THE UNIVERSITY of EDINBURGH

Sustainable Laboratories Steering Group (SLSG)

"Supporting World Class Laboratories"

Tuesday 22 March 2016, 9.30am

Raeburn Room, Old College

AGENDA

Members: Andrew Arnott; Graham Bell; David Brook; Michelle Brown; Rab Calder; Martin Crawford; Valerie Gordon; Dave Gorman; David Gray; Sharon Hannah; Angela Ingram; David Jack; Andy Kordiak; Julia Laidlaw; Sandra Lawrie; Stewart McKay; Brian McTeir; Caro Overy; Janet Philp; Simon Santamaria Garcia; Candice Schmid; Graham Thomas

Apologies: David Brook; Andy Kordiak; Julia Laidlaw; Simon Santamaria Garcia

1 Welcome, Introductions, Purpose and Aims of Meeting
The Director of SRS will outline the programme for the session

2 Minute **A**
To *approve* the minute of the previous meeting on 17 November 2015

3 Matters Arising
To *raise* any matters arising not covered on the agenda or in post-meeting notes.

SUBSTANTIVE ITEMS

4 Annual Report 2015 **B**
To *discuss* and *approve* a report from the Labs Coordinator updating the Group on progress against the 2015 Plan and making recommendations for 2016

5 SLSG Implementation Plan 2016 **C**
To *discuss* and *approve* a 2016 workplan from the Labs Coordinator

6 S-Lab Conference Report **Verbal**
To *receive* a briefing from the Labs Coordinator on the S-Lab conference in Strathclyde

7 Breakout Session – Forthcoming Developments **D**
The Labs Coordinator will lead a session to *discuss*:

- S-lab review
- Contacts and engagement
- Imminent estates changes affecting labs (if any)
- Update on campus fund and (if approved) discussion of lab spending priorities.

ROUTINE ITEMS

8 Thematic Workshops & Utilities Working Group meetings **Verbal**
To *receive* an update from recent Utilities Working Group meetings

9 Any Other Business
To *consider* any other matters from Group members.

A

UNIVERSITY OF EDINBURGH

MINUTE OF A MEETING *of the Sustainable Laboratories Steering Group held in the Elder Room, Old College on Tuesday 17 November 2015.*

1 Welcome and Introductions

The Convener welcomed attendees to the third meeting of the Group and outlined the agenda for the session.

2 Minute **A**

The minute of the meeting held on 2 June 2015 was approved as a correct record.

3 Matters Arising

There were no matters arising not covered on the agenda or in post-meeting notes.

SUBSTANTIVE ITEMS

4 Report from S-Labs Conference

The Labs Sustainability Coordinator briefed the Group on findings and developments from the September 2015 S-Lab Conference in Leeds. Content from the lectures was available from the S-Lab website. International presence at the event attested to the rising status of the awards. Ten representatives attended from UoE, an appropriate level given the range of content. Valuable insight was afforded into the various approaches being taken by different Universities, which was followed up through informal discussions between lectures. Attendance in future years was strongly recommended.

Members were keen for any feedback or recommendations around space standards. While there was no conclusive standard of square meterage per lab user, there were some examples of this being put in place. Some labs in the private sector such as AstraZeneca were using 13m^2 plus write up space. Wellcome Trust standards varied according to the science.

Action – AA to draft a briefing on the most pertinent case studies from other institutions.

5 Lab Refurbishment Presentation – University of Strathclyde **B**

Energy & Environmental Manager Dean Drobot presented on lessons learned from lab refurbishments. Strathclyde had been involved with S-Labs from an estates point of view for 18 months, with Sustainable Labs Co-Ordinator Ruby Oun now on board to link estates and academic areas, investigating how to better support the needs of students and researchers. Laboratory Superintendent Alaine Martin, in post for 11 years, had been involved with six or seven major refurbishment projects in that time. Given the cost of lab refurbs, it was essential that they last, with an expected lifespan of 15-20 years. Past refurbishment projects included a number of success stories, however there could be conflicting priorities between estates, which tried to make provision as generic as possible, and Schools which wanted clear ownership and specialist provision.

A new NMR facility (similar to Joseph Black at UoE) was created from fallow space in 2004. Its level 2 and level 4 teaching labs and organic chemistry research labs were refurbished in 2005/6. The level 7 organic chemistry lab was refurbished in 2007, the specialist forensic lab in 2008, and the specialised trace analysis lab in 2010. With each refurbishment Strathclyde learnt lessons which could be implemented in future projects.

Strathclyde worked with two design teams who had taken very different approaches. One had engaged with end users, sought critical information and clarification, asking questions regarding use, hazards and so forth. The other team did not engage beyond the initial meeting, did not share information, failed to collect vital information or did not use it, and did not seek technical input. Overall, the key aspects to making a project a success were

identified as: end user satisfaction; good quality product; safe; low maintenance; value for money; future-proof design; and never make assumptions (e.g. that a design team will know what needs to go into a lab).

The trace analysis lab was a positive example. Combining mass spectrometry and elemental analysis, the lab contained large kit needing routine maintenance. In order to do this safely, service galleys were created between banks of instruments. Gas cylinders were rationalised into one bank of gases fed on overhead gantries, allowing instruments to be moved relatively easily. Technicians and students had fed back positively on the changes.

On the less successful projects the key had been lack of consultation. Design teams had not asked what users were working with in these labs, resulting in significant retrofitting requirements (e.g. to raise taps up to accommodate glassware, provide eyewashes where users were working with solvents, retrofitting gas lines, replacing fume cupboards eaten away by acid). Cupboards fixed to the floor were a major problem as flexibility and movement were essential, to facilitate flooring repairs for example. One refurb needed to be redone six years on, leading to major expenditure for estates. Given uncertainty about the future of the space, this refurb was largely cosmetic, focusing on new floors, sink tops and sashes (£2.5K per fume cupboard, compared to £15K for full replacement).

The old microanalysis lab was in use from 1962 to 2010. The refurbished lab needed to have both temperature control (due to the mass specs and instrumentation) and fume cupboards, leading to issues around maintaining the temperature differential. The solution had been to create a small fume cupboard room in an adjoining space.

Innovation in space utilisation could lead to significant savings in terms of space charging (the chemistry lab yielded space savings of around £40K p.a). Where there were significant restrictions (e.g. windows along several walls) it could be prudent to split the lab, putting all fume cupboards in one space where solvent work could be done. At Strathclyde this would save up to £1million over the lifetime of the lab in space charges alone, not including the associated energy saving. Strathclyde additionally recommended auto sash closers on all fume cupboards, separate exhaust for vented cupboards and building supplies of nitrogen gas. These small changes were often value engineered out, yet could make a vast difference.

The same logic and criteria could be applied to new builds. If University controlled the process was relatively straightforward. In the case of a design and build it was vital to have tight control on requirements, evaluate all options and ensure all relevant information was gathered before going out to tender, as any subsequent changes were very expensive. It was important to keep a written record of what was agreed between the contractor and client.

Communication and information gathering was the critical first step to a successful project, establishing needs and then looking at these from a sustainability point of view to see what improvements could be suggested. It was vital to have a technical expert in place for projects, seconded in or employed by the University as liaison between estates and end users and feeding back to the design team, and these roles were becoming more commonplace.

Sustainable Labs Coordinator Ruby Oun outlined her first year in post, having been active in three of the 12 S-Lab criteria so far, with the aim to progress other areas next year. Traffic light posters had been designed (similar to those in use at Joseph Black) outlining good and bad fume cupboard practice. 42 fume cupboards in Chemistry had been upgraded from constant to variable flow. The introduction of automatic sash closers, funded by SALIX, had saved £50K. Waterless condensers were introduced, with students particularly positive on Asynt air condensers. Unichillers replacing two condensers per fume cupboard would create a saving of £25K p.a. Energy monitoring with different equipment was being carried out to raise awareness, identify the most energy intensive

and the cost if left on. Strathclyde had also held their first Sustainability Awards ceremony, sending the message that sustainability was important and valued, and a number of additional teams had joined since. There were a lot of opportunities for engagement with lab users and this area would be developed further. Plans for the next year included an energy and water incentive fund of £15K to help purchase energy efficient equipment and further energy monitoring, including a -80 freezer audit. There were plans to integrate S-Labs into the PhD research learning and development programme and to introduce a monthly S-Lab steering group.

Members thanked colleagues from Strathclyde for sharing their experiences, recognising the importance of involvement at the design stage from a technical person with an understanding of how the lab is going to run, and ensuring contractors have the right information from the outset to avoid additional costs. An experienced mechanical engineer was valuable in projects involving highly serviced buildings. Attendees generally advised against ring mains for deionised water as these had a relatively short lifespan and were expensive to maintain.

Attendees discussed their experiences of the SALIX funding application process - Strathclyde's primary source of funding for major projects - and of revolving green funds. It was possible to aggregate projects if they were over £5K. Published metrics were an early driver and starting point (e.g. Health & Safety lists depending on the class of lab) though there were not yet established metrics for sustainability. These could include heating, cooling and ventilation relative to occupancy, movement sensors and so forth. The more energy efficient the lab, the more money would be available for research.

As they were in the process of setting up a steering group, colleagues from Strathclyde were interested in how successful this group had been. Members had found SLSG helpful in giving access to a range of expertise and perspectives, allowing discussion of plans to establish consensus and identify issues. SLSG's membership was very mixed in terms of roles, responsibilities and status within the University, enabling the Group to give a more representative opinion.

6 SLSG Implementation Plan **C**

The Labs Sustainability Coordinator presented a quarterly update on progress against the Implementation Plan, split into 5 topics.

A. Evidence Building

The Labs Coordinator had drawn together evidence on three topics: ventilation, cold storage and lab equipment.

B. Training & Engagement

Work in this area had been taken forward through the Labs Workshops. There had been four meetings so far covering waste, procurement, utilities savings, design and CPD for technical staff. The workshops had been well-attended and topics for next year were being planned. Engagement materials had been developed including posters and induction materials. The S-Labs Conference had been useful in terms of generating soundbites and practical tips. Engagement with the School of GeoSciences had been initiated and other targeted areas included SCRM, Physics and Engineering.

C. Utilities and Waste Efficiencies

The next area to be targeted would be utilities and waste efficiency, particularly focusing on potential financial savings. Discussions were ongoing regarding fume cupboard changes at Joseph Black and roll out of LED microscopes, dependent on funding. The College Registrar had agreed to cover half the cost of the microscopes, and other funding streams including SALIX were being investigated to cover the rest. A new lab equipment fund for small scale projects had been set up.

D. Outreach and Securing Funding

The presentation from Strathclyde was one aspect of the outreach programme which had seen different partner universities present at different meetings. The S-Lab event had been particularly useful in getting in touch with other institutions working in this area. Negotiations on funding the labs post were ongoing, using internal and external funds, possibly including support from Zero Waste Scotland if there was sufficient overlap to their work.

E. Estates Design and Construction

A well-attended labs workshop on design had taken place on 16 June. There had been significant engagement in this area, with the Labs Coordinator invited to attend meetings on the Darwin development, Demand Based Ventilation (DBV), and the IRR Bioquarter. Attendees discussed concerns that there was only one producer with an effective monopoly in DBV. Other institutions including Cambridge and Aberdeen, feeling the pros outweighed the cons, were currently working toward implementation. Strathclyde were at a similar stage to UoE, waiting to see if it was effective elsewhere and if other suppliers came on to the market.

The aim was to be more strategic about finances and self-sustaining savings in future. Estates were currently working on a project with Engineering deciding whether sustainable systems could be incorporated at greater capital cost but with a 3-5 year payback. The Sustainable Campus Fund would be particularly valuable in rolling out improvements across schools. Aggregation made for better control over the process. The SCF would initially be funded at £1million, to set the direction of travel, and aim to generate savings within one year.

ROUTINE ITEMS

7 Breakout Session – Long Term Strategic Priorities & Future of the Group

The Labs Coordinator facilitated a group break-out session to discuss 3-5 year objectives and targets for lab sustainability - with an emphasis on energy savings and resource efficiency to inform the new Implementation Plan - and evaluate the Group so far, review its remit vis-à-vis labs workshops, and consider next steps.

Group A

This group recognised positive discussions and generation of ideas at SLSG, but less success in terms of implementation due to internal barriers which the Group had not yet succeeded in breaking down. More input was needed from academics and senior management, as well as greater student involvement. In terms of future objectives the group highlighted financial and carbon savings in the face of rising utility prices. A fund was needed to support and implement change.

Group B

Members recognised the contribution of the Labs Coordinator in engaging and taking plans forward, and the need for dedicated funding to support this role and further labs projects. In terms of 3 -5 year objectives, the group proposed that new up to date design guidelines be produced so all labs across the University would start from the same high level criteria, with internal estates guidelines feeding in, not just using BREEAM but also colleagues' own experience surfaced through wider consultation undertaken at an early stage by the managers and engineers responsible. The group acknowledged the time and budgetary pressures involved, but despite the initial resource requirement this would be gotten back tenfold at the end of the project. A soft landings process beyond practical completion was strongly recommended and needed to be costed in. Effort should be made to influence the procurement process, which was still largely focused on cost, to take a broader perspective. Videos were felt to be very useful in communicating good practice in labs.

There was scope to video demos of O&M manuals at Roslin, though the manuals themselves were still necessary to give the full picture. Existing apprenticeship programmes could be developed and new schemes introduced.

Group C

This group acknowledged the diverse representation and outreach efforts of SLSG, though it had not yet managed to achieve tangible outputs. Current membership was CMVM heavy and colleagues were asked to nominate potential representatives from the College of Science & Engineering. It was proposed that separate Labs Steering Groups for the two Colleges be set up, feeding in to the main group. Though the intention was to develop objectives across the five main areas, availability of funding may dictate objectives to some extent (e.g. Zero Waste Scotland and a focus on resource efficiency). Overall the aim was to develop an easily communicable vision of where the group wanted labs sustainability to be and promote this to relevant departments, organisations and individuals to secure buy-in and funding. It would be necessary to monitor lab developments within UoE to inform the Group's plans and projects and develop metrics to measure success.

Action – All to send their nominations to the Secretary.

Group D

The group advised involving SRS Communications and Marketing in future planning. The goal was to get the knowledge of the group back to academics and budget holders who had the influence to roll schemes out. SLSG and the labs workshops were felt to be running well, though concerns were raised about representation of SLSG at SRS Committee and communication up to University level. The group advised enhancing the visibility of monetary savings and where they feed back to. Further engagement with students and academics was recommended, including involving Chancellors Fellows in discussions.

8 Labs Business Case Options **D**

The Labs Coordinator outlined potential 5 Year Labs savings programmes. Paper D was a summary and visual representation of the spreadsheet circulated following June's meeting, comprising low, medium and high approaches and related resource implications. Four to six actions were planned for the first year, with a number of schemes identified at Joseph Black which were ready to go once funding was secured. Actions tagged as 'Low' were those from the original proposal which could be done in five years. 'Medium' projects were around two years. The aim was for annual savings of £200K in two years through short-term intensive projects. 'High' projects had no financial boundary.

The intention was to use these plans to develop a case for a Sustainable Campus Fund and link to University plans for a 10% utilities cost saving in two years. The final page gave costs, payback periods and carbon savings. The Low actions were the most attractive and readily achievable. The original business case would be expanded, using this Group to check assumptions and advise on which one to pitch for.

Action – All to review the paper, interrogate the figures, sense check and feed back to Andrew.

Action – AA to circulate the spreadsheet including the actual figures.

Action – AA to check if the cost of equipment disposal was included and liaise with FR on general figures.

Action – AA to change CO_2 savings for Medium from 2 to 5 years, to ensure like for like comparisons.

The findings of the Roslin cold storage study may be insufficient in themselves to persuade a large percentage of lab users to change temperatures. Progress could be made by clearing out old samples and if this was done ruthlessly and systematically it could

significantly cut the number of freezers. If funding could be secured for Schools to purchase the hardware and change PIs a fee for the space then a more efficient approach could be adopted. Under this approach initial SLAs would include the temperature the freezers would be maintained at, so researchers would know from the beginning what they were signing up to, rather than changing temperatures halfway through. A high level of academic support and enforcement would be needed to implement the change.

Action – All to feed back their thoughts to Andrew.

9 Funding for Sustainable Laboratories Role

The Convener gave a verbal update on funding scenarios for the Sustainable Laboratories role, including a proposal for shared funding from across the colleges over three years, linked to three year objectives, as a shared endeavour and commitment. UoE was continuing to make a case to Zero Waste Scotland. The Scottish Funding Council, while expressing interest, lacking immediate funds. Persuading other universities in Scotland to demonstrate that they wanted to take part would help, but it would be difficult to persuade other institutions to demonstrate that interest without the required funding. There were too many other commitments for labs funding to succeed in the planning round. SALIX and capital funding would also be pursued.

Action – All to share their ideas any other potential sources of funding.

10 Climate Strategy Review, Utilities Project & Sustainable Campus Fund Update

The Engagement Manager gave a verbal update on progress of the Climate Action Plan, utilities targets, and potential for a Sustainable Campus Fund. Despite positive developments including the CHP, UoE was not on track to achieve reduction targets. This was largely due to expansion of the campus and student numbers, which was set to continue. Looking at relative targets gave a better picture, but UoE still needed to take action. There were positive stories around the waste figures, commuting, and energy and infrastructure in the longer term. There would be further review of how the targets were set. Performance data had been published in the Annual Report and Accounts for the first time this year, putting climate targets into the main University story. A carbon forecasting and scenarios tool was being developed to help in setting future targets.

Action – All interested in seeing or testing out the tool to contact SRS.

Consultation was ongoing on best practice in carbon management within the sector. The baseline, boundary and scope had been reviewed and a business case around renewables was being developed and would soon be available for circulation. The deadline for the new Climate Action Plan was April 2016. The utilities target was a 10% reduction against business as usual over two years – effectively a £1.8m saving. SLSG would need to identify opportunities for labs to feed in to the utilities saving and to integrate with the Climate Strategy Review.

ROUTINE ITEMS

11 Thematic Workshops & Utilities Working Group meetings **E**

The Labs Coordinator presented for noting this summary and action log from the recent Labs Workshops on Lab Design, Utilities and CPD, as well as Utilities Practical Planning meetings. The workshop had discussed S-Lab design principles, the second version of which had recently been circulated.

Action – All to review and share their thoughts with Andrew to feed back to S-Lab.

12 Any Other Business

There were no other matters raised by Group members.

Sustainable Laboratories Implementation Plan 2015 - Review

B

January 2015 saw the inaugural meeting of the Sustainable Labs Steering Group. The meeting was very well attended and resulted in the identification of priority areas for the university to focus on, with the majority of the work to be facilitated by the Department for Social Responsibility and Sustainability, but involving substantial input from a broad cross-section of the university's research community and corporate services. The priorities identified were formed into the Sustainable Laboratories Implementation Plan, which was presented to the group and agreed in Spring 2015.

This document seeks to clarify the current status of action against the various priorities. In addition, it incorporates a set of recommendations for the focus of the SLSG in 2016 (a summary of the discussion held at the SLSG meeting in November 2015). Views on these recommendations are sought from SLSG members and other stakeholders.

Lessons learned from 2015

2015 was the first operational year for the Sustainable Laboratories Steering Group. As such, it is important at this time to critically assess the strengths and weaknesses of the Group. The final SLSG meeting of 2015 asked attendees to consider three questions: What do we do well? What are our weaknesses? What should the group focus on in 2016? Out of this wide-ranging discussion a few themes emerged:

- Cross University working and the steering group has worked well and performs a necessary function as we move to delivery of sustainability improvements.
- The Labs Sustainability Coordinator post is a crucial component in stimulating awareness, enabling action and developing further cross-university working.
- Substantial opportunities exist to reduce costs/energy/resource consumption/carbon whilst maintaining or even improving world class science through adopting best practice in terms of lab operations, equipment, and building services/design.
- There is a need to consider how to extend the reach of, and support for, labs sustainability actions in 2016.
- The peer-auditing aspect of the Labs Sustainability Awards (part of Edinburgh Sustainability Awards) won the Facilities and Services section of the Green Gown Awards 2015.

A. Evidence Building	Objective: To gather, collate and develop evidence and data on the effectiveness and consequences of various opportunities for efficiency improvements.			KPI: Number of topics for which a body of evidence has been produced and made available to SLSG.
Tasks and partners	**Outputs / Outcomes**	**RAG status**	**Achievements**	**Lessons Learned**
A1. Assess fume cupboards for suitability for Variable Air Volume (VAV) conversion. **Responsible:** Andrew Arnott; Estates (Premises Managers and Design Office). **Consulting:** Energy Office; Procurement; Representatives of relevant labs.	Develop/obtain an inventory of fume cupboards and whether they are fixed or VAV Identify fixed volume fume cupboards and investigate their suitability for converting to VAV Calculate savings, obtain quotes/indicative costs for conversion and identify suitable conversions with short payback periods		Quotes received from 2 companies for upgrading c. 25 fume cupboards in Joseph Black Building. These quotes indicate that there would be a payback period of around 3 years. This is to be assessed by estates (Robin McEwan and his colleagues in the Small Projects and Minor Works Team) at a time which suits them in order to ascertain if there are any hidden costs which may affect the payback period. A 'case study' document has been produced detailing energy savings available from F.C.s through good practice. http://www.ed.ac.uk/files/atoms/files/lab_case_study_-_ventilation_best_practice.pdf	Information for developing the inventory was not easily obtainable. Attempts still ongoing. Unclear whether more likely to obtain this data via centralised estates (i.e. estates Small Projects and Minor Works Team) or via individual contacts in each building with F.C.s. When obtaining quotes for F.C. replacement (or anything else) it is important to be very specific otherwise it is likely the quotes will not be comparable. Robin McEwan is an appropriate contact within estates who has substantial knowledge of the fume cupboards at Joseph Black.
A2. Investigate potential energy savings and	5 year project with 6 monthly assessments of energy savings and		This project is on-going. Almost all sample types have now had	It has been very difficult to find labs to undertake tests for some samples

risks to samples associated with raising the temperature of minus 80°C freezers. **Responsible:** Andrew Arnott; Brian McTeir; Lorna Bathgate; Irene McGuinnes. **Consulting:** Martin Farley Lee Murphy (other contributors of samples)	sample quality from the investigation operating at Roslin Institute. 6 monthly reports will be presented to the SLSG as a standing item on the agenda.		baseline testing done, and further tests (6 monthly or annually) will be arranged by a P.I. at Roslin, Dr Jayne Hope. Delays in conducting baseline tests have meant that 6 monthly reports have not yet been produced. The cost of undertaking tests was substantially more than budgeted for (£10k instead of £1k per year) but Roslin Institute have agreed to cover this cost. A 'case study' document has been produced detailing energy savings available from cold storage through good practice. http://www.ed.ac.uk/files/atoms/files/lab_case_study_-_freezers_best_practice.pdf	where the donating lab cannot/will not undertake these tests. In future, it might be preferable to stipulate that donating labs must also undertake the testing. The project management of this should be conducted by a relevantly experienced scientist/P.I. who can help to make decisions about the testing process. Dr Jayne Hope at Roslin has recently volunteered for this role.
A3. Investigate potential energy savings and risks to samples associated with changing DNA/RNA storage methods to room temperature. **Responsible:** Andrew Arnott; Peter James (S-Lab).	Report on the current state of knowledge (literature review) relating to alternative storage methods of DNA/RNA		This was included in the 'case study' and 'evidence base' documents relating to freezers and cold storage, as viewed by the SLSG in June 2015 (paper D).	Room temperature storage of DNA/RNA is possible and is being successfully used by some institutions internationally (mainly USA). Further engagement work is required at UoE before this may be adopted.

Consulting: SLSG				
A4. Compile a body of evidence and case studies relating to sustainable laboratories actions undertaken at other institutions. **Responsible:** Andrew Arnott; Peter James (S-Lab). **Consulting:** SLSG	Summary report showing actions, payback periods and links to any publications		A body of evidence has been compiled and has been used to produce a labs sustainability business case which has been presented to the SLSG a number of times and also forms part of a paper describing the actions required to achieve a 10% utilities cost saving at the University. A 'case study' document has been produced detailing energy savings available from lab equipment through good practice. http://www.ed.ac.uk/files/atoms/files/lab_case_study_-_lab_equipment_best_practice.pdf	With appropriate resource and investment substantial energy savings could be achieved at the University – with the most substantial contribution being through better control of ventilation.
A5. Conduct a trial/pilot project monitoring the impact of distributing 'switch off' stickers and other communications materials. **Responsible:** Andrew Arnott; Joe Farthing; (A building containing	Summary report showing methodology and impacts.		Based on a decision made in May 2015 this has been deferred until early 2016, As per 15/16 planning and to integrate with other SWITCH materials roll out.	

laboratories which has reliable energy data). **Consulting:** SLSG				

B. Training and Engagement	Objective: To increase knowledge and awareness of sustainability actions among laboratory users.			KPI: Number of communications (events/presentations/talks/meetings/distribution of materials) between Labs Sustainability Coordinator and key laboratories personnel.
Tasks	**Outputs / Outcomes**	**RAG status**	**Achievements**	**Lessons Learned**
B1. Develop a core list of sustainability criteria to be covered in induction and exit processes and disseminate this to laboratories. **Responsible:** Andrew Arnott; Core Audit Group. **Consulting:** Val Gordon SLSG	All relevant staff responsible for lab inductions have list of sustainability criteria		Exit process document is now complete and published on the SRS website. Lab sustainability sessions formed part of the inductions for labs users in September – these were provided either by the existing labs teams (e.g. Roslin) or by the SRS department (e.g. IGMM and Chemistry). Lab sustainability induction presentations are published on the SRS website.	Different requirements for inductions exist across the university depending on the discipline of science being conducted, and the rate of throughput of individuals through the lab. However, there are many common themes which can be described (and are described in the published materials).
B2. Host an event with HEaTED and S-Lab to focus on professional development of laboratory technical staff, and sharing best practice	Event delivered to UoE staff and staff from other universities		An event was hosted with HEaTED along with visiting speakers from Newcastle University who described the positive journey they have recently undertaken with regards to CPD and Professional Registration for	It is unclear currently if any individual in the university has responsibility for the professional development of lab technical staff. This is something we would wish to see clarified. The SRS department are developing a paper highlighting these issues which would be presented to CMG and/or other

Responsible: Andrew Arnott; Val Gordon **Consulting:** SLSG			labs technical staff. Subsequent to the meeting two attendees in lab managerial positions approached the representative from HEaTED to express their interest in Professional Registration for their staff.	committees/groups in order to raise awareness of the issue and stimulate action.
B3. Engage with more laboratories to encourage and enable sustainability actions and participation in Sustainability Awards. (Where ESA is not suitable for the lab, opportunities for improvement should still be identified and enabled). **Responsible:** Andrew Arnott; **Consulting:** SLSG	Additional laboratories engaging with SRS on sustainability improvement projects. 2 Additional laboratory teams taking part in ESA 2015-16 in comparison to 2014-15 (12 expected in 2014-15).		The number of laboratories now regularly engaging with the Labs Sustainability Coordinator has increased – noticeably recently during campaigns to distribute timer plugs and to promote the labs small equipment fund.	The ESA will not be taking place in its previous format in 2015-16 as the format and timeline is being reviewed in light of comments and concerns raised by participants. It is hoped there will be a good number of labs applying for the Special Awards (smaller version of the ESA for 2015-16) and that we will succeed in converting these new contacts into active ESA teams in 2016-17.
B4. Publish case studies on website and distribute to key stakeholders. **Responsible:** Andrew Arnott; SRS Communications Team **Consulting:**	Case studies of University of Edinburgh sustainable laboratories achievements published on website.		Case studies of good practice within UoE and the wider H.E. sector globally have been published on the SRS website in 3 topics: Ventilation, Cold Storage, and Lab Equipment.	There are lots of opportunities for improving our practices around the uni, in order to maintain our position as a world leading institution.

SLSG				
B5. Develop and distribute resources/ materials promoting best practice in laboratories. **Responsible:** Andrew Arnott; SRS Communications Team **Consulting:** SLSG	New printed and electronic materials to promote best practice in laboratories.		New posters were produced and distributed in summer, new stickers and tips cards distributed in autumn, and all materials uploaded to the website in autumn.	

C. Utilities and waste efficiencies	Objective: Identify and enable utilities efficiency improvement projects throughout the university	KPI: Number of utilities efficiency improvement projects implemented. (Cost and carbon savings quantified where data is available)

Tasks	Outputs / Outcomes	RAG status	Achievements	Lessons Learned
C1. Identify the air handling system settings for rooms containing -80°C freezers and assess for suitability (size of "dead band" and set point temperatures) **Responsible:** Andrew Arnott; Martin Crawford; Premises Managers. **Consulting:** Energy Office Relevant laboratories	Appropriate set points and dead bands identified and programmed for all -80 freezer rooms, and communicated to relevant staff.		Optimal temperature range identified from practices around the University and further afield, and communicated to UoE lab users via the 'case studies' documents and 'tips cards'.	A range of temperatures should be considered to be acceptable, depending on the number of freezers in the room, and whether the ventilation is 100% mechanical or partially natural.
C2. Identify funding to support replacing mercury lamps in	An understanding of the funding landscape and communicating this to laboratories.		A project to replace mercury microscopes with LED at IGMM has been promised 50% funding by the College Registrar	Financial payback from replacing with LED comes mainly from the much longer lifespan of the lamps – which also

microscopes with LED lamps. **Responsible:** Andrew Arnott; **Consulting:** Energy Office Relevant laboratories Colin Miller Registrars of Schools (or delegates)			for CMVM, the remaining funding is yet to be secured.	benefits the users and leads to less interruptions to the science.
C3. Identify areas for motion sensor/daylight sensor controls for lighting. **Responsible:** Andrew Arnott; Premises Managers. **Consulting:** Energy Office	Areas suitable for motion sensor/daylight sensor lighting controls identified. Business cases drawn up for the work and where suitable, applications for funding made.		Some areas have been identified on an ad hoc basis so far, but further more concerted efforts will be made during the planned Energy Audits for 17 of the top 20 energy consuming buildings.	Energy Audits for 17 locations will be carried out in 2016 as part of a slightly delayed energy communication and engagement programme
C4. Identify funding to support replacing older -80°C freezers with new models. **Responsible:** Andrew Arnott;	An understanding of the funding landscape and communicating this to laboratories.		A small fund was provided to the Labs Sustainability Coordinator which has supported this.	Further support may be provided through the College by approaching Registrar, through Estates by approaching the Energy Office, or potentially through a new Sustainable Campus Fund to be administered jointly by Estates and the SRS department.

Consulting: Energy Office Relevant laboratories Colin Miller				
C5. Identify opportunities to divert non-hazardous laboratory consumables from landfill (e.g. gloves, plastics) **Responsible:** Andrew Arnott; Laboratory Managers. **Consulting:** Waste and Environment Manager (Fleur Ruckley)	Waste streams analysed at a number of laboratories and arrangements made with waste providers to collect non-hazardous laboratory consumables. Awareness raised among users of these labs.		Initial meetings have been held with Sigma Aldrich in relation to this and other issues they can influence. Other suppliers will be approached early in 2016. No new practices or waste diversions have yet been agreed.	The Life Sciences tender resulted in a number of commitments from suppliers – the Labs Sustainability Coordinator will work to ensure these are met.
C6. Identify opportunities to raise the temperatures of back-up -80 freezers. **Responsible:** Andrew Arnott; Roslin Institute; Martin Farley. **Consulting:** Labs who have contributed Samples.	An understanding of the time taken for internal freezer temperature to change. An understanding of the different energy consumptions from operating ULT freezers at different temperatures.		The results of a short term study at the Roslin Institute have been written up but not yet published. This will be communicated to lab users in early 2016.	There is not a substantial difference in the time taken to reach -20^{o}C from a starting point of -70^{o}C compared to -80^{o}C.

SLSG				
C7. Identify opportunities to change fluorescent area lighting to LED lighting. **Responsible:** Andrew Arnott; Lab Managers; Premises Managers. **Consulting:** Energy Office	Areas suitable for LED lighting identified. Business cases drawn up for the work and where suitable, applications for funding made.		This task has been deferred until March/April 2016 in order to form part of planned energy audits of 17 of the top 20 energy consuming buildings.	
C8. Identify opportunities to establish packaging take-back schemes. **Responsible:** Andrew Arnott; Laboratory Managers. **Consulting:** Waste and Environment Manager (Fleur Ruckley); Colin Miller.	Waste streams analysed at a number of laboratories and arrangements made with suppliers to collect packaging. Awareness raised among users of these labs.		See C.5 above	
C9. Engage with academic colleges and corporate services to discuss improving accessibility to existing funding streams.	Streamlining of the application processes which must be followed by applicants for various existing funding streams available within the University.		See C.4 above	

Responsible: Andrew Arnott; Dave Gorman; Liz Vander Meer. **Consulting:** Dougie Williams/ David Jack.	Increased frequency of review of applications. Reduced time between applications being submitted and a decision being made. Increased number of applications from laboratories for funding for sustainability actions.			

D. Outreach and Securing Funding	Objective: To secure funding to support the continuation of sustainable laboratory work within the University of Edinburgh			KPI: Amount of time the sustainable laboratories work is supported for after January 2016.
Tasks	**Outputs / Outcomes**	**RAG status**	**Achievements**	**Lessons Learned**
D1. Engage with SFC to secure funding for further sustainable laboratories positions/ resources. **Responsible:** Dave Gorman Andrew Arnott; David Somervell. **Consulting:** SLSG	Funding secured to extend UoE's work with laboratories		Programme Proposals developed and submitted to SFC for Scottish Wide Programme. 3 year Programme Proposal following from Circular Economy Research submitted to Zero Waste Scotland. Preliminary discussions to determine appetite for shared funding model with specific schools / departments.	An application has been made to ZWS for a labs based project focussing on improving the circular economy aspects of labs. This has raised interest with ZWS and the Scottish Government and discussions are on-going. Independently of this the UoE Post Review Group have approved an extension to the contract of Labs Sustainability Coordinator until end of August 2016, and likely extension to end or August 2017.
D2. Engage with Universities Scotland Efficiencies Taskforce **Responsible:** Dave Gorman Andrew Arnott;	'buy-in' secured with other universities to strengthen bid for SFC funding			No further engagement has been made with USET. In August Dave Gorman met with Martin Kirkwood of SFC and mentioned that Sir Ian Diamond would be speaking at the EAUC conference and this could be an opportunity to gauge/build on sector-wide support for labs sustainability. Martin Kirkwood was

Consulting: SLSG				going to meet with Sir Ian Diamond subsequently.
D3. Engage with other institutions **Responsible:** Dave Gorman Andrew Arnott; Core Audit Group. **Consulting:** SLSG; Peter James (S-Lab).	Relationships formed and developed with those responsible for sustainable laboratories in other institutions. Best practice shared. Improvements encouraged.		Connections have been made with labs sustainability staff at other universities via S-Labs workshops and also through independent proactive engagement with St Andrews, Strathclyde, King's College London, Manchester, Exeter, Oxford, Warwick and Bristol including mutual visits to with St Andrews, and hosting representatives from Strathclyde and Bristol as well as regular engagement with Martin Farley who is now at King's College London.	

E. Estates Design and Construction	Objective: To ensure sustainability concerns are embedded within the processes of estates design and construction			KPI: Level and frequency of input from SRS into estates design and construction
Tasks	**Outputs / Outcomes**	**RAG status**	**Achievements**	**Lessons Learned**
E1. Review and develop design and construction guidelines for new laboratories. **Responsible:** Graham Bell; Andrew Arnott; Laboratory Representatives. **Consulting:** SLSG; Energy Office.	Guidance on: Lab ventilation Cooling/heating set points and dead bands Lighting technologies and controls Cold rooms vs fridges & freezers Space for storing recycling/packaging		A Labs Workshop on this topic was very well attended and included guest speakers from University of St Andrews who have constructed the UK's first labs building to achieve BREEAM 'Outstanding'. The Labs Workshop discussed the draft S-Labs guidance document on lab design, and comments were fed back to S-Labs prior to the second draft (not final draft). Further iterations of the S-Lab design principles will be discussed in 2016 with the aim of conducting a comparison with UoE existing processes.	Demand based ventilation is acceptable to the UoE H&S department in principle. UoSt Andrews guests stated that they would recommend a substantial amount (up to 50%) of flexible labs space which could be reconfigured for different uses with ease.
E2. Establish a mechanism by which SLSG/SRS can be informed of and influence new	SLSG/SRS can have input to new estates developments for laboratories, specifically including Darwin Project.		The Labs Sustainability Coordinator is currently attending meetings relating to: Darwin, IRR, BioQuarter,	

estates developments for laboratories. **Responsible:** Graham Bell; Andrew Arnott; **Consulting:** SLSG; Laura Skinner; Energy Office.			Quartermile; and hopes in future to be consulted on redevelopments at the Western General site too.	

Recommendations for 2016

A meeting of the Sustainable Labs Steering Group in November 2015 noted the following general points:

1. The group / the university needs to get better at converting ideas into action
    a. Barriers to action may be overcome by interacting more with budget holders

It was recommended that in broad terms the work of 2015 labs sustainability be continued into 2016 to build upon successes and address delayed projects. At the November 2015 meeting the Sustainable Labs Steering Group gave a broad consensus that the work of the SLSG was valuable and should continue in a similar format, (although see below for suggestions of ways in which it could be more effective). Thus it is suggested that the 'core' group of the SLSG meets 3 or 4 times in 2016 to review progress, and that parallel Labs Workshop sessions are held on specific topics.

Opportunities for improvement for 2016:

Format of the SLSG

1. The meeting/lecture based format of the labs workshops could be changed in favour of tours of exemplar labs within UoE – as identified through the documentation of case studies in 2015. These could be used to address 'amber' areas noted in the RAG grading above, such as lab design, engaging with new labs groups, demonstrating various technologies and practices such as LED microscopes, VAV fume cupboards, -70 freezers, and waste/packaging/procurement schemes.

2. Should invite more students and academics (Chancellor's Fellows) to SLSG
3. Ensure that learning from SLSG reaches the right groups, committees and people.

Activities and focus of the SLSG in 2016

Based on discussion at the SLSG meeting in November 2015, a number of suggestions were made for the focus of the SLSG in 2016:

a. Buildings and infrastructure
    i. Achieve savings - £/CO2/kWh/recycling % contributing to UoE targets
    ii. Development of sustainable design guidelines (reviewing S-Lab guidelines + estates existing guidelines) – especially for more highly serviced environments which should be judged against lifetime value for money
    iii. Gather data on a 'model' lab building
    iv. Ensure Value Engineering provides long term Value for Money rather than just a capital saving which contributes to higher running costs (either for the client or centrally)
    v. Ensure SLSG is made aware of labs developments in UoE (i.e. closures, opening, refurb)
    vi. Energy metering at a building, floor or equipment level to see the impact of actions

b. People
    i. Deliver labs workshops for specific networks or contacts groups (e.g. College specific meetings) in order to reach a greater number of lab users and receive a broader range of inputs/ideas/contributions. This could link with promotion of the Edinburgh Sustainability Awards.
    ii. Use SRS Comms team for engagement. Develop and communicate further analogies which resonate with the audience.
    iii. Consolidate experience into one document describing good practice in labs
    iv. Develop a vision by which to communicate our aims to people who could fund this (internally)
    v. Develop metrics for measuring success
    vi. Influence procurement (e.g. equipment: value for money, lifecycle)

The key focus areas identified in November 2015, along with on-going tasks carried over from 2015 fall into 4 categories: Operational savings, lab design and construction, data and evidence, and engagement. Further information is included in the SLSG Implementation Plan 2016, as included in Appendix A of this document.

Annex A

Sustainable Labs Steering Group: Implementation Plan 2016

A. Operational savings	Objective: Support the delivery of projects which result in reduced environmental and financial costs.			KPI: Savings in: £, tonnes CO_2e, kWh, tonnes waste.
Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**
A1. Replace fume cupboards (constant air volume to variable air volume)	Small Projects and Minor Works team (Robin McEwan). Andrew Arnott Andy Kordiak/ Procurement	Rab Calder David Jack Technical Manager (Ron Brown) Premises/Zone manager (Jim Brown) Martin Crawford	Joseph Black building aim for completion by September 2016.	**Outputs**: 24 Fume Cupboards in lab 29 converted from constant air volume to variable air volume. Monitoring of effectiveness of the project. **Outcomes**: Substantial reduction in requirement for treated make-up air and thus substantial energy savings as well as health and safety benefits. Monitoring data used to inform decisions about other similar projects.
	Resource/Support required: Data on existing equipment/infrastructure Information on future plans for the site Energy data Support with project management/ tender/purchasing			

A2. Change set point temperature of ULT freezers to -70ºC	Andrew Arnott Lab users	SLSG	On-going process of engagement.	**Output**: ULT freezers change set point temperature from -80ºC to -70ºC. **Outcome:** Energy savings in the region of £200 per freezer from reduced load on the compressors.
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			
A3. Remove DNA from ULT freezers and alternative storage methods identified	Andrew Arnott Lab users	SLSG	On-going process of engagement.	**Output**: A lab group agrees to trial alternative storage temperatures/methods. **Outcome**: Free up ULT freezer space and reduce the need for purchase of further freezer capacity.
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			
A4. Install demand based ventilation in relevant areas	Andrew Arnott Rab Calder Estates Development/Small Works team SLSG Premises managers	Health and Safety representatives Lab users	End of 2017	**Output**: Demand based ventilation retro-fitted to a University of Edinburgh laboratory to reduce air-changes when air quality is good. **Outcome**: Substantial reduction in requirement for treated make-up

	Resource/Support required: Data on existing equipment/infrastructure Information on future plans for the site Energy data Support with project management/ tender/purchasing			air and thus substantial energy savings. Also additional health and safety benefit from higher rates of air changes when air quality is poor.
A5. Implement a system for helium capture	Juraj Bella John Kenmure	Jim Brown Andrew Arnott	Summer 2016	**Output**: Installation of equipment to capture vented helium gas at the NMR lab in Joseph Black building, bottle it and sell it back to B.O.C. as part of a contract. **Outcome:** Reduced overall cost of helium (vs BAU) and guaranteed supply of a scarce resource vital for some scientific disciplines.
	Resource/Support required: Technical information on building Procurement support Project management support			
A6. Install a Solvent Purification System	Michael Cowley Phil McDonald Jim Brown	John Kenmure Andrew Arnott Rab Calder	Autumn 2016	**Output**: Installation of a bespoke large volume solvent purification system in Joseph Black building to allow removal of the existing stills. **Outcome:** Reduced energy consumption, reduced water consumption, reduced risk of fire and flood (as well as benefits to science from shorter solvent purification times).
	Resource/Support required: Technical information on building Procurement support Project management support Funding			

A7. Access funds for replacement of old inefficient lab equipment	Andrew Arnott Lab users	SLSG Andy Kordiak/other Procurement representative	Clarified picture of funding options by Autumn 2016	**Output**: Identification of funding stream(s) which can enable replacement of old, inefficient equipment. **Outcome:** Equipment replaced to achieve utilities savings (as well as benefits to science).
	Resource/Support required: SLSG members to help identify funds Procurement support			
A8. Work with lab group(s) to undertake freezer inventory(ies) including removal of redundant contents.	Andrew Arnott Lab users	SLSG	Winter 2016	**Output**: A lab group/groups conduct additional freezer inventory(ies) with support from SRS to enable removal of redundant contents. **Outcome**: Reduced need for purchase of further ULT freezer capacity, and associated energy consumption (£600-£1,000 per year).
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			
A9. Include a lighting replacement as part of a planned refurbishment	Andrew Arnott Small Works Team Premises managers	Lab users Rab Calder	Winter 2016	**Output:** With the Small Works team, identify a lab area(s) where refurbishment work will be happening, and propose appropriate efficient lighting for the area to be incorporated into the existing works. **Outcome:** This will achieve energy savings with minimal cost and disruption.
	Resource/Support required: Information from Small Works Team and Estates. Project management support and cooperation Funding			

A10. Conduct a trial/pilot project monitoring the impact of practical support and communications materials in a specific location.	SRS Comms team Andrew Arnott Lab users (a lab which has not previously had much SRS engagement)	David Jack SLSG	Spring/ Summer 2016	**Output:** A lab which was previously not engaged with SRS begins an engagement campaign at the same time as a temporary localised energy monitoring strategy is implemented to quantify any savings. **Outcome:** Increased awareness of energy consumption among the occupants. A report of the strategy and impact to be written up and presented to SLSG.
	Resource/Support required: Energy data Metering data SLSG members to help identify a lab group. Engagement materials			
A11. Identify funding to support replacing mercury lamps in microscopes with LED lamps.	Andrew Arnott Stewart McKay (IGMM) Andy Kordiak	SLSG	Summer 2016	**Output**: Identify funding to enable the replacement of mercury light-source microscopes with LED light-source microscopes at the imaging zone of IGMM. **Outcome:** Microscopes replaced. Health and safety, energy and cost benefits (as well as benefits to science through clearer imaging and reduced down-time).
	Resource/Support required: Help identifying funding Procurement support			
A12. Work with suppliers and Procurement to identify opportunities to reduce environmental and financial costs (waste and operational).	Andrew Arnott Andy Kordiak (and/or other representatives from Procurement)	SLSG	On-going process of engagement.	**Output:** Identify products/practices which could be changed to reduce utilities and waste costs at University of Edinburgh; and set up trials of the

	Resource/Support required: Help identifying appropriate suppliers/products/processes to engage with.		new products/practices to ensure suitability for wider roll-out. **Outcome:** Reduced waste and/or utility costs associated with trialled products/practices.

B. Lab Design and Construction	Objective: To ensure sustainability concerns are embedded within the processes of lab design and construction			KPI: Level and frequency of input from SRS into lab design and construction
Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**
B1. Review and develop design and construction guidelines for new laboratories.	Andrew Arnott Graham Bell (Others from Estates Development)	SLSG Labs users	Gap analysis to be complete by November 2016	**Output:** Gap analysis conducted comparing UoE practices to S-Lab guidance. **Outcome:** UoE lab design processes and practices revised in light of the findings to improve sustainability.
	Resource/Support required: Documentation etc showing existing processes. Contribution to debates and discussions.			
B2. Gather data on a 'model' lab building	Andrew Arnott Graham Bell	SLSG	December 2016	**Output:** A document describing best practice in relation to a wide range of parameters for lab design (i.e. air changes per hour, floor area per researcher, etc) **Outcome:** UoE lab design processes and practices revised in light of the findings to improve sustainability.
	Resource/Support required: Support developing the scope of the task.			

B3. Ensure Value Engineering strikes an appropriate balance between operational costs and capital expenditure.	Graham Bell (Others from Estates Development)	SLSG Andrew Arnott	Ongoing task	**Output:** SRS integrated in Value Engineering Process for labs developments. **Outcome:** Cost effective sustainability prioritised in Value Engineering, with a whole-life-costing approach to decision making.
	Resource/Support required: Engagement with SRS during the Value Engineering decision making process, allowing time for operational costs to be calculated and incorporated into the decision making process..			
B4. Ensure SLSG is made aware of labs developments in UoE (i.e. closures, opening, refurb)	Estates Development	SLSG SRS (Comms Team)	Ongoing task	**Output:** Lab developments are communicated, including to SLSG. **Outcome:** SLSG input to lab developments to promote sustainability and reduce costs.
	Resource/Support required: Updates on labs developments.			

C. Data and Evidence	**Objective: To gather, collate and develop evidence and data on the effectiveness and consequences of various opportunities for efficiency improvements.**			**KPI: Number of topics for which a body of evidence has been produced and made available to SLSG.**

Tasks	Colleagues Responsible	Colleagues to Consult	Dates	Outputs / Outcomes
C1. Develop metrics for measuring success	Andrew Arnott Dave Gorman Michelle Brown	SLSG	Summer 2016	**Output:** Metrics devised by which to measure success of sustainable labs project. **Outcome:** Greater ability to communicate impact of sustainable labs project succinctly with higher levels of management, leading to greater support for the sustainable labs project long-term.
	Resource/Support required: Support developing the scope of the task. Contribution to and review of the Metrics.			
C2. Energy metering at a building, floor or equipment level to see the impact of actions	David Jack Andrew Arnott	Lab users SLSG	Autumn 2016	**Output:** Increased detail of metering of lab spaces (could be temporary or permanent) to gather more accurate data on lab energy use. **Outcome:** Greater accuracy of data available for use in engagement and communications materials. Greater impact of communications materials from use of actual data from UoE spaces.
	Resource/Support required: Support developing the scope of the task. Metering information (location, accessibility, type, etc). Identification of a suitable location.			
C3. Report progress against the Implementation Plan to SLSG core group meetings (written report with RAG status)	Andrew Arnott	SLSG	Ongoing task – each SLSG core meeting.	**Output:** Report at each meeting on progress against SLSG Implementation Plan 2016.

	Resource/Support required: N/A		**Outcome:** SLSG is aware of progress against SLSG Implementation Plan 2016 and can intervene if considered necessary to achieve failing targets.

D. Engagement	**Objective: To secure funding to support the continuation of sustainable laboratory work within the University of Edinburgh.** **To increase knowledge and awareness of sustainability actions among laboratory users.**	**KPI: Amount of time the sustainable laboratories work is supported for after August 2017.** **Number of communications (events/presentations/talks/meetings/distribution of materials) between Labs Sustainability Coordinator and key laboratories personnel.**

Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**

D1. Identify gaps in engagement across UoE, and work with Schools to address those gaps.	Andrew Arnott Caro Overy	SLSG	March – Sept 2016	**Output:** Gap analysis report on lab sustainability contacts. **Outcome:** SLSG members suggest contacts to fill gaps. Greater universal engagement across all labs at UoE.
	Resource/Support required: SLSG members to help identify individuals/groups to engage with in areas where there are currently gaps in our engagement.			
D2. Deliver labs workshops for specific networks or contacts groups (e.g. College specific meetings) in order to reach a greater number of lab users and receive a broader range of inputs/ideas/contributions.	Andrew Arnott	Lab users	April – October 2016	**Output:** Hold an engagement event at each labs campus across the uni. **Outcome:** Enable the views and opinions of more people to be heard, while also discussing and disseminating knowledge of best practice. Greater awareness of lab sustainability best practice among lab users. Input of new ideas to the sustainable labs programme from engagement with new people.
	Resource/Support required: Support from SLSG members in each location to identify a suitable venue and time and help encouraging lab users to attend.			
D3. Increase labs participation in Edinburgh Sustainability Awards.	Andrew Arnott Caro Overy	SLSG	October 2016	**Output:** Greater number of labs applying for the Edinburgh Sustainability Awards.

	Resource/Support required: SLSG members to help identify potential labs groups who may want to join the awards scheme.			**Outcome:** Greater awareness of lab sustainability best practice across UoE labs, leading to environmental and cost benefits.
	Resource/Support required: Travel to and attendance at external meetings.			
D4. Communicate on labs sustainability and increase awareness.	Andrew Arnott SRS Comms team	SLSG	Summer 2016	**Output:** New materials developed with well-chosen analogies and other communications techniques. **Outcome:** Better communication of labs sustainability messages and better awareness among lab users of sustainability practices.
	Resource/Support required: Design and publishing of marketing materials.			
D5. Consolidate experience into guides describing good practice in labs.	Andrew Arnott	SLSG	November 2016	**Output:** Guides which describe good practice in labs. **Outcome:** Greater awareness of lab sustainability best practice.
	Resource/Support required: Review of guides			

D6. Develop a Vision by which to communicate our aims to people who could fund work to continue the work to improve sustainability in labs.	Andrew Arnott Dave Gorman Michelle Brown	SLSG	May 2016	**Output:** Short statement of the 'vision' of the SLSG allowing better communication of the key aims and purpose of the SLSG, the Sustainable Labs Coordinator and the labs sustainability programme. **Outcome:** Better understanding among key stakeholders/potential funders of the sustainable labs programme and its constituent parts, and the value of it.
	Resource/Support required: Contribution to and review of the Vision			

Annex B

Sustainable Laboratories Steering Group – remit and membership

A remit and membership for SLSG had been approved by the Sustainability Operations Advisory Group on 5 November 2014.

"The main purpose of the Steering Group would be to provide expert guidance and direct the expanding remit of work associated with sustainable laboratories. It would ensure that work on sustainable laboratories is continued through a coordinated approach. The proposed Steering Group would:

- Provide expert guidance to the Labs Sustainability Coordinator
- Contribute towards setting future objectives and monitoring progress

- Identify funding opportunities to support sustainable laboratories work
- Achieve buy in from academic schools, support groups and research centres
- Link sustainable laboratories agenda with University-wide strategic plans and objectives.

The Steering Group would aim to bring together colleagues from across university academic schools and support groups with expertise in laboratory practices and systems."

At the inaugural meeting it was proposed that a core steering group be established with additional representatives joining for themed meetings which would help develop strategy and advise on activities for the Labs Sustainability Coordinator. A wider mailing list of interested supporters would be maintained.

CORE GROUP MEMBERSHIP	
Andrew Arnott	Labs Sustainability Coordinator
Dave Gorman	Director of Social Responsibility & Sustainability
Rab Calder	Energy and Systems Manager
David Gray	Professor of Immunology, Institute of Infection & Immunology Research
Graham Thomas	Director of Central Bioresearch Services
David Jack	Energy Manager
Julia Laidlaw	Project Manager (Estates and Buildings)
Martin Crawford	Controls Manager
Andy Kordiak	Equipment Procurement Manager, MVM
Sandra Lawrie	Technical Services & Estates Manager, School of Biological Sciences
Brian McTeir	Easter Bush Campus Facilities and Services Manager
Stewart McKay	Technical Services Manager, IGMM
Heather Anderson	Senior Technical Officer, CMVM
Candice Schmid	Health & Safety Adviser
Valerie Gordon	Technical Officer, Institute for Education, Teaching & Leadership
Position Vacant	Student Researcher

THEMATIC/OPERATIONAL GROUP MEMBERSHIP	
Heather Anderson	Building Manager, Chancellor's Building
Andrew Arnott	Labs Sustainability Coordinator
Graham Bell	Estates Depute Director
Jim Brown	Zone Manager, KB
Michelle Brown	Head of SRS Programmes
Ronald Brown	Deputy Technical Services Manager, School of Chemistry
Rab Calder	Energy Systems Manager
Martin Crawford	Controls Manager
Valerie Gordon	Technical Officer, Institute for Education, Teaching & Leadership
Dave Gorman	Director of Social Responsibility & Sustainability
David Gray	Professor of Immunology, Institute of Infection & Immunology Research
Graham Thomas	Director of Central Bioresearch Services
Guy Lloyd-Jones	Forbes Chair of Organic Chemistry
David Jack	Energy Manager
Andy Kordiak	Equipment Procurement Manager, MVM
Sandra Lawrie	Technical Services & Estates Manager, School of Biological Sciences
Matthew Lawson	Programme Manager

Chris Litwiniuk	Engagement Facilitator
Stewart McKay	Technical Services Manager, IGMM
Brian McTeir	Easter Bush Campus Facilities and Services Manager
Lyndsay Murray	Health and Safety Manager – Chancellors - CMVM
Janet Philp	School Administrator, School of Biomedical Sciences
Fleur Ruckley	Waste & Environment Manager
Candice Schmid	Health & Safety Adviser
Laura Skinner	College Procurement Manager, Science & Engineering
Anna Stamp	Estate Development Manager, CMVM
Dawn Windsor	Easter Bush Deputy Campus Facilities and Technical Manager
Margarida Teixeira-Dias	Physical Resources and Scientific/Technical Services Manager (Geosciences)
Position Vacant	Student Researcher

Annex C

Core Audit Group – remit and membership

The Core Audit Group exists as an operational level group to steer and plan the activities relating to the laboratories section of the Edinburgh Sustainability Awards. The Group's activities includes timings and logistics of awards audits, as well as providing a forum for communication between participants of the awards scheme and the organisers of the awards scheme (Social Responsibility and Sustainability department).

The CAG consists of the Labs Sustainability Coordinator and representatives of laboratories who have taken part in the awards scheme for a number of years. This comprises:

AWARDS CORE AUDIT GROUP MEMBERSHIP	
Heather Anderson	Chancellors Senior Technical Officer, College of Medicine and Veterinary Medicine
Andrew Arnott	Labs Sustainability Coordinator, Department of Social Responsibility and Sustainability
Ronald Brown	Deputy Technical Services Manager, School of Chemistry
Brian McTeir	Easter Bush Campus Facilities and Services Manager, College of Medicine and Veterinary Medicine
Dawn Windsor	Easter Bush Deputy Campus Facilities and Technical Manager, College of Medicine and Veterinary Medicine
Stewart Franklin	Technical Officer, School of Chemistry
Eliane Salvo-Chirnside	Senior Research Technician, SynthSys, School of Biological Sciences
Carol Wollaston	Centre Manager, Centre for Integrative Physiology, College of Medicine and Veterinary Medicine

C

Sustainable Laboratories Implementation Plan 2016

2016 sees the beginning of the second year of operation of the Sustainable Labs Steering Group (SLSG). The group - consisting of members from the Department for Social Responsibility and Sustainability (SRS), Estates, Procurement, Health and Safety, and various representatives from labs and academic staff - was formed in January 2015 to facilitate and enable sustainability improvements in laboratories across the University of Edinburgh. Further details on the remit and membership of the group are provided in the annexes to this document.

This document sets out the intended aims, objectives and tasks of the group in 2016, along with proposed timings and the expected outputs and outcomes. The work of the SLSG is facilitated by SRS but also involves substantial input from a broad cross-section of the university's research community and corporate services. This input and support is also detailed in the document. Through the planned actions in 2016 it is hoped the SLSG will make a substantial contribution to improving sustainability and reducing costs across laboratory areas of the University of Edinburgh, and complement University-wide strategic plans and objectives.

A. Operational savings	Objective: Support the delivery of projects which result in reduced environmental and financial costs.			KPI: Savings in: £, tonnes CO_2e, kWh, tonnes waste.
Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**
A1. Replace fume cupboards (constant air volume to variable air volume)	Small Projects and Minor Works team (Robin McEwan). Andrew Arnott Andy Kordiak/ Procurement	Rab Calder David Jack Technical Manager (Ron Brown) Premises/Zone manager (Jim Brown) Martin Crawford	Joseph Black building aim for completion by September 2016.	**Outputs**: 24 Fume Cupboards in lab 29 converted from constant air volume to variable air volume. Monitoring of effectiveness of the project. **Outcomes**: Substantial reduction in requirement for treated make-up air and thus substantial energy savings as well as health and safety benefits. Monitoring data used to inform decisions about other similar projects.
	Resource/Support required: Data on existing equipment/infrastructure Information on future plans for the site Energy data Support with project management/ tender/purchasing			

A2. Change set point temperature of ULT freezers to -70ºC	Andrew Arnott Lab users	SLSG	On-going process of engagement.	**Output**: ULT freezers change set point temperature from -80ºC to -70ºC. **Outcome:** Energy savings in the region of £200 per freezer from reduced load on the compressors.
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			
A3. Remove DNA from ULT freezers and alternative storage methods identified	Andrew Arnott Lab users	SLSG	On-going process of engagement.	**Output**: A lab group agrees to trial alternative storage temperatures/methods. **Outcome**: Free up ULT freezer space and reduce the need for purchase of further freezer capacity.
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			

A4. Install demand based ventilation in relevant areas	Andrew Arnott Rab Calder Estates Development/Small Works team SLSG Premises managers	Health and Safety representatives Lab users	End of 2017	**Output**: Demand based ventilation retro-fitted to a University of Edinburgh laboratory to reduce air-changes when air quality is good. **Outcome**: Substantial reduction in requirement for treated make-up air and thus substantial energy savings. Also additional health and safety benefit from higher rates of air changes when air quality is poor.
	Resource/Support required: Data on existing equipment/infrastructure Information on future plans for the site Energy data Support with project management/ tender/purchasing			
A5. Implement a system for helium capture	Juraj Bella John Kenmure	Jim Brown Andrew Arnott	Summer 2016	**Output**: Installation of equipment to capture vented helium gas at the NMR lab in Joseph Black building, bottle it and sell it back to B.O.C. as part of a contract. **Outcome:** Reduced overall cost of helium (vs BAU) and guaranteed supply of a scarce resource vital for some scientific disciplines.
	Resource/Support required: Technical information on building Procurement support Project management support			

A6. Install a Solvent Purification System	Michael Cowley Phil McDonald Jim Brown	John Kenmure Andrew Arnott Rab Calder	Autumn 2016	**Output**: Installation of a bespoke large volume solvent purification system in Joseph Black building to allow removal of the existing stills. **Outcome:** Reduced energy consumption, reduced water consumption, reduced risk of fire and flood (as well as benefits to science from shorter solvent purification times).
	Resource/Support required: Technical information on building Procurement support Project management support Funding			
A7. Access funds for replacement of old inefficient lab equipment	Andrew Arnott Lab users	SLSG Andy Kordiak/other Procurement representative	Clarified picture of funding options by Autumn 2016	**Output**: Identification of funding stream(s) which can enable replacement of old, inefficient equipment. **Outcome:** Equipment replaced to achieve utilities savings (as well as benefits to science).
	Resource/Support required: SLSG members to help identify funds Procurement support			
A8. Work with lab group(s) to undertake freezer inventory(ies) including removal of redundant contents.	Andrew Arnott Lab users	SLSG	Winter 2016	**Output**: A lab group/groups conduct additional freezer inventory(ies) with support from SRS to enable removal of redundant contents. **Outcome**: Reduced need for purchase of further ULT freezer capacity, and associated energy consumption (£600-£1,000 per year).
	Resource/Support required: Lab teams to engage with the Labs Sustainability Coordinator and volunteer. SLSG members encouraged to identify possible labs to engage with.			

A9. Include a lighting replacement as part of a planned refurbishment	Andrew Arnott Small Works Team Premises managers	Lab users Rab Calder	Winter 2016	**Output:** With the Small Works team, identify a lab area(s) where refurbishment work will be happening, and propose appropriate efficient lighting for the area to be incorporated into the existing works. **Outcome:** This will achieve energy savings with minimal cost and disruption.
	Resource/Support required: Information from Small Works Team and Estates. Project management support and cooperation Funding			
A10. Conduct a trial/pilot project monitoring the impact of practical support and communications materials in a specific location.	SRS Comms team Andrew Arnott Lab users (a lab which has not previously had much SRS engagement)	David Jack SLSG	Spring/ Summer 2016	**Output:** A lab which was previously not engaged with SRS begins an engagement campaign at the same time as a temporary localised energy monitoring strategy is implemented to quantify any savings. **Outcome:** Increased awareness of energy consumption among the occupants. A report of the strategy and impact to be written up and presented to SLSG.
	Resource/Support required: Energy data Metering data SLSG members to help identify a lab group. Engagement materials			

A11. Identify funding to support replacing mercury lamps in microscopes with LED lamps.	Andrew Arnott Stewart McKay (IGMM) Andy Kordiak	SLSG	Summer 2016	**Output**: Identify funding to enable the replacement of mercury light-source microscopes with LED light-source microscopes at the imaging zone of IGMM. **Outcome:** Microscopes replaced. Health and safety, energy and cost benefits (as well as benefits to science through clearer imaging and reduced down-time).
	Resource/Support required: Help identifying funding Procurement support			
A12. Work with suppliers and Procurement to identify opportunities to reduce environmental and financial costs (waste and operational).	Andrew Arnott Andy Kordiak (and/or other representatives from Procurement)	SLSG	On-going process of engagement.	**Output:** Identify products/practices which could be changed to reduce utilities and waste costs at University of Edinburgh; and set up trials of the new products/practices to ensure suitability for wider roll-out. **Outcome:** Reduced waste and/or utility costs associated with trialled products/practices.
	Resource/Support required: Help identifying appropriate suppliers/products/processes to engage with.			

B. Lab Design and Construction	Objective: To ensure sustainability concerns are embedded within the processes of lab design and construction			KPI: Level and frequency of input from SRS into lab design and construction
Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**
B1. Review and develop design and construction guidelines for new laboratories.	Andrew Arnott Graham Bell (Others from Estates Development)	SLSG Labs users	Gap analysis to be complete by November 2016	**Output:** Gap analysis conducted comparing UoE practices to S-Lab guidance. **Outcome:** UoE lab design processes and practices revised in light of the findings to improve sustainability.
	Resource/Support required: Documentation etc. showing existing processes. Contribution to debates and discussions.			
B2. Gather data on a 'model' lab building	Andrew Arnott Graham Bell	SLSG	December 2016	**Output:** A document describing best practice in relation to a wide range of parameters for lab design (i.e. air changes per hour, floor area per researcher, etc.) **Outcome:** UoE lab design processes and practices revised in light of the findings to improve sustainability.
	Resource/Support required: Support developing the scope of the task.			

B3. Ensure Value Engineering strikes an appropriate balance between operational costs and capital expenditure.	Graham Bell (Others from Estates Development)	SLSG Andrew Arnott	Ongoing task	**Output:** SRS integrated in Value Engineering Process for labs developments. **Outcome:** Cost effective sustainability prioritised in Value Engineering, with a whole-life-costing approach to decision making.
	Resource/Support required: Engagement with SRS during the Value Engineering decision making process, allowing time for operational costs to be calculated and incorporated into the decision making process..			
B4. Ensure SLSG is made aware of labs developments in UoE (i.e. closures, opening, refurb)	Estates Development	SLSG SRS (Comms Team)	Ongoing task	**Output:** Lab developments are communicated, including to SLSG. **Outcome:** SLSG input to lab developments to promote sustainability and reduce costs.
	Resource/Support required: Updates on labs developments.			

C. Data and Evidence	Objective: To gather, collate and develop evidence and data on the effectiveness and consequences of various opportunities for efficiency improvements.			KPI: Number of topics for which a body of evidence has been produced and made available to SLSG.
Tasks	**Colleagues Responsible**	**Colleagues to Consult**	**Dates**	**Outputs / Outcomes**
C1. Develop metrics for measuring success	Andrew Arnott Dave Gorman Michelle Brown	SLSG	Summer 2016	**Output:** Metrics devised by which to measure success of sustainable labs project. **Outcome:** Greater ability to communicate impact of sustainable labs project succinctly with higher levels of management, leading to greater support for the sustainable labs project long-term.
	Resource/Support required: Support developing the scope of the task. Contribution to and review of the Metrics.			

C2. Energy metering at a building, floor or equipment level to see the impact of actions	David Jack Andrew Arnott	Lab users SLSG	Autumn 2016	**Output:** Increased detail of metering of lab spaces (could be temporary or permanent) to gather more accurate data on lab energy use. **Outcome:** Greater accuracy of data available for use in engagement and communications materials. Greater impact of communications materials from use of actual data from UoE spaces.
	Resource/Support required: Support developing the scope of the task. Metering information (location, accessibility, type, etc.). Identification of a suitable location.			
C3. Report progress against the Implementation Plan to SLSG core group meetings (written report with RAG status)	Andrew Arnott	SLSG	Ongoing task – each SLSG core meeting.	**Output:** Report at each meeting on progress against SLSG Implementation Plan 2016. **Outcome:** SLSG is aware of progress against SLSG Implementation Plan 2016 and can intervene if considered necessary to achieve failing targets.
	Resource/Support required: N/A			

D. Engagement	Objective: To secure funding to support the continuation of sustainable laboratory work within the University of Edinburgh. To increase knowledge and awareness of sustainability actions among laboratory users.	KPI: Amount of time the sustainable laboratories work is supported for after August 2017. Number of communications (events/presentations/talks/meetings/distribution of materials) between Labs Sustainability Coordinator and key laboratories personnel.

Tasks	Colleagues Responsible	Colleagues to Consult	Dates	Outputs / Outcomes
D1. Identify gaps in engagement across UoE, and work with Schools to address those gaps.	Andrew Arnott Caro Overy	SLSG	March – Sept 2016	**Output:** Gap analysis report on lab sustainability contacts. **Outcome:** SLSG members suggest contacts to fill gaps. Greater universal engagement across all labs at UoE.
	Resource/Support required: SLSG members to help identify individuals/groups to engage with in areas where there are currently gaps in our engagement.			

D2. Deliver labs workshops for specific networks or contacts groups (e.g. College specific meetings) in order to reach a greater number of lab users and receive a broader range of inputs/ideas/contributions.	Andrew Arnott	Lab users	April – October 2016	**Output:** Hold an engagement event at each labs campus across the University. **Outcome:** Enable the views and opinions of more people to be heard, while also discussing and disseminating knowledge of best practice. Greater awareness of lab sustainability best practice among lab users. Input of new ideas to the sustainable labs programme from engagement with new people.
	Resource/Support required: Support from SLSG members in each location to identify a suitable venue and time and help encouraging lab users to attend.			
D3. Increase labs participation in Edinburgh Sustainability Awards.	Andrew Arnott Caro Overy	SLSG	October 2016	**Output:** Greater number of labs applying for the Edinburgh Sustainability Awards. **Outcome:** Greater awareness of lab sustainability best practice across UoE labs, leading to environmental and cost benefits.
	Resource/Support required: SLSG members to help identify potential labs groups who may want to join the awards scheme.			
	Resource/Support required: Travel to and attendance at external meetings.			

D4. Communicate on labs sustainability and increase awareness.	Andrew Arnott SRS Comms team	SLSG	Summer 2016	**Output:** New materials developed with well-chosen analogies and other communications techniques. **Outcome:** Better communication of labs sustainability messages and better awareness among lab users of sustainability practices.
	Resource/Support required: Design and publishing of marketing materials.			
D5. Consolidate experience into guides describing good practice in labs.	Andrew Arnott	SLSG	November 2016	**Output:** Guides which describe good practice in labs. **Outcome:** Greater awareness of lab sustainability best practice.
	Resource/Support required: Review of guides			

D6. Develop a Vision by which to communicate our aims to people who could fund work to continue the work to improve sustainability in labs.	Andrew Arnott Dave Gorman Michelle Brown	SLSG	May 2016	**Output:** Short statement of the 'vision' of the SLSG allowing better communication of the key aims and purpose of the SLSG, the Sustainable Labs Coordinator and the labs sustainability programme. **Outcome:** Better understanding among key stakeholders/potential funders of the sustainable labs programme and its constituent parts, and the value of it.
	Resource/Support required: Contribution to and review of the Vision			

Annex A

Sustainable Laboratories Steering Group – remit and membership

A remit and membership for SLSG had been approved by the Sustainability Operations Advisory Group on 5 November 2014.

"The main purpose of the Steering Group would be to provide expert guidance and direct the expanding remit of work associated with sustainable laboratories. It would ensure that work on sustainable laboratories is continued through a coordinated approach. The proposed Steering Group would:

- Provide expert guidance to the Labs Sustainability Coordinator
- Contribute towards setting future objectives and monitoring progress
- Identify funding opportunities to support sustainable laboratories work
- Achieve buy in from academic schools, support groups and research centres
- Link sustainable laboratories agenda with University-wide strategic plans and objectives.

The Steering Group would aim to bring together colleagues from across university academic schools and support groups with expertise in laboratory practices and systems."

At the inaugural meeting it was proposed that a core steering group be established with additional representatives joining for themed meetings which would help develop strategy and advise on activities for the Labs Sustainability Coordinator. A wider mailing list of interested supporters would be maintained.

CORE GROUP MEMBERSHIP	
Andrew Arnott	Labs Sustainability Coordinator
Dave Gorman	Director of Social Responsibility & Sustainability
Rab Calder	Energy and Systems Manager
David Gray	Professor of Immunology, Institute of Infection & Immunology Research
Graham Thomas	Director of Central Bioresearch Services
David Jack	Energy Manager
Julia Laidlaw	Project Manager (Estates and Buildings)
Martin Crawford	Controls Manager
Andy Kordiak	Equipment Procurement Manager, MVM
Sandra Lawrie	Technical Services & Estates Manager, School of Biological Sciences
Brian McTeir	Easter Bush Campus Facilities and Services Manager
Stewart McKay	Technical Services Manager, IGMM
Heather Anderson	Senior Technical Officer, CMVM
Candice Schmid	Health & Safety Adviser
Valerie Gordon	Technical Officer, Institute for Education, Teaching & Leadership
Position Vacant	Student Researcher

THEMATIC/OPERATIONAL GROUP MEMBERSHIP	
Heather Anderson	Building Manager, Chancellor's Building
Andrew Arnott	Labs Sustainability Coordinator
Graham Bell	Estates Depute Director
Jim Brown	Zone Manager, KB
Michelle Brown	Head of SRS Programmes
Ronald Brown	Deputy Technical Services Manager, School of Chemistry
Rab Calder	Energy Systems Manager
Martin Crawford	Controls Manager
Valerie Gordon	Technical Officer, Institute for Education, Teaching & Leadership
Dave Gorman	Director of Social Responsibility & Sustainability
David Gray	Professor of Immunology, Institute of Infection & Immunology Research
Graham Thomas	Director of Central Bioresearch Services
Guy Lloyd-Jones	Forbes Chair of Organic Chemistry
David Jack	Energy Manager
Andy Kordiak	Equipment Procurement Manager, MVM
Sandra Lawrie	Technical Services & Estates Manager, School of Biological Sciences
Matthew Lawson	Programme Manager

Chris Litwiniuk	Engagement Facilitator
Stewart McKay	Technical Services Manager, IGMM
Brian McTeir	Easter Bush Campus Facilities and Services Manager
Lyndsay Murray	Health and Safety Manager – Chancellors - CMVM
Janet Philp	School Administrator, School of Biomedical Sciences
Fleur Ruckley	Waste & Environment Manager
Candice Schmid	Health & Safety Adviser
Laura Skinner	College Procurement Manager, Science & Engineering
Anna Stamp	Estate Development Manager, CMVM
Dawn Windsor	Easter Bush Deputy Campus Facilities and Technical Manager
Margarida Teixeira-Dias	Physical Resources and Scientific/Technical Services Manager (Geosciences)
Position Vacant	Student Researcher

Annex B

Core Audit Group – remit and membership

The Core Audit Group exists as an operational level group to steer and plan the activities relating to the laboratories section of the Edinburgh Sustainability Awards. The Group's activities includes timings and logistics of awards audits, as well as providing a forum for communication between participants of the awards scheme and the organisers of the awards scheme (Social Responsibility and Sustainability department).

The CAG consists of the Labs Sustainability Coordinator and representatives of laboratories who have taken part in the awards scheme for a number of years. This comprises:

AWARDS CORE AUDIT GROUP MEMBERSHIP	
Heather Anderson	Building Manager, Chancellor's Building
Andrew Arnott	Labs Sustainability Coordinator, Department of Social Responsibility and Sustainability
Ronald Brown	Deputy Technical Services Manager, School of Chemistry
Brian McTeir	Easter Bush Campus Facilities and Services Manager, College of Medicine and Veterinary Medicine
Dawn Windsor	Easter Bush Deputy Campus Facilities and Technical Manager, College of Medicine and Veterinary Medicine
Stewart Franklin	Technical Officer, School of Chemistry
Eliane Salvo-Chirnside	Senior Research Technician, SynthSys, School of Biological Sciences
Carol Wollaston	Centre Manager, Centre for Integrative Physiology, College of Medicine and Veterinary Medicine

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D

Leading on from the discussions held during the November Sustainable Labs Steering Group, it was decided that sustainable design of new and refurbished laboratories would be one of the focus areas for 2016.

In June 2015 we held a Labs Workshop on the topic of lab design, and in that workshop we reviewed a draft document from S-Lab on Design Principles. The latest draft, below, is not yet complete, and University of Edinburgh SRS department have been invited by S-Lab to contribute to the next iteration of it by comparing the Design Principles document to our current practices and using this process to identify opportunities for improvement within UoE, while also influencing the next iteration of the design guide.

Proposed plan and request:

1. March 2016 - Estates Development share document(s) describing their current process of labs design at different RIBA stages
2. March – May 2016 – Estates Development document(s) are compared to the S-Lab principles by UoE SRS department, along with S-Lab and their supporting partner AECOM. Input from Estates Development would be appreciated at this stage but is optional if time does not allow. A ‘gap analysis’ document is produced and circulated to key stakeholders.
3. Mid May 2016 – a workshop is held where key stakeholders are invited to discuss the S-Lab Principles and the gap analysis document, explore the initial findings and identify any flaws within the gap analysis document. S-Lab and AECOM to be present at this workshop to answer any questions.
4. May 2016 – September 2016 the gap analysis document is revised by UoE SRS department, along with S-Lab and their supporting partner AECOM. Input from Estates Development would be appreciated at this stage but is optional if time does not allow. A revised ‘gap analysis’ document is produced and circulated to key stakeholders.
5. Sept/Oct 2016 a second workshop is held to discuss the revised document and identify next steps.

Good Laboratory Design

Introduction

This document is the output of a small-scale project that aims to produce simple guidance for the design of university and research laboratories, and especially those which are refurbishments. It is being resourced by AUDE and S-Lab, with technical support from AECOM. The current version gives an indication of its architecture – a forthcoming version will be populated with more content.

The document is being produced to distil lessons from the many excellent projects that have taken place within the sector – for example, many of those applying to the S-Lab Awards – so that they can be applied more broadly. It also seeks to ameliorate some of the issues which have occurred in less successful projects, and to respond to growing financial and other pressures on the sector, and the consequent need to make new projects even leaner in design and operation than they are currently. Hence, as well as covering the design and estates aspects of refurbishment, it also views new build and refurbishment as an opportunity to consider longer term working practices within a laboratory.

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The document has been prepared with great awareness of the relatively small size, and tight time constraints, of many refurbishment projects. Hence, it has been kept as simple as possible, but with the scope to 'drill down' into specific areas that are of particular relevance and importance. It is also intended to provide a mechanism to draw in and learn from the insights of other people with relevant knowledge, but who are sometimes not involved until a late stage, if at all. These include technical support staff, maintenance staff, specialist suppliers and others. This is reflected in a two level structure with:

Level 1 being a set of high level principles (currently 22) aimed at giving context, and providing an agenda for high level discussion between interested parties. These can be found on the next page.

Level 2 fleshing out each principle into actionable criteria for relevant stages of the RIBA 2013 Plan of Work. The current document is a first indication of what these will be. Each criterion will have links to illustrative material from case studies of shortlisted S-Lab Award applications and other sources. The main aim of the criteria is to engender discussion, direct attention, suggest concrete measures that can be implemented into the design and construction and provide a framework for on-going assessment of the project. Not all criteria will be relevant to a specific project and so a selection process will take place at an early stage.

Level 3 that contains more detailed information for each criterion. The information is likely to include a) an explanation of why it matters, b) detailed guidance on how it can be achieved, c) more detailed links to good practice examples (taken from S-Lab Award applications and other sources), and – wherever possible – d) simple ways of assessing whether the criteria has been met. Current resources do not permit too much work at this level but it is hoped that further work might be done.

It is also hoped that some of the principles, criteria and materials can be useful to other schemes, e.g. the RICS Ska Rating scheme with regard to ventilation and containment and other issues influencing energy consumption and environmental performance, Soft Landings.

Prepared by S-Lab with support from Aecom 24/9/15. Please send any comments to s-lab@istonline.org.uk.

Table 1: The RIBA 2013 Plan of Work Stages

RIBA Stage	Summary
Stage 0 Strategic Definition	Stage 0 is used to ensure that the client's Business Case and the Strategic Brief have been properly considered before the Initial Project Brief is developed. The Strategic Brief may require a review of a number of sites or alternative options, such as extensions, refurbishment or new build. By asking the right questions, the consultants, in collaboration with the client, can properly define the scope for a project, and the preparation and briefing process can then begin.
Stage 1 Preparation and Brief	Several significant and parallel activities need to be carried out during Stage 1 Preparation and Brief to ensure that Stage 2 Concept Design is as productive as possible. These split broadly into two categories - developing the Initial Project Brief and any related Feasibility Studies; and assembling the project team and defining each party's roles and responsibilities and the Information Exchanges. A project Risk Assessment is required to determine the risks to each party. The development of the procurement strategy, Project Programme and, in some instances, a (town) planning strategy are all part of this early risk analysis.
Stage 2 Concept Design	Stage 2, the initial Concept Design is produced in line with the requirements of the Initial Project Brief. The project team also develops, in parallel with the Concept Design, a number of Project Strategies. Their importance at this stage will depend on how they are to influence the Concept Design. For example, the Sustainability Strategy is likely to be a fundamental component of the Concept Design, whereas a security strategy may have minimal or no impact and can therefore be developed during a later stage. In parallel with design activity, a number of other related tasks need to be progressed in response to the emerging design, including a review of the Cost Information, the development of a Construction Strategy, a Maintenance and Operational Strategy and a Health and Safety Strategy and updating of the Project Execution Plan.
Stage 3 Developed Design	During this stage, the Concept Design is further developed and, crucially, the design work of the core designers is progressed until the spatial coordination exercises have been completed. This process may require a number of iterations of the design and different tools may be used, including design workshops. By the end of Stage 3, the architectural, building services and structural engineering designs will all have been developed, and will have been checked by the lead designer, with the stage design coordinated and the Cost Information aligned to the Project Budget. Project Strategies that were prepared during Stage 2 should be developed further and in sufficient detail to allow the client to sign them off once the lead designer has checked each strategy and verified that the Cost Information incorporates adequate allowances. Change Control Procedures should be implemented to ensure that any changes to the Concept Design are properly considered and signed off, regardless of how they are instigated.
Stage 4 Technical Design	The architectural, building services and structural engineering designs are now further refined to provide technical definition of the project and the design work of specialist subcontractors is developed and concluded. The level of detail produced by each designer will depend on whether the construction on site will be built in accordance with the information produced by the design team or based on information developed by a specialist subcontractor. The Design Responsibility Matrix sets out how these key design interfaces will be managed. Using the design coordinated during the previous stage, the designers should now be able to develop their Technical Designs independently, with a degree of autonomy. The lead designer will provide input to certain aspects, including a review of each designer's work. Once the work of the design team has been progressed to the appropriate level of detail, as defined in the Design Responsibility Matrix and the Design Programme, specialist subcontractors and/or suppliers undertaking design work will be able to progress their design work. The lead designer and other designers, where required as part of their Schedule of Services, may have duties to review this design information and to ensure that specialist subcontractor design work is integrated with the coordinated design.

RIBA Stage	Summary
Stage 5 Construction	During this stage, the building is constructed on site in accordance with the Construction Programme. Construction includes the erection of components that have been fabricated off site. The procurement strategy and/or the designer's specific Schedule of Services will have set out the designer's duties to respond to Design Queries from site generated in relation to the design, to carry out site inspections and to produce quality reports. The output of this stage is the 'As-constructed' Information.
Stage 6 Handover and Close out	The project team's priorities during this stage will be facilitating the successful handover of the building in line with the Project Programme and, in the period immediately following, concluding all aspects of the Building Contract, including the inspection of defects as they are rectified or the production of certification required by the Building Contract. Other services may also be required during this period. These will be dictated by project specific Schedules of Services, which should be aligned with the procurement and Handover Strategies.
Stage 7 In use	This is a new stage within the RIBA Plan of Work. It acknowledges the potential benefits of harnessing the project design information to assist with the successful operation and use of a building. While it is likely that many of the handover duties will be completed during Stage 6, prior to conclusion of the Building Contract, certain activities may be required or necessary afterwards. These should be confirmed in the relevant Schedule of Services. While the end of a building's life might be considered at Stage 7, it is more likely that Stage 0 of the follow-on project or refurbishment would deal with these aspects as part of strategically defining the future of the building.

LEVEL 1: PRINCIPLES

PROCESS 1 Have an effective and inclusive decision process. 2 Ensure that the design and its implementation properly considers lifetime use of the space. 3 Ensure that there is a good understanding of all relevant regulations and good practice measures and that these are met in practice. 4 Ensure that the design specification and intent is implemented properly.
CONFIGURATION & WORK PRACTICES 5 Ensure adequate and effective space for write up, technical support, logistics, storage and maintenance. 6 Explore opportunities to reconfigure working practices and maximise interaction to take advantage of refurbished space. 7 Optimise siting and monitoring of dangerous and/or resource intense activities and equipment.
VENTILATION AND CONTAINMENT 8 Ensure safe working conditions in both contained and general laboratory spaces. 9 Ensure that ventilation can be varied in response to user demand. 10 Ensure that ventilation equipment and configurations are as efficient as possible.
HEALTH, SAFETY AND WELL BEING 11 Ensure adequate lighting and maximise daylighting and visibility. 12 Ensure that health and safety is a key influence on project decisions.
EQUIPMENT AND FURNITURE 13 Ensure that all equipment is fit for purpose, right sized and right sited. 14 Ensure that all equipment provides value for money on a lifetime basis. 15 Ensure that all furniture, fixtures and finishes are suitable for laboratory environments.
LABORATORY SERVICES 16 Explore potential for centralised support systems. 17 Minimise waste and manage effectively. 18 Minimise requirements for water usage.

LABORATORY OPERATION AND MANAGEMENT

19 Ensure that the future management and operation of the refurbished laboratory is a key influence on project decisions.

20 Identify and ameliorate threats to business continuity.

21 Identify and properly consider opportunities to improve use and management of chemicals, consumables, materials and samples.

22 Ensure that use of electricity and water can be monitored, managed and minimised.

LEVEL 2: IMPLEMENTING THE PRINCIPLES

The following sections will be fleshed out during the autumn. Red text is the Principle, **bold text provides more detail on how they can be achieved and assessed**, *italic summarises supporting cases and materials* (which can be found on www.dropbox.com/sh/1ut7wgstbbnk7yb/AAC6s68OcoTveIWVi9yCIcyAa?dl=0 or via the www.effectivelab.org.uk/good-laboratory-design.html page.

RIBA Stage	**1 Have an effective and inclusive decision process.**
0. Strategic Definition	**1.0 Identify and include key stakeholders for the scheme, including technical staff, students (for teaching space), maintenance and MEP and other specialist suppliers, in ways that encourage effective inputs at the right times to influence decisions.** *CTC Case – A challenging site in an occupied hospital necessitated good communication among stakeholders including weekly newsletters and face-to-face meetings.* *Glasgow Case – Main occupants of the lab were heavily involved in the briefing as well as site and progress meetings.* *Lilly UK Case – Full user group engagement and consultation with key stakeholders.* *Sheffield Case – Along with consultation with academic staff, live CAD sessions were held with relevant stakeholders to enable dynamic design of the facility and prevent repeated email correspondence.* *Oxford Case – A design team and user consultation framework was established to ensure communication remained consistent throughout the duration of the project.* *Tyree ETB Case – University students were given the opportunity to engage with a live site. Additionally the design team and University worked collaboratively to review and assess a variety of sustainability initiatives.* *UEA Case – Extensive consultation with stakeholders allowed fast-track design and build programme without compromising end result or user satisfaction.*
1. Preparation and Brief	**1.1 Establish early agreement on project scope, objectives and budget.**
2. Concept Design	

3. Developed Design	**1.3 Have a formal review and process for all changes to the design and its implementation and highlight cost/performance implications of significant ones to stakeholders.**
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**2 Ensure that the design and its implementation properly considers lifetime use of the space and, wherever possible, can be adapted to changing circumstances.**
0. Strategic Definition	**2.0 Take account of the current situation and planned change in adjacent spaces and identify synergies and potential problems.**
1. Preparation and Brief	**2.1 Consider key briefing objectives for how the space may need to consider future requirements.**
2. Concept Design	**2.2a Maximise the reconfigurability of rooms, fittings and furniture wherever feasible.** *CTC Case – Moveable furniture and equipment allows for continuous reconfiguration of 'working pods', increasing both capacity and productivity.* *Edinburgh Case – Adaptability through the ability to restore smaller laboratories, use of moveable storage units, exposed services, and spare gas lines.* *Lilly UK Case – The ability to swing between chemistry and biology functions is facilitated by fully mobile fume cupboards and plug and play services.* *Oxford Case – Use of 3.3m grid, sacrificial internal partitions, blackout curtains and moveable storage.* *Sheffield Case – Several smaller spaces were combined to form one large multipurpose laboratory which can host a range of practical experiments from a variety of disciplines.* *Tyree ETB Case – Flexible laboratory modules can be adjusted over time.* **2.2b Take a modular approach to plant and equipment wherever feasible.** *Oxford Case – Laboratory set out on a 3.3m grid.*
3. Developed Design	**2.3 Consider making fume cupboards a moveable item of furniture rather than a fixed item to create easy of modification to the space.** *Lilly UK Case – Fume cupboards are a moveable item of furniture.*
4. Technical Design	**2.4 Review Stage 4 design against brief.**
5. Construction	**2.5 Review relevant contractors' technical submissions and consider mock ups.**

6. Handover and Close out	
7. In use	

RIBA Stage	3 Ensure that there is a good understanding of all relevant regulations and good practice measures and that these are met in practice.
0. Strategic Definition	
1. Preparation and Brief	**3.1a Visit other facilities to benchmark good practice and space planning metrics.** **3.1b Assign responsibility for meeting key requirements.**
2. Concept Design	**3.2a Review relevant regulations with Designers.** **3.2b Visit other facilities to benchmark.**
3. Developed Design	**3.3 Review compliance with key regulatory/HSE requirements.**
4. Technical Design	**3.4a Review specifications for safety related equipment or systems.** **3.4b Identify commissioning requirements.**
5. Construction	
6. Handover and Close out	**3.6 Identify handover requirements for safety related equipment or systems.**
7. In use	

RIBA Stage	4 Ensure that the design specification and intent is implemented properly.
0. Strategic Definition	**4.0 Identify and implement relevant management protocols.** *Adopt Ska/BREEAM as early as possible etc.*
1. Preparation and Brief	**4.1 Ensure effective review process/consider peer review**
2. Concept Design	
3. Developed Design	**4.3a Ensure effective commissioning.** *Prepare maintenance and operational strategy and review handover strategy and documentation.* **4.3b Ensure that all relevant contractors understand the key design and specification issues of the project.** *While specialist sub-contractors will undertake their design work at Stage 4, they may provide information and guidance during stage 3 in order to facilitate a more robust developed design*.
4. Technical Design	
5. Construction	**4.5 Provide adequate quality monitoring/consider additional engineering site staff or COW for complex projects.**
6. Handover and Close out	
7. In use	

RIBA Stage	**5 Ensure adequate and effective space for write up, technical support, logistics, storage and maintenance.** *Glasgow Case – Analytical facilities and write up areas surround the laboratory space to enable poly-thematic approaches to tackle multi-disciplinary challenges.* *Lilly UK Case – Under-utilised colonnade space around the building perimeter was adopted into the footprint of the building creating additional write up space with both external views and internal views to the labs.* *Oxford Case – Write up spaces located in second floor with ample daylighting and adjacent to social spaces and meeting rooms to enhance collaborative environment.*
0. Strategic Definition	
1. Preparation and Brief	**5.1 Area briefing to include support spaces.**
2. Concept Design	**5.2a Benchmark space types/areas with other projects.** **5.2b Verify access routes for largest piece of laboratory equipment for maintenance /replacement.** **5.2c Provide adjustable height benches and take measures to provide access for people with disabilities.** *Glasgow Case – The lab is fitted with adjustable height benching for wheelchair users and the group meeting room has full induction loop facilities for hearing aid users.* **5.2d Ensure easy and non-disruptive access to plant and large equipment for maintenance/replacement.**
3. Developed Design	
4. Technical Design	
5. Construction	
6. Handover and Close out	

7. In use	

RIBA Stage	**6 Explore opportunities to reconfigure working practices and maximize interaction to take advantage of refurbished space.** *Lilly UK Case – Removal of cellular spaces in favour of large sub-divisible science spaces.* *Sheffield Case – Improved sightlines due to low level service upstands and installation of LCD relay screens increases interaction between staff and students.*
0. Strategic Definition	
1. Preparation and Brief	**6.1 Establish key briefing requirements.**
2. Concept Design	**6.2 Encourage resource efficiency and high utilisation through provision of common services, appropriate siting and other means.** *CTC Case – summarise* *Edinburgh Case – Siting of instrumentation rooms directly adjacent to main lab space ensures that transient species can be prepared and analysed immediately.* *Huntsman Pigment Case – Multiple laboratories housed in several buildings have been rationalised into one open plan facility with shared facilities.* *Kings College London Case – Consolidated two aquariums into one facility and introduced an automated feeding system which enabled the expansion of Zebrafish stock holdings and enabled staff to deal with more complex tasks* *Lilly UK Case – Introduction of central shared equipment zones to optimise use of specialist equipment and a central lab corridor to allow better interaction between researchers.* *Oxford Case – Provision of shared core laboratory resources and write up space allows multiple research groups to benefit from common knowledge and technical expertise.* *Tyree ETB Case – Interaction encouraged through generous circulation, social spaces and interconnected flexible labs.* *UEA Case – Two wings containing shared specialist facilities, lab, teaching and write up spaces are linked via an atrium containing shared social space.*
3. Developed Design	

4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**7 Optimise siting and monitoring of dangerous and/or resource intense activities and equipment.** *Huntsman Pigment Case – the predominantly open plan facility accommodates some satellite labs for specific risk based activities that may require enclosure.*
0. Strategic Definition	
1. Preparation and Brief	**7.1 Establish hazardous activities in initial brief process.**
2. Concept Design	**7.2 Minimise and provide hazard-free movement and storage of supplies and wastes.**
3. Developed Design	
4. Technical Design	**7.4 Ensure that all monitors and sensors are taking direct measurements of relevant activities/space/equipment and are not adversely influenced by other factors.**
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**8 Ensure safe working conditions in both contained and general laboratory spaces.**
0. Strategic Definition	
1. Preparation and Brief	
2. Concept Design	
3. Developed Design	**8.3 Provide ventilated storage to prevent hazardous materials/processes being stored in fume cupboards.** *Glasgow Case – Chemicals are stored in purpose built vented safety cabinets.*
4. Technical Design	**8.4 Risk assess all fume cupboards in compliance with BS EN 14175.**
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**9 Ensure that ventilation can be varied in response to user demand.** *Lilly UK Case – uses demand lead systems.*
0. Strategic Definition	
1. Preparation and Brief	
2. Concept Design	
3. Developed Design	**9.3 Ensure that high air flow spaces and containment devices can be switched off and/or put into standby mode when safety and science considerations permit.**
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**10 Ensure that HVAC equipment and configurations are as efficient as possible.** *Edinburgh Case – 3 existing stacks have been replaced with variable speed extract systems to service fume cupboards and other equipment.* *Glasgow Case – 50% reduction in capital and energy costs due to radical rethink of the fume cupboard system.* *Lilly UK Case – Fume cupboards are fully mobile with their own process cooling below each unit.* *Oxford Case – Three risers located at regular points throughout the building prevent large main duct runs over long distances and allows for future modifications in line with changes in user requirements.* *Sheffield Case – Radiant heat panels in the lab ceiling maximises available floor area and are more efficient than radiators.* *Sheffield Case – Fume cupboards use patented foil which is aerodynamically designed to produce a higher volumetric airflow with less power.* *Tyree ETB Case -* *UEA Case – Mechanical ventilation and cooling strategy is used in the research lab wing whereas the teaching wing is fully naturally ventilated. In addition, highly efficient under floor heating and solar PV's.*
0. Strategic Definition	
1. Preparation and Brief	**10.1 Consider alternative LEV systems to fume cupboards if appropriate.** *Glasgow Case – adopted a 'first principles' approach at the briefing stage to identify each aspect of energy in use in the fume cupboard system.*
2. Concept Design	
3. Developed Design	**10.2a Use high efficiency fans and inverters.** **10.2b 'Right size' cooling loads and establish diversified heat gain from operation of equipment.** *CTC Case – dedicated air handling system which re-circulates and re-conditions the air to each laboratory to minimise the heating and cooling loads for fresh make up air.* **10.2c Install fume cupboards with volume air flow rates lower than XX wherever risk assessment permits.** *Edinburgh Case – Fume cupboard face velocities are 0.3m/s and fume duct velocities are limited to 4m/s.* *Sheffield Case – Fume cupboard face velocities are 0.3m/s.* **10.2d Manifold fume cupboards wherever possible and consider diversity in use when sizing central plant.** *Edinburgh Case – 3 variable speed extract systems serve 13 low flow fume cupboards.*

	Sheffield Case – Fume cupboard sash has a diversity factor of 50%-60% whereby the investment and operating costs of the entire plant can be considerably reduced.
4. Technical Design	**10.4a Achieve as low as possible pressure drops.** *E.g. 3D design, optimise pipe runs, right size fans to load.* **10.4b Specify adaptive cooling when external ambient condition rise above the design values.**
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**11 Ensure adequate lighting and maximise daylighting and visibility.**
0. Strategic Definition	
1. Preparation and Brief	
2. Concept Design	**11.2a Maximise use of daylighting, especially in write-up and technical support areas.** *Glasgow Case – Reinstated and upgraded rooflights allowing north light to permeate the laboratory. Used automatic lighting controls incorporating daylight compensation.* *Lilly UK Case –Write up spaces are positioned around the building perimeter with external windows. Central lab spaces have internal windows to write up spaces and use fume cupboards with glazed side panels to encourage daylight penetration.* *Oxford Case – Internal planning ensures write up spaces are located on the floor with a shallower plan to utilise daylighting while laboratory spaces are open and transparent to maximise daylight penetration where possible.* *Tyree ETB Case – Use of rooflights, high performance glazing and atria to maximise daylight.* *UEA Case – Saw tooth roof design creates a series of North Lights that allow spaces to be day-lit without excess solar gain.* **11.2b Maximum internal and, wherever feasible, external visibility.** *CTC Case – extensive use of glazing between meeting, breakout area, office space and labs creates a collaborative working environment.* *Edinburgh Case – The lab has continuous vistas along the length of the newly unified space creating a clear visual link from the adjacent offices.* *Lilly UK Case – Write up spaces have external views and visual connectivity to the labs.* *UEA Case – All lighting is low-energy and generally controlled through absence detection.*
3. Developed Design	**11.3a Avoid general over-illumination and ensure right sized and fit for purpose task lighting for both vertical and horizontal planes.** *Glasgow Case - Automatic lighting controls in non-office spaces incorporating daylight compensation.* **11.3b Use energy efficient luminaires.** *CTC Case – Energy efficient LED lighting with movement detection system*

	Glasgow Case – Energy efficient T5 and compact fluorescent lamps and automatic lighting controls incorporating daylight compensation. *Lilly UK Case – Use of LED and daylight controls.* *Tyree ETB Case – Use of daylight sensors with time control clock.* Previous criteria still relevant: 11.2b
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	12 Ensure that health and safety is a key influence on project decisions.
0. Strategic Definition	
1. Preparation and Brief	**12.1a Ensure that a health and safety expert has input into all key project decisions.** **12.2b Identify and plan to remove or minimise all potential hazards.**
2. Concept Design	
3. Developed Design	**12.3 Ensure that safety stations for eyewash, hand wash etc. are available within easy access to users in all hazard areas.** *Sheffield Case – Hand wash area highly visible and accessible from main lab space.*
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**13 Ensure that all equipment is fit for purpose, right sized and right sited.** *Oxford Case – Heavily serviced areas are located in line with three service risers*
0. Strategic Definition	
1. Preparation and Brief	**13.1a Establish a holistic procurement strategy for equipment that involves all key stakeholders, including users.** **13.1b Create an inventory of equipment to be retained or transferred along with services requirements.**
2. Concept Design	**13.2 Identify equipment that may impact on the design proposals.**
3. Developed Design	**13.3a Systematically assess likely cooling and heating loads and other parameters in equipment areas and consider ways to meet them economically and energy efficiently.** **13.3b Ensure that equipment can be switched off easily when not in use and identify a 'switching off' protocol.**
4. Technical Design	**13.4 Create an inventory of equipment to be retained or transferred along with services requirements.**
5. Construction	
6. Handover and Close out	
7. In use	**13.7 Establish monitoring regime for equipment operation.**

RIBA Stage	14 Ensure that all equipment provides value for money on a lifetime basis.
0. Strategic Definition	
1. Preparation and Brief	**14.1 Identify Contract provided or Client provided equipment. Identify equipment budgets.**
2. Concept Design	**14.2 Agree performance requirements for equipment.**
3. Developed Design	**14.3 Take account of all cost parameters, including cooling, heating and maintenance. Consider pre-tendering activities for significant items that may affect energy usage**
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**15 Ensure that all furniture, fixtures and finishes are suitable for laboratory environments.** *Edinburgh Case – New finished such as flooring and worktops were carefully selected to be robust and sustainable.* *Tyree ETB Case – All materials were selected to be durable to ensure longevity, reduce maintenance and material replacement. Finishes selected were low in VOCs and formaldehyde content.*
0. Strategic Definition	
1. Preparation and Brief	
2. Concept Design	
3. Developed Design	**15.3 Consider requirements for mock ups of furniture to establish quality benchmarks.**
4. Technical Design	**15.4 Consider specifications of finishes that may be affected by cleaning or decontamination protocols.**
5. Construction	**15.5 Review Contractors Proposals/mock ups**
6. Handover and Close out	
7. In use	

RIBA Stage	16 Explore potential for centralised support systems.
0. Strategic Definition	
1. Preparation and Brief	**16.1 Review scope of laboratory services, eg vacuum systems, Laboratory gases, Analytical water, process cooling water.**
2. Concept Design	**16.2 Review scope of centralised laboratory services, eg vacuum systems, compressed air, laboratory gases, Analytical water, process cooling water and consider alternative local systems.**
3. Developed Design	**16.3 Agree options for centralised vs local systems. Identify what is provided in the Construction contract.**
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**17 Minimise waste and manage effectively.** *Huntsman Pigment Case – Innovative approach to effluent waste handling on site to ensure no waste is leached into the water table on the greenfield site.* *Tyree ETB Case – waste management strategies and recycling adopted throughout demolition, construction and occupation.*
0. Strategic Definition	
1. Preparation and Brief	**17.1a Review initial brief for waste management.** **17.1b Provide trade effluent statement.**
2. Concept Design	
3. Developed Design	**17.3 Review waste streams and storage/collection/recycle procedures.**
4. Technical Design	
5. Construction	
6. Handover and Close out	

7. In use	

RIBA Stage	**18 Minimise requirements for water usage.** *Edinburgh Case – The lab uses seven recirculating water chillers to serve from a single to small groups of fume cupboards and rotary evaporators.* *CTC Case – the exclusive use of single disposable systems eliminated the need for Water Treatment Systems* *Lilly UK Case – water saving measures (need more specific info)*
0. Strategic Definition	
1. Preparation and Brief	
2. Concept Design	**18.2a Review requirements for water; sinks, drip cups, whb, drench showers, eyewash, analytical.** **18.2b Review opportunities for grey water systems.** *Tyree ETB case – Rainwater harvested and used in grey water systems.*
3. Developed Design	**18.3a Review water efficient fittings/ limiting flow rates.** **18.3b Replace mains water cooling with local process cooling systems.** *Glasgow Case - Use of re-circulating chillers and air cooled condensers to minimise water use.* *Huntsman Pigment Case – Use of a single closed cooling system.* **18.3c Assess demand for analytical water and consider central points of use.** **18.3d Review metering strategy for different uses.**
4. Technical Design	**18.4 Specify water efficient fittings.**
5. Construction	
6. Handover and Close out	

7. In use	**18.7 Monitor water usage and analyse against benchmarks.**

RIBA Stage	**19 Ensure that the future management and operation of the refurbished laboratory is a key influence on project decisions.**
0. Strategic Definition	
1. Preparation and Brief	**19.1 Wherever possible, ensure that there is a single 'voice' to co-ordinate technical support and academic aspects of the project.**
2. Concept Design	
3. Developed Design	
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**20 Identify and ameliorate threats to business continuity.**
0. Strategic Definition	
1. Preparation and Brief	**20.1a Consider requirements for emergency shut off procedures for gases, water and power.** **20.1b Ensure effective monitoring, alarming and response plans for key activities and equipment.** **20.1c Anticipate and ameliorate the impact of changes in key personnel on project implementation and subsequent laboratory operation.**
2. Concept Design	**20.2 Establish provisions for resilience of laboratory support services, review impact of full or partial failure of laboratory services.** *Huntsman Pigment Case – In the event of power failure, there is the ability to connect to a generator sized to run the entire building.*
3. Developed Design	**20.3 Reconfirm provisions for resilience.**
4. Technical Design	**20.4a Review cause and effect on plant failure modes and establish resilience for business continuity.** **20.4b Specify testing of resilient systems and expected outcomes.**
5. Construction	
6. Handover and Close out	**20.6 Test any resilient systems.**
7. In use	**20.7 Review spares and maintenance for systems with low resilience.**

RIBA Stage	**21 Identify and properly consider opportunities to improve use and management of chemicals, consumables, materials, and samples.**
0. Strategic Definition	
1. Preparation and Brief	**21.1 Ensure that systems will be in place to track the location, ownership and use of chemicals, consumables, materials, samples and other substances within the refurbished laboratory.** *Glasgow Case – The School of Chemistry local chemical inventory system allows users to search for chemicals*
2. Concept Design	
3. Developed Design	
4. Technical Design	
5. Construction	
6. Handover and Close out	
7. In use	

RIBA Stage	**22 Ensure that use of electricity and water can be monitored, managed and minimised.** *Lilly UK Case – Commitment to an ongoing energy monitoring strategy. The monitoring of air flow usage has provided assurance for future phases of the refurbishment program.*
0. Strategic Definition	**22.0 Check that heating, cooling, power and other loads can be supplied by existing infrastructure and, if not, site for efficient operation.**
1. Preparation and Brief	**22.1 Review existing utility metering strategy and data and upgrade metering and monitoring to provide data on significant areas and types of energy and water use.**
2. Concept Design	
3. Developed Design	**22.3 Review and agree metering and monitoring strategy.** *Oxford Case -*
4. Technical Design	**22.4a Specify trend logging of parameters on BMS for performance analysis.** **22.4b Agree how metering can be commissioned at the start of the commissioning period.** **22.4c Review estimates of utility consumption.**
5. Construction	
6. Handover and Close out	**22.6 Review data against estimates.**
7. In use	**22.7 Monitor parameters against benchmarks to understand any unusual activity or to modify usage/set points.**