Environmental Noise Survey: PPG24

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Report No – **9587-2 R1**
Client – **Linden Homes**
Site – **Former Reservoir, Gondar Gardens, Camden, London**

1.0 Executive Summary.

A PPG24 survey has been carried out over a typical 24-hour period in order to assess the impact of road noise on the proposed development at the former reservoir, Gondar Gardens, Camden, London. It has been demonstrated that the internal design criteria from Table 5 Page 19 BS8233:1999 can be achieved so that the following will be the case in the occupied areas of the new development:

- 30dB L_{Aeq} during a 16-hour daytime period
- 30dB L_{Aeq} during an 8-hour night-time period

These represent the "Good" internal ambient noise levels inside a residential dwelling.

2.0 Table of Contents

3.0 Site Description

3.1 Site

The existing site is a former reservoir off Gondar Gardens, Camden. A large proportion of the site is sunk below ground level where there are existing structures. The site is situated in a residential area.

3.2 Proposed Development

location of the development is shown in figure 3.1.

Figure 3.1 – Plan view of the proposed development.

3.3 Noise Climate

The noise climate was dominated by faint continuous noise from urban trunk roads and transient noise from local residential traffic. Noise from air traffic overhead was also audible.

4.0 Assessment Criteria

PPG24: Planning and Noise

The most relevant criteria to assess the impact of existing noise levels on proposed residential developments is the national planning policy guidelines PPG 24: Planning and Noise, September 1994. This document sets out a range of 'Noise Exposure Categories' (NEC's), defined by ranges in noise level, each of which indicates advice to consider during the planning stage of noise sensitive developments. The four categories defined for mixed noise sources are set out in figure 4.1 below, with the corresponding noise levels and advice on noise considerations.

Figure 4.1 – Extract from PPG24

PPG24 – NOISE LEVELS CORRESPONDING TO THE NOISE EXPOSURE CATEGORIES FOR NEW DWELLINGS $L_{Aeq,T}$ dB				
NOISE SOURCE	NOISE EXPOSURE CATEGORY			
Road	A	B	C	D
0700-2300	<55	55-63	63-72	>72
2300-0700	<45	45-57	57-66	>66

BS8233:1999 Sound insulation and noise reduction for buildings – a code of practice

The British Standard BS8233:1999 recommends design criteria for internal noise levels within residential properties. This standard suggests reasonable resting/sleeping conditions and proposes noise limits that will normally satisfy these criteria for most people.

A summary of the noise guidelines that are to be applied to this development are given below.

Figure 4.2 – Performance criteria from BS8233:1999.

Area	Internal Level, dB(A)
Bedrooms ("Good")	30dB $L_{Aeq,T}$
Living Rooms ("Good")	30dB $L_{Aeq,T}$

5.0 Survey

5.1 Measurement Instrumentation

The measurement instrumentation used on the survey was as follows:

BS7445:2003 Part 1 Description and measurement of environmental noise. Guide to quantities and procedures can be found on the BSI website. 7658

Equipment Details		
Equipment Description	**Manufacturer and Type No.**	**Serial No**
Sound Level Meter	CEL 490 SLM	078258
Calibrator	CEL 284/2	4/07022837

The equipment was calibrated to comply with Section 4.2 of BS7445:1 – 2003 before and after the surveys. The calibration was as follows:

The calibration was as follows:		
Meter	**Before**	**After**
CEL 490	114.1 dB	114.1 dB

There was no adverse deviation.

5.2 Measurements & Timescale

During the survey 1-minute measurements were made over full 24-hour periods between 10th November 2010 and 11th November 2010, these were subsequently analysed into longer periods.

The following measurements are reported:

$$L_{Aeq,1min}$$

The measurements and their interpretation shall be in accordance with BS 7445: Parts 1, and 2. All sound pressure levels are in dB (re 20μPa)

5.3 Position of Monitoring Equipment

The monitoring equipment was placed at the boundary of the site with Gondar Gardens. The meter was mounted free-field and 1.5m from the ground. A plan showing the location of the monitoring equipment is shown in Figure 5.1.

Figure 5.1 – An image illustrating location of the monitoring positions.

5.4 Meteorology

During the survey site visits weather information was noted:

Figure 5.2 – Weather conditions during the survey.

Date	General	Temp (°C)	Roads (Wet/Dry)
10th November 2010		7	Dry
11th November 2010		5	Dry

6.0 Results

6.1 Summary

All reported results are free field.

Figure 6.1 – Summary of results

PPG24 assessment data				
Measurement	**Daytime**	**Period/Hour Ending**	**Night-time**	**Period/Hour Ending**
Maximum dB $L_{Aeq,1hr}$	57	0900	51	0700
Minimum dB $L_{Aeq,1hr}$	49	2300	42	0200
dB $L_{Aeq,16hr}$/$L_{Aeq,8hr}$	53	0700-2300	46	2300-0700

PPG24 assessment data

The daytime hourly equivalent continuous sound pressure levels at the façade of the proposed development were between 49-57dB $L_{Aeq,1hr}$ with an average sound pressure level over the daytime period of 53dB $L_{Aeq,16hr}$.

The night time hourly equivalent continuous sound pressure levels at the façade of the proposed development were between 42-51dB $L_{Aeq,1hr}$ with an average sound pressure level over the night-time period of 46dB $L_{Aeq,8hr}$. The maximum measured $L_{AMAX,1min}$ was 79dB.

6.2 PPG24: Noise Exposure Categories (NECs)

The site will be categorised based on the levels at the facades of the properties that front the road and the railway. The site is therefore categorised as the following:

Figure 6.3 – NEC exposure categories for the site.

	Daytime	Night-time
Position 1	NEC A	NEC B

Figure 6.4 – Extract from PPG24

NEC A: "Noise need not be considered as a determining factor in granting planning permission, although the noise level at the high end of the category should not be regarded as a desirable level."

NEC B: "Noise should be taken into account when determining the planning applications and, where appropriate, conditions imposed to ensure and adequate level of protection against noise."

7.0 Mitigation

The internal design criteria given in section 6 form the basis of the glazing design.

The mitigation for this project is based on a glazing specification performance requirement. The glazing configuration is selected based on the typical performance specifications detailed in the Pilkington Design Guide "Glass & Noise Control" – Technical Bulletin May 1997. This does not preclude selection of any other glazing specification providing it can be shown that it will in any event perform at the required level.

The maximum external levels are summarised in figure 7.1 below:

Figure 7.1 – External levels (with correction)

	Max Daytime $L_{Aeq,16hr}$	Night-time $L_{Aeq,8hr}$
Position 1	53dB	46dB

The sound pressure level spectrum of the prevailing ambient noise was dominated by road noise. The glazing performance selection will be based on the road traffic corrected sound reduction index (R_{TRA}).

Based on the measurement data the calculation method from BS8233:1999 is used to select the glazing. The assumptions for this are detailed in the Appendix, standard forms of construction are assumed such that the glazing is likely to be the lowest performing facade element.

The single figure glazing performance requirement in order to achieve the required internal design criteria is calculated in Table 2 in the Appendix and are summarised below:

Figure 7.2 – Minimum sound reduction qualities of the glazing

	Living Rooms	Bedrooms
Position 1	23dB R_{TRA}	16dB R_{TRA}

The glazing configurations which achieve the required performance from the Pilkington Design Guide performance tables are as follows:

Figure 7.3 – Minimum glazing specification.

	Living Rooms	Bedrooms
Position 1	4.12.4	4.12.4

Figures 8.2 and 8.3 indicate that there needs to be some consideration to meet the internal noise criteria of BS8233:1999. A glazing mark-up plan has been included in the appendix.

It should be noted that in order to achieve these internal levels the windows must remain closed in the affected areas.

8.0 Conclusions

The site has been surveyed in accordance with the requirement of PPG24 and reported in line with the recommendations in BS7445: 1 – 2003 and BS7445:2 – 1991.

The site is categorised as NEC B. This indicates that some consideration will have to be given in order to achieve the internal design criteria for bedrooms and living areas within the dwellings.

The internal ambient levels have been selected from the guidance given in BS8233:1999. We have referred to the internal design criteria in Section 4 and have designed to the higher standard. The specific treatment to achieve internal ambient levels is detailed in the mitigation section above.

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Noise & Vibration Consultant

9.0 Appendix

Appendix A: Survey Noise Levels

Table 1: Average Levels

Address: Former Reservoir, Gondar Gardens, Camden, Londoon
Survey Date: 10/11/2010-11/11/2010
All readings sound pressure levels

Hour End	Measured Levels dB LAeq	Corrections (dB)	Free Field dB LAeq
00:00:00	45.0	0	45
01:00:00	44.5	0	45
02:00:00	41.9	0	42
03:00:00	43.2	0	43
04:00:00	42.2	0	42
05:00:00	42.6	0	43
06:00:00	48.0	0	48
07:00:00	51.1	0	51
08:00:00	55.0	0	55
09:00:00	56.7	0	57
10:00:00	53.2	0	53
11:00:00	54.0	0	54
12:00:00	52.1	0	52
13:00:00	52.5	0	53
14:00:00	51.2	0	51
15:00:00	51.4	0	51
16:00:00	53.4	0	53
17:00:00	53.4	0	53
18:00:00	52.6	0	53
19:00:00	54.0	0	54
20:00:00	52.5	0	52
21:00:00	49.8	0	50
22:00:00	52.1	0	52
23:00:00	49.1	0	49

Max Night Time Hourly dB LAeq	**51.1**
Max Day Time Hourly dB LAeq	**56.7**
Min Night Time Hourly dB LAeq	**41.9**

PPG 24 Road Noise NEC Calculation

		NEC
Daytime	53	***A***
Night time	46	***B***

NOTE: hourly sound pressure levels have to be copied into correct cells to ensure daytime & night time periods a

Appendix B: Glazing Calculation

Table 2 - Internal Noise Criteria & Glazing Options

Address: Former Reservoir, Gondar Gardens, Camden, Londoon
Survey Date: 10/11/2010-11/11/2010

Assumptions

Night time 2300 - 0700hrs / Day 0700-2300hrs (worst case condition)
Assume road noise dominant

BS8233: 1999
Bedroom Criteria LAeq, T -30dBA "Good" - 35dBA "Reasonable" 45dBLAmax
Living Rooms Criteria LAeq, T - 30dBA "Good" - 40dBA "Reasonable"
$R_{RAIL} = R_{TRA} + 3$ Pilkington Glass & Noise Control "Technical Bulletin": Design Guide p16

Double Glazing	R_{TRA}	R_{RAIL}
4.12.4	25	28
6.12.6	26	29
6.12.6.4pvb	27	30
10.12.4	29	32
10.12.6	32	35
10.12.6.4pvb	34	37
Secondary Glazing		
6.100.4 Secondary	37	40
6.150.4 Secondary	39	42
10.200.6 Secondary	45	48

Type in Noise Levels Here
Worst Case Noise Levels

	Night LAeq	Day LAeq
	46	53
Barrier Performance dB(A) From barrier Calc Sheet if Applicable	0	0

Calculation

Internal Criteria: Calculation for Acoustic Glazing		
Noise Level at Property dB(A)	46	53
Desired Internal Level	30	30
Required Glazing Performance R_{TRA}	**16**	**23**
	4.12.4	4.12.4
Glazing Selection		
Achieves Internal Criteria	Yes	Yes

Specification of Glazing		Selected Glazing Performance dB R_{TRA}
Bedrooms	4.12.4	25
Living Rooms	4.12.4	25

Predicted Internal Levels with Glazing Selected

Night LAeq	Day LAeq
21	28

note: windows must remain closed to ensure compliance with internal design criteria

Appendix B: Glazing mark-up plan

	Living Rooms	Bedrooms
Position 1	23dB R_{TRA}	16dB R_{TRA}

	Living Rooms	Bedrooms
Position 1	4.12.4	4.12.4

Appendix C: Pilkington design specifications

Tables 1–3 Sound Insulation Data for a Variety of Glazings

(No contribution from wall)

In addition to the full thirdoctaveband sound insulation spectra, corresponding octaveband equivalent values are given in adjacent columns. Pilkington AUDIOSCREEN is a special acoustic laminate.

Table 1 – Single Glazing

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)																			
	4		6		10		19		6.4 PVB		Pilkington AUDIOSCREEN 7		9		11		13		17	
100	17		18		24		25		18		23		25		26		27		26	
125	23	20	22	20	26	26	29	28	22	20	26	25	27	26	29	27	30	29	28	28
160	22		22		28		31		22		25		27		29		30		32	
200	21		22		26		31		22		26		28		29		31		31	
250	21	22	26	24	28	27	32	32	26	24	27	27	29	29	31	31	33	32	33	32
315	24		26		29		35		26		28		30		32		33		34	
400	26		29		32		36		29		30		32		34		35		37	
500	29	28	31	31	34	34	38	37	31	31	32	31	34	34	36	36	37	37	39	39
630	30		33		36		36		33		33		36		38		38		41	
800	32		34		37		35		34		35		37		39		40		42	
1000	34	33	36	35	36	35	38	37	36	35	36	36	38	38	39	39	40	40	44	43
1250	34		36		33		40		36		38		39		40		41		45	
1600	36		32		33		44		36		39		41		40		40		46	
2000	36	34	26	29	38	36	47	46	34	33	40	40	41	40	38	38	38	40	44	41
2500	31		30		41		50		31		40		38		37		41		38	
3150	25		34		43		52		35		38		37		42		45		42	
4000	31	28	37	36	44	44	55	54	39	38	36	38	41	40	45	44	51	48	46	45
R_{Tr} (dB)	27		29		33		37		30		32		34		35		36		38	
R_w (dB)	30		32		36		40		33		36		37		38		39		41	
$R_{tr,s}$ (dBA)	25		28		32		35		29		31		33		34		36		36	

Table 2 – Pilkington Insulating Units

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)																			
	4/12/4		6/12/6		6/12/6.4 PVB		10/12/4		10/12/6		10/12/6.4 PVB		Pilkington AUDIOSCREEN 6/12/7		6/12/9		6/12/11		6/12/13		13/12/13	
100	25		17		19		23		27		27		26		24		26		27		29	
125	24	24	26	20	24	21	28	25	27	26	28	27	28	26	27	26	28	27	28	26	27	28
160	23		22		21		26		24		26		26		25		26		24		29	
200	21		18		19		19		24		26		23		24		24		25		33	
250	21	20	18	19	19	20	23	22	29	27	30	29	26	25	28	27	28	27	30	28	37	36
315	19		24		24		26		31		32		28		30		31		32		39	
400	22		27		28		31		33		34		30		33		34		36		42	
500	25	25	29	29	32	31	33	33	34	34	36	36	34	33	37	36	38	37	40	38	45	45
630	30		33		34		36		37		40		36		40		41		43		49	
800	33		37		38		39		39		41		41		43		44		45		52	
1000	36	35	39	38	40	39	41	40	41	40	42	41	43	43	45	45	45	45	46	46	52	52
1250	38		39		40		41		41		41		45		46		46		46		52	
1600	40		39		39		41		39		41		45		45		44		44		50	
2000	41	38	34	36	35	37	45	43	37	38	42	42	45	46	45	46	42	44	42	44	51	52
2500	35		37		39		45		40		44		49		47		44		46		55	
3150	31		42		44		42		43		49		55		50		51		52		60	
4000	40	35	47	45	49	47	44	44	47	46	53	52	57	57	55	53	56	54	57	56	65	63
R_{Tr} (dB)	29		30		31		34		34		36		36		37		37		38		44	
R_w (dB)	31		33		34		36		38		40		38		40		40		43		47	
$R_{tr,s}$ (dBA)	25		26		27		29		32		34		31		32		33		33		39	

Table 3 – Double Windows (Secondary Sashes)

Thirdoctaveband Centre Frequency (Hz)	Sound Insulation (dB) for Glass Thickness (mm)					
	6/100/4		6/150/4		10/200/6	
100	25		27		32	
125	27	26	30	29	37	35
160	27		30		39	
200	33		34		45	
250	33	34	34	35	46	46
315	37		39		46	
400	41		42		47	
500	46	44	46	45	45	46
630	50		50		45	
800	54		54		44	
1000	57	56	57	56	45	46
1250	59		58		50	
1600	58		58		53	
2000	52	53	52	52	58	56
2500	51		49		58	
3150	48		47		64	
4000	57	52	52	50	64	65
R_{Tr} (dB)	44		44		47	
R_w (dB)	46		47		49	
$R_{tr,s}$ (dBA)	37		39		45	

Appendix D: Architects Plans

NOTES

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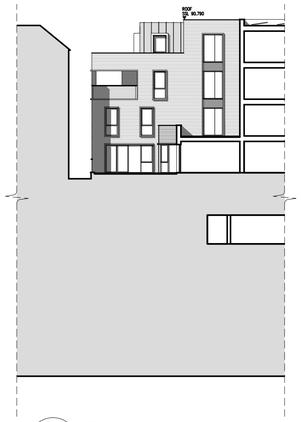
3 This drawing is not to be scaled
4 All work and materials to be in accordance with current applicable Statutory Legislation and to comply with all relevant Codes of Practice and British Standards



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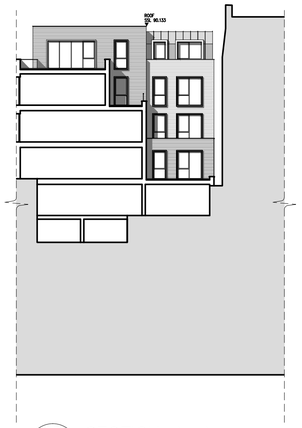
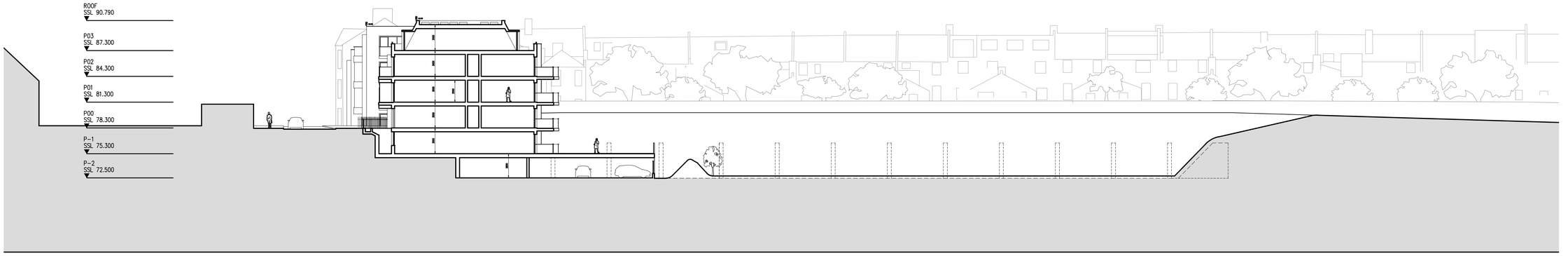


2B SECTION A–A
SCALE: 1:250 (A1)

4 SECTION D–D
SCALE: 1:250 (A1)

5 SECTION E–E
SCALE: 1:250 (A1)



3 SECTION B–B
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Rev		Date
B	Sections revised	28/10/13
A	Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
SECTIONS
GONDAR GARDENS

Scale	Date	Status
1:250(A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	**T(20) E01**	**B**

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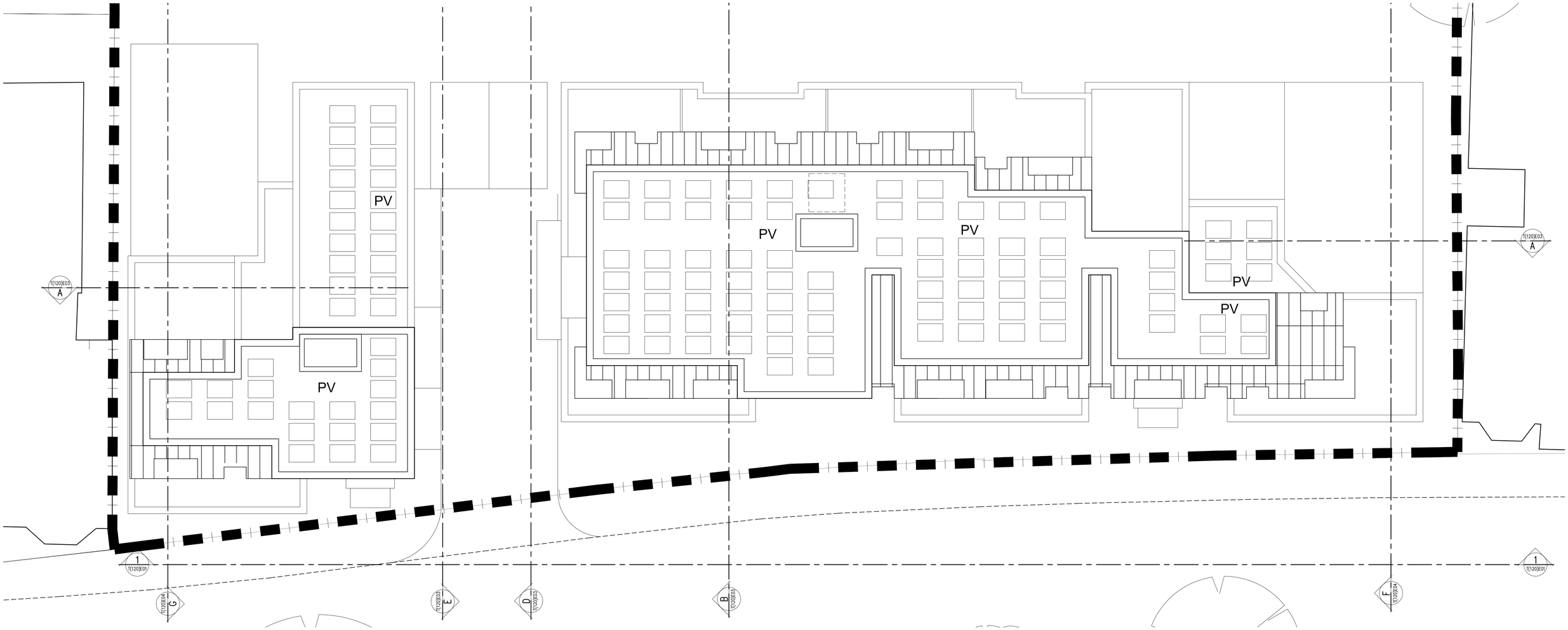

Rev	Date
B Plan revised	28/10/13
A Preliminary set	27/09/13

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Drawing
PLAN
ROOF LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) P04	B

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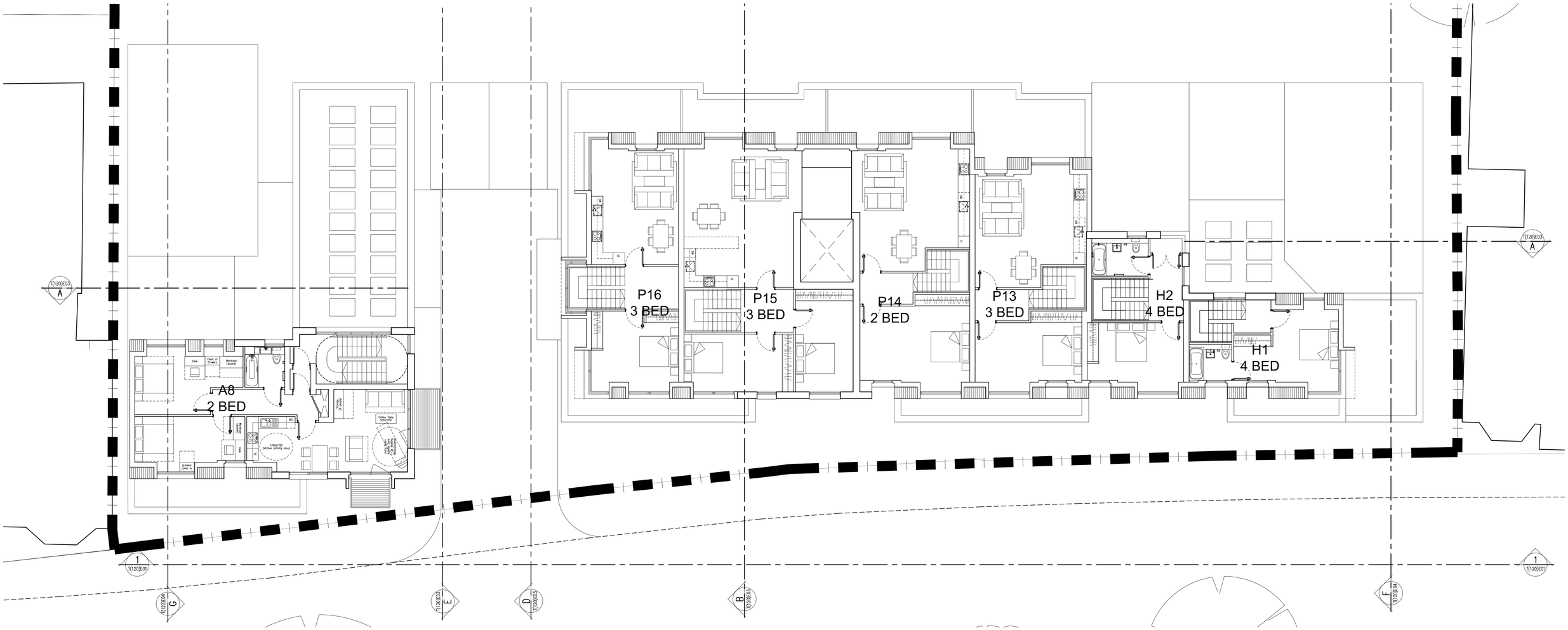

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Drawing
PLAN
THIRD FLOOR LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
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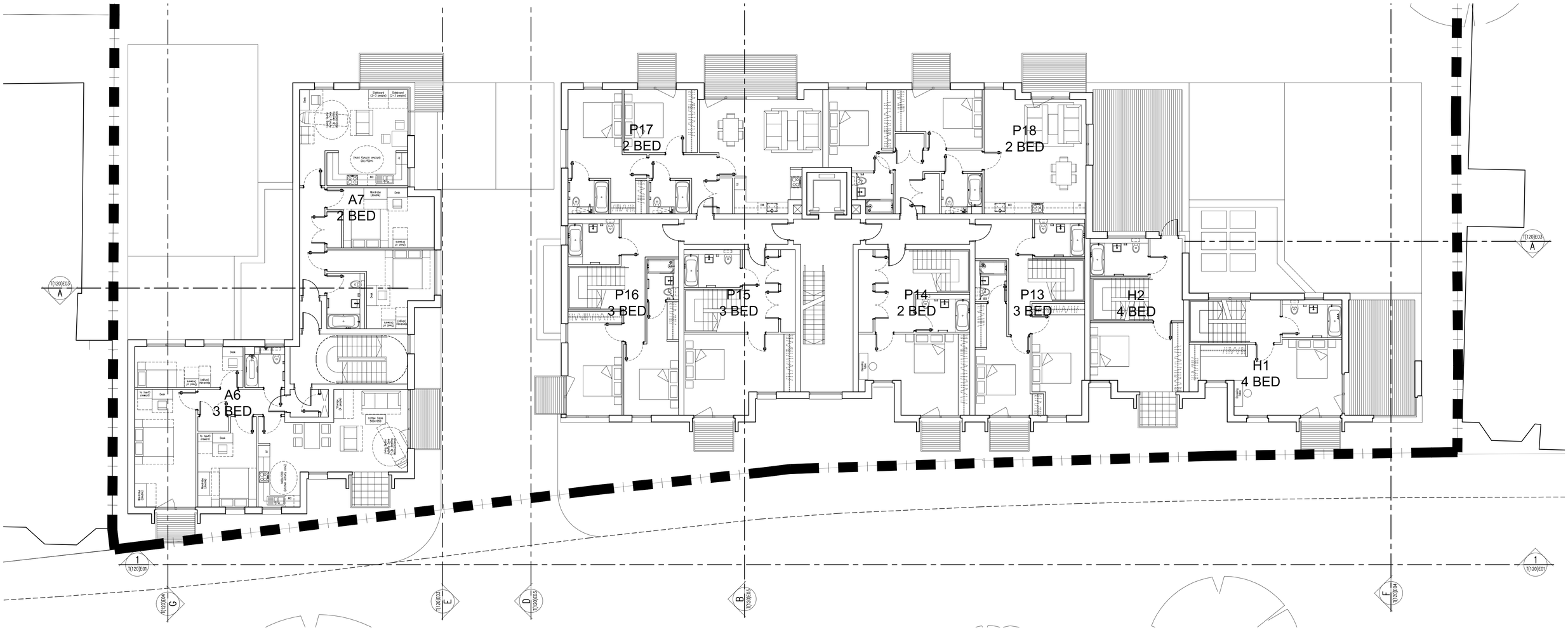

Rev	Date
B Plan revised	28/10/13
A Preliminary set	27/09/13

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Drawing
PLAN
SECOND FLOOR LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
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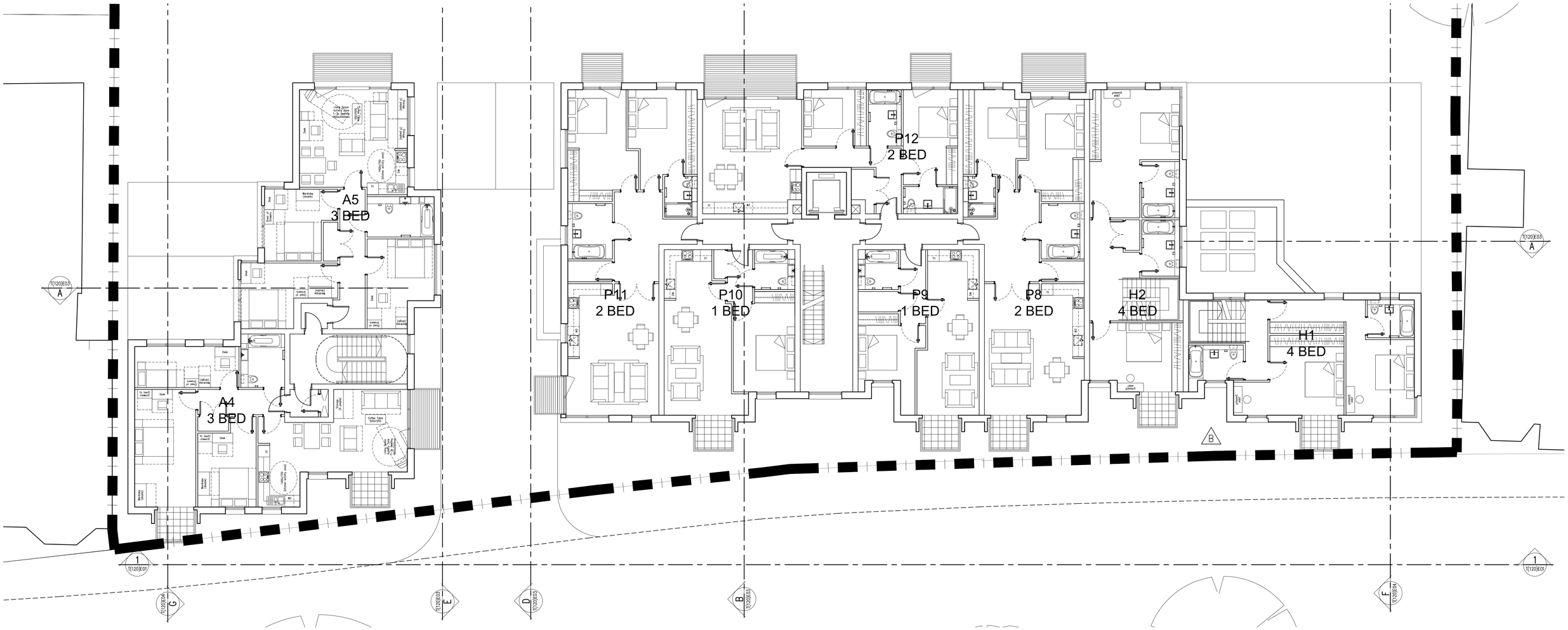

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Drawing
PLAN
FIRST FLOOR LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) P01	B

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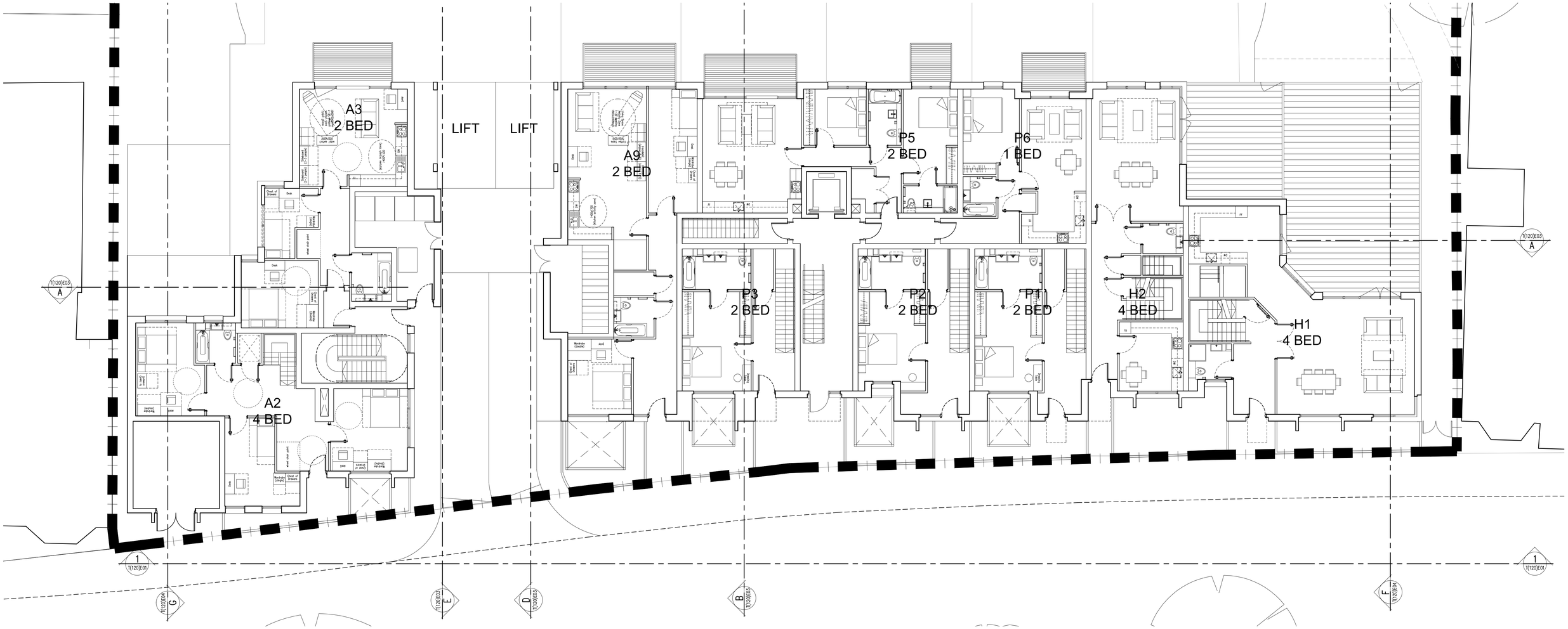
NOTES

1 The Contractor must check and confirm all 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



Rev	Date
B Plans revised	28/10/13
A Preliminary set	27/09/13

This scale is 10cm in length when printed at the size indicated in the title block. 0 1 2 3 4 5 10cm

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Client
LINDEN WATES
(WEST HAMPSTEAD) LTD.

Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
PLAN
GROUND LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	**T(20) P00**	**B**

G:\5388\T_Series\T20\T20P00

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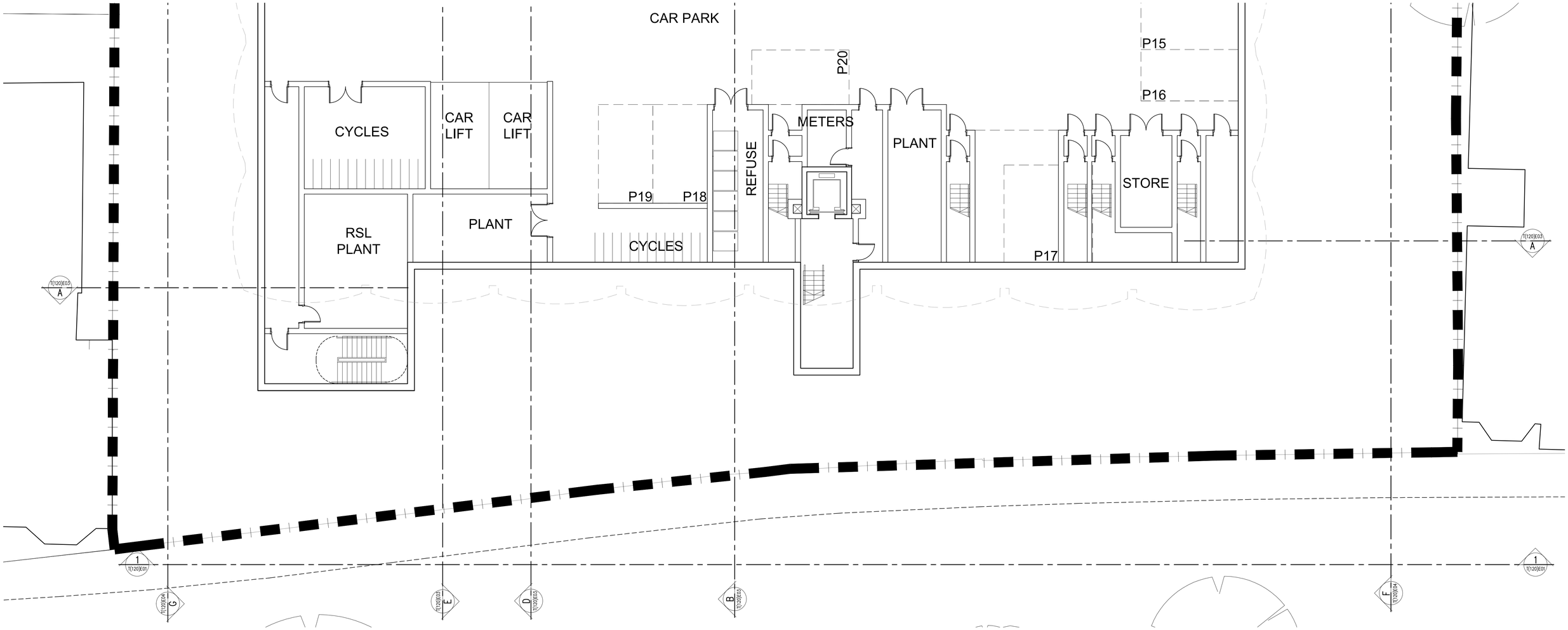

Rev	Date
A Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
PLAN
BASEMENT LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) P0-2	A

G:\5388\T_Series\T20\T20P0-2

0 1 2 3 4 5 10cm

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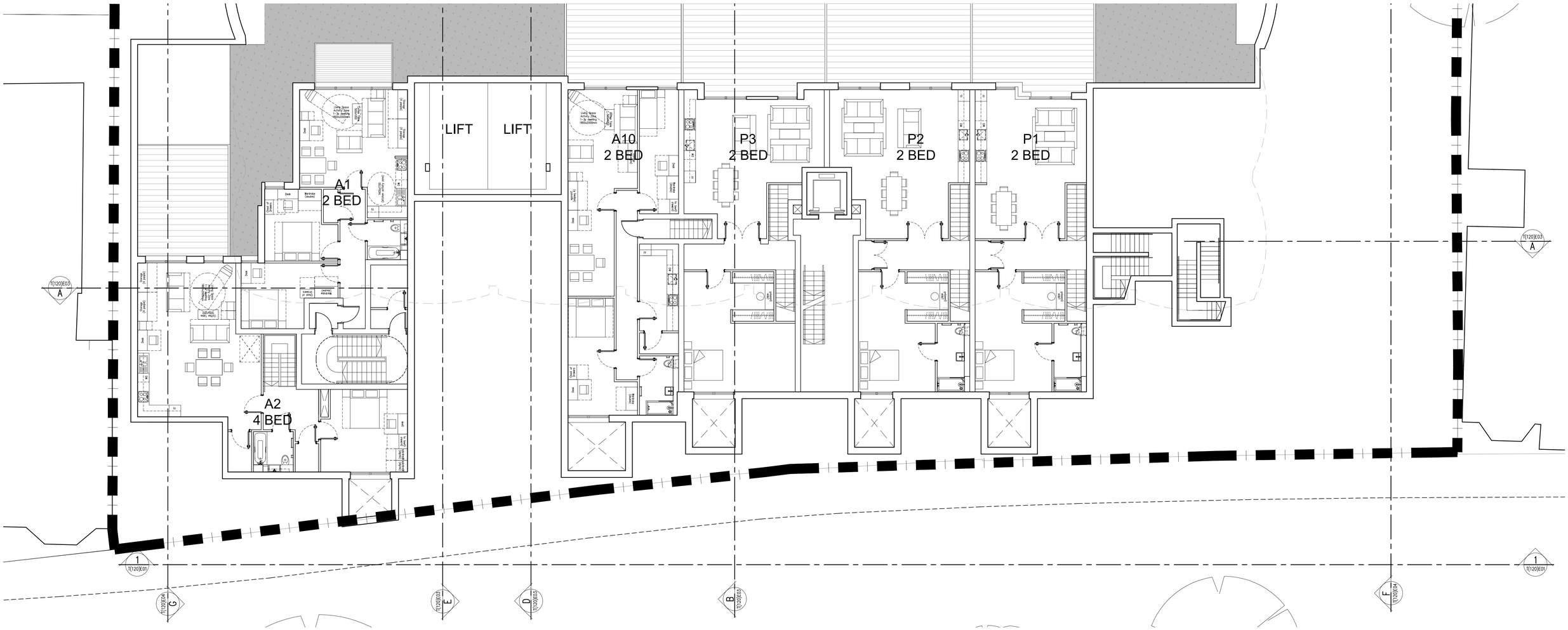

Rev	Date
A Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
PLAN
LOWER GROUND LEVEL

Scale	Date	Status
1:100 (A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	**T(20) P0-1**	**A**

G:\5388\T_Series\T20\T20P0-1

0 1 2 3 4 5 10cm

NOTES

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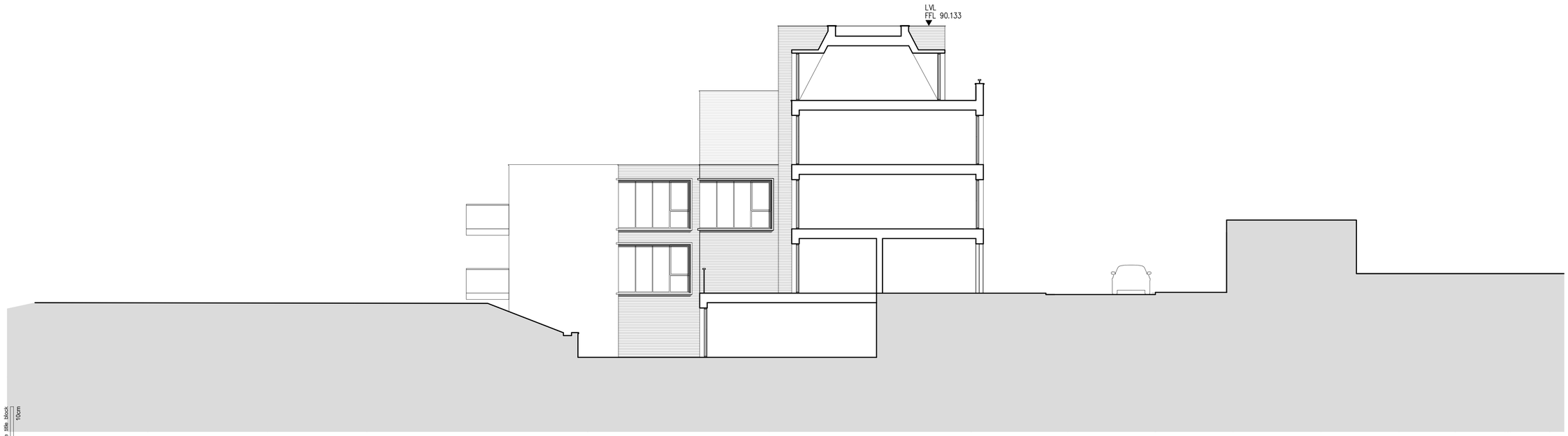
1 – SIDE SECTION/ELEVATION F–F
SCALE: 1:100 (A1)



2 – SIDE SECTION/ ELEVATION G–G
SCALE: 1:100 (A1)

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0 1 2 3 4 5 10cm

Rev		Date
B	Side section/elevation revised	28/10/13
A	Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
ELEVATION/SECTION

Scale	Date	Status
1:100(A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) E04	B

G:\5388\T_Series\T20\T20E04

NOTES

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1 – GONDAR GARDENS REAR ELEVATION
SCALE: 1:100 (A1)

2 – GONDAR GARDENS REAR ELEVATION
SCALE: 1:250 (A1)

Rev	Date
B Elevation revised	28/10/13
A Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
ELEVATION
REAR

Scale	Date	Status
1:100/1:250(A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) E03	B

G:\5388\T_Series\T20\T20E03

NOTES

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1 GONDAR GARDENS REAR ELEVATION
SCALE: 1:100 (A1)

2 GONDAR GARDENS REAR ELEVATION
SCALE: 1:250 (A1)

Rev	Date
B Elevation revised	28/10/13
A Preliminary set	27/09/13

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FRONTAGE SCHEME

Drawing
ELEVATION
REAR

Scale	Date	Status
1:100/1:250(A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) E02	B

G:\5388\T_Series\T20\T20E02

NOTES

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1 – GONDAR GARDENS STREET ELEVATION
SCALE: 1:100 (A1)

2 – GONDAR GARDENS STREET ELEVATION
SCALE: 1:250 (A1)

Rev	Date
B Elevation revised	28/10/13
A Preliminary set	27/09/13

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Project
GONDAR GARDENS
FRONTAGE SCHEME

Drawing
ELEVATION
GONDAR GARDENS

Scale	Date	Status
1:100/1:250(A1)	Sep 13	

Job Number	Drawing Number	Revision
5388	T(20) E01	B

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