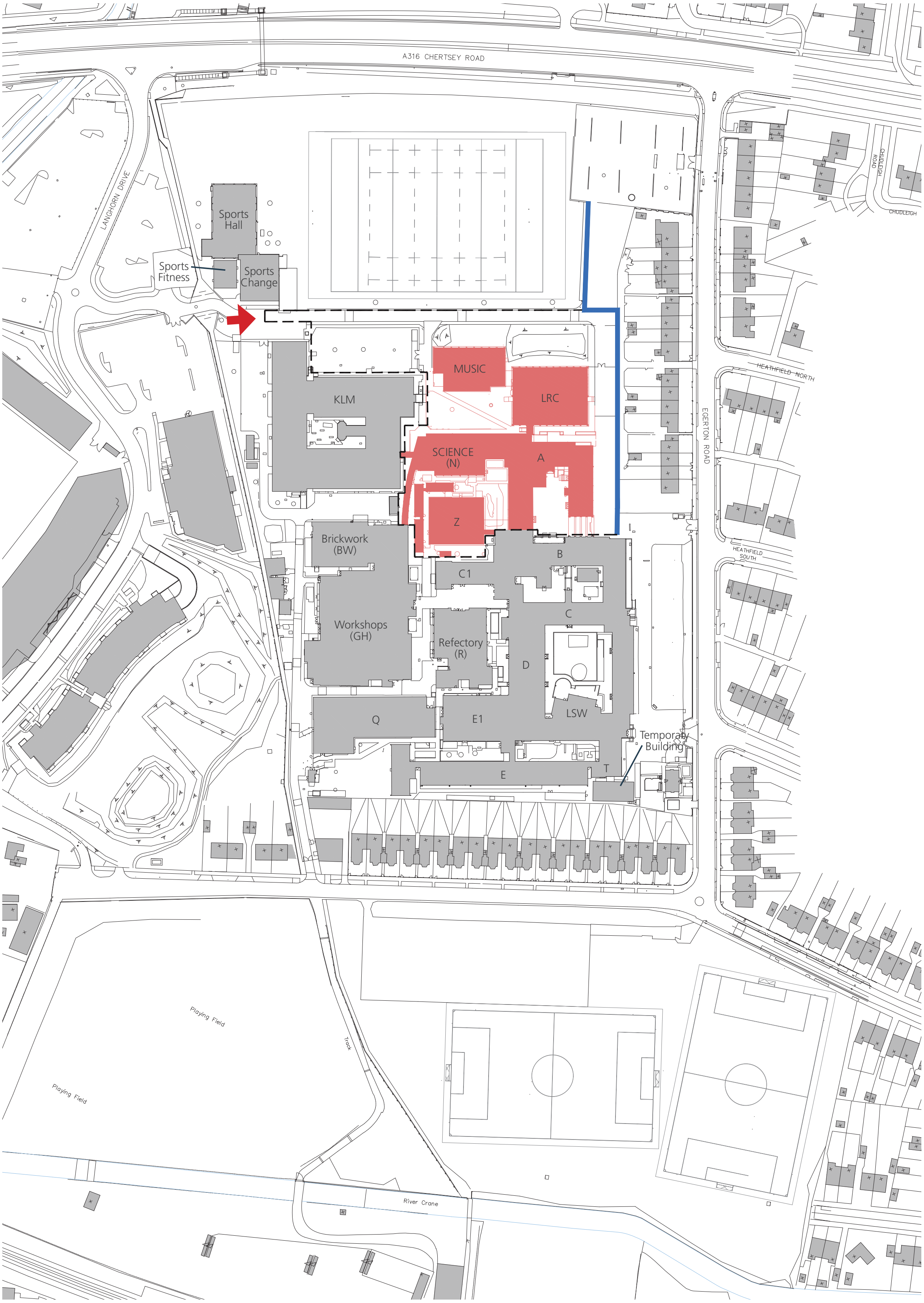
Attachment 1: Phase 1b Demolition Plan



ENABLING WORKS

PHASE 1b

Demolition of existing buildings (Music, LRC, Science and A block (part) and Z block)

Buildings to be Demolished

Existing Buildings

Construction Hoarding

2.4m high closed-boarded fence

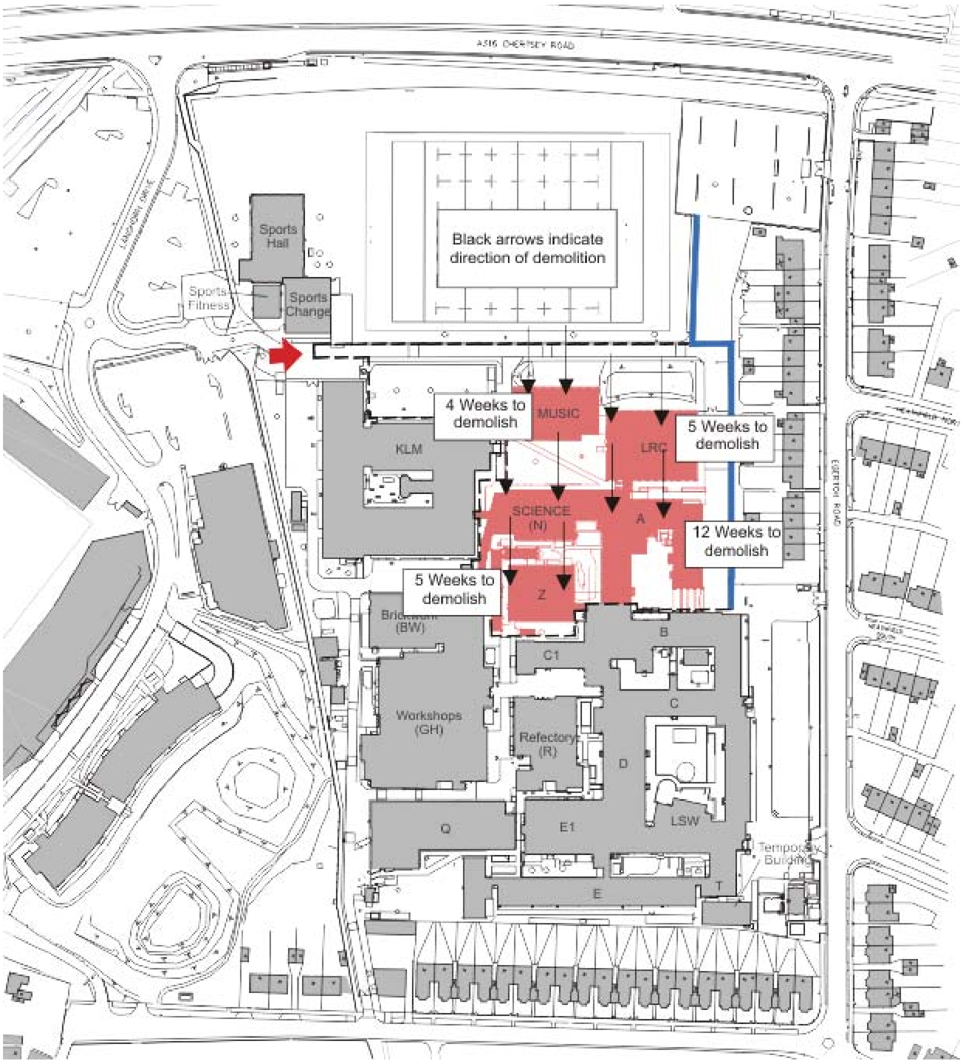
Construction Vehicle Access

Attachment 2: Phase 1b Demolition Method Statement

Richmond upon Thames College – Phase 1b Demolition Method Statement

Phase 1b Overview

Phase 1b demolition will require an estimated 14 weeks to complete. The below diagram shows the proposed programming of the demolition.



Blue arrows show the direction of demolition. It is likely that the Music, Science and Z blocks would be demolished first with LRC and A block being left in place to form an acoustic barrier between the site and the nearby residential dwellings. Access to the site will be via Langhorn Drive, as indicated by the solid black arrow. All contractor's parking and temporary facilities will be within the site boundary hoarding indicated by the dashed black line.

The timings shown for each building are indicative maximums and some elements of the demolition will be simultaneous to maintain the overall 14 week programme. During the construction period it is expected that a minimum of eight and a maximum of twenty operatives will be employed on the site at any one time. Traffic movements are estimated at 7 heavy good vehicles per day each way (therefore 14 movements in total each day). Entry to and exit from the site will be limited to off peak hours which will be agreed in advance with the College and local community.

Decommissioning, Asbestos Surveys and Removal:
Any ACM (Asbestos Containing Material) highlighted on the Demolition and Refurbishment (recently completed) will be removed in a controlled manner using only licenced and approved specialists who will also serve the relevant notices to HSE if applicable.

There are three categories of asbestos removal; notifiable licensed works, notifiable non-licensed works (NNLW) and non-notifiable asbestos works. All asbestos removal works would be carried out in accordance with The Control of Asbestos Regulations 2012. An individual Plan of Works will be provided by a specialist contractor for notifiable asbestos i.e. thermal insulation to pipework and associated debris and residue, AIB (Asbestos Insulation Board) etc.

All operatives have received training to recognise ACMs, should any additional ACMs be located within the buildings during demolition, work will cease and the Site Manager notified, an asbestos surveyor will be called to site and a sample taken for testing to confirm, prior to works in that area continuing.

Demolition
Once the buildings has been cleared of asbestos (where applicable) and certified as safe through a reoccupation 4 stage clearance the internal soft strip will commence. All soft strip work shall be carried out in accordance with BS6187 – code of practice for demolition works and planned and managed by Erith demolition project & site managers.

The soft strip works will include, but not be restricted to, the removal of suspended ceilings, fixtures and fittings, non-load bearing partition walls, doors, door furniture, skirting and sanitary ware. This will be completed using hand held tools including, but not restricted to, pinch bars, hammers, mattocks and shovels as well as the use of our excavator for loading. For high level works, e.g. ceiling removal, operatives will use alloy towers and podium steps. Operatives erecting these access platforms will have PASMA (Prefabricated Access Suppliers' & Manufacturers' Association) training.

All waste from the site will be controlled by the Site Waste Management Plan, with all materials given the correct duty of care and waste transfer notes on collection. All materials generated from the site will be recycled wherever possible.

If required any hot cutting will be carried out by trained/experienced operators, they will wear the required PPE (Personal Protective Equipment) including goggles, flame resistant coveralls, burning gauntlets and RPE (Respiratory Protective Equipment) (filter conforming to EN143 P2). Hoses and bottles will be inspected daily for damage or leaks and a permit to work system will be in place for all hot works. A fire risk of the building structure will be assessed before any hot works begin. Whilst the hot works are being carried out a second person will be monitoring the works with a fire extinguisher to hand. All hot cutting will cease 1 hour before end of working day, this is to allow a fire watch to take place to ensure that all areas have cooled down and the is no risk of fire before operatives have left site. In addition before any hot cutting is carried out, any painted surfaces to be cut will be tested for lead base paint, if found that the paint does contain lead then a risk assessment will be carried out and control measures put in place to minimise the operatives exposure.

The following method statement indicates how the unoccupied buildings will be demolished in each phase of the demolition works to ground floor slab. Prior to delivery of heavy demolition rigs, the proposed position of the machinery will be established and existing ground conditions assessed by structural engineers to ensure that they do not damage any underground services awaiting termination / diversion. It is particularly important that any sub-structures (below ground) in and around the building structure are identified and are documented within the risk assessment and safety plan. Where it is not possible or practical to backfill certain voids, these will be clearly marked and isolated from site actively by barriers which will be carefully maintained throughout the course of the works.

All demolition machinery will come fully fitted with FOP (Falling Object Protection), ROP (Roll Over Protection), and impact resilient glass whereby the operators must keep cab doors of the machinery closed at all times. The drivers shall ensure that there is good all round visibility, and no windows / mirrors are cracked, prior to commencement The machines will come equipped with the following attachments; combi-cutter crusher, Steel shear, Selecta grab, Hydraulic breaker. All attachments will be maintained and regularly inspected, excessive tool wear will lead to unnecessary strain being placed on the machine. Hydraulic hoses will be continually checked. Dust suppression systems fixed to the machine must be operational at all times. If, during the works it is deemed that the machine mounted dust suppression system is not sufficient, then additional equipment will be utilised i.e. Dust Boss DB60 or similar. All attachments will have the gross weight clearly marked on them, and used as per the manufacturer's instructions. Machinery will be sited as far away from the existing residential as practicably possible to minimise disruption.

It is a legal requirement for a competent person to carry out weekly inspections on all machines and attachments. However, it is best practice to undertake daily inspections. Machine operators will avoid sudden or sharp movements and carryout the controlled removal of sections of the structure, whilst retaining the stability of the remainder. Key structural members (columns or other load bearing instruments) on which the structure relies on, together with their sequence of removal, will be identified by the Project Manager prior to works commencing.

An exclusion zone around the building and Demolition Rig will be devised inclusive of the three main elements required to create a demolition exclusion zone as outlined with BS 6187. These will consist of: (1) the designated 'Debris Drop Area' - The immediate hazard area, where the principal mass of the removed arising's are designed to fall into. (2) 'Predicted Debris Area' - the area of predicted limit or extent to which any debris from, or secondary material resulting from, the structure being demolished will travel and come to rest and finally (3) the 'Buffer Area' - area that is planned to allow for any unpredictable events. All non-essential personnel will not be permitted into the Exclusion Zone. Essential personnel will include the machine driver and a banksman (the latter to assist the machine operator). Entry will be strictly monitored by the Project Manager, banksman, and machine operative.

Each structure will be divided into bays. These bays will be determined by any load bearing element of the structure i.e. rooms or columns. A suitably sized 360º tracked excavator fitted with a sufficiently long boom, equipped and various rotating attachments will then commence progressive demolition of the structures. Progressive demolition involves the controlled removal of sections of the structure, whilst retaining stability of the whole or part of the remaining building/structure. The D-Rig will be located at a safe distance from the structure for the commencement of the works.

The D-Rig using its reach will begin at the highest point. The roof frame will be systematically taken down with the released sections guided/lowered down to ground level, if required the sections will be further processed at ground level into machine sized manageable elements for ease of transportation off site. The roof covering and framework will be progressively removed with the reduction of the structure i.e. remove side and roof, progressively reduce main structural (bay by bay). Each building will be systematically reduced a single structural bay at a time working from the top of the structure down. Working column-to-column will maintain a ‘square’ to provide lateral support. Using the shears horizontally the D-Rig will cut through the steel upright columns as close to the base of the slab as practically possible. The column held in the jaws of the D-Rig will then be guided into the footprint for further processing for ease of transportation. The D-Rig will progressively reduce the main element of the structure to ground level using the methodology above a single structural bay at a time, this will ensure maximum stability of the structure.

With demolition of the buildings complete the removal of the ground slab/founds will be removed. The D-Rig will work with hammer attachment breaking the slab into manageable sized sections, the broken pieces then being lifted up by a second excavator with bucket attachment.

Demolition arisings will be segregated by the D-Rig using its grab attachment into waste streams for recycling. All waste movements will have transfer notes, copies of which will be retained on the site for inclusion in the developing health & safety file (see also Environmental Management below).

During the demolition works, traditional dust controls will be implemented to eliminate / reduce emissions. Knock down atomising sprays or water bowsers will be used to keep areas damp for the duration of the works, where required specific water sprays will used on particular points (see also Environmental Management below)..

All brick and concrete arisings are to be crushed, all works will be in full compliance with the NFDC (National Federation of Demolition Contractors) Guidance Notes of the Safe Use of Mobile Crushes in the Demolition Sector. Heras fencing with debris netting will be deployed around the crushing area, and water suppression techniques utilised throughout the entire process.
On delivery of the mobile crushing plant it will be set-up ready for work i.e. support jack legs lowered into position onto existing concrete or prepared surface until they take full weight of the unit. The hydraulic excavator will be positioned behind the loading hopper of the crusher at a level that ensures the driver/operator has full uninterrupted view of the crushing plant and crusher operator. He will then excavate into the stockpiles, filling the excavator bucket with demolition arisings and deposit as required (slowly) into the feed hopper ensuring even distribution on the feeder tray while at the same time checking for oversized pieces. Fines

and metals will be removed mechanically from the crusher, wood and plastics will be sorted as the machine loads the crusher and glass and remaining wood and plastic will be picked when safe to do so from the crushed pile. All crushed arisings are then moved from the discharge conveyor displacement location, this will usually be carried out by a pneumatic tyred loading shovel. Water hoses will be directed onto discharged conveyor and jaws to suppress dust arisings.

The mobile crushing unit will be located as far away from sensitive neighbouring residential properties as is practicably possible whilst having regard to health & safety requirements.

Close liaison with REEC, Richmond College, Richmond Borough and site neighbours will take place prior to commencement of any works.

Environmental management
Measures which will be implemented during the Phase 1b demolition works to reduce or avoid the potential environmental effects from the demolition activities are identified below.

Noise
A 2.4m high close boarded fence will be provided which will reduce noise from the proposed demolition to residential properties along Egerton Road. The fence will function as acoustic hoarding and will be located on the site boundary along the rear of 1-33 Egerton Road (refer to plan).

Works on site will follow the Code of Practice BS 5228: 1997 Noise Control on Construction and Open Sites which provides specific detail on suitable noise mitigation measures.

The best practicable means, as defined in section 72 of the Control of Pollution Act 1974, to reduce noise to a minimum shall be employed at all times:

- Where practical electrically powered plant / tools will be used.
- All vehicles and mechanical plant used for the purpose of the works shall be fitted with effective exhaust silencers.
- All compressors shall be "sound reduced" models fitted with properly-lined and sealed acoustic covers which shall be kept closed whenever the machines are in use, and all ancillary pneumatic percussion tools shall be fitted with mufflers or silencers of a type recommended by the manufacturers.
- Machines in intermittent use shall be shut down in the intervening periods between work or, where this is impractical, shall be throttled to a minimum.
- All plant and machinery shall be maintained in good and efficient working order.
- No plant shall be left running when not in use.

Prescribed working hours will be in accordance with LBRuT’s Considerate Contractor’s Advice Note7:

- 08:00 – 18:00 hours Monday to Friday (with a one hour period of mobilisation / demobilisation at the start and end of the day);
- 08:00 – 13:00 hours Saturday (with a one hour period of mobilisation / demobilisation at the start and end of the day); and
- No working on Sundays or Bank Holidays.

The hours of working will be as agreed with LBRuT Environmental Health Department prior to the commencement of works. It is possible that certain works may have to be undertaken outside these periods. Any works which are required to be undertaken out of these prescribed working hours will be subject to the prior agreement and reasonable notice with LBRuT.

Dust
Dust control measures in accordance with London Best Practice Guidance will be implemented during the proposed demolition including:

- Erecting solid barriers around the site boundary and ensuring these are kept clean at all times;
- Vehicle engines switched off when not in use i.e. no idling vehicles;
- No site runoff of silty water or mud allowed;
- Stockpiles kept for the shortest time possible and if necessary, the use of sprinklers and hoses for dampening of exposed soil and materials employed;
- Providing an adequate supply of water on site where sprinklers and hoses are used for dust suppression;
- Using enclosed chutes and covering skips where possible;
- Observation of wind speed and direction prior to conducting dust-generating
- Locating machinery and dust causing activities away from sensitive receptors where possible;
- Activities (including the location of the crusher) to assess the potential for dust nuisance to occur, minimising potentially dust-generating activities during periods when wind direction may carry dust into sensitive areas and minimising dust-generating operations during periods of high or gusty winds;
- Stockpiles of soils and materials located as far as possible from sensitive properties, taking account of prevailing wind directions and seasonal variations in the prevailing wind;
- Completed earthworks will be covered or vegetated as soon as is practicable;
- Regular inspection of local highways and site boundaries to check for dust deposits (and removal if necessary);
- Visual inspection of site perimeter to check for dust deposition (evident as soiling and marking) on vegetation, cars and other objects and taking remedial measures if necessary;
- Use of dust-suppressed tools where practicable;
- All demolition plant and equipment maintained in good working order;
- Supply adequate equipment on site to clean any dry spillages;
- Use registered waste carriers to remove waste from site using properly sheeted or covered vehicles;
- No unauthorised burning of any material anywhere on site;
- Construction vehicles will be kept clean and sheeted when on public highways; and
- Large-scale vehicle movements will be timed to avoid peak hours on the local road network if possible.

Traffic management
The proposed works are anticipated to generate approximately seven daily HGV movements each way (therefore up to 14 in total per day) and approximately 10 daily movements of other vehicles including construction staff (there are anticipated to be approximately eight to 20 full time equivalent staff). The access for the proposed demolition works will be from the A316 / Langhorn Drive junction.

All demolition vehicles will be received at the college site entrance on Langhorn Drive by banksmen who will supervise the vehicles into the demolition site past Marsh Farm Lane. On exit, banksmen will supervise the vehicles back onto Langhorn Drive. Hoarding will separate the demolition site from the rest of the college site to ensure segregation between users of the college site and the activities associated with the demolition process.

Parking for site personnel and visitors will avoid parking nuisance to the local community.

Areas currently used for staff car and motorcycle parking on the eastern side of the site will be closed for the duration of the works. There is sufficient space within the rest of the college site, particularly on the western side, to provide replacement parking areas to mitigate the loss of staff car and motorcycle parking on the eastern side of the site. Cars will be able to park in existing hardstanding areas without impacting on the movement of delivery and servicing vehicles in these areas.

Control of lighting
Site lighting shall be kept to a minimum necessary for adequate security and safety. To minimise the potential for nuisance, lighting will not be located or directed towards neighbouring or adjoining properties.

Storage of fuels and oils
Storage of all fuels and oil will conform to Government regulations and best practice guidance issued by the Environment Agency. Site storage areas will not be located near to sensitive receptors (such as water courses). Site spill kits will be appropriately located.

Contaminated land

In the unlikely event that there are small amounts of waste soil arisings requiring disposal, these will be segregated from any residual demolition waste. Such material is classified as waste by virtue of its contamination. It therefore cannot be re-deposited on site, nor used in construction on site or elsewhere (except under the provisions of the Environmental Permitting (England and Wales) Regulations 2010). The suitability of landfills to accept such material will be based on its classification according to the Landfill Regulations and the Environment Agency Waste Acceptance Criteria. Waste Acceptance Criteria testing of any such soil will be undertaken prior to disposal off site.

Waste management
The following measures will be implemented to minimise environmental impacts:

- Careful location of stockpiles and other storage areas;
- Segregation of waste streams to maximise opportunities for reuse and recycling;
- Use of on-site recycling plant, such as concrete crushing;
- Use of good practice in the design of waste storage areas and the use of suitable waste containers;
- Use of sheeting, screening, damping and seeding of stockpiles where appropriate and practicable;
- Control and treatment of runoff from soil and waste soil stockpiles;
- Minimising storage periods;
- Minimising haulage distances; and
- Sheeting of vehicles.

Ecology and trees

Any vegetation clearance will be undertaken outside the breeding bird season (March to August inclusive) or immediately following inspection by a suitably qualified ecologist.

Root protection areas for trees outside but immediately adjacent to the Phase 1b site will be demarcated and protected. No dig construction methods will be used near root zones of retained trees.

Management of invasive non-native species
Species identified on the site which are listed on Schedule 9 of the Wildlife and Countryside Act 1981 (as amended) will be managed appropriately (e.g. wall cotoneaster). It is an offence, under this legislation, to plant these species or otherwise cause them to grow in the wild.

Attachment 3: Phase 1b Demolition Noise Assessment

REEC Development

Phase 1b Demolition

Noise and Vibration Screening Assessment

Phase 1b involves the demolition of the Music, Science, Z Block, LRC and A Block over a 14 week period. The closest noise sensitive receptors to these works are the rear facades of 1-33 Egerton Road. There are no nationally established significance criteria for the assessment of construction noise. Noise from construction sources can be highly variable in its intensity and character and is always of a temporary nature.

When assessing construction noise the guidance in BS 5228 identifies a number of key factors in relation to the acceptability of noise (and vibration) to people living and working around a site. Construction noise levels have been calculated at the identified noise sensitive receptors close to the works. Details of plant and construction equipment have been supplied by the contractor as well as information on the likely usage of each item of plant.

The criteria used for the assessment of construction noise impact were as follows.

Criteria for Construction Noise	
Negligible	An increase in LAeq,10hr of less than 3dB, as a result of construction or an assessed level below 55dB LAeq,10hr
Minor adverse	An increase in LAeq,10hr of more than 3dB, as a result of construction, for a period of less than 8 weeks and the assessed level to be above 55dB LAeq,10hr
Moderate adverse	An increase in LAeq,10hr of more than 3dB, as a result of construction, for a period of more than 8 weeks and the assessed level to be above 55dB LAeq,10hr
Major adverse	An increase in LAeq,10hr of more than 10dB, as a result of construction, for a period of more than 8 weeks and the assessed level to be above 55dB LAeq,10hr

Baseline noise monitoring was carried out in May 2014 on the eastern boundary of the College at the rear of properties at 1-33 Egerton Road in order to establish ambient and background noise levels at these properties and the following results were obtained.

$L_{Aeq,12hr}$	L_{A1} max Day 12hr	$L_{Aeq,16hr}$	$L_{Aeq,8hr}$	L_{A90} min Night 8hr	L_{Amax} Night 8hr
61.1	80.8	60.7	57.1	31.9	83.7

The recent ambient noise levels supplied by the contractor (see Appendix A) were in broad agreement with those measured in 2014. The ambient noise level used in the assessment was taken during a period when aircraft were landing at Heathrow in a westerly direction. When aircraft are departing Heathrow in an easterly direction, ambient noise levels are typically 5dB higher.

The demolition noise levels were calculated according to the methodology of BS5228 using the supplied information on plant and equipment. The calculations took account of distance attenuation and intervening screening and were for a worst day assuming all plant operating.

During the demolition of the Music, Science and Z Blocks noise levels at the properties in Egerton Road would be screened by the LRC and A Block buildings resulting in a typical $L_{Aeq,10hr}$ of 58dB. This is below the ambient noise level and would have negligible impact.

During the demolition of the LRC and A Block buildings, unscreened noise levels at the properties would be $L_{Aeq,10hr}$ 75dB at the closest approach of the works, clearly a major impact. However, a 2.4m high close boarded fence on the site boundary (not the demolition works boundary) will provide acoustic screening along the rear of 1-33 Egerton Road.

This would result in a noise level of $L_{Aeq,10hr}$ 69dB during the demolition of the top floor of the buildings where the screening will be less effective. While this is more than 3dB above ambient it would be for less than 8 weeks thus classed as a minor impact. During the demolition of the lower floors the screening would be more effective resulting in a level of $L_{Aeq,10hr}$ 63dB at the properties and therefore also classed as a minor impact.

The use of hydraulic breakers for the Phase 1b demolition could result in occasional perceptible levels of vibration at the properties on Egerton Road during the closest approach of the works although the impact would be minor.

It is concluded that noise and vibration impacts from the Phase 1b Demolition would be no more than minor and therefore not significant.

Appendix A: Atkins Noise Data

Technical note

Project:	Richmond Education and Enterprise Campus	**To:**	Nolan Smith (Fusion)
Subject:	T.003 Technical Note – Atkins ANV – Baseline Noise Logging Data	**From:**	Adam Page
Date:	29 Sep 2015	**cc:**	Ian McNally

This technical note details the results of the baseline noise monitoring, which was undertaken from the 4th September until the 11th September 2015. As well as noise data, relevant weather data and aircraft data is presented.

Measurement Position

A sound level meter was placed on the roof of block A at approximately 12m above ground level, in a free field position and left unattended logging noise levels from the 4th to the 11th September. The positioning of the meter is presented in **Figure 1**.

Figure 1 Logger Position

Noise Monitoring Equipment

The noise measurements were undertaken using a RION NL-52 sound level meter, which conforms to the specifications for sound level meters of Class 1 as described in BS EN 61672 Electroacoustics - Sound Level Meters, Part 1: Specifications 2013.

The equipment was placed on a tripod with a windshield fitted to the microphone. The height of the microphone was approximately 2.0m above the roof level. The sound level meter was field calibrated using an acoustic calibrator, both before and on completion of the noise survey. No significant drift in calibration was observed.

Table 1 presents the equipment details used throughout both surveys. Calibration certificates can be provided upon request.

Table 1 Measurement Equipment

Item	Manufacturer	Model	Serial	Laboratory Calibration
Frequency Meter	Rion	NL-52	00620856	21/08/2014
Pre-Amplifier	Rion	NH-25	03692	21/08/2014
Microphone	Rion	UC-59	20916	21/08/2014
Calibrator	Rion	NC-74	35125803	29/07/2015

Additional Monitoring

Weather

Weather data was recorded throughout the survey period using an ANV weather station. The weather data was used to identify any unsuitable weather conditions throughout the survey period, where required periods of rain were edited out of the noise data. Wind speeds did not exceed 5m/s throughout the measurement period. Average wind speed and wind direction are included in the results tables.

A key requirement for recording the weather data is so that it can be compared with aircraft movement at Heathrow Airport.

Aircraft

Aircraft data has been provided in Appendix A, this includes the amount of arrivals and departures each day. This data has been taken directly from the Heathrow's operational data website:
http://www.heathrowoperationaldata.com/index.php?option=com_content&view=article&id=139&Itemid=159

For further analysis and understanding how often aircrafts fly over the college site the following links, provided by Heathrow Airport, can be used:

1. http://webtrak5.bksv.com/lhr4
2. http://myneighbourhood.bksv.com/lhr/
3. https://www.gov.uk/government/uploads/system/uploads/attachment_data/file/368905/LHR_2013_report.pdf

Technical note

ATKINS

Survey Observations

When setting up the logging sound level meter on the 4th September 2015, some notes were made about general noise conditions on site. Road traffic noise was the dominant source of noise and remained constant during the periods of time Atkins Acoustics, Noise and Vibration team members attended site. It was noted aircraft noise impacted on the site, with frequent flyovers occurring approximately every two minutes.

Results

The following Tables present the results of the noise survey, L_{Aeq} and L_{A90} indices are presented and other noise indices can be provided upon request.

Table 2 Baseline Noise Data (L_{Aeq}) 04/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Hz, dB							
				63	125	250	500	1k	2k	4k	8k
11:29	1	NW	57	58	58	56	55	52	49	44	42
11:44	1	W	57	59	58	56	56	53	46	36	26
11:59	1	NW	56	58	56	54	54	53	46	38	30
12:14	1	NW	55	57	54	53	52	52	46	38	28
12:29	1	NW	56	58	56	55	54	52	46	36	27
12:44	1	NW	56	58	56	56	55	53	45	35	26
12:59	1	NW	56	57	56	54	53	53	46	33	25
13:14	2	NW	57	59	57	56	55	54	46	34	26
13:29	2	NW	57	58	57	55	54	53	46	34	26
13:44	1	NW	57	58	56	55	54	53	46	33	24
13:59	1	NW	59	58	57	58	56	54	50	44	34
14:14	1	NW	56	59	57	55	54	53	46	35	29
14:29	1	NW	56	59	57	55	54	53	45	33	26
14:44	1	NW	59	59	56	57	55	56	52	40	30
14:59	1	NW	54	57	54	52	50	51	44	33	28
15:14	1	NW	53	58	54	51	50	51	44	33	28
15:29	1	N	54	57	54	53	51	51	46	35	27

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Hz, dB							
				63	125	250	500	1k	2k	4k	8k
15:44	1	N	54	58	53	50	50	51	45	35	28
15:59	1	N	56	58	53	51	50	52	47	47	41
16:14	1	NW	53	58	53	51	50	50	44	35	26
16:29	1	NW	55	57	53	52	52	52	46	39	34
16:44	1	NW	53	57	53	51	50	51	44	34	25
16:59	1	NW	55	57	52	50	51	53	45	38	29
17:14	1	NW	53	56	53	52	50	50	44	34	24
17:29	1	NW	53	57	53	51	50	51	44	35	27
17:44	1	NW	53	57	54	52	50	50	44	35	27
17:59	1	N	54	57	55	53	50	50	44	40	33
18:14	1	N	52	57	54	51	50	49	42	35	27
18:29	1	NW	53	60	55	53	50	49	44	41	33
18:44	1	N	51	56	52	50	48	47	41	34	27
Average	1	NW	55	58	55	54	53	52	46	38	32

Table 3 Baseline Noise Data (L_{A90}) 04/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
11:29	1	NW	52	55	52	50	49	49	42	30	21
11:44	1	W	54	55	52	49	50	51	44	31	21
11:59	1	NW	53	55	52	49	49	50	43	30	21
12:14	1	NW	53	55	51	49	49	50	43	31	21
12:29	1	NW	53	55	52	50	50	50	43	31	21
12:44	1	NW	53	54	51	49	49	50	43	31	21

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
12:59	1	NW	54	55	51	49	49	51	44	31	21
13:14	2	NW	54	56	52	50	50	51	44	31	21
13:29	2	NW	54	55	52	50	50	51	43	30	22
13:44	1	NW	54	55	51	49	50	51	44	30	20
13:59	1	NW	54	56	52	50	50	51	44	31	22
14:14	1	NW	54	55	51	50	50	51	44	31	23
14:29	1	NW	53	56	52	50	50	51	43	30	21
14:44	1	NW	53	56	51	49	49	50	43	30	21
14:59	1	NW	52	55	50	48	48	50	43	29	20
15:14	1	NW	52	54	50	48	48	49	42	29	21
15:29	1	N	52	55	49	48	48	49	42	30	20
15:44	1	N	52	56	50	48	48	49	43	31	22
15:59	1	N	52	55	50	48	48	49	42	30	19
16:14	1	NW	51	55	49	48	47	48	42	29	19
16:29	1	NW	53	54	49	49	49	50	43	30	20
16:44	1	NW	51	55	49	47	47	49	41	29	19
16:59	1	NW	51	54	49	48	48	48	42	29	20
17:14	1	NW	51	55	51	48	47	48	41	29	20
17:29	1	NW	51	55	50	48	47	48	41	28	19
17:44	1	NW	51	55	51	48	47	48	41	29	20
17:59	1	N	51	54	50	48	47	48	41	29	20
18:14	1	N	50	55	50	47	46	46	40	29	20
18:29	1	NW	50	54	50	47	46	46	40	29	20
18:44	1	N	50	54	50	47	46	46	40	29	20
Average	1	NW	52	55	50	49	48	49	42	30	21

Table 4 Baseline Noise Data (L_{Aeq}) 07/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	0	SW	59	61	61	58	57	55	50	41	36
07:14	0	SW	63	65	64	62	61	59	54	42	31
07:29	1	W	60	64	61	59	59	55	48	40	35
07:44	0	W	59	65	61	59	58	54	47	37	29
07:59	0	NW	60	64	62	59	58	55	49	41	35
08:14	1	NW	60	64	61	58	58	56	50	41	35
08:29	0	SE	61	63	62	60	59	56	50	43	40
08:44	0	W	58	66	61	58	57	54	48	37	33
08:59	1	SE	59	61	60	58	57	55	52	40	34
09:14	0	SW	61	66	63	61	60	55	49	38	29
09:29	0	SE	62	66	65	63	61	57	50	40	29
09:44	1	SE	63	67	65	62	61	60	52	40	28
09:59	1	NE	60	63	62	60	58	55	50	38	33
10:14	1	SE	60	66	62	59	59	55	48	36	26
10:29	1	SE	63	64	63	62	61	59	52	40	35
10:44	1	SE	61	65	63	61	59	56	54	41	28
10:59	1	SE	66	68	68	65	63	61	58	45	35
11:143	1	S	59	63	61	58	56	54	49	37	28
11:29	1	SE	58	62	60	57	57	53	46	34	26
11:44	1	SW	62	65	63	62	60	56	53	40	26
11:59	1	SW	62	65	63	62	60	56	53	40	26
12:14	1	SW	62	67	65	63	61	57	52	39	28
12:29	1	W	56	65	59	56	55	51	43	34	26

Technical note

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
12:44	1	W	64	66	65	64	62	59	54	42	26
12:59	1	W	62	65	64	63	60	57	51	40	26
13:14	1	NW	61	65	62	61	59	56	53	39	29
13:29	1	W	56	68	62	57	54	51	44	34	27
13:44	2	SE	58	63	61	58	56	54	46	33	25
13:59	1	W	65	68	68	65	64	60	54	42	35
14:14	1	W	60	65	62	60	59	55	49	36	28
14:29	1	NW	63	67	67	64	62	58	53	39	32
14:44	2	E	61	65	65	62	60	56	50	38	29
14:59	2	E	62	65	63	61	61	58	54	39	28
15:14	2	E	62	66	64	61	61	57	50	37	29
15:29	2	SE	61	64	62	61	60	56	48	35	28
15:44	2	SE	60	64	62	61	59	55	49	37	29
15:59	2	NE	64	68	67	65	63	59	53	40	31
16:14	2	SE	62	65	64	62	60	57	52	42	32
16:29	1	SW	63	65	65	63	62	59	53	40	27
16:44	1	NW	63	66	64	62	61	58	55	43	29
16:59	1	NW	58	65	62	59	56	54	47	35	25
17:14	1	SE	61	63	64	61	60	56	49	35	25
17:29	1	SE	62	65	64	62	60	57	50	41	32
17:44	1	SE	60	63	62	60	59	54	47	40	33
17:59	1	SW	60	65	63	61	59	55	50	39	30
18:14	1	W	58	62	61	58	57	54	47	36	26
18:29	1	SW	57	61	59	57	56	53	46	36	27
18:44			57	66	61	58	56	53	46	39	32

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
Average	1	SW	61	65	63	61	60	56	51	40	31

Table 5 Baseline Noise Data (L_{A90}) 07/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	0	SW	54	57	53	50	49	51	45	34	24
07:14	0	SW	54	57	54	51	49	51	45	33	23
07:29	1	W	51	57	52	49	47	48	42	32	23
07:44	0	W	50	57	52	48	46	46	40	31	21
07:59	0	NW	51	57	53	49	47	46	40	31	22
08:14	1	NW	50	56	52	48	47	47	41	31	23
08:29	0	SE	51	56	53	49	48	47	42	33	25
08:44	0	W	49	55	51	47	45	46	40	30	21
08:59	1	SE	50	56	51	48	46	46	41	32	23
09:14	0	SW	50	56	51	47	46	45	40	31	22
09:29	0	SE	51	55	51	48	47	47	41	32	23
09:44	1	SE	50	56	51	48	47	46	40	30	21
09:59	1	NE	50	54	50	47	46	46	40	29	21
10:14	1	SE	50	55	50	46	46	46	40	30	21
10:29	1	SE	49	53	49	46	46	46	39	30	20
10:44	1	SE	50	54	48	46	46	46	40	29	20
10:59	1	SE	50	54	48	46	46	46	40	29	20
11:143	1	S	49	54	50	47	46	46	39	29	21
11:29	1	SE	49	54	49	46	46	46	39	29	20

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
11:44	1	SW	49	54	51	47	45	46	39	29	21
11:59	1	SW	50	55	50	47	47	47	40	29	20
12:14	1	SW	51	55	51	48	48	47	40	30	21
12:29	1	W	50	56	52	48	47	46	40	29	20
12:44	1	W	51	56	52	48	48	47	41	31	22
12:59	1	W	51	56	52	48	48	47	41	31	22
13:14	1	NW	51	54	50	47	47	47	41	30	23
13:29	1	W	50	55	50	47	46	47	40	29	21
13:44	2	SE	50	53	50	47	46	46	39	29	20
13:59	1	W	51	54	51	49	48	48	41	31	22
14:14	1	W	51	55	50	48	48	48	41	30	21
14:29	1	NW	51	55	51	49	48	48	41	31	22
14:44	2	E	51	55	50	48	48	47	40	30	23
14:59	2	E	51	55	51	48	48	48	41	31	23
15:14	2	E	51	55	51	48	48	47	41	31	23
15:29	2	SE	51	55	50	48	47	47	41	31	23
15:44	2	SE	51	55	50	48	48	48	41	31	24
15:59	2	NE	51	55	50	48	47	47	41	31	23
16:14	2	SE	51	53	48	47	47	48	40	27	17
16:29	1	SW	52	55	51	49	48	48	42	32	22
16:44	1	NW	51	55	50	47	47	48	41	30	22
16:59	1	NW	51	54	50	48	47	48	41	29	20
17:14	1	SE	51	54	49	47	47	47	41	29	20
17:29	1	SE	51	55	49	47	47	47	40	29	20
17:44	1	SE	50	54	50	48	46	46	40	29	20

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90,\,dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
17:59	1	SW	49	54	49	47	45	45	39	28	19
18:14	1	W	49	54	49	46	45	46	40	28	19
18:29	1	SW	49	54	50	47	45	46	39	28	19
18:44			51	54	50	48	47	47	41	30	19
Average	1	SW	50	55	50	48	47	47	40	30	21

Table 6 Baseline Noise Data (L_{Aeq}) 08/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq,\,dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	0	SW	61	61	58	57	55	50	41	36	61
07:14	0	SW	65	64	62	61	59	54	42	31	65
07:29	1	W	64	61	59	59	55	48	40	35	64
07:44	0	W	65	61	59	58	54	47	37	29	65
07:59	0	NW	64	62	59	58	55	49	41	35	64
08:14	1	NW	64	61	58	58	56	50	41	35	64
08:29	0	SE	63	62	60	59	56	50	43	40	63
08:44	0	W	66	61	58	57	54	48	37	33	66
08:59	1	SE	61	60	58	57	55	52	40	34	61
09:14	0	SW	66	63	61	60	55	49	38	29	66
09:29	0	SE	66	65	63	61	57	50	40	29	66
09:44	1	SE	67	65	62	61	60	52	40	28	67
09:59	1	NE	63	62	60	58	55	50	38	33	63
10:14	1	SE	66	62	59	59	55	48	36	26	66
10:29	1	SE	64	63	62	61	59	52	40	35	64

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
10:44	1	SE	65	63	61	59	56	54	41	28	65
10:59	1	SE	68	68	65	63	61	58	45	35	68
11:143	1	S	63	61	58	56	54	49	37	28	63
11:29	1	SE	62	60	57	57	53	46	34	26	62
11:44	1	SW	65	63	62	60	56	53	40	26	65
11:59	1	SW	65	63	62	60	56	53	40	26	65
12:14	1	SW	67	65	63	61	57	52	39	28	67
12:29	1	W	65	59	56	55	51	43	34	26	65
12:44	1	W	66	65	64	62	59	54	42	26	66
12:59	1	W	65	64	63	60	57	51	40	26	65
13:14	1	NW	65	62	61	59	56	53	39	29	65
13:29	1	W	68	62	57	54	51	44	34	27	68
13:44	2	SE	63	61	58	56	54	46	33	25	63
13:59	1	W	68	68	65	64	60	54	42	35	68
14:14	1	W	65	62	60	59	55	49	36	28	65
14:29	1	NW	67	67	64	62	58	53	39	32	67
14:44	2	E	65	65	62	60	56	50	38	29	65
14:59	2	E	65	63	61	61	58	54	39	28	65
15:14	2	E	66	64	61	61	57	50	37	29	66
15:29	2	SE	64	62	61	60	56	48	35	28	64
15:44	2	SE	64	62	61	59	55	49	37	29	64
15:59	2	NE	68	67	65	63	59	53	40	31	68
16:14	2	SE	65	64	62	60	57	52	42	32	65
16:29	1	SW	65	65	63	62	59	53	40	27	65
16:44	1	NW	66	64	62	61	58	55	43	29	66

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
16:59	1	NW	65	62	59	56	54	47	35	25	65
17:14	1	SE	63	64	61	60	56	49	35	25	63
17:29	1	SE	65	64	62	60	57	50	41	32	65
17:44	1	SE	63	62	60	59	54	47	40	33	63
17:59	1	SW	65	63	61	59	55	50	39	30	65
18:14	1	W	62	61	58	57	54	47	36	26	62
18:29	1	SW	61	59	57	56	53	46	36	27	61
18:44	1	SE	66	61	58	56	53	46	39	32	66
Average	1	SE	60	64	62	60	59	55	50	40	33

Table 7 Baseline Noise Data (L_{A90}) 08/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	SW	50	55	50	47	47	47	41	31	23
07:14	1	SW	49	54	49	47	46	45	40	31	23
07:29	1	W	49	55	51	46	45	45	40	32	23
07:44	1	W	49	56	51	47	45	45	39	31	23
07:59	1	NW	50	55	51	47	46	45	39	32	23
08:14	2	NW	49	55	51	47	46	45	40	32	24
08:29	1	SE	50	55	51	47	46	45	40	32	24
08:44	1	W	50	55	51	48	46	46	41	33	25
08:59	2	SE	50	55	51	48	46	46	41	33	26
09:14	1	SW	49	54	49	47	46	45	40	32	24
09:29	1	SE	51	55	50	48	47	47	41	33	26

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
09:44	1	SE	50	54	50	47	47	47	41	31	23
09:59	1	NE	50	54	49	48	47	46	40	31	24
10:14	1	SE	51	54	49	48	48	48	42	32	23
10:29	1	SE	50	54	48	47	47	46	40	30	21
10:44	1	SE	50	56	50	47	47	46	41	31	22
10:59	1	SE	50	56	50	47	47	46	41	31	22
11:143	1	S	50	53	48	46	47	46	40	30	21
11:29	1	SE	49	53	49	47	46	46	40	30	22
11:44	1	SW	49	53	48	46	46	46	39	30	21
11:59	1	SW	51	54	50	48	48	47	41	31	21
12:14	1	SW	51	54	50	47	48	47	41	30	22
12:29	1	W	50	54	50	48	48	46	40	30	22
12:44	1	W	49	53	48	46	46	45	39	30	22
12:59	1	W	49	53	48	46	46	45	39	30	22
13:14	1	NW	49	53	48	45	46	46	39	29	20
13:29	1	W	50	54	50	47	46	46	39	29	19
13:44	1	SE	51	53	49	47	46	47	41	32	25
13:59	1	W	51	54	51	49	48	47	40	31	24
14:14	2	W	50	55	51	48	47	46	40	30	22
14:29	1	NW	50	55	50	47	47	47	40	30	22
14:44	1	E	50	54	50	47	46	46	40	30	23
14:59	1	E	51	54	50	48	47	47	40	30	22
15:14	1	E	50	55	50	47	47	47	40	30	22
15:29	1	SE	51	54	49	47	48	47	41	30	21
15:44	1	SE	50	53	48	47	47	47	40	29	22

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90,\ dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
15:59	1	NE	51	54	49	47	48	47	41	30	21
16:14	1	SE	40	48	44	41	37	34	28	15	13
16:29	1	SW	51	54	50	48	47	47	41	30	22
16:44	1	NW	48	52	47	45	45	45	38	28	20
16:59	1	NW	49	54	47	46	44	45	39	28	19
17:14	1	SE	49	54	49	47	46	45	38	27	18
17:29	1	SE	46	53	47	44	42	42	36	26	17
17:44	1	SE	47	54	49	46	43	43	36	26	17
17:59	1	SW	47	53	49	45	43	43	36	26	17
18:14	0	W	47	55	50	46	43	42	36	26	18
18:29	1	SW	47	53	49	45	43	42	36	26	17
18:44	0		48	53	49	46	44	43	36	28	18
Average	1	SE	49	53	49	46	46	45	39	29	20

Table 8 Baseline Noise Data (L_{Aeq}) 09/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq,\ dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	57	65	60	59	56	52	45	36	30
07:14	1	SE	64	63	64	62	61	58	58	46	47
07:29	1	SE	57	61	59	56	56	53	46	42	36
07:44	1	NE	59	61	61	58	58	55	48	40	34
07:59	1	NE	61	65	63	60	60	55	51	40	39
08:14	1	NE	59	63	60	57	57	54	52	42	39
08:29	1	NE	61	63	63	61	60	57	51	41	35

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
08:44	1	NE	60	64	62	59	59	56	49	39	33
08:59	1	NE	58	62	60	57	56	54	47	40	35
09:14	1	E	58	61	60	57	56	54	49	37	29
09:29	1	SE	60	61	60	59	59	55	50	40	33
09:44	1	SE	64	67	66	64	63	60	54	42	32
09:59	1	SE	63	65	64	62	62	59	53	42	33
10:14	1	SE	59	62	60	57	57	54	49	42	34
10:29	1	NE	63	64	63	61	60	60	53	41	32
10:44	1	E	63	66	64	63	61	59	55	43	33
10:59	1	NE	57	61	58	55	56	52	47	39	34
11:143	1	E	60	62	60	58	58	57	51	42	38
11:29	1	SE	56	59	57	55	54	52	45	35	29
11:44	1	NE	64	68	67	65	63	59	54	43	33
11:59	1	E	63	66	64	63	61	57	54	42	28
12:14	1	E	57	64	61	58	57	52	45	37	33
12:29	2	NE	61	63	63	60	60	56	49	39	33
12:44	1	E	63	68	66	63	61	57	51	39	29
12:59	1	E	60	65	62	61	59	55	50	39	32
13:14	1	E	60	64	63	60	58	55	49	44	42
13:29	2	E	60	62	62	60	59	55	50	41	32
13:44	1	SE	66	68	68	66	65	61	55	41	33
13:59	1	SE	57	62	59	56	56	53	45	35	28
14:14	1	E	62	66	66	63	61	57	50	36	29
14:29	1	SE	59	63	62	59	57	54	50	39	31
14:44	2	NE	62	66	65	63	61	57	50	37	29

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
14:59	1	E	60	63	63	60	59	56	49	37	32
15:14	1	E	63	66	66	63	61	58	52	37	29
15:29	1	NE	59	60	60	58	58	54	48	38	33
15:44	2	NE	62	66	64	63	61	58	51	44	39
15:59	1	E	59	62	60	59	57	55	50	38	32
16:14	1	E	62	63	63	62	60	57	55	48	32
16:29	2	NE	60	63	61	59	58	55	51	47	31
16:44	1	SE	59	63	61	58	58	54	47	34	30
16:59	2	E	61	63	63	61	60	57	51	40	33
17:14	2	NE	61	66	65	62	59	56	48	37	34
17:29	2	NE	58	63	59	58	57	53	46	36	31
17:44	1	SE	59	63	60	58	58	53	46	35	29
17:59	1	SE	60	62	62	60	59	56	49	36	29
18:14	1	E	58	66	62	57	55	54	47	38	30
18:29	1	E	60	62	62	60	58	55	49	38	38
18:44	1	E	58	61	60	58	57	54	47	43	35
Average	1	E	61	64	63	61	59	56	51	41	35

Table 9 Baseline Noise Data (L_{A90}) 09/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	50	56	51	48	46	46	40	31	23
07:14	1	SE	51	56	52	49	47	46	40	31	23
07:29	1	SE	50	56	51	47	46	46	40	31	23

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
07:44	1	NE	50	56	52	48	46	45	40	32	24
07:59	1	NE	50	57	52	48	46	46	41	34	29
08:14	1	NE	51	58	53	49	46	46	42	36	30
08:29	1	NE	51	58	53	50	47	47	43	37	30
08:44	1	NE	50	56	51	48	46	46	40	31	24
08:59	1	NE	50	55	51	48	47	46	41	33	24
09:14	1	E	49	55	51	47	46	45	40	31	24
09:29	1	SE	50	56	51	47	46	46	41	32	24
09:44	1	SE	52	56	52	48	48	48	44	35	25
09:59	1	SE	51	56	51	48	47	48	43	34	24
10:14	1	SE	51	56	51	47	46	47	43	34	25
10:29	1	NE	52	56	52	48	47	48	43	33	25
10:44	1	E	51	56	51	49	47	47	41	32	25
10:59	1	NE	51	56	51	49	47	47	41	32	25
11:143	1	E	49	54	49	46	46	46	41	31	24
11:29	1	SE	49	54	49	46	45	45	40	30	22
11:44	1	NE	51	55	52	49	48	47	41	31	23
11:59	1	E	50	55	50	47	46	46	39	29	22
12:14	1	E	50	54	51	48	47	46	40	31	24
12:29	2	NE	51	55	51	48	48	47	41	32	24
12:44	1	E	50	54	49	47	46	46	40	30	24
12:59	1	E	50	54	49	47	46	46	40	30	24
13:14	1	E	50	54	51	48	47	47	40	31	24
13:29	2	E	50	53	50	47	46	46	39	31	24
13:44	1	SE	50	53	50	48	47	46	39	30	22

Technical note

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
13:59	1	SE	49	54	51	47	46	46	39	29	21
14:14	1	E	49	54	50	46	46	46	39	29	22
14:29	1	SE	50	55	50	47	46	46	39	29	23
14:44	2	NE	49	55	51	47	46	45	39	30	24
14:59	1	E	50	54	50	47	46	46	39	29	24
15:14	1	E	50	55	51	48	47	46	39	31	25
15:29	1	NE	49	54	49	47	46	46	39	31	25
15:44	2	NE	50	54	48	47	46	46	40	31	25
15:59	1	E	49	54	49	47	46	46	39	31	25
16:14	1	E	51	55	50	49	48	48	42	33	24
16:29	2	NE	50	54	50	48	47	46	40	31	25
16:44	1	SE	49	53	48	46	45	45	38	31	24
16:59	2	E	50	55	50	48	46	46	39	31	25
17:14	2	NE	49	55	49	47	46	46	39	31	27
17:29	2	NE	49	54	49	47	45	45	38	30	24
17:44	1	SE	48	53	48	45	44	44	37	28	23
17:59	1	SE	48	53	49	46	44	44	37	28	21
18:14	1	E	49	55	50	47	45	45	38	28	20
18:29	1	E	49	55	50	47	45	45	38	30	23
18:44	1	E	49	53	49	47	46	46	39	30	23
Average	1	E	50	54	50	47	46	46	39	30	23

ATKINS

Table 10 Baseline Noise Data (L_{Aeq}) 10/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	58	61	60	57	56	54	47	39	33
07:14	0	NE	60	63	63	60	59	55	48	38	32
07:29	1	NE	57	61	61	57	56	53	46	37	32
07:44	1	NE	59	64	62	59	58	54	49	42	35
07:59	1	NE	57	62	60	57	56	52	45	37	32
08:14	1	NE	61	63	63	61	60	56	49	38	31
08:29	1	NE	57	63	60	57	56	52	46	37	33
08:44	1	NE	58	61	60	58	57	53	46	36	34
08:59	1	NE	61	62	63	60	60	56	50	39	34
09:14	2	NE	60	65	63	60	59	55	48	35	30
09:29	1	E	59	62	61	59	58	55	49	36	28
09:44	1	SE	60	62	61	60	58	55	49	39	29
09:59	1	E	62	67	65	62	62	58	50	36	29
10:14	1	NE	62	64	66	63	60	56	49	35	28
10:29	1	E	61	66	65	61	60	57	50	35	27
10:44	1	E	61	66	62	61	59	57	50	40	27
10:59	1	SE	63	65	65	63	62	59	53	39	28
11:143	2	NE	61	62	62	60	58	56	53	41	30
11:29	2	NE	58	64	61	58	57	53	46	35	31
11:44	2	NE	62	67	64	63	61	57	51	38	32
11:59	2	NE	61	65	62	61	60	56	51	39	36
12:14	3	NE	62	68	65	63	61	57	51	40	37
12:29	2	NE	58	65	60	57	56	53	46	40	37

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq,\ dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
12:44	2	NE	59	65	62	59	58	53	46	40	38
12:59	2	E	59	64	63	59	59	55	47	41	38
13:14	3	NE	60	66	63	61	59	55	49	40	35
13:29	2	NE	64	68	67	64	62	59	54	39	31
13:44	1	SE	61	64	63	62	60	56	49	36	28
13:59	2	NE	62	66	64	62	61	57	51	38	30
14:14	2	NE	56	63	59	56	55	52	46	37	31
14:29	1	E	56	64	60	55	54	51	45	40	32
14:44	1	E	66	69	69	67	64	61	56	41	30
14:59	2	NE	56	61	59	55	55	51	44	39	32
15:14	1	SE	59	63	61	58	58	54	48	39	31
15:29	2	NE	61	64	62	61	60	56	48	34	29
15:44	2	NE	62	65	65	62	61	57	49	35	31
15:59	2	NE	56	60	58	55	55	51	45	37	34
16:14	2	NE	62	65	64	63	61	58	52	39	32
16:29	2	E	59	62	60	59	57	55	47	40	36
16:44	2	E	57	64	61	57	56	53	44	33	31
16:59	2	E	59	64	62	60	59	54	46	34	31
17:14	1	SE	60	65	63	60	59	55	45	33	29
17:29	1	SE	61	65	65	63	60	56	47	41	36
17:44	1	SE	60	64	63	61	59	54	45	33	29
17:59	1	SE	57	64	61	58	56	53	45	33	29
18:14	1	SE	61	63	63	60	61	56	48	36	32
18:29	1	SE	56	61	59	57	55	51	44	36	32
18:44	1	SE	58	62	62	60	57	52	44	42	37

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
Average	1	E	60	64	63	61	59	55	49	38	33

Table 11 Baseline Noise Data (L_{A90}) 10/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	52	56	52	49	48	48	42	32	25
07:14	0	NE	50	57	52	49	47	46	40	32	25
07:29	1	NE	50	57	52	48	46	45	40	32	24
07:44	1	NE	50	57	53	49	47	45	39	32	24
07:59	1	NE	49	57	52	48	45	44	39	32	24
08:14	1	NE	49	57	52	48	46	45	39	31	24
08:29	1	NE	49	56	51	47	45	44	39	31	23
08:44	1	NE	49	56	51	47	45	45	39	30	24
08:59	1	NE	50	57	52	48	46	45	39	32	25
09:14	2	NE	49	57	52	48	45	44	38	31	25
09:29	1	E	48	56	51	47	44	44	37	29	24
09:44	1	SE	49	55	50	47	46	45	39	30	24
09:59	1	E	49	56	51	47	45	45	38	30	24
10:14	1	NE	49	55	50	47	46	46	39	30	23
10:29	1	E	49	54	49	47	46	46	39	29	23
10:44	1	E	49	54	50	47	46	45	39	30	22
10:59	1	SE	49	54	50	47	46	45	39	30	22
11:143	2	NE	49	54	49	47	46	45	39	31	25
11:29	2	NE	49	55	50	47	46	45	39	31	25

Technical note

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
11:44	2	NE	49	55	50	48	46	46	39	31	25
11:59	2	NE	51	56	52	49	47	47	40	33	28
12:14	3	NE	51	55	51	49	48	47	41	33	26
12:29	2	NE	51	54	50	48	48	47	40	32	26
12:44	2	NE	50	55	51	49	47	47	40	31	25
12:59	2	E	50	55	51	49	47	47	40	31	25
13:14	3	NE	50	55	50	48	47	46	39	30	24
13:29	2	NE	50	55	51	48	46	46	39	30	23
13:44	1	SE	49	53	50	48	46	46	39	29	21
13:59	2	NE	50	55	51	48	46	46	39	30	24
14:14	2	NE	50	55	51	48	47	46	39	30	24
14:29	1	E	49	54	49	46	45	45	39	29	22
14:44	1	E	50	55	49	48	46	46	39	30	23
14:59	2	NE	49	54	49	47	45	45	39	30	24
15:14	1	SE	50	54	50	47	46	46	39	29	22
15:29	2	NE	49	54	49	47	46	46	39	30	23
15:44	2	NE	49	54	50	47	46	46	39	30	24
15:59	2	NE	49	54	49	47	46	46	39	30	23
16:14	2	NE	51	55	50	48	48	47	41	30	22
16:29	2	E	49	53	49	47	46	46	39	30	24
16:44	2	E	49	53	49	47	46	46	38	29	23
16:59	2	E	50	55	50	47	46	46	39	29	23
17:14	1	SE	50	55	51	48	46	45	38	28	22
17:29	1	SE	48	53	49	47	45	45	38	29	25
17:44	1	SE	49	55	51	48	46	45	38	29	22

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
17:59	1	SE	48	54	49	46	45	44	38	28	22
18:14	1	SE	48	54	50	47	45	44	38	30	24
18:29	1	SE	49	54	50	47	45	45	39	30	22
18:44	1	SE	49	54	50	48	46	45	38	29	21
Average	1	E	49	54	50	47	46	46	39	30	23

Table 12 Baseline Noise Data (L_{Aeq}) 11/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	58	62	61	58	57	54	47	40	37
07:14	1	NE	58	61	61	57	56	53	46	40	35
07:29	1	NE	60	62	62	60	60	55	49	38	33
07:44	1	NE	58	62	61	59	58	53	46	39	33
07:59	0	E	58	62	61	59	58	53	45	39	34
08:14	1	E	60	63	62	60	59	54	46	39	34
08:29	1	E	60	64	63	60	59	55	47	39	34
08:44	1	NE	59	62	61	59	58	54	46	37	35
08:59	1	NE	60	64	61	58	57	57	47	36	30
09:14	1	NE	59	61	61	58	58	54	47	34	28
09:29	1	SE	62	65	65	63	60	57	49	34	28
09:44	1	E	61	66	64	62	60	56	49	36	29
09:59	1	E	57	62	60	58	56	52	45	37	33
10:14	1	SE	61	65	65	62	60	57	49	37	31
10:29	1	SE	50	57	53	50	48	46	40	33	29

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
10:44	1	SE	59	60	57	55	55	57	47	34	27
10:59	1	E	59	62	59	56	55	56	48	37	29
11:143	1	SE	61	66	63	62	60	56	51	38	28
11:29	1	E	60	63	63	60	60	55	48	40	37
11:44	1	SE	58	63	62	58	56	54	46	33	26
11:59	2	SE	59	65	63	60	58	54	46	36	33
12:14	1	SE	64	68	67	65	63	58	51	36	30
12:29	1	SE	60	64	62	60	59	55	50	35	31
12:44	2	SE	56	67	61	58	56	51	41	32	27
12:59	1	SE	61	63	63	62	60	56	49	35	27
13:14	1	SE	59	66	63	59	58	54	45	32	26
13:29	1	SE	64	67	67	64	62	59	52	34	25
13:44	2	SE	56	62	59	56	55	51	42	30	25
13:59	1	SE	63	67	65	63	62	58	51	37	30
14:14	1	SE	60	65	60	61	57	56	47	34	25
14:29	1	SE	62	65	64	63	61	57	49	34	26
14:44	1	SE	60	66	62	60	58	55	51	33	24
14:59	2	SE	61	63	62	60	60	56	48	32	25
15:14	2	SE	59	63	62	59	58	54	45	31	25
15:29	2	SE	62	64	64	63	61	57	48	34	25
15:44	2	SE	60	64	62	60	59	55	47	31	25
15:59	2	SE	55	61	58	56	54	50	42	32	26
16:14	2	SE	62	65	65	63	62	58	51	34	23
16:29	2	SE	61	67	64	61	60	56	47	33	29
16:44	2	SE	58	64	62	60	57	53	45	30	21

Time	Avg 15min wind speed m/s	Wind Direction	$L_{Aeq, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
16:59	2	SE	60	63	64	61	60	56	46	30	23
17:14	1	SE	59	66	63	60	59	54	45	32	24
17:29	2	SE	63	67	66	64	62	57	49	34	23
17:44	1	SE	60	65	66	62	59	55	47	34	23
17:59	1	SE	55	63	60	55	54	50	42	35	26
18:14	1	SE	59	62	62	59	58	55	47	31	21
18:29	1	SE	59	66	63	61	59	54	45	36	28
18:44	1	SE	54	59	56	54	53	49	42	36	24
Average	1	SE	60	64	63	60	59	55	47	36	30

Table 13 Baseline Noise Data (L_{A90}) 11/09/2015

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
06:59	1	NE	50	56	52	48	46	46	40	31	24
07:14	1	NE	50	56	52	48	46	46	39	32	24
07:29	1	NE	49	56	51	47	45	44	39	31	24
07:44	1	NE	49	56	52	48	45	45	39	31	23
07:59	0	E	49	57	52	47	45	44	38	31	24
08:14	1	E	49	56	51	47	45	45	39	30	23
08:29	1	E	49	57	52	47	46	45	39	31	25
08:44	1	NE	49	56	52	48	45	44	39	31	24
08:59	1	NE	50	57	52	48	46	46	39	31	23
09:14	1	NE	49	55	50	47	46	45	39	29	22
09:29	1	SE	48	55	50	46	44	43	38	29	21

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
09:44	1	E	49	55	51	47	45	44	38	30	23
09:59	1	E	49	55	50	47	46	45	39	30	23
10:14	1	SE	48	54	49	46	45	44	39	29	21
10:29	1	SE	47	53	47	45	44	44	37	29	22
10:44	1	SE	48	52	48	45	44	44	38	28	22
10:59	1	E	48	52	48	45	44	44	38	28	22
11:143	1	SE	49	54	49	47	45	45	39	29	22
11:29	1	E	49	54	50	47	45	44	38	29	23
11:44	1	SE	48	54	50	46	44	44	37	28	21
11:59	2	SE	48	54	50	46	45	44	37	28	20
12:14	1	SE	48	54	49	46	46	45	38	29	22
12:29	1	SE	48	53	50	45	45	44	38	29	23
12:44	2	SE	47	53	48	45	43	43	36	27	21
12:59	1	SE	47	53	48	45	43	43	36	27	21
13:14	1	SE	49	54	50	46	46	45	38	28	20
13:29	1	SE	47	54	49	45	44	43	37	28	20
13:44	2	SE	46	52	47	44	43	42	35	26	20
13:59	1	SE	48	54	50	47	45	44	37	28	19
14:14	1	SE	48	53	49	46	46	44	37	27	19
14:29	1	SE	47	54	50	45	44	43	36	27	19
14:44	1	SE	47	54	49	46	44	43	36	26	17
14:59	2	SE	47	53	48	45	44	42	35	26	19
15:14	2	SE	47	53	50	45	44	43	36	27	21
15:29	2	SE	47	53	47	44	44	43	36	26	19
15:44	2	SE	47	53	49	45	44	43	36	26	19

Time	Avg 15min wind speed m/s	Wind Direction	$L_{A90, dB}$	Octave Band Frequency Data Hz, dB							
				63	125	250	500	1k	2k	4k	8k
15:59	2	SE	47	53	47	44	44	43	36	26	19
16:14	2	SE	50	54	48	47	46	46	40	32	25
16:29	2	SE	46	55	49	45	43	42	35	25	18
16:44	2	SE	46	53	48	44	43	42	34	25	18
16:59	2	SE	47	54	49	46	44	43	36	24	17
17:14	1	SE	47	54	49	45	44	43	36	25	17
17:29	2	SE	48	55	51	47	44	43	36	26	17
17:44	1	SE	46	54	49	46	43	42	35	24	17
17:59	1	SE	46	53	48	44	42	42	35	24	17
18:14	1	SE	47	54	49	45	43	43	36	25	17
18:29	1	SE	47	55	49	45	43	43	36	25	17
18:44	1	SE	46	53	48	45	42	42	35	25	16
Average	1	SE	48	54	49	45	44	43	36	27	19

Technical note

Appendix A – Aircraft Data

Table 14 Aircraft Data 04/09/2015

Arrivals and Departures on 04/092015	
Total number of arrivals	692
Total number of departures	687
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	100.00%
Easterly operations (percentage of movements operated towards the east)	0.00%
Early Morning Flights (0430-0600)	
Number of aircraft movements	11
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Morning Flights (0600-0700)	
Number of aircraft movements	52
Number of aircraft movements that were not scheduled in this time period	9
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	15
Number of aircraft movements that were not scheduled that operated in this time period	15
Night Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	3
Number of aircraft movements that were not scheduled that operated in this time period	3
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	87.11%
Team & 09R Arrivals	
Total number of TEAM arrivals on westerly operations	27
Total number of TEAM arrivals on westerly operations after 0700hrs local time	11
Total number of 09R arrivals on easterly operations	0
Total number of 09R arrival on easterly operations after 0700hrs local time	0
Runway Operation	

Number of arrivals that operated on the designated departures runway	27
Number of departures that operated on the designated arrivals runway	15
Departure Vectors	
Total number of weather vectors	1
Complaints	
Total number of all complaints (phone, email, web, letters)	244
Notes	

Table 15 Aircraft Data 07/09/2015

Arrivals and departures on 07/09/2015	
Total number of arrivals	686
Total number of departures	687
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	0.66%
Easterly operations (percentage of movements operated towards the east)	99.34%
Early Morning Flights (0430-0600)	
Number of aircraft movements	13
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Morning Flights (0600-0700)	
Number of aircraft movements	53
Number of aircraft movements that were not scheduled in this time period	8
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	13
Number of aircraft movements that were not scheduled that operated in this time period	12
Night Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	0
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	87.70%
Team & 09R Arrivals	

Total number of TEAM arrivals on westerly operations	0
Total number of TEAM arrivals on westerly operations after 0700hrs local time	0
Total number of 09R arrivals on easterly operations	26
Total number of 09R arrival on easterly operations after 0700hrs local time	4
Runway Operation	
Number of arrivals that operated on the designated departures runway	26
Number of departures that operated on the designated arrivals runway	0
Departure Vectors	
Total number of weather vectors	1
Complaints	
Total number of all complaints (phone, email, web, letters)	253
Notes	

Table 16 Aircraft Data 08/09/2015

Arrivals and Departures on **08/09/2015**	
Total number of arrivals	690
Total number of departures	688
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	0.00%
Easterly operations (percentage of movements operated towards the east)	100.00%
Early Morning Flights (0430-0600)	
Number of aircraft movements	14
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Morning Flights (0600-0700)	
Number of aircraft movements	55
Number of aircraft movements that were not scheduled in this time period	8
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	10
Number of aircraft movements that were not scheduled that operated in this time period	10

Nights Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	0
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	84.31%
TEAM & 09R ARRIVALS	
Total number of TEAM arrivals on westerly operations	0
Total number of TEAM arrivals on westerly operations after 0700hrs local time	0
Total number of 09R arrivals on easterly operations	46
Total number of 09R arrival on easterly operations after 0700hrs local time	13
Runway Operation	
Number of arrivals that operated on the designated departures runway	32
Number of departures that operated on the designated arrivals runway	8
Departure Vectors	
Total number of weather vectors	0
Complaints	
Total number of all complaints (phone, email, web, letters)	237
Notes	

Table 17 Aircraft Data 09/09/2015

Arrivals and departures on **09/09/2015**	
Total number of arrivals	672
Total number of departures	671
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	0.00%
Easterly operations (percentage of movements operated towards the east)	100.00%
Early Morning Flights (0430-0600)	
Number of aircraft movements	12
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0

Morning Flights (0600-0700)	
Number of aircraft movements	52
Number of aircraft movements that were not scheduled in this time period	8
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	10
Number of aircraft movements that were not scheduled that operated in this time period	10
Night Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	1
Number of aircraft movements that were not scheduled that operated in this time period	1
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	80.91%
Team and 09 Arrivals	
Total number of TEAM arrivals on westerly operations	0
Total number of TEAM arrivals on westerly operations after 0700hrs local time	0
Total number of 09R arrivals on easterly operations	35
Total number of 09R arrival on easterly operations after 0700hrs local time	12
Runway Operation	
Number of arrivals that operated on the designated departures runway	48
Number of departures that operated on the designated arrivals runway	0
Departure Vectors	
Total number of weather vectors	0
Complaints	
Total number of all complaints (phone, email, web, letters)	306
Notes	

Table 18 Aircraft Data 10/09/2015

Arrivals and Departures on **10/09/2015**	
Total number of arrivals	686
Total number of departures	687
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	0.00%
Easterly operations (percentage of movements operated towards the east)	100.00%

Technical note

Early Morning Flights (0430-0600)	
Number of aircraft movements	14
Number of aircraft movements that were not scheduled that operated in this time period	1
Total number of flights dispensed from night quota scheme (e.g. emergencies)	1
Morning Flights (0600-0700)	
Number of aircraft movements	48
Number of aircraft movements that were not scheduled in this time period	7
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	14
Number of aircraft movements that were not scheduled that operated in this time period	13
Night Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	2
Number of aircraft movements that were not scheduled that operated in this time period	2
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	84.60%
Team & 09R Arrivals	
Total number of TEAM arrivals on westerly operations	0
Total number of TEAM arrivals on westerly operations after 0700hrs local time	0
Total number of 09R arrivals on easterly operations	48
Total number of 09R arrival on easterly operations after 0700hrs local time	25
Runway Operation	
Number of arrivals that operated on the designated departures runway	62
Number of departures that operated on the designated arrivals runway	1
Departure	
Total number of weather vectors	0
Complaints	
Total number of all complaints (phone, email, web, letters)	330
Notes	

Table 19 Aircraft Data 11/09/2015

Arrivals and Departures on **11/09/2015**	
Total number of arrivals	688
Total number of departures	689
Wind Direction	
Westerly operations (percentage of movements operated towards the west)	0.00%
Easterly operations (percentage of movements operated towards the east)	100.00%
Early Morning Flights (0430-0600)	
Number of aircraft movements	16
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Morning Flights (0600-0700)	
Number of aircraft movements	52
Number of aircraft movements that were not scheduled in this time period	7
Night Shoulder Flights (2300-2330)	
Number of aircraft movements	13
Number of aircraft movements that were not scheduled that operated in this time period	13
Night Flights During Quota Period (2330-0430 next day)	
Number of aircraft movements	0
Number of aircraft movements that were not scheduled that operated in this time period	0
Total number of flights dispensed from night quota scheme (e.g. emergencies)	0
Percentage of arrivals that performed Continuous Descent Approaches between 0700-2300 local time	82.99%
Team & 09R Arrivals	
Total number of TEAM arrivals on westerly operations	0
Total number of TEAM arrivals on westerly operations after 0700hrs local time	0
Total number of 09R arrivals on easterly operations	48
Total number of 09R arrival on easterly operations after 0700hrs local time	17
Runway Operation	
Number of arrivals that operated on the designated departures runway	32
Number of departures that operated on the designated arrivals runway	15

Departure Vectors	
Total number of weather vectors	1
Complaints	
Total number of all complaints (phone, email, web, letters)	266
Notes	

Attachment 4: Phase 1b Demolition Air Quality Assessment

PHASE 1B DEMOLITION:

AIR QUALITY ASSESSMENT

A qualitative assessment has been undertaken to determine the potential risk of air quality impacts arising from the demolition works proposed as at Richmond upon Thames College (RuTC) in Twickenham.

A summary of the likely effects of the proposed demolition works on local air quality is presented in **Table 1**.

Table 1: Potential Air Quality Impacts Due to Demolition W0orks

Likely Effect	Description	Nature of Effect
Dust (Ecological)	Dust deposition to local habitat sites	Temporary
Dust (Soiling)	Dust deposition to buildings and parked vehicles	
Dust (Human Health)	Increase in local airborne PM_{10} concentrations	
Traffic	Increase in local NO_2, PM_{10} and $PM_{2.5}$ concentrations	Temporary

Assessment Approach

Dust Impacts

To determine the potential impacts associated with dust and PM_{10} releases during the demolition phase an assessment has been undertaken based on the latest guidance from the Institute of Air Quality Management (IAQM) construction dust guidance[1], which is closely aligned with the Mayor of London's SPG for the control of dust and emissions during construction and demolition[2].

The risk of dust effects (low, medium or high) is determined by the scale (magnitude) and nature of the works and the proximity of sensitive human and ecological receptors.

The guidance recommends that an assessment be undertaken where there are sensitive human receptors:

- Within 350 m of the site boundary; or
- Within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

[1] Guidance on the assessment of dust from demolition and construction, IAQM, February 2014
[2] The Control of Dust and Emissions during Construction and Demolition Supplementary Planning Guidance, The Mayor of London, July 2014

An assessment should also be carried out where there are dust-sensitive ecological receptors:

- Within 50 m of the site boundary; or
- Within 50 m of the route(s) used by construction vehicles on the public highway, up to 500 m from the site entrance(s).

The magnitude of the dust impacts is classified as small, medium or large depending on the scale of the proposed works. **Table 2** summarises the IAQM criteria that may be used to determine the magnitude of the dust emission. These criteria are used in combination with site specific information and professional judgement.

Table 2: Dust Emission Magnitude Criteria

Source	Large	Medium	Small
Demolition	• Total building volume >50,000m^3 • Potentially dusty material (e.g. concrete) • Onsite crushing and screening • Demolition activities >20m above ground level.	• Total building volume 20,000 - 50,000m^3 • Potentially dusty material • Demolition activities 10 - 20m above ground level.	• Total building volume <20,000m^3 • Construction material with low potential for dust release • Demolition activities <10m above ground level • Demolition during wetter months

Source: IAQM Guidance 2014

Factors defining the sensitivity of a receptor are presented in **Table 3**. The sensitivity of a receptor will also depend on a number of additional factors including any history of dust generating activities in the area, likely cumulative dust impacts from nearby construction sites, any pre-existing screening such as trees or buildings and the likely duration of the impacts. In addition, the influence of the prevailing wind direction and local topography may be of relevance when determining the sensitivity of a receptor.

The sensitivity of the area as a whole to dust soiling and health impacts is dependent on the number of receptors within each sensitivity class and their distance from the source. In addition, human health impacts are dependent on the existing PM_{10} concentrations in the area. **Table 4** and **Table 5** summarise the criteria for determining the overall sensitivity of the area to dust soiling and health impacts respectively.

The worst-case area sensitivity is used in combination with the dust emission magnitude to determine the risk of dust impacts. The risk of dust impacts prior to mitigation is presented in **Table 6**.

A range of best practice mitigation measures are provided within the guidance, which are dependent on the level of dust risk attributed to the site. It is recommended that these measures are incorporated into the Demolition Method Statement for the proposed development.

The significance of the residual impacts following appropriate mitigation is determined by professional judgement.

Table 3: Factors Defining the Sensitivity of a Receptor

Sensitivity	Human Health	Dust Soiling	Ecological
High	• Locations where members of the public are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include residential dwellings, hospitals, schools and residential care homes.	• Regular exposure • High level of amenity expected. • Appearance, aesthetics or value of the property would be affected by dust soiling. • Examples include residential dwellings, museums, medium and long-term car parks and car showrooms.	• Nationally or Internationally designated site with dust sensitive features (b) • Locations with vascular species (c)
Medium	• Locations where workers are exposed over a time period relevant to the air quality objectives for PM_{10} (a) • Examples include office and shop workers (d)	• Short-term exposure • Moderate level of amenity expected • Possible diminished appearance or aesthetics of property due to dust soiling • Examples include parks and places of work	• Nationally designated site with dust sensitive features (b) • Nationally designated site with a particularly important plant species where dust sensitivity is unknown
Low	• Transient human exposure • Examples include public footpaths, playing fields, parks and shopping streets	• Transient exposure • Enjoyment of amenity not expected. • Appearance and aesthetics of property unaffected • Examples include playing fields, farmland (e), footpaths, short-term car parks and roads	• Locally designated site with dust sensitive features (b)

(a) In the case of the 24-hour objective, a relevant location would be one where individuals may be exposed for eight hours or more in a day.

(b) Ecosystems that are particularly sensitive to dust deposition include lichens and acid heathland (for alkaline dust, such as concrete).

(c) Cheffing C. M. & Farrell L. (Editors) (2005), The Vascular Plant. Red Data List for Great Britain, Joint Nature Conservation Committee.

(d) Does not include workers exposure to PM_{10} as protection is covered by Health and Safety at Work legislation.

(e) Except commercially sensitive horticulture.

Source: IAQM Guidance 2014

Table 4: Sensitivity of the Area to Dust Soiling Effects on People and Property

Sensitivity of Area	Number of Receptors	Distance from the Source			
		<20m	**<50m**	**<100m**	**<350m**
High	>100	High	High	Medium	Low
	10-100	High	Medium	Low	Low
	1-10	Medium	Low	Low	Low
Medium	>1	Medium	Low	Low	Low
Low	>1	Low	Low	Low	Low

Source: IAQM Guidance 2014

Table 5: Sensitivity of the Area to Human Health Impacts from Dust

Sensitivity of Area	Annual Mean PM_{10}	Number of Receptors	Distance from the Source				
			<20m	<50m	<100m	<200m	<350m
High	>32	>100	High	High	High	Medium	Low
		10-100	High	High	Medium	Low	Low
		1-10	High	Medium	Low	Low	Low
	28 - 32	>100	High	High	Medium	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	High	Medium	Low	Low	Low
	24 - 28	>100	High	Medium	Low	Low	Low
		10-100	High	Medium	Low	Low	Low
		1-10	Medium	Low	Low	Low	Low
	<24	>100	Medium	Low	Low	Low	Low
		10-100	Low	Low	Low	Low	Low
		1-10	Low	Low	Low	Low	Low
Medium	-	>10	High	Medium	Low	Low	Low
	-	1-10	Medium	Low	Low	Low	Low
Low	-	>1	Low	Low	Low	Low	Low

Source: IAQM Guidance 2014

Table 6: Risk of Dust Impacts

Sensitivity of Area	Dust Emission Magnitude		
	Large	Medium	Small
High	High Risk	Medium Risk	Medium Risk
Medium	High Risk	Medium Risk	Low Risk
Low	Medium Risk	Low Risk	Negligible

Source: IAQM Guidance 2014

Traffic Impacts

The recently published Environmental Protection UK (EPUK)/ IAQM planning guidance, states that within an AQMA a detailed air quality assessment is required where:

- There is a change in the annual average daily traffic (AADT) flow of light goods vehicles (LGV) flow of more than 100 vehicles;
- There is a change in the AADT flow of heavy goods vehicles (HGV) of more than 25 vehicles;
- There is a change in the road-realignment by more than 5m; and
- A new junction is introduced, which will significantly alter vehicle speeds.

During the demolition phase, the site is expected to generate a maximum of 14 HGV movements are expected per day. In addition, around 20 operatives will visit the site, resulting in a small LGV flow. According to the above criteria, an increase in traffic of this magnitude is unlikely to affect local air quality and on this basis the traffic related impacts have been screened out of the assessment.

Baseline

Local Monitoring Data

The nearest particulate monitoring site to the RuTC demolition is at Teddington (2.4km south), which measures suburban $PM_{2.5}$ concentrations. The site is affiliated to the DEFRA Automatic Urban and Rural Monitoring Network (AURN) and the data indicate that annual mean concentrations are between 45 and 70% of the EU limit value.

Urban background concentrations of PM_{10} are measured at the London Wetlands Centre in Barnes (a suburban site, approximately 7.5 km east-northeast of the RuTC demolition) and are around 50% of the annual mean air quality objective.

Mapped Background Data

In the absence of background monitoring sites in the vicinity of the proposed development, PM_{10} and $PM_{2.5}$ concentrations for use in the assessment have been obtained from the Defra UK Background Air Pollution maps[3]. These 1 km grid resolution maps are derived from a complex modelling exercise that takes into account emissions inventories and measurements of ambient air pollution from both automated and non-automated sites.

The latest background maps for PM_{10} and $PM_{2.5}$ were issued in June 2014 and are based on 2011 monitoring data. DEFRA guidance issued in conjunction with the new background maps[4] suggests that unusually high particulate concentrations were measured in 2011. A scaling factor of 0.91 is provided to adjust the mapped concentrations to more typical levels.

A summary of the 2014 annual mean mapped background concentrations is presented in **Table 7**. The concentrations were derived from contour plots of the mapped data to determine the maximum at the Site and sensitive receptor locations.

Table 7: Annual Mean Mapped Background Concentrations in the vicinity of RuTC for 2014 (μg/m³)

Pollutant	Annual Mean	Air Quality Standard
PM_{10}	18.6	40
$PM_{2.5}$	13.0	25

Impact Assessment

The proposed demolition works are expected to last approximately 14 weeks and will include the demolition of the Music, Science, Z block, A block and LRC block.

The assessment of dust impacts has been based on the proximity of the most sensitive receptors

[3] http://uk-air.defra.gov.uk/data/laqm-background-home
[4] http://laqm.defra.gov.uk/documents/Background-maps-user-guide-v1.0.pdf

to the demolition works. A summary of the receptor sensitivity and corresponding area sensitivity to health and dust soiling impacts in **Table 8**.

Due to the close proximity of existing residential properties and college site users the overall sensitivity of the area to dust soiling impacts is considered to be *high*. However, the annual mean background PM_{10} concentration is less than 50% of the air quality objective therefore the sensitivity of the area to human health impacts is considered to be *low*.

There are two locally designated sites of importance for nature conservation (SINC) in the area (Duke of Northumberland's River South of Knellar Road Borough SINC and Twickenham Junction Rough Local SINC). Both sites are considered to be of low sensitivity to dust impacts and are over 50m from the demolition area. On this basis the impact of the demolition phase on ecological sites is considered to be negligible.

Table 8: Sensitivity of Receptors and the Local Area to Human Health and Dust Soiling Impacts

Receptor	Approximate Distance from Demolition Works	Number of Receptors	Health Impacts		Dust Soiling	
			Receptor	Area	Receptor	Area
Site users (existing college) and car parking	<20m	-	High	Low	High	High
Residential properties on Egerton Road	<20m	<50	High	Low	High	High
Twickenham Stoop car park and Nuffield Health Club	75m	-	Low	Low	High	Low
Overall Sensitivity of the Area			**Low**		**High**	

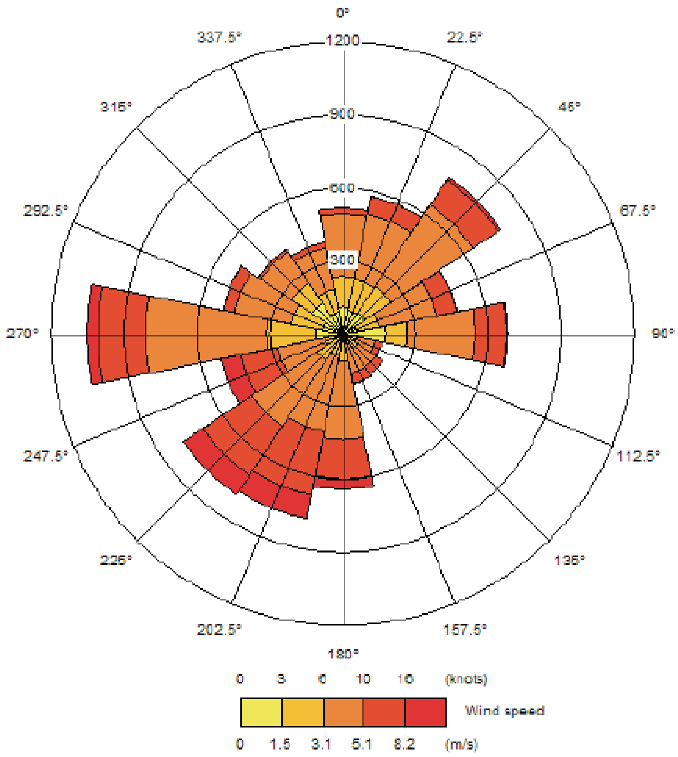
The precise behaviour of the dust, its residence time in the atmosphere, and the distance it may travel before being deposited will depend upon a number of factors. These include wind direction and strength, local topography and the presence of intervening structures (buildings, etc.) that may intercept dust before it reaches sensitive locations. Furthermore, dust would be naturally suppressed by rainfall.

A wind rose for Heathrow Airport is provided in **Figure 1**, which shows that the prevailing wind is from the west and southwest, therefore receptors to the east and northeast of the active demolition areas, such as residential properties on Edgerton Road, are the most likely to experience dust impacts from the Site.

The buildings to be demolished are two to three storeys high and cover an area of approximately 6,490m^2. There will be onsite crushing of concrete, therefore the magnitude of the dust emission during the demolition phase is considered to be *large*.

Taking into account the sensitivity of local receptors, the corresponding risk of dust impacts prior to mitigation is therefore *low* for health impacts and *high* for dust soiling impacts.

Figure 1: Wind Rose



Environmental Control Measures

In order to protect properties on Egerton Road from potential noise impacts during the demolition phase, 2.4m high acoustic hoardings will be construction along the eastern site boundary. These hoardings will also provide an effective barrier to dust generated during the demolition phase.

In addition, London Best Practice Guidance for dust control, as described in **Table 9**, will be implemented, as appropriate, during the demolition.

Table 9: Recommended Control Measures

General	• Develop and implement a stakeholder communications plan that includes community engagement before work commences on site. • Display the name and contact details of person(s) accountable for air quality and dust issues on the site boundary. This may be the environment manager/engineer or the site Manager. • Display the head or regional office contact information.
Site Management	• Record all dust and air quality complaints, identify cause(s), take appropriate measures to reduce emissions in a timely manner, and record the measures taken. • Make the complaints log available to the local authority when asked. • Record any exceptional incidents that cause dust and/or air emissions, either on- or offsite, and the action taken to resolve the situation in the log book.
Monitoring	• Carry out regular site inspections to monitor compliance, record inspection results, and make an inspection log available to the local authority when asked. • Increase the frequency of site inspections by the person accountable for air quality and dust issues on site when activities with a high potential to produce dust are being carried out and during prolonged dry or windy conditions. • Agree dust deposition, dust flux, or real-time PM10 continuous monitoring locations with the Local Authority. Where possible commence baseline monitoring at least three months before work commences on site.
Preparing and Maintaining the Site	• Fully enclose the site or specific operations where there is a high potential for dust production and the site is active for an extensive period • Avoid site runoff of water or mud. • Keep site fencing, barriers and scaffolding clean using wet methods. • Remove materials that have a potential to produce dust from site as soon as possible, unless being re-used on site.
Operating vehicle/machinery and sustainable travel	• Ensure all on-road vehicles comply with the requirements of the London Low Emission Zone and the London NRMM standards, where applicable. • Ensure all vehicles switch off engines when stationary - no idling vehicles. • Avoid the use of diesel or petrol powered generators and use mains electricity or battery powered equipment where practicable.
Operations	• Only use cutting, grinding or sawing equipment fitted or in conjunction with suitable dust suppression techniques such as water sprays or local extraction, e.g. suitable local exhaust ventilation systems. • Ensure an adequate water supply on the site for effective dust/particulate matter suppression/mitigation, using non-potable water where possible and appropriate. • Use enclosed chutes and conveyors and covered skips. • Minimise drop heights from conveyors, loading shovels, hoppers and other loading or handling equipment and use fine water sprays on such equipment wherever appropriate. • Ensure equipment is readily available on site to clean any dry spillages, and clean up spillages as soon as reasonably practicable after the event using wet cleaning methods.
Waste Management	• Avoid bonfires and burning of waste materials
Demolition	• Soft strip inside buildings before demolition (retailing walls and windows in the rest of the building where possible to provide a screen against dust) • Ensure effective water suppression is used during demolition operations. Hand held sprays are more effective than hoses attached to equipment as waster can be directed to where it is needed. In addition high volume water suppression systems, manually controlled, can produce fine water droplets that effectively bring the dust particles to the ground. • Avoid explosive blasting, use appropriate manual or mechanical alternatives. • Bag and remove any biological debris or damp down such material before demolition.

Source: IAQM Guidance 2014

Residual Effects

Actions to avoid or minimise potential impacts are integral to the design process and included in the Demolition Method Statement for the proposed development. The significance of likely dust impacts on nearby receptors following the implementation of appropriate and best practice environmental control measures is therefore considered to be **negligible**.

Conclusion

A detailed assessment has been undertaken to assess the likely impact of the RuTC demolition on local air quality.

The overall significance of the likely dust impacts are considered to be negligible following the implementation of appropriate and best practice environmental control measures as detailed in the Demolition Method Statement.

Traffic flows associated with the demolition phase are anticipated to be low and in accordance with IAQM/EPUK screening criteria are unlikely to significantly affect local air quality.

Attachment 5: Phase 1b Demolition Transport Assessment

Richmond Education and Enterprise Campus

Phase 1 Demolition EIA Screening Appraisal

Introduction

1. Transport Planning Practice have been commissioned to undertake a review of the Phase 1 demolition due to take place on the Richmond upon Thames College site as part of the Richmond Education and Enterprise Campus (REEC) development in order establish that the transport implications of the proposed demolition do not trigger the need for an Environmental Statement (ES). However, if an ES is required for other reasons this review could also be used to confirm that transport could be screened out of an Environmental Impact Assessment (EIA).

Demolition proposals, access and trip generation

2. The initial phase of demolition will take place on the northern part of the site. Appendix A shows a plan of the buildings to be demolished and the demolition site hoarding line. The demolition site hours of work will be 08:00 to 18:00.

3. The demolition site hoarding line will remove the use of approximately 20 student and 10 staff motorcycle parking spaces, and 25 staff car parking spaces located at the eastern side of the site and accessed from Egerton Road.

4. The demolition site will generate a total of 14 HGV movements a day i.e. 7 in and 7 out, spread throughout the day. There will also be a total of 10 light vehicle movements a day i.e. 5 in and 5 out.

5. The minimum number of demolition operatives on site per day would be 8 persons, with a maximum of 20 persons per day.

6. All demolition traffic will enter and exit the site via Langhorn Drive and the A316 Chertsey Road. Therefore, all demolition traffic will use private roads and the Transport for London's Road Network (TLRN) in the vicinity of the site. The Langhorn Drive / A316 junction has 'on' and 'off' slip roads allowing turning off vehicles to slow down gradually and for joining vehicles to build up some speed before fully joining the carriageway of the A316, reducing the need for other traffic to significantly adjust their speeds.

7. All demolition vehicles will be received at the college site entrance on Langhorn Drive by banksmen who will supervise the vehicles into the demolition site past Marsh Farm Lane. On exit, banksmen will supervise the vehicles back onto Langhorn Drive. Hoarding will separate the demolition site from the rest of the college site to ensure segregation between users of the college site and the activities associated with the demolition process.

Impact appraisal

8. With regard to the hours of working, the proposed demolition working day is consistent with the proposed construction working day outlined in the REEC EIA.

Transport Planning Practice| 70 Cowcross Street | London | EC1M 6EL| Tel: 020 7608 0008 | email@tppweb.co.uk

9. In respect of parking, there is sufficient space within the rest of the college site, particularly on the western side, to provide replacement parking areas to mitigate the loss of staff car and motorcycle parking on the eastern side of the site. Cars will be able to park in existing hardstanding areas without impacting on the movement of delivery and servicing vehicles in these areas.

10. The student motorcycle parking space lost during the Phase 1 demolition will not be replaced.

11. The REEC EIA states that:

    "The CLP states that the site will receive 24 construction HGV [trips] *a day, which results in a total of 12 arrivals and 12 departures. Based on a typical ten hour working day i.e. 08:00 to 18:00, this could result in an average of between one and two vehicles an hour. Therefore, it has been assumed that there will be two construction vehicles arriving at the site and two construction vehicles departing the site in the AM peak hour of 08:00 to 09:00 and one construction vehicle arriving at the site and one construction vehicle departing the site in the PM peak hour of 17:00 to 18:00.*

    There will also be 9 minibus arrivals and 9 minibus departures throughout the day for the contractors. Construction workers generally start early and leave early, hence a small proportion of the minibuses will arrive and depart in the traditional peak hour periods. Therefore, it has been assumed that three minibuses will arrive in the AM peak hour of 08:00 to 09:00 and three minibuses will depart in the PM peak hour of 17:00 to 18:00.

    There will be 150 contractors on site. Therefore, it has been assumed that 50 will arrive each hour throughout the AM peak period and 50 will depart each hour throughout the PM peak period."

12. An impact assessment of the all mode trip generation for the REEC including construction trips for its third and final construction phase was undertaken as part of the REEC EIA for the AM and PM peak hours of 08:00 – 09:00 and 17:00 – 18:00 respectively. The third construction phase was considered to provide the worst case scenario in terms of trip generation including construction trips.

13. The third construction phase of the REEC development trip generation consists of the total trips generated by the completed replacement college, the secondary school, the special needs school, the tech hub and the phase 1 of the residential scheme, plus the construction trips for the phase 2 residential scheme. The impact assessment demonstrated that the third phase of construction would result in a Moderate Adverse effect when compared the baseline trip generation.

14. Therefore, based on the proposed number of demolition vehicles and demolition operatives, which are lower than those assessed for the REEC third construction phase, the effects of the initial demolition phase trip generation is considered to be less than the effects the third REEC construction phase which has been assessed and is considered will not have a significant adverse effect on the local transport network or the local environment in transport terms.

15. As part of the REEC EIA, a junction capacity assessment of the Langhorn Drive / A316 Chertsey Road junction was undertaken using the Transport Research Laboratory's (TRL) junction capacity software 'PICADY'. Using baseline traffic flows obtained from surveys commissioned for the project, the assessment demonstrated that in the AM peak hour of

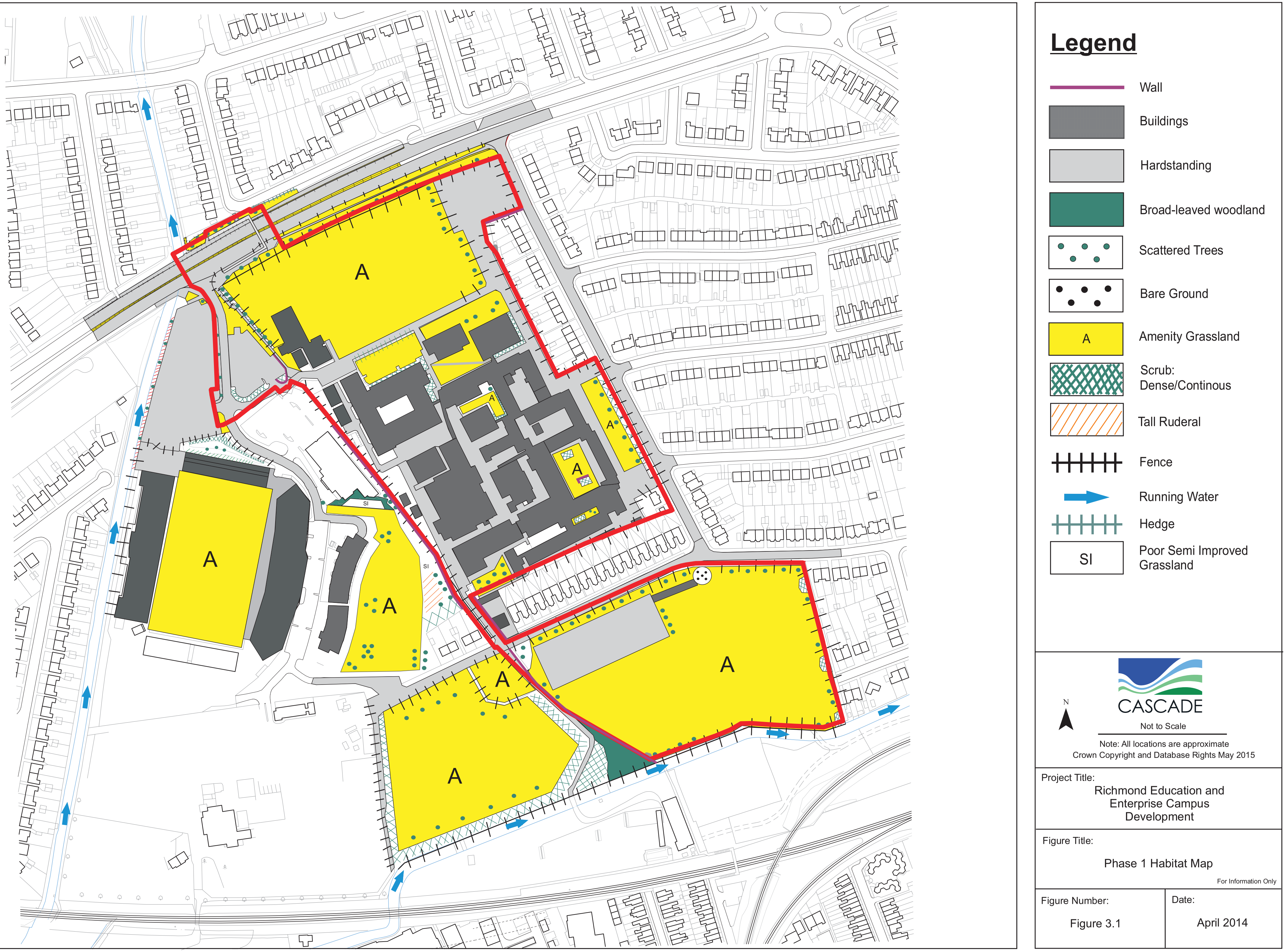
08:00 - 09:00, the junction operates with a Ratio of Flow Capacity (RFC) of 30.3% and has average queue lengths of one vehicle. Therefore, the junction effectively has 69.7% latent capacity. In the PM peak hour of 17:00 – 18:00, the junction in the same scenario has an RFC of 19.7% with an average queue of one vehicle, resulting in a latent capacity of 80.3%.

16. Therefore, based on the relatively low number of demolition vehicles set out previously, there is sufficient latent capacity within the Langhorn Drive / A316 junction to cope with the anticipated level of demolition vehicles.

Summary & conclusion

17. The impact appraisal of the Phase 1 demolition indicates that the effects of this phase will be less than those anticipated for the third REEC construction phase, which has been assessed and is considered will not have a significant adverse effect on the local transport network or the local environment in transport terms.

Attachment 6: REEC ES Phase 1 Habitat Map



CASCADE

Not to Scale

Note: All locations are approximate
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Project Title:
Richmond Education and Enterprise Campus Development

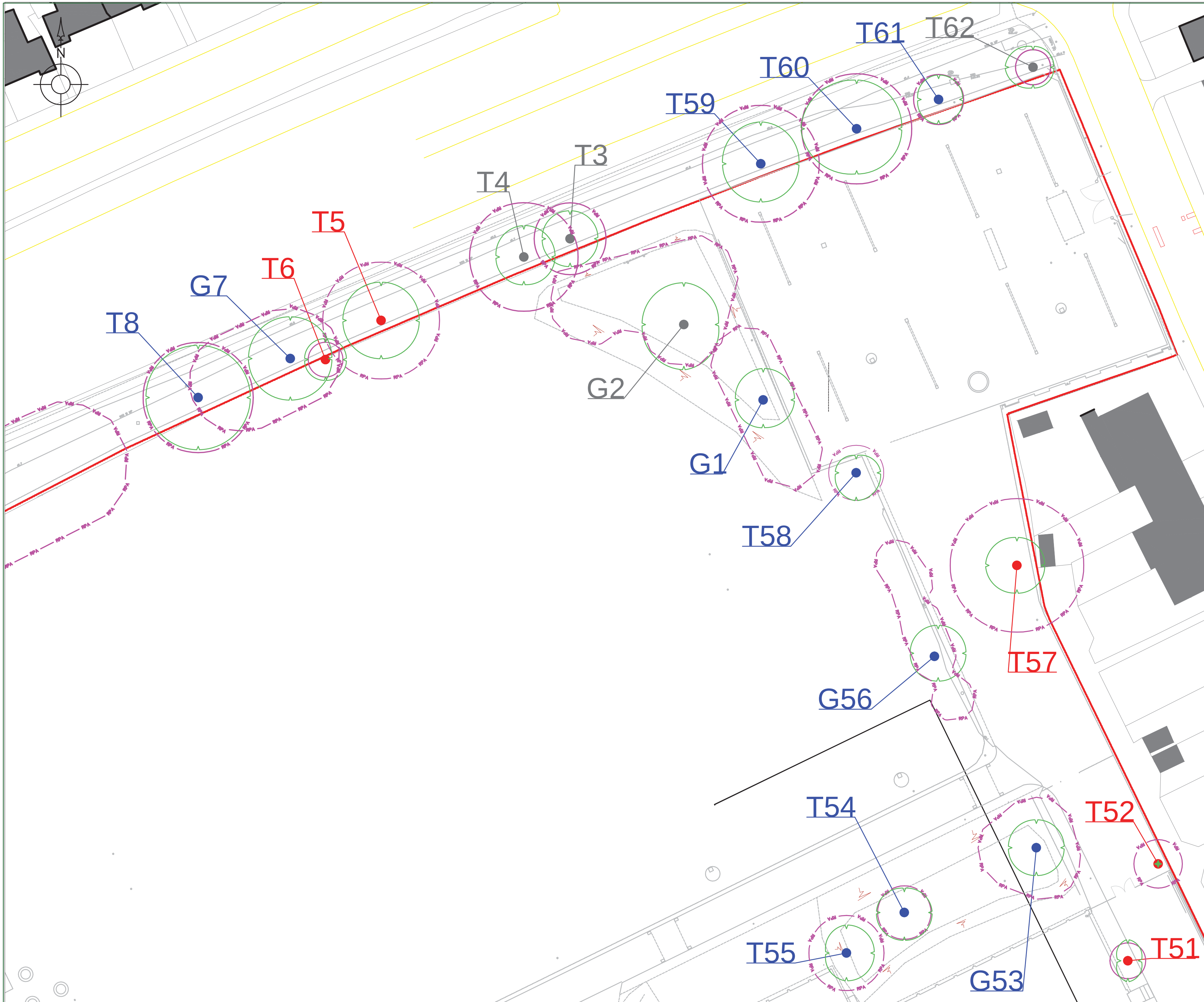
Figure Title:
Phase 1 Habitat Map

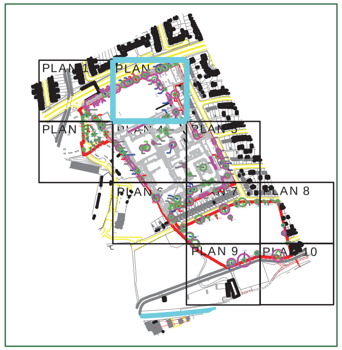
For Information Only

Figure Number: Figure 3.1

Date: April 2014

Attachment 7: Extract from Lockhart Garratt 2015 Tree Plan





LEGEND

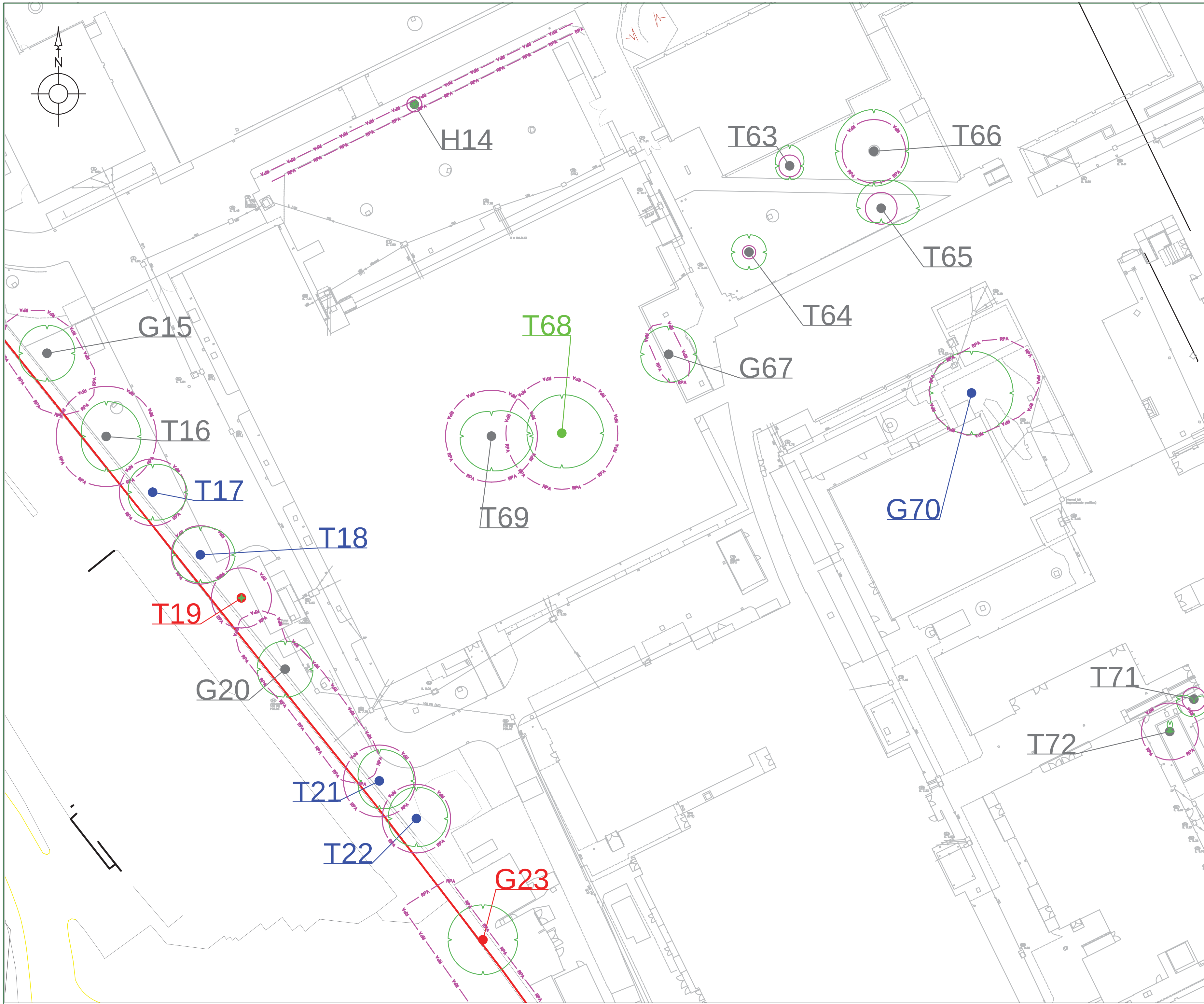
- Category A trees
- Category B trees
- Category C trees
- Category U trees
- Root Protection Area
- Indicative Site Boundary

LOCKHART GARRATT
www.lockhart-garratt.co.uk

TITLE:	Tree Constraints Plan - Plan 2
PROJECT/SITE:	Richmond College
CLIENT:	Cascade Consulting Ltd
MAP REF:	3376/02/D14-1291
REVISION:	2
DATE: 26/11/14	SCALE: 1:500@A3
APPROVED BY: NB	PRODUCED BY: RD

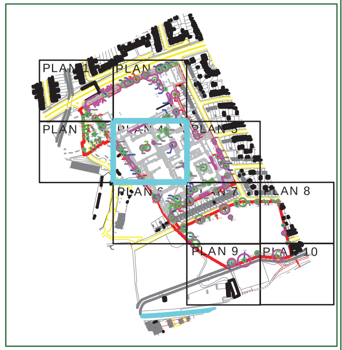
7 - 8 Melbourne House
Corbygate Business Park
Weldon, Corby
Northamptonshire NN17 5JG
01536 408840

Fairfax House
27 Cromwell Business Park
Chipping Norton
Oxfordshire OX7 5SR
01608 648657



LEGEND

- Category A trees
- Category B trees
- Category C trees
- Category U trees
- Root Protection Area
- Indicative Site Boundary



LOCKHART GARRATT
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TITLE:	Tree Constraints Plan - Plan 4
PROJECT/SITE:	Richmond College
CLIENT:	Cascade Consulting Ltd
MAP REF:	3376/02/D14-1291
REVISION:	2
DATE: 26/11/14	SCALE: 1:500@A3
APPROVED BY: NB	PRODUCED BY: RD

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Northamptonshire NN17 5JG
01536 408840

Fairfax House
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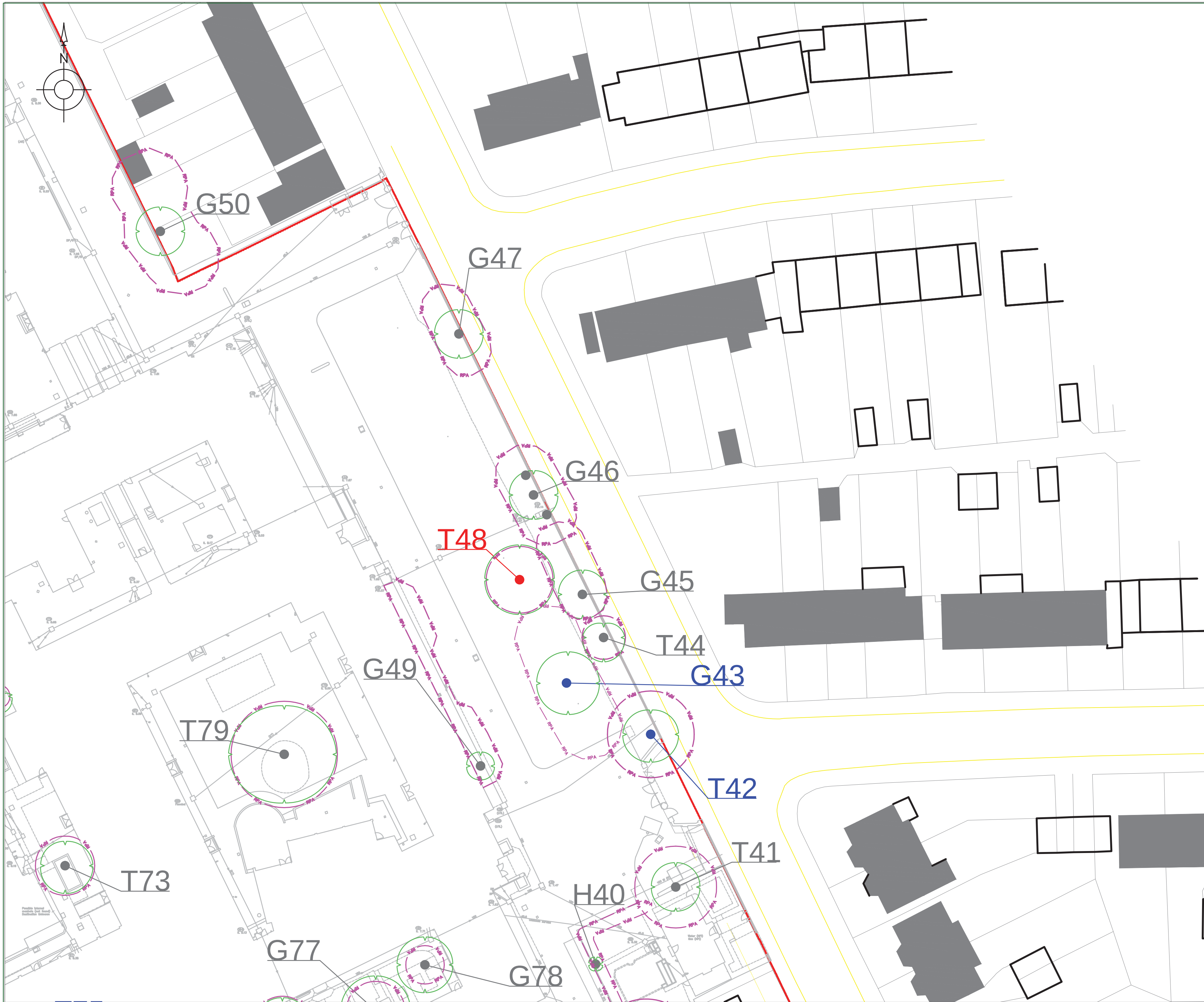
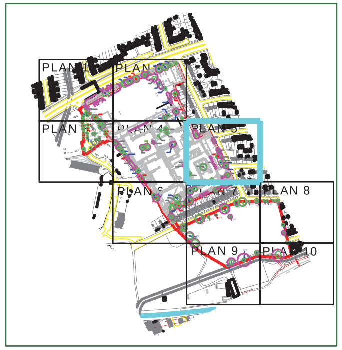
Chipping Norton
Oxfordshire OX7 5SR
01608 648657



LEGEND

- Category A trees
- Category B trees
- Category C trees
- Category U trees
- Root Protection Area
- Indicative Site Boundary



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TITLE:	Tree Constraints Plan - Plan 5
PROJECT/SITE:	Richmond College
CLIENT:	Cascade Consulting Ltd
MAP REF:	3376/02/D14-1291
REVISION:	2
DATE: 26/11/14	SCALE: 1:500@A3
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01536 408840

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01608 648657

Attachment 8: RuTC Baseline Ecology Report

Richmond College

Baseline Ecology Assessment

Produced for Cascade Consulting

By Applied Ecology Ltd

October 2014

Document Control:

Version	Date	Version Details	Prepared by	Checked by	Approved by
1.0	24.9.14	1.0	PTM/DP	DP	DP
2.0	01.10.14	2.0 (with bat emergence survey)	DP	DP	DP

Prepared for: Cascade Consulting

Title: Richmond College – Baseline Ecology Assessment

Project number: AEL0886

Document version: 2.0

Document status: Final

Document date: 1 October 2014

Signed on behalf of Applied Ecology Ltd:

Dr Duncan Painter

Director

APPLIED ECOLOGY LTD

St. John's Innovation Centre
Cowley Road
Cambridge
CB4 0WS

Tel: 01223 422 116
Fax: 01223 420 844
Mobile: 07725 811 777
Email: info@appliedecology.co.uk

Contents

1 Introduction

Background

1.1 Applied Ecology Ltd was appointed by Cascade Consulting in June 2014 to complete a breeding bird survey and bat activity survey of land around Richmond College in London as indicated by the red line plan shown by **Figure 1.1**.

1.2 In addition to completing a bird and bat survey, a watching brief was maintained for the presence of hedgehog during the bat activity survey and a professional judgement assessment of the likely value of habitats within the site for invertebrate species of conservation importance.

Legislation & Planning

Legislation

1.3 The Wildlife and Countryside Act 1981 (as amended) provides the main legal framework for nature conservation and species protection in the UK. The Site of Special Scientific Interest (SSSI) is the main statutory nature conservation designation in the UK. Such sites are notable for their plants, or animals, or habitats, their geology or landforms, or a combination of these. Natural England is the key statutory agency in England for advising Government, and for acting as the Government's agent in the delivery of statutory nature conservation designations.

1.4 Designation of a SSSI is a legal process, by which sites are notified under the Wildlife and Countryside Act 1981. The 1981 Act makes provision for the protection of sites from the effects of changes in land management, and owners and occupiers receive formal notification specifying why the land is of special scientific interest, and listing any operations likely to damage the special interest.

1.5 The Countryside and Rights of Way Act 2000, and The Natural Environment and Rural Communities (NERC) Act 2006, provide supplementary protected species legislation. Specific protection for badgers is provided by the Protection of Badgers Act 1992.

Habitats and Species of Principal Importance in England

1.6 The Natural Environment and Rural Communities (NERC) Act came into force on 1 October 2006. Section 41 (S41) of the Act requires the Secretary of State to publish a list of habitats and species which are of principal importance for the conservation of biodiversity in England. The list has been drawn up in consultation with Natural England, as required by the Act.

1.7 The S41 list is used to guide decision-makers such as public bodies, including local and regional authorities, in implementing their duty under section 40 of the Natural Environment and Rural Communities Act 2006, to have regard to the conservation of biodiversity in England, when carrying out their normal functions.

Richmond College

Figure 1.1

Habitats of Principal Importance

1.8 Fifty-six habitats of principal importance are included on the S41 list. These are all the habitats in England that were identified as requiring action in the UK Biodiversity Action Plan (UK BAP) and continue to be regarded as conservation priorities in the subsequent UK Post-2010 Biodiversity Framework. They include terrestrial habitats such as upland hay meadows to lowland mixed deciduous woodland, and freshwater and marine habitats such as ponds and sub-tidal sands and gravels.

Species of Principal Importance

1.9 There are 943 species of principal importance included on the S41 list. These are the species found in England which were identified as requiring action under the UK BAP and which continue to be regarded as conservation priorities under the UK Post-2010 Biodiversity Framework. In addition, the Hen Harrier has also been included on the list because without continued conservation action it is unlikely that the Hen Harrier population will increase from its current very low levels in England.

1.10 In accordance with Section 41(4) the Secretary of State will, in consultation with Natural England, keep this list under review and will publish a revised list if necessary.

National Planning Policy Framework

1.11 The National Planning Policy Framework (NPPF) was published in March 2012 and replaces previous planning policy guidance (PPS 9) on biodiversity. NPPF states the following in relation to biodiversity and planning:

1.12 "When determining planning applications, local planning authorities should aim to conserve and enhance biodiversity by applying the following principles:

- *if significant harm resulting from a development cannot be avoided (through locating on an alternative site with less harmful impacts), adequately mitigated, or, as a last resort, compensated for, then planning permission should be refused;*
- *proposed development on land within or outside a Site of Special Scientific Interest likely to have an adverse effect on a Site of Special Scientific Interest (either individually or in combination with other developments) should not normally be permitted. Where an adverse effect on the site's notified special interest features is likely, an exception should only be made where the benefits of the development, at this site, clearly outweigh both the impacts that it is likely to have on the features of the site that make it of special scientific interest and any broader impacts on the national network of Sites of Special Scientific Interest;*
- *development proposals where the primary objective is to conserve or enhance biodiversity should be permitted;*
- *opportunities to incorporate biodiversity in and around developments should be encouraged;*
- *planning permission should be refused for development resulting in the loss or deterioration of irreplaceable habitats, including ancient woodland and the loss of aged*

or veteran trees found outside ancient woodland, unless the need for, and benefits of, the development in that location clearly outweigh the loss; and

- *the following wildlife sites should be given the same protection as European sites:*
  - *potential Special Protection Areas and possible Special Areas of Conservation;*
  - *listed or proposed Ramsar sites; and*
  - *sites identified, or required, as compensatory measures for adverse effects on European sites, potential Special Protection Areas, possible Special Areas of Conservation, and listed or proposed Ramsar sites.*

1.13 The presumption in favour of sustainable development does not apply where development requiring appropriate assessment under the Birds or Habitats Directives is being considered, planned or determined."

Bat Legislation

Wildlife & Countryside Act

1.14 The Wildlife and Countryside Act 1981 (as amended) provides the main legal framework for nature conservation and species protection in the UK. All UK native species of bat are listed in Schedule 5 of the WCA. The legislation protects bats and their roosts under Section 9 of the Act, such that it is an offence to:

- Intentionally kill, injure or take a bat
- Possess, control or sell any live or dead specimen or anything derived from a bat
- Intentionally damage, destroy or obstruct access to any structure or place used for shelter or protection (i.e. a roost) by a bat
- Deliberately, or intentionally disturb a bat while it is occupying a roost

The Habitats Directive (1992)

1.15 The European Community Council Directive on the Conservation of Natural Habitats of Wild Fauna and Flora (92/43/EEC) aims to protect the European Union's biodiversity. It requires member states to provide strict protection for specified flora and fauna (i.e. European Protected Species) outside of designated sites.

Conservation of Habitats and Species Regulations (SI 2010/490)

The Conservation of Habitats and Species Regulations formally transpose the requirements of the Habitats Directive into national law. They build on existing nature conservation legislation for the protection of habitats and species by introducing requirements for assessing plans and projects affecting European designations and licensing certain activities affecting European Protected Species. All bat species are listed as 'European protected species of animals'.

1.16 Licences to permit illegal activities relating to bats and their roost sites can be issued for specific purposes and by specific licensing authorities in each EU country under the auspices of the of Conservation of Habitats and Species Regulations. These are sometimes called 'derogation licences' or 'European Protected Species' (EPS) licences, and in England, are issued by Natural England.

2 Breeding Birds

Background

2.1 The chapter details the results of a three visit breeding bird survey completed of all land areas within **Figure 1.1**.

Planning Context

2.2 All UK species of wild bird, their nests and eggs are protected by law (for the whole or part of the year) by the Wildlife and Countryside Act 1981 (as amended and strengthened by the Countryside and Rights of Way (CROW) Act 2000). The Act makes it an offence (with exception to species listed in Schedule 2) to intentionally:

- kill, injure, or take any wild bird,
- take, damage or destroy the nest of any wild bird while that nest is in use or being built (also [take, damage or destroy the nest of a wild bird included in Schedule ZA1] under the Natural Environment and Rural Communities Act 2006), or
- take or destroy an egg of any wild bird.

Schedule 1 Species

2.3 Special penalties are available for offences related to birds listed on Schedule 1, for which there are additional offences of disturbing these birds at their nests, or their dependent young. The Secretary of State may also designate Areas of Special Protection (subject to exceptions) to provide further protection to birds. The Act also prohibits certain methods of killing, injuring, or taking birds, restricts the sale and possession of captive bred birds, and sets standards for keeping birds in captivity.

Population Status

2.4 The population status of birds regularly found in the UK, Channel Islands and the Isle of Man is reviewed every five years to provide an up-to-date assessment of conservation priorities[1]. A total of 247 species has been assessed and placed onto one of three lists of Conservation Concern: Red, Amber and Green. Forty species are Red-listed, 121 are Amber-listed and 86 are Green-listed.

2.5 Seven quantitative criteria are used to assess the population status of each species and to place it on the Red, Amber or Green list. These are: global conservation status, recent decline, historical decline, European conservation status, rare breeders, localised species and international importance.

[1] Gregory, R D; Wilkinson, N I; Noble, D G; Robinson, J A; Brown, A F; Hughes, J; Procter, D A; Gibbons, D W and Galbraith, C A (2002) The Population Status of Birds in the United Kingdom, Channel Islands and Isle of Man: an Analysis of Conservation Concern 2002-2007. British Birds 95: 410-450

- Red-listed species are those that are Globally Threatened according to the IUCN criteria; those whose populations or ranges have declined rapidly in recent years; and those that have declined historically and not shown a substantial recent recovery.
- Amber-listed species are those with an unfavourable conservation status in Europe; species whose populations or ranges have declined moderately in recent years; those whose populations have declined historically but made a substantial recent recovery; rare breeders; and those with internationally important or localised populations.
- Green-listed species are those that do not fulfil any of the Red- or Amber-list criteria and they are not considered to be of particular conservation concern.

The Birds Directive

2.6 The European Union meets its obligations for bird species under the Bern Convention and Bonn Convention and more generally by means of Directive 2009/147/EC (Birds Directive) on the conservation of wild birds (the codified version of Council Directive 79/409/EEC as amended). The Directive provides a framework for the conservation and management of, and human interactions with, wild birds in Europe. It sets broad objectives for a wide range of activities, although the precise legal mechanisms for their achievement are at the discretion of each Member State (in the UK delivery is via several different statutes).

2.7 The main provisions of the Directive include:

- The maintenance of the populations of all wild bird species across their natural range (Article 2) with the encouragement of various activities to that end (Article 3).
- The identification and classification of Special Protection Areas (SPAs) for rare or vulnerable species listed in Annex I of the Directive, as well as for all regularly occurring migratory species, paying particular attention to the protection of wetlands of international importance (Article 4). (Together with Special Areas of Conservation designated under the Habitats Directive, SPAs form a network of European protected areas known as Natura 2000).
- The establishment of a general scheme of protection for all wild birds (Article 5).
- Restrictions on the sale and keeping of wild birds (Article 6).
- Specification of the conditions under which hunting and falconry can be undertaken (Article 7). (Huntable species are listed on Annex II of the Directive).
- Prohibition of large-scale non-selective means of bird killing (Article 8).
- Procedures under which Member States may derogate from the provisions of Articles 5-8 (Article 9) — that is, the conditions under which permission may be given for otherwise prohibited activities.
- Encouragement of certain forms of relevant research (Article 10 and Annex V).
- Requirements to ensure that introduction of non-native birds do not threatened other biodiversity (Article 11).

Survey Approach

Breeding Bird Survey

2.8 A breeding bird survey (BBS) was conducted by experienced ornithologist and Senior Ecologist from AEL, Dr Paul Tinsley-Marshall MCIEEM. Paul has over eight years professional ornithological experience, including conducting and managing breeding and wintering bird surveys for The Wildlife Trusts, and in addition holds a British Trust for Ornithology (BTO) licence to trap and ring birds for scientific purposes.

2.9 A standardised BBS methodology[2] was used as the basis for the survey, with three separate survey visits conducted during the recognised bird breeding period in 2014.

2.10 The survey visits were conducted on 25th June, 30th June and 10th July 2014 in good visibility and weather conditions that were suitable for birds to be active as follows:

- 25 June – 19.0-24.0^{o}C, 50% cloud cover, light wind, no rain
- 30 June – 16.0-19.0^{o}C, 50% cloud cover, gentle breeze, no rain
- 10 July – 18.0-22.0^{o}C, 100%, cloud cover, gentle breeze, no rain

2.11 The survey route was planned to bring the surveyor to within at least 25 m, and typically 5 m or less, of all wooded and scrub and shrub-covered parts of the site. Approach to within this distance of more open areas of grassland was deemed to be less critical because birds in such conditions are more easily seen and heard than those in more enclosed habitats and many bird species are more often seen during the breeding season in association with woodland and scrub vegetation.

2.12 The survey route followed the internal perimeters of the red line site boundary and external perimeters of most buildings, with particular attention paid to the north stand of the Harlequins stadium at the request of Cascade Consulting. The route was such that total coverage of the site was achieved and therefore considered to be more than sufficient to fully record the birds present.

2.13 Each survey commenced at around 8am in order to coincide with the main period of bird activity each day. The route was walked slowly, with frequent stops, and all species seen and heard were identified and recorded on field maps using the BTO two-letter code nomenclature.

2.14 Every effort was made, using the surveyor's judgement and the BTO field recording methodology, to record any individual bird once only, and from where the survey route passed closest to the bird's observed position.

2.15 All species of bird detected by both sight and sound were recorded on field maps using the BTO two-letter code nomenclature.

2.16 Particular attention was paid to bird species of conservation concern that have adapted to live in urban environments, such as the amber listed black redstart.

[2] Gilbert, G., Gibbons, D.W. & Evans, J (1998) *Bird Monitoring Methods: a manual of techniques for key UK species*. RSPB, Sandy, Bedfordshire.

Survey Findings

2.17 A total of 33 bird species were recorded over the three survey visits, including three Red-listed and seven Amber-listed species, details of which are found in **Table 2.1**, listed in descending order of peak recorded abundance.

2.18 The surveyed area comprised three main types of habitat: 1) the College buildings and grounds; 2) open areas consisting of amenity grassland and hard standing; and 3) vegetated areas of trees, shrubs and scrub. Most of the bird interest was found in association with the vegetated areas, with very little interest in the open amenity areas (see **Figure 2.1**), and less still in association with the College buildings and grounds. The College buildings were utilised only by feral pigeons, carrion crows and magpies. The College grounds were utilised by a range of typical garden species such as robin, blackbird, wren, blue tit, great tit and greenfinch. Open areas of amenity grassland were used by wood pigeons, stock dove, starling and blackbird, while the majority of species utilised vegetated areas. The two rivers on site, the River Crane in the south, and the Duke of Northumberland's River in the north held specialist wetland associated species including grey wagtail and moorhen.

2.19 The Red-listed species recorded were herring gull, house sparrow, and starling. The Amber-listed species recorded were dunnock, whitethroat, grey wagtail, mistle thrush, stock dove, swift and black-headed gull.

2.20 Swift, cormorant, herring gull and black-headed gull were not considered likely to be breeding on site having been recorded only as overflying foraging or commuting individuals, or as incidental observations of birds in unsuitable breeding habitat. All other species were considered breeding or potentially breeding on-site.

2.21 **Table 2.1** shows that in general terms, the survey area supported a typical bird community of an urban environment with open green spaces. Species such as wood pigeon, starling, wren, blue tit, great tit, blackbird and feral pigeon typically top the abundance lists of such habitats in southern England.

2.22 Black redstart was not recorded, and no breeding behaviour by birds was observed in the north stand of the Harlequins stadium.

Wildlife & Countryside Act Schedule 1 Species

2.23 No Schedule 1 bird species were recorded.

Key

Areas of value to breeding birds

N

Richmond College
Figure 2.1

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Table 2.1 Bird species and their abundance recorded during surveys of Richmond College, listed in descending order of peak abundance.

Species	Scientific Name	Total count by survey date			Peak Total
		1	2	3	
Wood Pigeon	*Columba palumbus*	29	24	14	29
Jackdaw	*Corvus monedula*	3	14		14
Starling	*Sturnus vulgaris*	2	5	14	14
Blackbird	*Turdus merula*	8	10	7	10
Ring-necked Parakeet*	*Psittacula krameri*	3	10	5	10
Feral Pigeon*	*Columba livia domestica*	3	1	9	9
Robin	*Erithacus rubecula*	3	9	4	9
Cormorant	*Phalacrocorax carbo*	8			8
Magpie	*Pica pica*	3	4	8	8
Blue Tit	*Cyanistes caeruleus*	7	1	7	7
Great Tit	*Parus Major*	1	7	2	7
Wren	*Troglodities troglodities*	6	6	4	6
Carrion Crow	*Corvus corone*	5	5		5
Coal Tit	*Periparus ater*		5		5
Dunnock	*Prunella modularis*	1	5		5
Collared Dove	*Streptopelia decaocto*	4	4		4
Goldfinch	*Carduelis carduelis*	3	4	3	4
Greenfinch	*Carduelis chloris*	2	4	4	4
Herring Gull	*Larus argentatus*	1		3	3
Moorhen	*Gallinula chloropus*	1	3		3
Whitethroat	Sylvia communis	3	1		3
Goldcrest	*Regulus regulus*		2	1	2
Great Spotted Woodpecker	*Dendrocarpus major*		1	2	2
Grey Wagtail	*Motacilla cinerea*	2			2
House Sparrow	*Paser domesticus*	2	1	2	2
Mistle Thrush	*Turdus viscivorus*		2		2
Stock Dove	*Columba oenas*	2			2
Swift	*Apus apus*	1		2	2
Blackcap	*Sylvia atricapilla*			1	1
Black-headed Gull	*Chroicocephalus ridibundus*			1	1
Chiffchaff	Phylloscopus collybita		1		1
Jay	*Garrulus glandarius*		1		1
Sparrowhawk	*Accipiter nisus*	1			1

Notes: **Red-listed and Amber-listed species highlighted, *UK conservation status not assessed.**

Conclusions and Recommendations

Conclusions

2.24 Fuller (1980) devised standard procedures for evaluating breeding bird communities on sites. Recording the number of species on a site can provide a simple measure of species diversity from which to confer a level of conservation importance to a site. For breeding birds, the standard qualifying levels provided by Fuller are as follows:

- National Importance, 85+ species
- Regional Importance, 70-84 species
- County Importance, 50-69 species
- Local Importance, 25- 49 species.

2.25 The species list for the whole site numbered 33, of which 29 were considered likely or potentially breeding species, placing the site within the range for Local Importance.

2.26 In spite of the presence of Red- and Amber-listed species, none of the species recorded on the site can be considered especially scarce or unexpected. They are a typical population, in terms of diversity and density, of birds to be found in southern England, in the mosaic of habitats present.

Recommendations

2.27 Any essential clearance of vegetation should adopt a precautionary approach, and be timed to avoid disturbance to breeding birds. Vegetation clearance work is permitted outside of the recognised bird breeding season, i.e. during the period August to February, or immediately following inspection and confirmation by a Suitable Qualified Ecologist that vegetation is devoid of breeding birds and their dependant young.

3 Bats

Background

3.1 The bat survey work reported here includes the results of an external building inspection survey completed of all College buildings and the north stand of the Harlequins stadium, and a bat activity survey to gain an understanding of the range of bat species using the site and to provide an indication of the presence or likely presence of a bat roost.

Survey Approach

Building Inspection

3.2 All buildings and mature trees within the red line site plan (**Figure 1.1**) were inspected externally for features that bats could use for roosting and for evidence of roosting bats from ground level using torches and close focussing binoculars as necessary on 30 June 2014, with a follow-up visual inspection of building features identified in June completed on 30 September 2014.

3.3 The inspection of buildings and trees for evidence of bats can be conducted at any time of the year according to best practice survey guidance produced by the Bat Conservation Trust (BCT)[3]. However, finding evidence of bats (e.g. their droppings) on external areas that are unprotected from rainfall may be restricted if undertaken outside of the main bat-active season and/or after periods of wet weather, as any evidence of bat presence may have been washed away. The current surveys were undertaken during the peak of the main bat active period in June and towards the end of the active period in September following a prolonged period of dry weather on each occasion such that evidence of bats would have been expected to be visible on external building surfaces on both occasions.

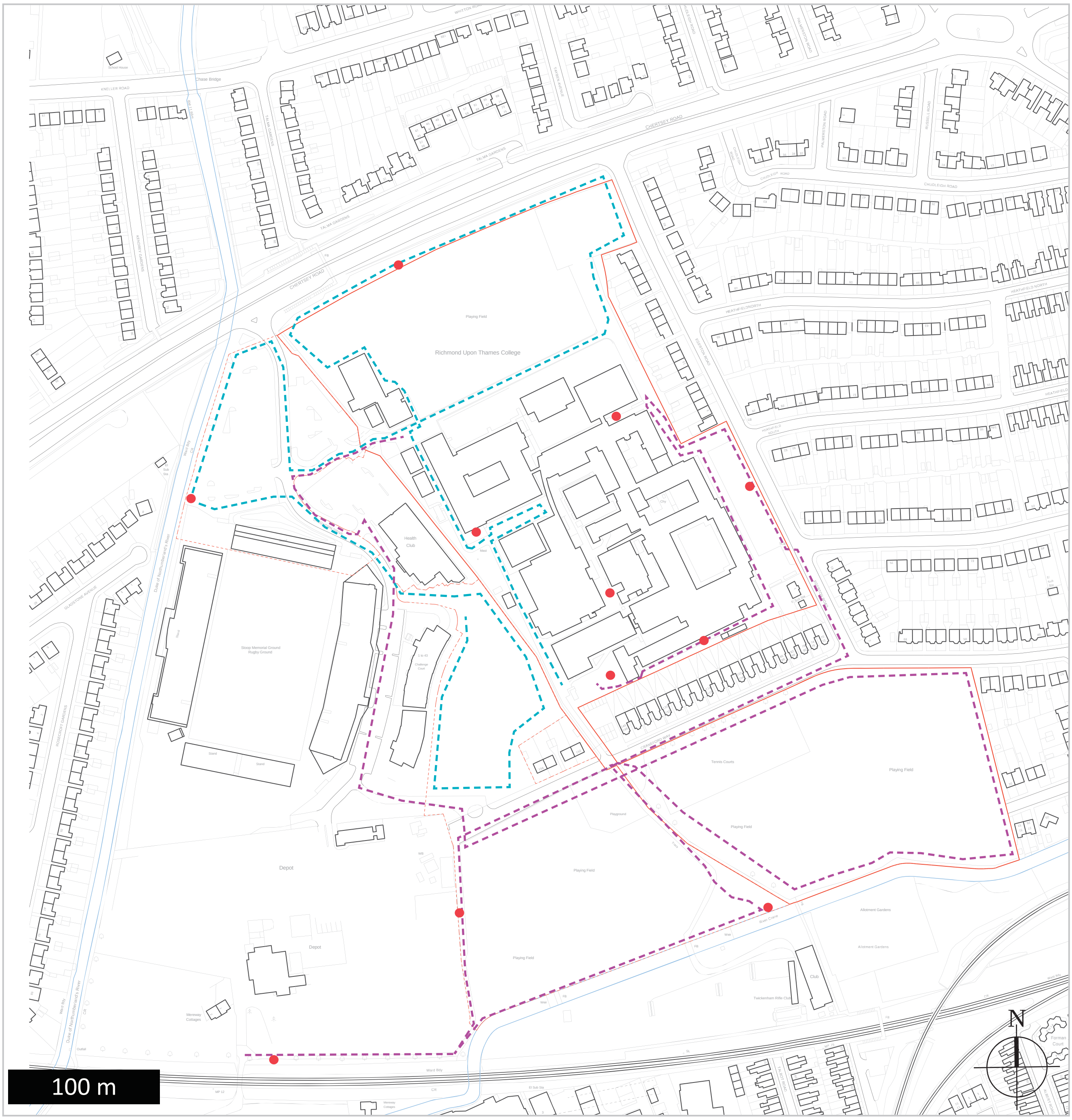
3.4 The survey was completed by Dr Duncan Painter CEnv MCIEEM (an experienced and licenced bat worker) and Dr Paul Tinsley-Marshall.

Bat Activity Survey

3.5 In line with previously cited best practice guidance, two transect routes were devised and walked concurrently by two surveyors on the 21 July and 5 August 2014 to record general levels of bat activity within the red line area and its surrounding land. The routes of each transect was reversed between the two surveys, and are shown by **Figure 3.1**.

3.6 Each transect walk commenced at 15 minutes before sunset and lasted for approximately two hours, each route was walked slowly with regular stopping points. Each surveyor was equipped with a hand-held Pettersson D230 bat detector set in frequency division mode with ear phones and an Anabat SD2 detector. In summary the Pettersson was used to hear

[3] Bat Conservation Trust (2012) *Bat Surveys – Good Practice Guidelines – 2nd Edition*. Bat Conservation Trust, London



Key

Transect route x 1 surveyor - 21 July & 5 August 2014

Transect route x 1 surveyor - 21 July & 5 August 2014

Anabat Express static bat detector location during transect surveys in July and Auguat 2014

Richmond College

Figure 3.1

Applied Ecology Ltd

bats, while the Anabat was used as a passive bat call recording device to enable subsequent bat call identification against recorded times.

3.7 All bats seen and heard were noted during the survey, with bat species being verified by comparing field notes with the bat call times recorded by and the Anabat detectors.

3.8 In addition to walking and noting bats seen and heard during the transect walks, supplementary information on bat species and their call times was recorded around the site using a total of eleven unattended Anabat Express bat detectors set up in locations that were considered to be relatively safe from third party interference and that were representative of the range of habitats present.

3.9 The playing fields and footpaths to the south of the College were all in use members of the public during both surveys prior to sun-set, and locations where detectors could be located without being observed by third parties was restricted as a result.

Bat Roost Emergence Survey

3.10 In line with BCT guidelines, a single bat roost emergence survey of all buildings within the College grounds with confirmed bat roost potential (all College buildings were confirmed as having negligible or low potential) was completed on 30 September 2014 by four surveyors each equipped with a hand-held Pettersson D230 bat detectors set in frequency division mode with ear phones. The surveyors were supplemented by eleven tripod mounted Anabat Express bat detectors and four infra-red camcorders and lamps.so that all identified potential bat roost features within the College were observed/filmed as part of the survey. The survey set-up is shown by **Figure 3.2**.

3.11 Sun-set was at 18.42 and the survey commenced 15 minutes before this time and lasted for 90 minutes past sun-set. All bats seen and heard and their directions of flight were noted by the surveyors.

Weather Conditions

3.12 Weather conditions were suitable for bats to be active on all survey occasions:

- 21 July 2014 – 0% cloud, gentle breeze, and an air temperature of 24.7^{O}C at the start of the survey and 19.0^{O}C by the end, no rain.
- 5 August 2014 – 20% cloud, gentle breeze, and an air temperature 21.2^{O}C at the start of the survey and 19.2^{O}C by the end, no rain.
- 30 September 2014 – 5% cloud, gentle breeze, and air temperature of 20.5^{O}C at the start of the survey and 18.0^{O}C by the end, no rain.

Bat Call Analysis

3.13 All bat calls were downloaded on a PC and analysed using Analook computer software.

Notes

Bat roost emergence survey 30.9.14

- Surveyor (x4) equipped withy hand held Pettersson D230 and ear phones - locations 1, 4, 5, & 7)
- Tripod mounted Anabat Express electronic bat detector (x11)
- Infra-red camcorder and lamp - field of view (x4 - locations 2, 3, 6 & 7)

N

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Figure 3.2

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Notes

Building inspection survey completed 30 June and 30 September 2014

N

1. Gap between two buildings - no associated evidence of bats
2. Holes (x3) in brickwork (former ventilation ducts) - no associated evidence of bats
3. Lifted roof covering along roof edge - no associated evidence of bats
4. Gap in feather board cladding - no associated evidence of bats
5. Hole in soffit - no associated evidence of bats
6. Gaps in facia board and behind associated roof tiles - no associated evidence of bats
7. Holes (x2) in soffit - no associated evidence of bats

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Figure 3.3

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Photo 1 - gap between buildings

Photo 2 - holes in brickwork

Photo 3 - lifted roof covering

Photo 4 - gaps in feather board

Photo 5 - holes in soffit

Photo 6 - gap behind facia and tiles

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Figure 3.4 (1 of 2)

Photos taken June & Sept 2014

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Photo 7 - Hole in soffit

Photo 8 - Hole in soffit

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Figure 3.4 (2 of 2)

Photos taken June & Sept 2014

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Survey Findings

Building Inspection

3.14 In general the buildings within the College Grounds were well maintained flat-roofed brick or metal clad structures that lacked any obvious external features that would be attractive to roosting bats and can be considered to be of negligible value to roosting bats.

3.15 A small number of external features were present that could theoretically support crevice roosting bats, but none possessed any obvious evidence that they were used by bats, and their value to bats is theoretical only. The location and description of these features is shown by **Figure 3.3**, and **Figure 3.4**. Buildings with external features of theoretical value to roosting bats can be considered to be of low value to roosting bats.

3.16 No trees with obvious features of value to roosting bats were present within the red line area.

3.17 The North Stand of the Harlequins stadium possessed no features of value to roosting bats and is also considered to be of negligible value in this respect.

Bat Activity

July 2014

3.18 The first bat (a soprano pipistrelle *Pipistrellus pygmaeus*) during the July transect survey was recorded by the static detector located along the tree line along the northern boundary of the playing fields to the north of the College buildings at 21.21 (17 minutes after sunset). The next recorded bat was a soprano pipistrelle at 21.31 by a detector located within the College building area. The static detectors located in the College grounds recorded mainly the calls of soprano pipistrelle bats with an average of 20 separate call files recorded (range 0 to 40). The most calls were recorded by the detector located within the roadside tree and shrub belt along the eastern boundary of the College.

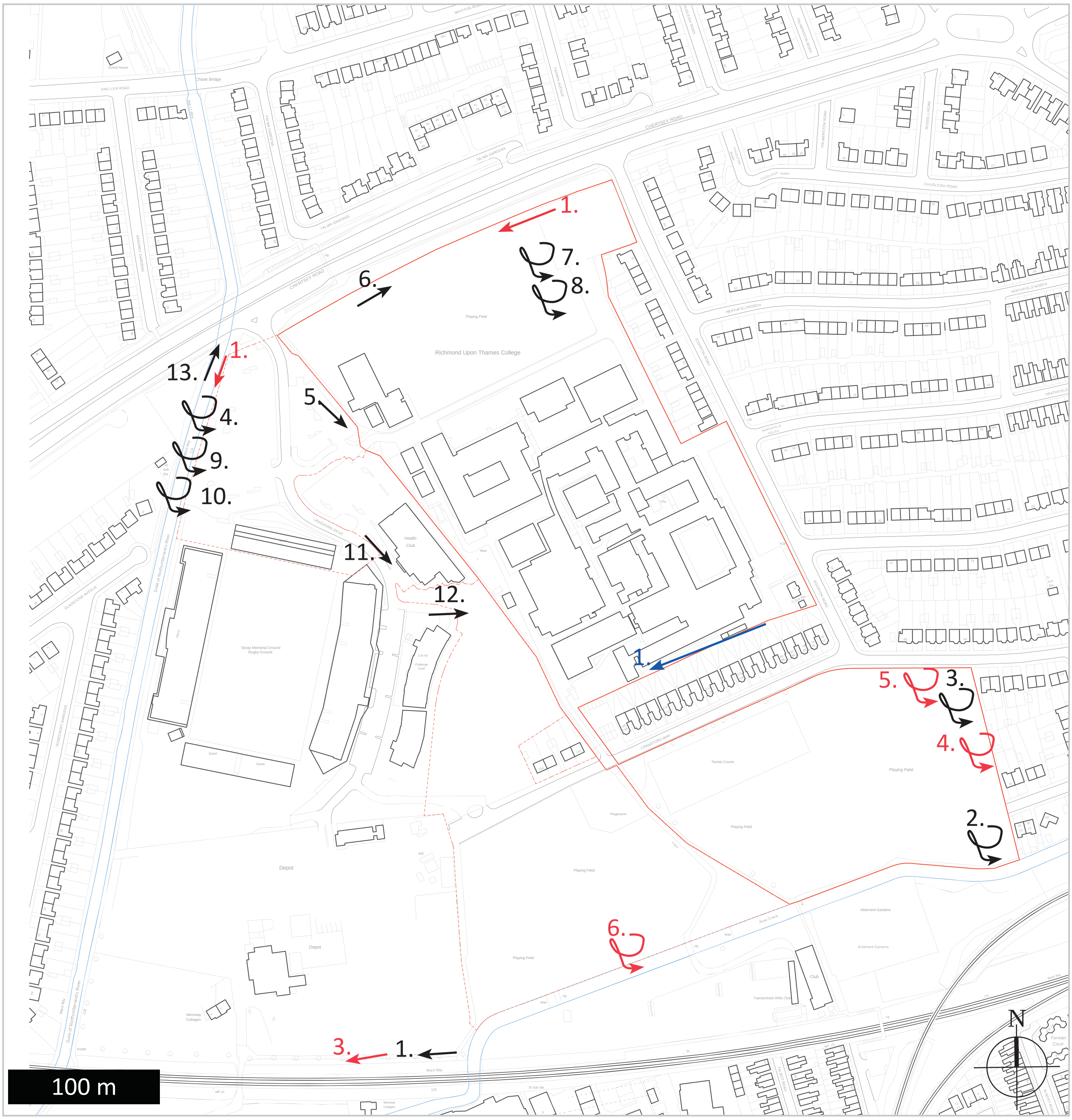
3.19 In addition to soprano pipistrelle, four of the College detectors recorded the calls of a common pipistrelle *Pipistrellus pipistrellus* at 21.33, 21.47, 22.11 and 22.12.

3.20 A single set of serotine bat calls was also recorded by the detector located in the south west corner of the College grounds at 22.19.

3.21 The overall breakdown of calls recorded by the College detectors was as follows: soprano pipistrelle (91% of all calls), common pipistrelle (8%) and serotine (1%).

3.22 The static detectors located outside the College grounds recorded only soprano pipistrelle calls with an average number of call sets per detector being 4 (range 0-13).

3.23 The surveyors walking the transects recorded mainly individual soprano and occasional common pipistrelle bats as commuting and foraging individual bats as summarised by **Figure 3.5**.



21 July 2014 - Sunset 21.04

1. Soprano pipistrelle x1 - commuting @ 21.36
2. Soprano pipistrelle x 1 + common pipistrelle x 1 foraging @ 21.47
3. Soprano pipistrelle x 1 foraging @ 21.52
4. Soprano pipistrelle x1 foraging @ 21:32
5. Soprano pipistrelle x1 commuting @21:36
6. Common pipistrelle x1 commuting @ 21:40
7. Common pipistrelle x1 foraging @ 21:42
8. Common pipistrelle x1 and soprano pipistrelle x1 foraging @ 21:43
9. Soprano pipistrelle x1 foraging @ 21:50
10. Soprano pipistrelle x1 foraging @21:52
11. Common pipistrelle x1 communting @ 21:56
12. Soprano pipistrelle x1 commuting @ 21:57
13. Soprano pipistrelle x1 commuting @ 22:10

5 August 2014 - Sunset 20.40

1. Common pipistrelle x 1 commuting @ 20.51
2. Soprano pipistrelle x 3 commuting @ 21.08, 21.26 and 21.28
3. Soprano pipistrelle x 1 commuting @ 21.16
4. Soprano pipistrelle x 1 feeding @ 21.43
5. Soprano pipistrelle x 2 feeding @ 21.45
6. Soprano pipistrelle x 1 feeding @ 21.27

30 September 2014 - Sunset 18.42

1. Common pipistrelle x1 - commuting @ 19.19 + soprano pip commuting @ 19.28

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Figure 3.5

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August 2014

3.24 The first bat (a common pipistrelle) during the August survey was recorded by the static detector located along the southern boundary of the College buildings next to the back gardens of the adjoining residential properties at 20.54 (14 minutes after sunset). The next recorded bat was a soprano pipistrelle at 20.59 by the detector located along the northern boundary of the site along the playing field tree line. The static detectors located in the College grounds recorded mainly common pipistrelle bat calls with an average of nine call sets per detector (range 0-41).

3.25 In addition to common pipistrelle, the College detectors recorded the calls of soprano pipistrelle (average 4 sets of calls per detector, range 0-10), and the occasional faint overhead commuting calls of a *Nyctalus* bat.

3.26 The overall breakdown of calls recorded by the College detectors was as follows: common pipistrelle (68% of all calls), soprano pipistrelle (26%) and *Nyctalus* (6%).

3.27 The static detectors located outside the College grounds recorded only soprano pipistrelle and *Nyctalus* calls with an average number of soprano calls per detector being 4 (range 0-10), and *Nyctalus* being 0.5 (range 0-5).

3.28 The surveyors walking the transects recorded mainly individual soprano and occasional common pipistrelle bats as commuting and foraging individual bats as summarised on **Figure 3.5**.

Bat Roost Emergence Survey

3.29 No bats were seen or filmed to emerge from any building during the roost emergence survey completed on 30 September 2014.

3.30 With the exception of the southern boundary of the College, no bat calls were recorded by any of the detectors within the College during the emergence survey or were heard by the surveyors within the College.

3.31 At 19.19 (37 minutes after sunset), a single commuting common pipistrelle bat was seen and recorded flying from east to west along the line of small trees and shrubs that delineate the southern boundary of the College alongside the back gardens of a line of neighbouring semi-detached residential housing. The timing, height and direction of flight suggested that the bat had emerged from an off-site roost – see **Figure 3.5**.

3.32 At 19.28, a single commuting soprano pipistrelle bat flew along the southern boundary of the site in the same direction as the common pipistrelle recorded nine minutes earlier.

3.33 At 19.32 a high flying (commuting) *Nyctalus* bat was heard above the College but the bat was not seen.

Conclusions and Recommendations

Bat Roosts

3.34 The static bat detectors recorded early call times of soprano pipistrelle in July (17 minutes after sunset) and common pipistrelle in August (14 minutes after sunset).

3.35 The July record was from the tree line that bounds the northern edge of the northern College playing fields and is considered most likely to represent a bat that had been roosting in a residential property somewhere close to the College playing fields to the east.

3.36 The August record of a common pipistrelle at 14 minutes after sun-set was recorded by a detector located within the College grounds next to the southern boundary of the site suggesting the presence of a roost close to or within the site.

3.37 The September bat roost emergence survey recorded no bats emerging from buildings within the College and recorded negligible bat activity levels suggesting strongly that the College does not support roosting bats, and that the early August recording of a common pipistrelle was more likely to have been a bat roosting in an off-site residential house rather than within a College building.

Valuation

3.38 The site can be valued for commuting and foraging bats using an approach described by Wray, S. *et al* (2010)[4].

3.39 Based on the survey findings, the land within the red line site boundary can be assessed of being of "District, local or parish" value for foraging and commuting bats, with lines of trees, shrubs, waterways, scrub and gardens being the most important features. The College itself is a relatively inhospitable location for bats with large areas of land being dominated by buildings and hard standing that are relatively well illuminated after dark, and lacking insects on which bats could feed. The exception to this appears to be the peripheral undeveloped habitat areas close to the southern boundary of the College which are unilluminated and support a number of trees and a small sheltered grassland area in close proximity to neighbouring gardens.

Recommendations

3.40 Consideration should be given to the incorporation of enclosed bat boxes into the external brickwork of new buildings as a biodiversity enhancement – see www.habibat.co.uk

3.41 Consideration should also be given to maintaining peripheral habitat areas unilluminated and to develop a soft landscape strategy that promotes insect diversity particularly around the periphery of the site for the benefit of bats and other wildlife.

[4] Wray, S *et al* (December 2010) *Valuing Bats in Ecological Impact Assessment*. In Practice

4 Other Species

Background

4.1 As part of the current survey, a watching brief was maintained for European hedgehog *Erinaceus europaeus* during the bat transect survey work, and to assess the habitat present for their likely importance to invertebrate species of conservation concern.

Hedgehog

4.2 No hedgehogs were seen at any point during the two after dark bat transect surveys completed in July and August 2014.

Invertebrates

4.3 The semi-natural habitats present on site were dominated by short turf amenity grassland of negligible value to invertebrate species of conservation concern. In general, there were no habitats present within the red line area that were considered to be of particular importance for invertebrate conservation.

4.4 The exception to this was the presence of a dead tree stump with evidence of beetle boring located next to a public footpath alongside the River Crane to the south of the site at grid reference TQ 15510, 73520 – see **Figure 4.1**.

4.5 The stump has the potential to support the legally protected stag beetle *Lucanus cervus*.

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Figure 4.1

Attachment 9: Soiltechnics 2008 Borehole Location Map

Symbol	Type	Method	Depth	Objectives
DTS	Borehole	Driven Tube Sample	~4m	• Measure Made Ground thickness • Soil sampling / logging
DTS	Borehole	Driven Tube Sample	2m	• Measure Made Ground thickness • Soil sampling / logging • Infiltration test
DCP	Dynamic cone penetration testing	Dynamic cone penetration	4-5m	• Insitu density testing
BH03-06	Borehole with water standpipe	Cable and tool precussion drilling	20m	• Soil profile • Standard Penetration Testing • Soil shear strength testing • Water sampling / monitoring
BH01-02	Borehole with water standpipe	Cable and tool precussion drilling	25m	• Soil profile • Standard Penetration Testing • Soil shear strenght testing • Water sampling / monitoring
TP	Trial Pit	Hand tools	1-2m	• Expose existing foundation arrangements • Measure Made Ground thickness • Soil sampling / logging
SA	Trial Pit	Hand tools	0.5-1.5m	• Measure Made Ground thickness • Soil sampling / logging • Infiltration test

SOILTECHNICS
GEOTECHNICAL ENGINEERS, ENVIRONMENTAL CONSULTANTS