to protect the building from such a flood in the future an automatic underground pump was installed at that time below the Reception as a precaution."

David Harries
Managing Director,
Studio Sound Design Limited
19 Jan 2016

Further evidence from Mr Harries

2. On the 3rd February I met Mr Harries at Air Studios so that he could describe more fully what he had seen, in particular;

- the nature of the brick pillars
- their location
- the dimensions of the area washed away
- the boundaries of this area
- the location where the material washed away had been deposited
- whether ground water was still visible.

The opportunity was also taken to read with Mr Harries the Minutes of site meetings of the time to remind him as far as possible of details that may have been forgotten. Fig.1 illustrates the descriptive parts of the conversation.

3. The walls for the basement for the Plant Room and Boiler etc (Fig.1) were complete and the floor had its reinforcing bars in place ready for a pour on the morning of the 31st July. Up until that time groundwater had not been a problem; i.e. it was controllable from sump pumping whilst each panel had been excavated; the basement walls underpinned those of the building above. A borehole (almost certainly shell and auger, and dated 14.02.91) had been drilled to assess the ground conditions and recorded 1.3m of Made Ground (silty clay with flint gravel) over weathered London Clay. No water was recorded *"during the short time the hole was open"* (quote from BH log). Formation level for the basement was approximately 4.5m below ground level and thus within the weathered London Clay, (Fig.2).

4. Site meeting Minutes of 8th July show Mr Harries requesting sump pumps for the lift shaft excavation and by the 30th Sept it is reported that the excavation is 90% complete, so the pumps were being requested whilst the excavation was in the material above the London Clay and the lift was being excavated after the basement.

5. That appears to be the situation immediately prior to the inrush. When Mr Harries arrived the next morning he saw the void, the lake within it, water moving through the lake and the Cottage standing on brick stilts. These stilts were of bricks and tiles and had a most irregular profile (Fig.1).

6. Mr Harries described the approximate limits of the void eroded from beneath the Cottage and what is now the Reception (10m long x 4m wide x 1.5m deep; Fig.1) and these give an approximate volume of 60m^3. None of this material was seen outside the building – it had not washed away out of what is now the front door and down the hill towards Pond Street. The void contained groundwater which could be see flowing from the area of the lift towards the front door, but in the ground. Water level was below ground level but above the base of the void. Samples of water revealed it contained traces of sewage; i.e. it was a mixture of pure ground water and leaking utilities.

7. The basement was full of water which when pumped out revealed its floor was covered in sediment. The concrete pour for that morning was cancelled and the sediment had to be removed (and new reinforcing installed). The dimensions of the basement at the time would have been at least 9.5m x 9.5m x 4.5m = 406m^3

Deductions

8. It is quite clear that the sediment eroded from beneath the Cottage landed up in the basement covering the reinforcing with silt, sand and clay to a depth of approximately 0.7m. This points to a failure somewhere in the wall of the excavations at the time with water pouring through it and into the basement where it came to rest.

9. The status of the lift shaft at the time is unknown and no records of its construction could be found but as it was not underpinning anything and by

reason of its smaller dimensions (2m x 2m) and greater depth, for it extended approximately 1m below the floor of the basement, it was probably sheet piled. Although the exact location of failure is immaterial it was most probably in these sheet piles.

10. There appear to be no records of the details of such a failure – if ever they were recorded, but it is also known that an arch between the Cottage and that part of the church which is now the access to the stairs to the basement (shown with the swing doors in Fig.1), dropped and had to be repaired – a repair that can still be seen; i.e. the base of the brick column upon which the arch had been sitting had been eroded. So the inrush was probably most severe towards that part of the excavation and eroded down to the top of the London Clay on which, it is presumed, the brick column was founded.

11. Water continued to be a problem after that and the minutes of site meetings describe delays and the need for pumps (Fig.3 Site meeting records for dewatering the Lift Pit).

12. The material point is that failure occurred on the night a pulse of water infiltrated from rainfall, augmented by the sudden discharge form leaky sewers and soakaways, could be expected within the sediment above the London Clay. A change in the level of water came and went within the space of hours, and found any weakness in the engineering that stood in its way. Further, the Made Ground, i.e. the material above the London Clay in this case, eroded readily given the circumstances to do so.

Conclusions

13. From this the following may be concluded;

13.1. Ground water on this hill can respond very quickly to rainfall, soakaways and leakage from utilities, and the applicant has no knowledge of this for his design and no proposals for managing it.

13.2. Ground water once out of control in this ground is erosive and can rapidly undermine foundations by washing away the soil around them.

13.3. The "Cottage" (= Reception and café) is built on brick piers and shows that the experience of the architect Teulon at St Stephen's, across the road, appears to have been used by Waterhouse. The chapel may well have similar foundations. The applicant seems to know nothing about this and the evidence of Mr Harries shows their predictions of the effect ground movement resulting from excavations will have on the building needs a major re-think.

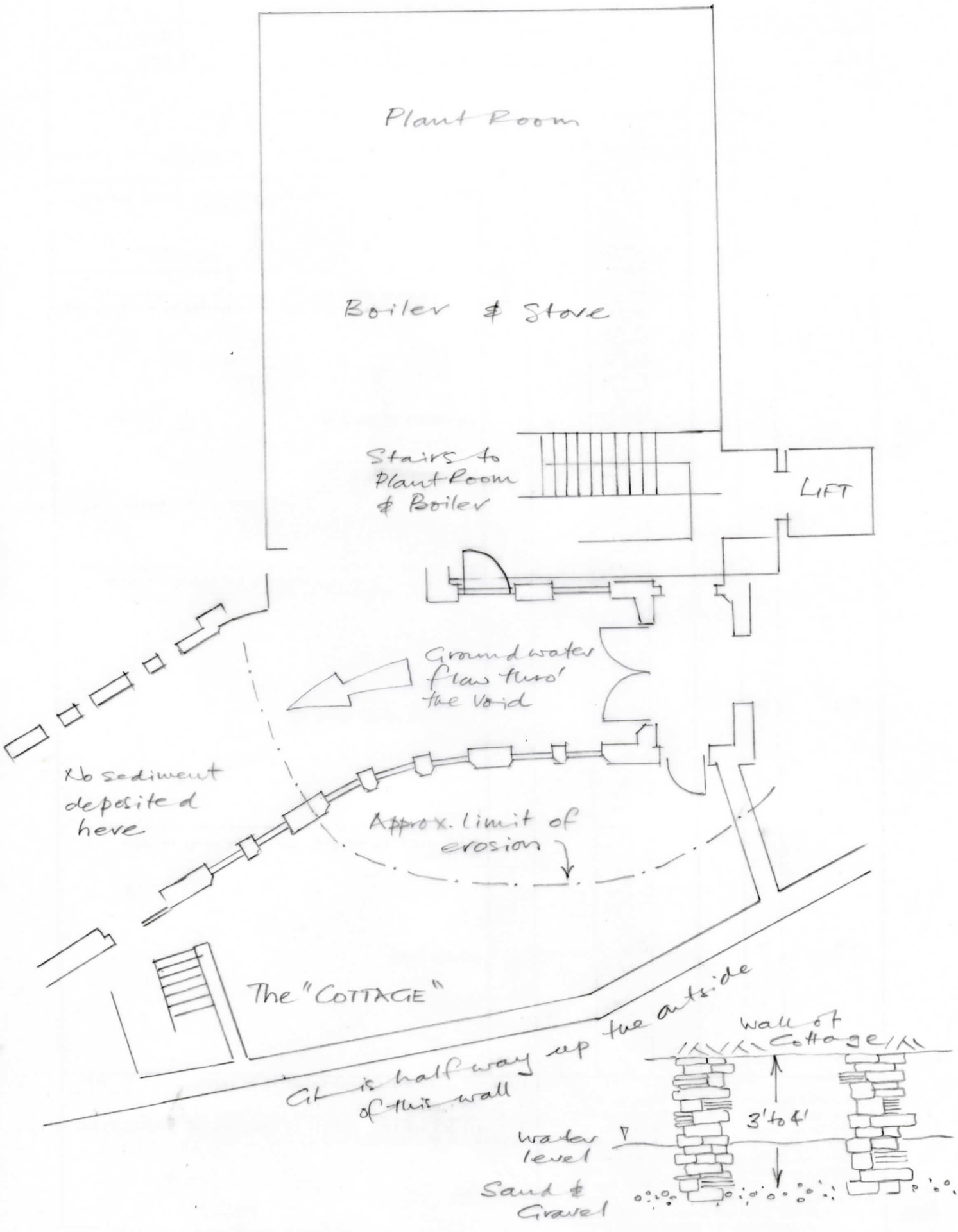
13.4. The applicant may be unaware of the size of the basement under Air Studios. It must be diverting groundwater around the building and concentrated flows might be encountered that could have significant potential for erosion if they were ever out of control.

14. The evidence also shows how erodible this material proves to be and raises the question of whether concentrations of flow following from both the existing basement of the studios, and the basements proposed, could result in flow velocities that enable internal erosion of the sands and silts above the London Clay to cracks and other openings that may exist underground associated with abandoned pipes and services of years ago. There is evidence in Hampstead that this can occur.

15. Mr Harries' evidence is entirely explainable by the geological circumstances of the site and shows that if it were ever repeated next to the studios very extensive damage could follow. No permission should be given until it is demonstrated that no such recurrence of this can occur during the construction of the basements proposed.

16. Mr Harries has read this account.

MH de Freitas PhD, DIC, C.Geol, C.WEM
Director First Steps Ltd, and
Emeritus Reader in Engineering Geology
Imperial College London.
Ground Engineering Adviser,
UK Register of Ground Engineering Professionals (RoGEP) (68302453)



Traced from Herbert Percy & Partners Drwg 672 Oct 1989

FIG 1 Scale 1:100

5m

SITE LYNDHURST HALL, HAMPSTEAD

BOREHOLE 1

Date: 14/02/91

Hole Size: 150mm dia to 10.00 m.

Ground Level

Sheet 1 of 1

Scale 1:50

Samples and in-situ Tests			Water	Legend	O.D. Level m	Depth m	Description of Strata
Depth m	Type	Blows					
						0.25	Hardcore fill and timber (MADE GROUND)
0.60	D1						Soft to firm brown silty clay with flint gravel and brick rubble etc (MADE GROUND)
						1.30	
1.60	D2						Firm becoming firm to stiff brown and grey mottled slightly fissured silty CLAY with decayed selenite crystals
2.80	D3						(WEATHERED LONDON CLAY)
3.90	D4						
						4.50	
5.00	D5						Firm to stiff brown and orange brown mottled fissured silty CLAY, occasional selenite crystals
6.10	D6						(WEATHERED LONDON CLAY)
7.00	D7						
						7.30	
7.50	D8						Stiff grey fissured silty CLAY, more silty in upper horizons
8.70	D9						(LONDON CLAY)
10.00	D10					10.00	

KEY

D - Disturbed Sample
B - Bulk Sample
U - Undisturbed Sample
W - Water Sample
M - Mackintosh Probe
S - Standard Penetration Test
C - Cone Penetration Test
V - Vane Shear Test Cohesion ( ) kN/m²
* S.P.T./C.P.T. Where 0.3m penetration not achieved, blows given for quoted penetration

N - Blows for 0.3m in penetration test
▽ Water Met
▼ Depth to Water on completion
▼ () Depth, hours after completion

REMARKS Borehole completed at 10.0m depth

5172

1. Borehole cased to 1.5m depth
2. Borehole dry during relatively short time it was open
3. STRATA DESCRIPTIONS, ESPECIALLY COHESIONS ARE BASED ON VISUAL EXAMINATION OF DISTURBED SAMPLES ONLY

FIG 2

SOILS ENGINEERING LIMITED, NEWARK ROAD, PETERBOROUGH. Tel: (0733) 68153

TRANSFORMATIONS
London Ltd

METHOD STATEMENT

DE-WATERING LIFT PIT

11th November 1991

Proposed method of relieving the water pressure in the lIft pit in order to apply the waterproof membrane.

This statement has been written after consulting the following:-

Martin Moore - Ellis Moore
Michael Ionianou - Sika Contracts Ltd
Alistair MacDonald- Servicised Ltd
Toby Robert - W. J. Engineering

1). Pump out water sump.

2). Break out blinding concrete and remove.

3). Dig out clay beneath concrete to 1m depth, full size of sump and tapering to a low point.

4). Lay in hose connected to pump to remove water.

5). Infill with shingle to 100mm below bottom of existing blinding concrete.

6). Pour blinding concrete 100mm below existing level and cast in an airtight cast iron cover with puddle flange.

7). Paint floor and wall with sevicised primer B2.

8). Fix Bituthene 4100X to primed areas.

9). Fix Servopak with approved adhesive.

10). Pour 100mm concrete slab to hold membrane in position

11). Extend floor raft reinforcement into sump.

12). Erect shuttering for kicker and pour floor

FIG 3