

APPENDIX H

WALLAP Output

CARD GEOTECHNICS LIMITED

Program: WALLAP Version 5.04 Revision A36.B51.R40

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Run ID: Party Wall

4 Hampstead Square

Party Wall - Wall F Underpin D Permanent

| Sheet No.

| Job No. CG5919

| Made by : RDB

| Date:27-02-2012

| Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Soil types
1	122.60	2 Bagshot Sand
2	120.05	3 Basement Slab

SOIL PROPERTIES

No.	Description	Bulk density kN/m3	Young's Modulus Eh, kN/m2	At rest coeff. Ko	Consol. state. NC/OC	Active limit Ka	Passive limit Kp	Cohesion kN/m2
	(Datum elev.)		(dEh/dy)	(dKo/dy)	(Nu)	(Kac)	(Kpc)	(dc/dy)
1	Not defined							
2	Bagshot Sand	20.00a 21.00b	27000	0.441	OC (0.200)	0.237 (0.000)	6.204 (0.000)	
3	Basement Slab	24.50	2.00E+8	0.100	OC (0.200)	0.054 (0.546)	173.9 (99.801)	100.0d

Note: (a) and (b) are Bulk Densities above and below the water table

Additional soil parameters associated with Ka and Kp

No.	Description	--- parameters for Ka ---			--- parameters for Kp ---		
		Soil friction angle	Wall adhesion coeff.	Back-fill angle	Soil friction angle	Wall adhesion coeff.	Back-fill angle
1	Not defined						
2	Bagshot Sand	34.00	0.670	0.00	34.00	0.670	0.00
3	Basement Slab	60.00	1.000	0.00	60.00	1.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	122.60	122.60

Automatic water pressure balancing at toe of wall : No

Water press. profile		Active side			Passive side			
Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1	1	122.60	122.60	0.0	1	119.70	119.70	0.0

WALL PROPERTIES

Elevation of toe of wall = 119.70
Maximum finite element length = 0.16
Youngs modulus of wall E = 2.0000E+08 kN/m2
Moment of inertia of wall I = 2.2500E-03 m4/m run
E.I = 450000 kN.m2/m run
Yield Moment of wall = Not defined

SURCHARGE LOADS

Surcharge no.	Elev.	Distance from wall	Length parallel to wall	Width perpendicular to wall	Surcharge kN/m2		Equiv. soil type
					Near edge	Far edge	
1	122.60	0.00 (A)	4.80	10.00	30.00	=	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply water pressure profile no.1
2	Apply surcharge no.1 at elevation 122.60
3	Excavate to elevation 120.05 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Type of structure - Retaining wall

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.20

Factor on soil strength for calculating tie force = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement	Active, Passive pressures	Graph. output
1	Apply water pressure profile no.1	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 122.60	Yes	Yes	Yes
3	Excav. to elev. 120.05 on PASSIVE side	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

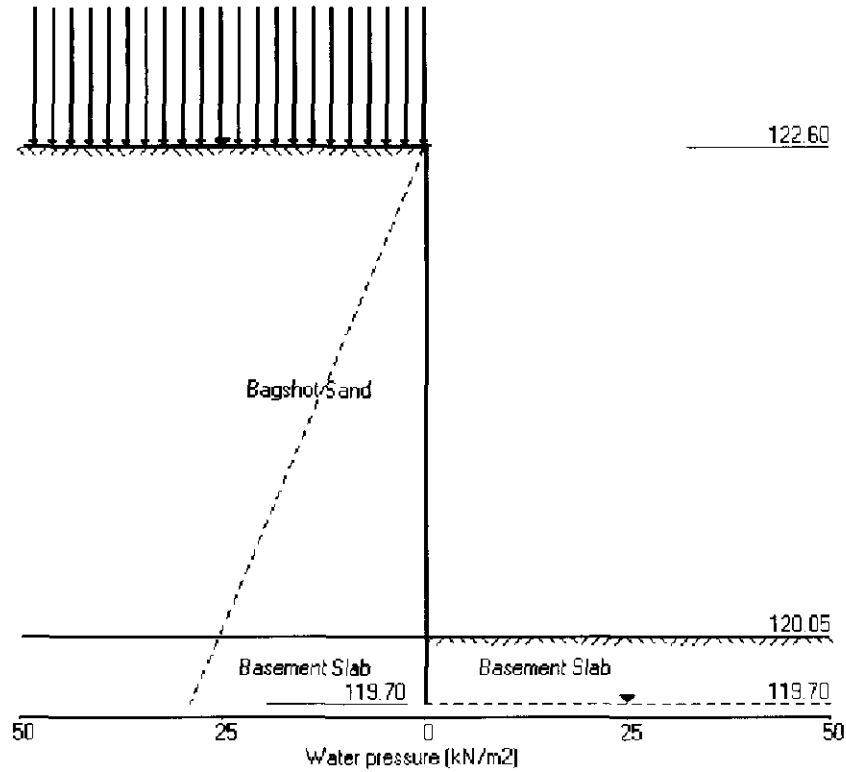
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Run ID. Party Wall
4 Hampstead Square
Party Wall - Wall F Underpin D Permanent

| Sheet No.
|
| Job No. CG5919
| Made by : RDB
| Date: 27-02-2012
| Checked :
|

Units: kN,m

Stage No.3 Excav. to elev. 120.05 on PASSIVE side



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 4 Hampstead Square
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| Sheet No.
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 | Job No. CG5919
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Units: kN,m

Summary of results

STABILITY ANALYSIS according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 119.70		Toe elev. for FoS = 1.200		Strut force for F=1.000	
			-----		-----		-----	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Strut
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr	force
				Safety	at elev.		-ation	kN/m run
1	122.60	122.60	Cant.		Conditions not suitable for FoS calc.			
2	122.60	122.60	Cant.	3.202	119.88	122.28	0.32	
3	122.60	120.05	Cant.	1.303	119.81	119.77	0.28	

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| Sheet No.
 |
 | Job No. CG5919
 | Made by : RDB
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Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT CALCULATION - Assumptions:

Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached
 Open Tension Crack analysis - No
 Length of wall perpendicular to section = 1000.00m

Rigid boundaries: Active side 20.00 from wall
 Passive side 20.00 from wall

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	122.60	0.000	0.000	0.0	-0.0	0.0	0.0
2	122.50	0.000	0.000	0.0	0.0	0.8	-0.0
3	122.40	0.000	0.000	0.2	-0.0	1.7	-0.1
4	122.24	0.000	0.000	0.6	-0.0	3.4	-0.0
5	122.08	0.000	0.000	1.3	0.0	5.4	0.0
6	121.92	0.000	0.000	2.3	0.0	7.7	0.0
7	121.76	0.000	0.000	3.8	0.0	10.4	0.0
8	121.60	0.000	0.000	5.7	0.0	13.4	0.0
9	121.44	0.000	0.000	8.1	0.0	16.8	0.0
10	121.28	0.000	0.000	11.0	0.0	20.5	0.0
11	121.12	0.000	0.000	14.6	0.0	24.7	0.0
12	120.96	0.000	0.000	19.0	0.0	29.3	0.0
13	120.80	0.000	0.000	24.0	0.0	34.3	0.0
14	120.64	0.000	0.000	29.9	0.0	39.6	0.0
15	120.48	0.000	0.000	36.7	0.0	45.4	0.0
16	120.32	0.000	0.000	44.5	0.0	51.5	0.0
17	120.19	0.000	0.000	51.8	0.0	57.0	0.0
18	120.05	0.000	0.000	59.9	0.0	62.8	0.0
19	119.96	0.000	0.000	54.6	0.0	0.0	-127.5
20	119.88	0.000	0.000	37.6	0.0	0.0	-215.5
21	119.79	0.000	0.000	17.1	0.0	0.0	-214.8
22	119.70	0.000	-0.000	0.0	0.0	0.0	0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	16.6	120.05	-0.0	122.24	22.2	120.05	-70.5	119.79
2	35.2	120.05	-0.0	122.60	36.8	120.05	-145.4	119.79
3	59.9	120.05	-0.0	122.60	62.8	120.05	-215.5	119.88

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.000	122.60	-0.000	119.70	Apply water pressure profile no.1
2	0.000	122.60	-0.000	119.70	Apply surcharge no.1 at elev. 122.60
3	0.000	122.60	-0.000	119.70	Excav. to elev. 120.05 on PASSIVE side

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Run ID: Party Wall

4 Hampstead Square

Party Wall - Wall F Underpin D Permanent

Sheet No.

Job No. CG5919

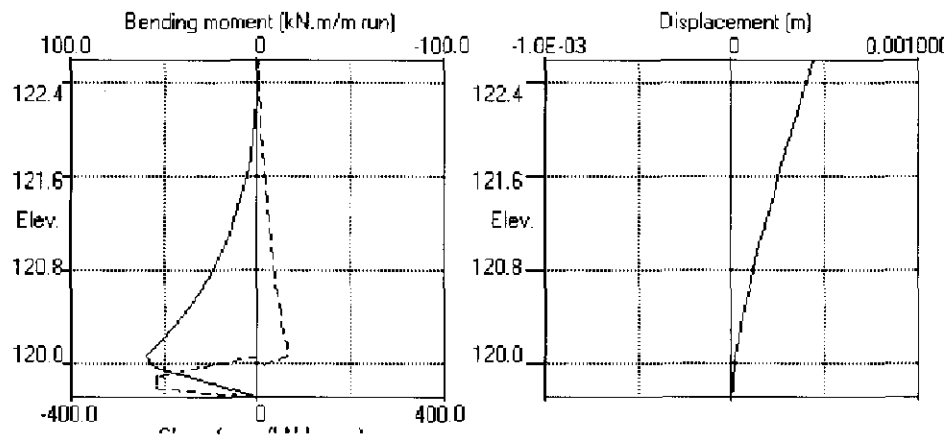
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Date: 27-02-2012

Checked :

Bending moment, shear force, displacement envelopes

Units: kN,m



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 Run ID. South section
 4 Hampstead Square
 Party Wall - Wall G Underpin E Permanent

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| Sheet No.
 |
 | Job No. CG5919
 | Made by : RDB
 | Date:27-02-2012
 | Checked :

Units: kN,m

INPUT DATA

SOIL PROFILE

Stratum no.	Elevation of top of stratum	Active side	Soil types	Passive side
1	122.60	2 Bagshot Sand	2 Bagshot Sand	
2	120.05	3 Basement Slab	3 Basement Slab	

SOIL PROPERTIES

-- Soil type --	Bulk density	Young's Modulus	At rest coeff.	Consol state.	Active limit	Passive limit	Cohesion
No. Description	Eh, kN/m3	Eh, kN/m2	Ko	NC/OC	Ka	Kp	kN/m2
(Datum elev.)	(dEh/dy)	(dKo/dy)	(Nu)	(Kac)	(Kpc)	(dc/dy)	
1 Not defined							
2 Bagshot Sand	20.00a	27000	0.441	OC	0.237	6.204	
	21.00b			(0.200)	(0.000)	(0.000)	
3 Basement Slab	24.50	2.00E+8	0.100	OC	0.054	173.9	100.0d
				(0.200)	(0.546)	(99.801)	

Note: (a) and (b) are Bulk Densities above and below the water table

Additional soil parameters associated with Ka and Kp

----- Soil type -----	--- parameters for Ka ---			--- parameters for Kp ---		
	Soil friction	Wall adhesion	Back-fill	Soil friction	Wall adhesion	Back-fill
No. Description	angle	coeff.	angle	angle	coeff.	angle
1 Not defined						
2 Bagshot Sand	34.00	0.670	0.00	34.00	0.670	0.00
3 Basement Slab	60.00	1.000	0.00	60.00	1.000	0.00

GROUND WATER CONDITIONS

Density of water = 10.00 kN/m3

	Active side	Passive side
Initial water table elevation	122.60	122.60

Automatic water pressure balancing at toe of wall : No

Water press.	Active side				Passive side			
profile Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	Point no.	Elev. m	Piezo elev. m	Water press. kN/m2	
1 1	122.60	122.60	0.0	1	119.70	119.70	0.0	

WALL PROPERTIES

Elevation of toe of wall = 119.70
 Maximum finite element length = 0.16
 Youngs modulus of wall E = 2.0000E+08 kN/m2
 Moment of inertia of wall I = 2.2500E-03 m4/m run
 E.I = 450000 kN.m2/m run
 Yield Moment of wall = Not defined

SURCHARGE LOADS

Surcharge no.	Elev.	Distance	Length	Width	Surcharge		Equiv. soil type
		from wall	parallel to wall	perpend. to wall	----- Near edge	----- Far edge	
1	122.60	0.00(A)	20.00	0.60	20.00	=	N/A
2	122.60	0.60(A)	10.00	0.70	60.00	=	N/A
3	122.60	1.30(A)	20.00	10.00	20.00	=	N/A

Note: A = Active side, P = Passive side

CONSTRUCTION STAGES

Construction stage no.	Stage description
1	Apply water pressure profile no.1
2	Apply surcharge no.1 at elevation 122.60
3	Apply surcharge no.2 at elevation 122.60
4	Apply surcharge no.3 at elevation 122.60
5	Excavate to elevation 120.05 on PASSIVE side

FACTORS OF SAFETY and ANALYSIS OPTIONS

Type of structure - Retaining wall

Stability analysis:

Method of analysis - Strength Factor method

Factor on soil strength for calculating wall depth = 1.20

Factor on soil strength for calculating tie force = 1.00

Parameters for undrained strata:

Minimum equivalent fluid density = 5.00 kN/m3

Maximum depth of water filled tension crack = 0.00 m

Bending moment and displacement calculation:

Method - Subgrade reaction model using Influence Coefficients

Open Tension Crack analysis? - No

Non-linear Modulus Parameter (L) = 0 m

Boundary conditions:

Length of wall (normal to plane of analysis) = 1000.00 m

Width of excavation on active side of wall = 20.00 m

Width of excavation on passive side of wall = 20.00 m

Distance to rigid boundary on active side = 20.00 m

Distance to rigid boundary on passive side = 20.00 m

OUTPUT OPTIONS

Stage no.	Stage description	Output options		
		Displacement Bending mom. Shear force	Active, Passive pressures	Graph. output
1	Apply water pressure profile no.1	Yes	Yes	Yes
2	Apply surcharge no.1 at elev. 122.60	Yes	Yes	Yes
3	Apply surcharge no.2 at elev. 122.60	Yes	Yes	Yes
4	Apply surcharge no.3 at elev. 122.60	Yes	Yes	Yes
5	Excav. to elev. 120.05 on PASSIVE side	Yes	Yes	Yes
*	Summary output	Yes	-	Yes

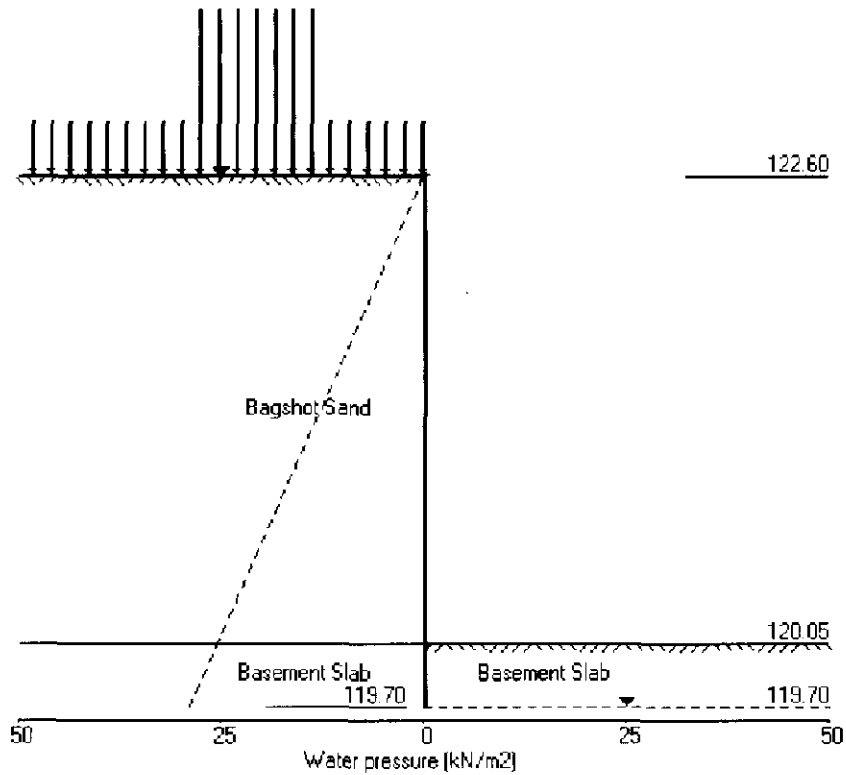
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Run ID. South section
4 Hampstead Square
Party Wall - Wall G Underpin E Permanent

| Sheet No.
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| Job No. CG5919
| Made by : RDB
| Date: 27-02-2012
| Checked :

Units: kN,m

Stage No.5 Excav. to elev. 120.05 on PASSIVE side



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Run ID. South section

4 Hampstead Square

Party Wall - Wall G Underpin E Permanent

| Sheet No.

|

| Job No. CG5919

| Made by : RDB

| Date:27-02-2012

| Checked :

Units: kN,m

Summary of results

STABILITY ANALYSIS according to Strength Factor method

Factor of safety on soil strength

			FoS for toe elev. = 119.70		Toe elev. for FoS = 1.200		Strut force for F=1.000	
			-----		-----		-----	
Stage	--- G.L. ---		Strut	Factor	Moment	Toe	Wall	Strut
No.	Act.	Pass.	Elev.	of	equilib.	elev.	Penetr	force
				Safety	at elev.		-ation	kN/m run
1	122.60	122.60	Cant.	Conditions not suitable for FoS calc.				
2	122.60	122.60	Cant.	4.856	119.90	122.39	0.21	
3	122.60	122.60	Cant.	3.488	119.88	122.39	0.21	
4	122.60	122.60	Cant.	3.347	119.87	122.39	0.21	
5	122.60	120.05	Cant.	1.317	119.81	119.78	0.27	

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Program: WALLAP Version 5.04 Revision A36.B51.R40	
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Run ID. South section	Made by : RDB
4 Hampstead Square	Date:27-02-2012
Party Wall - Wall G Underpin E Permanent	Checked :

Units: kN,m

Summary of results

BENDING MOMENT and DISPLACEMENT CALCULATION - Assumptions:

Subgrade reaction model - Boussinesq Influence coefficients
 Soil deformations are elastic until the active or passive limit is reached
 Open Tension Crack analysis - No
 Length of wall perpendicular to section = 1000.00m

Rigid boundaries: Active side 20.00 from wall
 Passive side 20.00 from wall

Bending moment, shear force and displacement envelopes

Node no.	Y coord	Displacement		Bending moment		Shear force	
		maximum m	minimum m	maximum kN.m/m	minimum kN.m/m	maximum kN/m	minimum kN/m
1	122.60	0.000	0.000	0.0	-0.0	0.0	0.0
2	122.50	0.000	0.000	0.0	0.0	0.5	-0.0
3	122.40	0.000	0.000	0.1	-0.0	1.2	-0.1
4	122.24	0.000	0.000	0.4	-0.0	2.6	-0.0
5	122.08	0.000	0.000	1.0	0.0	4.4	0.0
6	121.92	0.000	0.000	1.8	0.0	6.5	0.0
7	121.76	0.000	0.000	3.1	0.0	9.1	0.0
8	121.60	0.000	0.000	4.8	0.0	12.2	0.0
9	121.44	0.000	0.000	7.0	0.0	15.6	0.0
10	121.28	0.000	0.000	9.8	0.0	19.5	0.0
11	121.12	0.000	0.000	13.3	0.0	23.9	0.0
12	120.96	0.000	0.000	17.5	0.0	28.6	0.0
13	120.80	0.000	0.000	22.5	0.0	33.8	0.0
14	120.64	0.000	0.000	28.3	0.0	39.4	0.0
15	120.48	0.000	0.000	35.1	0.0	45.4	0.0
16	120.32	0.000	0.000	42.8	0.0	51.8	0.0
17	120.19	0.000	0.000	50.2	0.0	57.5	0.0
18	120.05	0.000	0.000	58.4	0.0	63.4	0.0
19	119.96	0.000	0.000	53.3	0.0	0.0	-123.2
20	119.88	0.000	0.000	36.8	0.0	0.0	-210.2
21	119.79	0.000	0.000	16.8	0.0	0.0	-210.4
22	119.70	0.000	-0.000	0.0	0.0	0.0	-0.0

Maximum and minimum bending moment and shear force at each stage

Stage no.	Bending moment				Shear force			
	maximum kN.m/m	elev.	minimum kN.m/m	elev.	maximum kN/m	elev.	minimum kN/m	elev.
1	16.6	120.05	-0.0	122.24	22.2	120.05	-70.5	119.79
2	25.8	120.05	-0.0	122.60	28.0	120.05	-106.7	119.79
3	32.6	120.05	-0.0	122.60	35.5	120.05	-135.3	119.79
4	34.0	120.05	-0.0	122.60	37.6	120.05	-141.3	119.79
5	58.4	120.05	0.0	122.60	63.4	120.05	-210.4	119.79

Maximum and minimum displacement at each stage

Stage no.	Displacement				Stage description
	maximum m	elev.	minimum m	elev.	
1	0.000	122.60	-0.000	119.70	Apply water pressure profile no.1
2	0.000	122.60	-0.000	119.70	Apply surcharge no.1 at elev. 122.60
3	0.000	122.60	-0.000	119.70	Apply surcharge no.2 at elev. 122.60
4	0.000	122.60	-0.000	119.70	Apply surcharge no.3 at elev. 122.60
5	0.000	122.60	-0.000	119.70	Excav. to elev. 120.05 on PASSIVE side

CARD GEOTECHNICS LIMITED

Program: WALLAP Version 5.04 Revision A36.B51.R40

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Run ID. South section

4 Hampstead Square

Party Wall - Wall G Underpin E Permanent

Sheet No.

Job No. CG5919

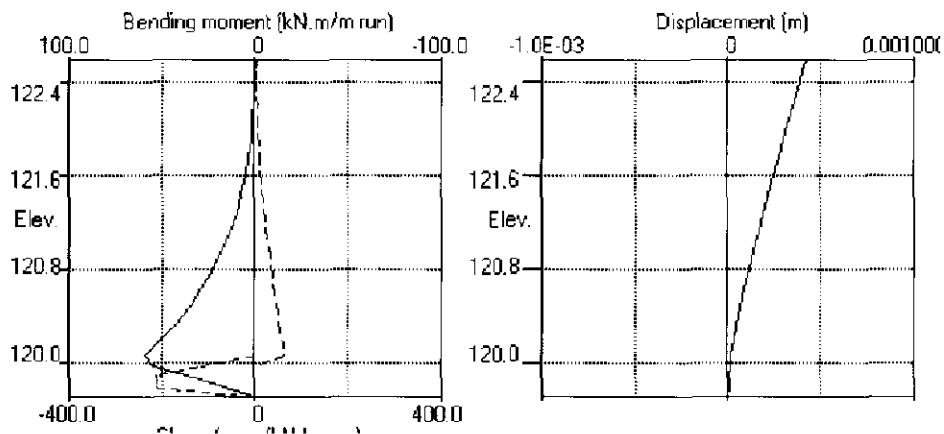
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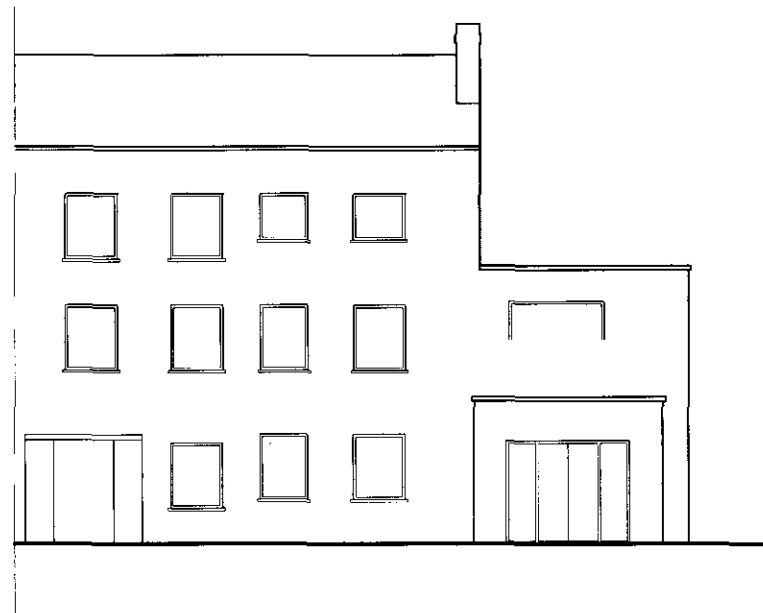
Date: 27-02-2012

Checked :

Units: kN,m

Bending moment, shear force, displacement envelopes

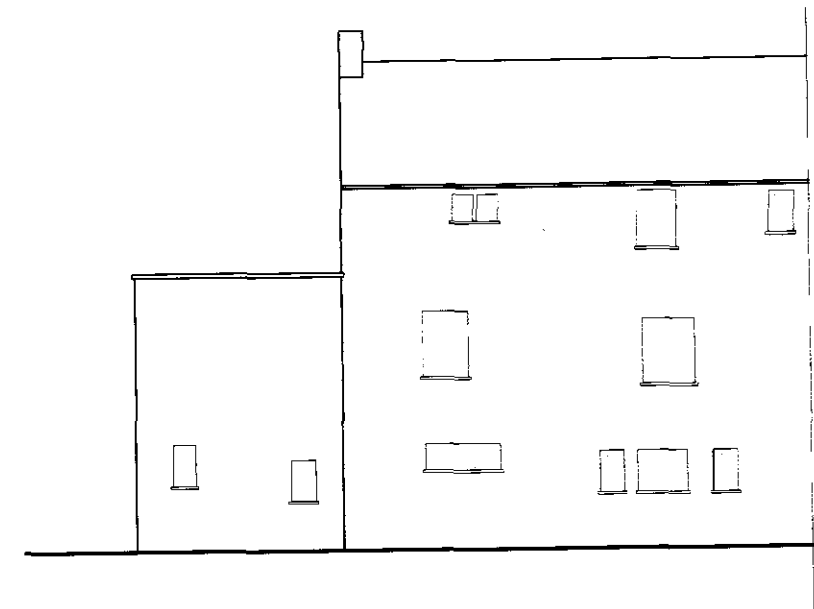




Proposed North Elevation



Proposed West Elevation



Proposed South Elevation

0 1 2 3 4 5
METRES
SCALE

A 21/03/12 Section reduced in size to match floor layouts

No Date Amendment

Client: Dr J Singer

Project: 4 Hampstead Square
London
NW3 1AB

Drawing: Proposed Elevations

Scale: 1:100 @ A2

Date: 01 Nov 11

Status: PRELIMINARY

Dwg No: 2100-003

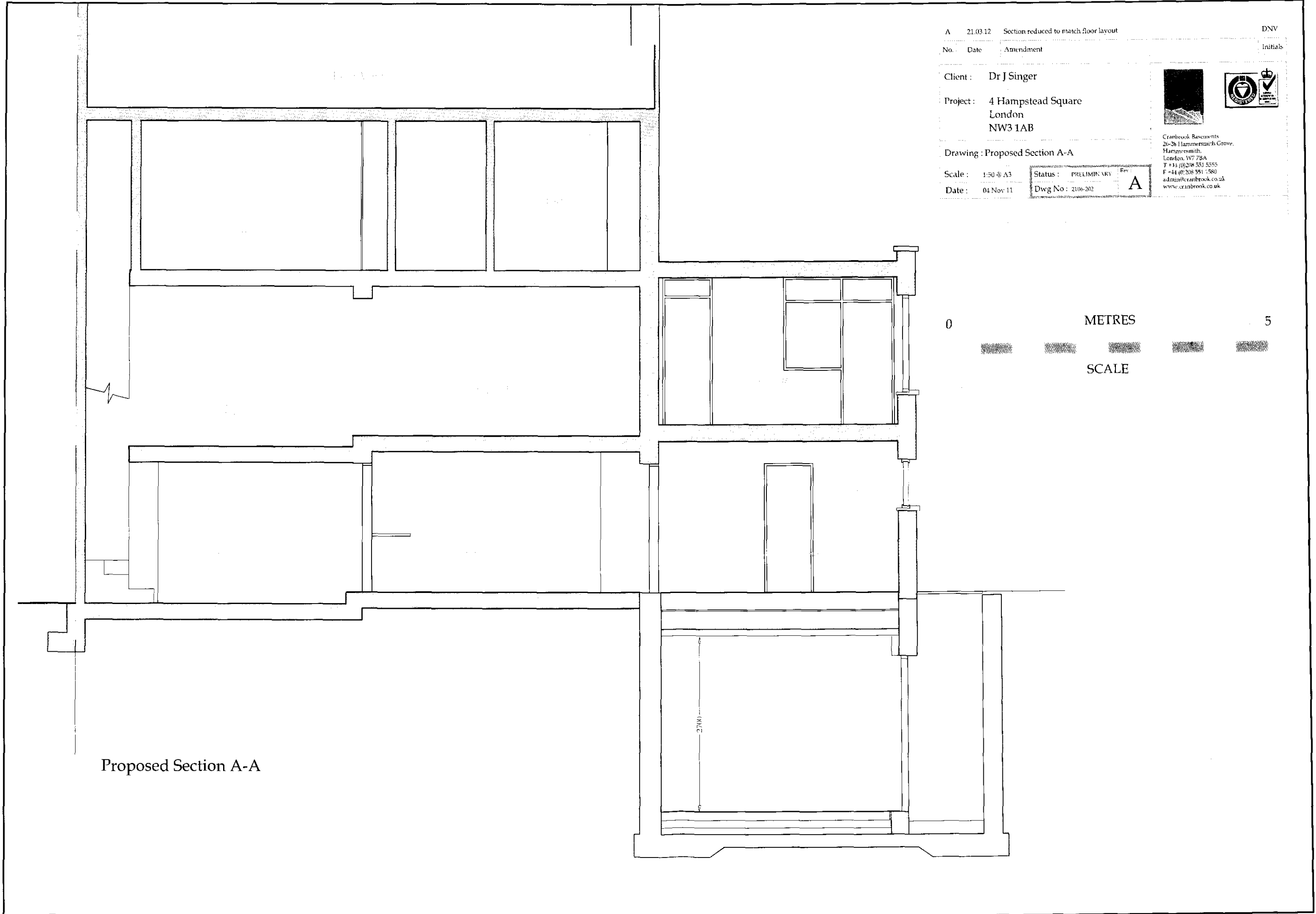
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F +44 (0)20 71 56 56
admin@crashbrook.co.uk
www.crashbrook.co.uk

DNV

: Initials



No.	Date	Amendment	Initials
A	21.03.12	Section reduced to match floor layout	DNV

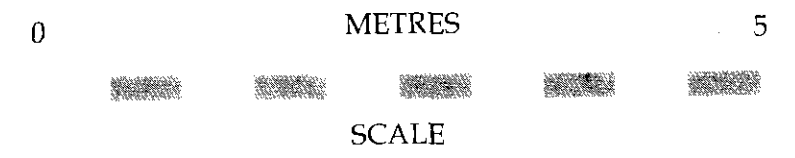
Client : Dr J Singer

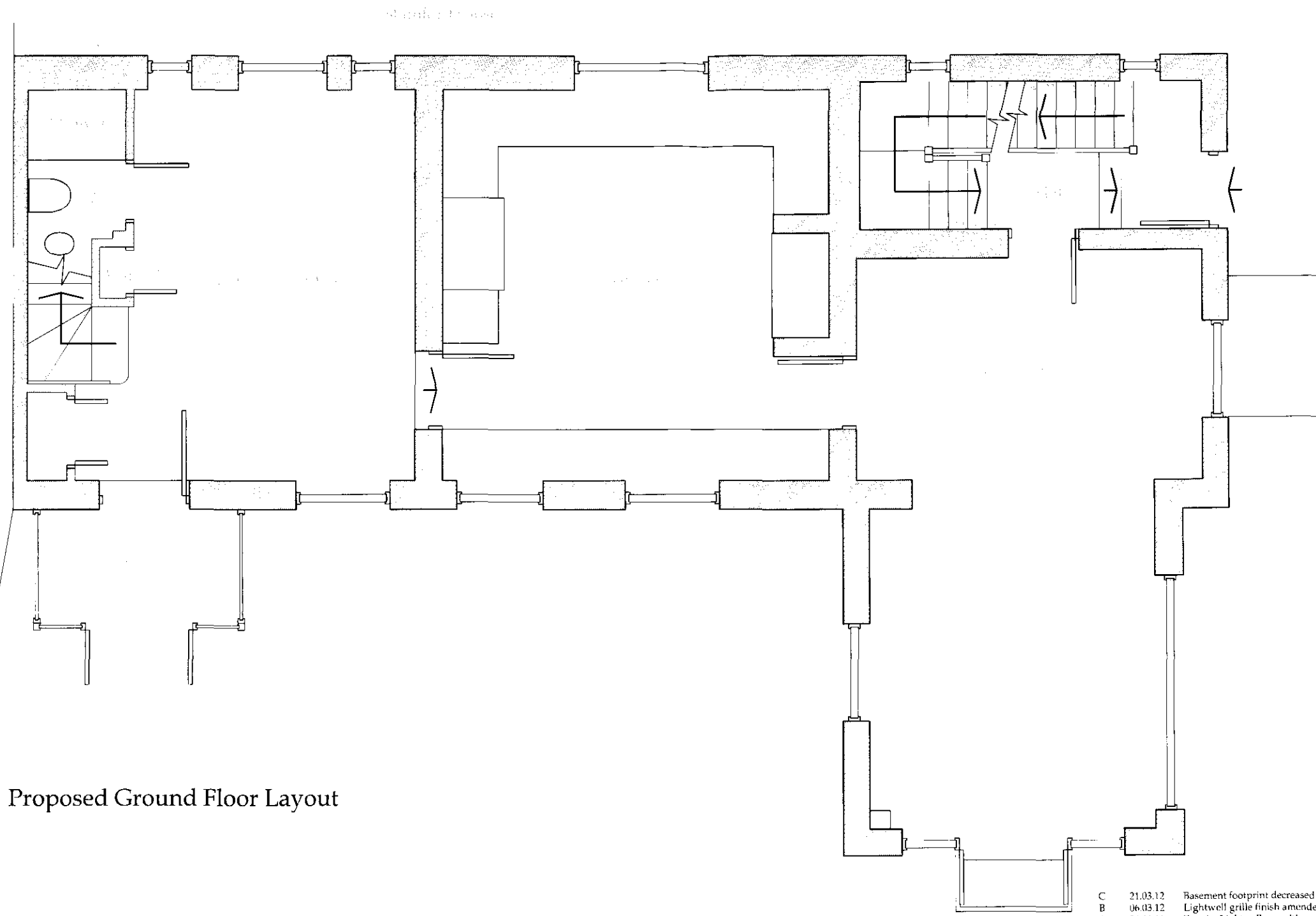
Project : 4 Hampstead Square
London
NW3 1AB

Drawing : Proposed Section A-A

Scale : 1:50 @ A3	Status : PRELIMINARY	Rev : A
Date : 04 Nov 11	Dwg No : 2106-202	

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26-28 Hammersmith Grove,
Hammersmith,
London, W7 7BA
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F +44 (0)208 551 5580
admin@cranbrook.co.uk
www.cranbrook.co.uk





Proposed Ground Floor Layout

0 METRES 5
SCALE

C	21.03.12	Basement footprint decreased in size
B	06.03.12	Lightwell grille finish amended
A	24.11.11	Ensuite Lightwell repositioned.

No. Date Amendment

Client : Dr J Singer
Project : 4 Hampstead Square
London
NW3 1AB

Drawing : Proposed Ground Floor Layout

Scale : 1:50 @ A3
Date : 26 Oct 11

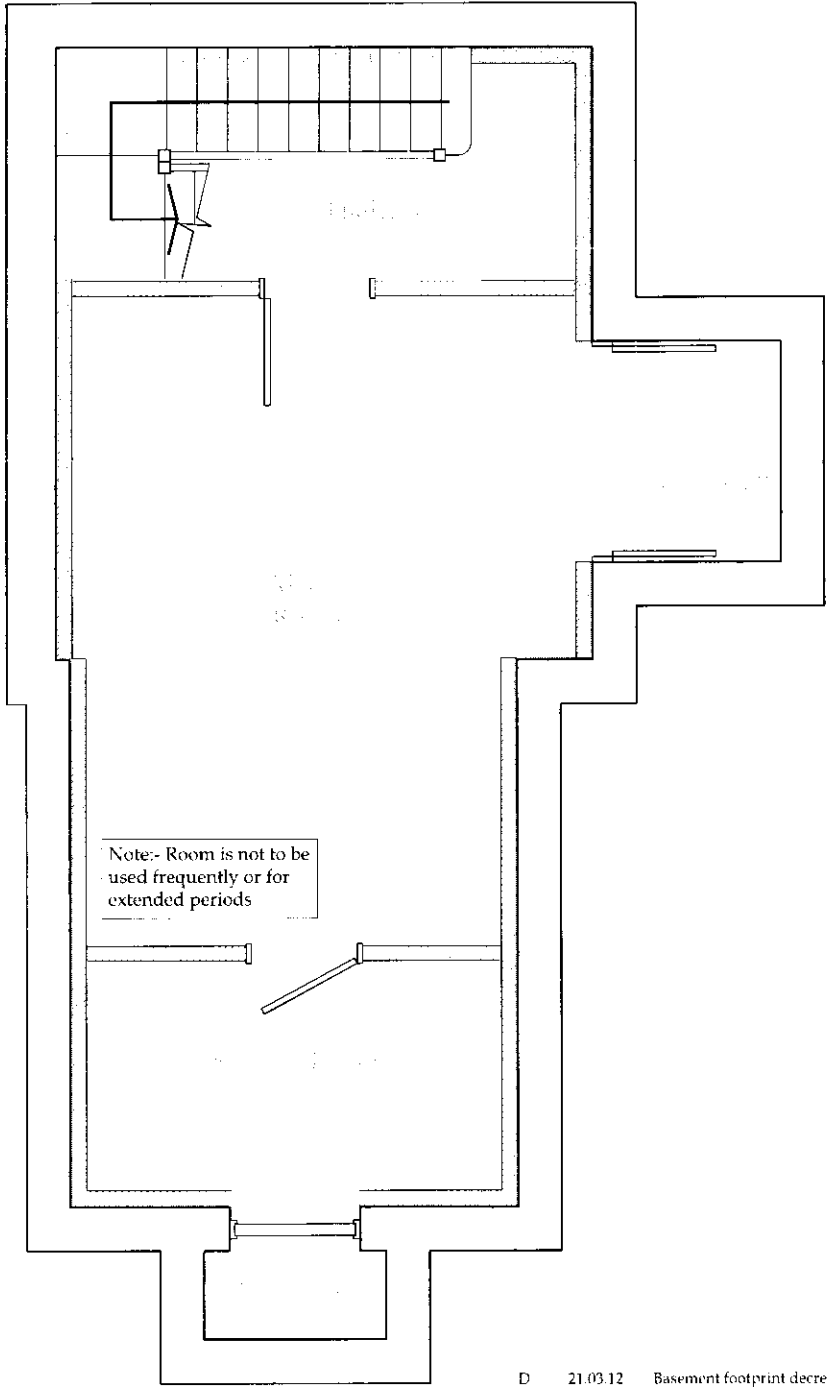
Status : PRELIMINARY
Dwg No : 2106-201

DNV
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Initials



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Proposed Lower Ground Floor Layout



D	21.03.12	Basement footprint decreased in size
C	06.03.12	Ensuite/Bedroom configuration amended
B	25.11.11	Bath amended
A	24.11.11	Ensuite Lightwell repositioned.

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DNV

No.	Date	Amendment	Initials
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Client : Dr J Singer
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Drawing : Proposed Lower Ground Floor Layout

Scale :	1:50 @ A3	Status :	PRELIMINARY	Rev	D
Date :	26 Oct 11	Dwg No :	2106-200		

