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BS5228 Vibration Impact Assessment

Prepared: 22nd December 2011

Report No	–	**9843-2 v**
Client	–	**Linden Wates (West Hampstead) Ltd**
Site	–	**Gondar Gardens, West Hampstead,**

1. Executive summary

1.1.1. Noise.co.uk have been instructed to conduct a BS5228 construction and demolition vibration assessment at the proposed development site at Gondar Gardens, West Hampstead, London NW16 1QF to assess the likely vibration impact the development of the site will have on the nearby residential receivers on Gondar Gardens, Hillfield Rd and Agamemnon Rd.

1.1.2. Where possible the report draws on current group standards & protocols and utilises prediction methods and proprietary software where appropriate in order to demonstrate the predicted impact at the local receivers facades.

1.1.3. This report covers all required parts of the BS5228 Vibration Impact Assessment, including identifying:

- proposed work schedule including activities & operations
- plant & machinery to be used
- prospective duration of works
- plant predicted on-times
- Vibration levels for plant types & operations.

1.1.4. It is noted that at this stage no direct demands for noise or vibration assessments have been received with respect to the requirements of the Local Planning Authority.

1.1.5. The assessment shows that there are some activities and operations associated with the development of the site which will give rise to low levels of vibration for a short period involving the demolition and groundworks phase of the contract.

1.1.6. It is recommended that the Client discusses the potential for environmental vibration impact with the appropriate parties involved in the planning and construction phases in order to arrive at an agreed mitigation and control strategy.

2. Contents

3. Introduction

3.1. Site

3.1.1. The proposed development site is an old underground reservoir situated at Gondar Gardens.

3.1.2. The site location is detailed in Fig 1.

Figure 1 - Proposed Site Location Plan **Layout**

3.1.3. In order to ensure that best practicable means are employed to develop the site the Client has commissioned a BS5228 Vibration assessment of the proposed groundworks required which will form the basis for the construction and building phase of the project.

3.1.4. It is intended that this will be presented as part of the environmental assessment package to the planning department at the Local Authority

3.1.5. This report is designed to be submitted for scrutiny by the Local Authority and their Environmental Protection team.

3.2. Nearby Sensitive Premises (NSPs)

3.2.1. The location of site is detailed in Fig 2 below. The site is surrounded on three sides by residential property, namely the side elevation and rear of properties on Gondar Gardens, The rear of residential property on Hillfield Road and Agamemnon Road.

Figure 2 - Nearby Sensitive Premises (NSPs)

Location

3.3. BS5228: 2009

3.3.1. The prevailing standard for assessing the vibration impact from a construction or demolition site is BS5228-2: 2009 "Code of practice for noise and vibration control on construction and open sites: Part 2 Vibration."

3.3.2. The standard states:

3.3.3. "This British Standard refers to the need for the protection against noise and vibration of persons living and working in the vicinity of, and

those working on, construction and open sites. It recommends procedures for noise and vibration control in respect of construction operations and aims to assist architects, contractors and site operatives, designers, developers, engineers, local authority environmental health officers and planners."

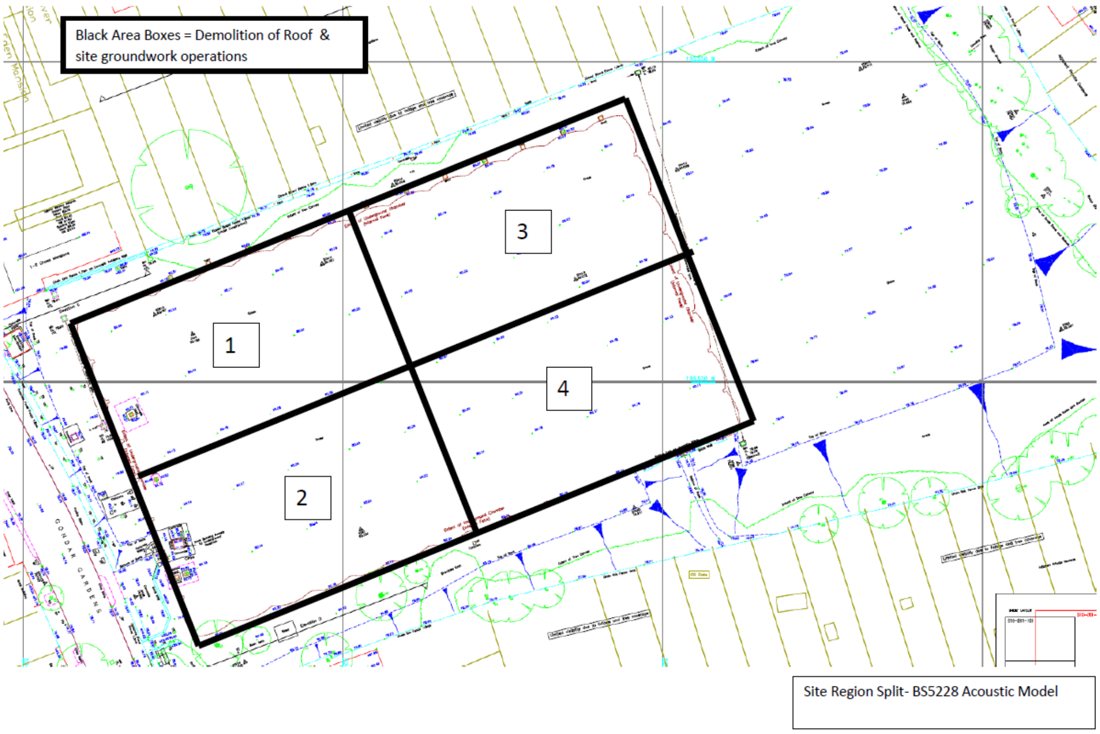
3.3.4. In order to assess the vibration impact due consideration has to be given to the location of site and the surrounding residential receivers In this location there are sensitive premises on all four sides of the rectangular development site with the closest to the likely vibration emitting operations being approximately 7m distance.

3.4. Vibration Assessment

3.4.1. The assessment is centred around the construction area of site which is basically divided into four sections. See below:

Figure 3 - Proposed Site Operational area Plan

Operational Area of Site



3.5. Vibration Levels

3.5.1. The vibration measurand used to assess the impact of vibration depends generally on the intended impact receiver (and their criteria).

3.5.2. When assessing the impact of vibration on buildings, structures or property it is usual to use "Peak particle velocity" or **PPV** mm/s.

3.5.3. When assessing the impact of vibration on humans it is usual to use "Acceleration" m/s/s or more latterly "Vibration dosage values" or **VDV** m/s $^{1.75.}$

3.5.4. The criteria used for assessing the vibration levels are contained in two main British Standards:

BS 6472 Part 1 & 2: 2008 - Guide to evaluation of human exposure to vibration in buildings

BS 7385-1:1990, Evaluation and measurement for vibration in buildings – Part 1: Guide for measurement of vibrations and evaluation of their effects on buildings

BS 7385-2, Evaluation and measurement for vibration in buildings – Part 2: Guide to damage levels from groundborne vibration

3.5.5. In general the parameters for assessing the impact are contained in Tables or graphical illustrations of limit levels against frequency (hz). These are detailed below for ease of reference.

BS 7385-2 gives guidance on the assessment of the possibility of vibration-induced damage in buildings due to a variety of sources. This guidance indicates that the probability of damage tends towards zero at a component PPV of 12.5 $mm \cdot s^{-1}$.

BS 6472 provides guidance on human response to vibration. Guidance is given on the magnitudes of vibration at which adverse comment might begin to arise. Advice is given on vibration measurement, factors which influence human response and satisfactory vibration magnitudes.

Figure 2: Section F.5 Criteria from BS5228-2: 2009

Table B.2 **Transient vibration guide values for cosmetic damage**

Line (see Figure B.1)	Type of building	Peak component particle velocity in frequency range of predominant pulse	
		4 Hz to 15 Hz	**15 Hz and above**
1	Reinforced or framed structures Industrial and heavy commercial buildings	50 mm/s at 4 Hz and above	50 mm/s at 4 Hz and above
2	Unreinforced or light framed structures Residential or light commercial buildings	15 mm/s at 4 Hz increasing to 20 mm/s at 15 Hz	20 mm/s at 15 Hz increasing to 50 mm/s at 40 Hz and above

NOTE 1 Values referred to are at the base of the building.

NOTE 2 For line 2, at frequencies below 4 Hz, a maximum displacement of 0.6 mm (zero to peak) is not to be exceeded.

Figure 3: Building Damage Criteria from BS7385

Figure B.1 **Transient vibration guide values for cosmetic damage**

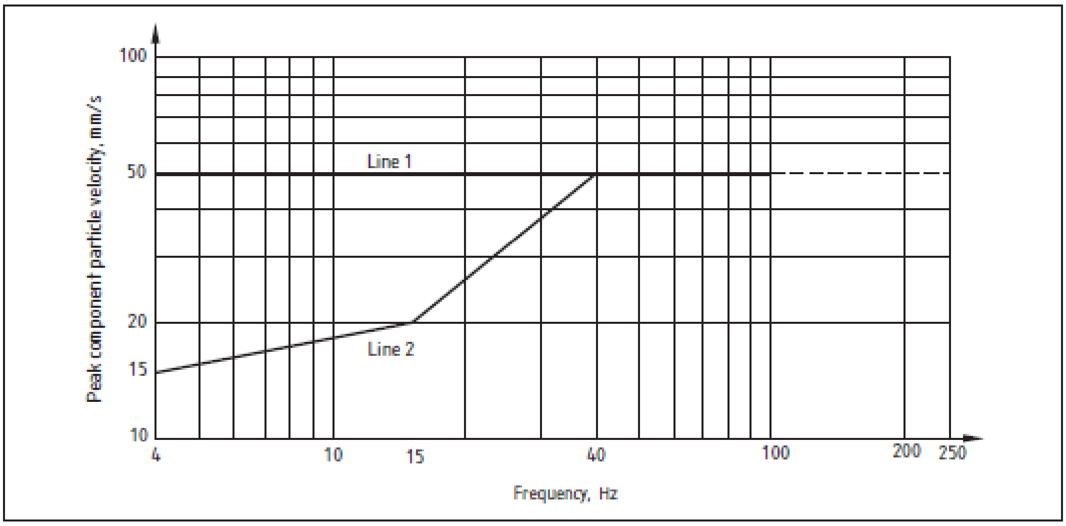


Figure 4: Building Damage Criteria - Graph from BS7385

Vibration dose value ranges which might result in various probabilities of adverse comment within residential buildings

Place and time	Low probability of adverse comment $m \cdot s^{-1.75}$ 1)	Adverse comment possible $m \cdot s^{-1.75}$	Adverse comment probable $m \cdot s^{-1.75}$ 2)
Residential buildings 16 h day	0.2 to 0.4	0.4 to 0.8	0.8 to 1.6
Residential buildings 8 h night	0.1 to 0.2	0.2 to 0.4	0.4 to 0.8

NOTE For offices and workshops, multiplying factors of 2 and 4 respectively should be applied to the above vibration dose value ranges for a 16 h day.

Figure 5: Human response criteria - Table 1 from BS6472-1: 2008

3.5.6. Where construction operations are concerned it is usual to work to building damage criteria levels rather than human disturbance criteria unless there are specific reason e.g. hospital critical care units, maternity units etc. This is because in general higher level of vibration can usually be tolerated as long as assurances can be made that the vibration levels emitted will have no adverse affects on the nearby receivers property and will be of limited duration.

3.5.7. In this situation it is useful to note that the usual expectation is that if vibration can be felt by a building occupant it will be doing lasting damage to the property. This is not the case and this is recognised within the BS5228-2: 2009 standard. (See section 6.1 "Disturbing effects of vibration").

3.5.8. The operations that occur in the areas 1-4 are detailed in the Client's document " Gondar Gardens Reservoir - Outline Method" which is detailed in the Appendix.

3.5.9. Nominally the hours of work are assumed to be 0800 - 1800 hrs Monday to Friday and 0800 - 1300 Saturday with no work on Sundays or Bank Holidays.

3.5.10. The individual construction & demolition activities and operations are scheduled to occur on a timeline which is subdivided into weeks. The table which details this (Gondar Gardens Programme) is sub divided to identify the type of plant to be used.

3.5.11. The progressive activity schedule means that some of the first activities take place at ground level i.e. on top of the roof, but as works progress the demolition of the roof means that the site activities will be based at the bottom of the reservoir approximately 7m below initial site level.

3.5.12. The work schedule shows that the potential vibration producing activities are due to occur over a relatively short time period.

3.5.13. The demolition of the roof is schedule to take place between weeks 1-8.

3.5.14. The bored (CFA) piling activity is due to take place between weeks 9-15.

3.6. Vibration Producing Plant

3.6.1. The detailed list of plant included Gondar Gardens Program and the operations they perform have been chosen so as to minimise the vibration emissions from site.

3.6.2. Breaking down and demolishing the existing reservoir & roof structure by percussive tools will be kept to a minimum. See Section 9 of the Linden Homes Construction Management Document in the Appendix. It is also noted that small percussive breakout activity such as those carried out by Backacting peckers and hand tools (jackhammers) do not feature in the vibration assessment part of BS5228-2: 2009. This is likely to be because they are usually localised impact sources and consequently the relatively low energy involved in them means that they are attenuated quickly over distance. **NB**: it should be noted that percussive breakout is mentioned with reference to re-radiated noise, see section 8.4 "vibration control targets". This is when breakout is taking place on a connected building structure e.g. where a building is built of the same foundation.

3.6.3. There is some small risk from the falling masonry from the reservoir roof. This is an unpredictable vibration source as the transient vibration levels depend on the size of the masonry "piece" and the relative fall height. It is noted that the maximum fall height is 7m which is the overall depth of the reservoir and this can be reduced. It is usual to control the impact of falling masonry and attenuate it to a large degree by using existing spoil and rubble as a cushion to minimise the impact on the foundation base slab of the reservoir.

3.6.4. Groundworks will involve bored piling operations although they will be low vibration "Continuous Flight Auger (CFA)" piling operations centred around an auger piling technique which drills a hole/shaft in which to cast the foundation pile. it is noted that there are instances where the auger technique requires additional vibratory or percussive interventions (This is covered in some detail in BS5228-2: 2009 section F.3.1.3 "Rotary bored piling":

"Although rotary bored piling tends to set up low level vibrations, transient vibrations can also occur when the auger strikes the base of the borehole. If it is necessary to insert an appreciable length of temporary casing to support the boring, a casing dolly can be used and, as with the impact bored piling method, this will give rise to intermittent vibrations. The use of special tools, such as chisels, will also result in intermittent vibrations."

3.6.5. It is recognised that the use of a chisel in the bored piling operation is a rare and unpredictable occurrence and the likely resulting vibration would depend on the obstruction composition which had to be removed

4. Vibration Predictions

4.1. Representative Scenario

4.1.1. The only practical way to identify the relative impact of a piling operation is to refer to similar operations which yielded data that can be used to assess the risk involved in using the operation. In the case of bored (auger) piling operations BS5228-2: 2009 lists some typical activities in Table D. These are summarised below:

Table D.6 Summary of historic case history data on vibration levels measured during rotary bored piling (including casing dollies)

Ref. no.	Year and location	Soil conditions	Pile dimensions	Mode	Measured peak particle velocity (PPV) at various plan distances						
					Theoretical energy per blow	Plan distance	PPV	Plan distance	PPV	Plan distance	PPV
					kJ	m	$mm \cdot s^{-1}$	m	$mm \cdot s^{-1}$	m	$mm \cdot s^{-1}$
100 ♦	1974 London W6	Fill/gravel/London clay	N/R	Driving casing		7	3.2				
				With 3 t dolly		7	1.0				
101	1981 London EC3	Fill/dense ballast/ London clay	1 050 mm ϕ	Augering		20	0.05				
				Auger hitting base of hole		20	0.23				
102	1982 Cheltenham (Glos.)	Fill/wet sand/lias clay	900 mm ϕ	Augering		9	0.2				
				Hammering casing with Kelly bar		9	0.8				
103	1983 Romford (Greater London)	Fill clay	350 mm ϕ 14.5 m depth	Augering		10	0.38	20	0.3	30	0.03
				Dollying casing	11.8	10	1.1	20	0.55		
				Auger hitting base of hole		10	0.96				
				Spinning off		10	0.57	20	0.44		
104	1985 London W1	Fill/sand/clay	500 mm ϕ	Augering		10	0.4	15	0.1	26	0.02
				Auger hitting base of hole		14	0.3	26	0.1		
				Mudding in		10	0.3	14	0.2		
				Spinning off		10	0.3				
				Dollying casing	11.8	10	1.0	14	0.8		
105	1985 St. Albans (Herts)	Sands and gravels over chalk	600 mm ϕ 12 m depth	Augering		3.5	0.23	8	0.04		
				Auger hitting base of hole		3.5	2.4	8	1.7		
				Spinning off		6	0.08	8	0.06		

4.1.2. It is noted in the table above (and reproduced full size in the appendix) that the likely minimum distance to a residential receiver is approximately 7m horizontal. The peak particle velocity recorded in the above sample data was through Fill/gravel/London Clay (potentially similar to site) and was 3.2mm/s when driving a casing into the hole. It can be seen that a level of less than 1mm/s at this distance is more likely when auger is employed in excavating the shaft.

4.1.3. Levels of 1mm/s and 3mm/s can be compared to the Building Damage criteria graph from BS7385 see below:

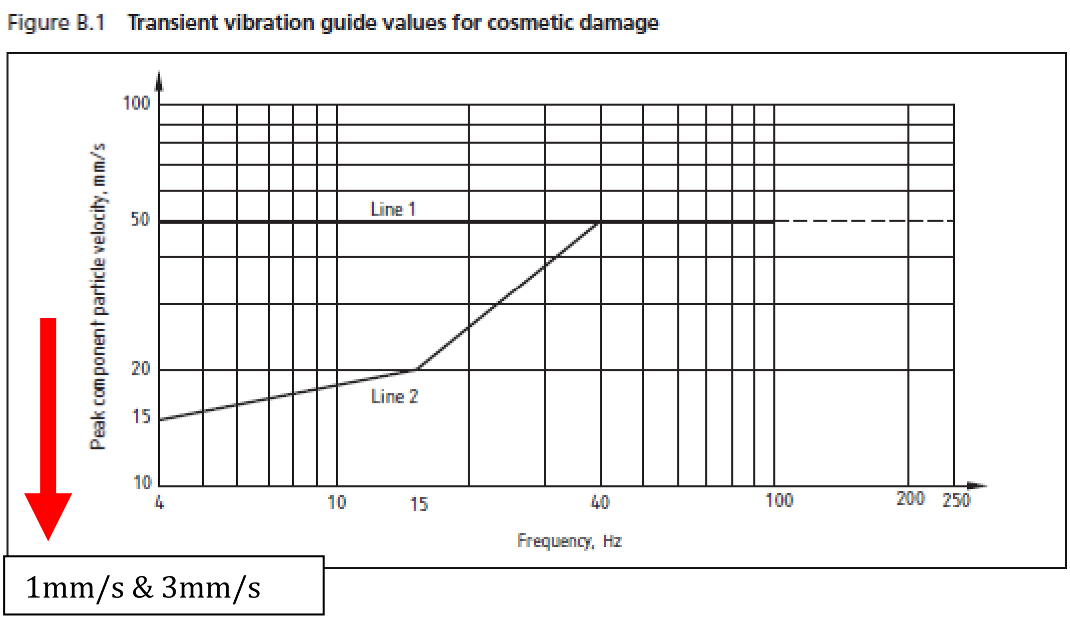


Figure 6: 3mm/s & 1mm/s are well below the level for cosmetic damage of buildings.

4.1.4. These typical levels associated with rotary bored piling are well below the cosmetic Building Damage criteria graph from BS7385:

5. Results

5.1. Vibration Impact

5.1.1. **<u>Roof Demolition:</u>** The predicted vibration impact from the demolition of the roof structure is negligible. Isolated breakout activity is likely to give rise to low levels of vibration at the nearby receivers due to the localised level and relatively low energy transmitted to the structure/ground. The falling masonry may cause transient shock when it strikes the base slab and measures should be put in place to provide a "cushion" to absorb this impact. It is usual to use the existing spoil and rubble from the previously demolished sections to attenuate the vibration impact of falling masonry. In this case the drop is assessed as 7m worst case (the depth of the reservoir from base slab to roof).

5.1.2. **<u>Bored Piling:</u>** The predicted vibration impact from the site operations during the demolition and construction phases of the contract are likely to give rise to vibration levels of 1 - 3mm/s (worst case) at a small number of properties closest to site i.e. the nearest sensitive premises.

6. Recommendations

6.1. Mitigation

6.1.1. A pragmatic approach needs to be taken when assessing the vibration impact of any construction project. Due consideration needs to be given to the disturbing effects of vibration on the local community. These may include, disturbance of work or leisure activities, disturbance of sleep, annoyance and possible health effects on local receivers. Given the representative vibration levels from the proposed activities, there are several options to reduce the impact on the nearby receivers:

6.1.2. **direct mitigation** (to reduce vibration levels may include)

- Using percussive breaking only where necessary:
- Providing a spoil/rubble "cushion" to minimise the vibration from falling masonry from the reservoir roof..
- Ensuring rotary piling operators place the auger on the ground rather than let it drop.
- Ensure the equipment operators are properly trained and briefed in minimising vibration emissions from their activity.

6.1.3. **Indirect mitigation** These are the issues associated with vibration affects and community reaction see section 6.3 of BS5228-2: 2009. (These may not necessarily reduce the vibration level emitted but can reduce the disturbance to local receivers. They are designed to reduce the impact on the receivers and may include):

- Hours of work: activities likely to produce vibration can be scheduled to occur in the middle of the day/afternoon rather than early morning.
- Public relations: close consultation with the Local Community can reduce anxiety of nearby receivers if they are aware of the type of operation due to be performed, the fact that it is being controlled and it will be of limited duration i.e. there is a proposed end date.

6.2. Structural Survey

6.2.1. It is strongly recommended that a structural survey of nearby receivers is undertaken and any current damage (either major faults or minor cosmetic) damage is recorded. Tell tales should be placed on visible cracks and records kept for comparison throughout the development of the site.

6.2.2. It is not unusual to receive complaints of building damage from nearby sensitive receivers when perceptible vibration is regularly felt from a demolition or construction site. The structural surveys will provide a baseline for comparison and an indication of deterioration should complaints arise.

7. Conclusions

7.1.1. This report has been commissioned to identify and assess the likely environmental vibration impact of the proposed demolition and construction activity associated with the redevelopment of Gondar Gardens on the nearby sensitive premises.

7.1.2. The representative vibration levels indicate that there is a low risk of cosmetic damage to the surrounding property to site.

7.1.3. Providing proper public consultation is carried out there is also likely to be a low probability of complaint given the relatively short duration of the works and the low vibration emission techniques proposed.

7.1.4. The practical direct measures for vibration control have been listed as well as the indirect mitigation procedures for minimising vibration impact on the neighbouring residential areas.

7.1.5. It is recommended that this report in the first instance, forms the basis for discussions on methods of reducing environmental vibration and its impact with both the demolition/construction sub-contractors and the Local Authority.

Bill Whitfield. **BA, MSc, MIOA**

Managing Director

8. Appendix

Gondar Garden Programme

Month		1	2			5	6	7	8		10	11	12	1	1	15	16	17	18	1	20	21	22	2	2
Task																									
Enabling works																									
Demolition																									
Site Set up																									
Structural Pilling																									
Foundation Piling																									
Services																									
Ground Works / Concrete frame																									
Superstrucutre																									
Internal fitout																									
Hard and Soft Landscaping																									
Completion																									

Rev. - dated ece er 2011

	From Plant & Machinery estimate																												
	Month		1				2													5				1	1		1	1	2
	Week		1	2			5	6	7	8		10	11	12	1	1	15	16	17	18	1	20	51	52		78	7		SWL
1	**Excavator**	o atsu C210-8 200																											
2	**Mobile Crusher**	0 sandv k 2011																											
	5 tonne dumper																												
	35ft CFA piling	So l ec C 50																											
5	**Tracked excavator**	C6.11 20 tonne C																											
6	**Concrete pump**	6.16 lorry ounted u																											
7	**Dumper**	7.81																											
8	**Tower Crane**	50 tonne																											
	Mini forklift	5 tonne n telehandler																											

t round level

t reservo r otto level

t new levels

W th new u ld n s

8.1. Appendix 2: Table D - BS5228-2: 2009 - Bored Piling data

Table D.6 Summary of historic case history data on vibration levels measured during rotary bored piling (including casing dollies)

Ref. no.	Year and location	Soil conditions	Pile dimensions	Mode	Measured peak particle velocity (PPV) at various plan distances							Remarks
					Theoretical energy per blow	Plan distance	PPV	Plan distance	PPV	Plan distance	PPV	
					kJ	m	$mm \cdot s^{-1}$	m	$mm \cdot s^{-1}$	m	$mm \cdot s^{-1}$	
100 ♦	1974 London W6	Fill/gravel/London clay	N/R	Driving casing		7	3.2					Horizontal
				With 3 t dolly		7	1.0					Vertical
101	1981 London EC3	Fill/dense ballast/ London clay	1 050 mm ϕ	Augering		20	0.05					Listed building nearby
				Auger hitting base of hole		20	0.23					
102	1982 Cheltenham (Glos.)	Fill/wet sand/lias clay	900 mm ϕ	Augering		9	0.2					Listed building adjacent to site
				Hammering casing with Kelly bar		9	0.8					
103	1983 Romford (Greater London)	Fill clay	350 mm ϕ 14.5 m depth	Augering		10	0.38	20	0.3	30	0.03	
				Dollying casing	11.8	10	1.1	20	0.55			2 t dolly
				Auger hitting base of hole		10	0.96					
				Spinning off		10	0.57	20	0.44			
104	1985 London W1	Fill/sand/clay	500 mm ϕ	Augering		10	0.4	15	0.1	26	0.02	
				Auger hitting base of hole		14	0.3	26	0.1			
				Mudding in		10	0.3	14	0.2			
				Spinning off		10	0.3					
				Dollying casing	11.8	10	1.0	14	0.8			2 t dolly
105	1985 St. Albans (Herts)	Sands and gravels over chalk	600 mm ϕ 12 m depth	Augering		3.5	0.23	8	0.04			
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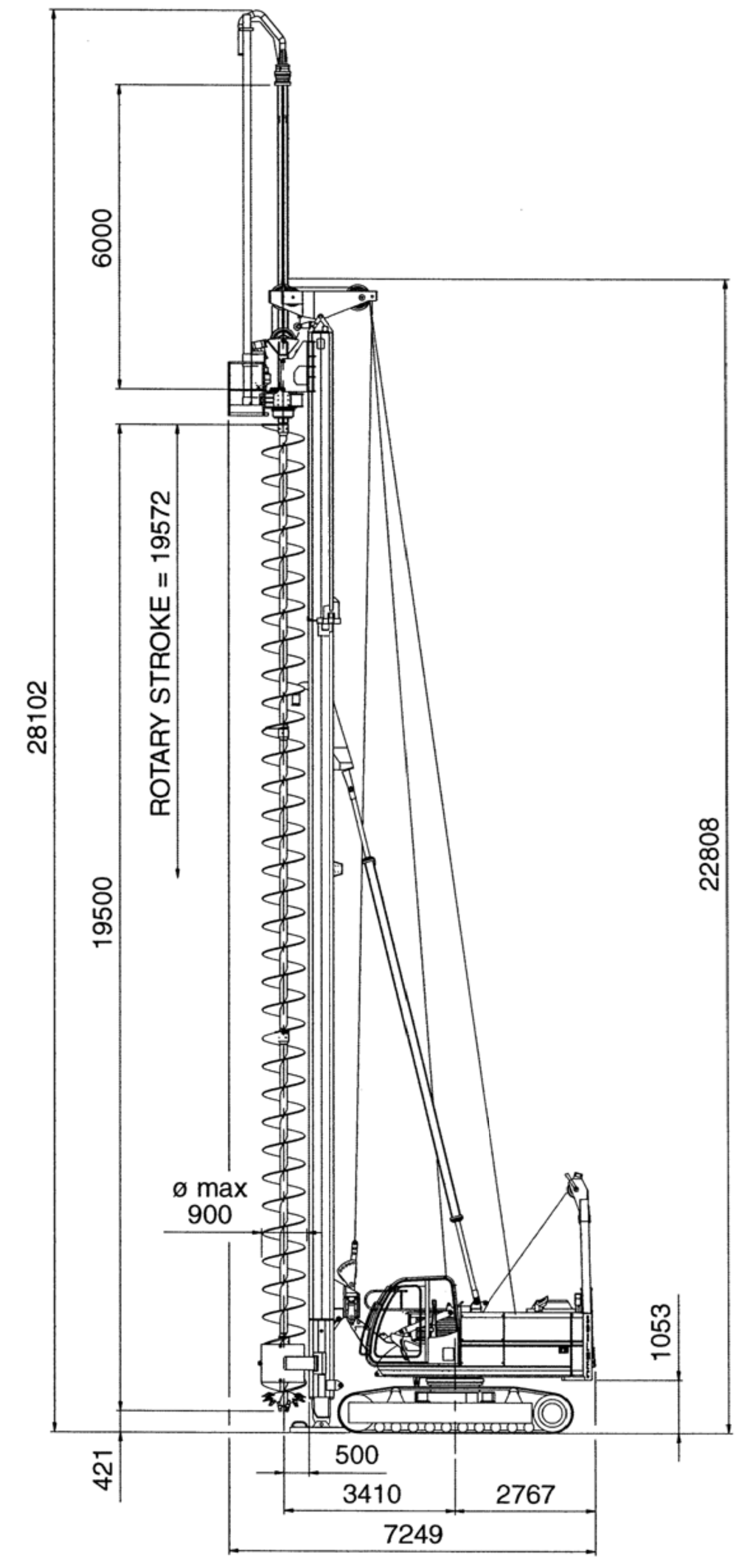
				Spinning off		6	0.08	8	0.06			

8.2. Appendix 3: Drawings

A-4 TECHNICAL FEATURES

A-4.1 DIMENSIONS AND WEIGHT

A-4.1.1 MACHINE IN WORKING POSITION



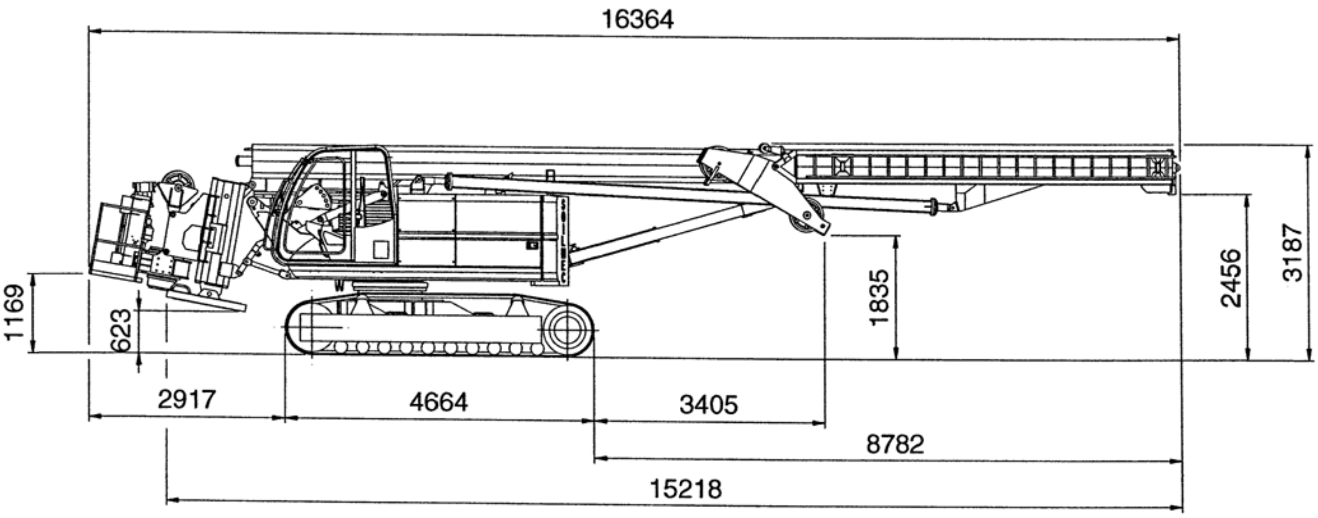
Weight in working configuration (c/w 6 m auger extension - w/o auger and auger cleaner) .. ~ **34200 kg**

SM164040.008Aft

Fig. A-4.1

A-4.1.2 MACHINE IN TRANSFER POSITION

- Configuration with rotary table



Weight in transport configuration .... **~ 32500 kg**

SM164040.009Aft

Fig. A-4.3

NOTES

1 The Contractor must check and confirm dimensions

2 All discrepancies must be reported and resolved by the Architect before works commence

3 This drawing is not to be scaled

4 All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards.

PRELIMINARY

Rev		Date
A	revised layouts	14/12/11

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Client

LINDEN WATES (WEST HAMPSTEAD) LTD.

Project

GONDAR GARDENS

Drawing

PLAN
GROUND LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) P00	A

CAD Ref No

G:\4870\T_Series\T20\2nd Application\T20P00

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PRELIMINARY

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Project
GONDAR GARDENS

Drawing
PLAN
FIRST FLOOR LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) P01 CAD Ref No G:\4870\T_Series\T20\2nd Application\T20P01	–

1 SECOND FLOOR LEVEL PLAN
SCALE: 1:200 (A1)

NOTES

1. The Contractor must check and confirm dimensions
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PRELIMINARY

Rev	Date

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Project
GONDAR GARDENS

Drawing
PLAN
SECOND FLOOR LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) P02	–

CAD Ref No
G:\4870\T_Series\T20\2nd Application\T20P02

1 THIRD FLOOR LEVEL PLAN
SCALE: 1:200 (A1)

This scale is 100mm in length when printed at the size indicated in the title block.

NOTES

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3 This drawing is not to be scaled

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Rev | Date

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Project
GONDAR GARDENS

Drawing
PLAN
THIRD FLOOR LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) P03	–

CAD Ref No
G:\4870\T_Series\T20\2nd Application\T20P03

1 LOWER GROUND LEVEL PLAN
SCALE: 1:200 (A1)

NOTES

1 The Contractor must check and confirm dimensions

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3 This drawing is not to be scaled

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PRELIMINARY

Rev		Date
A	Drawings developed	14/12/11

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Client
LINDEN WATES (WEST HAMPSTEAD) LTD.

Project
GONDAR GARDENS

Drawing
PLAN
LOWER GROUND LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) P-1	A

CAD Ref No
G:\4870\T_Series\T20\2nd Application\T20P-1

1 LOWER GROUND LEVEL PLAN
SCALE: 1:200 (A1)

NOTES

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PRELIMINARY

Rev		Date
A	Drawings developed	14/12/11

Rolfe Judd
Architecture Planning Interiors
Old Church Court, Claylands Road, The Oval, London SW8 1NZ
T 020 7556 1500
www.rolfe-judd.co.uk

Client
LINDEN WATES (WEST HAMPSTEAD) LTD.

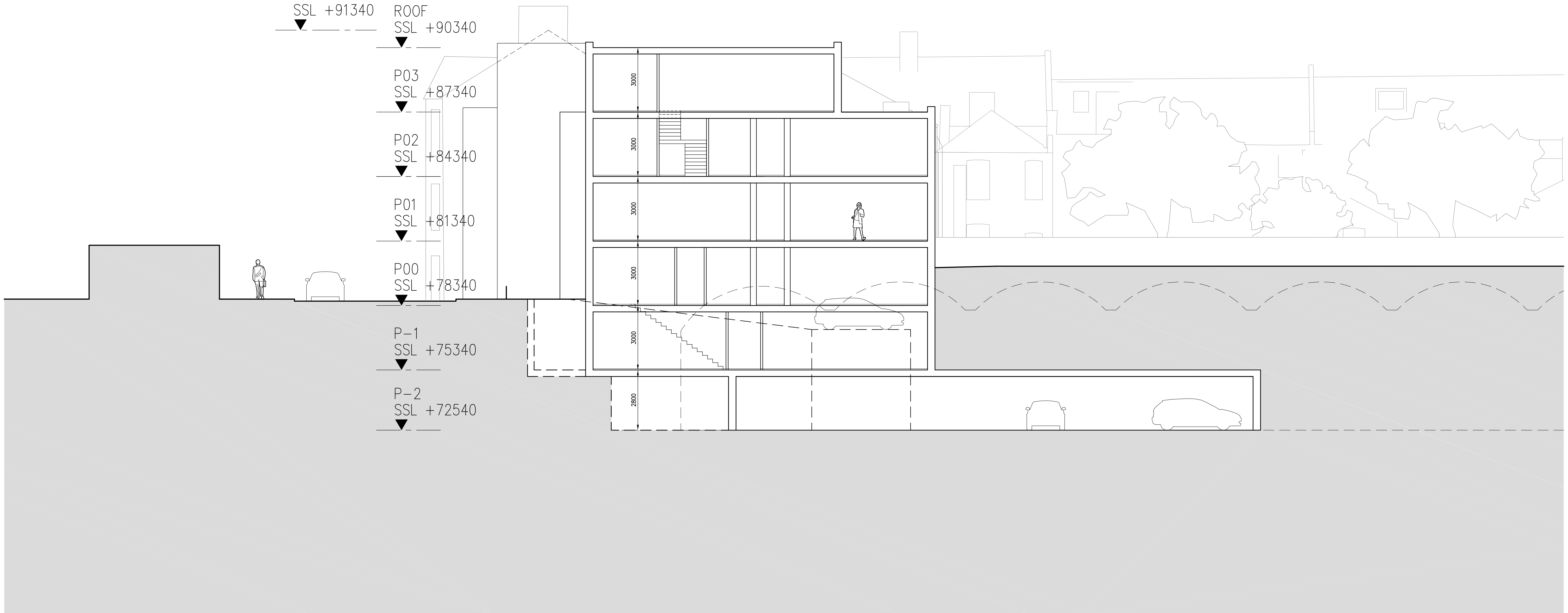
Project
GONDAR GARDENS

Drawing
PLAN
BASEMENT LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No
4870 / T(20) P-2
CAD Ref No
G:\4870\T_Series\T20\2nd Application\T20P-2

Revision
A



1 SECTION A-A
SCALE: 1:100 (A1)

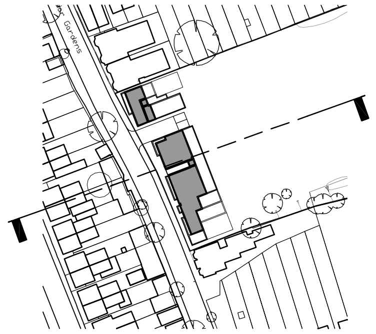
NOTES

1 The Contractor must check and confirm dimensions

2 All discrepancies must be reported and resolved by the Architect before works commence

3 This drawing is not to be scaled

4 All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards.



SECTION LOCATION PLAN
Scale: 1:1500 (A1)

PRELIMINARY

Rev		Date

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Project
GONDAR GARDENS

Drawing
SECTION
A-A

Scale	Date	Drawn
1:100 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(20) S01	-

CAD Ref No
G:\4870\T_Series\T20\2nd Application\T20S01

This scale is 100mm in length when printed at the size indicated in the title block.

NOTES

1 The Contractor must check and confirm dimensions

2 All discrepancies must be reported and resolved by the Architect before works commence

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4 All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards.

PRELIMINARY

Rev		Date

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Client
LINDEN WATES (WEST HAMPSTEAD) LTD.

Project
GONDAR GARDENS

Drawing
PLAN
ROOF LEVEL

Scale	Date	Drawn
1:200 (A1)	NOV 2011	RS

Drawing No	Revision
4870 / T(27) P04 CAD Ref No G:\4870\T_Series\T20\2nd Application\T27P04	–