



APPENDICES

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APPENDIX 1.1 DRAWINGS OF PROPOSED DEVELOPMENT

Proposed Site Plan

Site Aerial

Indicative Site Division

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Richmond upon Thames College



Project
**RICHMOND COLLEGE
FEASIBILITY**
Egerton Rd, Twickenham, Middlesex TW2
7SU
Prepared For
**RICHMOND-UPON-THAMES
COLLEGE & LONDON
BOROUGH OF
RICHMOND-UPON-THAMES**
Project No: 12-33036.00



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DRAWING KEY
— PROPOSED SITE BOUNDARY

Drawn by: **ap** Reviewed by: **apb**
Drawn Date: 2014/07/11 Scale: **NOT TO SCALE**
Project No: 12-33036.00
Sheet Title:

**AERIAL PHOTOGRAPH
SHOWING INDICATIVE RED
LINE**

Original Number: **SK-042** Revision:
Sheet Number: **C**



Image © 2014 Bluesky





Richmond upon Thames College
LONDON BOROUGH OF RICHMOND UPON THAMES

Project
RICHMOND COLLEGE FEASIBILITY
Egerton Rd, Twickenham, Middlesex TW2 7SU
Prepared For
RICHMOND-UPON-THAMES COLLEGE & LONDON BOROUGH OF RICHMOND-UPON-THAMES
Project No: 12-33036.00



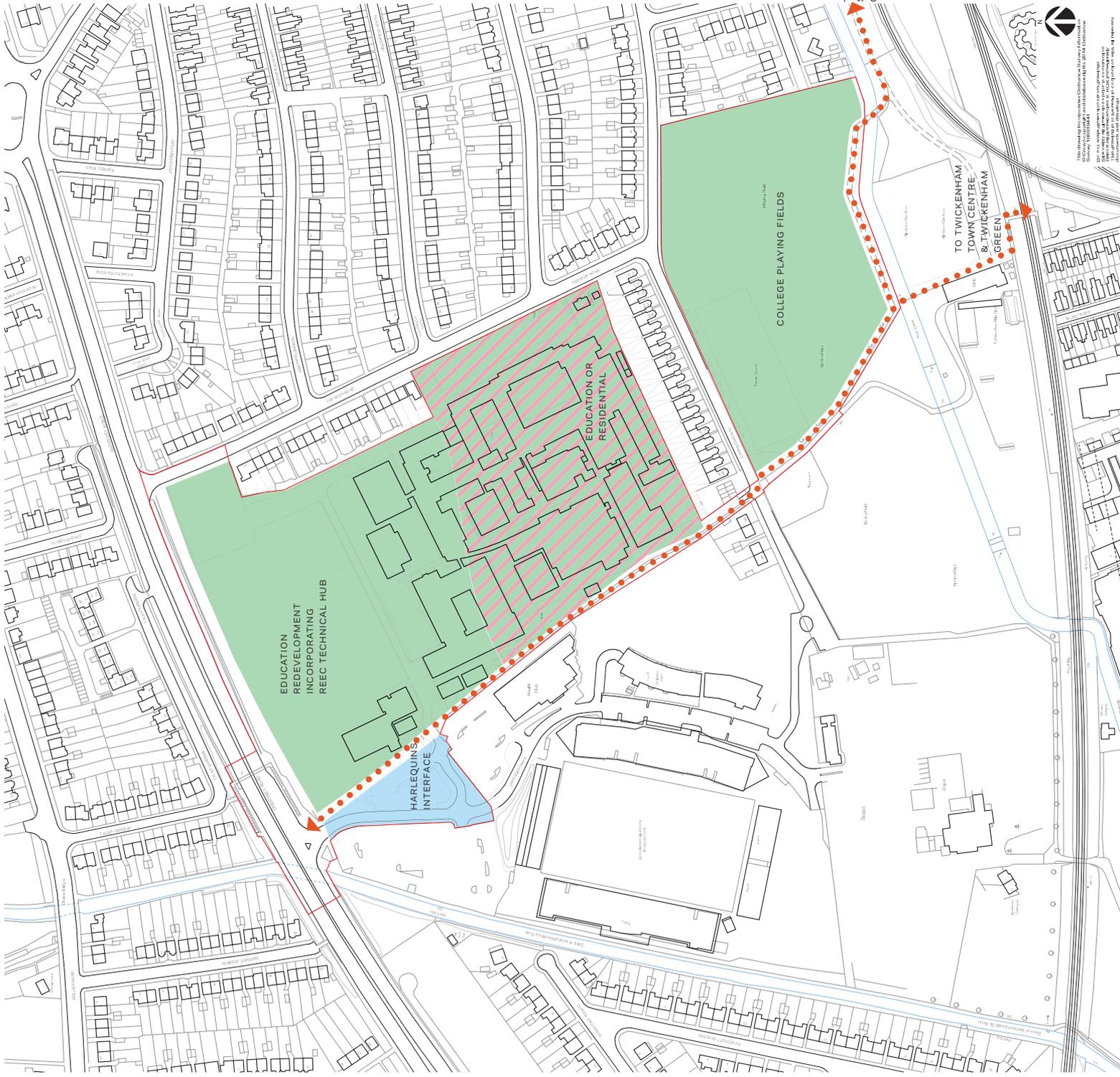
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KEY TO DRAWING

-  EDUCATION REDEVELOPMENT INCORPORATING RECC TECHNICAL HUB (LOCATION TO BE DETERMINED)
-  EDUCATION OR RESIDENTIAL REDEVELOPMENT
-  HARLEQUINS INTERFACE
-  UPGRADED PEDESTRIAN AND CYCLE ROUTE (DEPENDANT UPON 3RD PARTY WORKS AND PERMISSIONS) (ROUTE TO BE CONFIRMED)
-  NOTE: BUILDING FOOTPRINTS REFLECT EXISTING BUILDINGS, NOT NEW PROPOSALS



DRAWING KEY

 PROPOSED SITE BOUNDARY

Drawn by: **zsp**
Drawn Date: 2014-07-11
Scale: 1:1,250 @ A1

Project No: 12-33036.00

Sheet Title:

RUTC SITE PLAN SHOWING INDICATIVE SITE DIVISION

Organization: **hok**
Sheet Number: **SK-039**
Revision: **F**

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APPENDIX 6.1 SUMMARY OF BASELINE NOISE SURVEY

Baseline Noise Monitoring

Method

As agreed with LBRuT EHO, a long-term measurement over seven days was taken at the site of the existing college, two 24 hour measurements were taken at residential locations close to the site boundaries, and day and night attended measurements were taken at the boundary with the A316. The locations of the monitoring are shown in Figure 1.

All measurements were taken in acoustically 'free field' conditions, at least 3.5m away from any vertical reflective surfaces. A windshield was fitted to the microphone at all times to minimise the effects of wind-induced noise across the microphone diaphragm. Instruments used for the measurements were calibrated before and after the surveys and no drifting of the calibration signals were observed. Calibration certificates for all instruments are available.

Position 1 was located on the first floor roof of the college so as to measure aircraft noise as well as background noise levels, primarily from distant traffic on the A316. An environmentally protected measurement system was left at this position for seven days from 24 April to 1 May 2014, recording continuously. Weather data was obtained from Heathrow so that data measured during periods of high wind could be identified as this can distort the results due to overloading of the microphone signal. This data is shown in Appendix A. Data on air traffic movements was also obtained such that periods of westerly and easterly operations could be distinguished.

Position 2 was located at the southern boundary of the college, adjacent to the rear gardens of properties in Craneford Way. Measurements were carried out over a 24 hour period from 1 to 2 May again using an environmentally protected system, in order to establish ambient and background noise levels at these properties.

Position 3 was located on the eastern boundary of the college at the rear of properties in Egerton Road where measurements were also carried out for a 24 hour period from 2 to 3 May, in order to establish ambient and background noise levels at these properties.

Position 4 was at a distance of 20m from the edge of the A316 near the northern boundary of the existing college sports field. Attended noise measurements were carried out at this position covering day and night time periods, in order to quantify traffic noise levels along this boundary.

Figure 1: Baseline Noise Monitoring Positions



Results

The detailed results are shown in Appendix B and are summarised in Tables 1 to 3. This shows the daytime average $L_{Aeq,12hr}$ over the period 07:00 to 19:00 and the highest value of LA1 (the level exceeded for 1% of the time) over that period; the daytime $L_{Aeq,16hr}$ average over the period 07:00 to 23:00; the night time $L_{Aeq,8hr}$ over the period 23:00 to 07:00; the lowest night time L_{A90} and the highest night time L_{Amax} . These parameters will be used for different aspects of the assessment.

Table 1: Summary of Results of Baseline Noise Monitoring at Position 1, Roof of College Building

Date	L _{Aeq,12hr}	L _{A1} max Day 12hr	L _{Aeq,16hr}	L _{Aeq,8hr}	L _{A90} min Night 8hr	L _{Amax} Night 8hr
24-Apr	59.5	72.7	60.6	57.8	44.3	77.8
25-Apr	62.2	79.3	62.0	56.8	44.9	83.3
26-Apr	60.9*	81.9*	61.5*	56.1	45.0	80.7
27-Apr	63.5	81.6	63.3	57.7	45.7	76.5
28-Apr	63.0	80.9	62.7	58.3	44.9	79.4
29-Apr	63.6	83.1	63.8	57.4	45.6	76.3
30-Apr	60.9	72.2	60.4	57.6	45.0	73.8

* High wind during this period

Table 2: Summary of Results of Baseline Noise Monitoring at Positions 2 and 3, rear of Craneford Road and Egerton Road.

Posn.	Date	L _{Aeq,12hr}	L _{A1} max Day 12hr	L _{Aeq,16hr}	L _{Aeq,8hr}	L _{A90} min Night 8hr	L _{Amax} Night 8hr
2	01-May	58.6	84.2	58.2	55.0	30.4	81.9
3	02-May	61.1	80.8	60.7	57.1	31.9	83.7

Table 3: Summary of Results of Baseline Noise Monitoring at Position 4, 20m from A316

L _{Aeq,6hr} Day	69.3
L _{A1} max Day 12hr	75.1
L _{Aeq,8hr}	64.4
L _{A90} min Night 8hr	44.3
L _{Amax} Night 8hr	77.3

Appendix A: Weather Report for the Long Term Noise Measurement 25th April to 1st May 2014

Date & Time	tt [°C]	td [°C]	ff [km/h]	ff [kn]	fx [km/h]	fx [kn]	dd	ppp [hPa]	vv [km]	sd [min]
01.05.2014 08:00:00	10,3	9,7	7	4	-	-	S	1009,9	2,2	0
01.05.2014 07:00:00	10,2	9,6	6	3	-	-	-	1009,9	2,0	0
01.05.2014 06:00:00	9,9	9,2	6	3	-	-	SSE	1009,9	1,6	0
01.05.2014 05:00:00	9,7	8,9	6	3	-	-	S	1010,1	2,2	0
01.05.2014 04:00:00	9,9	8,7	7	4	-	-	S	1010,6	2,4	0
01.05.2014 03:00:00	9,9	8,1	7	4	-	-	SSW	1011,1	5	0
01.05.2014 02:00:00	10,0	8,0	9	5	-	-	SW	1011,4	7	0
01.05.2014 01:00:00	10,0	7,5	11	6	-	-	SW	1011,8	10	-
01.05.2014 00:00:00	10,8	7,8	11	6	-	-	SW	1011,9	7	0
30.04.2014 23:00:00	11,1	7,9	13	7	-	-	SSW	1012,1	10	0
30.04.2014 22:00:00	11,9	8,0	13	7	-	-	S	1011,9	10	0
30.04.2014 21:00:00	13,1	7,3	15	8	-	-	SW	1011,7	10	0
30.04.2014 20:00:00	14,3	6,9	19	10	-	-	SW	1011,5	10	6
30.04.2014 19:00:00	15,9	6,5	22	12	-	-	SW	1011,3	10	54
30.04.2014 18:00:00	17,1	6,4	20	11	-	-	SSW	1011,2	10	54
30.04.2014 17:00:00	18,0	5,6	20	11	-	-	SW	1011,5	10	36
30.04.2014 16:00:00	17,9	7,0	19	10	-	-	SSW	1011,7	10	42
30.04.2014 15:00:00	18,7	7,5	13	7	-	-	SW	1012,1	10	48
30.04.2014 14:00:00	18,1	6,8	9	5	-	-	-	1012,5	10	60
30.04.2014 13:00:00	18,1	8,4	11	6	-	-	SSW	1012,9	10	60
30.04.2014 12:00:00	16,7	7,7	9	5	-	-	-	1013,3	10	60
30.04.2014 11:00:00	14,5	8,8	9	5	-	-	SW	1013,5	6	60
30.04.2014 10:00:00	11,7	8,8	9	5	-	-	SW	1013,6	3,5	60
30.04.2014 09:00:00	9,6	8,1	9	5	-	-	SSW	1013,8	0,8	60
30.04.2014 08:00:00	8,4	7,7	6	3	-	-	-	1013,6	0,3	48
30.04.2014 07:00:00	7,6	6,7	6	3	-	-	-	1013,5	2,5	12
30.04.2014 06:00:00	6,8	5,9	0	0	-	-	N	1013,0	4,8	0
30.04.2014 05:00:00	7,6	6,7	4	2	-	-	N	1012,8	5	0
30.04.2014 04:00:00	7,9	6,9	4	2	-	-	NNE	1012,7	6	0
30.04.2014 03:00:00	8,6	7,4	7	4	-	-	N	1013,0	7	0
30.04.2014 02:00:00	9,3	7,9	4	2	-	-	E	1012,9	4,9	0
30.04.2014 01:00:00	9,5	7,9	11	6	-	-	SW	1013,0	8	-
30.04.2014 00:00:00	9,6	7,4	4	2	-	-	-	1013,0	6	0
29.04.2014 23:00:00	10,6	7,7	6	3	-	-	ESE	1012,9	7	0
29.04.2014 22:00:00	11,6	7,8	7	4	-	-	ESE	1012,9	10	0
29.04.2014 21:00:00	12,2	7,5	6	3	-	-	E	1012,6	10	0
29.04.2014 20:00:00	13,8	7,7	13	7	-	-	E	1012,0	24	36
29.04.2014 19:00:00	15,3	6,7	15	8	-	-	ESE	1011,8	10	54
29.04.2014 18:00:00	16,2	7,2	13	7	-	-	E	1011,5	10	18
29.04.2014 17:00:00	15,8	8,5	17	9	-	-	E	1011,4	10	36
29.04.2014 16:00:00	16,5	9,0	19	10	-	-	E	1011,5	10	24
29.04.2014 15:00:00	16,5	8,9	15	8	-	-	ENE	1011,7	10	6
29.04.2014 14:00:00	15,3	8,1	17	9	-	-	ENE	1012,1	10	18
29.04.2014 13:00:00	15,7	9,3	13	7	-	-	ENE	1012,1	10	18
29.04.2014 12:00:00	15,2	9,2	17	9	-	-	ENE	1012,3	8	18
29.04.2014 11:00:00	15,0	9,5	15	8	-	-	E	1012,6	8	18
29.04.2014 10:00:00	13,2	9,4	11	6	-	-	ENE	1012,8	6	0
29.04.2014 09:00:00	12,2	8,9	9	5	-	-	ENE	1012,7	4,2	12
29.04.2014 08:00:00	11,0	8,9	9	5	-	-	NE	1012,8	3,1	0
29.04.2014 07:00:00	10,4	8,9	7	4	-	-	NE	1012,5	2,5	0
29.04.2014 06:00:00	10,1	9,1	7	4	-	-	NE	1012,3	2,5	0
29.04.2014 05:00:00	9,6	8,9	7	4	-	-	NE	1012,3	2,5	0
29.04.2014 04:00:00	8,8	7,9	7	4	-	-	ENE	1012,4	4,0	0
29.04.2014 03:00:00	8,9	7,6	6	3	-	-	NNE	1012,7	7	0
29.04.2014 02:00:00	9,7	8,6	6	3	-	-	E	1013,1	4,0	0
29.04.2014 01:00:00	9,6	8,2	6	3	-	-	E	1013,5	8	-
29.04.2014 00:00:00	10,6	8,9	4	2	-	-	ENE	1013,7	10	0

28.04.2014 23:00:00	10,9	8,2	6	3	-	-	SSW	1013,6	10	0
28.04.2014 22:00:00	12,2	9,3	9	5	-	-	SSW	1013,3	10	0
28.04.2014 21:00:00	12,7	9,2	11	6	-	-	S	1012,7	10	0
28.04.2014 20:00:00	13,9	8,1	9	5	-	-	ESE	1012,0	10	18
28.04.2014 19:00:00	15,0	5,7	15	8	-	-	E	1011,7	10	18
28.04.2014 18:00:00	15,8	6,1	20	11	-	-	E	1011,5	10	0
28.04.2014 17:00:00	16,7	6,5	19	10	-	-	ENE	1010,9	10	18
28.04.2014 16:00:00	17,6	6,1	15	8	-	-	E	1010,6	10	24
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28.04.2014 14:00:00	15,7	8,1	17	9	-	-	NE	1011,0	10	18
28.04.2014 13:00:00	15,4	8,7	13	7	-	-	ENE	1010,8	10	12
28.04.2014 12:00:00	14,3	9,0	9	5	-	-	NE	1010,8	10	6
28.04.2014 11:00:00	14,0	9,1	11	6	-	-	NE	1010,6	8	12
28.04.2014 10:00:00	13,0	9,9	11	6	-	-	NE	1010,4	5	0
28.04.2014 09:00:00	11,0	8,6	13	7	-	-	NE	1010,2	4,0	0
28.04.2014 08:00:00	10,1	8,4	9	5	-	-	NNE	1009,8	3,1	0
28.04.2014 07:00:00	10,1	8,1	11	6	-	-	NE	1009,3	3,8	0
28.04.2014 06:00:00	9,9	7,8	9	5	-	-	NNE	1008,7	4,5	0
28.04.2014 05:00:00	10,0	7,5	9	5	-	-	NNE	1008,2	7	0
28.04.2014 04:00:00	10,1	7,5	7	4	-	-	NNE	1008,1	8	0
28.04.2014 03:00:00	10,0	7,3	7	4	-	-	NNE	1007,9	8	0
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27.04.2014 22:00:00	11,9	7,8	19	10	-	-	ENE	1006,7	10	0
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27.04.2014 20:00:00	12,6	7,4	13	7	-	-	ENE	1005,5	10	0
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27.04.2014 07:00:00	9,6	7,4	19	10	-	-	E	1001,3	10	0
27.04.2014 06:00:00	9,5	7,4	17	9	-	-	E	1001,2	10	0
27.04.2014 05:00:00	9,1	6,4	15	8	-	-	E	1001,0	10	0
27.04.2014 04:00:00	9,1	5,9	19	10	-	-	E	1001,2	10	0
27.04.2014 03:00:00	8,9	5,8	17	9	-	-	E	1001,5	10	0
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27.04.2014 01:00:00	9,5	4,9	17	9	-	-	ESE	1002,6	10	-
27.04.2014 00:00:00	9,3	4,6	19	10	-	-	ESE	1003,0	10	0
26.04.2014 23:00:00	10,1	4,9	19	10	-	-	SE	1003,0	10	0
26.04.2014 22:00:00	10,1	5,3	17	9	-	-	SE	1003,2	10	0
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26.04.2014 17:00:00	13,6	9,0	30	16	50	27	S	1003,8	10	48
26.04.2014 16:00:00	14,8	5,0	30	16	48	26	S	1003,7	10	48
26.04.2014 15:00:00	15,0	5,9	28	15	-	-	S	1003,9	10	30
26.04.2014 14:00:00	15,5	6,9	31	17	46	25	S	1004,3	10	36
26.04.2014 13:00:00	14,2	6,4	28	15	46	25	S	1004,6	10	30
26.04.2014 12:00:00	13,6	5,9	28	15	-	-	S	1004,8	10	6

26.04.2014 11:00:00	13,1	6,9	28	15	-	-	S	1004,8	10	48
26.04.2014 10:00:00	13,2	9,8	24	13	-	-	S	1004,8	10	24
26.04.2014 09:00:00	11,8	9,5	22	12	-	-	S	1004,8	10	12
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26.04.2014 07:00:00	9,7	8,4	22	12	-	-	SSE	1004,8	10	0
26.04.2014 06:00:00	9,6	7,8	22	12	-	-	SSE	1004,9	10	0
26.04.2014 05:00:00	9,6	7,4	17	9	-	-	SSE	1005,5	10	0
26.04.2014 04:00:00	9,7	8,0	17	9	-	-	SSE	1006,4	10	0
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26.04.2014 02:00:00	8,1	7,4	13	7	-	-	SE	1007,8	3,4	0
26.04.2014 01:00:00	8,0	7,0	9	5	-	-	S	1008,6	6	-
26.04.2014 00:00:00	8,1	7,1	11	6	-	-	SSE	1008,9	6	0
25.04.2014 23:00:00	9,5	8,2	11	6	-	-	S	1009,5	7	0
25.04.2014 22:00:00	9,7	8,5	15	8	-	-	SW	1009,9	10	0
25.04.2014 21:00:00	10,1	8,7	15	8	-	-	SW	1009,8	10	0
25.04.2014 20:00:00	10,3	9,0	17	9	-	-	W	1009,2	10	0
25.04.2014 19:00:00	10,1	9,4	20	11	-	-	W	1009,0	10	0
25.04.2014 18:00:00	10,0	9,4	24	13	-	-	W	1009,0	5	0
25.04.2014 17:00:00	10,1	9,4	24	13	-	-	W	1009,0	5	0
25.04.2014 16:00:00	11,4	10,7	13	7	-	-	W	1009,0	4,0	0
25.04.2014 15:00:00	11,8	11,2	7	4	-	-	NW	1009,4	3,1	0
25.04.2014 14:00:00	11,2	10,4	7	4	-	-	NW	1010,3	2,8	0
25.04.2014 13:00:00	11,0	10,0	9	5	-	-	N	1010,8	3,4	0
25.04.2014 12:00:00	10,6	9,6	9	5	-	-	N	1011,5	3,8	0
25.04.2014 11:00:00	10,0	9,1	7	4	-	-	N	1012,3	3,1	0
25.04.2014 10:00:00	9,7	8,5	9	5	-	-	N	1012,6	5	0
25.04.2014 09:00:00	9,3	8,1	9	5	-	-	N	1013,2	3,4	0
25.04.2014 08:00:00	9,2	7,9	11	6	-	-	NNE	1013,2	5	0

tt	=	temperature
td	=	dewpoint
ff	=	wind speed
fx	=	gusts
dd	=	wind direction
ppp	=	reduced air pressure
vv	=	visibility
sd	=	sunshine duration

Appendix B: Detailed Results of Baseline Noise Measurements

1. Long Term Measurements on College Roof

Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
24-Apr	1030	59.4	73.2	66.6	61.5	56.0
	1130	58.6	72.0	67.2	60.7	55.2
	1230	59.2	75.3	71.3	61.0	55.5
	1330	58.7	69.3	66.0	60.8	55.4
	1430	60.1	73.2	70.2	62.2	56.2
	1530	60.4	74.1	70.4	62.4	56.6
	1630	58.8	79.3	72.7	60.9	54.9
	1730	58.5	69.7	66.5	61.2	53.9
	1830	60.8	69.1	66.9	62.9	56.8
	1930	60.9	75.4	71.2	62.9	57.4
	2030	60.1	70.4	66.5	62.3	56.3
	2130	62.8	81.6	79.0	63.0	55.0
	2230	64.5	81.2	79.1	67.4	53.2
	2330	56.0	66.9	64.5	59.2	49.8
25-Apr	0030	54.3	73.8	68.1	57.4	46.5
	0130	51.6	62.1	61.0	55.6	45.6
	0230	51.4	66.4	63.8	55.1	44.3
	0330	52.9	67.0	64.3	56.7	45.7
	0430	55.5	66.2	63.8	59.0	50.2
	0530	60.9	77.0	73.2	63.1	55.1
	0630	63.2	77.8	73.3	65.2	59.2
	0730	63.0	73.5	70.8	65.0	59.5
	0830	62.3	77.7	72.6	64.5	57.8
	0930	62.1	71.6	69.3	64.2	58.5
	1030	62.3	80.9	73.6	64.1	58.4



Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	1130	62.6	75.1	72.6	64.3	59.1
	1230	62.4	77.0	74.7	64.0	58.4
	1330	63.8	81.2	79.3	64.6	59.2
	1430	63.3	81.3	76.2	64.6	59.0
	1530	60.3	77.8	74.6	62.1	56.3
	1630	60.4	82.3	75.9	61.8	56.9
	1730	60.4	70.9	67.6	62.5	57.2
	1830	62.2	70.0	67.6	64.3	58.8
	1930	62.7	79.6	73.1	64.7	59.2
	2030	61.4	75.9	68.2	63.6	57.8
	2130	60.2	67.4	66.6	62.6	56.2
	2230	59.0	74.3	71.6	61.6	53.8
	2330	57.1	72.7	64.8	60.0	50.0
26-Apr	0030	55.3	65.8	63.9	58.6	47.6
	0130	53.3	66.0	62.8	57.0	46.5
	0230	51.2	66.0	61.2	55.2	44.9
	0330	51.4	64.9	63.0	55.2	46.1
	0430	54.2	69.7	65.0	57.5	48.9
	0530	56.8	76.3	72.7	59.0	50.1
	0630	62.5	83.8	79.8	63.5	54.3
	0730	62.9	80.9	76.6	65.8	56.0
	0830	64.0	82.8	80.7	65.9	56.5
	0930	62.0	82.6	78.7	62.9	56.2
	1030	62.8	85.8	81.9	61.4	54.3
	1130	57.7	69.8	66.3	59.9	54.4
	1230	56.4	72.2	64.8	58.6	52.7
	1330	55.8	69.4	62.0	58.0	52.2
	1430	56.2	69.7	66.7	58.8	50.9

Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	1530	58.2	73.1	69.0	60.7	53.6
	1630	59.2	79.0	73.1	61.1	54.8
	1730	62.6	85.2	80.8	62.8	51.0
	1830	62.1	84.4	80.0	63.2	54.3
	1930	61.4	80.3	76.4	63.7	54.1
	2030	61.1	81.0	78.2	62.1	53.1
	2130	65.6	84.1	80.9	69.1	53.1
	2230	62.1	83.4	79.3	63.9	52.4
	2330	57.9	77.5	74.4	59.7	50.8
27-Apr	0030	55.2	64.3	62.9	58.4	48.7
	0130	54.5	75.7	68.1	57.8	46.9
	0230	52.8	65.6	62.6	56.5	45.0
	0330	52.8	65.3	62.9	56.3	46.3
	0430	53.8	67.4	63.8	57.2	47.1
	0530	56.0	77.6	72.4	58.7	49.7
	0630	60.2	80.7	75.0	61.9	52.2
	0730	61.2	78.9	74.5	63.7	54.9
	0830	63.9	80.6	78.7	66.1	57.4
	0930	62.6	81.6	76.8	63.9	57.6
	1030	62.5	83.1	78.0	63.4	56.4
	1130	63.4	82.2	78.6	65.3	57.5
	1230	64.3	83.8	80.6	65.9	57.4
	1330	63.6	80.3	77.1	66.2	57.6
	1430	64.1	81.9	79.3	66.0	57.6
	1530	63.9	81.0	77.7	66.2	58.0
	1630	64.3	86.2	81.6	66.0	57.8
	1730	63.1	78.9	75.4	64.9	58.4
	1830	63.6	83.6	78.4	65.0	58.2



Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	1930	62.4	78.7	74.2	64.7	57.5
	2030	61.9	78.9	75.7	63.9	55.9
	2130	64.5	84.3	79.7	67.0	54.7
	2230	61.1	80.8	78.2	62.5	51.9
	2330	54.8	65.6	63.7	58.2	49.0
28-Apr	0030	52.9	67.6	63.4	56.6	47.8
	0130	51.2	66.4	62.7	55.3	46.3
	0230	50.5	65.5	62.0	54.6	45.7
	0330	51.7	67.2	63.0	55.4	45.9
	0430	56.3	76.1	65.6	59.4	49.9
	0530	60.8	72.9	69.9	63.4	55.6
	0630	63.4	76.5	73.5	65.3	59.3
	0730	63.0	78.5	75.2	64.8	58.6
	0830	63.5	80.2	76.9	65.6	58.0
	0930	62.9	78.5	75.3	64.5	58.1
	1030	63.4	82.1	78.5	64.0	57.3
	1130	62.7	82.9	78.5	63.7	57.5
	1230	64.4	84.5	80.9	64.8	56.9
	1330	62.6	81.5	78.0	63.8	57.1
	1430	61.9	81.6	75.7	63.6	56.7
	1530	63.1	79.6	76.3	64.8	57.3
	1630	62.8	78.2	75.3	64.7	57.7
	1730	62.3	78.5	75.7	64.0	57.1
	1830	62.5	80.9	76.5	64.1	57.4
	1930	61.5	77.0	73.7	63.9	55.3
	2030	61.6	81.5	78.4	61.7	53.5
	2130	63.9	83.8	79.4	65.2	53.1
	2230	57.7	70.0	65.7	60.8	50.9

Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	2330	56.2	66.1	64.0	59.5	48.1
29-Apr	0030	53.1	71.4	63.3	56.8	46.6
	0130	52.7	79.0	69.4	56.4	47.0
	0230	52.2	64.1	61.9	56.1	44.9
	0330	52.9	65.0	62.0	56.4	45.2
	0430	57.3	68.8	65.6	60.6	49.5
	0530	61.4	75.9	72.0	63.8	56.4
	0630	63.6	79.4	75.6	65.2	58.1
	0730	62.6	80.3	74.7	64.5	56.8
	0830	62.4	81.3	77.6	64.0	54.3
	0930	63.2	85.5	78.1	64.4	54.7
	1030	64.1	81.7	78.6	65.3	57.3
	1130	62.2	82.2	76.9	63.4	57.0
	1230	64.9	86.0	82.1	65.5	57.7
	1330	62.7	79.5	77.3	64.0	57.6
	1430	64.8	88.8	83.9	65.2	57.4
	1530	63.4	86.8	78.5	64.4	57.0
	1630	62.8	80.3	75.6	64.7	55.6
	1730	64.1	78.7	75.3	65.2	61.8
	1830	64.3	80.7	77.3	65.7	59.6
	1930	64.7	81.2	75.9	66.4	60.7
	2030	65.0	87.1	85.8	63.8	55.3
	2130	64.9	84.0	80.3	66.8	54.4
	2230	62.2	83.1	77.6	63.0	51.2
	2330	54.5	68.9	64.4	57.9	49.7
30-Apr	0030	56.2	76.3	75.0	57.3	48.0
	0130	52.3	65.0	63.5	56.2	46.7
	0230	51.5	66.4	63.0	55.5	45.9

Date	Time	LAeq	LMax	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	0330	52.7	65.7	63.0	56.5	45.6
	0430	57.3	70.9	66.7	61.0	49.9
	0530	60.8	70.4	67.4	63.5	55.3
	0630	61.7	72.7	68.1	63.9	57.3
	0730	61.4	76.6	72.2	64.0	55.8
	0830	61.6	74.0	68.7	63.8	57.1
	0930	63.1	72.0	69.4	64.5	61.3
	1030	63.1	73.5	68.3	64.4	61.6
	1130	62.9	74.2	69.2	64.3	61.3
	1230	62.6	71.1	67.7	63.9	61.2
	1330	61.3	71.5	68.2	63.6	56.3
	1430	58.0	70.9	66.4	60.1	54.8
	1530	58.2	80.9	71.5	59.8	54.6
	1630	56.4	72.7	63.2	58.7	53.1
	1730	56.7	71.9	66.4	59.1	53.0
	1830	58.5	72.6	69.3	60.8	54.0
	1930	58.9	71.5	67.2	61.0	55.3
	2030	58.7	73.5	69.4	60.9	54.2
	2130	58.2	67.1	64.5	60.8	53.5
	2230	57.9	73.1	68.2	60.6	52.6
	2330	55.5	73.8	68.9	58.5	47.8
01-May	0030	52.2	66.2	62.0	56.0	47.0
	0130	51.6	63.4	61.8	55.6	46.1
	0230	50.8	62.6	60.8	54.9	45.0
	0330	53.2	67.8	64.2	57.1	45.7
	0430	57.5	68.9	66.7	60.9	48.2
	0530	61.2	71.6	67.9	63.9	56.1
	0630	62.3	70.7	68.4	64.5	58.3

Date	Time	LAeq	LAmx	LA1	LA10	LA90
		dB	dB	dB	dB	dB
	0730	61.5	79.1	75.3	63.4	57.1
	0830	61.1	74.2	70.5	63.6	57.1
	0930	61.4	77.7	70.0	63.3	58.1

2. 24 Hour Measurement at Craneford Road Boundary, 1-2 May 2014

Time	LAeq	LAmx	LA1	LA10	LA90
	dB	dB	dB	dB	dB
1330	59.0	80.6	78.3	58.3	43.0
1430	62.1	82.8	79.5	64.5	41.7
1530	59.0	76.6	73.9	62.5	37.9
1630	58.8	84.2	75.5	62.4	40.2
1730	59.0	76.9	72.4	62.9	39.9
1830	56.7	77.5	73.0	59.7	41.3
1930	56.6	80.5	73.1	60.2	39.7
2030	54.5	74.3	71.7	58.1	39.2
2130	55.4	80.4	75.3	53.9	38.0
2230	59.6	80.1	77.5	62.6	41.2
2330	55.2	76.8	73.7	51.0	36.9
0030	35.6	54.4	46.1	37.2	33.4
0130	33.8	46.7	43.5	35.6	31.2
0230	32.7	42.8	40.3	34.5	30.4
0330	37.1	53.4	48.2	39.9	32.3
0430	60.7	81.9	76.5	64.0	38.6
0530	58.0	79.0	74.6	60.3	41.5
0630	56.0	80.7	73.2	58.4	43.3
0730	58.8	78.6	75.3	61.9	43.6
0830	58.7	78.6	75.3	61.5	44.2
0930	57.2	79.9	76.4	59.2	41.6
1030	58.9	86.8	76.8	60.0	42.1
1130	57.6	78.8	75.9	58.0	42.1
1230	60.9	82.3	79.8	61.8	43.5

3. 24 Hour Measurement at Egerton Road Boundary, 2-3 May 2014

Time	LAeq	LAmx	LA1	LA10	LA90
	dB	dB	dB	dB	dB
1300	61.5	82.5	78.6	59.7	44.4
1400	63.4	82.2	79.8	66.3	44.4
1500	60.6	75.0	73.9	64.0	39.3
1600	59.9	85.4	75.7	63.5	41.4
1700	61.3	77.4	72.5	64.4	42.7
1800	58.0	77.1	73.1	60.7	43.5
1900	58.1	79.7	73.4	62.0	41.2
2000	55.9	72.3	72.5	60.0	41.9
2100	58.4	79.6	75.8	55.4	39.2
2200	62.4	81.5	78.2	64.0	42.6
2300	56.7	78.0	74.5	53.0	38.1
0000	38.5	54.0	47.0	38.4	36.2
0100	35.7	46.9	43.8	37.5	34.0
0200	35.3	44.0	40.9	36.2	31.9
0300	38.7	53.0	48.9	41.5	34.4
0400	63.0	83.7	77.3	65.6	39.6
0500	59.7	78.5	75.2	61.4	43.2
0600	58.3	80.2	73.4	59.4	45.5
0700	61.7	78.9	75.5	63.9	45.1
0800	59.7	78.2	75.8	63.3	46.6
0900	59.1	79.1	77.2	61.1	42.9
1000	61.2	88.3	77.5	61.7	45.1
1100	60.3	80.1	75.9	60.0	44.2
1200	63.4	84.1	80.8	63.4	45.0
1300	60.6	73.8	73.3	64.3	44.9

4. Attended Measurements on A316 Boundary

Date	Time	LA_{eq}	LAm_{ax}	LA₁	LA₁₀	LA₉₀
24- Apr	10 30	69. 3	76.5	74 .5	72. 6	62. 2
	11 30	69. 2	76.4	74 .2	72. 1	63. 9
	12 30	69. 0	76.4	74 .4	72. 2	62. 4
	13 30	69. 7	77.7	75 .1	72. 4	65. 1
	14 30	68. 9	76.0	74 .0	71. 8	62. 5
	15 30	69. 5	76.8	74 .3	72. 7	64. 2
02- May	23 00	64. 7	75.8	73 .0	67. 6	54. 8
	00 00	64. 2	76.3	74 .1	67. 8	51. 6
	01 00	61. 0	71.2	68 .6	64. 7	48. 5
	02 00	59. 5	73.5	70 .4	62. 3	46. 1
	03 00	61. 2	70.9	69 .1	63. 9	44. 3
	04 00	64. 6	76.2	74 .2	67. 5	52. 1
	05 00	66. 3	77.1	74 .8	70. 1	59. 7
	06 00	67. 8	77.3	75 .0	71. 3	61. 9



APPENDIX 12.1 SUMMARY OF EXTENDED PHASE 1 HABITAT SURVEY RESULTS

Designated Sites

The 2km study area does not contain any European (Special Areas of Conservation, Special Protection Areas or Ramsar sites) or nationally designated sites (Sites of Special Scientific Interest or National Nature Reserves). The study area did contain two Local Nature Reserves (LNRs), three Sites of Metropolitan Importance for Nature Conservation (SMINCs), one Borough (Grade 1) Site of Nature Conservation Importance (SINC), four Borough (Grade 2) SINC and six Local SINC. These are identified in **Table 1**.

Habitats

An Extended Phase 1 Habitat survey, completed in 2014, recorded the habitat types present across the site as a whole. The survey included consideration of the potential for the habitats to support legally protected or ecologically significant species along with the presence of invasive species listed under Schedule 9 of the Wildlife and Countryside Act 1981 (as amended).

The site is dominated by a variety of buildings and hardstanding that comprise the existing college with landscaped areas interspersed between the buildings. To the north and the south of the college are recreational fields with scattered mature trees surrounding them. The site also includes part of the hardstanding car park and access road to the north-west of the site.

The Extended Phase 1 Habitat survey recorded few semi-natural habitats present on or in the adjacent habitats: broadleaved semi-natural woodland; scrub/shrub; poor semi-improved grassland; scattered trees; amenity grassland; tall ruderals; running water and intact species-poor hedge. Many of these habitats originate from amenity planting, and as such are unlikely to meet the value thresholds for consideration. The habitats recorded, and their value, are provided in **Table 2**.

Table 1 Summary of Designated Sites within the Study Area

Site	Proximity	Designation Criteria
Statutory Designated Sites		
Ham Lands LNR	940m	An extensive area of grassland and scrub that supports a diverse floral and faunal assemblage. Restoration from its previous use for gravel extraction has resulting in a unique mosaic of different vegetation types, with a diverse assemblage of wildflowers, that attract may butterfly and bird species.
Isleworth Ait LNR	2km	An island with tall canopy of mixed woodland, consisting mainly of poplar and willow species, which is regularly flooded. An absence of recreational disturbance has enabled the habitat to become a sanctuary for a variety of birds, notably treecreeper <i>Certhia familiaris</i> , kingfisher <i>Alcedo atthis</i> and heron <i>Ardea cinerea</i> . The site is also important for several rare beetles and mollusc, notably the two-lipped door snail <i>Balea biplicata</i> and the German hairy snail <i>Pseudotrachia rubiginosa</i> .
Non-Statutory Designated Sites		
Crane Corridor SMINC	450m	The site covers a 5km reach of the River Crane, where it is bordered by semi-natural habitats of remarkable diversity: woodland, dry pastures, water meadows and areas of open water. The river in this reach is one of the most natural in London and is a stronghold for uncommon wetland plants along with the former ox-bow ponds in the floodplain. The habitats support a rich breeding bird community and extensive populations of water vole.
Ham Lands SMINC	940m	Restored gravel pits alongside the River Thames, comprising a mosaic of habitats that include flower-rich grassland, scrub and woodland. These support a diverse floral assemblage with nationally scarce species and provides a variety of habitats for a diverse range of birds and mammals.
River Thames and Tidal Tributaries SMINC	1.3km	The Thames and tidal sections of creeks and rivers flowing into it comprise a number of valuable habitats not found elsewhere in London. These support a variety of species from freshwater, estuarine and marine communities that are rare in London and is of particular importance for wading birds, black redstart <i>Phoenicurus ochruros</i> wildfowl, fish, floral species and invertebrates.
Duke of Northumberland's River north of Kneller Road Borough I SINC	160m	The site comprises a 650m reach of the watercourse and supports excellent aquatic and marginal vegetation, including branched bur-reed <i>Sparganium erectum</i> , unbranched bur-reed <i>S. emersum</i> and water plantain <i>Alisma plantago-aquatica</i> in the channel and marsh horsetail <i>Equisetum palustre</i> , great yellow-grass <i>Rorippa amphibia</i> , greater pond-sedge <i>Carex riparia</i> , reed sweet-grass <i>Glyceria maxima</i> , water forget-me-not <i>Myosotis scorpioides</i> , water figwort <i>Scrophularia auriculata</i> and skullcap <i>Scutellaria galericulata</i> . The river has greatly improved for wildlife over the recent years, with increases in habitat provision for birds, fish and invertebrates.
Mogden Sewage Works Borough I SINC	730m	The site comprises a large sewage works surrounded by tall earth banks with a series of sludge lagoons on the western side. These provide a series of successional stages between open water and willow woodland and provide an important resource for a range of wildflowers, invertebrates and birds. The Duke of Northumberland's River flows through the site and supports a range of wetland plant species.
Duke of Northumberland's River south of Kneller Road Borough II SINC	Adjacent	The site comprises an 800m section of the watercourse that is straight and shallow with vertical banks and a gravelly bed. The site has established an interesting aquatic flora including greater pond sedge and scattered plants of skullcap, water-pepper <i>Persicaria hydropiper</i> and marsh horsetail. Arrowhead, an uncommon plant in London, emerges in some places with river water-crowfoot <i>Ranunculus fluitans</i> and unbranched bur-reed beneath the surface. Kingfisher is also relatively common.

Site	Proximity	Designation Criteria
River Crane at St. Margarets (including Richmond Site) Borough II SINC	200m	The site includes the Crane between Chertsey Road and the tidal limit at Northcote Road, below which it is included within the River Thames and Tidal Tributaries SMINC. The river is divided into two channels, lined by trees and shrubs, with kingfisher frequently seen.
Strawberry Hill Golf Course Borough II SINC	1.2km	The site supports old oak trees scattered around the course along with a small woodland and scrub. The rough areas contain some fine acid grassland habitat with characteristic plants present. The site also supports a stream with limited vegetation and a large railway triangle to the south-east which is important for bird and butterfly species which receives little disturbance.
Petersham Lodge Wood & Ham House Meadows Borough II SINC	1.4km	The site comprises a former landscaped garden, woodland, grassland and meadows, many of which are regularly flooded by the River Thames. This has led to a diverse and rich ground flora which include nationally scarce species and London rarities.
Duke of Northumberland's River at Woodlands Borough II SINC	1.5km	The site comprises a narrow section of the watercourse to the north of Mogden Sewage Works, flowing through the Woodlands housing estate. The river has good water quality and supports aquatic vegetation that includes fennel pondweed <i>Potamogeton pectinatus</i> and water crowfoot <i>Ranunculus sp.</i> which area scarce in London.
Hounslow, Feltham and Whitton Junctions Borough II SINC	1.5km	The site comprises a triangle of railway land including three junctions and the immediately adjacent habitat. This includes a large area of wildlife habitat that is not dominated by woodland, instead comprising scrub with long strips of rough grassland and tall herb communities which provide opportunities important for many animals and plants.
Hounslow Loop Railsides Borough II SINC	1.6km	The site comprises a long section of railside line that runs through most of Hounslow Borough providing connection between semi-natural habitats in the wider environment. The site is largely uniform in structure and comprises rank grassland, scrub, tall herbs and scattered trees.
Fulwell & Twickenham Golf Courses Borough II SINC	1.7km	The site comprises a range of different habitats, including acid grassland, woodland, scrub, wet ditches and a pond. The acid grassland contains characteristic floral species and the small copper butterfly <i>Lycaena phlaeas</i> . The pond supports a variety of plants, amphibians, water birds, dragonflies and damselflies and the presence of a former allotment provides habitat and food resource for the green woodpecker <i>Picus viridis</i> .
The Copse, Holly Hedge Field & Ham Avenues Borough II SINC	1.9km	The site supports an attractive flowery meadow with a diverse ground flora that includes London rarities. The site also includes a small copse of woodland, comprised of ancient oaks with dead wood supporting a variety of insects, fungi, birds and bats. The ancient avenue provides additional habitat opportunities for a range of birds and mammals.
Petersham Meadows Borough II SINC	2km	The site comprises a sloping meadow alongside the River Thames which experiences variations in flooding regime. Consequently the site supports a varied ground flora with a good diversity of plant species.
Twickenham Junction Rough Local SINC	Adjacent	The railway line to the west of Twickenham station creates an island of habitat that receives little disturbance. The site comprises a mixture of rough grassland, tall herbs, scrub and young woodland with old brick walls, which support three fern species that are scarce in London.
Moor Mead Local SINC	880m	A small park alongside the River Crane with overhanging trees that supports a variety of wildflowers and a diverse range of bird species.
Marble Hill Park and Orleans House Gardens Local SINC	1.2km	An attractive landscaped park adjacent to the River Thames with the gardens of Orleans House, which supports both grassland and woodland habitats. The infrequent management has allowed a diverse ground flora to develop. The woodland supports a range of bird species.

Site	Proximity	Designation Criteria
Twickenham Cemetery Local SINC	1.3km	Due to its size, the site provides an important wildlife resource with grassland, hedge and scattered tree habitats present. The grassland is a mixture of neutral and acid grassland, with characteristic species present. The mixture of habitats provides valuable urban habitat for birds and butterflies.
Teddington Cemetery Local SINC	1.5km	The grassland habitat is subject to infrequent management, allowing a variety of floral species to develop, whilst the scattered trees provide habitat to a range of birds.
Inwood Park Local SINC	1.8km	An urban park with flowerbeds, shrubberies and recreational facilities, with the eastern end managed for nature. A large meadow here supports a range of plants whilst the tall hedgerow and trees provide habitat opportunities for a range of birds and butterflies.
Twickenham Road Meadow Local SINC	2km	A narrow strip of grassland with scattered trees that is partly flooded by the River Thames. As a result the site supports a ground flora capable of supporting interesting invertebrate species. The drier habitats support a greater diversity of wildflowers and old brick walls support specialist flora.

Table 2 Summary of Habitats within and immediately adjacent to the Site

Ecological Receptor	Proximity	Description	Value	Policy
Broadleaved semi-natural woodland	Adjacent	A small copse at the southern edge of the site alongside the River Crane with a mixture of native and ornamental species with a tall ruderal understory.	Local	The habitat is considered to comprise part of the London and London Borough of Richmond upon Thames BAPs.
Scrub/shrub	Within site and adjacent	Areas of semi-natural scrub have developed in the recreational areas with ornamental shrub planting within the amenity areas of the college.	Within immediate survey area only	None.
Poor semi-natural grassland	Adjacent to site	A small area of grassland alongside Challenge Court left outside the mowing regime to allow grass and wildflower species to develop.	Local	The habitat is considered to comprise part of the Urban Greenspace BAP habitat at the local and regional scale.
Scattered trees	Within site and Adjacent	Ornamental species are present as part of the landscaping of Richmond College, with mature species present surrounding the recreational fields. The amenity area alongside Challenge Court includes recently planted trees with mature trees located along the periphery.	Up to Local	The mature trees are of greater value locally and are referenced in local planning policy. Some may qualify as veteran trees.
Amenity grassland	Within site	Grassland areas within the landscaped sections of the college and recreational areas to the north and south, where management of the areas results in a short grass sward.	Within immediate survey area only	None ¹
	Adjacent	Grassland areas alongside Challenge Court and the recreational area to the south-west, where management of the areas results in a short grass sward.	Local	The habitat is considered to comprise part of the Urban Greenspace BAP habitat at the local and regional scale.
Tall ruderals	Adjacent to site	A discrete area is located within the unmown parts of the Challenge Court grassland area.	Within immediate survey area only	None
Running water	Adjacent	The watercourses are typical urban rivers and are identified as heavily modified under the WFD. The River Crane alongside the study area is within an artificial culvert which is uniform through the survey area with limited habitat opportunities. The Duke of Northumberland River, although artificial in nature, resembles a more natural river albeit straightened with reinforced banks.	Up to local	The habitat is considered to comprise part of the London and London Borough of Richmond upon Thames BAPs. The watercourses are also protected under the Environmental Damage (Prevention and Remediation) Regulations 2009.

¹ The London Parks and Green Spaces Habitat Action Plan identifies that the scope of the plan is limited to land managed for public access, with the recreational fields falling under the ownership of Richmond upon Thames College not considered to fall within this definition.



Ecological Receptor	Proximity	Description	Value	Policy
Intact species-poor hedge	Within site	A short length of hedgerow is located within the college and originates from the landscaping of the site with a single cypress species present.	Within immediate survey area only	None

Species

No detailed surveys have been completed on the site, and therefore this section has been completed based on the suitability of the habitat and the potential supporting value as identified during the Extended Phase 1 Habitat survey and the desk-based information received.

No floral species listed under Schedule 8 of the Wildlife and Countryside Act 1981 (as amended) or listed on a BAP at the national, regional or local scales were identified in the survey area. Furthermore, considering the nature of the habitats present, with amenity grassland dominating and poor semi-improved grassland, the latter of which is likely to originate from landscaping following development of Challenge Court, such species are considered unlikely to be present. As there is very limited potential and the habitats on the site are generally of low species diversity and value, further detailed survey is not considered necessary.

The presence of a single floral species on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) was identified, with wall cotoneaster *Cotoneaster horizontalis* widely utilised in landscaping of the college. Further survey is not required as these areas were identified in the Extended Phase 1 Habitat survey.

The semi-natural habitats, notably the grassland, scattered trees, woodland and scrub habitats, provide a number of habitat opportunities for bird species. Desk-based information identifies the importance of the River Crane corridor, adjacent to both options, for bird habitat in the area and identifies a number of species listed on Schedule 1 of the Wildlife and Countryside Act 1981 (as amended) and/or as species of conservation concern. Further survey is required to fully understand the value of the development site and surrounding habitats to breeding birds and their distribution across the habitats. This will be completed by undertaking a breeding bird survey following the Common Bird Census methodology, over three separate survey visits. These visits will be undertaken in summer 2014, and consist of the surveyor walking the proposed development site and adjacent habitats slowly, within 30m of all cover habitats, and plotting registrations of individual singing birds to allow the number of territories of each species to be identified. The value of the site for breeding birds will be established following the methodology proposed by Fuller (1980)².

The semi-natural habitats and some features on the buildings provide a variety of habitat opportunities for bats. The scattered mature trees have some potential to support roosting bats, although most of these are in a good condition and exhibit few

² Fuller, R. J. (1980) A Method for Assessing the Ornithological Interest of Sites for Conservation. *Biological Conservation* 17: pp 229 - 239.

features suitable for roosts, along with some potential in the outbuildings and garages within and alongside the college. The grassland and scrub habitats provide some opportunities for foraging, particularly where plant species are not regularly mown, and the River Crane and Duke of Northumberland's River are likely to provide commuting corridors for various species. Further survey is required to fully understand the value of the site and surrounding habitats to bats and fully understand the utilisation by and distribution of bats within the habitats. A walkover survey of the site will be completed by an experienced bat ecologist to confirm any potential roosting opportunities within the site. If any roosts are discovered, this will be followed by dusk surveys following appropriate survey guidance, with the number of visits depending upon the value of the roosts identified. Activity surveys of the site will also be completed using a walked transect, which will be completed over two evening visits following the Bat Survey Guideline³ recommendations.

The semi-natural habitats within the site are not considered to be suitable for common reptiles, as the sward height of the grassland areas are unsuitable. However, the scrub, tall ruderal and areas of longer grassland adjacent to the site have some potential to support common reptiles. However, this area is relatively isolated from the railway corridor, which is located to the south-west of the site and provides linkages to wider habitats, and is of very limited extent and therefore is unlikely to support anything greater than a very low population of common reptiles. Therefore, as the habitats within the proposed development site are generally considered unsuitable or are largely disconnected and limited in extent, common reptiles are considered unlikely to be present or present in very low numbers and therefore further survey to support the proposed development is not required. Mitigation for any works proposed in this area will be incorporated to ensure any potential impacts are avoided.

The semi-natural habitats present within and adjacent to the site have some potential to support invertebrate species, particularly where these provide nectar rich sources of food. Although the main habitats of interest are located alongside the site in the grassland habitat alongside Challenge Court and the playing field to the south, there is some potential within the landscaped areas of the college. Consequently, further survey is required to understand the value of the habitats present and potential for ecologically significant species to be present. A walkover survey will be completed by an experienced entomologist to identify key habitats on the site for invertebrates and consider the potential invertebrates that are likely to be present on site. During the walkover, invertebrates will be collected as encountered and identified to provide a general list of species commonly present on the site.

³ Bat Conservation Trust (2012) Bat Surveys - Good Practice Guidelines - 2nd Edition. Bat Conservation Trust, London.

The habitats on site have potential to support hedgehogs, particularly the woodland and amenity grassland habitats to the south and north of the college, and alongside Challenge Court, where these are connected to residential gardens. Although not legally protected, the species is considered to be ecologically significant due to declines in populations, as highlighted by its inclusion as a UK BAP and London BAP priority species. A targeted survey is not proposed, however a watching brief will be undertaken during the completion of the evening bat activity surveys and any sightings of the species noted.

The riparian habitats of the River Crane and Duke of Northumberland's River are not considered to be suitable for the presence of water vole *Arvicola amphibious*, as the banks are reinforced and provide very little shelter in the form of vegetation cover. Furthermore, the absence of marginal macrophytes and shallow depth are unsuitable for the species. No records of otter *Lutra lutra* have been identified in the desk study and the habitats are not considered to hold great value for the species. No other legally protected or ecologically significant species are considered likely to be present on the site.



APPENDIX 14.1 SUMMARY OF CULTURAL HERITAGE AND ARCHAEOLOGY DESK STUDY RESULTS

Palaeolithic & Mesolithic Periods (c 500,000 BP – c 4,000 BC)

Upper Palaeolithic (c 500,000 BC - 8,000BC) and Mesolithic activity in the Greater London area has been found to be concentrated along the gravels and flood plains of the Thames and its tributaries (MoLAS, 2000, 49).

The Kempton Park Gravels which cover the site are a well-known source of Palaeolithic material in the Greater London Area. However, no human Palaeolithic artefacts have been found within the site or the wider study area. Although fragments of animal bone dating from the Devensian period (OA 20), c 100,000 BP, have been found 475 metres to the south of the site, this site did not include any recorded evidence of human occupation at this time.

Due to the nomadic nature of Mesolithic society activity is not restricted to one type of landscape or geology and therefore isolated scatters of Mesolithic material can found across the region. No heritage assets dating from the Mesolithic period (8,000 – 4,000 BC) have been recorded within the site or the wider study area.

Neolithic Period (4,000 – 2,200 BC)

The introduction of agriculture saw the development of permanent settlements along the Thames valley although activity on the gravel terraces above the river seems to have been somewhat limited (MoLAS, 2000, 66). This view however may be simply due to a lack of archaeological field investigations on higher ground in the Greater London area. Sites along the Thames have been studied more intensely due to the large amount of gravel extraction carried out on the first river terrace in the 19th and 20th centuries. The well-drained soils of this terrace together with the nearby Whitton Brook, located c 360 metres to the north east of the site, would have been attractive to Neolithic farmers.

Neolithic assets within the wider Study Area currently amount to a Neolithic arrowhead found during an archaeological evaluation 585 metres to the north east of the site (OA 3) and two flint adzes found in the area of Pope's Grove Cutting (OA 30), 645 metres to the south east of the site.

Bronze Age Period (2,200BC – 700BC)

The Bronze Age saw an expansion of settlement along the Thames valley, particularly in the Middle and Late Bronze Age. In the Late Bronze Age in particular there appears to have been an intensification of agriculture and increased pressure on land use, leading to settlement spreading out from the floodplains and up onto the terraces. The introduction of metalworking to the area would have also led to the exploitation of local resources such as timber for charcoal burning.

Evidence of settlement in the form of ditches and pottery dating from the Bronze Age were recorded during an evaluation carried out 585 metres to the north east of the site (OA 3). A spearhead, together with artefacts made from bone and stone, have also been recovered from the Pope's Grove Cutting area (OA 30), 645 metres to the south east of the site.

Iron Age Period (700BC – AD 43)

The regional archaeological evidence suggests that the continued growth of population, along with the introduction of iron and improved agricultural practices saw a profound change in society in southern England from the 8th Century BC onwards (MoLAS, 2000, 102). Archaeological investigations have, like studies of Neolithic and Bronze Age sites, primarily been confined to the gravel floodplains of the Thames due to late 20th century gravel extraction.

No assets dated to the Iron Age have been recorded within the site or the wider study area.

Prehistoric Period (c 8,000BC – AD 43)

A number of worked flint tools that clearly date from the prehistoric era, although they have not been dated to a precise period have been recorded within the wider Study Area. These were recorded during archaeological evaluations carried out at South Middlesex Hospital (OA 4) 570 metres to the north east of the site; at Kneller Gardens (OA 7) 600 metres to the north west and at Amyard Park Road (OA 52) 730 metres to the east of the site.

Roman Period (AD 43 – AD 410)

The Roman period sees the founding of London and its development as the trading centre of southern Britain. Scattered settlements developed in relation to the trade coming in and out of the city, particularly along the Thames and its tributaries and especially at the bridging points for the main roads out of the new capital.

The area to the west of London and above the Thames is thought to have been heavily forested at this time and little evidence for settlement or temporary occupation has been recorded to this date. The only Roman material to be recorded within the wider Study Area was pottery that was found during an archaeological evaluation at South Middlesex Hospital (OA 4) 570 metres to the north east of the site.

Early Medieval Period (AD 410 – 1066)

There was a settlement at Twickenham by 704, (VCH, 1962, 139) probably on the slightly higher ground by Twickenham Ait where the village stood in later times (OA

29) 645 metres to the south east of the site. The Saxon Charters of 704 and 709 (ibid) state that Tuican hom (Twickenham) was bounded on the east and south by the River Thames and to the north by a flooded plain situated on either side of the River Crane. The higher ground to the north became what was known as Whitton Land, bounded to the west by Hounslow Heath and to the north and east by Birket's Brook, later known as The Whitton Brook, which is located 300 metres to the north east of the site (ibid).

In the absence of any further evidence, it is assumed that the site, like much of the area to the west of London, was forested at this time. However, the large area of scrubland to the west of London known as Hounslow Heath is known to have extended as far as Twickenham Green c 400 metres to the south of the site and may have extended further (VCH, 1962, 140).

Later Medieval Period (AD 1066-1550)

It is likely that the medieval village of Twickenham was clustered along Riverside, in Church Street and King Street in the far south east of the wider Study Area, as well as in the alleys leading from them down to the river and at the junction of London Road and King Street. There were common meadows on the river-bank east of the village and behind them was open-field land which stretched to Isleworth (VCH, 1962, 140).

Few archaeological finds dating from this period have been recorded within the wider Study Area. A medieval rubbish pit, containing pottery from the 15th century as well as animal bone, oyster shells and tile was recorded during an archaeological evaluation undertaken 700 metres to the south east of the site (OA 34). A moated site (OA 6) was possibly located 575 metres to the north west of the site (Copley, 1958). It is likely that the site itself remained as open land to the north west of Twickenham village and to the east of Witton.

Post Medieval Period (AD 1550 – 1900)

The main route through the parish at this time was the London-Hounslow road through Isleworth to Twickenham, via Strawberry Vale to Teddington and Kingston. There was a stone bridge over the Crane on the London Road, just over 1 km to the north east of the site, by 1636 (VCH, 1962, 141). This road was turnpiked in 1767.

The demand for gunpowder in the Seven Years War against France (1756-1763) led to the establishment of gunpowder manufacturing in 1757 along the north bank of the River Crane, an area now designated as an APA by the Borough of Richmond-upon-Thames (GLHER, DLO33459). This area includes the southern third of the site itself. Although in located in Twickenham parish, the industry became known as Hounslow powder mills because it was centred upon Hounslow Heath, An extensive system of

leats and millstreams was created around a central large mill head pond at Crane Park, c 1.4km to the south west of the site, although the industry spread along much of the Crane valley to the north of Twickenham. Production continued through the 19th century. The buildings were sited far apart, screened by trees or mounds of earth and the potentially dangerous parts of the site were built of lightweight materials to reduce the resistance to shock if they blew up. The mills chiefly produced high class small arms powders for military and sporting purposes. The mills finally closed in 1927

The Twickenham ferry across the Thames was revived in 1659 (VCH, 1962, 141), crossing the river at the lower end of Eel Pie Island c 100 metres to the south east of the Study Area. This was the only river crossing in the parish above Richmond Bridge until modern times. It was replaced by a bridge in 1777.

Moses Glover's map of Isleworth Hundred, published in 1635, (VCH, 1962, 143), showed no detail over the area of the site itself, although open field systems are shown immediately to the north of Twickenham and c 100 metres to the south of the site with the common land of Hounslow Heath reaching to within 700 metres to the west of the site. Rocque's map of London, published in 1746 shows the eastern half of the site to be covered by part of a large arable field with pasture paddocks in the west. Milne's map of 1800 shows the site now covered by a series of enclosed fields of undefined land-use. It also shows that much of the land within the wider Study Area had been enclosed in the intervening 50 years in a piecemeal manner and converted to market-gardens and orchards or to pleasure-grounds for the big houses which were being built around Twickenham to the south east and Whitton to the west. The site appears to have been enclosed by the turn of the 18th century. In 1818 the remaining open fields in the parish were enclosed by Act of Parliament and these are shown in the Enclosure Map that was published in 1819. This map also shows the River Crane meandering across the southern third of the site now occupied by recreation grounds. By the publication of the first Ordnance Survey (OS) map of the area in 1871, a farm known as Marsh Farm has been established in this southern third, along with Marsh Lane, which still exists, dividing the two parts of the recreation grounds. None of these early maps depict any buildings connected with the Crane Valley industries within the site.

By 1723 Twickenham had already become a fashionable suburb for the very wealthy, including the poet and writer Alexander Pope, who moved to Twickenham in 1719 and built a villa with large gardens to the rear, including a grotto and tunnel which gave access to 5 acres of land he also leased. These gardens still exist and are a Registered Park and Garden (OA 28), while the tunnel is a Grade II* Listed Building (OA 24 and 25).

A large number of villas were constructed along the river and around the town and common at this time including Brimsworth House, 670 metres to the south west of the site (OA 12); Briar House (OA 14) 430 metres to the south west; Knowle House (OA 22), 290 metres to the south; Nos 10, 12, 54, 60 and 62 King Street (OA 32-3 and 36) 620 metres to the south east; Grosvenor House (OA 40), 560 metres to the south east Heatham House (OA 49) 350 metres to the east and Neville House (OA 50) 570 metres to the north east. The number of houses in the area increased through the 19th century and by 1871 there were over 2000 houses in the parish. The arrival of the railway in the late 1840s didn't stimulate a great increase in housing, the development of which was gradual up to the end of the 19th century.

Modern Period (1900 – present)

There was a great increase in house building in the area at the beginning of the 20th century (VCH, 1962, 145). This is usually attributed to the creation of a tram service to Shepherd's Bush in 1902 that provided the first cheap commuter route into London from Twickenham. Around 11,000 houses were built in the last decade of the 19th century and nearly 17,000 in the next. The Rugby Union ground (located in the north of the wider Study Area and opened in 1909) also dates from this period (ibid). Between the two World Wars (1919-1939) the main developments were at Whitton, to the north west of the site but there was also rapid building elsewhere and many of the remaining big houses disappeared.

This expansion is not immediately reflected in the cartographic evidence with the 1920 OS map of the area showing that a sewage works had been established immediately to the south west of the site, but with no further construction. By the publication of the 1938 OS map however, new housing estates have been established all around the site while the Great Chertsey Road has been constructed. The original core of the college building is also in place by this time.

During the Second World War it is believed that the site was used for military purposes (College Estates staff pers.com) and that air raid shelter may have been constructed in the northern third of the site beneath the current sports fields (ibid). The site has been established in more or less its present form by the mid-1960s (OS 1966 Edition 1:10000).