SCOTTISH HOSPITALS INQUIRY

Hearing Commencing 26 February 2024

Witness Bundle

Volume 3

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Scottish Hospitals Inquiry
Witness Statement of
Brian Currie

1. My name is Brian James Currie. I am a Senior Programme Director for NHSL. My previous statement provided to the Scottish Hospitals Inquiry for the purposes of the May 2022 Hearings sets out my professional background and experience.

2. This statement seeks to provide information to the best of my recollection. It was originally drafted in response to specific questions I was asked at interviews by the Scottish Hospitals Inquiry (SHI) on 17 November and 6 December 2022. It should be read in conjunction with my previous witness statement provided to the Inquiry in advance of the Hearings commencing on 9 May 2022 **(A37753091– Witness Statement Brian Currie – Bundle 13, Volume 9, Page 338)**. I was unable to finalise the witness statement prior to the SHI hearing commencing 24 April 2023 or to give oral evidence at that hearing.

3. I have now finalised my statement, including updating it to respond to specific issues I have been asked to clarify by the Inquiry.

Activity Database (ADB)

4. I am aware that NHS Lothian (NHSL) used the Activity Database (ADB) during the capital funded stage to prepare a Royal Hospital of Sick Children (RHSC) ADB, though I was not involved in the Project at that time. This RHSC ADB was provide to BAM, the Principal Chain Supply Partner (PSCP) to develop its design.

5. Hulley & Kirkwood (H&K) were appointed by BAM as their Mechanical and Electrical (M&E) engineers. This was before I was employed by NHSL in August 2009. However, I'm aware the NHSL Information Pack (HLIP) provided to BAM as the Principal Supply Chain Partner (PSCP) under the capital funded project refers to the use of the relevant design guidance and the ADB at paragraph 4.11 of Appendix C.

When the project switched to NPD, the requirement to use Chief Executive Letter (CEL) 19 2010 **(A37215536 – Chief Executive Letter (2010) "A Policy on Design Assurance for NHS Scotland 2010 Revision" – 2 June 2010 – Bundle 13, Volume 5, Page 2229)** was contained in the Invitation To Participate in Dialogue (ITPD) and the Project Agreement (PA).

6. I have been informed that H&K did not use the ADB when generating the Environmental Matrix (the EM). The only other way to prepare an EM would be to take information directly from the national design guidance, by which I mean the Scottish Health Technical Memorandum (SHTM), Scottish Health Planning Notes (SHPN) and Health Building Notes (HBN) and populate the EM directly from that.

7. During the reference design period, i.e. following the switch to an NPD funded model, H&K continued as the M&E engineers and Nightingale Associates and BMJ continued as the architects. There was a desire to utilise the operational functionality elements from the capital design – i.e. all the work done with the clinicians to develop the design in terms of layouts and adjacencies. Although I was not directly involved in the day to day management of the Reference Design Team, I would imagine the architects would have used their valuable knowledge from their meetings with the clinicians to develop the capital design to assess which elements of it could be salvaged to inform the reference design.

8. I do not know whether the Reference Design Team (Nightingale, BMJ, H&K and Arup) who were sub-contracted to our Technical Advisors, Mott MacDonald Ltd (Motts), used the ADB as a reference tool when developing the reference design. I certainly would have expected the Reference Design Team to refer to the national design guidance, including SHTM 03-01 for ventilation requirements. I note that the Reference Design Team did issue a compliance statement dated 16 March 2012 to Motts certifying that their design was compliant.

9. However, ultimately it was Project Co (IHSL) who were responsible for the final design given that the design risk transferred to them under the terms of the Project Agreement (PA), with the exception of operational functionality. NHSL brief was to

produce the Room Data Sheets (RDS), using the ADB and complying with SHTM 03-01. This was communicated to Bidders at the Bidders day\, in the Memorandum of Understanding, during Competitive dialogue, and in the ITPD, PA and Board Construction Requirements (BCR), which required compliance with SHTMs and CEL 19 2019. If there was doubt or inconsistency, it should have been flagged to NHSL by IHSL. It was not .I would be surprised if the ADB was not used by IHSL when generating RDS. It appears that it was used by HLM (IHSL architects) on the basis of the labelling evident on IHSL' RDS both at final tender and at financial close (FC) which quite clearly states at the bottom: "Department of Health Activity DataBase".

CEL 19 (2010) (A37215536 – Chief Executive Letter (2010) "A Policy on Design Assurance for NHS Scotland 2010 Revision" – 2 June 2010 – Bundle 13, Volume 5, Page 2229)

10. I was aware of CEL 19 2010. On 16 June 2010, MML provided a copy of CEL 19 (2010) and the Policy on Design Quality (**A37215536 – Chief Executive Letter (2010) "A Policy on Design Assurance for NHS Scotland 2010 Revision" – 2 June 2010 – Bundle 13, Volume 5, Page 2232**) by way of email to me for information and advised that BAM were aware of the revised information. MML were employed to recognise and incorporate all such requirements, which they did in the ITPD and BCRs. It is perhaps academic because IHSL appear to have utilised the ADB to prepare the RDS.

11. In my view, CEL 19 (2010) was drafted with capital funded projects in mind and did not anticipate NPD to the extent it transfers risk to the private sector. The whole point of NPD is to transfer sufficient risk to the private sector so that it can be accounted for as "off book" for national accounts purposes, which means it results in lower recorded levels of government debt and public spending in the short term. To get over that risk transfer threshold, the design, apart from operational functionality, sits firmly with the private sector and thus the production of RDS and EM, or other forms of specification, rests firmly with the private sector. I discuss the transfer of risk in more detail below.

12. CEL 19 (2010) imposed a requirement for NHS Scotland bodies to use ADB as a tool for briefing, design, and commissioning. If an alternative tool is used, it should be of equal quality and value to ADB in its application. However, the ADB was not deemed inappropriate for the project. Its use was specified in the ITPD and BCRs and was in fact used by IHSL to prepare the RDS. An alternative approach was used, i.e. that the onus was on the bidders to use the ADB to prepare the RDS, which reflects the transfer of risk inherent within NPD. So the ADB was used as a briefing tool but it was used by IHSL and not NHSL.

13. The ITPD and subsequent PA required bidders to comply with CEL 19 (2010) and a list of national design guidance (including SHTM 03-01) unless a specific derogation was made, which there was not. My assumption would therefore have been that the bidders were using the ADB to prepare their RDS. It would be difficult to produce RDS otherwise. The ADB provides template sheets from which the RDS are prepared.

14. I would, however, add that as noted in CEL 19 (2010), the ADB is not comprehensive nor project specific and has no reference to Scottish design guidance and accordingly requires extreme care and caution when being used in Scottish healthcare. What that means is that anyone using the ADB would have to cross-check the template ADB against the relevant SHTMs and HBNs.

15. An EM is not of equal quality and value to the ADB in that it only represents one aspect of the ADB, i.e. the environmental data. The EM was a supplementary tool which was used to capture the M&E information, but that M&E information was also contained in the RDS, which appear to have been prepared using the ADB. However, an EM contains additional M&E detail (more than can be found on the ADB alone) and so it could be said the EM was of equal (if not better) quality and value to the environmental data in the ADB on its own. The reality is that both an EM and, it would appear, the ADB were used by IHSL. RDS were produced by IHSL. Both the RDS and the EM contained the same errors. Any

errors/inconsistencies in the EM could and should have been flagged up by IHSL when they utilised the ADB to prepare the RDS.

16. NHSL were reassured by the fact that the documentation in the ITPD available to bidders, and the subsequent contract with the successful bidder, included a requirement for the successful bidder to ensure that the facilities (i) adhered to the requirements of CEL 19 (2010) and (ii) complied with Scottish design guidance SHTM 03-01 as mandatory in relation to ventilation requirements. I cannot recall specific discussions but we had numerous conversations with IHSL about compliance with guidance. IHSL were very much aware that NHSL brief was to deliver a building that complied with guidance. All the tender returns confirmed compliance with guidance. They would have failed if not. In addition, bidders would have to do their own due diligence on all contract documentation which would have highlighted the mandatory status in this particular contract.

17. In the ITPD and PA, Schedule Part 6, Section 3, **(A33405670 – Schedule Part 6: Construction matters, section 3 (Board's Construction Requirements), Subsections A, B and C – Hearing commencing 24 April 2023, Bundle 5, Page 194)** set out the Board's Construction Requirements and provided at paragraph 2.3(v) that, unless the Board had expressed elsewhere in the Board's Construction Requirements a specific and different requirement, which it did not, then IHSL had to *"take fully into account the guidance and advice included within such SHTM and HTM; ensure that the facilities comply with the requirement of such SHTM and HTM; and adopt as mandatory all recommendations and preferred solutions contained in such SHTM and HTM."* (**A33405670 – Schedule Part 6: Construction matters, section 3 (Board's Construction Requirements), Subsections A, B and C – Hearing commencing 24 April 2023, Bundle 5, Page 213**). The PA provided that, where there was an inconsistency in standards, the most onerous standard would prevail, unless there was an agreed derogation, which there was not. This reflected my understanding, i.e. that compliance with SHTM and HTM was mandatory, subject to any agreed derogations.

18. The EM was not NHSL brief. I refer to my first statement given to the Inquiry in advance of the Hearings in May 2022 where I explain the purpose of the EM in detail and to paragraph 31 below.

Reference Design

19. Motts were originally appointed as the NEC Supervisors in February 2010 during the capital funded project. Following the announcement of a switch to non-profit distributing public private partnership mode (NPD) in November 2010, NHSL re-appointed Motts to provide Project Management and Design Team Services on 13 June and 11 October 2011 (the Appointment). The Appointment was made under Framework Agreement RM457/1 signed on 20 October and 2 November 2009. The Appointment was varied and extended, as required, by a number of contract control orders.

20. Motts sub-contracted Davis Langdon as Project Managers. The designers who had been involved at the capital stage (NA, BMJ, H&K and Arup) were in turn sub-consulted by Davis Langdon to prepare the reference design. In terms of clause 50 of the Appointment, Motts were responsible to NHSL for services provided by sub-contractors as if they had been undertaken directly by Motts. (**A36878553 – Sub Consultancy Agreement between Mott MacDonald and Davis Langdon – 10 May 2011 – Hearing commencing 24 April 2023, Bundle 2, Page 144**).

21. Davis Langdon produced a Design Summary as at end of November 2010 (dated September 2010) (see earlier draft **A33146596 – Mott MacDonald, Davis Langdon Project Execution Plan – September 2011 – Hearing Commencing 9 May 2022, Bundle 3, Volume 2 (of 3), Page 488**). The document was a summary of the suspended design of the RHSC project at the point of suspension on 29 November 2019. Its purpose was to act as a reference document, detailing the outputs which had been compiled both by the design and advisory teams over the previous 18 months, as well as a schedule of actions which were ongoing as at the point of suspension and required further action. The design process, including the design monitoring system, is detailed and there is then a schedule of all current

design information, including generic and key room layouts and Clinical Output Based Specifications (COS).

22. From an NHSL perspective, the reference design team was being managed by Motts and Davis Langdon. Janice Mackenzie, Fiona Halcrow, Graham Gillies, and Neil McLennan from NHSL worked with the reference design team to ensure NHSL operational functionality requirements were being met in the reference design, e.g. that the departmental and room layouts and adjacencies were all as the users (clinicians, patients, and families) would wish.

23. Other work streams during this period included getting the supplemental agreements (SA) and a programme of enabling works agreed with Consort Healthcare (the Private Finance Initiative (PFI) provider running the Royal Infirmary of Edinburgh at Little France). I discuss the site constraints, SA6, SA7 and the enabling works in detail in my first statement at paragraphs 6 – 16 **(A37753091 – Witness Statement Brian Currie – Bundle 13, Volume 9, Page 338)** .

24. There was a collective discussion with The Scottish Futures Trust (SFT), Scottish Government, Motts and ourselves in relation to the use of a reference design. It was a step on from an exemplar design for the unique reasons that were brought to bear on this project. I discuss this in detail in my first statement generally and at paragraphs 22 – 30.

25. At paragraph 31 of my first statement I refer to the Approach to Reference Design paper prepared by Mott MacDonald **(A33432217 – Mott McDonald "RHSC+DCN Approach to Reference Design" - May 2012 – Bundle 3, Volume 2 (of 3) for the Hearing Commencing 9 May 2022 at Page 898)**. I authored a Reference Design paper for the Project Steering Board Meeting on 11 May 2012 which recommended that the Approach to Reference Design report was used as the basis for accurately conveying NHSL's intentions to bidders in relation to mandatory and non-mandatory elements of the design (**A32676784 – NHS Lothian, 'Reference Design Report', (11 May 2012) – Bundle 13, Volume 9, Page 369**). I wish to clarify, for the

avoidance of doubt, that the Approach to Reference Design Paper was never issued to bidders.

26. In addition to the comments on reference design in my first statement, I would add that SFT, as part of their programme of infrastructure which they were championing and delivering for the Scottish Government, were very keen to have a clear picture of the commercial outlays in this Project, and indeed all Projects, which the Scottish Government were running. SFT were keen that we should have a clear and informed view of risk in the cost appraisals and cost plans to avoid optimum bias. I understood this to be one of the reasons SFT were keen on the use of the reference design. A reference design provided one possible graphical representation of the Project incorporating satisfactory operational functionality requirements and would enable quantity surveyors to provide a cost plan with the degree of accuracy necessary to satisfy SFT in this regard.

27. I have been asked if it was NHSL's intention that the reference design would have fulfilled its purpose by FC. Paragraphs 24 – 26 of my first statement **(A37753091 – Witness Statement Brian Currie – Bundle 13, Volume 9, Pages 346 to 347)** clarify that NHSL laboured the point that the reference design was to be replaced with the Preferred Bidders' design. At preferred bidder stage our reference design had fulfilled its purpose in informing the bidders' during dialogue, through graphical or diagrammatic means, of our operational functionality requirements.

28. The bidders were very aware that the reference design was to fall away. This was communicated at the outset at the open day for bidders (see appendix to my first statement (**A37753091 – Witness Statement Brian Currie – Bundle 13, Volume 9, Pages 360 to 368**) and during competitive dialogue. We communicated continuously, as appropriate, the status of the reference design.

Operational Functionality

29. This project was set up on the basis of almost total transfer of design risk from the Board to IHSL. The only design aspect that NHSL as the employer was responsible

for was operational functionality; nothing else. That is the fundamental principle of NPD.

30. Operational functionality is narrowly defined in the PA and did not encompass M&E matters such as ventilation. We repeatedly explained to Multiplex (MPX) and IHSL that NHSL would be reviewing IHSL's design in terms of the Reviewable Design Data (RDD) protocol, giving approval ratings A, B, C and D, in relation to operational functionality only. That said, where we did find, collectively as a team with Motts, that there was something wrong with the design or construction, e.g. the drainage, the pressure regime, and the fire void detectors, we pointed that out to IHSL as our duty of care demands. There were hundreds of issues of this nature that we, in conjunction with Motts, picked up that went beyond operational functionality.

Review of the Environmental Matrix pre Invitation to Participate in Dialogue (ITPD)

31. H&K adopted the use of an EM as a reference tool for the M&E information**(example seen at A34691163 - Environmental Matrix Version 1 issued in September 2010 – Hearing commencing 24 April 2023, Bundle 4, Page 42)**. The draft EM could be used by IHSL as a starter for 10 but it could not be relied upon. IHSL had to do their own due diligence on all disclosable / design data provided in terms of clause 7 (discussed below at paragraph 57). Any designer would want to do their own due diligence. From a professional perspective, a designer cannot just take someone else's design data without reviewing it and accepting its accuracy and relevance or otherwise.

32. I have been asked about the costs involved. The cost of each bidder fully reviewing an EM would not be unduly prohibitive in my view and particularly given the benefit to each bidders tech team. The cost we and SFT were keen to minimise in preparing a reference design including COS, BCR's and SOA was in relation to the lengthy clinical interaction. M+E Engineers for each bidder would have needed to generate the environmental data in any case for construction and procurement reasons whether it was labelled an EM or something else.

33. As I understand it, H&K continued to develop the EM they had been developing for the capital funded project for the NPD project. The version of the EM that went into the ITPD pack was inconsistent in terms of the ventilation requirements for critical care. The Guidance notes which preface the EM stated that SHTM 03-01 had to be followed and explicitly stated that 10 ac/hr was required in critical care. However, the body of the EM incorrectly stated that there should be 4 air changes per hour instead of the required 10 in certain rooms in critical care. The body of the EM, however, referred the reader back to the Guidance Notes. How this error arose in the body of the EM is best answered by the author. I understand it was correct in an earlier version of the EM and suspect it was simply human error.

34. I have been asked if clinicians had any input to the EM. The best person to ask is Janice Mackenzie, the Project Clinical Director, but as far as I'm aware they did not. The lead clinicians met with the Reference Design Team on various occasions and provided input to the operational functionality elements of the reference design via: the Schedule of Accommodation; reference design drawings (1:500, 1:200 and 1:50); the COS. The clinicians were available to answer any questions via the Project Clinical Director both during competitive dialogue where input was requested; and, during the detailed design development meetings with IHSL post appointment of Preferred Bidder. However, clinicians would not review the EM – they would not be qualified to do so.

35. The COS are a really important briefing tool in terms of communicating the clinicians' needs for their department. The COS were reviewed by Motts and Capita (healthcare planners) in relation to the technical details, including ensuring there was reference to the relevant design guidance.

36. I have been asked if Motts should have picked up the inconsistencies in the EM during the reference design period before it was issued as part of the ITPD. Motts were not the designers; however, they did prepare the suite of documents for the ITPD including the design and construction output specification. One of the many reasons for employing a Technical Adviser was to ensure that the documents that

were being produced complied with SHTMs (a mandatory requirement in this project and not mere guidance) and were consistent. In terms of their Appointment, Motts had an obligation to check the reference design for compliance with all appropriate NHSL and legislative guidelines and requirements and identify any derogations (See Motts Appointment, Technical Advisor Scope, section A, Core Technical Advisors Role up to Financial Close (**A32618292 – Contract between Lothian Health Board and Mott MacDonald Limited – 22 March 2011 – Hearing commencing 24 April 2023, Bundle 2, Page 86**). It was unfortunate that Motts did not pick up the inconsistencies in the EM. However, they had obtained a compliance statement from the Reference Design Team so they may have been reassured by that. The compliance statement gave the reference design a degree of credibility and practicality. It was reassuring that there were indeed the bones of an architectural and engineering solution available which satisfied operational functionality and, as far as we were aware, complied with guidance.

Purpose of the Environmental Matrix (EM)

37. I have been asked what the purpose of the EM was. My understanding of the purpose of the EM is set out in my first statement at paragraphs 44 – 46 **(A37753091 – Witness Statement Brian Currie – Bundle 13, Volume 9, Page 351 to 352)**. The draft EM that was provided to bidders as part of the ITPD was disclosable data. It was provided for information but it was not a mandatory requirement. Disclosable data is defined in the PA as *"any Design Data and any other written information, data and documents made available or issued to Project co or any Project Co party in connection with the Project by or on behalf of the Board (or any Board party) whether on, before or after the execution of this Agreement."* (**A33405351 – Main Body of Contract – Bundle 13, Volume 10, Page 5**) *Clause* 7.3.1 of the PA also makes it clear that IHSL must have *"conducted its own analysis of the Disclosed Data and has, before execution of this Agreement, satisfied itself as to the accuracy, completeness and fitness for purpose of such Disclosed Data upon which it places reliance."* (**A33405351 – Main Body of Contract – Bundle 13, Volume 10, Page 4**) The draft EM provided by NHSL during

the ITPD was Disclosed Data and IHSL had to conduct its own analysis of the EM, including its accuracy and fitness for purpose. NHSL had no design liability other than in relation to operational functionality. M&E matters such as the number of air changes per hour did not fall within the definition of operational functionality.

38. NHSL were not the designers on the Project. IHSL had to undertake their own M&E design, including review of all design data provided as disclosable data. They employed M&E sub-contractors, TUV SUD / Wallace Whittle, for the M&E design and it may be informative for the Inquiry to review the terms of that Appointment. We did not present bidders with a design solution. The only thing we were clear that bidders had to stick to were our operational functionality requirements. We specified and required compliance with SHTM 03-01 as mandatory and a whole host of other national design guidance and policies as a starting point.

39. Even if the EM was not perceived by IHSL to be disclosable data, that did not negate the need for IHSL to flag the inconsistencies within the EM, and the inconsistencies between the EM and SHTM 03-01, to NHSL and seek a derogation. The requirement for IHSL to produce a complete derogation register was discussed (and noted in the minutes) at competitive dialogue meetings 1, 2, 4A, 4B, 4C, 4D, 5, 5A and 6. Sample examples can be found at (**A34697046 – Competitive Dialogue Meeting 1 (Financial) Agenda – Bidder C – Action Notes - Bundle 13, Volume 9, Page 373), (A41322251 - 2- Bidder C Competitive Dialogue Meeting 2 – Action Notes 2 May 2013 – Bundle 13, Volume 9, Page 375), (A34700234 – Competitive Dialogue Meeting 5 – Finance Action Notes - Bundle 13, Volume 9, Page 385), (A34700260 – Competitive Dialogue Meeting 5A Agenda - Bundle 13, Volume 9, Page 386), (A41322385 – Competitive Dialogue Meeting 6 Agenda –- Bundle 13, Volume 9, Page 387)**

40. The minutes of the competitive dialogue meetings show that there was ongoing discussion to the extent that IHSL should not assume that reference design related derogations were already accepted. We made it clear that, even if IHSL thought that the EM contained derogations that were intentional, the onus was still on them to flag those derogations within the appropriate Schedule of Derogations. These

discussions are all minuted in the competitive dialogue action notes. No derogation in relation to critical care ventilation, specifically the requirements of SHTM 03-01, was ever sought by IHSL. IHSL had multiple opportunities to flag the inconsistency, seek clarification and/or seek a derogation at the final tender stage, during preferred bidder, at FC and/or during construction, but did not do so.

41. I do not recall ever saying during competitive dialogue (or at any point in the Project) that the H&K EM was mandatory or was, in any way, our "fixed brief". I do not recall ever referring to the EM as a "line in the sand" or "the bible". That was not my understanding so I would not have used that language. There are no discussions to that effect in the competitive dialogue action notes either.

42. The Guidance Notes of the EM identify and highlight the key overriding requirements to assist whoever is reading the document. The guidance notes preface the EM and are referred back to within the line items of the EM as "See Guidance Notes". Guidance Note 15 of the EM is particularly relevant in that it specifies 10 air changes in Critical Care and the need to comply with SHTM 03-01 **(A34691163 - Environmental Matrix Version 1 issued in September 2010 – Hearing commencing 24 April 2023, Bundle 4, Page 43**).

43. The EM is complementary to the RDS. For me, the EM extracts the environmental data and holds it in one place as an aid for engineers. I have been asked how I anticipated the process would operate in relation to the EM and RDS at FC. The IHSL EM and IHSL RDS were unapproved at FC and became part of the RDD process post FC, which I discuss below. To be clear, however, the draft EM provided in the ITPD was redundant at FC; it was contractually IHSL's EM from that point onwards. IHSL started reviewing and developing their EM post preferred bidder, effectively taking ownership of it from that point.

Room Function Reference Sheets

44. I have been asked about the room function sheet that was inserted at the front of the EM. I do not know anything about the room function reference sheet; where it came from or who introduced it.

45. I have been asked if a clinician engaged with the Reference Design Team when it came to assigning functions for rooms. I don't know. I know the clinical teams were very much an integral part of the development of the reference design and were involved in the detailed design following the appointment of IHSL as preferred bidder but I doubt they had any involvement in the EM itself, including the addition of a room function reference sheet.

46. The fact the term "HDU" was removed from the room function reference sheet was not fatal to the accuracy of the document given there was still reference to critical care.

Lessons Learned – Environmental Matrix (EM)

47. My preference would be that future healthcare projects in Lothian do not involve the production of an EM by NHSL. If the designer and/or contractor wants to produce an EM for their purposes they are free to do so. NHSL produced a paper for discussion with NHS Scotland Assure in November 2022 in relation to three NHSL projects setting out the pros and cons of utilising an EM.

48. I have been asked if the EM contributed to errors in the ventilation system, particularly in critical care. On the basis it contained inconsistencies which IHSL did not seek to challenge or correct, then of course it did. It would appear IHSL simply copied the draft EM over to their RDS (ignoring the SHTMs and ADB) and did not challenge it, seek to raise a derogation, or bring any inconsistences as between it and the SHTMs to our attention, all of which they were obliged to do under the terms of the PA. That definitely led to the issues we had with ventilation in critical care.

49. I have been asked if I think the use of an EM is best practice. I can see the logic and the rationale behind M&E engineers wishing to have one document which contains all the environmental data to assist them in their ongoing design and build. However, my view is that any decision to use it would be a decision for the builder and designer. An EM is a tool that design teams may or may not avail themselves of to assist their development of their design. From my point of view on the client side going forward, the information should be in the RDS.

50. In hindsight, the use of an EM could (and did) cause misunderstanding. However, that comment could be used in the context of various other complex design information/recording/documentation and communications in a large-scale project. It would appear that the misinterpretation of the Guidance by the M&E engineer responsible for IHSL's EM (discussed at para 50 below) was a key contributing factor to the issues in the ventilation system in critical care.

Design Guidance – Interpretation

51. The main interpretation of Guidance issues that we were aware of during construction was the issue of the multi-bed rooms and what status they had in terms of environmental and ventilation requirements. IHSL held the view that a multi-bed room was a general ward. Our view, confirmed by Health Facilities Scotland (HFS), was that a multi-bed room should be treated, in terms of a ventilation strategy for infection control purposes, in the same manner as a single bed room and not as a general ward.

52. NHSL sought the advice of HFS in relation to this issue in June 2017. The question posed to HFS was: What is HFS interpretation of the ventilation pressure requirements for 4 bed wards? The HFS response was: *"SHTM 03-01, Part A, Appendix 1, Table A indicates the air change rates and pressure regime for clinical areas within healthcare premises. There is no four bed ward noted in table A, however it would not be unreasonable to treat this area as one would a single bed ward with respect to ventilation as the measures for infection control would be the same. Therefore the room should be neutral or slightly negative with respect to the*

corridor." **(A40072413 – NonRFI_0080_20160619 IAN STORRAR HV REPORT (+4 Bed) - Bundle 13, Volume 8, Page 2344)**. This indicates that a multi-bed room should be treated as a single bedroom. IHSL disagreed with this interpretation but, further to protracted discussions, negotiations, and the threat of potential litigation by NHSL against IHSL, IHSL resolved the pressure issue as required by NHSL to ensure balanced or negative pressure, irrespective of what was in the EM. In other words, there was a recognition by IHSL that the Guidance prevailed over the EM.

53. I understand that Stewart McKechnie, the M&E designer from TUV SUD / Wallace Whittle, considers that the EM did not contain any errors because, in his view, the EM was compliant with SHTM 03-01. I understand this is because, in his view, the only rooms in critical care which require 10 ac/hr are isolation rooms. For the avoidance of doubt, I was not aware during the construction period that this was how Stewart McKechnie interpreted the Guidance and I disagree with his interpretation. There were various opportunities for IHSL and their supply chain to flag the error or inconsistency in the EM but they did not. This can perhaps be explained by the fact that TUV SUD / Wallace Whittle did not consider there was an error to flag.

54. In terms of environmental parameters, my understanding is that the requirements of table A1 of SHTM 03-01 applies to all patient rooms in critical care, though isolation rooms may have their own requirements. Indeed, this is set out specifically in the COS provided to bidders and which formed part of the PA. The first line states "*The department will provide a comprehensive critical care service this includes paediatric Intensive Care (PICU), High Dependency Unit (HDU), and Surgical Neonatal Unit (SSNU)."* (**A41179262 - Schedule Part 6 (Construction Matters), section 3 (Board's Construction Requirements) – Hearing commencing 24 April, Bundle 5, Page 377**). The COS states that bed spaces must be of the same specification to allow flexibility of use (**A41179262 - Schedule Part 6 (Construction Matters), section 3 (Board's Construction Requirements) – Hearing commencing 24 April, Bundle 5, Page 389**).

55. It is important to understand that the critical care department is a clearly defined zone and area within the hospital. There are not critical care areas scattered throughout the hospital as there are with isolation rooms. TUV SUD / Wallace Whittle did not consider the single rooms or multi-bed rooms in the critical care department were subject to the critical care requirements of table A1 of SHTM 03-01 and MPX did not build to those standards. We were not aware of this during construction of the Project. Thankfully, our independent validation process picked that up before the hospital opened. Given the significant variance of the final measured performance of the ventilation system in critical care against SHTM requirements, we didn't initially believe the independent validator's, Institute of Occupational Medicine (IOM), results and thought there must have been an error. We spent significant time with IOM checking and double checking the calibration of their measuring equipment and re-testing. It was not until a meeting with MPX and IHSL, during which they disclosed to me that they (MPX) never designed, procured, or installed the relevant air handling units to deliver ten air changes in critical care, that I understood the results were accurate and immediately escalated the issue to NHSL's executive team.

Invitation to Participate in Dialogue (ITPD)

56. Motts prepared the technical aspects of the ITPD. NHSL did not produce RDS for use by the bidders. A decision was made by NHSL, in conjunction with Motts, to place the responsibility for the production of RDS with the bidders. A suite of other room information was provided to assist bidders in the preparation of their RDS. That other room information included reference to the EM. This was the EM that had been produced by H&K originally as part of the capital funded scheme and then developed further by H&K as part of the reference design.

57. As detailed at paragraph 31 above, the ITPD EM was disclosable data, which means it was provided within the package of design data given to bidders for information only. It was not warranted in any shape or form as to its accuracy; indeed it is expressly stated at clause 7 that it is for IHSL to analyse and satisfy itself as to the accuracy of all design data provided before, during or after execution

of the PA. I do not recall exactly when the decision to use an EM was taken but it was during the capital funded days, so probably in around 2010. NHSL has submitted a narrative to the Inquiry in relation to the ADB and RDS which may be of assistance **(A42408446 – NHS Lothian's Narrative on ADB and RDS submitted 3 February 2023 – Scottish Hospitals Inquiry - Hearing commencing on 24 April 2023, Bundle 15, Page 4)**.

58. I have been asked whether within the suite of documents provided to bidders in the ITPD there was a lack of clarity in relation to the purpose of the EM. In hindsight, I think the ITPD was confusing in the sense that the EM was referred to as part of the suite of documents comprising the room information to be used in the preparation of RDS by IHSL. However, the ITPD and PA were explicit in terms of (i) all design data provided by NHSL (including during the ITPD) as being disclosable data, which IHSL had to analyse and satisfy itself as to its accuracy, and (ii) the hierarchy of standards such that where there were any inconsistencies, the most onerous standard, i.e. SHTM 03-01, would prevail. The hierarchy of standards alone should have prompted any experienced M&E designer to at least seek clarification on any perceived ambiguities and seek any derogations if required. IHSL did not challenge the inconsistencies or non-compliances in the EM, despite their contractual obligations to do so. "Why not?" is best answered by them. One possible explanation is the fact that their M&E engineer did not consider there was an inconsistency to flag.

59. In terms of ITPD, volume 2, I have been asked when it was decided that the EM would be added as part of reviewable design data. I cannot recall when that happened and whether I was involved with that particular decision or not.

Competitive Dialogue

60. Competitive Dialogue was a very intensive process. It was well catalogued and recorded. We had three bidders' submissions to review and the way it worked was that we had various one day competitive dialogue meetings/workshops with each bidder. We had two weeks between the workshops. The bidders provided

submissions a week before the workshops which the Project Team (including Motts) reviewed in advance of the workshops. On the day of the workshop, we broke into separate workstreams and brought in particular people where relevant, e.g. City of Edinburgh Council town planners who were keen to understand where the three bids were going in design terms.

61. We were able to satisfy ourselves through the months of competitive dialogue; the to'ing and fro'ing, the submissions, the conversations, the development, the resubmissions, the iterations, that the bidders all understood and could meet our operational functionality requirements. There was physical evidence of this via the drawings submitted and discussions had. When all three bids were of an acceptable standard, the decision was taken to close competitive dialogue and the invitation to submit final tenders (ISFT) was issued.

62. All three bidders developed their design to an extent during competitive dialogue and all focussed on developing different aspects of the design, as you would expect. What the bidders produced at final tender was nowhere near a final design. Their supply chain had much more design work to do if/when they were appointed as preferred bidder. I'm sure bidders would have expected their supply chain to produce designs that were compliant with the Scottish design guidance and I would assume that requirement was reflected in the sub-consultant's appointments with IHSL.

63. As noted above, I do not recall ever saying during competitive dialogue (or at any point in the Project) that the H&K EM was mandatory or was, in any way, NHSL's "fixed brief".

Project Steering Board – 29 November 2013

64. I have been asked to refer to the Project Steering Board meeting dated 29 November 2013 **(A32676816 – Project Steering Board Action Notes 29**

November 2013 - Hearing commencing 24 April 2023, Bundle 8, Page 5). At that meeting it was agreed that the dialogue phase should close and the ISFT should be issued on the conclusion of the key stage review (KSR). I have been asked why that decision was taken. The project team and our supporting external advisors were of the view that all three bids and all three bidders had satisfied us through submissions and dialogue that they could achieve our operational functionality requirements.

65. I have been asked if there were any outstanding issues with the prospective bids at the close of dialogue phase. While we knew there was significant design development still to take place, we had sufficient information to assess whether our operational functionality requirements had been met in the final tenders. We completed the Pre-Close of Dialogue KSR with SFT noting that there was a programme in place for the preferred bidder to develop the design through to FC **(A33337058 – Pre-Close of Dialogue Key Stage Review – dated 13 December 2013 – Hearing Commencing 24 April 2023, Bundle 9, Page 93 to 94)**.

66. There had previously been a lot of debate with SFT, particularly, in relation to the duration of the competitive dialogue. SFT's view was that we had a reference design and that should speed things up. In theory, having a reference design might have shortened the process but in practice, given the scale and complexity of the project, in my view no programme saving occurred through having a reference design.

67. We got halfway through the dialogue process and it was clear that more time was going to be needed for design interaction so we introduced another three or four rounds of dialogue. The eventual competitive dialogue period was sufficient to allow for a full evaluation of whether our operational functionality needs were being met and we were confident that the appointed Preferred Bidder would design, build, and maintain a compliant facility.

Scottish Futures Trust (SFT) Role

68. Donna Stevenson was a lawyer in SFT and was the main point of liaison between NHSL and SFT at Project level. Donna was interested in all aspects of the project on behalf of SFT, for example making sure that we were giving sufficient space for the bidders to be innovative. Donna was also very interested in the supplemental agreements with Consort Healthcare in terms of SA6 and SA7 and the implications that they might have for bidders, which became part of the reference design, and one of the many reasons why there was a reference design.

69. SFT were kept well up to speed with and were very interested in the project as it was developing. Donna was not embedded in the Project team but spent a lot of time with us and participated in meetings such as the programme steering board. If Donna was not in attendance at the programme steering board then Peter Reekie would attend. I have checked the minutes and generally one or the other was in attendance at most, but not all, of the meetings from 2011 – 2019.

70. I was very aware that SFT's role in the KSR process was as a validator. It is a condition of Scottish Government funding support that all projects in the revenue funding programme are, in addition to any existing project approvals processes, externally validated by SFT.

71. This project was the first acute healthcare NPD project. I took comfort in SFT's involvement given they owned the process. SFT gave assurance to the Scottish Government that health boards were delivering value for money for the public purse. I remember being told many times: "Brian, it's about needs, not wants." SFT took on the role that had previously been undertaken by the Scottish Government Health Directorate through the Gateway review process. In coming to the judgement that the project was ready to proceed to the next stage, I believe SFT would by necessity require to be heavily involved and integral to the process.

Pre Close of Dialogue Key Stage Review (KSR) – 13 December 2013

72. I have been asked to look at the pre close of dialogue KSR dated 13 December 2013 Section 2, question 2 states "*Is the procuring authority and are its advisers*

satisfied with the overall quality and level of detail supplied by the bidders during dialogue, in respect of the design and build and service delivery solutions, and that bidders' proposals are capable of meeting its requirements?" and the SFT recommendation is that *"Recommendation: That prior to close of dialogue the board receives and copies to SFT letters in the form of drafts which the Board have earlier provided to SFT, from each of its financial, legal and technical advisers confirming that each consider that it is appropriate to close dialogue.*" **(A33337058 – Pre-Close of Dialogue Key Stage Review – dated 13 December 2013 – Hearing Commencing 24 April 2023, Bundle 9, Page 59).** The letters referenced are those which were provided and presented at the F&R committee by each of our advisers – Ernst & Young as commercial advisers, MacRoberts as legal advisers, and Mott MacDonald as technical advisers that they were satisfied it was appropriate to close dialogue.

73. Question 3 asks: "*Based on dialogue with bidders, is the procuring authority satisfied that final tenders will contain solutions that satisfy its operational and functional requirements?*" The answer provided is "*yes*." **(A33337058 – Pre-Close of Dialogue Key Stage Review – dated 13 December 2013 – Hearing Commencing 24 April 2023, Bundle 9, Page 59).** There were strong indications that the bidders would be able to develop all the supporting information, technical information, specifications, etc. to provide a compliant facility as they would be obliged to do in terms of the PA.

74. Question 16 asks: *Please confirm what further development of technical information is required from preferred bidders between now and final tender submission and from the preferred bidder between appointment and financial close.* The Answer is "*100% compliance for operational functionality and minimum room layouts has now been achieved with all bidders' programmes for design development through to financial close. The Board's view is that the programme from preferred bidder to financial close is challenging."* IHSL produced a programme to FC (as did the other bidders) based on what they considered to be appropriate from the resources at their disposal. As noted, the view from the board, certainly, was that it was ambitious or, as it says there, challenging **(A33337058 – Pre-Close of Dialogue**

Key Stage Review – dated 13 December 2013 – Hearing Commencing 24 April 2023, Bundle 9, Page 62).

Pre Preferred Bidder Key Stage Review (KSR) – 28 February 2014

75. I have been asked to comment on the pre preferred bidder KSR dated 28 February 2014 where the response to question 3 is: *"The board has confirmed that all bidders have provided detailed programmes to cover the activities for the period until financial close, and that the development of the technical information is at least as advanced as the board anticipated at this stage. The board and its advisors are satisfied that any further development of technical information, from preferred bidder appointment to financial close, is achievable within the current project timetable."* **(A33337163 – Pre-Preferred Bidder Appointment Key Stage Review dated 28 February 2014 – Hearing commencing 24 April 2023, Bundle 7, Page 11)**

76. As above, the programme was undoubtedly challenging, as we'd stated in the December 2013 KSR, but IHSL were telling us it was achievable and they had a workable project timetable. Obviously SFT approved the KSR and thus presumably took this view also.

Evaluation of Final Tenders

77. Assessing a tender as compliant did not mean, and was not understood to mean, that NHSL and its advisors had reviewed the tenders and confirmed that the tenderers' technical specifications complied with all statutory guidance (see section 5 of ITPD vol.1) (**A34697102 - Invitation to Participate in Dialogue Vol 1, Revision B – Hearing commencing 24 April 2023, Bundle 2, Page 1001)**. That said, it is important to say at the outset that, as far as we were aware, the EM that had been issued with the ITPD had been signed off as compliant by the Reference Design Team at the reference design stage. We were not aware of the inconsistencies that existed within it. The bidders were to use the EM to develop their own design. Any derogations within the reference design were to be flagged to

NHSL and any inconsistencies in standards were to be flagged to NHSL. Otherwise, the most onerous standard, SHTM 03-01, would prevail. In terms of their Appointment Motts had to "*evaluate the design & construct and FM elements of Final Tenders, in particular, compliance with bid documents and legislative requirements"* (See Motts Appointment, Ref 44 (**A32618292 – Contract between Lothian Health Board and Mott MacDonald Limited – 22 March 2011 – Bundle 13, Volume 9, Page 578**) so NHSL had a level of reassurance in that regard.

78. Bidders were assessed on an initial pass-fail criteria basis and, if they passed, then certain evaluation criteria were scored as well. C.21 provided that compliance with the BCRs (including SHTM 03-01) was mandatory and accordingly could only be pass or fail. If a bidder had not met the provision of C.21 (i.e. a pass/fail on compliance with BCRs), then their bid would not have proceeded any further in the tender process and would be deemed a non-compliant tender. MML were employed to verify elements of the bids in relation to compliance as far as I recall. However, there is naturally also a degree of self-certification given the statements provided by the bidders that they will comply with Guidance and the ultimate transfer of risk and design responsibility held by the bidders.

79. At Final Tender, as part of submission C.21, IHSL confirmed compliance with the BCRs subject to any derogations scheduled in submission C.30. No derogations were identified in C.30 in relation to SHTM 03-01. No derogation in relation to critical care ventilation, specifically the requirements of SHTM 03-01, was ever sought by IHSL at any stage in the Project. All bidders passed C.21 and had compliant bids and did not fail any evaluation criteria.

80. C.30 was a Schedule of Derogations which the bidders had to populate. It was clearly communicated by NHSL to IHSL throughout competitive dialogue that the onus was on them to flag any derogations within the appropriate Schedule of Derogations in C.30, even if they perceived it to be a derogation from the reference design. This is evidenced in the minutes of the Competitive Dialogue meetings.

81. C.8.3 provides that *'Whilst Bidders are required to undertake their own design, the Board has provided a draft Environmental Matrix as part of the ITPD documentation. Bidders must confirm acceptance of the Board's Environmental Matrix, highlighting any proposed changes on an exception basis.'* I have been asked for my views on the wording of C8.3. Read in isolation it is poorly worded by MML. However, when the ITPD (and the EM itself given the guidance notes refer to compliance with SHTM 03-01 and expressly state 10 ach in critical care) is read as a whole, compliance with Guidance is the overriding and mandatory requirement.

82. IHSL stated that they were not proposing any changes to the EM but would continue to review and advise back. The final tender evaluation sheet C.8 for IHSL, completed by NHSL, clearly demonstrates a bare but satisfactory pass by IHSL. It was remarked upon at the time of evaluation that no EM had been provided, but environmental layout drawings had.

83. Bidder C was the only bidder to submit their own EM at final tender. From recent examination, while bidder C's EM did correct the inconsistency in critical care, it also introduced other errors. However, at the time of evaluation I have no recollection of reviewing bidder C's EM.

84. I have been asked how, if Mosaic marked up amendments to the EM and IHSL didn't, they both be classified as compliant tenders. In terms of C.8, both Bidder B and C confirmed acceptance of the Board's draft EM so were both compliant with that requirement in terms of the ITPD. Bidder C revised the EM whereas Bidder B accepted the draft EM noting no proposed changes but that they'd continue to review and advise back. It was not necessary to look behind the bidders' response.

85. This should also be seen in light of submission C.21 where both bidders confirmed compliance with the BCRs submission C.30, where there were no listed derogations. In the circumstances, there was no requirement for NHSL to check every detail of the bids to assess whether those claims were correct prior to the preferred bidder carrying out their detailed design.

86. I can remember being in ventilation workshops and dialogue sessions with the bidders but cannot recall the specifics. I cannot remember the specifics of any discussions with any of the bidders during competitive dialogue phase regarding the EM. I don't think we ever discussed that bidder C had corrected the air change rate for some critical care rooms in their EM.

87. I do not recall reviewing the bidders' EMs. I am not a building services engineer so would not be qualified to do so. A detailed examination of the EM was not necessary to assess whether the submissions met our operational functionality requirements. This, and the fact that the design process naturally had a long way to complete post final tender, was not seen as an impediment to awarding a bare pass. It was recognised that no bidder would develop the detailed building services design to a level at final tender where all specifications would be available given the commercial risk and abortive costs associated should they fail to make preferred bidder status.

88. In terms of the scores, IHSL was the weakest of the three bidders for Mechanical, Electrical and Plumbing (MEP) matters. Bidder B scored 5 and Bidder C scored 8. Overall, Bidder C had a higher quality score but lower price score – so, on the face of it, Bidder B scored comparatively on quality but bid lower on cost equating to a higher score for evaluation purposes (although the highest score (lowest bid) on cost was Bidder A).

89. If the errors in IHSL's tender in relation to SHTM 03-01 had been spotted at final tender it would not have been sufficient to reject them as a bidder, in my opinion. It would have been an issue to be addressed in their EM while developing design post preferred bidder, and certainly to be addressed through the RDD process.

90. I would say that the experience and qualifications of the individuals involved in assessing the technical aspects of the tenders was sufficient for the task. Motts were evaluating the design & construct elements of Final Tenders, in particular, compliance with bid documents and legislative requirements as required per their Appointment. From NHSL, Ernie Bain was very experienced from an Estates and

Facilities perspective. He had decades of experience in healthcare and hospitals, particularly in relation to building services and the maintenance of them. He would have been aware of the SHTMs and the need for compliance but would not have had the technical expertise which Motts brought. Colin McCrae, Motts, was the engineer on the mechanical side and absolutely a very experienced guy. If I recall correctly then Willie Stevenson from Motts was the lead for the electrical side. Motts had other engineers and architects that were supporting the evaluation workstreams.

91. I have been asked whether, at the point H&K exited the project, I would say the skillset they provided was replicated by members of the remaining team. We did not have that skillset internally within NHSL at this point in time, which is why we appointed Motts as technical advisors. While Motts were not the M&E designers, they did have members of their team with a similar mechanical engineering skill set to H&K. The key point is that IHSL's supply chain, namely their M&E designers TUV SUD / Wallace Whittle, would absolutely have replicated the skillset of H&K. The other key point is that NHSL did not know the H&K EM did not meet the requirements of SHTM at the time. The intention and understanding was that it did – as per the compliance statement and as is clear in the guidance notes of the EM itself. It was then for IHSL to then undertake its own due diligence on their own EM.

Evaluation Criteria

92. The 60:40 ratio of price to quality came from SFT as one of their requirements. We had been used to a 40:60 ratio (price/quality), which was the HFS framework requirements for capital-funded projects. We were concerned at this change and expressed our concerns at the time. I can't remember the exact discussions, but the SFT ratio of 60:40 (price/quality) prevailed.

Design at Final Tender

93. In terms of an NPD contract, in my opinion, we could not expect to have 100 percent design complete by preferred bidder or final tender stage because bidders

would have been at risk of significant abortive costs. The market would never have bought into that in terms of the amount of work they would need to have done to get to a final tender, at their risk. I don't know what bid competition costs were to these bidders, but certainly millions of pounds. For us to demand that they complete the design of the whole building at final tender stage would have been unacceptable to the market. We wouldn't have got any bidders interested in participating. However, SFT would be better placed to answer this – it was their programme of infrastructure.

94. The only time this complete design approach prevails, in my experience, is the original Joint Contracts Tribunal (JCT) traditional build type of project where the employer prepares a complete and very comprehensive suite of information with everything designed and specified that goes to the market for tender and the builder bids on that basis. JCT traditional contracts are rarely used these days and could not have been used in a PPP / NPD style contract given the purpose is to transfer the design risk to the private sector.

95. I have been asked what briefing tool should be used in future projects. That very much depends on the agreed risk transfer in the contract and who is best placed to create what briefing information. Who has accepted the design & construction risk? The clinical and operational requirements (e.g. the layouts and adjacencies of departments) should be defined by the Employer and compliance with the technical Guidance is part of that. The designer, in particularly here the M+E designer, can use whatever tools available to them to meet those requirements. Even if a briefing tool such as RDS or an EM is provided, it is for the M+E designer to undertake their own due diligence on all aspects of the M+E design.

Appointment of Preferred Bidder

96. Overall, IHSL were the highest scoring bidder. The Project Steering Board recommended to the F&R Committee that IHSL were appointed as the Preferred Bidder on that basis. The decision was discussed at the F&R committee on 5 March

2014 (**A33887882 – Minutes of the Lothian NHS Board, Finance and Performance Review Committee Meetings from 2005-2021, dated 5 March 2014 (excerpt 650-653) – Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 5 onwards)**. Representations were made to the committee from the Core Evaluation Team and our external legal, commercial, and technical advisors.

97. At this meeting, I stated that all bids were of an acceptable quality and that everything possible had been done to mitigate the risk of poor quality facilities and/or poor services being provided to NHS Lothian. This was based on my personal understanding and knowledge following competitive dialogue and tender evaluation in conjunction with views expressed by technical, legal, and financial advisers and NHSL project team members. This followed a hugely demanding and intensive Competitive Dialogue process. It was felt at the time to have gone well and been a very successful process. The design at tender stage had a long, long way to go. We were assessing the bid on what could be reasonably expected to be produced and reviewed. IHSL were offering to produce a compliant facility. It's important to bear in mind that the technical and design submission is one very small element of a broad and extensive contract. The legal; commercial; and FM side were hugely significant.

98. In relation to the technical workstream, it is noted in the F&R Minutes at 61.10 that Mr Cantlay, Motts, advised the Committee that: *"he believed from a technical perspective that the technical evaluation had been carried out in a manner consistent with the evaluation methodology. From their involvement in this process, the considered scores awarded form the technical evaluation criteria seemed to be correct and it appeared appropriate for the Board to conclude the evaluation process and appoint the bidder identified as having the most economically advantageous tender as the preferred bidder."* Mr Cantlay also confirmed that: *"the scores were all appropriate and he was happy with the evaluation and satisfied that the preferred bidder was in full accordance with the requirements."* **(A33887882 – Minutes of the Lothian NHS Board, Finance and Performance Review Committee Meetings from 2005-2021, dated 5 March 2014 (excerpt 650-653) –**

Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 6). I have been asked whether NHSL placed significant reliance on these comments and I would say that, yes, we did.

99. The preferred bidder was appointed by way of letter dated 5 March 2014 **(A36382455 – Preferred bidder letter from NHSL to IHSL – 5 March 2014 – Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 87)**. It sought to hold to task IHSL and their supply chain to deliver certain key documents and key design deliverables as well as legal, commercial, and financial deliverables within a certain time scale to enable FC. IHSL developed and submitted a programme demonstrating how they would achieve this. Unfortunately, they failed to meet their programme and deliver all the information originally required.

Preferred Bidder to Financial Close (FC)

100. IHSL had submitted a programme of work to FC, which included a series of technical work streams and user groups for detailed design development from preferred bidder to FC. Janice MacKenzie and Fiona Halcrow led on the design development with the Project Team (including Motts), user groups (clinicians), and the IHSL design team in terms of ensuring our operational functionality needs were being met in the developing design in terms of the 1:200 and 1:50 drawings. Basically, it was picking up the design as at final tender and developing it further with the relevant users. I did not attend these user group meetings.

101. I have been asked whether I was aware ventilation was considered by MML to be high risk. Yes I was aware of that and agreed with MML that ventilation, along with all other critical building services, are high risk in acute healthcare projects. As stated previously, it was considered by NHSL and MML at this point in time that IHSL had sufficient time, expertise, motivation, and obligation to provide a compliant product.

102. When the detailed design got to a sufficient stage, there was provision for the cost that IHSL had bid on at final tender to be adjusted, within reason. SFT introduced a

cost cap on that. From memory, IHSL's tender was £137 million. I think SFT's cap was £159 million but I would have to check the figures. We eventually got to an adjusted contract sum based on the detailed design that had then been developed. As discussed below, there came a point when MPX, the building contractor, refused to undertake any further design. I think we were at £151 million at that point and that became the agreed contract sum that formed part of the financial model and the PA.

103. What we were keen to do working with MPX was to identify and develop areas that still had to be fully scoped to a point where MPX could confidently agree a contract sum with us. Identifying these type of cost issues at an early stage should result in a more cooperative builder, because they knew their profit margin stood more chance of being protected. An example is the appropriate reverberation times in the public areas at reception desks in the large public spaces and the acoustic design necessary to achieve a satisfactory solution. With the introduction of acoustic panels on the wall and doing some quick desk top tests, MPX got to a position where a clearer scope could be costed and introduced into their adjusted figure.

104. I was involved in the commercial side of that quite a bit, and I remember two or three quite difficult meetings with MPX and respective cost advisers to agree the contract sum. Until that contract sum was concluded, the legal, commercial, and funding side of the IHSL could not proceed. The lenders and their technical advisers were heavily involved at that stage.

105. I have been asked to clarify whether I recall having "lengthy discussions" with John Ballantyne, Project Director for MPX, during the preferred bidder phase where the phrase "Environmental Matrix" kept reappearing.

106. I did have lengthy discussions on a wide range of topics with John Ballantyne during the preferred bidder phase but none specifically about the EM. I certainly did not communicate that the EM was a prescriptive and mandatory brief of the Board's environmental requirements.

107. The Board were indeed keen to avoid a similar situation to other PFI projects which they had been involved with (most notably the Royal Infirmary of Edinburgh) where through imprecise and ambiguous requirements and different interpretations of those requirements, arguably less than the optimum solution was delivered by the PFI provider. Topics such as compliance with standards and the need for IHSL/MPX to carefully absorb our specific clinical and operational requirements were, as I recall, discussed with JB in this period whilst not seeking to inhibit innovation by IHSL/MPX if appropriate.

108. However, in practice, I would say whilst MPX's architects did grasp this and developed positively the mandatory requirements of the Board illustrated by the Reference Design, MPX M&E Engineers simply took all information they had been provided with and apparently adopted it as theirs without further thought. That goes against clause 7 of the PA where it is clear that IHSL had to review design data to satisfy itself as to its accuracy prior to execution of the PA. This highlights, in my opinion, an ignorance of the obligations and responsibilities of parties to the PA in parts of MPX's supply chain.

109. Undoubtedly IHSL / MPX will have had to commit to essential components of M&E systems immediately after FC and one would have thought that is another reason why they would have verified the accuracy of all data upon which they were placing reliance.

Payment Mechanism

110. The Payment Mechanism within the PA (Paymech) was another big issue to sort. I have been asked to refer to the minutes of the Project Steering Board Meeting 20 June 2014. It states that there has been "*extensive payment mechanism discussions*" **(A32676819 – Project Steering Board Meeting – 20 June 2014 - Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 31)**. The Paymech proposal was very detailed. Iain Graham with Mott MacDonald and Ernst Young were more involved with the detail than I given Iain's responsibility for the commercial workstream. I got involved at some points however because of some of

the implications, technically and physically, with the construction. As I understand it, PayMech was the mechanism by which NHSL sought to ensure availability and meaningful performance standards during the operation of the hospital. I can't remember the detail now, but NHSL and IHSL had to agree the parameters of PayMech and there were often opposing views. The outcome was all parties were obviously satisfied that the position was maintained or catered for but it was a long and tortuous process. It has far-reaching financial consequences for both parties because it's over the 25-year concession period.

Special Project Steering Board – 22 August 2014

111. IHSL's programme to reach FC was originally summer 2014. That target date was pushed back on various occasions to: 2 October 2014, 27 November 2014, 12 December 2014, 23 January 2015, and 5 February 2014. FC was ultimately achieved on 14 & 15 February 2015. I have been asked to look at the minutes of the Project Steering Board meeting, 22 August 2014 (later known as the Project Steering Board Commercial Sub-group) **(A43277749 – Minutes of a Meeting of the Project Steering Board on 22 August 2014 – Hearing commencing 24 April 2023, Bundle 14, Page 71)**. I had flagged my concerns to Susan Goldsmith, our Finance Director, that IHSL's programme to FC was slipping and that various milestones (including productions of the RDS) were not being met. Susan escalated my concerns to George Walker, the chair of the F&R committee, and it was agreed that a special Project Steering Board meeting was required to allow IHSL to discuss progress with the Project Steering Board directly. The meeting was chaired by George Walker and attended by senior people from across the respective organisations: Peter Reekie from SFT, Mike Baxter from Scottish Government; Richard Osborne from Macquarie Capital (for IHSL) and Ross Ballingall from MPX (for IHSL). Susan Goldsmith, Iain Graham, and I were also in attendance from NHSL. The purpose was to escalate my concerns as Project Director and bring senior heads together and consider the issues or impediments in getting to FC in an effort to resolve them.

112. I have been asked whether NHSL considered walking away at this point. It certainly was discussed as an option but dismissed as impractical given the time pressure and prevailing view that we could work though the issues to arrive at a satisfactory outcome with IHSL.

113. The minutes of the 22 August 2014 meeting record me stating that NHSL were comfortable that 100% of RDS would not be completed for FC, although prioritisation of what was definitely required was still to be agreed. There must have been prior discussion about this for me to make that statement. That is not a decision I would have made unilaterally. I would have discussed it with the Project Team and Motts, though I cannot recall the specific discussions. We had to take a pragmatic view about the amount of RDS that needed to be provided. There was a necessity to get on with the job and that meant not being as prescriptive in terms of deliverables, knowing that we'd get the balance of those deliverables during the RDD process, post FC. There was an acceptance that not insisting on 100% of RDS would result in more reviewable design data post FC and that did cause concern, as recorded in relevant risk registers.

114. I have been asked whether I was concerned about (i) the number of derogations from the published criteria and (ii) a potential challenge under the procurement regulations. Many concessions were made with IHSL as preferred bidder which were not anticipated at the drafting of ITPD stage – technical, legal, and financial. A challenge from an unsuccessful bidder was a risk but the changes agreed were seen ultimately as below the threshold to trigger such a challenge.

115. This decision should be read in the context of the remainder of the minutes, within the Action Notes where Mr Ross Ballingall of MPX states that there was a *"genuine mismatch in NHSL's and IHSL's expectations, where IHSL were being asked to deliver much more than on other projects, and considerably more than was required for the comfort of operational functionality".* MPX felt that this demonstrated "*paranoia and lack of trust"* in IHSL, by NHSL **(A32676824 – Action notes RHSC and DCN Special Project Steering Board – 22 August 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 13)**. To me, this demonstrates that

MPX/IHSL understood that all NHSL had design responsibility for was operational functionality and that we should trust them to deliver the rest, i.e. a compliant facility.

116. My response is minuted as follows: "*BC noted that NHSL has developed this revised programme in conjunction with IHSL and proposed to be pragmatic as to the level of detail required, but that that NHS governance process means that operational functionality must be satisfied."* **(A32676824 – Action notes RHSC/DCN Special Project Steering Board – 22 August – Hearing commencing 24 April 2023, Bundle 8, Page 13)**. We took a pragmatic approach by being more understanding in terms of deliverables subject always to our operational functionality requirements being satisfied.

117. I have been asked if I felt there was a mismatch in expectations as stated by Ross Ballingal. We were clear, as clear as we ever could be, to communicate to IHSL what our expectations were, not least in the preferred bidder letter, as to what was required for FC. In my view IHSL's supply chain, including MPX and TUV SUD / Wallace Whittle, should have entered into this arrangement as preferred bidder with eyes wide open, knowing exactly what they were required to deliver.

Project Management Group Meeting – 27 August 2014

118. I have been asked to refer to the minutes of the Project Management Group Meeting at paragraph 2.8 where it is stated "*LE* [Liane Edwards, Multiplex] *advised that during a review of the environmental matrix a number of discrepancies have been uncovered, impacting on RDS production, and requested input from NHSL. IHSL to raise RFI.*" (**A34225367 – Project Management Group Meeting Minute – 27 August 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 55).** This could be in relation to what eventually became the single-bed room pressure differential issue. I do not know what steps were taken after this particular meeting

to action any subsequent request for information that IHSL may or may not have raised but I do know their EM was not approved at FC. There could have been other issues of concern but I cannot recall.

Room Data Sheets (RDS)

119. The requirement for RDS for every room in the hospital to be produced by the preferred bidder by FC as set out in the ITPD and the ISFT was relaxed at FC. MPX, possibly for the commercial reasons set out above, refused to generate the full set of RDS and so we agreed they could produce RDS for Generic and Key Rooms at FC, with the remaining RDS to be produced during RDD.

120. It would have been my colleagues, Janice MacKenzie, and Fiona Halcrow, who determined the classification of rooms as Key Rooms and Generic Rooms. Janice Mackenzie prepared a paper for the Board "Design Development to Financial Close" for the Project Steering Board dated 29 November 2013 **(A39472521 - PB_0219_Project Board Paper Design Development PB to FC 29 November 2012 – Bundle 13, Volume 9, Page 393)** It has a list of Generic Rooms in Appendix 1 and List of Key Rooms in Appendix 2 **(A39472521 - PB_0219_Project Board Paper Design Development PB to FC 29 November 2012 – Bundle 13, Volume 9, Page 393)**. I understand that key rooms were those rooms that had critical operational requirements, including all rooms in critical care; and generic rooms were rooms that were replicated more than 4 times in a building, for example a dirty utility and a single bedroom children en-suite. I understand that the combination of the two represented 52% of the rooms in the building. The remaining 48% of the rooms comprised a range of rooms, for example, ward kitchens and play rooms.

121. While the original intent was to have 100% RDS at FC, MPX refused to do it. We agreed that they could concentrate on key & generic rooms, which were rooms that were significant in terms of the operational functionality of the facility. We were satisfied with this approach because there was time to develop the other, less significant, RDS. Subsequent approval of the RDS was only ever in relation to

operational functionality. See Schedule part 8, Appendix 1, Table A which clarifies that, in relation to a Level A or Level B endorsement of any room data sheet: *"means that Project Co may proceed to construct in accordance with the Submitted item and that the Board is satisfied that the design and other information in the relevant room data sheet states Operational Functionality". (***A33405351- Main Body of Contract – Bundle 13, Volume 10, Page 6)**

122. I have been asked if the decision to not have 100% RDS at FC resulted in the EM continuing as a concept at FC which was beyond the period originally intended. I don't think so. At FC, we asked for an EM generated by the preferred bidder regardless of whether all RDS's were available to us or not. IHSL did generate an EM and we gave it Approval Status C, meaning IHSL's EM was not approved at FC. This means it did not pass operational functionality requirements. At FC, the EM was IHSL's EM and any design risk transferred to them.

IHSL's Room Data Sheets (RDS) at Financial Close (FC)

123. I do not know how IHSL produced the RDS at FC. What is clear to me is that the RDS are labelled "Department of Health" and "Activity DataBase" so it would appear they were prepared using the ADB template. However, in my opinion, it appears that IHSL have taken the ADB template and manually altered the template from 10 air changes per hour to 4 air changes per hour in relation to critical care. I did not know that at the time. We would have expected IHSL to have flagged this to us via Motts as a proposed derogation. We would have expected Motts to draw our attention to any issues with the environmental data in the RDS and/or the EM.

124. I have been asked how rigorous the review of IHSL' RDS provided in September 2014 was. I was not involved in that so cannot answer the question. Janice Mackenzie as Project Clinical Director and Motts as Technical Advisor would be better placed to answer. However, the assessment of RDS supplied prior to FC was not the final opportunity to review. We were very much aware that further detailed design was required. Indeed, IHSL' RDS were unapproved at FC.

23 September 2014 – Areas of Concern

125. On 23 September 2014 I emailed Susan Goldsmith copying in Iain Graham and Moira Pringle, flagging areas of concern in relation to IHSL's progress to FC **(A35616638 - Email chain Brian Currie to Susan Goldsmith and Iain Graham to B Currie and S Goldsmith re Progress to Financial Close Areas of Concern, 23 September 2014 – Hearing commencing 24 April 2023, Bundle 10, Volume 2, Page 18)**. This was in advance of the Project Steering Board commercial sub-group meeting we had with IHSL, SFT and SG on 26 September 2014. It was helpful to set out my thoughts to my colleagues via email before the meeting itself.

126. Iain Graham responded by email on 24 September and noted that he didn't consider the position would be significantly different with any other bidder – just potentially different issues. Iain goes on to note his concerns, and states his main consideration is the risk of where and why IHSL have got to the position we're in. He notes that it had been made clear that IHSL had expended their pre FC funds and it was questionable whether any further delay to FC would be likely to elicit significant improvement. Iain goes on to discuss a number of options, one of which was to reject IHSL as preferred bidder, but ultimately his recommendation was to accept the position presented by IHSL, which was that they were going to meet their proposed programme.

127. There was a definite change in behaviour and attitudes from IHSL and particularly MPX after the preferred bidder was announced. This email was an escalation of my frustrations and my concerns that a lot of the deliverables were not being satisfactorily addressed by IHSL and certainly not within the time frame set.

128. We were growing increasingly concerned as to IHSL's ability to follow through and successfully deliver the project, hence the reason I listed out my areas of concern. I think the value judgment call that was made collectively by everybody at the time was whether we thought those issues could be resolved and we could move forward with IHSL. At that point, from my point of view as project director, there was

still reasonably good communication and understanding between myself and MPX's project director and their other directors on most issues that arose. Because of that we felt able to manage the process, resolve the issues and move forward with IHSL.

129. Although there were issues which might have meant that FC was, in terms of timescales, deferred or pushed out, I did not ever think the best option would be to reject IHSL as preferred bidder. Rather, my thinking was that the issues were all resolvable.

Project Steering Board Commercial Subgroup - 31 October 2014

130. The next meeting of the Project Steering Board Commercial Subgroup was 26 September 2014 and then there was another meeting on 31 October 2014 Mike Baxter and Susan Goldsmith gave apologies but otherwise there was representation from SFT, NHSL and IHSL (by way of MPX and Macquarie Capital Group Ltd) **(A33044797 – Steering Board Sub-group 31 October 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 27)**. The purpose of the meeting was to address the continued slippage in IHSL programme and lack of progress by IHSL towards FC. IHSL had not produced a revised programme but Macquarie confirmed that the revised FC target date of 27 November 2014 would not be possible and that 12 December 2014 was being targeted but would be challenging.

131. I have been asked to comment on the following section in the minutes: "*Peter Reekie asked John Ballantyne if, in his opinion, the board had changed what it was asking for since the invitation to tender. JB replied that there was a difference of opinion over the level of detail expected in Project Co's Proposals (PCPs), but the open-ended requirement that 'the Board has to be satisfied' was difficult to achieve. JB acknowledged that the Board had agreed latitude on signing off operational functionality where 100% technical info not yet produced*". **(A33044797 – Steering Board Sub-group 31 October 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 28)**

132. This is a reference again to the mismatch as between IHSL and NHSL re the level of design detail required to satisfy operational functionality for FC. IHSL felt NHSL were asking for too much design detail. The resolution was to take a pragmatic approach and ensure that the PA was caveated so that all outstanding design information was to be made available to NHSL for approval (as regards operational functionality only) through the RDD process.

133. The RDD process was an approach that SFT were aware of and endorsed: "*Peter Reekie advised the board and the IHSL to resolve these issues or to ensure that they were captured as reviewable design data post FC. BC undertook to review the board's outstanding PCP queries with their technical advisor and collate any such non-material issues into the schedule to be addressed post FC*" see **(A32676832 – RHSC and DCN Steering Board Commercial Sub-Group minutes - 31 October 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 17)**

<u>Single Room – Pressure Issue – November 2014.</u>

134. I have been asked to refer to an email trail **(A35614364 – Email – G. Greer to Brian Currie – Single Room Ventilation (with attachment) 13 November 2014 – Hearing commencing 24 April, Bundle 8, Page 69).** In this email, Motts are commenting on and assessing IHSL's EM in circulation at that time. The issue highlighted in the email from Motts to me relates to the pressure regime in the single bedrooms (not in critical care) as I read it. Motts are flagging to me there that this is potentially a compliance issue. The outcome of this email was that this single room pressure issue became part of the Schedule 6 list of outstanding information or issues to be resolved post FC via the RDD process, see **(A32435789 - Schedule Part 6: Construction matters, section 5 (Reviewable Design Data) – Hearing commencing 24 April 2023, Bundle 5, Page 793).** This document was prepared by Motts and lists various issues in relation to IHSL's Project Co Proposals (PCPs). IHSL's EM is included, see **(A32623049 - Schedule Part 6: Construction matters, section 6 (Room Data Sheets), Appendix 2 (Environmental Matrix) – Hearing commencing 24 April 2023, Bundle 5, Page 1454)**. This is of course IHSL's EM which was unapproved by NHSL. The comments include: "*Detailed proposal*

awaited on bedroom ventilation to achieve balanced/negative pressure relative to corridor."

Board Commentary on the Technical Information Requested by the Board and Technical Information issued by IHSL – 19 November 2014

135. I have been asked to refer to Board Commentary dated 19 November 2014 **(A33044733 – Board Commentary on the Technical Information Requested by the Board and Technical Information issued by IHSL – 19 November 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 23).** I cannot recall this document specifically. It is not in the format of Board Papers that we tended to present to the Project Steering Board, (there is no author or indication that it is to be discussed at the Project Steering Board or any other meeting) but it does contain the type of information we were discussing at that time. There is no author on it but I suspect Motts were the prime author and I would have contributed to it but I cannot say for certain. I cannot recall exactly what the purpose of the document was but it does accurately record the position at the time. The conclusion is that: "*The level of information requested is considered reasonable and in line with other projects. Preferred bidder has been late in providing information at each stage. The quality of information submitted has not been in line with the level expected*." **(A33044733 – Board Commentary on the Technical Information Requested by the Board and Technical Information issued by IHSL – 19 November 2014 – Hearing commencing 24 April 2023, Bundle 8, Page 25).** There is then an appendix which details what information had been provided by IHSL and when, which would have been prepared by Motts.

Project Steering Board Commercial Sub-Group - 21 November 2014

136. The next meeting of the Project Steering Board Commercial Subgroup was 21 November 2014 **(A33328602 - SFT - RHSC DCN - Project Steering Board - Commercial Sub-Group - Action Notes 21 November 2014 – Hearing commencing 24 April 2023, Bundle 10, Volume 2, Page 4080)**. Iain Graham gave his apologies but otherwise there was representation from SFT, Scottish

Government and IHSL (MPX and Macquarie Ltd). IHSL were presenting their fourth FC target date, which was to reach FC on 23 January 2015. MPX confirmed that all technical information had been agreed and shared with the Lenders' Technical Advisers for review and recommendation. The remainder of the meeting was generally focused on commercial, financial, and legal in an effort to iron those issues out and meet the target FC date.

January 2015

137. I have been asked to refer to which is an email trail relating to ventilation pressure differentials and the impact of opening windows dated 14 January 2014 **(A35614504 – Email from David Stillie to Janette Richards – 13 to 14 January 2015 – Hearing commencing 24 April 2023, Bundle 8, Page 58 to 62)**. I was not copied into this correspondence. I might have been aware of these emails at the time but I cannot remember. I cannot remember the input of HFS into this specific issue but I know generally, if we needed advice beyond the expertise available to us in Lothian, we would go to HFS / Health Protection Scotland (HPS) and seek their opinion. It was on an as-needs basis.

138. I have been asked to refer to **(A34813021 – IHS Lothian RHSC & DCN Request for Information Summary, 20 January 2015 – Hearing commencing 24 April 2023, Bundle 10, Volume 2, Page 15)**. I do not recognise this document. It appears to be a MPX document summarising their RFIs as at 21 January 2014. There is reference to a meeting on 13 January 2015. I have been advised this was a HAI-SCRIBE meeting. I was not in attendance at the HAI-SCRIBE meetings. As far as I can recall, I was not made aware of the risk of MRSA and Norovirus specifically. If I had I would have discussed with the Project Clinical Director and Infection Control Nurse and taken their view as central to allowing this problem to be resolved at a future date. I understand those discussions did occur, but I was not part of them and did not need to be given the Project Clinical Director's involvement.

139. I have been asked to refer to a document dated 28 January 2015 **(A36308801 – Design Risks to the Board to Financial Close – Hearing commencing 24 April**

2023, Bundle 8, Page 84). This is a Mott Macdonald risk register. It states that it should be read in conjunction with the detailed feedback that has been provided through each Workstream. One of the risks highlighted in red is an M&E Ventilation risk. The mitigation measure in place is noted as follows: "*The single room with en-suite ventilation shall comply with SHTM 03-01. The design solution should not rely in any with the opening windows as these will be opened or closed by patient choice. The critical factor from SHTM 03-01 for infection control will be the resultant pressure within the room being balanced with or negative to the corridor. Isolation room ventilation shall comply with SHPN 04 Supplement 1."* **(A36308801 – Design Risks to the Board to Financial Close – Hearing commencing 24 April 2023, Bundle 8, Page 84)**

140. This design risk was appropriately mitigated at the time in that it became subject to the RDD process post FC under Schedule 6 of the PA. I have been asked why this was not flagged as a risk in the Pre- FC KSR. While this specific RDD item was not flagged in the KSR, it was flagged in the KSR that some technical documentation was subject to further development through the RDD process, which was a process that SFT were very much aware of and content with.

141. I have been asked to refer to **(A36308810 – Technical Risks to the Board at Financial Close – 31 January 2015 – Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 84)** dated 30 January 2015. This is a Mott MacDonald Risk Register. One of the issues noted is that "*Despite best efforts of the Board, more RDD than was expected by the Board".* The mitigation measures employed by the Board up to FC to manage this risk is as follows: *"IHSL pushed very hard to achieve maximum information during PB stage. Further Developed RDD schedule for the Board."* **(A36308810 – Technical Risks to the Board at Financial Close – 31 January 2015 - Hearing commencing 24 April 2023, Bundle 10, Volume 1 (of 2), Page 84).** For clarity, this means that IHSL were pushed very hard by the Board to achieve maximum information during PB stage. The RDD process was developed further to manage this risk.

142. We did have concerns about the volume of reviewable design data at FC and what is recorded in the risk registers reflects that. Our main concern was that the volume of RDD required additional resources to allow for appropriate review. We bolstered our Project Team and reliance on Mott MacDonald to cope. We tried to ensure there was a controlled or steady stream of information coming in for review from IHSL but unfortunately that did not transpire. Sometimes there were gaps in time where we didn't get anything from IHSL; other times there was a tsunami of information. We knew we had turnaround times contractually to adhere to in terms of reviewing the RDD and getting it back to IHSL and MPX, so it was a very demanding process. It went on for months, if not years, as a result of the sheer volume of design information that was coming in.

Pre-Financial Close (FC) Key Stage Review (KSR) – 11 February 2015.

143. The Pre-FC KSR dated 11 February 2015, asks at Question 2 whether the Board is satisfied that the preferred bidders' solution satisfies its operational and functional requirements. The answer is "yes" and it is commented that the detail of the design has been discussed with user groups to ensure clinical support and the Board confirms that there was appropriate internal sign off. **(A33336933 – Pre-Financial Close Key Stage Review – 11 February 2015 – Hearing Commencing 24 April 2023, Bundle 9, Page 11)**.

144. Question 3 seeks confirmation re the status of the technical documentation and asks whether NHSL, and its advisers, are satisfied that the further development / document production is achievable. It is answered that the Board is content with the documentation subject to further development through RDD following FC and that the construction proposals are of sufficient detail to provide sufficient certainty to the Board as to what is to be provided. **(A33336933 – Pre-Financial Close Key Stage Review, 11 February 2015 – Hearing Commencing 24 April 2023, Bundle 9, Page 11)**

145. The format of the KSR and the purpose of the KSR is for SFT to satisfy themselves that they could give the go-ahead to Scottish Government to release the funding. It

was an SFT process, an SFT template and SFT questions. The KSR was a standard template as far as I'm aware. We were never given the option to introduce another question or take one out. We would endeavour to answer the questions laid out in the KSR as best we could. Donna Stevenson and Peter Reekie, in particular, were very well-informed. Peter Reekie attended the Project Steering Board commercial sub-group meetings detailed above so he was very much aware, as was the Scottish Government who also attended the meetings, of the issues encountered with IHSL from preferred bidder to FC.

146. The process and the ensuing period between the two meant that these risks were reduced to a point where it wasn't seen as significant enough to not agree the KSR and not move forward.

Financial Close (FC) – 15 February 2015.

147. Iain Graham and Susan Goldsmith from NHSL and others from SFT and Scottish Government would be better placed to discuss the mechanics of FC. The linkage between SFT and The Capital Investment Group (CIG) is an area I have no real knowledge of.

148. I have been referred to a CIG meeting some 6 months earlier, on 26 August 2014, it is stated that the business case is: "*Not approved at this meeting due to a number of outstanding comments."* **(A35001841 – Capital Investment Group Minutes – Meeting of 26 August 2014 – Hearing commencing 24 April 2023, Bundle 10, Volume 1, Page 36).** I was not at this meeting and neither was anyone else from NHSL. I don't know why this issue arose in August 2014. It may have simply been a standing item on the agenda and/or because the original programme for FC was around that time.

149. I have been asked how the original date was arrived at for FC. From memory, it was arrived at from discussions with all relevant parties, looking at benchmarking, past experience and looking at what would be the normal expectations in the PFI market to get through the process. It was also based on IHSL's own programme to FC.

However, IHSL's programme was pushed out many times and I'm not sure if there were any particular commercial factors around the final date for FC.

150. SFT were concerned about the affordability side of the Project. It was part of an infrastructure programme of works that they were managing on behalf of the Scottish Government. We had received, as it transpired, three very competitive bids at the end of competitive dialogue phase, which was seen as a good outcome and confirmation of the appropriateness of a three bidder competitive dialogue process. I think we also hit a sweet spot in the funding market where we were one of the most economic or certainly the best value for money NPDs at the time. I remember Ernst & Young, or EY as they now are, presenting a comparison chart showing that we had benefitted from an optimum point in the funding markets.

151. Iain Graham and Susan Goldsmith are better placed to discuss the commercial aspects of FC. My understanding is that there were two senior debt providers (M+G Investments and the European Investment Bank) and there was Macquarie Capital Ltd as provider of junior debt with all their individual teams of technical and legal advisers. If FC had continued to be pushed back then no doubt there would have been commercial implications.

152. I cannot comment on any funding or NPD implications in terms of a continuing delay to FC. SFT are best placed to answer this. They were looking after expenditure across Scotland through their infrastructure programme, so there may very well be good reasons why FC needed to be concluded sooner rather than later.

153. I would also imagine that MPX were keen to make a start on site given construction would trigger payments to them from IHSL as Project Co under the PA arrangements. MPX would be keen to commence cash flow and start earning an income from the Project.

154. I do recall that there was an astounding amount of money to be made or saved on the final interest swap rate but again I'm not sure what, if any, relationship this bore to the final date for FC.

Reviewable Design Data (RDD) – post-Financial Close (FC)

155. What was agreed at FC was the status of design at the time. It was not a complete design and we went to great pains to introduce Schedule 6 in the PA, which was a list of design deliverables for the RDD phase that IHSL had to address.

156. In terms of their appointment Motts were to provide necessary input to Design & Construction, FM and Paymech elements of FC, including the initial RDD process, and were to manage the RDD process on behalf of NHSL including progress reporting, attendance at workshops, administration, and stakeholder input during construction.

157. There was a process set up by NHSL and Motts post FC whereby IHSL met with user groups (clinicians) and the Project Team (including Motts and the architects) to finalise the very detailed 1:50 room layouts, equipment lists and so on, which was part of the RDD process. While the RDD process was ongoing, early construction activity could commence at the same time. This is not uncommon in the building industry. Design for early construction activity such as piling, drainage and sub-structure would come first so that construction could commence whilst room layouts and finishes would come later.

158. There was a need and desire to get on site and get the project underway. The need and desire to commence construction was very much there from Scottish Government, from SFT and from the main board in NHSL. The Project had already suffered delays as a result of the change from capital to NPD; the ultimately successful but protracted negotiations with Consort; and the NPD procurement process in general. There was a lot of pressure to get to FC. But that's the job and it’s normal in large and important projects.

159. It could be argued that including the EM in the RDD rather than insisting that IHSL’ EM was concluded and approved before FC contributed to issues that arose in relation to the ventilation system. However, I understand that Stewart McKechnie,

the M&E designer from TUV SUD / Wallace Whittle, considers that the EM did not contain any errors because, in his view, the EM was compliant with SHTM 03-01. I understand this is because, in his view, the only rooms in critical care which require 10 ac/hr are isolation rooms. For the avoidance of doubt, I was not aware that this was how Stewart McKechnie interpreted the Guidance and I disagree with his interpretation. There were various opportunities for IHSL and their supply chain to flag the error but they did not. This can perhaps be explained by the fact that TUV SUD / Wallace Whittle did not consider there was an error to flag.

160. If we or Motts had spotted the error in the IHSL's EM or the RDS before FC we would have drawn it to IHSL's attention and highlighted it as an issue to be corrected post FC. That said, I do not believe such an issue on its own would have held up FC, rather, it would have been an item for RDD in the way the ventilation pressure issue was. After all, MPX had informed us long before FC that they were doing no more design until the contract was signed, which may have been because that was when monies began to flow to MPX from IHSL.

IHSL's EM at Financial Close (FC)

161. IHSL's EM and the form in which it appears in the PA at FC constituted RDD by virtue of part 4 of section 5 of schedule 6 to the PA. It was not approved by NHSL at FC. We expected to review IHSL's EM during the RDD process and we did comment on it regularly back and forth. From memory, the Project Team (including Motts) kept pointing IHSL generally to SHTM 03-01 and flagging that they needed to comply with those requirements.

162. I have been asked whether the EM should ultimately have been superseded by completed RDS and, if so, why the EM needed to be included as RDD rather than just requiring completed RDS. I cannot recall the exact reasoning at the time, however, IHSL's EM contained far more detailed environmental data than included in the RDS and presumably we were keen to evidence it's development, particularly given its unapproved status at FC.

163. I have been asked why Schedule 6, Section 5, Part 4 includes a comment that the EM should be updated by IHSL to reflect all rooms and room types based on the updated Schedule of Accommodation **(A33644029 – Section 5 of Part 6 of the Project Agreement – Reviewable Design Data RevHClean (NHSNSS) – Bundle 13, Volume 9, Page 404)**. I cannot recall exactly. There would have been some minor changing of certain rooms post preferred bidder, e.g., an extra room here, a lesser room there. Janice Mackenzie would be better placed to comment on this. She will have a better memory than me of it, but it was necessary to adjust IHSL's EM to reflect the accurate schedule of accommodation.

164. The whole of the EM was subject to RDD. That is self-evident from the amount of correspondence on the EM during construction that focussed on various parts of it, not just the points noted in the schedule of the Project Agreement at FC.

Escalation / Oversight

165. I have been asked about escalation and oversight of the Project at Scottish Government level. Mike Baxter or Alan Morrison's attendance at the Project Steering Board (including the additional Project Steering Board commercial sub-groups discussed above) was deemed, I would imagine, to be sufficient escalation of issues that arose in the Project to the Scottish Government. They would also have received the relevant Project Steering Board papers and minutes and been party to any ongoing discussions where appropriate. In addition, SFT were in close and regular contact with the Project Team and also engaged with us through their KSR validation exercise. There might have been other conversations, either formal or informal, between Executives of NHSL and the Scottish Government, that I don't know about. However, from a Project Director and Project Team point of view, this was Scottish Government's visibility and eyes on the project.

166. I have been asked if NHSL should have been signing a contract with IHSL when parties seemed so far apart. That was a collective value judgement by the Scottish Government, SFT, our main board, our Chairman of the F&R committee and our Director of Finance, Susan Goldsmith. There was sufficient comfort that any issues

that had not been fully resolved could be resolved post-FC. That would be my take on it and recollection of it. I would have been party to those discussions and would have been asked for a view and provided an opinion.

167. I have been asked if NHSL were influenced by the fact that MPX had been involved with the Queen Elizabeth University Hospital (QEUH) in Glasgow. In my experience over many years, if not decades, on projects of various sizes, where such as in this case, a contractor is rolling on from another project of a similar scale, size, and complexity with substantially the same individuals and teams, that is usually a very positive factor because of that in-built experience and know-how. From my point of view, it certainly was an advantage to have a team from MPX who had worked on what was deemed to be, at that point, a successful major new hospital in Scotland. We had key players that had worked at the QEUH involved in our Project, although some of them left very quickly after FC.

168. We consulted with HFS and HPS, Scottish Government bodies, on an ad hoc basis as/when we needed to.

169. In terms of design assurance, my view would be that Scottish Government and SFT took comfort and reassurance from the contractual obligations and duties of the parties in an NPD contract. I think Scottish Government and SFT's assumption was that IHSL would deliver a compliant facility in line with their contractual obligations and the transfer of risk.

The Atkins Review

170. SFT commissioned WS Atkins to undertake an independent design review **(A33335814 – Atkins Independent Design Review Report dated 12 December 2011 – Bundle 13, Volume 9, Page 580)** during the reference design period. It was mainly about efficiencies and affordability. For example, it was to ensure that the circulation, communication, areas, ratio of support and public space to clinical accommodation were within an affordability envelope and that the building was

efficiently designed with no surplus space. HFS reviewed the Atkins report and provided comments.

Achieving Excellence Design Evaluation Toolkit (AEDET)

171. AEDET is an architectural assessment rather than one concerning building services engineering. AEDETs were undertaken at various stages during the Project: (i) the capital funded project (October 2009, April 2010, and August 2011); (ii) the reference design phase following the switch to NPD (August 2011 and March 2012); and (iii) by each of the bidders during competitive dialogue (June 2013). The reference design was subject to an AEDET review as was the bidders' schemes in competitive dialogue though I was not part of that.

172. From memory, either the Architects or HFS would facilitate the AEDETs. I did not attend the AEDETs from the NPD phase onwards because it was essential not to influence the process by Project team members who could introduce a biased perspective having been the facilitators of the design being assessed. Contributors should be impartial. I would doubt any of the design team had an active role in the AEDETs for the same reason. If they did, it would be a passive one. The process is used all the time, it's still used to this day. It is a useful tool which is in use right across the construction industry, not just in healthcare.

173. I have been asked for my view on at what point RIBA stage E should have been reached. In order to comment on this I would have to map MPX's release of design information against this now old RIBA stage. It would be very difficult, impossible really, given the nature of the NPD contract, to try and draw a direct comparison.

Healthcare Associated Infection - HAI-Scribe Review

174. HAI-Scribe is a process that health boards go through at all the different stages of a project to assess the risk to patients and staff in relation to planned construction works. HAI scribes are undertaken: (i) at the outset of a Project; (ii) at the design and planning stage; (iii) during construction; and (iv) prior to occupation. The focus

is on infection control and infection control nurses, along with the relevant members of the Project Team and IHSL, attend the HAI-scribe meetings. Janice Mackenzie, Project Clinical Director, is better placed to advise on HAI-scribes than me. I did not have a direct role in the HAI-scribes.

NHS Scotland Design Assessment Process (NDAP)

175. An NDAP wasn't required because we had already secured business approval and the project fell into transitional arrangements. Architecture + Design Scotland (A+DS), who are part of NDAP, reviewed the three bidders design proposals during competitive dialogue, as did the City of Edinburgh Council's planning department. I am not convinced that an NDAP would have identified the critical care ventilation issues which led to the failure to open in July 2019. I address this further in my first statement at paragraphs 66 and 68.

Transfer of risk

176. In my view, this all goes back to the inherent NPD transfer of risk principle enshrined in the PA. The public sector utilised an NPD contract to transfer the risk to deliver a compliant facility to the private sector. However, the Board, the procuring authority, remained responsible for the operational functionality side. As long as we were satisfied that the bidder could deliver a building that would allow us to operate as a hospital in the way we desired (e.g. which departments were located next to each other), then in theory the responsibility of achieving compliance with Guidance did not rest with us.

177. I say in theory because in practice the Project team and its advisers have a duty of care to the patients and staff who will use the facility to ensure that it is safe on completion and so we did pick up more than we contractually had to. Most regrettably, and even after all our interventions in terms of picking up non-compliances during the build, nobody spotted the inconsistency in the EM re critical care. It transpired there were many more construction issues picked up during the build which manifested and eventually resulted in the Settlement Agreement

between IHSL and NHSL (SA1). There were 81 items that required resolution within SA1 alone. Some of them were significant technical issues that would have threatened health and safety of patients and staff. To me, the fact we had to enter into SA1 at all speaks to the underlying behaviours and failures of IHSL, MPX and their supply chain throughout the Project.

178. There was an assumption on our part that all parties knew their responsibilities and obligations under the PA. IHSL should have been policing their supply chain. IHSL's supply chain, as I understand it, would have back-to-back agreements where the obligations of the parties flow down, for example to the Building Contract with MPX and the FM Contract with Bouygues Ltd.

179. IHSL were responsible, given the transfer of risk necessary in NPD, for the design, procurement, construction, funding and operation and maintenance of the facility. That is the whole point of NPD – to get it "off book". The Scottish Government and SFT are better placed to answer than me why NPD was chosen as the procurement route. Paradoxically, the project was never taken "off book" because that transfer of risk, significant as it was, did not reach the required threshold prescribed by ESA 10 when it was published in Sept 2014 some five to six months before FC. SFT is best placed to explain why this occurred.

180. Compliance with Guidance was mandatory in the PA. I understand that the M&E engineer from TUV SUD / Wallace Whittle who was responsible for IHSL's EM does not think there was an error in their EM and, accordingly, that the hospital as built in 2019 was compliant with Guidance. Thankfully, NHSL provided for an independent validation process prior to the hospital opening and through that process discovered that the critical care ventilation system designed and installed by IHSL, MPX and TUV SUD / Wallace Whittle was not compliant with Guidance. As soon as NHSL were aware of this, the matter was escalated to Scottish Government, who decided to delay the opening of the hospital so that no patients were put at risk.

Concluding Remarks

181. I have been asked how the error in the EM arose. The EM was not entirely incorrect, it was inconsistent. The guidance notes, indeed, the front page of the EM, explicitly required 10 ach critical care but the body of the EM mistakenly required 4 ach. In terms of the reference design, the original designer, H&K, have confirmed that the requirement for 4 ach in the body of the EM was a result of human error. H&K consider the body of the EM should have reflected the guidance notes and all rooms in critical care should have had 10ach. In terms of IHSL design, the M+E designers, TUV SUD, confirmed that they consider 4 ach in critical care (other than in isolation rooms) was and is compliant with Guidance. This is a unique interpretation and may explain why TUV SUD, Multiplex and IHSL did not flag and remedy the situation.

182. There were systems in place to try and avoid such a scenario:
    i. Project Agreement and BCRs specified compliance with Guidance, subject to any agreed derogations.
    ii. Requirement to submit derogations from guidance was clear and discussed throughout ITPD with IHSL – there were no such derogation submitted re critical care.
    iii. Requirement for IHSL to satisfy itself as to the accuracy, completeness, and fitness for purpose of disclosable / design data as per clause 7, and the EM was design data.
    iv. Requirement to comply with CEL 19 2010 and utilise ADB to prepare RDS. This should have flagged to IHSL the errors in the EM, and IHSL should have flagged the non-compliances to NHSL and/or submitted a derogation.
    v. The guidance note of the EM itself actually specified 10 ac/hr for critical care. Again, that inconsistency should have been flagged by IHSL and a derogation submitted.
    vi. Appointment of Technical Advisory team throughout who did review the EM on various occasions.
    vii. Independent tester role from FC onwards. Included obligations to familiarise itself with the Project Agreement and project documents and flag any inconsistencies – which they did not.

viii. Assurance Letter from IHSL dated 31 January 2019 which states that all critical vent systems installed and compliant with SHTM 03-01.

ix. Ultimately: NPD style contract. Risk and obligation sits with IHSL to deliver a fully compliant facility. In other words, reliance on bidder's quality control.

183. I have been asked how the issues that arose on this project could be avoided in future projects. Firstly, I would say that the project team worked tirelessly from the outset to deliver a building which would make a measurable difference to the experience of patients, staff and visitors and used resources more efficiently, costs less to run and maintain and is more readily adapted as service needs evolve and change. Patient experience was central to the design.

184. Turning to lessons learned, many of the issues that arose in this project resulted from the fact this was an NPD style project. However, some of the issues and lessons learned are applicable to all healthcare projects. With that in mind, and with the benefit of hindsight, my thoughts are as follows:

i. Increased sharing of information between health boards, in particular: a fuller exchange of performance of contractors on projects.

ii. Independent validation of all key building services operational performance before practical completion.

iii. Role of Independent Tester enhanced to incorporate more thorough testing and commissioning and undertaking a Clerk of Works and Resident Engineer role.

iv. Insisting on a more modular and "off site" approach to design and construction.

v. More fully testing bidding consortia on their understanding and their knowledge of the specific contract and their risk and obligations through the incorporation of an agreed risk matrix in the contract.

vi. Special Purpose Vehicle to appoint an accountable Project Director to oversee overall delivery and in particular performance of builder.

vii. Builder in consortium to have a long-term financial stake in facility.

viii. Insisting on design being more fully complete prior to FC with attendant time and cost implications.

ix. Close loopholes/ambiguities in mandatory SHTM requirements to mitigate disputes through ignorance, commercial gain, or incompetence or all three.

x. Wording of technical ITPD documentation checked by procurement lawyers to ensure continuity and clarity of intent across all sections.

xi. Long term and consistent pipeline of major acute healthcare projects encouraging investment in resources and knowledge acquisition across construction industry.

xii. Increased investment in procuring authority project teams particularly in relation to clinical input, infection control and MEP.

Declaration

185. I believe that the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

Scottish Hospitals Inquiry
Witness Statement of
Darren Pike

Witness Details

1. My name is Darren Michael Pike. I am currently employed as a Project Director at Multiplex Construction (Europe) Limited ("Multiplex"). I have worked at Multiplex for approximately 14 years, first as a Project Mechanical and Electrical Engineering ("M&E") Manager. I then became a Project Director from around January 2016.

2. Prior to joining Multiplex, I worked for Balfour Beatty Engineering Services (formerly Haden Young) for approximately 13 years and was a Preconstruction Manager for healthcare in that business. I graduated from Strathclyde University in 1997 with a degree in Mechanical Engineering. I started as a Mechanical Project Engineer and then became a Project Manager. I then worked on the Design and Build side before then becoming a pre-construction manager in 2009, before then joining Multiplex.

Background

3. I worked on the Royal Hospital for Sick Children ("RHSC") project ("the Project") from April 2015 until practical completion was certified in February 2019. When I joined, the Project was in the early phases after Financial Close. Multiplex were employed by IHS Lothian Limited ("IHSL"), which was a Special Purpose Vehicle ("SPV") company, also referred to as "Project Co", set up specifically for the Project. They were in turn employed by the health board, NHS Lothian ("the Board") to deliver the Project.

4. From April 2015 to December 2016, I attended various meetings to develop the relationship with the Board and IHSL, then from January 2016 onwards I

became Multiplex's Project Director on the Project. The role of a Project Director is to oversee the delivery of the contract, which included managing the Multiplex team but also liaising with our contract partners and other stakeholders. I liaised regularly with IHSL and with the Board as part of that.

5. I also had regular contact with Wallace Weir (Project Director from IHSL) and with Brian Currie (Project Director from the Board). I had a meeting with both of them most Monday mornings, which was intended to ensure everyone was kept up to date and to allow the respective Project Directors to take direct actions to their teams, if needed to progress matters. Wallace Weir would feed back to IHSL and their funders, and Brian Currie would feed back to the Board and their advisors. These meetings took place from 2016 to 2018.

6. The Board was advised directly by Mott MacDonald ("MM") as well as its own clinical team. I did not have a lot of direct contact with the NHS clinical team and only met them on a couple of occasions. However, my understanding is that they were consulted regularly by the Board. The project team attending meetings on behalf of the Board would rarely make decisions at the meeting itself – the information or proposal was usually taken from the meeting and put before the Board's own advisory team before a decision was made.

7. I oversaw a team of Multiplex individuals reporting to me, each heading up a different discipline area – e.g., Construction, Health and Safety, Commercial, M&E and Architectural. In terms of the M&E design, I wasn't involved in the detailed design but would get reports from the Multiplex team involved. Specific items would then be escalated up and, if needed, I would become more involved.

8. I was not involved in the actual design of the ventilation system; this was carried out by Wallace Whittle. Our Ken Hall (Package Manager) and Colin Grindlay (Lead M & E Manager) would be the liaison between Wallace Whittle, the Board and MM in relation to correspondence. Wallace Whittle would generally lead design meetings discussing directly with MM and the Board, with Multiplex in attendance.

RDD Process

9. There was a design development ("RDD") process with the Board on the Project. The aim of this process was to submit the design information to allow this to be reviewed to ensure it was in line with the Board's Requirements and expectations.

10. From a mechanical, electrical and plumbing ("M&E") point of view there was usually a pre-RDD submission and meeting held for each submission. This ensured everyone had sight of the information and an opportunity to discuss it before it was formally submitted to identify any comments/queries as early as possible.

11. Pre-RDD packs of drawings and specifications were prepared by the design consultants and issued to the Board and their advisors ahead of a specific meeting date. The relevant representatives from each party then attended the pre-RDD meeting, where they raised any comments on the proposed submission. These comments were then taken away, and any agreed changes or alterations were reflected in the drawings for the formal RDD submission. The aim of the pre-RDD meeting was to ensure the design complied with the contract. It also allowed the stakeholders to raise any concerns so that the formal RDD process would go as smoothly as possible.

12. I did not generally attend the pre-RDD meetings, instead the relevant Multiplex team lead would attend and feed back to me as necessary. For M&E ventilation design matters, Ken Hall or Colin Grindlay would usually attend from Multiplex and David Martin (exact position/role unknown) would usually attend as a representative from IHSL. MM would also be present at these meetings. I understand the Board also attended some of the meetings.

13. After the pre-RDD meeting, the formal RDD submission was made. The submission was then reviewed by the Board, the Board's technical advisors and anyone else thought relevant by the Board. The Board would then mark the submission, either status A, B or C.

14. Status A meant that the submission was accepted without any comments and construction/procurement was to proceed in accordance with that design. Status B meant that the submission was accepted subject to comments, and again we were to proceed in accordance with that design. Status C meant that the submission was not approved. We therefore could not proceed with construction or manufacture unless the design submission was returned status A or B.

15. There was an RDD schedule to monitor this process that I would review every month or so with my Multiplex colleagues to ensure that design submissions were being submitted, reviewed and approved according to that schedule. This was to allow us to track the packages so from a programming point of view, we knew the information was being received from the design team, going through pre-RD/RDD and being submitted to then allow us to procure and construct in accordance with the programme.

16. As I understand it, the ventilation design for critical care went through this RDD process and was approved by the Board.

Development of the Environmental Matrix

17. The Environmental Matrix is what the M&E services design consultants use as their design brief, for each space/area on the Project. Meaning Multiplex and our design consultants (Wallace Whittle) would produce the design for M&E elements to achieve the requirements stated in the Environmental Matrix.

18. Amongst other things, the Environmental Matrix specified the required air change rates per hour ("ac/hr"), pressure regimes and ventilation type (i.e., mechanical or natural) that were required for each room or area of the hospital.

19. I was not directly involved in the development of the Environmental Matrix. When I joined the Project, my understanding was that the Environmental Matrix was already in place and Multiplex were completing their design in line

with the matrix. My understanding was that when the Environmental Matrix was then re-submitted for RDD post Financial Close, it would only be reviewed against the comments raised by the Board pre-Financial Close. The Board, however, reviewed the whole document again and produced further comments. This re-review occurred across the whole Project, not just the Environmental Matrix. The Board were effectively doing a further review of what they wanted post Financial Close. Multiplex did not agree with this approach as the contracts had been agreed on the basis of the requirements at Financial Close, but we reviewed the comments and tried to identify which of the new comments/requirements had a cost and/or time impact and which did not. We tried to submit change requests in relation to those with a cost impact to allow them to be discussed with the Board. As far as I can recall there were no significant changes made to the ventilation strategy and requirements.

20. Overall, both the Environmental Matrix, and the underlying design documents which achieved the output shown in the Environmental Matrix, went through the RDD process to allow the Board to ensure they met their requirements. Each of the underlying design documents (being ventilation drawings and grille schedules), were reviewed and approved in the same way as the Environmental Matrix through the RDD process.

21. There were 11 revisions in total of the Environmental Matrix, each of which went through the RDD process.

Single Bedroom Ventilation

22. In relation to the single bedroom ventilation, I was aware that there were discussions in relation to whether or not "derogations" were required. Multiplex's position was that these were not changes to our contract, as the design aligned with the Environmental Matrix; but we were willing to prepare these for the Board as a form of audit to reflect the design. The derogations in question were WW014 **(A46365902 – ANX_EDN000379537 - Bundle 13,**

Volume 2, Page 543) and WW015 **(A46365903 – ANX_EDN000429472 – Bundle 13, Volume 2, Page 544)**.

23. Our understanding was that these reflected the agreed position/the Board's Construction Requirements. The Board, however, rejected the derogations.

24. It wasn't clear why the Board were rejecting the derogations. Our view was that we were providing what the contract required and what reflected the Board's requirements that had been agreed at Financial Close.

25. This remained a contractual point of dispute throughout the Project, however (as I explain in more detail below), it was resolved as part of the Settlement Agreement between the parties.

26. Whilst this was a contractual dispute, the technical position was agreed and the design was approved through the RDD process, including 4 ac/hr in the single bedrooms in critical care.

Environmental Matrix Revision 6 and 7

27. In around October 2016, revision 7 of the Environmental Matrix was returned status C **(A46440425 – Appendix 01 - ANX_EDN000088432 – Bundle 13, Volume 1, Page 7)**. I recall we questioned how, when the fundamental information in the matrix had not changed, it could be downgraded from a B to a C. At this point Multiplex had already begun to procure and construct in accordance with the Status B Matrix.

28. The Board raised the following comments in their covering email:

> *"The Board have reviewed the Environmental Matrix and still has significant concerns on items that do not appear to comply with the BCR's*
>
> *The Board notes the following general comments:*

1. *The Board has highlighted cells in blue and red bubble on the hard copy which require PCo review*
2. *The Environmental Matrix should be updated to reflect the Production Group drawings*
3. *Currently the matrix doesn't reflect the clinical lights schedule submitted through Clinical Lights Specification and Clinical Lights Technical Submittal*
4. *EM shall be updated to reflect all circulation areas as per SoA*
5. *Some lux levels don't appear to align with LG2*
6. *Some ventilation rates don't appear to comply with BCRs. The Board would like to point that is still awaiting response from PCo to the issues raised as per MM-RFI-000172 & MM-GC-002006 relating to ventilation rates"*

29. Point 1 suggests a detailed room by room review has been undertaken by the Board and their advisers. However, the 4 ac/hr for the multi-bed wards and single cubicles in critical care has not been highlighted, nor has the pressure differential in the rooms. The only comment in relation to these rooms is room 1-B1-063, where the ventilation type of "Central Supply Air" and extract of 0.5 have been highlighted.

30. In relation to Point 6 and the reference to communication MM-GG-002006, this relates to the ventilation rates in the single bedrooms and the Board's rejection of the derogations I discuss above (WW014&015) – however no further specific details are provided. MM-RFI-000172 relates to the ventilation system for the CT, MRI, Fluoroscopy & Gamma Camera rooms. This specific query was closed out by Multiplex under communication mail number MPX-RTRFI-001075 **(A46440427 – Appendix 02 – ANX_EDN000208018 – Bundle 13, Volume 1, Page 10)** and **(A46440426 – Appendix 03 – EDN_000301119 – Bundle 13, Volume 1, Page 11)**

31. In terms of the Board's specific comments noted in their email, again these suggest a room-by-room analysis has been carried out and again no comments are raised in relation to the air change rate or pressurisation in the single

cubicles or multibed wards in critical care. The Board's comments were as follows:

"Some specific comments as follows:

1. *See example G-D1-015 in the table – confirm filtration to physical measurement rooms*
2. *Areas off the circulation area/corridor, i.e.. 1-D6-060 Resus Bay indicates transfer air but not known from where. Same principles applies to all Bays and Receptions*
3. *See example 1-D7-005 in the table – indicates area of 4m2 however General Arrangement drawing shows 4.8m2. Please review this and all other similar instances.*
4. *See example 3-D9-009 in the table – indicates no cooling and no ventilation but filtration. Please review this and all other similar instances.*
5. *See example 3-D9-016 in the table – contradiction, please confirm for this and all other similar instances*
6. *See example G-F1-037 in the table – only extract and filtration. Please confirm for this and all other similar instances*
7. *See example 1-H2-013 in the table – confirm temperature and cooling requirements for this and all other similar instances*
8. *See example 1-L1-015 in the table – "via bedroom and en-suite" confirm extract rates for bedroom and en-suite*
9. *All dirty utility rooms – please confirm dirty utility heating type and control*
10. *Changing cubicles – will be supplied with 18 deg C fresh air with no option to increase temperature. Please confirm*
11. *Dictation rooms – will be supplied with 18 deg C fresh air with no option to increase temperature. Please confirm*
12. *1-P1-067 (see table) – please confirm proposal*
13. *1-P1-090 and 1-P1-005 – should this not be the other way round? Please confirm"*

32. Overall, it appeared to me that the Board had returned Revision 7 as status C because they were frustrated that it was not up to date with certain other documents that had been approved since the previous revision. However, in

my opinion, it is not common practice to do so. An environmental matrix is usually updated every few months, rather than every time there is a change, particularly this late in the Project when it has already been awarded Status B.

33. Giving the document Status C meant that it was not approved. At this stage of the Project that was a major risk.

34. On 7 November 2016, the Environmental Matrix was then upgraded to status B again, but under reservation of the Board's position **(A46440428 – Appendix 04 – ANX_EDN000079746 – Bundle 13, Volume 1, Page 12)**. The reason given for the concerns, however, was mail MM-GC-002084 **(A46440429 – Appendix 5 - MM-GC-002084 – Bundle 13, Volume 1, Page 16)** which is the mail reference for the Board's comments dated 17 October 2016 on Rev 7 of the Matrix discussed above. The ventilation comment then being the ongoing contractual disagreement in relation to derogations WW014&015 and the single bedroom ventilation, Multiplex's position being the design was in accordance with what the Board had requested. This then being confirmed in the Settlement Agreement.

35. Nothing materially changes between the Status C and Status B Environmental Matrix.

Multi Bedroom Ventilation

36. On 31 January 2017, Wallace Whittle issued a note entitled "Bedroom Ventilation Key Considerations" **(A46440430 – Appendix 06 – ANX_EDN000208856 – Bundle 13, Volume 1, Page 19)**. My understanding is that this was being produced following meetings with the Board/MM to address queries and points they had raised. I did not review it in detail at the time, but I was aware of it.

37. The first paragraph of this document addresses the single bedroom en-suite ventilation. This explained their position in relation to the higher air change rate used in the en-suites.

38. The four-bedroom ventilation is also considered in the report. This is because by this point the Board had now started suggesting that they may want the pressure differential in the multi-bedrooms to be balanced, contrary to their original requirements, which was that they be positive.

39. A review was therefore undertaken by Wallace Whittle to try to get the pressure in the rooms to balance. It stated as follows:

"4 Bed Room Ventilation:

As agreed at the workshop we have undertaken a review of the 4 bed rooms current ventilation design with the view to getting the rooms into a balance. We have looked at a compromise solution by increasing the en-suite and WC ventilation rates from 10ac/hr to 17ac/hr and decreasing the room supply air from 4ac/hr to circa 3ac/hr, which would give a room balance and still maintain supply air to provide the minimum parameters in SHTM 03-01 of 10l/s per person.
In order to achieve this we would need to undertake ductwork alterations which in some instances are quite extensive inclusive of the additional grillage on the dirty extract system as well as increasing the room grille sizes to accommodate the larger air volumes.
There is little opportunity to utilise the general extract system due to ductwork location as it does not tend to run the full length of the systems and main branch sizes, accordingly are relatively small at the duct terminations".

40. Wallace Whittle then issued a further report on 9 February 2017 entitled "Multi Bedroom Ventilation Amendment Proposal" **(A46440433 – Appendix 07 – ANX_EDN000209393 – Bundle 13, Volume 1, Page 21)**.

41. This document developed the proposal to achieve the Board's change in relation to the ventilation pressure in the multi-bedrooms. The rooms noted in this document include "B1" coded rooms – in other words, rooms in Critical Care. The drawings attached to this report show exactly where the multi-bed

wards are, including the "B1" multibed rooms in the Critical Care department of the hospital

42. The updated proposed solution was to add an extract to the bedroom, rather than increasing the extract from the en-suites.

43. As noted above, the multi-bed Critical Care rooms were originally detailed as being 4 air changes in the Environmental Matrix, but positive pressure differential. The proposal at this stage was that the air pressure be reduced to 3 air changes in order to achieve the negative/balanced pressure that the Board now wanted.

44. All parties were proceeding on the basis that the start point for all the multibed wards (including those in critical care) was the 4ac/hr rate noted in the Environmental Matrix. This was not questioned by the Board, and at no point was it suggested the Critical Care multi bedrooms were required to have 10 air changes.

45. On 23 February 2017, Wallace Whittle then issued "General Ward – Ventilation Amendment Proposal issue 3", in relation to the changes being request by the Board to the Multi-bed Ward pressurisation **(A46440435 – Appendix 07A – ANX_EDN000199766 – Bundle 13, Volume 1, Page 28)**. Nothing changed in this report in respect of the proposals mentioned above for the multi bedrooms. The report instead talks the Board through exactly what would need to happen in order to implement the proposals and achieve their desired balanced/negative pressure.

46. On 24 February 2017, there was a meeting held with the Board, Multiplex, Wallace Whittle, MM and others to discuss the proposal **(A46440437 – Appendix 08 – ANX_EDN000273257 – Bundle 13, Volume 1, Page 32)**. I did not attend this meeting but was copied into the subsequent emails **(A45500356 – 18 GRC_002_1_00000003-11290 – Bundle 13, Volume 7, Page 431).**

47. In the record of this meeting, there is a marked-up extract of the Wallace Whittle's "General ward – Ventilation Amendment Proposal to Achieve Room Balance" report produced, with "essential" marked against some of the rooms in red pen **(A46440438 – Appendix 09 – ANX_EDN000273258 – Bundle 13, Volume 1, Page 35).** My understanding was that this essential/non-essential distinction was being made because of the timing of these alterations and so the Board was specifying what rooms in their opinion it was essential to change, and which were non-essential and therefore did not require to be changed. The multi bedrooms marked as essential in this extract include the Critical Care ones – with the proposal at this stage still being to reduce the air change rate from 4 to 3 ac/hr.

48. On 12 May 2017, I then issued the updated ventilation drawings to IHSL to reflect this proposal **(A46440441 - Appendix 10 - ANX_EDN000177039 - Bundle 13, Volume 1, Page 39)**. These drawings show the changes needed to accommodate the Board's request for negative or balanced pressure in the multibed rooms.

49. We considered this proposal to be an amendment to the original brief for the environmental conditions in the rooms and that it therefore constituted a Board Change. We expressed this to IHSL, and they forwarded the request to the Board **(A46440392 - Appendix 11 - COG_001_1_00000001-25843 - Bundle 13, Volume 1, Page 49)**.

50. The Board, however, rejected the change request **(A46440394 - Appendix 12 - EDI_001_1_00110530 - Bundle 13, Volume 1, Page 51)**. They said that the air change rates in relation to the multi bedrooms did not reflect the relevant SHTMs and were therefore not compliant. They requested a contractor change for this deviation instead.

51. To support their position, the Board made reference to the Activity Data Base (ADB) "Room Environmental Data" sheets, which they said contained the correct ventilation requirements for these multi bedrooms.

52. ADB sheets contain generic guidance and on larger projects they are usually amended to meet the requirements of that particular project – as had happened here.

53. The generic ADB codes referred to by Mott MacDonald for these Multi-bed Areas (including the critical care bedrooms) state the Minimum Air Change as 6, with pressure to be balanced or negative **(A35230437 – 6.10_0070_20111003 ADB_Multi Bed Room_4 Beds – Bundle 13, Volume 7, Page 437)**

54. However, the 01 revision included in the Project Agreement, had been amended to suit the Board's specific requirements and shows 4.0 Air Changes and Positive Pressure **(A46803307 - HLM-SZ-SL-RD-400-001 Room Data Sheets – Bundle 13, Volume 5, Page 1,419)**

55. This is also what was required by the Environmental Matrix incorporated into the Project Agreement and which had been reviewed and approved through the RDD process.

56. In an email of 15 June 2017, Multiplex responded to the Board's rejection **(A46440395 - Appendix 13 - COG_003_1_00000003-04723 - Bundle 13, Volume 1, Page 59)**. Multiplex referred to the correct ADB room data sheets included with the Project Agreement and Building Contract.

57. Given these clearly stated that "positive pressure" was required in the multi bedrooms, our view was that the Board's request for negative/balance pressure was therefore a change from these requirements.

58. These comments were then forwarded to the Board by IHSL on 19 June 2017 **(A46440405 - Appendix 14 - ANX_EDN000110700 - Bundle 13, Volume 1, Page 63)**.

59. Whilst the discussions were ongoing in relation to the Multi-bed Wards, the Environmental Matrix was being reviewed through RDD.

60. Revision 11 of the Environmental Matrix was then returned status B by the Board on 17 November 2017 **(A46440399 – Appendix 15 – ANX_EDN000074985 – Bundle 13, Volume 1, Page 664)**

61. In the body of the email returning the Matrix, the Board stated:

> *"The design for single and multibedroom ventilation design being progressed by Project Co remains non-compliant and this non-compliance should either be rectified, a PCo change submitted for the Board's consideration or a dispute raised between the parties."*

62. No further details or specifics are given; however, my understanding was that this was being added because of the ongoing contractual dispute and discussions in relation to the multi-bed wards. The Minutes of the Project Group Meeting held on 29 November 2017 **(A46440400 - Appendix 16 - ANX_EDN000103645 - Bundle 13, Volume 1, Page 725)** note at item 1.1: "Environmental Matrix: Returned to MPX by Board with minor comments".

Final Position on Multi Bedrooms

63. Following Rev 11 of the Matrix, discussions continued with the Board in relation to the ventilation strategy for the multi bedrooms.

64. In April 2018, Wallace Whittle provided updated ventilation drawings for all areas. The Rev 5 document "General Ward – Ventilation Amendment Proposal to Achieve Room Balance" **(A46440403 – Appendix 17 – ANX_EDN000276472 – Bundle 13, Volume 1, Page 732)**, document still referred to the supply ventilation being reduced to 3AC from 4AC, however by this point the Board had confirmed they wanted 4AC in all multi bedrooms.

65. Updated drawings were then submitted to RDD on 2 May 2018. The relevant drawing for the critical care multi-bedrooms being "WW-Z4-01-PL-524-001". **(A46440409 - Appendix 18 - EDL_003_1_00000004-04681 - Bundle 13, Volume 1, Page 739)**.

66. The Board then responded on 4 May 2018 stating they had reviewed the drawings and had no comments on the proposal **(A46440411 - Appendix 19 - ANX_EDN000074983 - Bundle 13, Volume 1, Page 742)**.

67. In an email dated 17 May 2018, Wallace Whittle provided Multiplex with an updated version of the Environmental Matrix showing just the multi ward bedroom which reflected this agreed approach **(A46440412 - Appendix 20 - ANX_EDN000208279 - Bundle 13, Volume 1, Page 745)**. This shows the air changes in the multi bed bedrooms in Critical Care as 4AC/HR, balanced pressure and a mix of Natural and Central Supply & Extract. This was provided to NHSL and MM on 05 July 2018 **(A46440416 – Appendix 21 ANX_EDN000497477 (1) – Bundle 13, Volume 1, Page 750)**.

68. Revision 6 of the "General Ward – Ventilation Amendment Proposal", which detailed this agreed approach, was submitted to RDD and returned Status B by the Board on 31 May 2018 **(A46440414 - Appendix 22 - ANX_EDN000544526 - Bundle 13, Volume 1, Page 754)**. Rev 7 was then returned status A on 27 July 2018 by the Board **(A46440418 - Appendix 23 - ANX_EDN000544528 - Bundle 13, Volume 8, Page 2228)**. The Critical Care Multi Bed Wards are those where the room number includes “B1”. The proposed solution for each of these rooms, includes the following:

> *“Retain the supply ventilation at 4ac/hr. Introduce new general extract ductwork and grille into the room to provide 4ac/hr overall”*

69. This again records the agreed approach that the multi bedrooms in Critical Care would have 4AC/HR.

70. These works were carried out and the systems commissioned in around October 2018.

IHSL Letter 31 January 2019

71. I have been referred to a letter from IHSL dated 31 January 2019 **(A43103366 – IHS Lothian letter re compliance with SHTM dated 31 January 2019 – Bundle 13, Volume 7, Page 425)** I understand the Inquiry is interested in the statements made in the final paragraphs of the letter in relation to SHTM 03-01.

72. On 28 January 2019, IHSL issued a letter to Multiplex, enclosing a letter from the Director-General Health & Social Care and Chief Executive NHS Scotland. **(A46440417 - Appendix 24 - PID_001_1_00000001-009826 - Bundle 13, Volume 1, Page 760)**.

73. The letter is general in nature and appears to have been issued to all Directors of Estates following reviews undertaken at the QEUH hospital and asks for confirmation in relation to four points. The fourth being that: "All critical ventilation systems inspected and maintained in line with "Scottish Health Technical Memorandum 03-01"

74. On 31 January 2019 at 13.03 Multiplex provided a response to IHSL and stated the following in relation to this fourth point: **(A46440420 - Appendix 25 - SIK_001_1_00000002-035641 - Bundle 13, Volume 1, Page 763)**.

> *"All ventilation systems have been designed, installed and commissioned in line with SHTM 03-01 as required"*

75. Later the same day at 15.06, an updated version of the letter was then issued, with point 4 having been changed to state **(A46440422 - Appendix 26 - ANX_EDN000214931 - Bundle 13, Volume 1, Page 765)** and **(A46440419 - Appendix 27 ANX_EDN000214932 - Bundle 13, Volume 1, Page 766)**

> *"All ventilation systems have been designed, installed and commissioned in line with SHTM 03-01 as required systems are maintained in such a*

manner which allows handover at actual completion to meet SHTM 03-01 standards"

76. I am the author of these letters. I do not recall why the letter was updated and issued twice. At the time we were in the same office as IHSL, and it may have been that a discussion took place with IHSL, and they asked that the letter be updated, to specify the maintenance aspect which was the predominant point in the letter from the Director-General Health & Social Care and Chief Executive NHS Scotland.

77. In terms of what is stated in the letter - the first part of the fourth bullet confirms the ventilation systems have been designed, installed and commissioned in line with SHTM03-01 as required, i.e., the ventilation systems complied with SHTM 03-01 except to the extent the Board had stated a different requirement. In relation to the second part that was added, this second sentence (there should be a full stop after "as required") relates to the maintenance of the systems. At this point Practical Completion had not yet been granted, so this sentence is confirming the systems are being maintained to allow handover.

78. On 12 February 2019, IHSL then issued a further letter to Multiplex asking for our written assurance in relation to a number of specific matters **(A46440421 - Appendix 28 - PID_001_1_00000001-164402 - Bundle 13, Volume 1, Page 767)**.

79. Multiplex responded on 06 March 2019 **(A46440423 - Appendix 29 - ANX_EDN000214968 - Bundle 13, Volume 1, Page 771)**, confirming the systems had been designed, installed, commissioned and maintained in accordance with the Construction Contract as varied by the Settlement Agreement. The Multiplex response stated:

"Further to your letter dated the 12th February 2019 requesting our written assurances, we can confirm the following –

1. *The engineering systems are designed and have/are being installed and commissioned to meet the relevant Construction Contract standards, as varied by the Settlement Agreement*
2. *The project has been managed to ensure safety, quality and compliance*
3. *The engineering systems have been commissioned and validated in accordance with the standards withing the Construction Contract, as varied by the Settlement Agreement*
4. *Staff and contractors involved in installing, commissioning and operating the systems are suitably trained and qualified*
5. *The systems at Actual Completion were designed and constructed to the specified requirements, including those within the Settlement Agreement*
6. *The engineering systems have been maintained in line with standards and guidance within the Construction Contract as varied by the Settlement Agreement, for the construction phase of the project*
7. *The systems are maintainable and built within the Construction Contract parameters with regard to operating cost, reliability and efficacy*
8. *The records of construction and as fitted documents are complete, save fort those varied under the Settlement Agreement. Regarding storage of these records we can only confirm that Multiplex are storing and managing our records in line with the Construction Contract requirements".*

Settlement Agreement

80. I was part of the Multiplex team involved in the Settlement Agreement between Multiplex, NHSL and IHSL ("SA").

81. NHSL had produced a list of approximately 70 items, which they considered needed to be resolved. My understanding was that this list had been compiled with assistance from NHS Clinicians and MM.

82. Each item was reviewed in detail and discussed.

83. There were some items that were still works in progress, whilst for others the works had been done and the disagreement was in relation to the contractual position.

84. The negotiations were lengthy and detailed and both sides were legally represented throughout the process.

85. The negotiation was recorded in the Project Group Technical Management Meetings. The Minutes from August 2018 to February 2019 show the different SA ventilation items being discussed, culminating in the Minutes on 13 February 2019 **(A46712228 – ANX_EDN000148524 - Bundle 13, Volume 7, Page 1014),** which stated the following action at item 1.21:

1.21	**SA – comments on technical items**	BC asked if any of the attendees had any queries regarding the outstanding technical items? The Board don't think they have any, bar the comments issued to MPX regarding the programme which are being incorporated. WW noted that Rev D of Programme is on Pinsent Masons data site, and will be replaced with Rev E when it is issued. LES noted that Brodies have issued USBs for uploading the latest files to the Pinsents site. BC noted that the Board will need to review the documents once uploaded. DP noted that MPX will also check these. GG asked WW if there was any feedback from the Funders? WW noted that this was progressing, they are carrying out due diligence. They are expecting a report by COB on 13/02/19 from the TA.

86. The SA was then executed by all parties on 22 February 2019.

87. Under the final SA, the agreed technical solution for each item, was set out in a Technical Schedule appended to the SA **(A46409292 – Appendix 65 A – Technical Schedule – Bundle 13, Volume 2 – Page 1308)**

The Agreed Technical Position Under the Settlement Agreement in Relation to Ventilation

88. There are 79 items in total detailed in the Technical Schedule, of these 7 relate to Ventilation.

89. Two are particularly relevant to what I have discussed above:

Item 7 – 4 Bed Ventilation

90. Item 7 of the Technical Schedule relates to the Ventilation in the multibed wards **(A46409292 – Appendix 65 A – Technical Schedule – Bundle 13, Volume 2, Page 1308)**

91. The Agreed Resolution was the technical resolution I discussed above - as per Rev 7 of the "General Ward – Ventilation Amendment Proposal", which was returned status A on 27 July 2018 **(A46496633 - Appendix 30 – Extracts from SA – Item 07 – WW-SZ-XX-DC-XXX-010 (1) - Bundle 13, Volume 1, Page 789)**.

92. No further works were required.

Item 13 – Single Bedroom Ventilation Air Changes (A46409292 – Appendix 65 A – Technical Schedule – Bundle 13 Volume 2 – Page 1308)

93. The dispute here related to the single bedroom and ensuite ventilation and derogations WW014 and WW015 I discuss above.

94. The Agreed Resolution notes that this item was closed as the agreed technical solution had already been approved and agreed.

95. No further works were required.

96. My understanding is that this was for all single bedrooms in the hospital with no distinction being made between critical care and non-critical care, as had been the case in the Environmental Matrix.

Practical Completion

97. On 7 February 2019, the Independent Tester issued a letter stating he was ready to certify the works as both practically complete and commissioning complete **(A46457198 – Appendix 31 – 07 Feb 2019 - Bundle 13, Volume 1, Page 827)**.

98. On 22 February 2019, the same day as the Settlement Agreement was executed, the Independent Tester then issued:
(1) The Commissioning Completion Certificate **(A46457205 - Appendix 32 - Commissioning Completion Certificate - Bundle 13, Volume 1, Page 828)**; and
(2) The Certificate of Practical Completion **(A46457203 - Appendix 33 - Certificate of Practical Completion - Bundle 13, Volume 1, Page 829)** Confirming the works were complete.

99. Following practical completion, we continued to have a presence on site to support NHSL and Bouygues with the handover.

100. There were also some works to be carried out post Practical Completion, in accordance with the Settlement Agreement. There was an agreed programme for these works, and everyone was working to a July migration.

Involvement of Institute of Occupational Medicine ("IOM")

101. Multiplex were not involved in the appointment of IOM.

102. On 3 June 2019, we were contacted by the Board and informed by them that they would be carrying out an independent validation of all critical ventilation systems beginning 17th June for approximately 8 to 10 days **(A46457202 – Appendix 34 - WID_002_1_00000007-03830 – Bundle 13, Volume 1, Page 830)**. By this point we had already handed the ventilation systems over to NHSL and Bouygues.

103. On 25 June 2019, the Board then forwarded the first "issues log" from IOM **(A46457206 – Appendix 35 - GRC_001_1_00000001-74087 – Bundle 13, Volume 1, Page 832)**

104. One of the items noted states:

"HDU's – Only achieving 3-4 ach/hr vs required 10 – NHS have apparently agreed this"?

105. Initially the Board did not ask for any input in relation to Critical Care.

106. However, on 2 July 2019 an all-party meeting was held and critical care became the major discussion point. It became apparent that the clinicians and infection control were not in agreement with the Board's project team as the clinicians and infection control wanted 10 air changes per hour in the single bedrooms and multi bedrooms in critical care. However, the design and commissioned systems were 4 ACH.

107. This impacted rooms on the first floor as indicated on the marked-up plan at Appendix 36 - First Floor GA B1 Bedroom Mark Up **(A46457204 - Appendix 36 - First Floor GA B1 Bedroom Mark Up - Bundle 13, Volume 1, Page 835)**:

108. As a result, the Board's Project Team asked for IHSL/MPX's assistance in coming up with a change that could be implemented before the migration (i.e., before the opening of the hospital) and then a longer-term modification that could be undertaken post migration.

109. At the meeting on 2 July, various suggestions were made for the interim options and the Board informed MPX they want us to implement an interim option which gave 5 ACH in multibed rooms and 7 ACH in single bedrooms. This being achieved by not using one of the multibed rooms and one single bed, closing off the air supply to these rooms and then diverting that air volume into the remaining rooms.

110. In relation to the longer term change it was discussed that this would likely entail a new AHU and splitting the existing installation roughly in half, using existing plant to serve half and new plant to serve the other half.

111. The Board left the meeting on 2 July and went to their own internal meeting to discuss this subject.

112. On 03 July 2019, the Board then issued an instruction for IHSL/MPX to **(A46457201 - Appendix 37 - BAJ_003_1_00000007-20089-1 - Bundle 13, Volume 1, Page 836)**:

> *"proceed with adjusting the installed ventilation system in Critical Care to achieve air change rates as per option A on the attached schedule. You are to provide as a minimum 7 air changes/hour in all single bedrooms (with the exception of room 1 B1 037) and 5 air changes/hour in all four bedded rooms (with the exception of room 1 B1 063)"*

113. The email also noted the programme which had been discussed for these works, namely commencing on Thursday, 4th July and anticipated completion on Saturday, 6th July 2019.

114. At 13.07 on 4 July 2018, the Board then issued a scope and drawings for both the interim and permanent solution which MPX issued to our subcontractor TUV SUD, advising a Change Instruction would follow given this was new additional works **(A46457196 - Appendix 38 - PID_002_1_00000006-37082 (1) - Bundle 13, Volume 1, Page 839)**. The attachments confirm the position I have explained above.

115. At this point, Multiplex's understanding was that the interim solution would be implemented, and the hospital would open as planned.

The Delayed Opening

116. On 4 July 2019, IHSL and MPX were then informed by the Board that the Scottish Government would shortly be releasing a press statement advising that the planned move of patients into the hospital on the 9th July 2019 would not be going ahead on the grounds of safety. As can be seen from my email dated 04 July 2019 at 16.33 **(A46457197 - Appendix 39 - BAJ_003_1_00000007-04340 - Bundle 13, Volume 1, Page 845)**, the reason we were given was that it related to the critical care ventilation.

117. This was the first Multiplex were told that the hospital would not be opening, we had no involvement in this decision.

118. That same day the Scottish Health Secretary announced that the opening of the hospital was being postponed due to "final safety checks which revealed that the ventilation system within the critical care department of the new hospital requires further works to meet national standards".

Proposed Post Completion Change

119. Following the delayed opening the Board began discussing the possibility of a post Completion Change for IHSL/MPX to undertake additional works to increase the air change rate in the single and multibed rooms in Critical Care to 10AC.

120. The suggestion being this work would be undertaken as an agreed change to the position required under the Project Agreement, as amended by the SA. Given the significance of the works, we asked the Board to confirm in writing their exact requirements.

121. On 26 July 2019 IHSL forwarded to me the Board's draft High Value Change Notice **(A46457200 - Appendix 40 - PID_001_1_00000001-007859 - Bundle 13, Volume 1, Page 846)**.

122. The change asked Project Co to design, supply and install a ventilation system capable of delivering 10 AC per hour and 10 PA of pressure in the critical care areas:

123. On 31 July 2019, IHSL responded **(A46457199 - Appendix 41 - MAJ_001_1_00000001-29141 - Bundle 13, Volume 1, Page 851)** suggesting that contractually the High Value Change process may not be the most appropriate and quickest way of carrying out the change.

124. As the email notes, Multiplex's preference was a separate agreement for the works, as this would allow works to be started as soon as possible and avoid any unnecessary complexity associated with the Change Process under the Project Agreement.

125. This approach was accepted, and the parties then began negotiating an agreement detailing the further ventilation works the Board were now requiring. An agreement could not be reached and so Multiplex did not carry out the additional works.

Declaration

126. I believe that the facts stated in this witness statement are true, that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website

Scottish Hospitals Inquiry
Witness Statement of
Donald Inverarity

Background

1. My name is Donald James Inverarity. I have been asked to provide a statement detailing my involvement with the Royal Hospital for Children and Young People and Department of Neurosciences (RHCYP / DCN) Project (the Project).

Professional Experience

2. I am currently employed as a Consultant Medical Microbiologist by NHS Lothian (NHSL) and started in this post on 1 October 2014. I am also currently the Lead Infection Prevention and Control Doctor (LIPCD) for NHS Lothian and began that role in October 2015. I was an Honorary Senior Clinical Lecturer, Division of Pathway Medicine with the University of Edinburgh (2015 – 2020). Prior to joining NHSL I was the Infection Prevention and Control Doctor (IPCD) at Monklands Hospital (2009 – 2014) and LIPCD for NHS Lanarkshire (2013-2014).

3. My areas of expertise in microbiology include:

- Clinical liaison (including several years as a trainee physician treating patients with infectious diseases);
- Tropical Medicine;
- Diagnosis and management of Infections of People Who Inject Drugs;
- Pneumococcal disease diagnosis and management and comparative genomics of *Streptococcus pneumoniae*;
- Intensive Care microbiology;
- Infection Control (particularly in relation to advising on Healthcare-associated infections (HAI) risk from water systems and ventilation systems in healthcare settings such as resolving water contamination with *Legionella species* or *Pseudomonas aeruginosa* bacteria);

- Antimicrobial stewardship. This is defined in the British National Formulary as, “an organisational or healthcare system-wide approach to promoting and monitoring judicious use of antimicrobials to preserve their future effectiveness.”

4. As a consultant medical microbiologist, I am part of the senior management team of the medical microbiology laboratory service for NHS Lothian. The role of a consultant medical microbiologist is a specialist role as a senior decision maker involved in the accurate diagnosis of human infections (through utilisation of a wide range of laboratory tests) and also has a clinical aspect through being able to advise on optimal antimicrobial management and broader infection management of patients. This is contextualised to the individual medical needs of such infected patients. It also involves participation in laboratory management, to maintain a quality laboratory service that meets the standards set out by the United Kingdom Accreditation Service (UKAS) for clinical microbiology laboratories. To function as a consultant medical microbiologist, I have undergone higher specialty training in medical microbiology and virology and passed the Fellowship exams of the Royal College of Pathologists in order to appear on the specialist register of the General Medical Council. To continue to function in this role I undergo annual appraisal and revalidation every 5 years.

5. Specialty training in medical microbiology and virology involves understanding and being able to apply principles of infection control and incident management to control and resolve infection outbreaks. With regards to the built healthcare environment and healthcare water systems, this would include understanding how healthcare water systems can be contaminated with *Legionella species* of bacteria or the bacteria *Pseudomonas aeruginosa* and an understanding of some of the basic principles to apply to mitigate risk and to resolve the contamination. With regards to healthcare ventilation there should be an understanding as to how an operating theatre ventilation system works to reduce post operative wound infection incidence. The context of such training though is generally to provide insight and leadership into what measures to take when faced with clusters of human infections caused by micro-organisms that may have originated from exposure during the delivery of healthcare, recognising that some such micro-organisms may have arisen from the healthcare environment. Micro-

organisms that do not cause human disease or are recovered from areas which are not the human body are generally considered “out of scope” for a medical microbiologist as the training does not cover all aspects of environmental microbiology, ecology, veterinary microbiology or food microbiology. The laboratory tests that a medical microbiologist is familiar with and the standard methods (UK Standards for Microbiology Investigations or UK SMIs) that are followed in medical microbiology laboratories are tailored to optimal detection of micro-organisms from human body fluids or human tissues. Sampling of non-human items for micro-organisms would generally not be undertaken in NHS medical microbiology laboratories unless there was a clearly validated, reproduceable method by which to perform such testing and when reported, the result would need to explicitly state the UKAS accreditation status of the laboratory and whether the test was considered to be a UKAS accredited test for that laboratory.

6. As an IPCD, I am expected to demonstrate participation in continuous professional development annually in learning related to infection prevention and control which may include aspects of infection risk from the built environment. As LIPCD I work with a team of other medical microbiologists (either consultants who are medically trained or who are consultant clinical scientists) who have also undertaken further training in aspects of infection control after completion of specialist training in medical microbiology and/or virology, specialist infection prevention and control nurses (IPCNs), administrative staff and scientific staff. The LIPCD role brings with it a leadership aspect working, in NHSL, with the Associate Nurse Director for infection prevention and control in providing senior decision maker level advice to the infection control team and to other senior clinical and healthcare management colleagues in NHSL including executive board members (particularly the HAI Executive Lead), leadership during infection incident or outbreak management as well as local and national infection control policy development and implementation.

Qualifications

7. I graduated from the University of Edinburgh in 1995 with a Bachelor of Medicine

and Bachelor of Surgery (MBChB) degree, having also gained a Bachelor of Science in Pharmacology degree (First Class Honours) (BSc) in 1992. I received a Masters of Science degree in Infection and Health in the Tropics (MSc) in 2000 from the University of London (London School of Hygiene & Tropical Medicine) and a Doctor of Philosophy degree (PhD) from the University of Glasgow (2009). I gained my Certificate of Completion of Training in Medical Microbiology and Virology in 2005 and joined the General Medical Council (GMC) Specialist Register in 2005.

8. I passed the required exams to become a Member of the Royal College of Pathologists (MRCPath) in 2005 and was awarded a Fellow of the Royal College of Pathologists (FRCPath) in 2008. I was also awarded a Fellow of the Royal College of Physicians of Edinburgh (FRCP (Ed)) in 2012 having passed the exams to be a Member of the Royal College of Physicians in 1998.

9. Relevant postgraduate infection control training and courses include:

- Public Health Laboratory Service (PHLS) Colindale, Laboratory of Healthcare Associated Infection and Hospital Infection Society, Hospital Infection Control Course, 21st-25th February 2005. (PHLS provided a network of public health and reference laboratory functions in England and Wales at the end of the 20th century and beginning of the 21st century. PHLS became part of Public Health England (PHE) in 2013 and PHE has more recently been replaced by another organisation known as the UK Health Security Agency (UKHSA). With regards to the healthcare built environment, this course introduced me to the concepts by which healthcare specialist ventilation systems are built and maintained in order to minimise risk from airborne micro-organisms.

- Eastwood Park Training and Conference Centre, Falfield, Gloucestershire Health Protection Agency and Hospital Infection Society, Engineering Aspects of Infection Control Course, 17th-21st May 2010. This course is considered additional learning to foundations taught in the PHLS Colindale course noted above. It is a 5 day residential course exploring healthcare ventilation in much greater detail, covering the principles behind ventilation

systems for isolation rooms, operating theatres and pharmacy cleanrooms. Training in ventilation systems was delivered by Dr Peter Hoffman and Mr Malcolm Thomas. The extant technical guidance for healthcare ventilation in use at this time was HTM 2025. Healthcare water quality was discussed but in the context of decontamination of endoscopes. This particular course is tailored to the needs of infection prevention and control nurses and consultants and registrars training in medical microbiology.

- Cadham Consultancy Ltd and Malcolm Thomas: Specialised Ventilation Systems in Healthcare Practical Information and Guidance Workshop. Ventilation in Hospitals – its role in Infection Control, Royal Hotel Bridge of Allan, Stirling. 22nd-23rd May 2013. This course was undertaken by me as an update following the pandemic of swine flu. My employer, NHS Lanarkshire, was planning an upgrade of air handling units to all its operating theatres as well as designing a new intensive care unit at the time for Monklands Hospital and Mr Malcolm Thomas was employed as an external ventilation specialist. This course was more technically demanding and less tailored to the needs of IPCT staff. Many attending were NHS estates staff with an engineering background involved in maintaining healthcare ventilation systems and the course involved being able to determine air flows and pressure cascades in operating theatres, for example. Some of the content of Scottish Health Technical Memoranda (SHTM) 03-01 was alluded to as Malcolm Thomas was a key author but the extant ventilation guidance being discussed and applied was HTM 2025 and SHTM 2025.

- Healthcare Infection Society Spring Meeting, 14th May 2019, at the Royal College of Physicians, London. “Worries with the (hospital) water: problems, practices and pragmatic solutions.” This training day covered many aspects of risk assessment and risk mitigation for healthcare water contamination events due to *Legionella species* and *Pseudomonas aeruginosa*. It was practical and much of the learning presented from Birmingham regarding *P aeruginosa* water contamination and the use of point of use filters we were able to quickly implement as we were managing a very similar situation at the Department of Clinical Neurosciences building on the Western General Hospital (WGH) campus in Edinburgh. I was able to network with my

microbiologist colleague Dr Teresa Inkster and informally gained some insights into the water quality issues being experienced at the Queen Elizabeth University Hospital (QEUH) in Glasgow. All the above learning proved very useful to be able to understand the implications and infection risks of the water microbiology results relating to RHCYP/DCN which were beginning to be shared with me by that stage of 2019.

- Healthcare Infection Society Spring Meeting 20th June 2023. "How do you build a safe hospital? IPC considerations for the built environment." I was an invited speaker at this national training event and asked to teach on the subject of "Infection Control, Competing Priorities, New Technologies and Building Safe Healthcare Buildings." Other speakers spoke about their experiences as infection control staff and estates officers in Northern Ireland, Scotland and England regarding building safe and unsafe healthcare water systems and healthcare ventilation requirements.

10. I am (or have recently been) a member of the following groups:

- Scottish Microbiology Association (SMA) Council member 2019-2022. The SMA is a multidisciplinary group comprised of biomedical scientists, laboratory managers, clinical scientists, medics, vets, IPCNs and academics all working in the area of microbiology in Scotland. It holds two weekend conferences each year for members to meet socially and academically with speakers teaching on subjects relevant to working as a microbiologist in Scotland. The Spring 2022 weekend conference featured Dr Mike Weinbren speaking about healthcare water systems and risk of infection and Professor Malcolm Richardson speaking about fungi in healthcare water systems.

- Scottish Microbiology and Virology Network Infection Prevention and Control Doctors (SMVN IPCD) subgroup. I have been a member since this group formed in 2020. The SMVN recognised that IPCDs in Scotland would benefit from more than an informal group to be able to communicate with each other about issues affecting them and now hosts the IPCD subgroup enabling all IPCDs in Scotland to formally meet together to address current

issues on a quarterly basis. This group has been instrumental in scoping out the role of IPCDs within built environment projects as well as responding to several groups asking for expert opinion regarding draft documents on a variety of issues such as hospital water quality, high consequence infectious disease preparedness, IPCD job descriptions and IPCD recruitment and retention issues. It has provided a group that can be approached for IPCD opinion by national bodies such as Scottish Government, Antimicrobial Resistance and Healthcare Associated Infection (ARHAI), NHS Scotland Assure rather than targeting individual members.

- Scottish Health Protection Network High Consequence Infectious Disease (HCID) Group representing Scottish IPCDs since 2019. This group is actively seeking to improve resilience, co-ordination, capacity and resource allocation during the response within Scotland to the importation of High Consequence Infectious Diseases such as Ebola or Middle Eastern Respiratory Syndrome. Isolation room design and capacity and healthcare ventilation systems designed for source isolation of infectious patients are fundamental to this work. It provides insight into the current optimal design of such facilities as well as how they would be used.

- National Infection Prevention and Control (NIPC) Steering Group represented Scottish IPCDs and SMVN (2016 – 2019). I resigned from this group in August 2019 due to a personal concern that I had a conflict of interest when asked to be a member of NHSL's RHCYP/DCN Executive Steering Group. I had a contractual obligation to advise the Executive Directors in NHSL regarding infection control matters and interpret and contextualise infection control advice discussed at the RHCYP DCN Oversight Board. The RHCYP DCN Oversight Board had representation from NHS National Services Scotland (NSS) and represented views of NSS staff, who were also members of the NIPC Steering Group, which I did not share. In particular, my views differed regarding assessment and interpretation of microbiologically safe water and the role of a clinical microbiologist in the competent interpretation of environmental water microbiology results and the need for standardisation and quantification of laboratory methodologies to perform water culture for organisms other than

Legionella species and *Pseudomonas aeruginosa*. There were proposals at NIPC Steering Group during 2019 to change aspects of national policy with regards to assessment and monitoring of microbiological water safety. Neither did I agree with suggestions that, during a time of national shortage of medical microbiologists, medical microbiologists should deprioritise their involvement in advising on optimal infection management of patients with complex, difficult to treat infection, increase their programmed activities as IPCDs, undertake further training in aspects of plumbing and ventilation engineering and then dedicate time each week to meetings discussing optimal performance of taps, showers and air handling units and their compliance with technical standards as compliance officers when there are other disciplines, such as authorising engineers, better qualified and more appropriately trained to perform such a role. My views were being influenced by events and investigations at the RHCYP DCN so, I felt I could no longer represent the SMVN and IPCDs on this national body (where my role was to assess or agree changes in national policy in relation to infection control issues) with objectivity and without personal bias.

- Scottish Microbiology and Virology Network (I previously represented NHS Lanarkshire microbiologists until 2014).

- I was NHS Lanarkshire's Lead Microbiologist on their Antimicrobial Management Team until 2014.

- NSS Centre of Excellence (now named NHS Scotland Assure) workstream member scoping needs for Environmental Microbiology Laboratory Services 2019-2020. I was invited to contribute to this group by the consultant microbiologist at Public Health Scotland, Dr Michael Lockhart, given the experiences I had during 2019 as a clinical microbiologist being faced with water quality issues that were associated with healthcare infections and insights into how provision of microbiological assessment of water testing could be improved to assist such incident investigations.

- ARHAI Scotland Clinical Assurance Oversight and Advisory Group where I

represent the Scottish IPCDs. I joined this group at the request of ARHAI Scotland for an SMVN IPCD Subgroup representative in early 2023. It is a governance group that allows stakeholders such as IPCDs, IPCNs and ICMs to feed back to ARHAI Scotland concerns they have about the service delivered to them by ARHAI Scotland.

Experience in Healthcare Construction Projects

11. I have experience of healthcare construction projects. When I was IPCD at Monklands Hospital I was involved with the design and commissioning of the refurbished adult haematology unit in 2010 and the design of a new adult ITU in 2013/2014. I was also involved in the early stages of an operating theatres refurbishment project working with Malcolm Thomas, the author of SHTM 03-01, but then left to join NHSL in October 2014.

12. In general, the involvement of a consultant microbiologist or an IPCD in a project will often be very bespoke to the particular project and what clinical areas are being planned and built and what risk of infection to users can be anticipated from the design. For instance, a project building an outpatient unit for mental health services will predictably require little IPCD involvement as the risk of acquiring an infection for patients and staff in such a facility is very low. However, for a suite of operating theatres, intensive care unit or a bone marrow transplant unit, there will be numerous infection risks to identify and mitigate and issues to discuss by nature of the complexity of the building systems involved and susceptibility of the patients to infections. There will be numerous points for clarification and discussion and potentially escalation or derogation during design and significant involvement in ensuring critical services (which could result in infections if malfunctioning) such as water systems and ventilation systems are running optimally before patient occupation. IPCD and IPCT involvement is also not generally uniform throughout a project but tends to be most required in the design stages and the safety checks pre-occupation with less involvement during the construction phase when there is a building site rather than a completed healthcare building.

13. I consider my role as an IPCD primarily to be a stakeholder with clinical infection

training who can identify potential clinical risk of infection to the designers and users of the facility through understanding how micro-organisms can cause infection, where they are likely to be found and grow, how activities within the facility might increase or decrease the risk of exposure for facility users, measures that can be taken to mitigate infection risk and an understanding of potential consequence of any infection through training in diagnosis and management of infection. I would emphasise that I don't consider the IPCD role to be one of a compliance officer cross checking engineering specifications in technical guidance or that of a clerk of works on a building project. The ability to assess technical engineering information and translate it into potential clinical consequences is a skill we acquire that is sometimes required by IPCT staff to spot where a deviation may subsequently manifest as an infection risk but compliance checking and identification of areas where there may be a need to seek derogation from guidance is not fundamentally the role of IPCT in my view.

14. My familiarity with technical guidance such as SHTMs is primarily to have insight into how human infection risk can be increased or decreased through engineering, plumbing and architecture and I have no specific qualification in engineering or plumbing or environmental microbiology. Assessment of compliance against engineering standards is, in my view, more appropriately determined by authorising engineers who have the required breadth of understanding of extant technical guidance, statutory regulations as well as relevant qualifications to assess engineering performance more comprehensively. Authorising Engineers working in a healthcare context usually also have some insight into what designs or malfunctions will pose risk to patients, visitors or staff.

15. The risk of acquiring an infection after an exposure to micro-organisms during a healthcare episode is only one aspect of clinical risk. There are other clinical risks that the built environment may create for patients – for example a risk of tripping and sustaining a fracture or risk of scalding from hot water. Nevertheless, there are often misconceptions that the infection control team (by nature of having a clinical background) will advise on all aspects of clinical risk (some of which may be very specialty specific) or that the IPCT will represent and speak for the clinical services who will use a facility or that the IPCT have authority to approve

derogations from technical guidance on behalf of the health board. This often arises through not having appropriate stakeholder involvement in decision making meetings.

16. I am not aware of any formal preparation of IPCDs for involvement in the processes of building projects. It is therefore an activity that generates much trepidation amongst many newly qualified consultants who find themselves in an IPCD role. My experience was fortunately gained from shadowing more experienced consultant colleagues in the early stage of my consultant career and observe these activities being performed as well as through self-directed learning. In 2011 the Infection Prevention Society issued a draft document (to help IPC practitioners demonstrate competence in their work **(A47150199 – Journal of Infection - Bundle 13 - Volume 8, Page 115)**. Under "Clinical Practice" point 5 in relation to the built environment it states "advise on the design, construction, modification of facilities to prevent and control infection in the built environment." (**Page 125)**. The competence is predominantly around using skills to prevent and control infection in the built environment and monitoring for infection once the building is occupied by patients, rather than advise on all aspects of risk during design, construction and modification of facilities.

17. Of note demonstration of such competence was proposed as primarily through self-directed learning and reflection on any personal knowledge gaps and could be achieved through "self-study, undertaking learning programmes and/or academic qualifications or seeking learning opportunities in the workplace such as mentoring and job shadowing." (**Page 120**). It was not prescriptive about specific courses or qualifications that would be expected to be obtained to qualify an individual for their role and so for IPCDs there is no set curriculum to follow specifically with regards to built environment issues. IPS updated their competencies framework in 2021 (**A47150205 – Competencies Framework for Infection Prevention and Control Practitioners – dated 21 June 2021 – Bundle 13 - Volume 8 - Page 10**) and (**A47150214 – Education Framework for Infection Prevention and Control Practitioner (IPC) Workforce – dated 05 October 2023 – Bundle 13 - Volume 8 - Page 17),** but the remit of IPCT with regards to the built environment remains about identification of infection risk and

optimisation of infection risk mitigation strategies such as cleaning, waste management and equipment decontamination and not a compliance function with regards to technical performance of engineering systems (**A42215058 – IPC Standards for Health and Adult Social Care settings– dated 16 May 2022 – Bundle 13 - Volume 8 - Page 64)** and **(A47150199 – Journal of Infection Prevention – Outcome competencies for practitioners in infection prevention and control – dated 2011 – Bundle 13 - Volume 8 - Page 115)**. Some health boards may easily find themselves with consultants undertaking an IPCD role with little to no experience of large building projects, although they will have insight into the infection prevention and control principles to apply. Some health boards have little or no IPCD capacity at all, far less an IPCD with extensive understanding of infection risks of healthcare facilities. **(A47225939 – Healthcare Built Environment – NES infection prevention and control education team – Bundle 13 - Volume 8 - Page 2110).**

Role on a Day to Day basis

Up to March 2019

18. Currently my day to day role bears little resemblance to what I did on a day to day basis in general microbiology up to March 2019.

19. Pre 2019 I had the following roles:

- LIPCD for NHSL
- Site IPCD for WGH
- IPCD for primary care/Health and Social Care Partnerships
- Site IPCD for RIE
- Clinical liaison activities for microbiology (1 Programmed Activity (PA) per week) which involved reviewing patients at the bedside on ward rounds.
- On call nights and weekends for microbiology 1:8 (i.e. roughly 1 night in every 8 days averaged over a year.)
- Provision of specialist microbiology input to WGH ITU, WGH oncology,

Royal Victoria Hospital building (on WGH campus)
- Year 4 teaching of University of Edinburgh medical students
- Deputy for the Director of the Scottish Mycobacteria Reference Laboratory

20. Day to day work in the above roles included: (i) general microbiology, e.g. results authorisation, overseeing laboratory work, dealing with specific outbreaks of infection and clinical liaison; (ii) teaching and trainee clinical supervision; and (iii) local IPCT guideline development and advice.

21. During the Covid pandemic the majority of my role, when not dealing with IPCT issues relating to water and ventilation systems, was in the implementation and development of ever changing Covid guidance, outbreak and incident management and providing expert advice to hospital site management and Executive Directors but that has since eased off.

Post Spring 2019

22. Post Spring 2019 I retained the following roles but with much less time allocated to the day to day work because of the additional activities I began to undertake (noted in the following paragraph):

- LIPCD for NHSL;
- Site IPCD for WGH and primary care/HSCPs;
- Clinical liaison activities for microbiology 1 PA per week;
- On call nights and weekends for microbiology 1:8;
- Provision of microbiology input to WGH ITU, WGH oncology, RVH building at WGH.

23. The additional activities that I was required to support are listed below. Those that directly addressed issues being uncovered at RHCYP DCN are prefixed by RHCYP.

- NHSL Water Safety Group - 2 hr monthly (previously quarterly 2 hr)

- NHSL Ventilation Governance Group - 2 hr monthly (new meeting)
- Decontamination Governance Group - 2 hr monthly (not previously invited)
- RHCYP site Operational Water Safety Group Meeting - 2 hr monthly (new meeting)
- RHCYP Executive Steering Group -1 hr every 2 weeks (new meeting)
- RHCYP Water Remedials Meeting *(This was a task and finish group intended to resolve non-conformances detected within the water system. It developed into the site Operational Water Safety Group and reported to the RHCYP Executive Steering Group (ESG))* - 1 hr per week (new meeting)
- RHCYP Ventilation Remedials Meeting (*This was a task and finish group intended to resolve non-conformances detected within the ventilation system. Outputs from this group were reported to the RHCYP ESG)* - 1 hr per week (new meeting)
- Emerging Infection Preparedness Group - 1 hr per month (new meeting)
- IPCD Building Project Input on SJH A&E Refurbishment, WGH ITU Refurbishment, WGH Cancer Assessment Unit Refurbishment, East Lothian Community Hospital Commissioning – Variable but about 2 hr weekly (new involvement)

Role in the RHCYP/DCN Project

Pre 2019

24. I was not involved with the original design of the RHCYP + DCN, was not part of the NHSL RHCYP DCN Project Team and did not attend Project Meetings. It was an established Project when I joined NHSL in October 2014 and there was already representation from Infection Prevention Control Team (IPCT) by way of the lead HAI Scribe Nurse, Janette Richards (now Rae) with additional input from Dr Pota Kalima (Consultant Medical Microbiologist) who had performed the role of IPCD for the existing Royal Hospital for Sick Children (RHSC) at Sciennes for many years. I did not take up any specific infection control duties in NHS Lothian until a year later in October 2015 so during the period of October 2014 to October 2015 I had no need to be aware of any background or specifics to the project although I could see that excavation work to dig foundations had begun. Once I

undertook the role of LIPCD in October 2015 I took more of an interest in the project and began to be asked my views if Dr Kalima was unavailable. These were views about infection risk from aesthetic issues relating to fixtures and fittings being planned rather than infrastructure and engineering issues relating to critical systems. Dr Kalima and myself were in regular contact as we shared (and continue to share) an office at the Western General Hospital but I don't recall any need for either of us to discuss aspects of the RHCYP DCN project during 2015.

25. My understanding of the situation with regards to the project in 2014/15 was that the construction phase had begun and that the design stage had been completed prior to this. Dr Kalima had been involved in discussions regarding isolation room provision in the hospital and ventilation strategy in critical care and the haematology/oncology ward and those discussions took account of best practice principles and guidance that was current at the time. Dr Kalima was the most appropriate consultant microbiologist in NHSL to be involved in the initial design stage as he had around 15 years' experience as a consultant medical microbiologist in NHSL and had been advising on infection control issues at the Royal Hospital for Sick Children (RHSC) throughout that period and was highly respected by the clinical staff in paediatrics. He had also undertaken additional postgraduate training in issues of infection control in the built environment at Eastwood Park, Falfield. Consequently, the project team were able to utilise his knowledge of microbiology, infection control and the built environment during design as well as his extensive understanding from personal experience of how these would need contextualised to a paediatric hospital. It was not his full time job though and was fitted in around his other consultant microbiologist duties.

26. It is very unusual for health boards to dedicate a consultant full time to an IPCD role or an IPCD full time to a building project. This is more about workforce capacity though, as it is very difficult to provide additional consultant microbiologist staff to cover the regular microbiology workload that would be left through such a project secondment. It is also not attractive for the consultants who can become deskilled in laboratory microbiology and infection management. The model of consultant medical microbiologist involvement in an IPCD capacity only providing limited time to a new building project (or refurbishment) was therefore not unusual across health boards in Scotland. For the project team to

be able to tap into the knowledge and experience of the most qualified staff it would inevitably end up as an additional task amongst other established duties rather than a dedicated role. NHSL was unusual in having a HAI Scribe nurse i.e. a dedicated IPCN who had additional experience of building projects, their stages and processes and relevant guidance to be able to provide more skilled and focussed involvement in project teams. There wasn't workforce capacity to mirror that with dedicated IPCD involvement. It is still unusual to be able to provide an individual in an IPCD role to be able to support building projects as their primary responsibility. Workforce capacity in medical microbiology has deteriorated since 2014 in Scotland.

27. My role and responsibilities in relation to the Project changed over time. Pre 2019, my involvement was sporadic and ad hoc and related to a variety of IPC issues. For example, the first time I was involved in the Project was in March 2016, when I was asked whether fish tanks would be a risk for Healthcare Acquired Infection (HAI) in the new building. As detailed below, my first involvement in any discussion about ventilation was in August 2016 in relation to Positive Pressure Ventilation Lobby (PPVL) isolation room ventilation strategy in Lochranza (the paediatric haematology and oncology ward) where I disagreed with the proposal to have all 5 isolation rooms for protective isolation of neutropenic patients supplied by a single air handling unit. I had subsequent involvement in ventilation issues in September 2016 in relation to operating theatres and separately in relation to Radiology and CT scanners.

28. In NHSL IPCT, the staffing and skill mix model that had been developed for all infrastructure, building and refurbishment projects was that one of the IPCNs (Janette Rae) had been trained with particular specialist experience and understanding of SHTMs and Health Building Notes etc. and had a specific role to inform stakeholders (who would be completing a HAI Scribe assessment) of HAI risks. To a large degree, this was done without input from others in the wider IPCT (Infection Prevention Control Team) but their input and involvement would be requested when felt to be needed and issues would be raised with consultant medical microbiologists or other senior IPCNs. In 2015 the IPCT was comprised of an infection control manager role (Head of Service), a Lead IPCN role, 4 Geographical lead IPCNs with a remit for quadrants of the health board, 2

healthcare scientists, a HAI Scribe specialist IPCN, 3 administrative staff and about 17 IPCNs (not all working full time). There were two consultant microbiologists performing an IPCD role for St Johns Hospital (SJH) and RHSC with one programmed activity (4 hour time sessions per week) each for those sites and myself with 2.5 programmed activities (10 hours per week) in the lead IPCD role. It was an established model of working when I arrived at NHSL.

29. The role of IPCD is not a full time role and the number of programmed activities per week in a consultant job plan for IPCDs is not uniform across health boards. It is generally between 1 and 4 programmed activities for all infection control activities including infection surveillance and incident management. Large building projects will at points in the design and commissioning stages require much of that time allocation which can be to the detriment of time required for other infection control or laboratory based activities. As a result, it is unusual for an IPCD to have sufficient time in their week to be considered a full time, formal member of the project team and attend all necessary project meetings. Participation in such project meetings often requires an element of planning for the IPCD to provide added value to discussions and not waste their time when there is nothing for them to contribute.

30. The role of HAI Scribe IPCN allowed a dedicated staff member with an appropriate skill mix in infection control and familiarity with the HAI Scribe process (which I explain in detail at paragraph 67 onwards below) to interact with the Project Team and be more responsive to their questions. It is not an ideal model as having the added skills of the IPCD brings a wider perspective to discussions and avoids a “single point of failure” but full IPCD involvement in every project team is too resource intense in terms of IPCD available time to be deliverable, particularly if there is more than one capital project to assist. In my experience, the IPCD will usually be responsive to addressing specific questions from a project team within a set timeframe but that is reliant on the project team engaging with the IPCD and having awareness that the issue in question has a component that would benefit from IPCD input. There is risk that for some issues, recognition of the benefit and added value of an IPCD perspective may be missed. Similarly increasing the time that an IPCD can dedicate to such projects then compromises their time to maintain essential skills outwith infection

control which reduces their job satisfaction.

31. When I started the role of LIPCD in 2015, I was supported by one consultant microbiologist colleague who undertook IPCD activities for St Johns hospital (SJH) and one consultant microbiologist colleague (Dr Pota Kalima) who undertook the IPCD activities for the Royal Hospital for Sick Children (RHSC) at Sciennes. Site infection control doctor responsibilities at the Royal Infirmary of Edinburgh (RIE) and Western General Hospital (WGH) would fall to me along with other infection control activities such as surveillance programmes. I would be assisted with incident management activities by other consultant microbiologists if it was in a clinical specialty that they had a particular interest in (such as intensive care or obstetrics) or if the incident related to viral infection I was supported by a team of 4 virology consultants who would take the lead for incident management for influenza or norovirus outbreaks. By mid 2019, through further successful consultant recruitment, and some departmental re-organisation, we were able to have 4 microbiology consultants as site IPCDs at SJH, RHSC, RIE and WGH which allowed me to focus attention on issues with the RHCYP DCN building and oversee the other mandatory IPCT activities such as infection surveillance across the health board.

32. After my appointment as LIPCD in Oct 2015 (following a period of a vacancy where NHS Lothian had no lead infection control doctor in post after the resignation of my predecessor, Dr Elzbieta Czarniak, as lead IPCD in March 2015) and the appointment of Lindsay Guthrie as Lead Nurse for Infection Control ,who started on 1st June 2015 (after the resignation of her predecessor Natalie Oakes from the Lead Nurse for Infection Control in early 2015), there was *ad hoc* input to the RHCYP DCN project from either of us as required. I believe our predecessors had less involvement with regards to issues of the built environment. Janette Rae, as the HAI Scribe IPCN, was line managed by Mrs Guthrie. Ms Rae would seek a second opinion on her interpretation of matters relating to the built environment if she was unsure, from her own training and experience, from myself or others such as Mrs Guthrie within the wider IPCT; or I would be asked a direct question from one of the Project Team seeking my view. That view would be given but often I would not be informed of the outcome and whether that had changed an approach in the Project or not. Decisions regarding

any action to take based on IPCT advice given would sit with the Project Team.

33. I was content that Janette Rae, in her role as HAI Scribe IPCN, was the appropriate representative from IPCT. Janette Rae was an experienced IPCN who had developed a particular understanding of the infection control nursing issues encountered during new building and refurbishment projects. She was clear that she considered herself a nurse and matters of engineering were outwith her expertise. In relation to ventilation issues, Janette Rae in my experience, would make reference to SHTM 03-01 or seek a second opinion from colleagues in Health Facilities Scotland if there was a particular scenario not covered by SHTM 03-01 or a point where differences in interpretation of SHTM 03-01 had arisen. When she considered issues were outwith her competency, she would consult others for a second opinion or steer. She consulted with me, Lindsay Guthrie, Health Facilities Scotland (HFS) or Health Protection Scotland (HPS) as required. NHSL also had technical advisors, Mott MacDonald, who I understand were there to advise on technical issues such as engineering and the applicable Guidance. I am not aware of comprehensive guidance that outlines which disciplines should all be present during discussions about design of ventilation systems. My experience is that it is most productive if it is a multidisciplinary discussion with the involvement of the independent authorising engineer for ventilation, the project team, design team, estates team, IPCT and informed representation by the future clinical users of the facility being built all involved in the discussion.

34. My experience is that there is great variation amongst consultants of other clinical specialties with regards to their understanding of infection risk from the healthcare environment. It varies between specialty and varies with the age and experience of the colleague. For instance, surgical consultants and anaesthetic consultants often have a good understanding of the principles behind ventilation of operating theatres, consultant colleagues working in cancer services may have a greater understanding of isolation rooms for protective isolation of immunocompromised patients and consultant colleagues who routinely manage highly infectious patients may understand the principles of source isolation through having to deliver care in such rooms. Generally, the principles of how to design and build a safe healthcare facility are not taught in specialty training but

are acquired through working in a specialist unit (with specialist ventilation or isolation rooms) or through being involved in relocating services when something has gone wrong and the environment for delivering care has been compromised such as microbiological contamination of water or ventilation system failure. Often there are misconceptions that need corrected and unawareness of standards set in technical guidance or even the existence of such technical guidance.

35. It is often the case that in design meetings there are very good intentions proposed but ideas which do not align with statutory requirements or best practice. There is sometimes a need for well-intentioned enthusiasm to be tempered by pragmatism and the voice of someone in the multidisciplinary project team who is able to explain what is not legal, not safe, not practical, not workable or not affordable. This can be the project manager, technical advisors, independent authorising engineer, contracted design team or IPCT staff for example. My experience of clinical colleagues and indeed many IPCT colleagues is that they are not aware of NHS Capital Planning processes unless they have had prior experience of involvement in a building project. As a consequence of the Covid 19 pandemic, there was a substantial increase in awareness of all staff groups regarding ventilation provision, air quality and the roles of droplets and aerosols in the transmission of respiratory viral infection in clinical areas, the concepts of mechanical and natural ventilation and air changes per hour but there was not such awareness prior to early 2020. How water quality issues arise and the contribution of healthcare staff to either exacerbate them or improve them generally is not well understood in my experience and often it is not appreciated that some of the control measures required to prevent microbiological contamination of healthcare water are legal requirements.

36. Janette Rae represented IPCT on the RHCYP DCN as the main point of contact for the Project Team and was the HAI Scribe IPCN from around 2014. This was a role within IPCT that I had not come across when working in other health boards in Scotland. Where I had previously worked, the IPCN involved in a multidisciplinary completion of HAI Scribe would be an experienced IPCN but whose role was not specific to involvement in building projects. Janette Rae retired around December 2018 and after a short period of succession planning

and upskilling, Sarah Jane Sutherland was appointed to the role that Janette Rae had performed as “HAI Scribe IPCN.”

37. The role of IPCT in healthcare construction projects needs careful consideration and I have set out my views on that below.

From March 2019 onwards

38. My roles and responsibilities in relation to the Project changed significantly from around March 2019, when it became apparent that IPCT needed more information on the validation of the ventilation systems and water quality. On my return from a week of annual leave (4th to 10th March), I discussed with Professor Alex McMahon (as HAI Executive Lead) my concerns face to face that I had not seen ventilation validation data for RHCYP DCN prior to handover of the building which was announced to NHSL staff on 27th February 2019. This discussion took place on 13th March 2019 at the end of an incident management meeting about *Pseudomonas aeruginosa* water contamination at the Western General Hospital. Professor McMahon instructed me to e-mail him and outline my concerns which I did on 13th March **(A34010959 – Email from Lindsay Guthrie to Annette Rankin regarding a Sunday Hearld Article on ventilation issues QEUH RHCYP - Bundle 5 - Page 35)**. Professor McMahon escalated this among other Executive Directors also on 13th March (I discuss this email chain in more detail at paragraph 104 below).

39. During the period December 2018 to 12th March 2019 there was heightened concern regarding water safety and ventilation safety and compliance with best practice in all NHSL buildings including RHCYP DCN. On 25th February 2019 I had e-mail correspondence with the Director of Facilities, George Curley, and the Deputy Director of Facilities, Brian Douglas regarding the content of the NSS report, “Summary of Incident and Findings of the NHS Greater Glasgow and Clyde: Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHS Scotland” which had been issued on 22nd Feb 2019 (**A47150204 – Glasgow report on water incident at QEUH – dated 12 March 2019 – Bundle 13 – Volume 8 - Page 158**). During that correspondence a draft of a paper to be presented at the NHSL Healthcare

Governance meeting on 12th March was shared with me It included a copy of the letter **(A35270542 – Letter from SG Health & Social Care and CE NHS Scotland to NHS CEs setting out a set of actions about an ongoing incident (Cryptococcus infections) in QEUH – dated 25 January 2019 – Bundle 4 - Page 8)** dated 25th January from Scottish Government to NHS Scotland Chief Executives and Directors of Facilities seeking assurance regarding compliance with SHTM 03-01 for ventilation systems and subsequent correspondence from NHSL in response. This was the context in which I raised concern that I, as the LIPCD, had not had sight of any critical system ventilation validation data for RHCYP DCN with the HAI Executive lead on 13th March 2019.

40. It was and continues to be established best practice that commissioning of operating theatres involves a step to assess the microbiological air quality **(A47150195 – Microbiological Commissioning and Monitoring of operating theatre suites – Hoffman et al – dated 2002 – Bundle 13 - Volume 8 - Page 173)**. As the consultant medical microbiologist with most experience of interpretation of this data in NHSL I was expecting to see such information to be able to assess this parameter of whether the theatres were providing a safe environment for surgery. Likewise, I was expecting to see data regarding air quality in the HEPA filtered isolation rooms in the building. In my role of IPCD and a senior member of the IPCT I was expecting to see a validation report (as per SHTM 03 01 section 8.64 and 8.65) for each operating theatre to be assured that they were meeting the parameters described in SHTM 03-01 Appendix 1 for air change rates and pressure cascades. I was expecting to see water culture results for *Legionella species* from sampling taken throughout the building (as per SHTM 04-01) and *Pseudomonas aeruginosa* results water culture results from augmented care areas (as per HTM 04-01) and assurance that water met all the microbiological criteria to meet a drinkable standard.

41. I was requested by various Executive Directors in NHSL to participate in discussions and planning regarding RHCYP DCN and was effectively seconded from the majority of my clinical microbiology activities to give the majority of my time to address issues arising at RHCYP DCN and other high profile infection control incidents happening concurrently e.g. *Pseudomonas aeruginosa* infections in neurosurgical patients and critical care patients at Western General

Hospital (WGH) and post-operative invasive fungal infections in cardiothoracic surgery at Royal Infirmary of Edinburgh.

Governance

42. Initially an Incident Management Team (IMT) for RHCYP DCN was formed and first met on Monday 8th July 2019 which later transitioned into an ESG. The IMT was formed by the Executive Directors as a forum to discuss and address the non-conforming issues being identified at RHCYP DCN but I wasn't involved in the formation of the group membership or deciding its remit – I was only asked to attend to provide infection control specialist input. The ESG comprised:

- Susan Goldsmith, Director of Finance – Chair
- Tim Davison, Chief Executive
- Tracey Gillies, Medical Director
- Alex McMahon, Nurse Director (took over as Chair from 28 October 2019)
- Jacquie Campbell, Chief Operating Officer
- Janis Butler, Director of Human Resources
- Judith Mackay, Director of Communications
- Iain Graham, Director of Capital Planning and Projects
- Brian Currie, Project Director
- George Curley, Director of Facilities
- Donald Inverarity, Lead IPCD and Consultant Microbiologist
- Lindsay Guthrie, Lead Infection and Prevention Control Nurse
- Sorrel Cosens, Programme Manager.

43. Mary Morgan, who was appointed as the RHCYP DCN Strategic Programme Director by Scottish Government in September 2019, also attended the ESG and others from time to time. Lindsay Guthrie and I were present at the ESG meetings to provide representation from IPCT. We were not necessarily the ultimate decision–makers in the meetings, that was Chief Executive and Executive Directors, but we were consulted as subject matter experts. From that point onwards, I was heavily involved at the request of the NHSL Executive Team in respect of advising on infection control risks in the built environment.

44. There were also specialist sub-groups for the RHCYP DCN building set up including a Water Safety Group (Tracey Gillies was the Executive Lead) and a Ventilation Safety Group (Alex McMahon was the Executive Lead), which both Lindsay Guthrie and I attended. The work generated by these groups became almost a fulltime job and from around September 2019 onwards, NHSL released funds to provide consultant microbiologist backfill so NHSL could employ a locum consultant to do more of the day-to-day consultant microbiology work that I would have otherwise been doing. I continued to advise in relation to infection control in the built environment at RHCYP DCN until the last ESG meeting post full occupation of the building which was held on 22nd March 2021. Since then, I have continued to advise NHSL generally on built environment infection control issues in existing buildings and on other new build capital projects.

45. As above, pre 2019 my role in the Project was *ad hoc* and I had communications with the Project Team both directly and indirectly via Janette Rae, the HAI Scribe IPCN. In the Project Team, I had communicated with: Ronnie Henderson (Commissioning Manager Hard Facilities Management), Brian Currie (Project Director), Ashley Hull (Commissioning Manager), Janice MacKenzie (Clinical Director), Jackie Sansbury (Head of Commissioning) and I would also communicate with George Curley as Director of Estates and Facilities about the RHCYP DCN project.

46. Post 2019, in relation to water and ventilation issues at the new RHCYP DCN building and also water quality issues at the old DCN at the Western General Hospital, I had discussions with the NHSL Project Team and other external parties including: Westfield Caledonian water safety experts (John Bryson), Dennis Kelly the NHSL Authorising Engineer for water; John Rayner and Jamie Minhinnick as the Authorising Engineers for ventilation (Turners Engineering) who represented NHSL; Hoare Lea; Bouygues; IHSL; Wallace Whittle (Stewart McKechnie), Multiplex; Mott MacDonald; HFS (Eddie McLaughlin and Ian Storrar); HPS (Annette Rankin and Laura Imrie). I also attended as a witness some of the assessments of ventilation performance with the Institute of Occupational Medicine (IOM) staff (Paul Jameson) after June 2019.

47. I reported to Professor Alex McMahon in his role as the HAI Executive Lead and

Director of Nursing and Tracey Gillies, Medical Director who was lead for water issues at RHCYP DCN. She was also HAI Executive lead before that passed to Alex McMahon but also as Medical Director she was the Executive who managed me as a medic. There were frequent and direct communications between the three of us and Lindsay Guthrie. I also reported to the Executive Director members of the ESG as detailed above.

48. I sat on Lothian Infection Control Advisory Committee (LICAC) which was chaired by the Director of Public Health, Dr Alison McCallum. This committee predated my arrival in NHSL in 2014. It did not oversee issues at RHCYP DCN but they could be discussed there with the Director of Public Health.

49. I sat on the Pan Lothian Infection Control Committee (PLICC), which held quarterly meetings. It pre-existed the issues with the Project and while the issues with the Project will likely have been reported there, it would have been for interest rather than oversight.

50. After January 2020 I was also a Member of NHSL COVID Silver Command Group and NHSL COVID Gold Command Group. These committees did not provide oversight of RHCYP DCN but did address Covid impacts at RHSC and DCN (while it was at WGH) and across the whole of NHSL. Questions about the RHCYP DCN building and whether it was at a point which it could be used to ease Covid pressures in any way would arise.

51. The forums available to me where IPCT could raise a patient safety concern around the RHCYP/ DCN Project were:

- Directly to HAI Executive Lead, Tracey Gillies initially then Professor Alex McMahon (2019 onwards)
- Directly to Medical Director Tracey Gillies (line manager)
- Pan Lothian Infection Control Committee chaired by HAI Executive Lead
- Lothian Infection Control Advisory Committee chaired by Director of Public Health
- RHCYP DCN Executive Steering Group (from July 2019)

52. I also liaised with my consultant microbiologist colleagues to seek their views and provide feedback and support as my deputy at meetings if I was on leave.

Role Of Infection Prevention Control in the Built Environment

53. The role of IPCT members in healthcare projects and the built environment is not clear in the NHS in United Kingdom and has been unanswered for a long time. I found a useful paper published in the Journal of Hospital Infection in 2004 called **(A46883669 - The Future of the UK infection control doctor: report of a one-day Association of Medical Microbiologists organized workshop – dated 3 September 2004 – Bundle 13 - Volume 8 - Page 201)** and there is absolutely nothing to suggest any specific IPCD role in respect of the built environment in the UK at that point in time. The Vale of Leven Inquiry was disparaging of its IPCD but there has been no clear guidance or understanding as to the remit of IPCD in Scotland before or since then. If there can be clarity for health boards as to the remit of (i) Authorising Engineers (AE) for Water, Ventilation and Decontamination and (ii) IPC nurses and doctors, then that would be helpful particularly in relation to who is best placed to establish compliance against technical guidance.

54. SHTMs such as SHTM 01-01 do not accurately describe the role of IPCD as they consider it to be the same as a clinical microbiologist but they are not necessarily interchangeable roles – a consultant clinical microbiologist can undertake the role of an IPCD but an IPCD can also have the background of a consultant virologist or consultant infectious disease physician for instance and may not have the same laboratory expertise as a consultant microbiologist but have different skill sets within infection medicine. SHTM 01-01 also presumes the infection control doctor has skills in decontamination without any clarity as to what that skill set entails. With regards to SHTM 00 **(A33662233 – Scottish Health Technical Memorandum 00, Best Practice guidance for healthcare engineering, Policies and Principles dated February 2013 – Bundle 13 - Volume 3 – Page 325)** I believe the roles of the authorising engineers are too vague. SHTM 00 says that the authorising engineer role is *"to provide services in accordance with SHTM guidance"* (section 4.18) and only cross references a role in compliance

with other SHTMs whereas my experience of working with authorising engineers is that the role also considers other relevant subject matter such as building standards, health and safety executive legislation or relevant guidance from other learned organisations. Section 4.19 says the AE will *"monitor the performance of the service"* and alludes to a role in audit and compliance assessment but isn't explicit enough in my view.

55. Within SHTM 00 (p91-94) the only mention of infection control is in a table listing commonly encountered estates issues where "infection control infection involvement?" is listed against every scenario. I think this needs revision as it is generating many unnecessary requests for IPCT involvement in areas where there is little requirement for infection control (examples from SHTM 00 being, "extreme weather" or "fire" or "explosions" or "paging systems") and creating the perception that infection control must sanction all estates activities. I think clarity is also required for national bodies too as it is not unusual for guidance documents to be issued from them which task IPCT members with activities that don't align with their skill mix, experience or competence with little or no reference to the authorising engineer role (who may be more experienced, competent and able to perform the task). My experience is that IPCT members will have their most effective impact in establishing patient safety when working in a multidisciplinary group along with the project team, facilities staff, authorising engineers and clinical teams who will use a facility, as no individual team has all the knowledge and experience to assess practicality and safety wholistically. Scottish Government has attempted to create role descriptors for members of the IPCT but these have not been popular or accepted within the IPCT community in Scotland so far.

56. It is not uncommon in more recent NSS documents for IPCT members to be tasked with activities outwith their training (e.g. related to engineering compliance assessments) which could be more competently and more knowledgeably performed by Authorising Engineers or other professional groups. One example was the NSS HFS Lessons Learned and Recommendations Report on Cowlairs CDU Incident Nov 2018 **(A47150197 – Lessons Learned & Recommendations report on Cowlairs CDU Incident Nov 2018 – dated 06 September 2019 – Bundle 13 - Volume 8 - Page 204)** issued regarding a review of a failure of a

decontamination unit in Glasgow and purported to identify lessons learned, one of which advised particular “focus” on the training of IPCDs and medical microbiologists (**Page 210**). This was in relation to recommissioning a cleanroom within the decontamination unit with the inference that there had been a training issue of the medical microbiologists involved during the incident. There was no representation of either IPCDs or medical microbiologists during the writing of the document or its review, before publication, so no opportunity to explain that the tasks the medical microbiologists were being expected to be proficient at may legitimately be outwith their training or that the tasks may be better delivered by an Authorising Engineer for Decontamination. This is one of the reasons why the SMVN IPCD subgroup was formed to be able to give IPCDs more of a voice to correct misconceptions regarding their role and to highlight that the skill set required to deliver an infection prevention and control service comprehensively is more than can be delivered by IPCNs or IPCDs alone.

57. In Scotland although there are a few IPCDs with extensive experience and understanding of clinical risk from building water and ventilation systems, many have only generic understanding of the infection control principles involved as outlined in the FRC Path curriculum. These skills and experience are not evenly distributed across all health boards. The expectations put on IPCDs are often aligned to what a smaller group of more experienced and trained individuals can deliver rather than recognising that many IPCDs cannot necessarily perform at that level and have not had extensive access to either the training or the experience of projects where technical guidance has not been followed, novel technologies have been installed, critical system maintenance has been suboptimal or where known microbiological hazards have been identified within buildings resulting in patient infections.

58. Consultant Medical Microbiologists are usually medically qualified (although some have clinical scientist rather than medical training) and are skilled in the laboratory diagnosis and “end of the bed” diagnosis of infections of all forms and in all ages of patient in any specialty be that medical, surgical, paediatrics, obstetrics or any other specialty. That involves a repertoire of clinical history and patient examination skills appropriate to an experienced ward based doctor as well as a wide understanding of prescribing antimicrobials and laboratory skills

equivalent to microbiology based biomedical scientists. It involves understanding laboratory methods, quality structures and laboratory management and also involves understanding infection control principles and infection incident management. Most consultants will develop specialist interests and may pursue further postgraduate training in such areas as teaching, quality improvement, antimicrobial stewardship, laboratory management skills. Within infection control one such area is infection control relating to healthcare buildings and their water and ventilation systems. It is not mandatory to undertake such training and not all consultant medical microbiologists will have had such training.

59. In Scotland, membership of the SMVN IPCD subgroup is constantly changing so it is difficult to give figures for how many individuals are in that role. The expectation is that every health board should have at least one IPCD. The present reality is that some health boards do not have an IPCD and some island health boards share their IPCD with another mainland health board. For some mainland health boards, it has been recognised that the workload is too great for one individual to deliver with a model of some individuals taking on particular aspects of the IPCD remit such as water issues or ventilation issues or antimicrobial stewardship. There is no framework against which such doctors can benchmark themselves as to whether they have undertaken training to make them proficient in these tasks and no list of appropriate training activities to cross check against. Consequently, training needs are usually self-identified as part of a personal development plan within the annual consultant appraisal process and any personal assessment of whether the IPCD feels that they have had adequate training or not becomes a private discussion between them and their appraiser. That then can help to formulate the perceived training need and a process of how that can be escalated by them and their line manager or HAI Executive lead. So IPCDs across Scotland will often be in very different parts of the spectrum of post completion of specialist training learning for any matter and not just infection control aspects of the built environment.

60. I started to specialise in infection control in the built environment, mostly as a result of the circumstances I found myself in. My knowledge and interest stemmed from the healthcare refurbishment projects or repairs I was involved in at Monklands Hospital as an IPCD there. I worked for a short time with Malcolm

Thomas, author of SHTM 03-01 (**A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1 - Page 2490**), who was contracted as external advisor to the Monklands operating theatres refurbishment project and gave advice on ventilation systems. However, I would flag that this all pre-dated publication of SHTM 03-01 and was based on SHTM 2025, (**A33103351 – SHTM 2025 Part 1 dated June 2001 – Bundle 1 - Page 3208**) which did not contain the same level of detail as found in Appendix 1, Table A of SHTM 03-01 regarding air change rates and pressure cascades required for particular areas.

61. Lindsay Guthrie and I gained a phenomenal amount of practical knowledge on ventilation in the built environment and SHTM 03-01 and water quality and SHTM 04-01 from the RHCYP DCN project. However, the learning and knowledge that we have gained is as a result of the circumstances we found ourselves in, i.e. sitting through lengthy and detailed meetings with ventilation engineers and the Authorising Engineers for ventilation or discussions about water systems and their components with the Authorising Engineer for water and Estates staff. By 2019, this was not all learning arising from the RHCYP DCN project though as there were significant incidents being investigated at both the Royal Infirmary of Edinburgh and Western General Hospital campuses where ventilation systems and water systems were being systematically assessed as possible sources for microbiological hazards that were causing patient infections prior to March 2019. HFS and HPS were aware of the incidents and were invited to participate in the IMTs. It is not usual for IPCT members to have such a detailed understanding of mechanical ventilation systems or healthcare water systems or to navigate IMTs of such complexity and both incidents had substantial input and support from NHSL's Executive Directors. These IMTs at The Royal Infirmary Edinburgh (RIE) and The Western General Hospital (WGH) were ongoing active issues when concerns about RHCYP DCN systems were being discussed in 2019.

62. There are professional groups and bodies who have an interest in developing a clearer remit for IPCT in the built environment. I am part of Scottish Microbiology and Virology network Infection Prevention and Control Doctor subgroup and we wrote a paper for the Scottish Government from our perspective as to what the role of the infection control doctor is becoming and how the IPCD role may help to minimise clinical risks related to the built environment. This was shared with

Scottish Government as part of the IPCT workforce planning exercise that was being undertaken in 2021/2022. The increasing role of IPCDs in built environment issues is specifically addressed in section 2.7 of the paper which SMVN IPCD subgroup produced in March 2021 titled “The Infection Prevention and Control Doctor in Scotland – report on current position.” **(A47150209 – The Infection and Prevention Control Doctor in Scotland – dated 29 March 2021 – Bundle 13 - Volume 8 - Page 224).**

63. There is often (but not always) a mismatch in perception between what IPCD consider their role to be; what IPCN consider their role to be; and what Project Managers consider the IPCD and IPCN role to be. Bringing clarity here would be welcomed. IPCDs and IPCNs bring different perspectives from a nursing and medical perspective as to what is and what is not a safe patient environment with regards to the possibility of acquiring an infection during the delivery of healthcare. Often the role of IPCT is incorrectly perceived to be one of assessing compliance with various guidance documents and approving and “signing off” documents on behalf of the Health Board but IPCT members generally do not have the authorisation to “sign off“ on documents which ultimately sits with the Project Sponsor in an Executive role for capital projects.

64. This is particularly important because newer microbiology consultant appointees over the last 10 – 15 years have far less infection control exposure and experience. My sense is that there is some reticence to get involved due to their lack of experience and fear of doing something wrong. The challenges with infection control in the built environment at both the QEUH and RHCYP DCN has only intensified that. The result is that we are losing experienced IPCN and IPCDs en masse in Scotland and there are few newly qualified staff with sufficient experience of the built environment issues specifically. Many have retired, some have changed career and left the health service after the demands on them from the Covid pandemic or for other personal reasons such as illness or family, some have dropped their IPCT work to focus on other less demanding areas of their specialty and several have moved from working in health boards to work for NHS Scotland Assure, ARHAI or Scottish Government HAI policy unit.

65. In general, IPCNs and IPCDs do not receive much training on infection control in

the built environment as part of their basic training. There are training courses run by the Healthcare Infection Society such as the Engineering Aspects of Infection Control held twice a year Eastwood Park Training Centre, Falfield, Gloustershire (discussed above at paragraph 9) which is a highly rated UK course for learning about ventilation and water systems but it's not mandatory and not everyone does it or is interested in it and there is often a waiting list of places. The result is that there are only a small pool of people in the UK with relevant experience and that pool seems to be getting smaller.

66. I discuss the role of IPCT and its impact on this Project specifically below.

HAI Scribe

67. The risk of acquiring an infection while attending a healthcare facility in Scotland is generally assessed by the HAI Scribe process which stands for Healthcare Associated Infection System for Controlling Risk In The Built Environment. It was issued in NHS Scotland by National Services Scotland (Health Facilities Scotland) after a pilot in the early 2000s and features now in Scottish Health Facilities Note (SHFN) 30 Parts A, B and C. Its use in Scotland became mandatory with the issuing of CEL (2007) 18 and reiterated in DL (2015) 19 and DL (2019) 23. The current version 3 of HAI Scribe was issued in 2014/2015. It is important to appreciate that a set of circumstances that leads to an HAI in one healthcare setting may not do so in another healthcare setting and may not do so in the same setting on the same day if the set of circumstances is altered even marginally. The permutations of circumstances that can occur in one ward far less the whole building over a year are enormous so the prediction of possible infection risk is never all encompassing.

68. The HAI Scribe document itself makes the point that its intent is to "minimise risk of infection" – it is not intended to cover all dimensions of clinical risk and it cannot eradicate infection risk from a building. It is only intended to, as far as can be reasonably achieved, anticipate infection risk and either design it out or mitigate against it. The HAI Scribe document itself is really a checklist of questions that categorises into sections recognised hazards that lead to infection, if all is not optimal or following best practice. It is not applied only once but is to

be used during 4 stages of the pre-occupation life of the building and these are:

Development Stage 1:	Initial briefing and proposed site for development
Development Stage 2:	Design and planning
Development Stage 3:	Construction and refurbishment work
Development Stage 4:	Pre handover check, ongoing maintenance and feedback.

69. The anticipation of the infection risk changes as the stages progress. All stages require an element of “horizon scanning” and prediction based on knowledge of current best practice in infection control. Much like completion of a picture on a jigsaw, understanding of the hazards bespoke to the design or building becomes clearer as the building is completed as they move from being hypothetical issues to being demonstrable issues. It isn’t until system performance assessments have been performed (at validation in stage 4) that a clearer picture is available regarding the water and ventilation systems by which to assess the hazards and mitigate risk before a point when patients and staff may be exposed. Not all questions in the checklists are relevant for every building or can be answered accurately at every development stage of the project. The perspectives of an infection prevention and control nurse and infection prevention and control doctor with experience of assessing and identifying infection risk from building systems are important and they can be considered key stakeholders but they do not complete the document alone. Completion is intended to be multidisciplinary and would optimally involve the contractor doing the building, owner of the building if not NHS, clinical teams or site management teams who will use the building and have knowledge of the needs of the services it will host, estates team with engineering and plumbing expertise, and may involve domestic services representative to assess anything that may impair their cleaning processes too. The project team in a large project would be the co-ordinators of its completion and in smaller refurbishment projects it would be the NHS Estates team for the health board. In the later stages such as Stage 4 there will also be a dependence on information being generated by water testing laboratories and assessment of the ventilation system by the independent authorising engineer to fully assess if they are SHTM compliant and “fit for purpose.” The Authorising Engineers may also be considered stakeholders themselves in the HAI Scribe if the nature of the

project involves significant revision work on a water system or ventilation system or commissioning of new systems in new buildings and so HAI Scribe can't easily be completed at short notice.

70. I was not present during the meeting regarding the HAI Scribe stage 4 that generated the document scanned **(A35230420 - SHFN 30 Part B form on Development stage 4 Review of completed project - dated 1 June 2019 – Bundle 5 - Page 95)**. I had been invited to attend but was on annual leave that day. My colleague, Lindsay Guthrie, Lead IPCN, is the best person to speak to the HAI Scribes in the Project. Sarah Jane Sutherland, who became lead HAI Scribe nurse after Jeanette Rae retired, was also involved.

71. The HAI Scribe process that should be followed is set out clearly in SHFN 30 Part B and C. Stage 4 should be completed after verification and snagging is completed or near completion but before handover, see Part B at 1.6. (**A33662208 – 416 SHFN 30 Part B v3 dated October 2014 – Bundle 13 - Volume 3 - Page 471)**

72. My understanding is that at no point did Lindsay Guthrie or Sarah Jane Sutherland approve the stage 4 HAI Scribe before 9th July 2019. Indeed, they refused to sign it because they did not have the information needed to assess whether the ventilation and water systems were "fit for purpose". This was an unusual stance to take and as such it had been discussed with me by Mrs Guthrie but none of us were comfortable that we could truthfully sign a document that explicitly asks whether the ventilation system and water system do not pose a risk of spreading infection when we did not have sight of data that had demonstrated that they didn't. SHFN 30 Part B section 4.26 **(Page 533)** asks "Is the ventilation system designed in accordance with the requirements of SHTM 03-01 Ventilation in Healthcare Premises?" and section 4.27 asks "Is the ventilation system designed so that it does not contribute to the spread of infection within the healthcare facility?" **(Page 533)** Section 4.37 asks "Are water systems designed installed and maintained in accordance with current guidance SHTM 04-01 series Water Safety"? (**Page 534)** We could not answer "Yes" to any of these. To answer them we agreed we needed to see validation reports for the operating theatres ventilation systems and isolation rooms ventilation

systems as well as microbiological evidence that the water system was of a drinkable quality, free of *Legionella* species bacteria and free of *Pseudomonas aeruginosa* bacteria in augmented care areas.

73. As discussed above, Mrs Guthrie and I were both heavily involved in two other concurrent IMTs where ventilation and water systems were being considered as a source of microbiological hazard where patients had acquired significant infections in other hospitals in NHS Lothian and we were also aware from the NSS report regarding water quality issues at QEUH of the experiences there too. We were aware that if these systems were not functioning optimally and safely the probability was that patients would eventually come to harm. The decision not to sign the HAI Scribe stage 4 at that stage was done collectively within the senior IPCT and I was consulted and agreed. I don't recall us being aware that the practical completion certificate would be signed off without the HAI Scribe Stage 4 being signed. The stage 4 HAI Scribe was not signed off until just prior to occupation and was done with the agreement of the Oversight Board (OSB).

Lochranza Unit (haemato-oncology)

First Issue: Resilience of Ventilation Strategy to Supply the Isolation Rooms (August 2016)

74. There were two separate ventilation issues in relation to the Lochranza unit. The first was to do with the resilience of the proposed ventilation strategy of running 5 isolation rooms from one air handling unit (AHU). In around August 2016, Janette Rae raised a concern in this regard **(A41295527 – Email Re: for comments (Email correspondence between Janette Rae and Donald Inverarity) - dated 22 August 2016 – Bundle 13 - Volume 8 - Page 233)**, resulting in a meeting with the Project Team, IHSL, Multiplex, Wallace Whittle & Mott MacDonald to discuss the ventilation. I was not at the meeting but was aware of the issue and was provided with a copy of the August 2016 Situation Background Assessment Recommendation (SBAR) that was subsequently produced by Janette Rae following the meeting **(A41295528 – 2016 08 22 Ventilation – dated 22 August 2016 – Bundle 13 - Volume 7 - Page 40)** and I

provided comment. An SBAR is a communication tool used in NHSL that provides a succinct summary of written information to interested persons and is an acronym for Situation, Background, Assessment, Recommendations and usually consists of a paragraph or two under each heading.

75. Janette Rae suggested to the Project Team that they should consult with HFS about the issue of 5 isolation rooms being served by one AHU as it primarily is an issue about best practice regarding ventilation system design, compliance with an HBN (HBN 04-01 Supplement 1) and resilience of a clinical service. Being able to articulate the risk of infection would depend on the final ventilation system design but there were clear concerns being expressed that a ventilation system was being installed which increased the risk of infection transmission rather than minimised it if it had been compliant with HBN 04-01 Supplement 1. Other deviations with regards to SHTM 03-01 compliance with regards to ventilation in Lochranza were not known by IPCT at that time. IPCT's expectation was that the Project Team, would seek the view of a ventilation engineer and consult with the NHSL Authorising Engineer for ventilation (An SBAR written by Janette Rae identifies John Rayner of Turner FM as NHSL's Authorising Engineer for Ventilation in August 2016) and/or directly with HFS. It would be an unusual expectation for an IPCN to be co-ordinating discussions about a point of clarification with regards to compliance with technical ventilation engineering guidance as that's one of the roles of the project team and a question better answered by an AE for ventilation.

76. Janette Rae prepared an SBAR outlining IPCT concerns. It sets out that there were to be isolation rooms throughout the new build that would have gowning lobbies and en-suites with shower facilities, i.e. PPVL isolation rooms (positive pressure ventilation lobbied rooms). The ventilation in terms of air change rate (10 ac/hr) and pressure regime in the room is detailed in the SBAR and is noted as being compliant with SHTM 03-01 and Health Building Note 04-01, Supplement 1, Isolation facilities for infectious patients in acute settings. The concern that was being flagged, is that there should have been a ratio of one air handling unit serving (AHU) supplying air to one isolation room, whereas what was proposed was one AHU to serve all 5 isolation rooms in Lochranza.

77. We were concerned as to what would happen if the AHU were to fail, which would result in 5 isolation rooms losing their supply air and pressure cascades which would compromise the protective isolation environment for neutropenic immunocompromised children. The strategy of having all isolation rooms fed by one AHU was discussed but not acceptable to IPCT as there was no redundancy in the design and nowhere else in the building that would provide a protective isolation environment to keep neutropenic patients safe co-located with the haematology and oncology medical and nursing teams in the event of a failure of the AHU or during periods of necessary AHU maintenance.

78. From a patient risk perspective, the children being treated in the isolation rooms could not be easily moved. They can be extremely vulnerable to the risk of infection. They require a protective isolation environment. We had to consider a contingency plan for 5 vulnerable patients if the single AHU serving all 5 rooms failed. There was no contingency in the ventilation strategy for that scenario. It was a scenario that was avoidable if each lobby, isolation room, and toilet/shower room (i.e. each PPVL isolation suite of lobby, bedroom and shower/toilet room) had its own AHU as outlined in HBN 04-01 Supplement 1 section 2.37. **(A37329297 – Health Building Note 04-01 Supplement 1 – Isolation facilities for infectious patients in acute settings – Department of Health 2013 ED – Bundle 1 - Page 1219)** This is also “strongly recommended” in section 4.5 of the Scottish document published in 2008 titled, “Scottish Health Planning Note 04 Inpatient accommodation: Options for Choice Supplement 1: Isolation Facilities in Acute Settings,” **(A36372665 – H5 – SHPN 4 Supplement 1 (2) – Bundle 13 - Volume 3, Page 425)** which predated HBN 04-01 Supplement 1 (published in 2013). I am unclear how this situation arose as my view of it was requested on receipt of the SBAR after the issue had been identified by Janette. To deviate from key guidance in this way I would have expected that the issue would have been raised with NHSL by the ventilation system designer and construction company and opportunity given for the project ventilation group (with input by IPCT and Authorising Engineer for Ventilation) to discuss its implications and seek approval of a derogation if it was considered suitable before the non-compliant ventilation system was installed. I would not have considered it a suitable design though had I been asked about it at an earlier stage.

79. To clarify further, these isolation rooms would be present to provide protective isolation for post chemotherapy neutropenic patients susceptible to infection or for containment (source isolation) of any child with an infectious disease (e.g. chicken pox) and an underlying cancer. As such, they would be frequently used and the safety of the patient inside or the patients and staff outside depends heavily on the reliability and performance of the supply mechanical ventilation, with respects to the number of air changes, pressure cascades, quality of filtered air and crucially no interruption to any of those aspects. Best practice, according to HBN 04-01 Supplement 1 (2013), **(A37329297 – Health Building Note 04-01 Supplement 1 – Isolation facilities for infectious patients in acute settings – Department of Health 2013 ED – Bundle 1 - Page 1219)** which Janette Rae had been trying to convey was that one isolation room is served by one AHU. HBN 04-01 Suppl1 concedes that more than one isolation room could be served from one AHU but actively discourages such an arrangement. The 1:1 ratio minimises the clinical risks but is more expensive to deliver and needs more plant room space for all the Air Handling Units (AHUs) and ceiling void space for ductwork and is more expensive to run and maintain. In the event of a critical failure of an AHU or the need for annual maintenance there is redundancy and resilience in the system such that for a short period of hours to days a room can be closed to clinical use and patient care maintained in the other unaffected PPVL isolation rooms so only one room is impacted rather than them all simultaneously.

80. The proposed supply ventilation to the PPVL rooms though in Lochranza was designed such that all of them were supplied by one AHU. This would be cheaper to run and maintain but there was absolutely no redundancy or resilience in the design to safely continue to care for neutropenic children in the event of AHU failure or when they needed switched off for a period of annual maintenance or filter changes. This was a red flag to me. I had been heavily involved in providing microbiological clinical liaison to the adult haematology unit while working at Monklands Hospital and knew that neutropenic patients can be incredibly unwell and can’t just be moved to a new location at short notice. This could easily compromise their outcomes and avoidably and unnecessarily risk exposure to micro-organisms that could lead to fatal infections. My understanding of the design of the RHCYP DCN building at that time was that there was no other

suitable similar location where patients could be moved to on the site that would be anywhere near co-located with the specialist staff with best expertise to care for them. There were substantial clinical risks to patients and uninterrupted service delivery which would not be hypothetical but real as the AHU would need to be shut down at least once a year. These were issues which, in my view, were not satisfactorily resolved prior to the decision to delay opening RHCYP DCN. It was only after that date that the performance of the proposed solution of a back up air supply to the isolation rooms in the event of AHU failure was demonstrated and found to be inadequate to sustain the protective environment for patients required in the isolation rooms. In my view, the issue was only resolved satisfactorily once the installed Lochranza ventilation had been revised and a new HBN 0401 Supplement 1 compliant system installed.

Second Issue: (February 2017)

81. I have been asked to look at an email chain in February 2017 between Dorothy Hanley, service lead for Redesign and Commissioning for NHSL, and some of my IPCT colleagues, including Janette Rae and consultant medical microbiologist Pota Kalima. I was not included in that email chain and was not aware of it at the time **(A42980258 - Email chain - Dorothy Hanley and Janice Mackenzie meet with Haem & Onc team for consultation - dated 13 February 2017 – Bundle 13 - Volume 8 - Page 235).**

82. It refers to a meeting to take place to discuss a deviation from SHTM 03-01 in relation to ventilation for single rooms in the Lochranza ward, including the balance of potential risks to patients. I understand that was in relation to ventilation settings in non-isolation rooms. It appears from the email chain that a date was agreed for the meeting on the afternoon of 23 February 2017 but I did not attend it. I do not know who attended as I was not present. From the email chain, it appears as though Pota Kalima, Janette Rae, Dorothy Hanley, Mark Brougham, Ann Cairney and Ronnie Henderson were invited to the meeting. I do not know what was discussed at the meeting or what was decided regarding the supply ventilation to Lochranza ward. I understand that it was to risk assess and discuss strategies to compensate for impacts on optimal care of paediatric cancer patients as the supply ventilation system was already installed.

September 2019

83. When Lindsay Guthrie and I were consulted by other members of the RHCYP DCN Executive Steering Group regarding our views of the ventilation strategy in Lochranza ward in August and September 2019, my understanding was that the air change rate in the single occupancy spaces, other than the isolation PPVL rooms, in Lochranza ward had been designed and installed to 4 ac/hr, rather than the recommended 10 ac/hr for neutropenic patients as set out in table A of SHTM 03-01. In the circumstances, i.e. where the non-compliant ventilation system had already been installed, my view was that as long as the demand for protective isolation by neutropenic patients did not exceed 5 patients at one time (who could be managed safely in the PPVL isolation rooms) then there may not be an adverse impact. The majority of children receiving inpatient haematology or oncology management in Edinburgh are not neutropenic and therefore would not need the specialist environment for care of neutropenic patients. Edinburgh is not a paediatric bone marrow transplant centre for instance whereas the children's hospital in Glasgow is and provides inpatient management for more immunocompromised children. Discussions relating to this risk assessment are in the initial draft SBAR within the e-mail trail from 9 September 2019 **(A47150202 – First Draft of risk assessment relating to addressing HAI risks in RHCYP clinical areas taking account of ventilation and its delivery – dated 30 August 2019 – Bundle 13 - Volume 8 - Page 239)**.

84. It is important to understand that neutropenia is not a disease. It describes a period (usually transitory but may persist in terms of days, weeks or months) when the neutrophil count in peripheral blood drops below 0.5×10^{9} cells per litre, most often as a consequence of receiving chemotherapy drugs to destroy cancer cells in the body but particularly cancer cells in bone marrow. Not all patients who are neutropenic are susceptible to infection to the same degree as often the severity of immunosuppression depends on which chemotherapy regimen they have been exposed to and not the fact they are neutropenic *per se*. It is also influenced by the duration of the period of neutropenia. The neutropenia is a marker indicating that a period of greater infection susceptibility has been entered and more careful monitoring for infection is required. Traditionally such

patients have been placed in “protective isolation” i.e. a room on their own to minimise contact with other people and any micro-organisms others are carrying or shedding that they might be exposed to. During the period of neutropenia there may also be susceptibility to environmental micro-organisms so traditionally attempts have been made to provide an environment that is as clean as possible with attention given to what sort of foods are consumed, water quality and air quality and use of antimicrobial prophylaxis to try to prevent infection with antibiotics and antifungal drugs. The air quality issue is primarily to avoid exposure to fungal spores which are ubiquitous in the air that everyone breathes as during the period of neutropenia there is particular susceptibility of some patients to fungal opportunistic pathogens. *Aspergillus species* are moulds which cause the infection Invasive Aspergillosis and are particularly feared in haematology patients as it is a condition that is difficult to diagnose, difficult to treat successfully and requires the use of antifungal drugs which have lots of side effects and drug interactions. Another fungal pathogen to which such patients are susceptible is *Pneumocystis jiroveccii* which causes pneumonia and is also very difficult to treat successfully, can be fatal and requires the use of drugs with significant side effects and interactions.

85. It is hard to advise on the risks and impacts that not providing an environment of 10Pa positive pressure and 10 Air changes per hour would have as the infection risk is now very individual to particular patients and their degree of immunosuppression and an assessment of the clinical risk of acquisition of infection is often best done by the clinical team looking after the patient who understand which cancer they are treating and which chemotherapy regimen is being used. Many neutropenic patients (paediatric and adult) are now managed at home with no protective isolation and until 2022, the adult haematology and oncology wards at the Western General Hospital had no such isolation facilities and did not experience excess mortality among their patients over several decades of using those facilities. Neither did RHSC at Sciennes have such facilities. I am not an expert in this area and not fully versed in the evidence base for the ventilation parameters stipulated in SHTM 03-01 for wards managing neutropenic patients but I am aware of guidance issued by the Centre for Disease Control (CDC) in the USA which has advised use of greater than 12 air changes per hour for such areas which references papers from the late 20th

century and early 21st century to support this. See **(A47205320 - Guidelines for Environmental Infection Control in Health-Care Facilities – dated July 2019 – Bundle 13 - Volume 8 - Page 1867).**

86. I'm not in a position to describe the corporate risks to NHSL from non-compliance with SHTM 03-01 or impacts on other aspects of the delivery of cancer care.

87. Once the Critical Care ventilation issue became to light in the Summer of 2019 and it was clear that remedial works would be required there, IPCT took the opportunity to suggest a review and improvement of the ventilation system in the Lochranza ward so that it fully complied with SHTM 03-01. This is set out in the SBAR from Tracey Gillies to ESG on 3 Sept 2019 **(A42980429 - Haematology Oncology Provision in the RHCYP briefing - dated 3 September 2019 – Bundle 13 - Volume 8 - Page 256)**. It was considered an opportunity to improve resilience and capacity to manage neutropenic patients based on increasing demand for paediatric cancer inpatient beds in NHSL. This was partly driven by events at the QEUH in Glasgow whereby the time spent in Glasgow for treatment by Lothian paediatric cancer patients was being minimised, with consequently more pressure on Lothian inpatient beds for neutropenic children, and realignment of referral patterns from other health boards. I understand that some paediatric cancer patients from Glasgow were also receiving care in Lothian around that time. It also aligned with the refurbishment already in progress which was installing an updated ventilation strategy for the adult haematology ward at WGH.

Radiology

88. In September 2016, there was an issue in relation to air change rates in CT (Computed Tomography scanner) rooms. The issue related to scanning the heads of neurosurgical patients who were also being treated in intensive care and may have been on ventilators. That poses particular problems and I discussed the best approach with ITU consultants at WGH who were familiar with transferring patients for such scans and scanning while the patient is attached to a mechanical ventilator to allow them to breathe. They described that current practice at the time was that they did use medical gases (sometimes anaesthetic gases) during CT scans. Janette Rae then discussed that with Iain Storrar of HFS

to agree a sensible approach. It was agreed that the air change rates should be increased from 8 ac/hr to 15 ac/hr in CT rooms where that activity would be undertaken **(A34443759 – RE CT Air Change Rates – dated 29 September 2016 – Bundle 13 – Volume 8 – Page 258)**.

Multi-bedded rooms - Pressure Issue

89. In July 2017, an issue arose in relation to bedroom ventilation design in multi bedded rooms throughout the hospital in relation to the pressure of the rooms. In summary, whether you need positive pressure or negative pressure is the difference between trying to create a protective bubble around the patients who are profoundly susceptible to infection (which requires positive pressure); or source isolation where you need to isolate the patients who are highly infectious to keep the organisms that they're shedding from spreading outside their room (which requires balanced but preferably negative pressure between room and corridor). If patients are infectious particularly with pathogens that are spread by an airborne route (such as respiratory viruses) then a positive pressure environment could actively facilitate spread and transmission to other patients, staff and visitors rather than contain it to a room. Multi-bedded bays can be used to cohort patients with the same infection but that is never the first choice. Best practice would be to first isolate patients who have such infections in mechanically ventilated isolation rooms until all such capacity runs out, then single bedrooms would be used until all such capacity runs out and only then consider cohorting patients together in a multi-occupancy room and even then only if there was certainty that they were infected with or recovering from the same pathogen.

90. I was not consulted at the time but have since read the risk assessment dated 5 July 2017 **(A40981178 – Record of General Risk Assessment_ combinedrev300118 – Bundle 6 – Page 14)** assessed by Janice Mackenzie (Project Clinical Director), Dorothy Hanley and Fiona Halcrow, Project Manage**r**. The SBAR sets out that, at that time, the bedroom ventilation design in the multi bedded rooms throughout the hospital did not meet the recommendations of SHTM 03-01 because the design had the multi bedded rooms as being positive pressure. In SHTM 03-01 (2014) Appendix 1 (**A32353809 – SHTM 03-01 Part A**

dated 1 February 2014 – Bundle 1 - Page 2628) the criteria for a general ward is not positive pressure. Clinical areas which should be at positive pressure in Appendix 1 are indicated as +ve or +10 Pascals and general ward areas do not feature as pressurised areas. The design of not being at positive pressure assists with preventing air from leaving the room to corridor and this is beneficial when trying to contain spread of common viral infections encountered in hospital such as norovirus or influenza. It was considered that in order to allow cohorting of patients with the same air-borne infections the multi-bedded rooms required to be balanced or negative pressure to corridor. There were risk assessments carried out for all wards that included multi-occupancy rooms, including critical care. At the time, it was considered by the project team that the multi-occupancy rooms in critical care should have balanced pressure. This was, I believe, based on the agreed design for paediatric critical care ventilation that predated the publication of SHTM 03-01 when the previous ventilation guidance document SHTM 2025 (**A33103351 – SHTM 2025 Part 1 dated 1 June 2001 – Bundle 1 - Page 3208**) was not explicit regarding ventilation parameters for critical care units. However, that design was not in line with SHTM 03-01, which required all rooms in critical care to have 10 pascals positive pressure.

91. As noted, I was not consulted at the time but can try to put the thinking in to context. At the old hospital in Sciennes, there was no mechanical ventilation for most bedspaces. Clinicians and IPCT were familiar with outbreaks of pathogens like the respiratory virus, Respiratory Syncytial Virus (RSV), which causes bronchiolitis, on wards and is very common amongst children admitted to hospital during winter. They were very keen to have a negative pressure cascade so that air flows into the bedroom from the corridor and not from the bedroom into the corridor to help prevent spread of respiratory viruses from room to corridor. That school of thought is completely justifiable and is just a different way of approaching mitigating the risk of spread of respiratory viruses than is set out in SHTM 03-01. However, the pressure cascade is not the only feature of critical care ventilation design that mitigates against spread of infection and it shouldn't be considered without considering the roles of other mitigating measures such as the air change rate, the distance between rooms, positioning of doors and the positioning of air extraction points within rooms which were later considered in our discussions regarding an SHTM 03-01 compliant critical care design in July

2019.

92. The types of clinical activities in critical care are very different to general wards. For example, invasive procedures such as chest drain insertion can be needed in emergencies and, on rare occasions, a room in critical care needs to be on par with, or at least closer to, the parameters for an operating theatre rather than a general ward. That is because occasionally an ITU bed space can of necessity function as an operating theatre if a patient requires immediate surgical intervention and it is not feasible to transfer them to an operating theatre until they are more stable. In my view, that's why you need conditions with air changes and positive pressure, which effectively replicate operating theatre conditions or treatment room conditions. However, as noted, the concern of colleagues coming from Sciennes was a more common scenario of RSV outbreaks which was a legitimate concern but based on having worked for many years in a cramped environment without mechanical supply or extract ventilation.

93. I understand the 4 bedded ventilation risk assessment was reviewed in January 2018 **(A40981178 – Record of General Risk Assessment ventilation_ combinedrev300118 – dated 30 January 2018 – Bundle 6 – Page 14)** but again I did not have any input into that. I discuss below at paragraphs 164 onwards how the decision to have balanced pressure for to multi-bed rooms in critical care was discussed, reviewed and ultimately changed at meetings on 10 & 11 July 2019.

Theatres

94. On 9 January 2019 Jackie Sansbury, NHSL Project Team, emailed me **(A40979123 – Email – FW Theatre Ventilation - Bundle 2 - Page 1394)** attaching an example (for theatre 30) of a commissioning checklist to clarify whether it would serve the purpose of independent validation. It was Jackie Sansbury who had re-initiated this discussion, following up an original discussion initiated by Jackie Sansbury on 23 August 2018 and I had replied with my views on 24 August 2018 **(A41295523 - Email Independent verification of theatres and isolation room ventilation - dated 24 August 2018 – Bundle 13 - Volume 8 - Page 460)**.

95. There was growing concern about the clinical and corporate risks associated with suboptimal ventilation. I was concerned that we had no data regarding whether the ventilation performance in theatres and isolation rooms was acceptable. From my perspective, to avoid HAI risk, theatres and isolation rooms were the priority areas that required independent validation. The need for microbiological assessment of air quality in an operating theatre as part of its commissioning has been best practice for many years and certainly since 2002 when the working party of the Hospital Infection Society issued guidance regarding how and when to do it **(A47150195 – Microbiological Commissioning and Monitoring of operating theatre suites – Hoffman et al – dated 2002 – Bundle 13 - Volume 8 - Page 173)**. It is also covered in SHTM 03-01 (2014) section 8.59-8.155 (**A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1, Pages 2613 to 2624**). My expectation was that a company with experience of building operating theatres in the United Kingdom would be aware of these guidance documents that are essentially describing safety checks of the air quality within the operating theatre being acceptable before using it for surgery. If not followed there would be substantial clinical risk of poorer surgical outcomes. In my view not following this guidance as written should not be an option. My experience has been that the fact there are different methods to performing the microbiological assessment of air quality in a conventional theatre and an ultraclean theatre is not always understood by non microbiologists and there is often a need to be explicitly clear which test to perform in which theatre to avoid unnecessary testing or delayed results. I had some awareness from microbiology colleagues in Glasgow that there had been issues with PPVL isolation room functioning at QEUH identified after the building was opened from e-mails sent around the informal group of IPCDs in 2016 **(A47150212 – Ventilation Query - Teresa Inkster – dated 20 May 2016 – Bundle 13 - Volume 8 - Page 463)** and then a conversation with colleagues in Glasgow and did not want to see that happen at RHCYP DCN.

96. I considered independent validation required to be arranged pre-handover. I would say, roughly, that the issue of independent validation was first raised by Janette Rae in an e-mail to Ashley Hull on 29 December 2016 along with a copy of SHTM 03-01 Part B outlining the expectation (please see paras 125 onwards

below where I discuss the requirements of validation more generally). I was copied in to the e-mail. Janette Rae had discussed this with me. I was next contacted by Jackie Sansbury on 23 August 2018 and replied 24 August 2018 outlining the need for independent validation and the expectation of what would be received. The issue was then raised again in January 2019 with Ronnie Henderson and Jackie Sansbury **(A40979123 - Email FW - Theatre Validation - 10 May 2019 – Bundle 2 – Page 1395)**. At this point in time though it was not possible to deliver independent validation of the operating theatres ventilation performance as the building of the operating theatres had not been completed.

97. Ronnie Henderson advised in his email of 11 January 2019 **(A40980996 – Email chain – RE: Theatre Ventilation, 10 - Bundle 2 - Page 1394)** that MPX would by handover have carried out all the tests and validation required in the SHTM and would record that they had done so. The first half of the e-mail read as though it would not be necessary to arrange such further validation as it was being arranged by Multiplex and IPCT took this at face value. We were being advised that we would be provided with ventilation validation documents that complied with SHTM 03-01 prior to handover and so we understood we would be able to review such information prior to handover to assess HAI risk and complete the Stage 4 HAI Scribe section about ventilation suitability.

98. However, it was announced to NHSL staff on 27th February 2019 that handover had taken place and IPCT had not had any sight of any validation data far less read validation reports. Our understanding was to expect that there would only be minor snagging issues to resolve and if anything more significant arose there would be opportunity for further correction and validation between handover and occupation to assess and correct items of concern. It was a compromise. We had stated several times what we wanted to see was an independent validation report but we were being advised that this would not be the case. My expectation was that such a validation report would be recently written by an independent ventilation engineer such as an authorising engineer for ventilation and be unambiguous, easy to read, detailed (as per SHTM 03-01 section 8.64 **A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1 - Page 2614**) and as such contain data that indicated current performance of the ventilation system serving each operating theatre i.e. provide baseline

measurements of air changes per hour and pressure cascades to be able to compare with future measurements, should the performance of the air handling units deteriorate, and end with, “a clear statement as to whether the ventilation system achieved or did not achieve the required standard” as per SHTM 03-01 section 8.65. It is not a document written by infection control as it is entirely a compliance assessment of the performance of the ventilation engineering against current technical guidance.

99. As far as I can recall, the email discussion did not go any further at this point in time. I do not know if it was continued in Commissioning meetings as I was not invited to them. IPCT were waiting on the validation data we had requested.

100. It is important to note that this period coincides with media coverage of deaths from cryptococcosis at QEUH, possibly linked to ventilation, so we were also awaiting whether further guidance would be issued in relation to this which might influence what we would need to comply with. NSS and HFS interim guidance ‘Managing the Risk of Contamination of Ventilation Systems by Fungi from Bird Droppings v1.0 was issued in March 2019 **(A43168692 – Bird Droppings Guidance V 1.0 – dated March 2019 – Bundle 13 - Volume 8 - Page 468)**. There was also information about preventing cryptococcosis from ventilation systems produced by the Specialised Ventilation for Healthcare Society (SVHSoc) in April 2019 **(A33625562 – SVHSoc Briefing Document on Cryptococcus - dated Feb 2019 – Bundle 13 - Volume 8 - Page 472)**.

101. There was a parallel discussion about how to validate ventilation for an intra-operative MRI scanner and microbiological air sampling in early February (4-11) 2019. Through Sarah Jane Sutherland, I had offered to meet with the Project Team to discuss the role microbiological air sampling as part of theatre commissioning but was advised on 11 February that it wouldn’t be necessary for me to meet **(A47150200 – RE Air testing MRI intra-operative scanning room – dated 11 February 2019 – Bundle 13 - Volume 8 - Page 476)**. There were ongoing discussions about aspects of assessment of air quality and ventilation performance, see **(A47150210 – Ultraclean laminar flow ventilation in DCN new theatres – new RHSC and DCN – dated 15 April 2019 – Bundle 13 – Volume 8 - Page 478)** and **(A47150203 – RE Ultraclean laminar flow**

ventilation in DCN new theatres – new RHSC and DCN – dated 15 April 2019 – Bundle 13 - Volume 8 - Page 483).

102. In relation to the emails from Ronnie Henderson of 10 May 2019 and 13 May 2019 I was being asked my opinion as to whether the Multiplex report for theatre 30 would suffice as the independent validation report for theatre ventilation as the format was quite different to the example I had provided of a theatre validation report issued to NHSL for a recently built operating theatre at St Johns Hospital (**A40980996 – Email from Donald Inverarity to Ian Laurenson et al regarding Theatre Validation at RHSC and DCN – dated 10 May 2019 – Bundle 6 - Page 6)** and **(A40981038 – Email from Kerryann Little to Tracey Gillies acknowledging the response provided on Theatre Validation at RHSC and DCN - dated 13 May 2019 – Bundle 6 - Page 8)** and **(A40988868 – Email from Ronnie Henderson to Donald Inverarity regarding Theatre Validation at RHSC and DCN - dated 13 May 2019 – Bundle 6 - Page 11)**. The reasons I did not consider the Multiplex reports would satisfy the requirements in SHTM 03-01 sections 8.64 and 8.65 **A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1 - Page 2614)** for independent validation of the ventilation systems are as follows:

- Not independent;
- Not in an easy to read format - it was a checklist not a validation report;
- Items marked yes had to be taken on trust - there was no evidence I had access to which verified the statements;
- No Data about theatre air changes rates or pressure cascades;
- Dated October 2018 and significant works had been ongoing in theatre suite since that time so not reflective of current state.
- In the comments it made reference to commissioning certificates as evidence rather than measurements of current performance.
- It wasn't signed so it was unclear whether the theatre was considered to meet "the required standard" or not.

103. My understanding was that the reason sample reports were only sought in May when we had been raising concerns for several months was that many of the

areas with critical ventilation systems e.g. theatres had not finished being built and so could not undergo a validation exercise.

104. I considered that the technical standards required to be met with a wide safety margin because ventilation systems deteriorate over time. AHU life span is considered to be around 20 years so it would need reserve capacity to maintain performance for such a period of time without potentially creating clinical risk of HAI and poor patient outcomes. There is a need to have reserve capacity to overcome filters silting up over time. There is also a need to minimise down time for servicing and maintenance as that creates service disruption and delays access to surgery.

105. As at 15 March 2019, when I first escalated my concerns to Professor Alex McMahon (**A34010959 – Email from Lindsay Guthrie to Annette Rankin regarding a Sunday Herald Article on ventilation issues at QEUH and RHCYP 5 August 2019 – Bundle 5 - Page 30**) and that information we would need to understand potential infection risks and progress with the HAI Scribe process at RHCYP DCN was not available, I had not had sight of any ventilation system validation reports. At this point, my involvement with the Project had only been sporadic and I was only consulted on an ad hoc basis. I hadn't been invited to or attended any commissioning meetings. At around this point in March 2019, we were beginning to have awareness of non-compliant issues but the full nature and scale was not known and so it was not easy to anticipate risk of HAI or other clinical risks. As information began to be shared about the experiences with building systems at QEUH we started to see some potential parallels that could lead to HAI risk if occupied by vulnerable patients with regards to: water contamination with recognised bacterial hazards in some areas; water that was not of a drinkable standard in others; deviations in ventilation and room design in critical ventilation systems, (primarily the PPVL isolation rooms in Lochranza); and the neurosurgical operating theatres.

106. We were also concerned about the future impact a major flood which occurred during the summer of 2018 may have on air quality within the building given the subsequent risk of mould and fungal exposures, particularly given media attention regarding cases of cryptococcal infections (a fungal infection) at QEUH.

Retention of water damaged building materials in walls for example can lead to mould growing behind the walls and release of fungal spore into the environment and so removal of water damaged material and rebuilding of walls was required. These were fully addressed and resolved by the time of occupation but did not appear to be complete when we performed an inspection visit in March 2019.

20 March 2019 – IPCT Walkround

107. There was an IPCT inspection visit or "walkround" with some of the Project Team which took place at the new site on 20 March 2019. There is an email from Ronnie Henderson of 21 March 2019 **(A40988839 - Email from Ronnie Henderson to Donald Inverarity providing a summary of main points of discussion and evidence following a site visit of 20 March 2019 addressing concerns raised by IPC – dated 21 March 2019 – Bundle 5 - Page 44)** reporting on the IPCT walkround. In retrospect, there were probably several purposes to this walkround, one of which was to gather information relevant to completing a Stage 4 HAI Scribe but we were not planning to complete it there and then. I think different people had different expectations as to what it was about. My expectation was that I was there to support the Executive Director of Nursing/HAI lead, Professor Alex McMahon, to see first-hand what issues IPCT had been raising and whether they had been addressed or resolved and gauge what remaining work was required and whether that could compromise the planned date of occupation.

108. Ronnie Henderson's email **(A40988839 - Email from Ronnie Henderson to Donald Inverarity providing a summary of main points of discussion and evidence following a site visit of 20 March 2019 addressing concerns raised by IPC - Bundle 5 - Page 44)**, notes that the following people attended: Janice MacKenzie; Ronnie Henderson; Alex McMahon; Sarah Jane Sutherland; David Gordon (Bouygues); and, me.

109. We visited areas that had been affected by flood damage in summer 2018 to see the extent of the repairs and extent of removal of water damaged building materials. We were able to visit a neurosurgery operating theatre and see the intra-operative MRI room. We were shown in a plant room and shown vermin

control measures to assess their adequacy in response to guidance from HPS about controlling pigeons and their excrement. We visited a PPVL isolation room in Lochranza and were able to see the solution to the lobby ceiling void drip tray ventilation issues that had been a concern during second half of 2018.

110. During the visit we were advised that independent validation of the theatres would be performed once construction was completed. It was confirmed that there were some commissioning and validation reports for theatres and isolation rooms but on the visit it became clear that some of the theatre areas were still building sites and construction was still in progress so it was unclear how the historical reports reflected current performance.

111. We identified and visited a water outlet that had a persisting contamination issue with *Pseudomonas aeruginosa* and for the first time IPCT were able to clarify the purpose of the room which was to be a 4 bedded room in the paediatric respiratory ward. This was a concern as children with chronic lung diseases are particularly prone to developing *P aeruginosa* lung colonisation or infection and there was potential for them to be exposed to and inhale this bacteria if the water contamination issue was not resolved.

112. On visiting the neurosurgery operating theatre, we established that all the neurosurgery theatres had been designed as ultraclean theatres and had installed laminar flow canopies. This was an unconventional design for neurosurgery and raised some concern about whether surgery could be performed in a conventional mode and how both modes would be validated. Many neurosurgical tumour resection procedures last many, many hours and there was perceived risk that brain tissue could be dried out if laminar flow ventilation was used in such operations.

113. Additionally, the neurosurgical theatre had an adjoining MRI room for intra-operative MRI scans and this raised concerns as to how to commission the ventilation in that room and how transfers from the theatre to scanner could take place without compromising the sterile field of the operation. There was nothing written yet in national guidance that covered how to assess air quality for such a new design of operating theatre and we were unable to seek advice from other

health boards as we could not identify another board with an existing intra-operative MRI scanner facility. Discussions about the design and ventilation provision of the facility had predominantly been with members of the neurosurgical team and it may have been that the difficulties that would be encountered in establishing microbiological air quality and safe performance of both the theatre and the MRI scanner in the context of use by a patient with an open skull may not have been anticipated until it had been built. There had been IPCT input in discussions regarding the intra-operative MRI scanner in October 2017 but they were around how the surgical team and radiology team would be segregated and routes they should take to enter and exit the facility and what level of personal protective equipment (scrubs and gowns) the radiology team would need and not about ventilation **(A34443491 – RE Urgent advice required – dated 04 October 2017 – Bundle 13 - Volume 8 - Page 2162)**. The involvement of someone with experience of ventilation in such a setting (Authorising Engineer or Microbiologist) would have been a helpful additional resource to consult but I'm not aware of anything that mandates such involvement.

114. From IPCT perspective, I concluded that the building was not yet sufficiently complete to undertake a Stage 4 HAI Scribe but my understanding was that the building had already been handed over to NHSL.

115. In my view, independent validation of the ventilation system had not been agreed at this point because Multiplex were not independent of the construction process. They may have been able to supply commissioning data but that was unlikely to be unbiased. The Project Team were aware of the type of report we wished to see having been given an example from previous theatre commissioning at St John's Hospital. We wished to see what style of report Multiplex would provide and whether it included any data that would allow us to assess even provisionally whether the theatres were safe to operate in. At this point we had no data regarding the theatre performance with which to do that and were aware that some of the theatres had not been completed, as we had seen that first hand on the walkround, so we were aware that validation reports would be impossible to write as theatre performance can only be assessed once building work is complete. The IPC team were taking their steer from my view at this point.

116. The only document provided by Multiplex had been a checklist about theatre 30, which had no useful data and was dated October 2018. We knew there was still construction work happening in theatres so that document, as well as having no useful data in it, was not contemporary on which to base any judgement of current or future safety.

Settlement Agreement 1 – February 2019

117. I was not aware of Settlement Agreement 1 (SA1) (**A32469163 – Settlement Agreement and Supplemental Agreement relating to the Project Agreement for the provision of RHSC and DCN between Lothian HB and IHS Lothian – 22 February 2019, Bundle 4 - Page 11**) or its contents until after it had been signed. I first found out NHSL had taken possession of the building on 27 February 2019 when an announcement was made to all NHSL staff.

118. I have discussed above that there was a risk assessment in relation to balanced pressure in multi-bed rooms, which included multi-bedded rooms in critical care **(A40981178 – Record of General Risk Assessment ventilation_copmbinedrev300118 – dated 30 January 2018 – Bundle 6 - Page 14)**. I am not aware of IPCT having carried out a formal risk assessment for a derogation to 4ac/hr for multi-occupancy or single rooms in general wards or rooms in critical care prior to SA1 being entered in to. However, in relation to single rooms and multi-occupancy rooms in general ward areas (i.e. not in critical care), if the project team presented to IPCT that these areas were receiving 4 ac/hr mechanical plus 2 ac/hr natural ventilation they would be considered compliant with SHTM 03-01 as it would be 6 ac/hr by mixed mode ventilation in a general ward area and therefore wouldn't need any risk assessment.

119. I have previously reviewed e-mails from Janette Rae that relate to air change rates in general ward areas and I did not find anything in writing to suggest that, as the IPCT representative, she was involved in consenting to such a derogation (see e-mail trail to Tracey Gillies and Alex McMahon sent 9 July 2019) **(A41295517 – Email from Tracey Gillies to Audrey Trotter – request to print out email (6) attachments as relevant to discussion about whether HPS**

and HFS had been involved in the earlier stages of RHCYP – dated 14 August - Bundle 7, Volume 1 - Page 203). There is also an e-mail exchange on 20 January 2017 where she highlights that in HTM 03-01 the required environmental conditions in such a 4 bedded room would be 6 ac/hr **(A47150211 – FW Other matters – dated 20 January 2017 – Bundle 13 - Volume 8 - Page 2165)**. I don't know the mechanism by which the change from 6 ac/hr to 4 ac/hr was approved or who was involved or if it was done before or after the ventilation systems had been installed.

120. In my view, if there was considered a need to derogate from guidance that is considered best practice then consideration should be given as to whether that approach may adversely increase any clinical risk. The risk of the proposed new environmental conditions facilitating the acquisition of an infection through the delivery of healthcare is only one aspect of clinical risk that should be considered along with other considerations about impacts on fire protection, room temperature control etc. Because there would be potential for easier transmission of respiratory viruses with fewer than 6 ac/hr I would have expected some risk assessment by IPCT to be done that would involve understanding the nature of the patient group and their probability of being admitted with respiratory viruses or susceptibility to acquiring respiratory viruses if exposed (and the possible consequences to them of that) and, whether aerosol generating procedures would be undertaken in the room for example.

121. Lindsay Guthrie and I performed a retrospective risk assessment much later in the autumn of 2019 **(A32653315 – SBAR General ventilation IPC risk assessment – dated 29 August 2019 – Bundle 13 - Volume 8 - Page 2169)** with ventilation performance data provided by IOM and assessed the impact the reduced air change rate of 4 ac/hr provided by mechanical ventilation might have on the risk of infection transmission for multi-occupancy rooms and single beds in general wards and outpatient areas. This acknowledged that 4 air changes per hour is substantially higher than the majority of bed spaces within the pre-existing NHSL estate which has natural ventilation provision via windows only from buildings that pre-date 2014 and SHTM 03-01. Therefore, achieving 4 ac/hr was not considered unsafe as it represented improvement compared to ventilation provision at RHSC at Sciennes which had natural ventilation in general wards.

Additionally, at this stage in autumn 2019, IPCT were being advised that in addition to 4 ac/hr mechanical ventilation there would also be an additional 2 ac/hr provided if windows were open in such general ward areas and so meet the 6 ac/hr stipulated in SHTM 03-01 by provision of mixed mode (mechanical and natural) ventilation.

122. We knew that low air changes were a concern for containment of respiratory viruses in the existing RHSC at Sciennes. To perform such a risk assessment, there would need to be knowledge of how the ventilation system performs but also knowledge of what patient group would occupy the area and what range of medical or surgical interventions would be performed. The risk of HAI is not uniform nor solely determined by the room ventilation parameters. Knowledge of what patient groups (and their susceptibility to infection) would be in which areas and which procedures would be being performed was not information that was comprehensively available to IPCT at the time of SA1.

123. We were also aware verbally of other new build healthcare facilities that were open to patients which had 4 ac/hr or less. Under most circumstances, 4 air changes per hour mechanical ventilation in general wards would not likely compromise patient safety and care but it would impact on the risk of infection transmission if someone on the ward was shedding respiratory viruses who was not isolated, be that staff, visitors or patients.

124. It would not be appropriate to have 4 air changes per hour mechanical and 2 air changes per hour natural ventilation instead of the required 10 mechanical air changes per hour in either multi-bed or single bedrooms in critical care as a modern critical care unit should not be designed with opening windows. The critical care unit should be at 10 Pascals positive pressure and opening windows would render it at atmospheric pressure not positive pressure. Health Building Note 04-02 published in 2013 relates to the design of critical care units and it states in section 6.7 that, “ceilings and windows should be sealed.” This is to allow pressurisation of the room. **(A37329307 – Health Building Note 04-02 – Critical Care Units – Department of Health – dated 2013 – Bundle 1 – Page 2853)**.

125. I do not agree that SA1 represented an important missed opportunity to spot and address further issues with non-compliant ventilation before the end of the construction phase. It would represent missed opportunity to detect non-compliant aspects of ventilation design. I understand that the ventilation system had been installed for some time before SA1 was signed so the issue wasn't that the specification was incorrect and not detected, it had progressed from a specification to being installed. Other aspects of construction work for instance in the theatres were not complete by the time of signing SA1 so it would not be possible to fully assess how their ventilation systems performed. Non-compliant and unsuitable ventilation performance is determined once the room being ventilated is completely built and the ventilation system is installed and running. There may have been earlier opportunities to identify that some aspects of the design would become a concern. For instance, that Air Handling Units and supply air ductwork did not have capacity to deliver parameters of ventilation set in SHTM 03-01 but that is an issue of ventilation engineering non-compliance and outwith the remit of IPCT. It was not the case that all ventilation non-conformance with SHTM 03-01 was missed prior to the signing of SA1. For example, Ronnie Henderson had alerted IPCT and HFS in October 2018 to an issue regarding placement of heater batteries in the ceiling void of the lobbies of PPVL isolation rooms in Lochranza ward **(A47150206 – RE Isolation Room Heater Batteries – dated 06 December 2018 – Bundle 13 - Volume 8 - Page 2201)**. This had the potential to cause water pooling beneath them. We were asked for our view regarding the solution that Multiplex proposed of placing water drip trays beneath them, but this concerned us. The infection hazard was that it could create stagnant water within the ceiling void of the isolation room with the risk that immunocompromised children would potentially be at unnecessary risk of breathing aerosols of any environmental bacteria or mould that grew in the stagnant water or that water damage from a drip tray overflowing would form damp areas in the ceiling void with risk of fungal growth and fungal spores being inhaled by vulnerable children defeating the purpose of the ventilation system that was there to provide ultraclean air and minimise risk of inhaled fungal spores. The location of the heater batteries did not conform with SHTM 03-01 as outlined in Ronnie Henderson's initial summary when he escalated the issue **(A47150198 – Issues Relating to location of Heater Batteries – Bundle 13 - Volume 8 - Page 2205)**. Discussions about this matter continued to December

2018 **(A47150207 – RE Isolation Room Heater Batteries – dated 06 December 2018 – Bundle 13 - Volume 8 - Page 2208)** when it was agreed the heater batteries (used in control of the ambient temperature within the bedroom) would not be used but radiant heater panels in the ceiling would be used instead. The installed heater batteries were not being removed though, just made redundant and not used to avoid condensate forming. It was still a non-conforming ventilation system design, but it had been identified and escalated by the project team prior to the signing of SA1.

Commissioning and Validation

126. It is an important point to understand the distinction between and the timing of commissioning and validation. The applicable guidance at the time was SHTM 03-01(2014) Part A **(A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1 - Page 2490)** and section 8 page 114 (**Bundle 1 - Page 2603)** of the guidance deals with the commissioning and validation of specialised ventilation systems. On page 114 Commissioning is defined as follows:

> *"Commissioning - Commissioning is the process of advancing a system from physical completion to an operating condition. It will normally be carried out by specialist commissioning contractors working in conjunction with equipment suppliers. Commissioning will normally be the responsibility of the main or mechanical services contractor."*

127. Validation is defined on page 114 **(Page 2603**) as follows:

> *"A process of proving that the system is fit for purpose and achieves the operating performance originally specified. It will normally be a condition of contract that "The system will be acceptable to the client if at the time of validation it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life."*

Note:

…

It is unlikely that 'in house' staff will possess the knowledge or equipment

necessary to validate critical ventilation systems such as those serving operating suites, pharmacy clean rooms and local exhaust ventilation systems. Validation of these systems should therefore be carried out by a suitably qualified independent Authorised Person appointed by the NHS Board.

It is anticipated that training in the validation of specialised healthcare ventilation systems for independent Authorised Persons will become available during the life of this SHTM."

On page 125 (**Bundle 1 - Page 2614**) the guidance states:

"Ventilation system commissioning/validation report

8.64 Following commissioning and/or validation a full report detailing the findings should be produced. The system will only be acceptable to the client if at the time of validation it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life.

8.65 The report shall conclude with a clear statement as to whether the ventilation system achieved or did not achieve the required standard. A copy of the report should be lodged with the following groups: · the user department; · infection control (where required); · estates and facilities."

128. In line with Guidance, Multiplex undertook the commissioning of the ventilation system, including independent tester sign off by Arcadis. However, the information provided to me did not have the level of detail and assurance I needed to conclude that the system reached the required standard. For me to assess infection risk in an operating theatre, as a minimum, I would need to know:

- the air change rate per hour in the theatre and adjoining rooms. This involves a calculation which is outwith my expertise to perform and requires knowledge of the volume of the room being assessed not just air flow measurements.
- The air pressure in Pascals in the theatre and adjoining rooms

- Information about the airflows. In a conventional theatre there must be turbulent air demonstrated above the surgical site. The direction of air flow must be from the cleanest area to least clean/disposal areas.
- In addition to these ventilation checks I would include a visual inspection to be assured, for example, that there are not avoidable horizontal surfaces for dust to gather, that wall and floor surfaces are intact and sealed to allow cleaning, that air extract grilles are correctly positioned to avoid extraction of air that has only just entered and bypassed the room, that scrub sinks do not splash, that doors close properly to maintain pressure cascades.

Although I was not part of the decision, my understanding is that IOM were appointed by NHSL (with input from HFS) as suitably qualified, independent, Authorised Persons to carry out the validation of the critical and specialised ventilation systems at RHCYP & DCN. They provided the validation reports and it was through those that the issues with the air change rates in critical care were first discovered by NHS Lothian.

IPCT Role in Validation

129. With reference to SHTM 03-01, page 114 para 8.65 (**A32353809 – SHTM 03-01 Part A dated 1 February 2014 – Bundle 1 - Page 2614**) quoted above, my understanding is that the IPCT role is that we only need to be provided with a copy of a self-explanatory validation report that outlines either a fully compliant and "fit for purpose" ventilation system or that there is non-compliance with guidance affecting any particular area of the hospital. IPCT would then seek to understand what patient groups use that area and what interventional procedures may be performed there. IPCT can then assess whether the non-compliance may cause clinical risk for the patients or staff using the area. IPCT will either be content that the facility is suitable or seek to mitigate against any particular HAI risk that might be anticipated.

130. In terms of SHTM 03-01, independent validation should take place before a Stage 4 HAI Scribe as it informs how the question about ventilation being fit for purpose can be answered. This should be done before hand over of the building.

131. The risks of independent validation in terms of SHTM 03-01 not taking place

timeously are: (i) HAI risk from accepting sub optimally performing systems; and (ii) other corporate risks such as financial, reputational and service disruption.

Validation of all critical systems

132. In early 2019, I was not aware that the requirement for independent validation, in terms of SHTM 03-01, applied to all critical systems and not just theatres. The ventilation system training I had and my previous experiences had mainly focussed on assessing infection risk from critical ventilation systems serving operating theatres and isolation rooms and I was aware of the need for annual verification of local exhaust ventilation systems in laboratories. Much of that previous experience and training had been before SHTM 03-01 had been published though in 2014. My understanding of the term “critical ventilation” in healthcare is that it refers to any clinical area that is fully or partially dependent on mechanical supply or extract ventilation (or both) to maintain an optimally safe environment for the delivery of clinical activities such as operating theatres, isolation rooms, endoscopy suites, containment level 3 laboratories for example. The ventilation system is “critical” to the provision of a safe environment. It should not be confused with the term “critical care” (synonymous with “intensive care”) which refers to a clinical area where the patients being managed are critically ill and have a significant probability of dying without complex life-saving interventions. Confusion often arises because all critical care areas are supplied by critical ventilation systems but not all critical ventilation systems deliver air to critical care areas.

133. I agree it is clear in on page 114 of SHTM 03-01 Part A **(A32353809 – Part A 1 February 2014 – Bundle 1 – Page 2603)** that it should apply to all critical systems. From the perspective of preventing HAI, it would be wider than just theatres as it would also involve isolation rooms. It would make sense to independently validate all critical ventilation systems given their fundamental role in providing and maintaining safe clinical environments.

134. Page 114 of SHTM 03-01 indicates that it is the role of the Independent Authorised Person to ensure that the relevant parts of SHTM 03-01 were interpreted correctly and validation was completed in all the required areas. At

the end of the validation process, defined on page 114 of SHTM 03-01 as assessment of "fitness of purpose as a whole," the health board should be assured that the ventilation system is optimally functioning to deliver the safest clinical environment (in terms of parameters such as pressure cascades, air changes, air filtration) that it can and that all measures to mitigate against predictable ventilation related hazards (which would include fire risk as well as possible microbiological hazards) have been taken. To me, that indicates it should be an independent Authorising Engineer for Ventilation to determine compliance with design best practice and engineering parameters, which is ultimately what IOM did. It is not a recognised role of an infection control doctor.

Period following independent validation (July 2019)

135. My first awareness of IOM's test results in the Critical Care unit was it being reported verbally at one of the RHCYP DCN systems update meetings in the run up to the decision whether to occupy the building or not. I certainly had awareness of it on 1 July 2019. I don't recall if it was mentioned at the 4pm ventilation discussion on Friday 28 June 2019 but for most of that day we were only aware of operating theatre ventilation issues.

136. My immediate involvement in the days following the Critical Care air change issues coming to light was explaining the potential patient safety implications in critical care (particularly risk of HAI through respiratory virus transmission) of the IOM performance data to NHSL Executive Directors and Project Team colleagues. On 2 July 2019, I contacted my IPCD colleague Dr Teresa Inkster in NHS Greater Glasgow & Clyde (NHS GG&C) to discuss if there were similarities between what IOM had found at RHCYP DCN and what had been discovered regarding ventilation systems at QEUH. On 4 July 2019, I was asked to attend a meeting to be held on 5 July and chaired by the NHSL Chief Executive, Tim Davison, and attended the meeting on 5 July. I had further e-mail discussion with Dr Inkster on 5 July.

137. On 2 July 2019, I attended a meeting with Tim Davison, Iain Graham, Brian Currie, Tracey Gillies, Lindsay Guthrie, Pota Kalima, Eddie Doyle, Jacquie Campbell, and Fiona Mitchell. The purpose of this meeting was to assess the

Critical Care ventilation issue and possible solutions. This meeting was held at 17:30. At 16:30 IHSL and their contractors had presented calculations relating to 3 options A, B and C to alter the ventilation supply to critical care in order to increase air change rates in some areas. 3 options were presented as follows **(A47150196 – Air change enhancement options – dated 02 July 2019 – Bundle 13 - Volume 8 - Page 2211)**.

138. All of the options involved starving a 4 bedded bay and a single room of their mechanical supply air and re-directing that supply air to the remaining rooms to enhance their air change rates in varying combinations. In option A, four bedded bays were hoped to achieve 5 ac/hr and single rooms were hoped to achieve 7 ac/hr. In option B, more air would be supplied to single rooms which it was hoped would achieve 6 ac/hr and the 4 bedded bays would achieve 4 ac/hr. In option C, the 4 bedded rooms would be given priority for the supply air and it was hoped they would achieve 8 ac/hr while the single rooms would achieve 4 ac/hr.

139. I do not recall in any detail what risks were discussed relative to each course of action but clinical risks to patients, service delivery and business continuity risks and corporate legal risks of accepting the proposals were discussed. I do not recall why the meeting was not minuted. I do not have a record of it. I only have a copy of the options being discussed. Lindsay Guthrie took some handwritten notes at the meeting.

140. I recall the conclusion of the meeting was that HFS were to be consulted for their interpretation of the data and advice. Other UK experts in healthcare ventilation were also mentioned as potential people to contact for advice such as Dr Peter Hoffman at Public Health England, Colindale. No option was decided upon at the meeting. The IHSL calculations were to be checked.

141. My view/input on the options tabled was that none of them were good options and all of them had substantial compromises. They were theoretical, unverified calculations and there was no assurance that they were correct or that rebalancing in this way was achievable. None were compliant with SHTM 03-01 as none of them could achieve 10 ac/hr. All of them involved the ITU losing 5 bed spaces and created compromised rooms which already had ITU equipment

installed. None of them addressed the room pressure issues and none would achieve 10 Pa positive pressure. Logistically it would be difficult to perform the proposed ventilation system rebalancing work in an occupied ITU as it would inevitably disrupt the delivery of care to critically ill children. All 3 options had inequity between bed spaces with regards to supply ventilation provision. In each, only a proportion could meet SHTM 03-01 requirements of a general ward bedspace and several would not but none met criteria for ITU. Bedspaces receiving only 4 ac/hr would, according to Appendix 1 of SHTM 03-01, be similar in ventilation provision to a ward single room toilet which intuitively was just wrong for a bed occupied by the most critically ill children in the hospital.

142. In terms of other discussions I had about this issue on the same day, 2 July 20I9, I had an e-mail discussion with Dr Tracey Gillies regarding Appendix 1 of SHTM 03-01 and recommended air changes for rooms **(A40984693 – Summary of critical care ventilation (Email from Donald Inverarity to Tracey Gillies) - dated 2 July 2019 – Bundle 13 - Volume 8 - Page 2212)**. I updated my microbiologist colleague Dr Pota Kalima regarding IOM data relating to PITU ventilation performance ahead of a ventilation meeting at 16:30 which he would attend with me. I spoke with microbiology colleagues looking for contact details for Dr Peter Hoffman in PHE Colindale. I had regular contact with Lindsay Guthrie through the day as we kept each other updated. I attended the twice daily RHCYP DCN ventilation meetings at 12:00 and 16:30. I had a telephone discussion with Dr Teresa Inkster during the morning and further e-mail contact with her in the early afternoon.

143. I have been referred to an email of 2 July 2019 from Jacquie Campbell summarising discussions from that day (**A35827796 – Email from Jacquie Campbell to Iain Graham et al, summarising the key topics of discussion – dated 2 July 2019 – Bundle 7 - Volume 1 - Page 33**). Jacquie Campbell notes in this email that I advised all the air exchange rates in the new build are nonetheless better than the existing site at RHSC, Sciennes. My understanding of the conditions at Sciennes, as at July 2019, was that very little of the ward areas had mechanical supply ventilation. As it was opened in the 19th century, most areas only had natural ventilation from opening windows. There had been a Healthcare Environment Inspectorate inspection in October 2018 and window

cleanliness had been discussed and it was established that some of the windows didn't open. The room hosting some bedspaces of the high dependency unit in the critical care area had once been a library and still had a mezzanine floor and stairs to it. The haematology/oncology ward was ward 2 and although it had some segregated bedspaces, they didn't all have lobbies and did not have supply ventilation. When we were undertaking preparation work ahead of the first wave of Covid in January 2020 we identified that ward 6 (Surgical Admissions Unit) had some mechanical supply ventilation and single rooms. ITU had 2 switchable pressure rooms for isolation and so did the HDU **(A47172277 – Survey of Isolation Facilities – dated 09 January 2020 – Bundle 13 - Volume 8 - Page 2217)**.

144. Continued occupation of clinical spaces at RHSC, Sciennes was far from ideal architecturally and not aligned to the delivery of 21st century healthcare. Many areas were of a "Nightingale" ward design and there were very few single rooms in which to isolate infectious children. As a result, children with transmissible infections (such as some lung pathogens in Cystic Fibrosis) might be located in single rooms anywhere in the building with an available single room and not necessarily co-located with the nursing skill mix and medical staff with the most expertise of looking after them. Preventing the transmission of respiratory viruses was difficult (although ward design and ventilation was only a component of that) and cohorting of infectious patients happened much more often than we would have liked as the number of patients with the infection exceeded the single room capacity. There were no isolation rooms that met any modern design or performance with regards to ventilation. However, the staff were very familiar with the issues of their wards and hospital and were proficient at working around them such that patient outcomes were optimal. Infection rates for infections where there was mandatory surveillance were very low. The deficiencies of the RHSC site were common knowledge among staff who worked on the site and the senior staff who managed it. It was one of the primary reasons for building a new children's hospital.

145. On 3 July 2019, one of the options being considered was whether the move could go ahead as planned, with the exception of the Intensive Care Unit only. By this time, I, along with Lindsay Guthrie, had been invited to participate in the

discussions at the Incident Management Team/Executive Steering Group as the most senior members of the IPCT to advise the Executive Directors on the potential infection consequences and outcome to patients using the areas in their present configuration and design. The ultimate decision was not ours to make and that rested with the Executive Team members.

146. I was becoming more concerned that proceeding with the move without the Paediatric Intensive Care Unit may not be a feasible or a safe option if there was an open Accident and Emergency department or emergency surgery being performed in operating theatres. These areas have interdependencies as very ill patients in these areas would most likely need to go directly to intensive care and not a ward. It often wouldn't be safe to attempt to transfer unstable patients to other hospital sites and without an operational intensive care unit there may not be easy access to appropriate facilities even to stabilise them prior to transfer for longer term intensive care management.

147. There would there have been an HAI risk to patient safety and care in proceeding with the planned move and carrying out remedial works to the ICU with patients *in situ* in other parts of the building. The delivery of patient care adjacent to building sites is well recognised as leading to Healthcare Associated Infection (HAIs) in both immunocompetent and immunocompromised patients. That is why the HAI Scribe process was developed to try to identify and minimise such risk.

148. The clinical risks in proceeding with the move as planned but without ICU were risks of misalignment of the needs of critically ill children and access to the support they need in the shortest possible time. Managing critically ill patients adjacent to an active building site has many predictable consequences. With regards to HAI, the incidence of ventilator acquired pneumonia would likely increase and potentially due to environmental bacteria. The incidence of intravenous device infections would also be at risk of increasing too along with other invasive device infections in even more crucial locations such as intraventricular devices accessing cerebrospinal fluid etc. It is much harder to maintain a suitably clean environment for delivery of clinical care when there is building work in the vicinity due to dust generation. Dust settling on equipment is a predictable issue which can directly or indirectly lead to higher incidence of

post-operative wound infections. The HAI risks though are perhaps not as great as other potential clinical risks from inadvertent electrical failures or ventilation system failures or compromised access to life saving equipment during emergencies. Additionally, at this point in time, it was highly likely that the hospital would not initially have all its operating theatres functional – surgical capacity in a major incident with paediatric trauma casualties or adult head injuries would potentially be compromised. Critical care nursing and medicine are not universally held skills and visibility and co-location of such patients with skilled teams is critical to their welfare and optimal outcomes. Likewise, the equipment required to look after them is highly specialised and would be unlikely to be located elsewhere in the building.

149. In my view, keeping the existing RHSC site in full operation was the safest option until rectification works at RHCYP DCN could be planned, implemented, completed and checked. Moving paediatric A&E across without an ICU risked adverse outcomes and had, at that point, lots of unknown risks and unknown consequences. There was a very stark reality that delayed or impeded access to intensive care might result in children dying. Trying to rectify the intensive care ventilation system while using the area as an active intensive care unit had some predictable risks, unknown consequences and would be logistically very difficult to arrange and run and would take much longer to complete than if the unit was unoccupied. Reversing the move and continuing to keep services delivered from the RHSC site was not ideal, as many areas were wound down, packed and ready to move but the clinical and HAI risks at RHSC were known and known to be manageable and staff were familiar with it. It was the safest option available at that time in my view. This personal view was made based on information and discussions I was privy to during the weeks leading up to the decision not to occupy. My views about the move and my interpretation of potential future HAI risk had been requested by Professor Alex McMahon during June 2019 and shared with other Executive Directors, IPCT and Project Team for consideration, see **(A47172502 – HAI SCRIBE RHCYP Risks and Mitigations – dated 17 June 2019 – Bundle 13 - Volume 8 - Page 2218)**. As more information became available, my views were still being requested by the NHSL Executive Directors to inform the Chief Executive, see **(A40984626 – RE Summary email or critical care ventilation – dated 01 July 2019 – Bundle 13 - Volume 8 - Page 2223)**

and **(A47172339 – RE question – dated 08 July 2019 – Bundle 13 - Volume 8 - Page 2108)**. Throughout the week prior to the decision not to occupy RHCYP DCN being taken, my views were being taken into consideration when requested at daily update meetings with the Executive Directors, Chief Executive and Project Team and in the weeks following regarding interpretation of HAI risk and corrective actions required to resolve the issues that were being identified **(A40988883 – RE Summary email or critical care ventilation – dated 01 July 2019 – Bundle 13 - Volume 8 - Page 2376)**.

150. It is important to recognise that IPCT were very keen to have DCN moved off the WGH site to Little France as soon as it was safe to do so. Since February 2019, NHSL was trying to resolve issues of *Pseudomonas aeruginosa* water contamination that was manifesting throughout the DCN building. Additionally, since June 2019 NHSL had discovered *P aeruginosa* water contamination issues in the WGH adult Intensive Care Unit which were also proving hard to resolve. If DCN services moved to the Little France site it would be a safer area for the neurosurgical patients to be managed than WGH DCN and the number of WGH ICU beds was due to be reduced (as the majority of WGH ICU patients were neurosurgical and their ICU support would follow them to be provided at the RIE adult ICU). This would have reduced patient numbers in WGH ICU as we were concerned about the risk from water contamination to them and by having fewer patients it would have facilitated access for the estates team to more comprehensively address the microbiological hazard by replacing the affected plumbing that was inaccessible without structural disruption to areas that were in use such as penetrating behind walls.

151. By not moving DCN we had ongoing legitimate concerns about the safety of neurosurgical patients. Some had developed post operative ventriculitis (which is a difficult to treat infection of the ventricles within the brain which invariably requires difficult to administer intrathecal antibiotics and revision surgeries to remove infected cerebrospinal fluid shunts with the risk of worsening hydrocephalus and deterioration in neurological function). We desperately wanted to decommission the DCN building at WGH to stop the risk of *Pseudomonas aeruginosa* exposures and post operative infections there. In the first week of July 2019 though a move of DCN from the WGH campus was not

feasible as we did not yet have confidence that the newly completed neurosurgical operative theatres were functioning optimally and we did not yet know if there was *Pseudomonas aeruginosa* contamination of water within the new neurosurgical wards. The new adult DCN wards and operating theatres were not dependent on the paediatric ITU being operational so there were discussions at the Executive Steering Group about the feasibility of phased migration of services with DCN being one of the first to move across and I was part of those discussions as a member of the Executive Steering Group.

Communication with NHS GG&C

152. I have been referred to an email dated 5 July 2019 from me to NHSL colleagues regarding contact from Teresa Inkster at NHS GG&C **(A40986380 – FW – QEUH building related HAI issues from GG&C ICD perspective – dated 05 July 2019 – Bundle 13 – Volume 8 – Page 2226).** Dr Inkster and I had trained together in microbiology at the same time in Glasgow. She was based at the Western Infirmary and I was based at Glasgow Royal Infirmary and we would meet at training events. We became consultants within a couple of years of each other. When I worked in NHS Lanarkshire there was a service level agreement with NHS GG&C and several microbiology tests performed on NHS Lanarkshire patients were tested in NHS GG&C and occasionally I would be discussing results with GG&C consultants like Dr Inkster. Contact was intermittent and remained so when I moved to NHSL.

153. At that time there was an informal ‘network’ of the IPCDs in Scotland such that we had each other’s e-mail contact details and it wasn’t too unusual for an IPCD in one health board to contact IPCDs in other boards to check if an issue they were experiencing was being experienced in other boards and compare ways of dealing with the same problem. Dr Inkster and Dr Christine Peters at NHS GG&C had used this route themselves to ask questions of the Scottish IPCDs regarding isolation room design and performance and suitability for High Consequence Infectious Disease (HCID) infections in 2016. Face to face contact sometimes would happen at national events run by Scottish Antimicrobial Prescribing Group or SMVN. I had met Dr Inkster earlier in London at the HIS Spring Meeting in May 2019 which was devoted to discussing *Pseudomonas aeruginosa* in

healthcare water and we naturally discussed issues she had been experiencing with water quality in QEUH as at the time these issues were only beginning to emerge in the public domain.

154. I don't recall having any further direct contact until July 2019 although some details of the HAI problems at QEUH were emerging via the media, word of mouth and some information from HPS. By then I was aware that QEUH and RHCYP DCN were both built by the same company and Dr Inkster had acquired substantial awareness of HAIs which might be linked to design of some of the QEUH building systems. Because patient safety was potentially at stake if RHCYP DCN was occupied it was natural to contact her to gain awareness of where she had identified non-conformance that might lead to HAI risk in QEUH to be able to quickly check if we had any of the same design issues in RHCYP DCN, while there was opportunity to intervene and protect patients. The opportunity was because the RHCYP DCN building had not been occupied yet with patients. The information we received about HAI risks and building system non-conformance coming from Glasgow was exceedingly valuable and helpful in targeting our actions when time was short but it is not my view that issues at RHCYP DCN would not have been detected or unaddressed without it. IOM were already detecting multiple areas of concern with the critical and non critical ventilation systems and Westfield Caledonian and Callidus had already begun to identify areas of risk within the water system. The decision to delay the occupation of RHCYP DCN was being informed by provisional data from these sources as well as information about the possible consequences that were being experienced at QEUH in Glasgow.

155. The process of sharing experiences as described above was open to all IPCDs in Scotland and not just between Dr Inkster and myself. Following some e-mail exchange and a telephone conversation together on 2 and 3 July 2019 there was further communication between us on 5 July that I recall specifically was about RHCYP DCN. It wasn't an ongoing discussion. It didn't need to be as following the discussions we had on 2, 3 and 5 July 2019 all the key issues had been communicated. I had further contact with Dr Inkster by e-mail in October 2019 about a decontamination issue that had occurred in NHS GG&C that was unrelated to either QEUH or RHCYP DCN.

156. It was extremely useful to have that shared insight into what technology or design was being considered problematic at QEUH and which HAI risks might arise from them. Much of it was not relevant to RHCYP DCN but some of it was crucial. Without that direct contact with Dr Inkster, I would have had no awareness of these issues as it was not information accessible in the public or professional domain. It facilitated being able to quickly distinguish between what issues could be considered hypothetical risks for HAI and what in her experience were genuine areas to be concerned about that would need rectification. Such information wasn't being volunteered by any other agency we had contact with at the time in as much detail or microbiological insight.

157. The information from Dr Inkster was shared by me with members of the Executive Steering Group who had a particular remit for addressing water system and ventilation system issues. Her insights into the HAI risk from thermal wheels in ventilation systems for heat recovery heavily influenced discussions about the RHCYP DCN operating theatres. We identified there were thermal wheels installed in some critical ventilation systems where we wanted a zero tolerance approach towards the mixing of clean air and fouled air. In the revised designs I think plate heat exchangers were installed which did not have the same potential of air streams mixing.

158. Dr Inkster's positive experience of the Markwik 21 design of tap along with our own experiences of controlling *Pseudomonas aeruginosa* at WGH and the experiences of colleagues in Birmingham resulted in us adopting that tap design in the areas where we detected *P aeruginosa* in the augmented care areas of the RHCYP DCN water system. We were able to quickly establish that there were no chilled beams for comfort cooling installed in RHCYP DCN. Her suggestions to contact HFS and Dr Peter Hoffmann at Public Health England Colindale (PHE Colindale) for help were being actively followed up. Guidance about thermal wheels and chilled beams now features in the 2022 revision of SHTM 03-01 and Dr Inkster has published papers regarding designing bone marrow transplant units and intensive care units based on her experiences.

159. I have been referred to an email from me to Tracey Gillies on 5 July 2019

(**A40986421 – Email from Donald Inverarity to Tracey Gillies et al advising Tracey's note on the shortfall in the standard of air changes in the paediatric critical care ares looks measured and addresses the points covered – dated 5 July – Bundle 7 - Volume 1 – Page 125)** commenting on a draft internal briefing prepared by Tracey Gillies. The intended recipient of the final internal briefing was the NHSL Chief Executive, Tim Davison. It is noted that IPCT staff did not believe safe patient care could be provided even with an interim solution, which was reflective of my view. IPCT considered that an interim solution would compromise patient safety and care because there was still risk that transmission of air borne pathogens could occur and not be controlled by the ventilation, e.g. measles, influenza, chickenpox, drug resistant pulmonary tuberculosis along with the other clinical and HAI risks that I have outlined earlier in this statement.

160. The interim solution would still not conform with SHTM 03-01 and be considered non-compliant. There was uncertainty as to when or how interim work could be completed. Once an ICU is occupied and running it is very difficult to safely perform the kind of invasive rectification works that would be required without risk to patient outcomes and HAI from excessive dust generation or excessive noise generation or excessive vibration. There were also interdependencies between sub-optimally functioning systems to consider. For instance, A&E could not open as a trauma centre without a functioning ICU and functioning operating theatres and at this stage we were aware none of the operating theatres were functioning correctly when first assessed by IOM and neither was critical care ventilation. At best, NHSL hoped that four of the operating theatres might be functional by 9 July 2019. If the interim solution was implemented there would be very little resilience if an AHU failed or required maintenance or if a mass casualty trauma major incident occurred particularly if it involved children. There would likely be unintended impacts on paediatric hospitals elsewhere in Scotland if planned capacity had to be reduced at RHCYP DCN and risk Lothian patients being managed in other health boards which is added stress and inconvenience to parents at a very traumatic time if their child is critically ill.

Decision to Delay

161. I have been referred to an email from me to Tracey Gillies and Alex McMahon on 09 July 2019 (**A41295517 – Email from Tracey Gillies to Audrey Trotter – request to print out email (6) attachments as relevant to discussion about whether HPS and HFS had been involved in the earlier stages of RHCYP – dated 14 August - Bundle 7 - Volume 1 – Page 203)** in which I make reference to IPCT advising the project team of the need for theatre validation since December 2016 (with supporting emails attached). The December 2016 communication I'm referring to **(A41263314 – Email Theatres new build – dated 29 December 2016 – Bundle 13 – Volume 8 – Page 499)** was with Ashley Hull who was part of the Project Team. There was further communication with Ashley Hull in May 2019 about microbiological assessment of air quality in operating theatres, see **(A47172271 – Theatres Air sampling – dated 24 May 2019 – Bundle 13 – Volume 8 – Page 548)** and **(A47172352 – RE Air Sampling Theatres – dated 16 June 2019 – Bundle 13 – Volume 8 – Page 551)**.

162. In the same email, I also refer to communication in 2018. This relates to the communication with Jackie Sansbury in August 2018 discussed and January 2019, discussed above at paras 93 and 95 above.

163. I also make reference to Janette Rae's advice to install air handling units in isolation rooms on a 1:1 ratio which is discussed in detail at paragraph 76 above. When we undertook the remedial works, we ensured that the clinical team was involved for the following reasons:

i. My role is primarily to explain and anticipate HAI risk but this plan risked the provision of safe care to neutropenic patients predictably for periods of AHU maintenance or filter change or for an undefined time instantly in the event of AHU failure. The implications of provision of service continuity and contingency planning are not my remit for any other service other than some aspects of the running of the microbiology laboratories.

ii. My experience of working with haematology teams was that they are very dedicated to their patients and very knowledgeable regarding the possible impacts of environment on neutropenic patients and will often default to being

risk averse. This proposed plan had substantial future clinical risk so I was seeking assurance that the clinicians (who would eventually be running their service from that ward and were key stakeholders) were aware of the implications of the design to their service continuity and potentially patient outcomes.

164. Communicating effectively with colleagues and working collaboratively with colleagues are professional standards required of doctors by the General Medical Council. The awareness of potential clinical risk from a building to paediatric haematology patients, given the media coverage of events relating to QEUH in Glasgow was substantial for both staff and the public. Colleagues working in paediatric haematology therefore were keen to be involved in plans for Lochranza to ensure it was as safe as possible and also to be able to field questions from their patients. Referral and admission patterns for their specialty had also been changing too since the original design stage and there was a will to keep abreast of that in what would be provided going forward. It's not that there hadn't been effective engagement with the clinical teams in the design stage in the past, it was about ensuring what was installed in a revised design met current and not historical requirements as the landscape with regards to what was being considered as safe paediatric haematology service provision in Scotland was changing significantly and quickly over 2018 and 2019 and was, in part, due to events relating to QEUH.

Meeting on 10 and 11 July 2019

165. On 10 and 11 July 2019, I attended a meeting with Critical Care clinicians, IPC Nurses, microbiologists, and members of the Project Team to discuss the Critical Care ventilation issue (**A40988924 – Summary of RHCYP Critical Care Ventilation discussions – dated 10 and 11 July 2019 – Bundle 13 – Volume 8 – Page 554)**. At this meeting, it is noted that previously a decision had been made in relation to the 4 bedded areas to allow patients with the same air-borne infection to be cohorted and following consultation with the clinical team and IPCT representatives at the time the decision was made that these areas should have air pressure which was balanced or slightly negative to the neighbouring spaces, see **(A40981178 – Record of General Risk Assessment**

ventilation_combinedrev300118 – Bundle 6 – Page 14). The SHTM 03-01 states that critical care areas should have 10 air changes and 10PA (positive pressure) and I understand that recommendation to apply to both 4 bedded areas and single rooms in the critical care department. As noted at paragraph 90 above, I had no involvement in that earlier decision but can further explain the possible reasoning behind it and the reason to change from it.

166. It should be understood that a paediatric intensive care unit is not the same as an adult intensive care unit. Children are not just small adults when ill. From an intensive care perspective, it is more difficult to insert life saving devices as they are much smaller, dosing of drugs is more complicated based on weight, they are much less able to communicate what is wrong with them, they deteriorate much quicker than adults physiologically, when septic for instance, and are less able to regulate body temperature. This is why HBN 04-02 notes a different criteria for bedspaces in a paediatric ICU than an adult ICU as in a paediatric ICU the bedspace temperature control must be controllable locally at the bedspace, as ill children require a higher ambient room temperature than adults as they lose body heat more readily due to their smaller size (HBN 04-02 section 4.9). The case mix of patients in a paediatric ICU has a higher proportion of children with congenital diseases, many of whom are there because they require long term mechanical ventilators to breathe and have tracheostomies so may be more susceptible to micro-organisms in water when exposed to water for personal hygiene, and more susceptible to airborne respiratory viruses if exposed as their lungs may not be physiologically normal. They may also have impaired immunological systems and be less able to fight off infections. They also require much more hands on care by staff and parents for airway positioning in cots or beds and personal hygiene with greater risk of transmission of micro-organisms by hands. Devices are more commonly dislodged in infants through unpredictable movement or contaminated by sucking them or soiling them. Additionally, they are also more likely to be asymptomatic carriers of bacteria (*such as Streptococcus pneumoniae* or *Streptococcus pyogenes/* Group A Strep) or viruses (such as RSV or SARS CoV2) in their throats which can be highly transmissible in an ICU. As such, optimising ventilation system dependent control measures to prevent micro-organisms spread by a droplet or airborne route is very important in a paediatric intensive care unit, particularly for the winter

months when the presence of these microbiological and virological hazards in the ICU environment is common and predictable.

167. Maintaining good quality water is also very important. From the perspective of intensive care bedspaces, all bedspaces should be considered as the same with regards to being able to mitigate or minimise these risks. For many diverse clinical and operational reasons, patients may move bedspaces often during their admission and it makes no sense to have some bedspaces perform better than others as that would mean some areas in the unit were effectively safer than others. I would be wary of singling out one dimension of the intensive care environment (for instance the ventilation system) and focussing on one dimension of that (for instance, the air change rate or the room pressure). There are many other aspects of a ventilation system that influence whether there is an optimal environment for vulnerable patients and trying to focus on the risk or benefit of any single aspect is likely misleading as they interplay with each other in a live ward and with other non ventilation parameters. For example, the position of air extraction grilles and rate of air extraction within a room may influence the pressure in the room and the probability that airborne microbiological hazards remain in the room for long. Spread of microbiological hazards is influenced by simultaneous dilution with wholesome air being pumped in and removal by mechanical extraction before they have a chance to leave the room by an open door. Closing doors reduces risk of suspended droplets leaving the room. Gravity will pull most air suspended droplets to the floors or horizontal surfaces before they travel any great distance so having distances between doors of rooms at much greater than two metres assists the removal of any droplets that escape into a corridor by gravity before they can enter another room. Having air extraction grilles within corridors also assists that process of removing anything that may have escaped a room before it enters another room (assuming that somehow it could also overcome the 10 Pascal pressure gradient pushing it back into the corridor at the doorway).

168. I have explained in paragraph 123 that windows shouldn’t be openable in a pressurised ward area (such as intensive care) as it removes the pressurisation and that an intensive care environment benefits from being positive pressure in paragraph 92 to replicate conditions in a treatment room or operating theatre. If

there are no opening windows, apart from some small amounts of air leaving through doors, the bulk of the air needs to leave through mechanical extraction and replacement with fresh/wholesome newly delivered air which is a process of dilution for any microbiological or virological hazard in the air. If the air change rates are low and the ICU is filling up with admissions of children with complications of RSV infection (for example during periods of high community prevalence) and those children in ICU are excreting virus into the air through breathing and aerosols being generated by high flow oxygen delivery for example, it won't take long before there is increasingly higher probability of being exposed to RSV in the air as a non-infected patient or staff member than if the air change rate had been higher.

169. It is preferable to manage or cohort patients with respiratory viruses in a room at balanced or slight negative pressure (see Specialised Ventilation for Healthcare Society Guidance on the Considerations for the ventilation aspects of healthcare facilities for coronavirus from 2020) but it is feasible to be able to cohort patients with respiratory viruses in a room together that is pressurised to 10 Pascals but that hinges on other factors too such as a high air change rate, the distances between bedspaces being much greater than two metres, having air extraction points within the room and a high extraction rate, preferably near to where the patient's head will be at each bedspace where most contaminated aerosols will be generated, having doors shut, having distances of over two metres between rooms, having air extraction points in the corridors and ensuring staff are using respiratory protective equipment optimally. This was all demonstrated in intensive care units during the first wave of the Covid 19 pandemic but was all perhaps more theoretical in early 2019 and would not have been widely appreciated when the original Paediatric Intensive Care Unit (PICU) design was being discussed and agreed in 2013/2014. It is covered in documents produced by the Specialised Ventilation for Healthcare Society (SVHSoc) in early 2020. See **(A47172280 – Specialised Ventilation for Healthcare – dated 27 April 2020 – Bundle 13 – Volume 8 – Page 557) and (A47172257 – Updated Briefing and Guidance on Considerations for the Ventilation Aspects of Healthcare Facilities for Coronavirus – dated 24 March 2020 – Bundle 13 – Volume 8 – Page 575).** The positive pressure environment as explained in paragraph 92 is, I believe, to minimise risk of post procedure infection when invasive devices are

being placed or any surgical procedures performed in the ITU at the bedspace. The optimal environmental conditions needed to minimise risk of post procedure infection (positive pressure) and the optimal conditions needed to minimise spread of respiratory viruses leaving the room (balanced or negative pressure) need somehow to be reconciled in the same multipurpose intensive care bedspace. SHTM 03-01 approaches this in my view by advocating positive pressure at 10 Pascals but with a higher air change rate than a general ward at 10 ac/hr.

170. My contribution to the meeting on 10 and 11 July 2019 was that I was there with members of the Project Team to answer the critical care teams' concerns about the findings of the IOM discoveries about the performance of the PICU ventilation and to discuss the need to enhance the ventilation to align it as much as possible with what was set out in SHTM 03-01. I was also there to discuss what a new design might look like and address concerns that critical care colleagues had regarding that with regards to the ability to prevent transmission of infection but particularly Respiratory Syncytial Virus (RSV). RSV is a respiratory virus and is very common in children under five years old during winter months and creates predictable pressure on capacity to isolate infected children to prevent transmission in hospital. It also causes the condition bronchiolitis which can cause respiratory failure by itself or exacerbate chronic lung diseases in children (such as asthma) leading to acute respiratory failure and hypoxia needing high amounts of oxygen and sometimes intubation and management on a ventilator in intensive care. At times of peak community prevalence of RSV, paediatric ITU will often be managing several children each day with RSV related respiratory failure and with a high number of infected children in the unit, the risk of onward transmission to unaffected children co-located there with other needs for intensive care management increases. If capacity to segregate infected from non infected patients is exceeded, then cohorting of the RSV infected children together in the same area is the usual next step.

171. The outcome of the discussions by end of 11 July 2019 was that there was agreement by all involved (IPCT, Project Team and Paediatric ITU team) to move to an SHTM 03-01 compliant design for PITU and concerns that this might facilitate transmission of respiratory viruses had been explored and addressed

and the features of a compliant design that would mitigate against that had been understood by all involved. Simultaneous to these discussions on 10 and 11 July 2019 in Edinburgh I had contacted NHSL colleagues in infection control (Lindsay Guthrie and Sarah Jane Sutherland) and microbiology (Dr Jennifer Poyner and Dr Michelle Etherson) who were attending the Health Protection Agency and Hospital Infection Society, Engineering Aspects of Infection Control Course at Eastwood Park, Falfield with the very questions and concerns being raised by the intensive care staff and me about infection risk from either a positive pressure ICU bedspace or a balanced or negative bedspace to have them raised with and discussed with national experts in healthcare ventilation (Peter Hoffman particularly from PHE). Their response on 11 July 2019 by e-mail was reassuring that the conclusion we had come to was not considered wrong.

172. Janice MacKenzie communicated the outcomes of these meetings on 12 July 2019 to IPCT, microbiology, project team and PICU stakeholders indicating that the conclusions would be fed back to HFS **(A47172712 – Critical Care Ventilation – dated 12 July 2019 - Bundle 13 - Volume 8 - Page 586)**. There had been discussion at the RHCYP DCN IMT meeting at 4pm on 11 July 2019 about the critical care ventilation and the decision to start to design an STMH 03-01 compliant unit with 10 ac/hr and 10 Pascals positive pressure so the NHSL Executive Directors and other IMT members were aware of this progress on 11 July 2019, see (**A47172285 – SHTM 03-01 Critical care – dated 11 July 2019 – Bundle 13 - Volume 8 - Page 591)** and **(A47172483 – FW SHTM 03-01 Critical care – dated 11 July 2019 – Bundle 13 - Volume 8 - Page 593).**

173. I considered compliance with SHTM 03-01 to be a necessary part of the remedial design. Had I been involved in the original design discussions and been made aware that the designers and contractors intended to build a critical care unit that did not conform to guidance, I would have raised compliance with extant guidance as an issue. However, it is my understanding that the initial critical care design stage was undertaken and a final plan reached with the clinical team, infection control and microbiology stakeholders when SHTM 2025 was the extant guidance for ventilation systems and it does not include any parameters in terms of air changes or pressure cascades for ventilation in a critical care unit. The final agreement about the design was just around the time when SHTM 03-01 was

released.

174. I have been referred to an email dated 11 July 2019 from Janice Mackenzie circulated of which I was one recipient **(A41263402 – Email from Janice MacKenzie to Brian Currie et al which provides an update from tow meetings with the Critical Care Clinician Team with Donald and other colleagues from the IPCT – dated 11 July 2019 – Bundle 7, Volume 1 – Page 316)**. I consider that satisfying the requirements of SHTM 03-01 would provide a safe ventilation design.

175. Even if there was a fully compliant ventilation system in the critical care unit, there would still have been remedial issues such as the rebalancing of the theatres to address. 'Rebalancing' of the operating theatre ventilation is a term that might be better explained by a ventilation engineer that performs it, but my rudimentary understanding is that it is a fine-tuning process of optimisation of supply and extract ventilation delivery, pressure cascades and airflows to optimise the safety of the clinical environment (such as an operating theatre) from a ventilation perspective. Opening could either have been done with patients *in situ* (which in my view would not be the preferred option); or there could have been a shorter delay to the planned opening of the hospital in order to rebalance the theatres. It is important though to understand that the opening of a hospital very much depends on the interdependencies between departments and streamlined migration of patients and staff, as I explain in more detail below.

176. I have been asked to comment on an email of Tracey Gillies, Medical Director, dated 5 July 2019 which I reviewed **(A40986421 – Email from Donald Inverarity to Tracey Gillies et al advising Tracey's note on the shortfall in the standard of air changes in paediatric critical care ares looks measured and addresses the points covered – dated 5 July 2019 – Bundle 7, Volume 1 – Page 125)**. Here, Tracey Gillies is referring to the process of rebalancing theatres in her bullet point "Ventilation in 10 theatres, a detailed technical assurance matrix of measurements of the ventilation has been requested for each theatre. In the light of the issues identified by IOM, engineers have been working to rectify these issues and provide the level of assurance required that each theatre is delivering against the design parameters" The process of

rebalancing of theatres had begun prior to 5 July 2019. It had been discussed with the Project Team and with Executive Directors during that week. There had been a consensus view taken that if four theatres could be rebalanced and optimised then it might be possible to safely run essential emergency surgical services from RHCYP DCN. If I recall correctly by 5 July 2019 four theatres had been made operational.

177. It looked feasible to open the DCN parts of the building with minimal delay because there was not an inter-dependency with the PICU. Adult neurosurgical and neurological patients requiring ICU were always planned to go to the adult ICU in RIE, the neuro imaging suite did not have any issues that would have prevented occupation and it looked feasible that neurosurgical theatres could be rebalanced, independently validated and ready for use in a fairly short time scale. There appeared to be minimal work required on water outlets with raised TVCs or *P aeruginosa* and localised water risk mitigation measures could have been employed. Not being able to occupy DCN, when the Health Secretary's announcement was made on 5 July 2019 that none of the building was to be occupied until all building systems had been independently verified and partial occupation was not possible, was a significant blow as the existing facilities on WGH site were deteriorating and there were significant issues with water contamination in WGH DCN and WGH ITU and the decision to delay DCN occupation meant services had to continue in a very compromised environment with real risk of post-operative HAIs. Even being able to open the neuro-imaging suite would have helped mitigate other non-infection risks being experienced by NHSL.

178. Partial occupation was not a decision being made without due consideration as it creates a new set of clinical risks such as access to support from other services in an emergency such as cardiac arrest, staff access to food and staff wellbeing, whether staffing levels are sufficient if services are split across two sites, risks of patients inadvertently being injured if building work is in progress. There are always IPCT concerns about delivering care near an active building site because of dust that is generated and inhalation of fungal spores. There are more hazards than would normally be expected in a clinical environment and so it becomes more of a challenge to keep patients and staff safe but it is not uncommon in the

NHS to need to continue to deliver care in areas near refurbishment activities.

179. Likewise, there was far less assessment and corrective work required to have areas operational for Child and Adolescent Mental Health Services (CAMHS) to run from as CAMHS areas do not require critical ventilation systems and this could have been considered as part of a phased occupation before the more acute paediatric services could occupy. There would still be the same potential new issues of access to help in a clinical emergency, staffing levels, staff welfare and risk of injury if a building site area was accessed by mistake.

180. The risk profile changed over the course of the week before 9 July 2019, as more information emerged from the work IOM was doing to identify ventilation issues and the work engineers were doing to resolve the issues simultaneously. Firstly, all healthcare buildings will potentially compromise patient safety and care in the wrong set of circumstances and that needs to be acknowledged. I was concerned that there were also non-conformances with all the operating theatres. That had been identified by IOM before the issue with PICU ventilation. However, IOM along with other ventilation engineers had been working tirelessly to correct and rebalance some theatres.

181. If the hospital had opened on 9 July 2019, it would have done so with reduced surgical capacity as only a proportion of operating theatres would have been functional. The ESG was hoping at best to have 4 functional operating theatres by 9 July 2019. There were many other “snagging issues” that needed addressed and although perhaps no single issue from them was a show-stopper, in combination it would have been hard to provide an optimal service to paediatric patients and their parents. That may not have translated into harm but would certainly have been inconvenient. I can only really speak to whether there may have been harm from hospital acquired infection but the potential harms that can happen when there is building work or repair work happening on a ward are wider than just infection risk. Many areas were fit for opening but often had interdependencies with areas which were not. The issue with non functioning theatres was predominantly affecting paediatric surgery but also affected adult neurosurgery. Neurosurgery has an absolute requirement for ready access to an emergency operating theatre to intervene for some conditions such as rising

intracranial pressure after trauma or bleeding where delay may be fatal or spinal decompression where delay may lead to permanent paralysis.

182. However, many of the issues that might have compromised patient safety were not infection issues. Staffing was being discussed at ESG as a major issue as the specialist paediatric teams were just not large enough to sustain working across two sites for very long. It became clear that all paediatric inpatient services would need to either come across to RHCYP DCN at Little France or stay at RHSC Sciennes because of that.

183. ESG were concerned regarding the resilience of what had been delivered. For instance, in Lochranza, there was capacity to manage neutropenic patients safely in what was provided but only for a maximum of 5 patients at a time in the PPVL rooms. With events in NHS GG&C paediatric haematology and cancer services where there had been a move of the childrens' haematology/oncology ward to the adult hospital, reports of excessive blood stream infections from Gram negative bacteria that might relate to water quality at QEUH campus, deaths from cryptococcosis that were suspected as having a link to ventilation systems and plant room cleanliness at QEUH campus, there were unintended impacts on NHSL and concerns were emerging that the number of bedspaces suitable for patients now requiring protective isolation for neutropenic management might be outstripped by demand due to NHSL providing some mutual aid and caring for paediatric cancer patients from Glasgow These events in Glasgow were changing awareness of clinical risk from attending paediatric services throughout Scotland by patients, their families and staff. Public opinion was clear that it would not accept a ventilation system as suitable in a new hospital that had been designed and installed in ways that had clear deviation from current guidance as that guidance was to be considered safe and anything else was viewed as unsafe by the media.

184. As an IPCT, we were concerned regarding where we could safely manage a child presenting with a High Consequence Infectious Disease (HCID), particularly one that was airborne. This was prior to the emergence of SARSCoV2 and Covid 19 in China and more focused on patients potentially having Middle Eastern Respiratory Syndrome (MERS) or Ebola virus as there had been a large Ebola

outbreak in West Africa and colleagues in NHS Lanarkshire and NHS GG&C had had to initially manage a complex case of Ebola infection in an adult. The facilities that we were dealing with in July 2019 at RHCYP DCN did not assure us that these diseases could be optimally contained for long on the site. There were no negative pressure isolation rooms for instance. This didn't necessarily make the hospital unsafe such that it shouldn't open, just unprepared and lacking resilience in some situations which were more than just hypothetical possibilities. This issue was more around capacity to provide safe services (particularly critical care and A&E services), in the face of changing disease patterns that had not been anticipated, with minimal disruption to the hospital if someone who was highly infectious presented and needed to be segregated from other patients quickly. It was also being influenced by a changing perception of clinical risk by world events. During the period July to December 2019, it was not much more than a hypothetical concern but as news reports emerged from Wuhan, China and then closer countries like Italy where health services were being overwhelmed by a new highly contagious respiratory viral infection it became much more of a concern. It was a real issue of preparedness to maintain safe service delivery and avoid HCID transmission episodes that needed addressed by March 2020.

Issues as at July 2019

185. I have been asked to provide my view on how serious the issues were around the following, and whether they should have prevented the hospital from opening in July 2019:

The air handling units

186. I'm not a ventilation engineer and not best placed to comprehensively answer this question. My view relates to their performance and whether any aspect of performance might create an environment where a patient may acquire a HAI. The IOM independent validation had identified AHU issues which posed a fire risk and AHUs were running at a higher speed than expected suggesting they could not meet the demand placed on them and their lifespan may be reduced as well as there being access issues which would hamper maintenance. One issue IOM

identified which did alarm me was that there were surplus drip trays in the AHU suggesting that there could be at some point stagnant water in the airstream which would increase the risk that bacteria which might grow in stagnant water such as *Legionella* could then be aerosolised and potentially inhaled if air bypassed filters.

187. Much of what I learned about the issues of the AHUs were identified in September 2019 when there were multidisciplinary inspections of the AHUs with IHSL, Project Team (Brian Currie, Ronnie Henderson), NHSL Estates (George Curley), Authorising Engineer Ventilation for NHSL (John Rayner), Mott MacDonald (Ian Brodie), David Gordon (Bouygues) and IPCT (myself and Lindsay Guthrie) present **(A41355176 – AHU 02-06 Inspection dated 27 September 2019 – Bundle 13 – Volume 8 – Page 596)**. We witnessed design failings that would allow air to bypass filters in the units which would potentially compromise air quality being delivered to clinical areas such as operating theatres which might increase the risk of post-operative infections. There were issues of resilience and unanswered questions as to what would happen during periods of maintenance and how much delivery of service would be impacted. I was generally being guided by the view of the authorising engineer for ventilation and other ventilation engineers in Mott MacDonald and estates team in NHSL that the AHUs were not of standard expected in a healthcare facility far less providing air for critical ventilation systems in a healthcare facility. But, prior to 9 July 2019 many of the AHU issues were not yet identified.

<u>Ventilation in Critical Care</u>

188. The air changes per hour at all bedspaces (except the PPVL isolation rooms) was lower than what would be optimal for performing many of the invasive procedures involved on a daily basis in an intensive care unit and could have compromised patients undergoing the procedures and increased their risk of infection e.g. device infections, blood stream infections, nosocomial pneumonia all of which could have fatal consequences for children already critically ill for other reasons.

189. Likewise, the low air change rates would have hampered dilution and removal of

airborne pathogens such as respiratory viruses which are a predictable microbiological hazard in ITU and would risk staff and other patients catching infections like influenza from ill patients. As the air change rates weren't uniform across all bedspaces, the risk of occupational exposure would be greater in some bedspaces than others. It didn't align with Health and Safety Executive hierarchy of controls as mitigation of the airborne hazard would be very dependent on respiratory PPE being used optimally whereas HSE hierarchy of controls advocate that the hazard should be engineered out as a higher priority before use of PPE. The hierarchy of controls advise that before resorting to PPE to protect staff from a hazard there should be steps to elimination (physically remove the hazard), substitution (replace the hazard), engineering controls (isolate people from the hazard) and administrative controls (change the way people work). **(A47172252 – Using personal protective equipment (PPE) to control risks at work – Bundle 13 – Volume 8 – Page 600).**

190. As all the isolation rooms were of the PPVL design we were not assured we had optimal facilities for some uncommon (but predictable) situations e.g. a critically ill child with drug resistant tuberculosis or MERS for example with respiratory failure. This was partly based on a document that had been shared with me by Dr Teresa Inkster in Glasgow that was written in relation to the PPVL isolation rooms at QEUH, by Ian Storrar of HFS, **(A32310951 – QEUH Isolation Rooms report 2016 – dated 29 June 2016 – Bundle 13 – Volume 8 – Page 601)** and NICE guidance for management of tuberculosis, that advocates a negative pressure isolation room as being the optimal environment for placement of patients with drug resistant tuberculosis (section 1.5.1.4) **(A47172398 – NICE Tubercolosis – dated 12 September 2019 – Bundle 13 – Volume 8 – Page 609)**.

191. Concerns about PPVL room suitability in this circumstance is that the contaminated exhaust air requires to be HEPA filtered before discharge when isolating an airborne HCID and PPVL rooms don't have this in their design unless explicitly requested so it might not be included. Also because the lobby is at positive pressure there is a hypothetical risk of contaminants generated by doffing PPE being directed into the corridor which doesn't exist with a negative pressure isolation room configuration.

192. I agree that the findings in the ventilation provision to critical care were of sufficient magnitude to justify not opening. A fully functioning ICU would be critical to virtually all acute paediatric inpatient services in RHCYP DCN and because it is so critical there are rarely safe opportunities to undertake substantial repair work while it is occupied.

Ventilation in the Lochranza Ward

193. The issue of ventilation in Lochranza is not straight forward and that relates more to patient case mix and projected demand. Not all cancer patients require protective isolation for neutropenia. The original provision of Lochranza did provide accommodation that could have provided suitable protective isolation for post chemotherapy neutropenic children. NHSL was not intending to provide a bone marrow transplant unit so the degree of susceptibility to infection in the patient group in Edinburgh was not on a par with the immediately post Bone Marrow Transplant patients at QEUH in Glasgow. The two units should not be compared for that reason.

194. The issue in RHCYP DCN was not that there weren't bedspaces with suitable ventilation for neutropenic patients as there were 5: the issue was that changing demands and availability of paediatric cancer beds was changing (some of which as a consequence of events in NHS GG&C) and there was a real concern that the future need would outstrip what had been installed in the building.

195. There was one significant concern which had not been resolved and related to objections made in 2016 as all the isolation rooms in Lochranza did indeed run from one AHU and so there was no resilience for times of AHU maintenance or critical failure. Either all isolation rooms would be operational or all would be offline and that created substantial inability to sustain protective isolation during such periods with no other suitable location to place affected children where suitable room design and staff skill mix were co-located. This scenario is actually outlined in HBN 04-01 Suppl 1 in section 2.37 as one to avoid during design. Additionally, although we were told there had been built a means to divert air from supplying top floor offices to supply the Lochranza isolation rooms in event of AHU failure this was a very unconventional solution and was predicted to

substantially compromise the function of the rooms through delivering lower air change rates and compromised pressure cascades and worryingly this appeared to have never been tested. It was not clear to me why the concerns that were first raised in 2016 had not led to a revised ventilation strategy by July 2019 although I now believe it was because of the additional cost and space required to provide one AHU per isolation room.

196. Even though the ventilation provision Lochranza meant the majority of bedspaces were non-compliant with SHTM 03-01 criteria for a neutropenic ward, it didn't in my view merit delaying occupation overall as it was an improvement to what was being provided for cancer patients at RHSC, Sciennes (ward 2 at RHSC only had 6 'cubicles' for neutropenic patients but they did not provide HEPA filtered air or a positive pressure cascade to corridor). The Lochranza ventilation strategy for isolation rooms was however non-compliant with HBN 04-01 Suppl 1 during periods of maintenance, and lacked resilience and the decision to delay occupation provided a window of opportunity to resolve these issues.

Ventilation in General Wards

197. The key issue here was whether the rooms were at balanced or slight negative pressure to corridor. If the rooms had been at positive pressure to corridor then there would have been possible risk of spread of airborne infection to other rooms (although this would also be influenced by the distance between doors and what the pressure gradient was and locations of air extraction in corridors). In a paediatric context that could be chickenpox, measles, influenza, or other respiratory viruses. I believe that had been addressed by July 2019. This is based on the principle outlined in paragraph 150 by the Specialised Ventilation for Healthcare Society (SVHSoc) that prevention of spread of respiratory viruses is best achieved in an area that is at balanced or slight negative pressure to its corridor.

198. I don't believe the ventilation performance in general ward areas on 9 July 2019 merited preventing the hospital from opening. The risk though was not universally the same. The respiratory team managing cystic fibrosis patients did ask IPCT what the impact 4 ac/hr may have on transmission of bacteria which commonly

colonise lungs of this patient group **(A40988924 – Summary of RHCYP Critical Care Ventilation discussions – dated 10 and 11 July 2019 – Bundle 13 – Volume 8 – Page 554)** but as we were not experiencing such transmission in less well ventilated facilities in RHSC and there were functioning PPVL isolation rooms with 10 ac/hr, this was considered a manageable risk rather than a show-stopper to occupation. Although not aligned to SHTM 03-01 it was an improvement on what was provided at the RHSC Sciennes site.

Remedial Works

Critical Care

199. In relation to my involvement with the design development of the Critical Care remedial works solution, I was representing the infection control service along with Lindsay Guthrie in the multiagency team formulating what became known as High Value Change 107 (HVC 107) relating to Paediatric Critical Care and Haematology ward ventilation to make them SHTM 03-01 compliant. I attended the RHCYP DCN Ventilation Meetings which were tasked by the RHCYP DCN ESG to address issues of ventilation performance at RHCYP DCN from their start in 2019 and then was involved in each of the different workstreams addressing different areas of non-compliant ventilation systems. Updates from these workstreams were fed back to the RHCYP DCN ESG by Brian Currie. I attended the HVC 107 Meetings from their start in December 2019 and when Imtech Hoare Lea were appointed as the design team I attended meetings with them.

200. In the Critical Care remedial project, the initial plan had been to ensure all the isolation rooms performed optimally as PPVL isolation rooms but as 2020 progressed there was more awareness that this might not be the most resilient configuration and it was agreed to alter one of the existing PPVL isolation rooms to be a negative pressure isolation room. This was the preference of colleagues in Paediatric Infectious Diseases as well as the virology and microbiology consultants who covered paediatric issues as it would provide more optimal isolation for any child requiring respiratory support because of drug resistant tuberculosis or MERS for example (see paragraph 189). I don't believe that the choice of design of all isolation rooms as PPVL rooms rather than negative

pressure isolation rooms was one that had been discussed with the paediatric infectious disease service initially as they had questions regarding how PPVL rooms worked for protective and source isolation which they addressed to the project team in July 2019.

201. It was identified during 2020 that there were some changes that could be made to create a negative pressure cascade with HEPA filtered extract air or extraction at height which would safely create a negative pressure isolation room and provide this additional resilience without having to alter the built architecture of a pre-existing PPVL room. There were several reasons why there was a wish to have more assurance regarding containment of HCID at that time:

    - There were no negative pressure isolation rooms anywhere in NHSL.
    - The first wave of Covid 19 was beginning to spread outwith China in January 2020 and Covid 19 was classed, at the time, as an HCID akin to MERS and upscaling of isolation facilities in preparation for a mass influx of patients of all ages to intensive care was a national healthcare priority.

202. Both myself and Lindsay Guthrie were core members of the multiagency team who worked together to agree a design and implement High Value Change 107 and design, install and commission SHTM 03-01 compliant ventilation performance for Paediatric Critical Care **(A34012543 – RE RHCYP DCN – Little France – High Value Change 107 – Vent works to PCC and HP – dated 03 December 2019 – Bundle 13 – Volume 8 – Page 716)**. I believe that the design was finalised around June 2020 although the project team would likely have more detail regarding this exact date and approved initially at the RHCYP DCN ESG and then the RHCYP DCN Oversight Board which was composed of NHSL, NSS and Scottish Government Representatives.

203. We attended the planning meetings with the Project Team and Hoare Lea and Mott MacDonald and the NHSL Authorising Engineer for ventilation to plan how and where to install replacement and supplementary AHUs to enable the PICU ventilation to be upgraded and the conversion of one PPVL isolation room to be a negative pressure isolation room.

204. We were part of the multidisciplinary team who inspected the “exemplar” AHU after it had undergone all the corrective repairs and then subsequent AHUs as they also underwent corrective work. We were involved in planning corrective repairs, rebalancing and witnessing the performance of operating theatres and isolation rooms. A final report was produced by IPCT in early March 2021 for the project team and ESG that outlined all the risk assessments that IPCT had undertaken on aspects of the ventilation system and that IPCT were satisfied all the HAI risks had been addressed to our satisfaction and at that point we signed the HAI Scribe Stage 4 documents. This report was informed by reports produced by IOM and the NHSL Authorising Engineer for RHCYP DCN (John Rayner) regarding the performance of the ventilation systems in February and March 2021 **(A47091309 – 20211203 NHS Lothian Infection Prevention Control Team Review of Suitability of the Performance of Redesigned Ventilation Systems in RHCYP DCN – dated 03 December 2021 – Bundle 13 - Volume 7 – Page 152)**. I was not involved in the ultimate decision to open the hospital. Although I was a member of the RHCYP DCN ESG, I did not attend the Oversight Board meetings and the ultimate decision to open was made by the oversight board.

Other Remedial Works

205. We were asked for IPCT input on various other issues by the Project Team and RHCYP DCN ESG as follows.

- How to improve preparedness of A&E for respiratory virus containment changing cubicle curtains to doors, identify an area of A&E suitable to contain airborne HCID and help in the design of its ventilation and advise on suitability and rebalancing of the ventilation of the A&E resus rooms.

- We were asked to risk assess every clinical area in the hospital as to whether the ventilation provided aligned with the need to safely perform the planned activities in the rooms, and we concluded that it would not be considered unsafe if due thought was given to appropriate patient placement. **(A40981178 – Record of General Risk Assessment ventilation_combinedrev300118 – Bundle 6. Page 14) and (A47172292 –**

SBAR Assessment Outpatient and therapy areas Ventilation Room Review RHCYP DCN – dated 12 November 2019 – Bundle 13 – Volume 8 – Page 721).

- We were involved in assessing the suitability of repairs after the flooding event in summer 2018 and were able to view their outcome on the walkround visit in March 2019 and were satisfied.

- We were asked to risk assess significant water damage to the walls in dental chair rooms in outpatients on discovery that there had been leakage from incorrect plumbing of the supply water to the dental chairs, and this resulted in an incident management team being formed to ensure the issue was resolved while minimising disruption and patient risk of exposure to mould. The IMT did not close until there was satisfaction that the work was completed. No HAIs arose from this. See **(A47172700 – Dental RHCYP – dated 19 February 2021 – Bundle 13 – Volume 8 – Page 724)** and **(A47172447 – NHS Lothian – Infection Prevention and Control – dated 13 January 2021 – Bundle 13 – Volume 8 – Page 2109).**

- We were asked for views on the suitability of rectification plans to address the issue of over-pressurisation of the operating theatre corridor that was preventing fire door closure. This issue has not yet been resolved to IPCT or NHSL's satisfaction.

<u>IPCT involvement in issues with water systems at RHCYP / DCN</u>

206. To provide some context to the IPCT involvement in issues with the water systems at RHCYP DCN, it is of note that NHSL was actively managing two unrelated but complex *P aeruginosa* water contamination issues on the WGH site around the same time in the first half of 2019. There had been adverse media coverage about the issues at WGH and they were not resolving quickly. Additionally, information was being released via the media, HPS, and word of mouth about the nature of water contamination issues at QEUH in Glasgow and the alleged connection between unresolved high Total Viable Counts (TVCs) at commissioning and later HAIs with water associated bacteria had been made

public.

207. My initial concerns about water quality in the RHCYP DCN building were raised with the Project Team, Ronnie Henderson (NHSL Director of Facilities) and Brian Currie (Deputy Director of Facilities), in February 2019 in response to being alerted by Ronnie Henderson of water commissioning results which were detecting growth of indicator organisms. Of significant concern for a new building that was unoccupied was detecting of a *Legionella species* at 25cful/1000ml from a kitchen area and detection of *Pseudomonas aeruginosa* in areas that might be augmented care areas.

208. SHTM 04-01 Part B section 6.6 states that the infection control doctor has responsibility for water quality once it leaves the tap. In SHTM 04-01 Part B Section 6.3 and 6.7 it also advises that where there are *Legionella* or *Pseudomonas aeruginosa* issues with the water that a consultant medical microbiologist should be contacted for advice as a key decision maker. So as the microbiologist who attends the water safety group, I should have an awareness of where there are microbiological hazards affecting a healthcare water system and be involved in the planning of corrective work and hazard mitigation measures. The nature of the hazard mitigation measures will be influenced by the vulnerability of anyone likely to be exposed to developing an infection. Multiplex had issued the Project Team with some water results that indicated that *Legionella* had been detected and *Pseudomonas aeruginosa* had been detected. Although the *Legionella* count was low, it should not be present. Its presence indicates that *Legionella* control measures which are required by law by the Health and Safety Executive had failed to prevent the growth of *Legionella*.

209. With the information provided we didn't know the extent of the problem as the number of water outlets tested in the building was quite small (only 12 water outlets had been tested and 1 was positive and in a building the size of RHCYP DCN I would have expected more outlets tested to fully assess the water system). We didn't know what *Legionella* control measures were in place and we didn't know why they had failed. *Legionella,* once in a water system, invariably is difficult to remove and requires targeted actions like intensive flushing and/or chemical or thermal disinfection to eradicate it. It does not usually go away itself.

It usually gets worse and begins to affect more outlets at higher concentrations if left unaddressed. The presence of *Pseudomonas aeruginosa* is also difficult to resolve and requires similar control measures. NHSL IPCT and Estates teams had gained extensive experience of measures need to mitigate the risk of *Pseudomonas aeruginosa* in the DCN building and ITU at the Western General Hospital where there were ongoing IMTs and much replumbing had been required but those were in old buildings.

210. This however was an entirely new water system which already had evidence of water outlets with bacterial contamination with organisms that were recognized hazards. This suggested that there may be water temperature issues, flow issues or contaminated components within the system that would need to be addressed. We also had not been told where in the building the *Pseudomonas aeruginosa* was detected so it was impossible to adequately assess risk to any vulnerable patient groups who might be placed in the affected rooms as we had not been told where the affected rooms were or the type of patients who would occupy them. We didn't know if the *Pseudomonas aeruginosa* issues were widespread across the building or just localised. Without measures to remove the hazard though it would invariably spread in the system and get worse too.

211. There were parallels with what was beginning to be described about the QEUH water system which were a concern to me **(A47172335 – RE RHCYP DCN Edinburgh – Water Quality – dated 21 February 2019 – Bundle 13 – Volume 8 – Page 725)**. Although some water testing had been performed, it was suggesting the water system might not be in good condition and this had clear implications for patient safety in the future if true, so we needed to know more about what was causing these hazards and through further testing define the nature and the extent of the issues and resolve them. The concern was not so much that there hadn't been assessment of risk, it was because there was the presence of recognised microbiological hazards and a strong suspicion that Health and Safety Executive (HSE) requirements for control of Legionella were not being met. I was not alone in my conclusions as they were shared by my microbiology consultant colleagues, and it transpired they were shared too by Bouygues who had already directly raised their concern with IHSL prior to my being notified by the Project Team. **(A47172311 – RHCYP and DCN Edinburgh**

– Water Quality – dated 19 February 2019 – Bundle 13 – Volume 8 – Page 762) and **(A47172329 – RE RHCYP & DCN Edinburgh – Water Quality – dated 13 February 2019 – Bundle 13 – Volume 8 – Page 765)**

212. I then updated Professor Alex McMahon as HAI executive lead on 13 March 2019 (I was on annual leave from 2 to 10 March) **(A34010959 – Email from Linsday Guthrie to Anette Rankin regarding a Sunday Herald Article on ventilation issues at QEUH RHCYP – dated 5 August 2019 – Bundle 5 – Page 35)**, as discussed at paragraph 104 above.

213. It was announced on 27 February 2019 by e-mail to NHSL staff that NHSL had taken ownership of the RHCYP DCN building. This was a surprise to IPCT members who had involvement in the Project and we had not known that it was coming. Professor Alex McMahon was also chairing the IMT in relation to water contamination with *Pseudomonas aeruginosa* in WGH DCN at the time and he escalated concerns to other Executive Directors. As uncertainties remained unresolved through June 2019 there was wider communication with Ronnie Henderson, Brian Currie, Janice Mackenzie, George Curley, Susan Goldsmith, and Tracey Gillies.

214. During the first six months of 2019 the main issue was that the data in relation to the out of range water test results was very limited. It was received in a piecemeal fashion and it was not clear what location in the RHCYP DCN the data related to. I recall that there was data received on 21 February and 17 May 2019 but there were no ward locations given for the affected outlets, just a file showing water results with out of range *P aeruginosa* results (many >100 colony forming units(cfu)) and raised TVC counts (some >1000 cfu). With regards to *P aeruginosa* in water, there was draft HPS guidance in circulation from December 2018 that set out what interventions to take to resolve the hazard based on what level (in colony forming units) was detected. *P aeruginosa* should be completely absent from water in augmented care areas but it wasn't clear which parts of the hospital were affected so we did not know if they were augmented care areas.

215. Generally, in a newly installed water system the expectation would be that the water would be free of *P aeruginosa* and other bacteria that are used as indicator

organisms (i.e. markers that the water quality is poor) such as *Escherichia coli* (or other Gram negative bacteria in the Enterobacteriales group more commonly called coliforms) and *Legionella species.* Any detection of these bacteria would be considered 'out of range' as there should be none. For other specific bacteria which are not used as indicator organisms there are no set parameters in the United Kingdom that would determine an acceptable level from an unacceptable level or a 'normal range' of values to compare against to determine if they are 'out of range'. This includes Total Viable Count (TVC) measurements where there is no longer an agreed normal range to identify acceptable from unacceptable. For water that may be ingested, there were historical criteria set by the World Health Organisation but these are no longer used and are considered by some to be too strict. They were also used primarily to determine if water was of an acceptable quality for drinking whereas in a healthcare building water may be used for personal hygiene (bathing and showering) or some clinical purposes (mouth care and wound care) and cleaning and there are no criteria that would indicate if such water was poor quality or not. That creates clinical risk though as if a patient is bathing or showering with healing surgical wounds exposed to water with a high burden of micro-organisms or damaged lungs and at risk of inhaling micro-organisms or has a skin penetrating medical device like an intravenous catheter then the micro-organisms in the water have any easy route by which to enter the body and cause deep infections.

216. In February 2019 the water testing was being performed as part of a commissioning exercise initially to pass maintenance responsibility for water management over to Bouygues Energies and Services who had identified the same concerns about water quality. It was being performed I believe more from the perspective of assessing a water system from a plumbing perspective to complete an aspect of building commissioning in a public building. But this was to be a functioning hospital for children and a high proportion of those would be susceptible to infection from the organisms being identified in the water if they were exposed and exposure to the water would be inevitable during an inpatient admission. The future clinical risk of paediatric infections associated with what was being uncovered did not seem to be fully recognised by all involved. It was recognised by the NHSL project team and IPCT but there was insufficient information being shared with them to assess the extent of the problems, the

cause of the problems or plan how to mitigate them.

217. My understanding was that NHSL did not have responsibility for maintaining the water system. A key issue was that with the water system now filled with water, if there was stagnation and tepid water the micro-organisms present would be growing and seeding around the building and as it was now a dynamic water system there would be water movement and movement of micro-organisms too along with the water. As time progressed it would become harder to resolve. To reiterate, NHSL Estates, IPCT and Executive Directors were at this same time intensively involved in trying to resolve the *P aeruginosa* water contamination issues on the WGH campus in the existing DCN building and were acutely aware of the potential consequences from an HAI perspective if the RHCYP DCN water quality situation was not addressed comprehensively.

218. The locations of other outlets with water quality issues were not known until 19 June 2019 when that information was released to Brian Currie by IHSL, but until then the location of the affected water outlets and therefore the nature of the patients to be treated in those locations was not known. These two crucial parts of the assessment of potential risk of water related HAI did not align until the first week of July 2019 (as explained below).

219. The causes of the ‘out of range’ water results were likely to be a combination of:

(i) inadequate water flowing throughout in the building and outlet flushing to replicate a live building once the water system had been filled
(ii) Swarf and other particulate debris left within the water system and taps
(iii) Uncertainty regarding water temperature controls being consistent. There had been a gas leak and issues with calorifiers being switched off in April 2019
(iv) Uncertainty whether pipework had been appropriately protected from contamination during construction
(v) Lack of system wide chemical disinfection of the water system before handover.

220. Although some of the above causative factors might have been addressed during

completion of system commissioning it is important to realise that a microbiologically contaminated and filled water system in an unoccupied building is not a static hazard. With each day, the micro-organisms will grow and spread and so if they are not promptly removed by effective flushing and disinfection the hazard burden increases and the ability to effectively decontaminate the system decreases over time as the extent of contaminated pipework and the concentration of micro-organisms increases. What starts as a small and localised issue doesn't stay small and localised if not promptly and effectively addressed by removal of the predisposing factors and cleaning out the contamination either physically by flushing or by thermal or chemical disinfection. NHSL wanted to avoid a bigger problem and bigger clinical risk manifesting in the future. It is true that the water system commissioning had not been completed prior to handover but it was also, in places, demonstrating microbiological contamination. Although a flushing regimen was being performed this now had to be ramped up to replicate water turn over in an occupied hospital and there needed to be more investigatory water testing performed so it wasn't just that the commissioning process needed to be completed.

221. In my view, these issues would have posed a risk to patient safety and care, in particular: (i) *P aeruginosa* in augmented care clinical areas; and (ii) raised TVCs – although the impact of this is unknown but data was beginning to emerge from QEUH of possible severe consequences. As noted, the presence of high TVCs (a marker that there is significant microbiological contamination of the water) in a healthcare building where that water may be used for bathing or hand hygiene has risk of contaminating wounds or invasive devices (such as Hickman lines) with an aqueous suspension of micro-organisms and a risk that infection will then develop. Intuitively, the lower the concentration of micro-organisms in the water (a lower TVC) the lower that risk becomes. It could be considered an avoidable risk if there is assurance that TVCs were low for instance. HPS had been reviewing evidence and mechanisms of transmission for outbreaks of water related micro-organisms and they circulated a draft of this for discussion in April 2019 **(A47172358 – Rapid Review of Healthcare Associated Infection Risks and Outbreaks Associated with Healthcare Water Systems – dated April 2019 – Bundle 13 – Volume 8 – Page 767)**. Additionally the HPS report 'Summary of Incident and Findings of the NHS Greater Glasgow and Clyde:

Queen Elizabeth University Hospital/Royal Hospital for Children water contamination incident and recommendations for NHS Scotland" which we had seen in February 2019 **(A42362411 - Summary of Incident and Findings of the NHSGGC QEUH RHC water contamination incident and recommendations for NHS Scotland – dated 20 December 2018 – Bundle 13 – Volume 8 – Page 796)**, inferred that there was a relationship between raised TVCs in the water system detected prior to occupation and the incidence of bloodstream infections with organisms related to water in the paediatric bone marrow transplant unit, Schiehallion.

222. Callidus were contracted by NHSL Project Team to undertake a compliance audit of *Legionella* controls. This was initiated by the Project Team and IPCT were not involved in that decision. It was prepared following site visits by Callidus on 21 and 22 March and 25 and 26 April 2019. The Callidus report was issued in May 2019 and identified several areas of concern. This report however was not shared with IPCT and other members of ESG until after 9 July 2019. The report notes that Callidus had identified several issues in the water system that would predispose to the growth of Legionella species and the water testing in February 2019 had identified growth of Legionella species in one outlet so it appeared that the root causes of this were still present when Callidus did their review. I was surprised that the Callidus report hadn't been flagged earlier to me as microbiologist on the water safety group or to the Executive Directors earlier as it notes on page 19 that a Legionella Risk Assessment for the building had been performed in February 2019 and the overall risk rating was determined as high. Callidus too gave Legionella control a red rating as they could not obtain evidence that there was an adequate flushing regimen in place (page 27). **(A34053106 – Callidus – Compliance report (Final) – dated 01 May 2019 – Bundle 13 – Volume 8 – Page 1005)**.

223. Westfield Caledonian were contracted by NHSL to perform an assessment of the whole water system and independently perform microbiological water testing. I believe this was arranged by the NHSL Director of Facilities (George Curley). This began on 1 July and was not completed until 12 July so the results of this were not available to IPCT until after 9 July 2019 (which had been the date that the hospital was due to open to patients.) **(A40982080 – Email from Anna**

Munro to Lindsay Guthrie et al re HAI SCRIBE RHCYP Risks and Mitigations - dated 12 June 2019 – Bundle 13 - Volume 8 – Page 821). This had been discussed and planned at the RHCYP DCN IMT meeting where NHSL Estates, Project Team, IPCT and Executive Directors were in attendance. Neither IPCT nor microbiology contract water testing from commercial laboratories directly in NHSL.

224. Without comprehensive data to inform a risk assessment (because commissioning water data provided by IHSL was very scant), IPCT (based on experience of trying to resolve significant water system contamination due to *P aeruginosa* at the WGH with the assistance of Westfield Caledonian) took a risk averse stance with regards to water issues at RHCYP DCN. The NHSL Authorising Engineer for Water (Dennis Kelly of Pro Lp Consulting Ltd) and Director of Estates (George Curley) were also involved.

225. I was concerned that there was an unsafe water system at the RHCYP + DCN. We had been told there were recognised microbiological hazards in the water (particularly *Legionella* species and *Pseudomonas aeruginosa*) but had uncertainty regarding the extent or locations. We had no assurance they had been appropriately eradicated. There were too many unknowns to consider it safe when we first had awareness in 2019. It wasn't until 19 June 2019 that actual water result locations were received by the Project Team from IHSL, who then forwarded the results to me and Lindsay Guthrie, to be able to begin to understand what the actual issues were and where they were in the building.

NSS Reports

226. With reference to an email from Annette Rankin to Ian Storrar **(A34012673 – Email from Annette Rankin to Ian Storrar regarding the 2015 HAI standards - dated 28 August 2019 – Bundle 7 - Volume 3 – Page 287)** and an email from Donald Inverarity to Sorrel Cosens and others (**A41352302 – Email from Donald Inverarity to Sorrel Cosens with comments on the report of the NSS - dated 5 September 2019 – Bundle 7 - Volume 3 – Page 345)**, there were several different water reports that originated from NSS which I have been asked by the

Inquiry to review and give an opinion regarding in the period between 23 August and 5 September which I have done in the following paragraphs.

227. Regarding, **(A42362411 - Summary of Incident and Findings of the NHSGGC QEUH RHC water contamination incident and recommendations for NHS Scotland – dated 20 December 2018 – Bundle 13 - Volume 8 - Page 796)**, we received on 20 August 2019 from SMVN (although had been published online in February 2019). The NHSL response is within **(A47172460 – HPS Water Report – made available to NHS Lothian via Scottish Microbiology and Virology Network – dated 20 December 2018 – Bundle 13 - Volume 8 - Page 827)**.

228. The significance of the NSS/HPS report to the RHCYP DCN building is that it was released in February 2019 at the time when we first were seeing water results with raised TVCs, *Pseudomonas aeruginosa* and *Legionella species* detected in water testing that IHSL had undertaken. In the hypothesis section on p14/15 HPS proposed that microbial contamination at installation could have been enabled to flourish in the filled water system due to lack of flushing and allowed to establish biofilms in the system. We were concerned that the same scenario would manifest at RHCYP DCN if there wasn't intervention to increase water throughput in the system by increasing the flushing frequency and begin disinfection of the affected outlets.

229. An interim report from "Water Solutions Group" into RHCYP DCN which had been commissioned by NSS along with a selection of environmental microbiological reports issued by a company called Intertek. The significance of this report is that it was commissioned by NSS (HFS and HPS) to investigate the water system at RHCYP DCN. The same company had been involved in the investigation of water safety at QEUH. When the system was assessed microbiologically for conventional markers of water safety it identified that:

- *Legionella species* were not detected in the water at any location page 5
- TVC counts "in some areas were slightly elevated but would not be considered excessive" page 5
- No detection of *Pseudomonas aeruginosa from* 60 outlets tested page 9

- "there is no indication from the microbiological results to suggest that the water system is not fit for use" page 6. **(A34053098 - 20190718 Water Safety Consultant Report (T Wafer) dated 18 July 2019 – Bundle 13 - Volume 8 - Page 879)**

230. There were several concerning issues about compliance with a duty structure, documentation, information management, training and other matters relating to water safety governance and quality management but it did not identify any major issues with the microbiological state of the water system itself when using methodology for a conventional assessment of the water quality. Strainers in many of the wash hand basins demonstrated that they had metal filings and general debris caught in them. Bearing in mind the building was not yet open this likely occurred during its construction and the aftermath of that but if left in place would easily facilitate growth of micro-organisms and a loss of water quality through rising TVCs. It raised questions about why it had not been detected earlier during the commissioning process. This can be seen in the following documents **(A34053122 – 20190813 Fwd Draft water and ventilation reports – dated 13 August 2019 – Bundle 13 – Volume 8 – Page 839)** and **(A34053098 – 20190718 Water Safety Consultant Report (T Wafer) - dated 18 July 2019 – Bundle 13 – Volume 8 – Page 879)**

231. A further report from NSS was received in September 2019: Royal Hospital for Children and Young People and Department of Clinical Neurosciences NHSL response to actions identified in the NSS National Services Scotland – Review of: Water, Ventilation, Drainage and Plumbing Systems v2 **(A47172417 – NHS Lothian response to actions identified in the NSS review of: Water, Ventilation, Drainage and Plumbing Systems – dated September 2019 – Bundle 13 – Volume 8 – Page 894)**.

232. This was an updated version of a draft that was circulated on 9 August 2019, see **(A47172405 – NHS National Services Scotland Review of: Water, Ventilation, Drainage and Plumbing Systems – dated September 2019 – Bundle 13 – Volume 8 – Page 904)**

233. This replaced an earlier draft and confidential version that was issued to NHSL

on 6 August, see **(A47172508 – Fw Draft RAG Report of the NSS Review of the NHSL RHCYP and DCN – dated 6 August 2019 – Bundle 13 – Volume 8 – Page 925).**

234. These reports initially gave red, amber or green ratings based on perceived risk severity. It was understandable that a red rating was given to matters relating to water system management and compliance with Health and Safety Executive legislation regarding Legionella controls or Scottish Water Bylaws. But a red rating was given to "Pseudomonas being found in taps in critical care areas" which had never been described or found in the NSS commissioned Water Solutions Group investigation or any other investigation to date. It was baseless. There was also a red rating given for "widespread fungal contamination" and the basis for this statement was also very unclear. Assessment of water for fungi is not a conventional means of assessing water quality. It had been found in water at QEUH (where there had been much media attention about deaths from fungal infections) and so was being interpreted as a significant clinical risk but nothing had been shared which demonstrated to us in NHSL that it was anything other than a normal feature of the ecology of a building water system. There was no requirement we knew of that the water should be free of fungi or what level of fungal growth was to be considered acceptable or unacceptable.

235. The NSS report seemed to have drawn two very different conclusions to the Water Solutions Group based on the same microbiological data and given them red ratings for high clinical risk. The various drafts of the NSS reports were all concluding there were serious concerns about significant clinical risk from the microbiological state of the RHCYP DCN water system whereas the Water Solutions Group report did not. The draft NSS report was then revised and re-issued as version D0.20 without the RAG rating and now conceding that, "testing identified no widespread contamination of the water system." It still erroneously stated that *Pseudomonas* was found in critical care taps as a main finding (page 16). It also noted that because of the finding of fungal contamination of the water, it merited system wide disinfection and retesting for fungi (page 17) which rather than being advised by standards and guidance, was an opinion. By the final version 2.0 the location of *Pseudomonas aeruginosa* detection in paediatric medical inpatient and DCN inpatient wards and not critical care had been

corrected but the instruction to undertake system wide disinfection and retesting for fungi remained which in my view was not deliverable. A system wide disinfection was indicated before occupation but not because of the detection of fungi in my view. This raised questions for me about the NSS interpretation of the microbiological data that they were using to formulate their actions for NHSL and their understanding of what was and what wasn't deliverable regarding laboratory testing of water.

236. To clarify, it is the Draft Versions of reports and the RAG ratings within them (6 and 9 August 2019), along with the "Water Solutions Group" paper and email exchange 14 August that the email exchange with Tracey Gillies on 23 and 28 August 2019 (**A34012673 – Email from Annette Ranking to Ian Storrar regarding the 2015 HAI standards - dated 28 August 2019 – Bundle 7 - Volume 3 - Page 287)** relate to.

NHSL commissioned assessments of the RHCYP DCN Water System

237. As detailed above, there were also two water reports commissioned by NHSL during July 2019 produced by:

- Westfield Caledonian (e-mail contains the actual water test results) **(A47172495 – FW RHCYP DCN Water Safety Assessment – dated 17 July 2019 – Bundle 13 – Volume 8 – Page 938**) and **(A34053095 – NHS Lothian Report on Water Safety Assessment at RHCYP & DCN – dated 1 July 2019 – Bundle 7 - Volume 1 - Page 10)**

238. Lindsay Guthrie and I wrote a paper outlining the implications of this report from our infection prevention and control perspective with regards to HAI risk from water, see **(A47172450 – IPCT response to Westfield Caledonian Water Safety Report – dated 19 July 2019 – Bundle 13 - Volume 8 - Page 974)**.

239. There was then additional feedback from Dennis Kelly (Authorising Engineer for Water), who added to this updated version to aid interpretation of the risks being flagged for the RHCYP DCN Executive Steering Group, see **(A34053090 – IPCT response to Westfield Water Report v2 – dated 24 July 2019 – Bundle 13 -**

Volume 7 - Page 144).

240. The Callidus Report (also discussed in paragraph 221) **(A34053106 – Callidus – Compliance report (Final) – dated 01 May 2019 – Bundle 13 – Volume 8 – Page 979)**.

241. IPCT did not have sight of the report from Callidus until it was issued via the ESG in July although it relates to inspections in March 2019 and was issued in May 2019. This raised our concern that *Legionella* controls in the building were not optimal.

Interpretation of the microbiological water testing results made available by September 2019

242. In relation to water, not all of the items with a red rating in the NSS draft report **(A47172508 – Fw Draft RAG Report of the NSS Review of the NHSL RHCYP and DCN – dated 6 August 2019 – Bundle 13 – Volume 8 – Page 925)** were contested by me (and consequently the RHCYP DCN ESG) and for some, plans were already in place or being formulated to allow rectification. Two items did however cause me significant concern. Firstly, a statement that *Pseudomonas aeruginosa* water contamination was present in the critical care area. This was factually incorrect. Commissioning water testing results from IHSL that we had seen had identified an outlet with >100cfu/100ml *P aeruginosa* in 3c1.1.-046. (this is a room reference using IHSL nomenclature for rooms in the building and was identified as in Dalhousie which would be the paediatric respiratory ward which would be in the category of an augmented care area for *P aeruginosa* risk in water, but it was not a critical care area). Critical Care had not been sampled. The more extensive testing for *P aeruginosa* performed by Westfield Caledonian for NHSL identified several outlets with *P aeruginosa* contamination but all the water outlets in PICU and Neonatal (area 1-B1) had been tested during the period 1 to 11 July 2019) and found to be completely free of *P aeruginosa*.

243. Secondly, the statement that there was widespread fungal contamination of the water system because:

- It inferred that detection of fungi in healthcare water was an abnormal finding. There was no data provided to justify this conclusion. Some laboratory results were shared which showed taxonomical naming of fungi being performed in a laboratory in Bremen, Germany but no data regarding quantitative counts of fungi present or interpretative framework being used to distinguish ‘normal’ from ‘abnormal’ in relation to fungal counts in healthcare water was provided.
- It inferred that NHSL should take a “zero tolerance” approach to fungi in healthcare water. This would indicate a change in national policy regarding acceptable water quality in healthcare which hadn’t been approved through NSS governance routes that reviewed changes in policy and was not something that all other health boards were being expected to implement.
- It was advocating that the red rating would not change until repeat testing for fungi in water was performed after system disinfection. This was not deliverable by NHSL as the water testing for fungi methodology had not been shared and we had not been given any steer as to whether there were any commercial water testing laboratories within the UK who could offer this as a United Kingdom Accreditation Service (UKAS) accredited laboratory test. This was testing that NHSL microbiology did not have the equipment, staff training or expertise or laboratory accreditation to perform.

244. I was also concerned that the report issued on 9 August 2019 outlined an entire section explaining how the findings were to be considered as based in interpretation of standards and guidance. In my view many of them were not based in standards and guidance but were ‘expert opinion’ with no explanation as to what criteria made the advisor an expert and no assessment as to whether the expert advice was biased or not. In section 1.3.7 of the report, NHSL is advised to take account of “lessons learned” from elsewhere without description as to what the lessons were or whether or not they were unbiased conclusions or biased speculation.

245. I can explain why, given my prior concerns around bacteria in the water system, there is a suggestion here that some micro-organisms may not pose a risk to patient safety and care. Healthcare facilities are not sterile environments and neither are they expected to be. Water systems within healthcare facilities are not

sterile either and many different types of micro-organisms can be found in healthcare water coming from the mains water supply but usually beneath the level of detection by microbiological culture. All water systems form dynamic ecological systems and may contain microscopic levels of biofilm containing micro-organisms including bacteria and fungi. So in any healthcare water system the following would be true:

- There will be a range of bacteria and fungi present at low levels.
- Those organisms can be considered as opportunistic pathogens i.e. not all of the micro-organisms present would necessarily pose a threat to patient safety all of the time. This is a dynamic situation though and bespoke to individual patients based on whether there is a route of entry into the body, patient's immune system and ability to fight off infection and the infectious dose of micro-organism the patient was exposed to.
- The presence of pre-defined "indicator" organisms would raise a red flag that patient safety may be compromised.

246. As a public building, a hospital would be expected to provide water that met a drinkable standard. It is not practical to test for all potential micro-organisms that could be encountered in water so particular representative bacteria (for which there are agreed thresholds to distinguish acceptable from unacceptable levels) are chosen from which water quality is inferred – in the context of commissioning a new healthcare water system these are total coliforms, *E coli*, *Legionella species*, *Pseudomonas aeruginosa* and testing for Total Viable Counts (TVC) incubated at two different temperatures (22 and 37 degrees Celsius). These organisms are internationally agreed by the World Health Organisation (although the WHO interpretative criteria for TVC testing is no longer mandated.)

247. My concerns regarding detection of bacteria in the water related to the clear detection of one of these indicator organisms e.g. *P aeruginosa* and several TVCs which were too high to quantify (i.e. >1000cfu/ml) which suggested that water quality was not optimal pre-occupation in some locations. Without intervention, these levels would inevitably increase as the micro-organism grow, divide and multiply and potentially spread to other areas of the water system, settle and create contamination there too. This was not necessarily a complete

bar to occupation as the microbiological hazard that such water outlets posed could be mitigated effectively in the short term while rectification work was undertaken e.g. using point of use water filters.

248. Additionally, the comprehensive independent site wide water testing performed by Westfield Caledonian was indicating that of around 770 water outlets tested, *P aeruginosa* was detected in only about 40 and the vast majority of water outlets were not raising any concerns at all from the microbiological water test results and several of the outlets which were flagging as having poorer quality water were not in areas where patients would have any exposure to the water. Westfield Caledonian also demonstrated that there was no growth of *Legionella* species from the water system in July 2019 and although there were legitimate concerns regarding not being able to demonstrate compliant documentation with regards to *Legionella* controls and risk assessment, that had not translated into its sustained presence yet.

249. I did not agree that detecting other micro-organisms solely by a qualitative method (i.e. the test can only tell if it is detected or not detected but no indication as to how much is present or what threshold determines safe from unsafe) informs current or future risk of HAI. WHO advocate that if other micro-organisms were to be considered as indicator organisms the testing should be supported by a verification and validation process that would determine safe from unsafe levels at least in the context of ingestion of the micro-organisms. See **(A47172465 – Guidelines for drinking-water quality – dated 24 April 2017 – Bundle 13 – Volume 8 – Page 1015)**.

250. The criteria that, “any potential pathogenic contamination found should be eradicated before patients and staff move in,” would substantially delay occupation as it could be unachievable. There would always be the potential for pathogenic micro-organisms in the water as it is not sterile and such a zero tolerance approach to micro-organisms in healthcare water far from being a “lesson learned” was at odds with my reading of water system ecology where certain micro-organisms were not tolerated but only once they had breached a threshold based on a quantitative culture method. Virtually any micro-organism may be pathogenic if a patient is particularly susceptible. The ability to cause

infection is not solely a feature of the organism but also of the susceptibility of the person exposed and the infective dose i.e. how much the person was exposed to. The infective dose varies substantially between organisms –some bacteria require very few organisms to cause disease while others require thousands or more.

251. The accepted thresholds at which microbiological samples would pose a risk to patient safety and care relate to specific micro-organisms in specific situations in healthcare in the UK. The thresholds currently used in a hospital context are outlined (Tables 3-9) by Public Health England (PHE) in **(A47172694 – Examining food, water and environmental samples from healthcare environments – dated February 2020 – Bundle 13 - Volume 8 - Page 1640)**.

252. There is also PHE guidance regarding managing the detection of Legionella in a healthcare facility. These align with what is outlined in SHTM 04-01 Parts B and C. **(A47172318 – Responding to the detection of legionella in healthcare premises – dated December 2015 – Bundle 13 - Volume 8 - Page 1687)**.

253. In Scotland, the thresholds for dealing with *P aeruginosa* in water are less clear than in the English HTM04-01. In 2018 and 2019 there were draft documents circulated by HPS for comment in Scotland but no definitive guidance about microbiological assessment of water by culture for *P aeruginosa* has been issued in Scotland since then. Water coming out of water outlets in augmented care areas should be kept free of *P aeruginosa*. **(A47172391 – Psuedomonas aeruginosa routine water sampling in augmented care areas for NHS Scotland – dated September 2018 – Bundle 13 – Volume 8 - Page 1708)**. The term augmented care is defined in draft guidance from HPS in 2018 as:

- Bone Marrow Transplant Units, Haemato-Oncology and Neonatal Units, and any other care areas where patients are severely immunosuppressed through disease or treatment.
- Critical and intensive care units (neonatal, paediatric and adult), renal units, and respiratory units (including Cystic Fibrosis patient care units). Burns units and other care areas where patients have extensive breaches in their dermal integrity.

254. With regards to fungi in water, there is no accepted threshold that distinguishes safe from unsafe levels in the UK. Fungal colony growth would be detected through TVC testing so if there was a substantial issue with fungal contamination, it would manifest as high TVC counts and that should then trigger a review as to why the TVCs were high. If TVCs are below 100cfu then by inference, fungal counts must be below 100 cfu also.

255. DEFRA have proposed that threshold level for numbers of fungi that can cause altered taste or smell of water may be around 102-103 cfu per 100ml water, see **(A47172717 – A Review of Fungi in Drinking Water and the Implications for Human Health – dated April 2011 – Bundle 13 - Volume 8 - Page 1713)**.

256. Fungal assessment of drinking water is performed in Sweden but not routinely. The limit of acceptability for the occurrence of fungi in water is 100cfu per 100ml water according to the Swedish regulatory authority, see **(A47172603 – Fungal contaminants in drinking water regulation – dated 13 June 2017 – Bundle 13 - Volume 8 - Page 1820)**.

257. Data that was eventually shared with NHSL by NSS in January 2020 listed the cfu per sample of fungi that had been detected to inform the report issued by "The Water Solutions Group" and this showed that only one outlet tested (from a shower) breached a 100cfu/100ml water threshold yet NSS considered this as representing "widespread fungal contamination" of the water system. Only 60 outlets were tested and only 2 others had fungal counts that exceeded 10cfu/100ml, see **(A47172296 – Edinburgh Sampling – dated 26 July 2019 – Bundle 13 - Volume 8 - Page 1864)**.

258. PHE used to run food and water testing proficiency quality assurance schemes for microbiology laboratories undertaking microbiological assessment of water. There was a scheme for Hospital water and Mycobacteria in water although I'm not sure if these EQA schemes still run.

259. Food and water proficiency testing schemes: scheme guide - GOV.UK (www.gov.uk) Their scheme for *Mycobacteria species* in water was not

accredited but that for hospital water was. I'm not very familiar with them as I don't work in a water testing laboratory.

260. WHO addresses how to determine risk of infection from ingestion of micro-organisms in healthcare from water in the following document from 2017 in Chapter 7. Often risk of infection from ingestion is extrapolated to represent all risk of infection acquisition situations in healthcare and it may not be appropriate to do that. **(A47172465 – Guidelines for drinking-water quality – dated 24 April 2017 – Bundle 13 - Volume 8 - Page 1015)**.

261. I am not aware of any reliable means of assessing clinical risk of HAI from washing or bathing in tap water contaminated with micro-organisms that is used as this would be a factor of many variables such as the amount of micro-organism in the water, a route of transmission into the body e.g. open wound or device puncture site and host immunity of the exposed patient.

Reflections on IPCT involvement

262. I do not think there were sufficient opportunities for the complete set of relevant skills or experience that was present in IPCT to be involved with, and provide clinical input to, the Project at all stages. Initially, input from me as Infection Control Doctor was *ad hoc* at the request of existing Project team members. That began to change from summer 2018 onwards because of the nature of some of the ventilation issues being encountered (e.g. discussion over the design of the lobbies in the Lochranza isolation rooms) and the imminent retirement of Janette Rae. From March 2019, we were much more heavily involved but by then we were uncovering many issues that concerned us, some of which might have been avoidable through earlier involvement in the design stage such as the ventilation strategy to neurosurgical theatres.

263. I think IPCT used the opportunities we had to be involved with the Project as they came up but only Janette Rae had dedicated time to be fully involved. The rest of us had our regular workload to deliver and initially no back fill of our posts to free us up. A project of this scale really needs the IPCT stakeholders to have agreed, dedicated, funded time to be involved to the depth that is required. It became a

full time job and for many months that was on top of our existing full time job responsibilities and commitments although colleagues did try their best to free us up to dedicate time to RHCYP DCN issues. There were several, prolonged, high profile or complex HAI incidents in NHSL at RIE and WGH described above being experienced that required our skills as the leads for IPCT in the period summer 2018 to summer 2019. This was before the Covid 19 pandemic. The pandemic made the human resource availability to address issues of the built environment much worse even when the projects were related to improving ventilation provision in clinical areas to minimise risk of SARS CoV2 exposure and Covid 19 outbreaks. It continues to be a problem through the ongoing loss of experienced IPCNs and IPCDs as described in paragraph 279 below.

264. From January 2020, IPCT resource was by necessity focussed on preparing for the first wave of Covid 19 with the awareness that we were only 2 weeks behind other European countries who were being swamped by this new disease. But Lindsay Guthrie and I were still having to balance involvement in ESG meetings, walkrounds and inspections, ventilation and water meetings and risk assessments for RHCYP DCN as the pandemic hit the UK and that continued up until RHCYP DCN was fully opened and occupied. The expectation of IPCT involvement by the Oversight Board exceeded IPCT human resource and skill mix to fully engage at times.

265. In my view IPCT members with further specialist training in the infection control implications of critical building systems (such as ventilation performance and assessment and water quality) should be involved as stakeholders at the design stage when there were discussions with clinical teams. Traditionally IPCT involvement has been more related to discussions about whether fixtures and fittings might harbour micro-organisms and whether they are able to be cleaned with disinfectants. The design stage is the point when it is easier to highlight where a clinician’s wish may not be deliverable or permissible due to the framework of guidance that would need to be complied with or would risk creating a clinical environment that doesn’t reflect best practice while there is opportunity to steer plans back towards a safe outcome. Or it may present opportunity to highlight to a designer that too great an emphasis was being put on energy recovery for instance and creating a non-compliant design or that there was

misunderstanding of the clinical purpose of the area. Of note though, many of the design discussions with clinical teams and the plans that were formulated with regard to RHCYP DCN occurred before 2014 and before there was very explicit guidance regarding ventilation parameters and performance for areas like intensive care and there was IPCT involvement. The issue may have been to do with designs not being sufficiently reviewed to comply with updated, current guidance or changing clinical needs before building and installation commenced, though I have been advised that the Project Agreement did specify compliance with SHTM 03-01.

266. Ideally though having an Authorising Engineer for Ventilation or Water either present or reviewing the outcomes of design discussions adds another important perspective as to whether what is being proposed is compliant or not with current standards or any standards that are being revised and updated of which IPCT may not yet be aware or to identify non-compliance that creates risk to the project outcome but not necessarily an infection risk. Many clinicians have no knowledge of healthcare ventilation or water systems and their safe functioning or the technical guidance behind designing and maintaining them. That said, clinicians and IPCT should be able to rely on engineers designing a healthcare building in line with current Guidance. I have noticed that if the designers and engineering team have experience of working on previous successful healthcare projects then discussions go much more smoothly and an experienced project manager with a background in healthcare is a clear asset. I have worked with teams with little or no healthcare experience and not only is much time wasted explaining mandatory processes like HAI Scribe there is no memory of when things have gone wrong in the past and so similar errors are repeated unnecessarily.

267. A clearer competence assessment of contractors for healthcare projects would be beneficial before they begin and waste clinicians time and generate unnecessary additional costs. This shouldn't be an IPCT function though. Any proposed non-compliances with Guidance should be flagged up by the engineers at the design stage for input from relevant other stakeholders such as IPCT. IPCT can then consider, along with the clinicians in that particular department, whether the proposed non-compliance would compromise patient safety and

whether, or not, any risk from a non-compliance can be appropriately mitigated. The design stage definitely needs multi stakeholder participation that involves the design team, project team, clinicians who will use the facility, IPCT and Authorising Engineer input too in order to be most effective but that can be prohibitively time consuming for comprehensive IPCT and clinician input. It is dangerous though for people who will not be using the area to assume that they know how it will be used as invariably they have misconceptions and that can then translate into an incorrect design from which it may be difficult and costly to step back from.

268. In summary, an explanation of how a clinical area will be used best comes from the clinical team who will be using it. The infection control team can then explain the potential infection risks that could be encountered, highlighting known risks from other projects or current infection control guidance. The design team then take this information and create a design that designs out the known and identified risks and doesn't inadvertently design in clinical risks to the best of their ability. The project team co-ordinates the process, assessing that what is built aligns with best practice and current technical guidance, through liaising with the construction company or subcontractors, with the independent support of authorising engineers and identifies areas for clarification and may escalate those to NHS Scotland Assure to adjudicate.

269. There could have been more scrutiny during critical system commissioning but a variety of NHS stakeholders were unaware of this happening or the implications of any information being generated. Had IPCT had more visibility of that data and process then there might have been earlier opportunity to explain the relevance of the data to timely completion of the Stage 4 HAI Scribe – which was not signed off in July 2019. That said, SHFN 30 Part A and Part B are comprehensive NSS documents that explain the multidisciplinary nature and timing of the HAI Scribe assessment process and it is clear that IPCT are not the lead agency but provide an advisory role (Part B section 2.9 p18). Ideally it should be the estates team or project team that take the lead role in HAI Scribe completion with input from IPCT. Clear and visible record keeping throughout the project of why decisions have been made, and based on what available information, would help with continuity when project team members change which they inevitably do for

various reasons during a long, protracted project.

270. There was a change as to the level of IPCT involvement sought by the project team from around June/July 2019 as the implications of the extent of the non-compliances in ventilation and water systems became more apparent. Between March and July 2019, it did feel like IPCT involvement was more valued by the NHSL Executive Directors than the Project Team. IPCT were perhaps perceived as holding things up and at risk of derailing the project timelines. Once the IMT, subsequently renamed as the ESG, was set up and the water and ventilation workstreams began from July 2019, I had more of a feeling that we were all working together with a common goal.

271. I have been asked whether the Critical Care issue could have been avoided had IPCT been more involved at any particular stage and, if so, to describe how and when. In this particular Project, the answer is probably no because nobody in NHSL knew there was an error in the Environmental Matrix. I also understand the engineers designing the hospital, TUV SUD / Wallace Whittle, consider all rooms in critical care (other than isolation rooms) only require 6 ac/hr in order to comply with Guidance SHTM 03-01. For that reason, it seems unlikely that they would have ever proposed a derogation from 10 ac/hr and sought IPCT input given they did not think critical care required 10 ac/hr in the first place. I believe it was the reduction in air change rate from 10 to 4 ac/hr that was the key deviation that was making the clinical environment unsafe in critical care but other design deviations like the installation of opening windows were also a concern.

272. In subsequent capital projects for NHSL, experienced IPCNs and IPCD have participated in multidisciplinary room data sheet review meetings at the design stage to utilise both perspectives and wider skill mix. Had that model occurred in the design stage of the RHCYP/DCN project then I believe issues where room ventilation provision doesn't align with room purpose would have been more likely to be detected and corrected prior to building. However, as above, that does not mean the specific issue regarding the air change rate in critical care (or other engineering issues) could or should have been picked up in the Project had IPCT been more involved, because of the engineer's belief that 6 ac/hr was compliant with SHTM 03-01. It should not be for IPCT or clinicians to go through

each and every RDS (or an Environmental Matrix) to check for non-compliances. That is just not their role or always within their professional expertise, and nor should it be. IPCT practitioners won't know off the top of their head what each space in a building should have in terms of air change rates and would themselves need to consult with Guidance and/or HFS/HPS (now NHS Scotland Assure) on technical issues.

273. Clinicians generally do not know how to design and build ventilation systems but they do know how to use the areas that are served and can communicate that to the designer. Since the Covid 19 pandemic awareness of safe room ventilation parameters has increased among clinical teams but it is quickly forgotten when teams have a high turnover of staff. Teams that have had their service disrupted by a ventilation system failure or RIDDOR event from a ventilation issue will tend to have more awareness of room ventilation design and parameters. In my view, the Guidance should be the starting point for everyone on the Project. If any party, be it the designer, contractor or a clinician, wishes to propose a derogation from Guidance, that should be flagged with IPCT (both IPCN and IPCD disciplines) for discussion but IPCT are not the decision maker who "approve," rather they provide an assessment of risk of infection from what is proposed in the same way that the fire officer would provide an assessment of fire risk. It is up to the project team to co-ordinate such discussions and include the project sponsor and collectively agree the way forward with regards to derogation. The earlier this is done the better.

274. Generally though, as I've said before, clinical teams may not often know the design guidance or what is considered best practice but they will be enthusiastic about doing something differently, that they perceive to be quality improvement, without necessarily realising that it can't be done without appreciable corporate risk from non-compliance with design guidance or building standards for instance. A common example we experience are well intentioned plans to refurbish offices or bathrooms to become areas to perform clinical activity which may have an invasive component like insertion of a device through skin or minor surgery without appreciating that the area isn't large enough or doesn't have anywhere to wash hands or doesn't have sufficient supply fresh air for the number of people who will be in the room. Essentially it is identifying that the new

purpose doesn't align with the old environment and the environment needs changed too. IPCT can then be perceived as delaying progress when all we are doing is trying to prevent poor outcomes or harms and explain that if there is predictable infection risk then there is also corporate risk to address. With regards to the signing of SA1 and handover of the building I do think that if IPCT had been consulted it would have been flagged that due process as outlined in HAI Scribe was not being followed as completion of the HAI Scribe process is now such a fundamental part of the IPCT job. It would not have corrected the issues but may have reduced adverse impact on NHSL.

275. I do not think that the Critical Care issue could have been avoided had IPCT taken a different approach during discussions in respect of general wards and Haematology/Oncology ventilation provision. When there was IPCT awareness of the reduction of mechanical supply to general wards it was in the context of there being additional natural supply from opening windows and so it was perceived that there would still be the advised 6 air changes overall (4 mechanical and 2 natural) and it would still function as a general ward. With Lochranza ward, IPCT were asked to advise how the installed ward ventilation system could be aligned to clinical needs of neutropenic patients once it was realised that the 4 bedded rooms and single rooms met the criteria of a general ward and only the PPVL isolation rooms met criteria for neutropenic patients. That was a manageable infection risk because not all the inpatients on that ward required the protective measures of a neutropenic patient and fortuitously the 5 isolation rooms provided appropriate ventilation for that purpose. Lochranza could still function as a haematology/oncology ward. I believe critical care was also past a point when the extensive changes needed to comply with SHTM 03-01 could be implemented, at the point of discovery of the non-compliance in Lochranza, as I understand that the AHUs were not powerful enough to deliver the optimal 10 air changes per hour to all clinical areas of the critical care unit. The difference with PICU was that all bedspaces were expected to meet the same criteria of 10 ac/hr to be considered optimally safe for the activities that would take place in them but only the PPVL isolation rooms were designed to that standard. The remainder (and majority) of bedspaces, as built, had greater risk of exposures to respiratory viruses for patients and staff during periods when the number of admissions with respiratory viral infections leading to respiratory failure exceeded 4 (the number

of isolation rooms). This avoidable hazard had been designing into the unit by nature of the low air change rates to 4 bedded rooms and single rooms. The design that involved a component of natural ventilation in single rooms was also non-compliant with best practice in the health building note for designing critical care units HBN 04-02 and not just SHTM 03-01. It suggests to me that the designer did not understand that the environment required all bedspaces in PICU (critical care) to have higher ventilation delivery, through mechanical supply, than a general ward and that a general ward and an intensive care unit have different functions and different environmental conditions. Bedspaces in an intensive care unit are served by a critical ventilation system in its entirety and a general ward is not. It would be difficult to derogate from that position and still consider all the bedspaces to be suitable for the full range of critical care activities. What had been built from the ventilation strategy appeared to be a 4 bedded intensive care unit (composed entirely of 4 PPVL isolation rooms) within a 20 bedded general ward footprint. NHSL was anticipating a fully functional 24 bedded critical care area. The PICU design was changed to align with the ventilation strategy (and windows) of a general ward without challenge because NHSL were unaware that it had been changed until after it was already installed.

276. I do not have any concerns about the extent to which issues with building systems in general were addressed and resolved prior to the hospital opening to patients in 2021. There was much more comprehensive testing and assessment of the performance of systems before patients were allowed to occupy it.

Future Role of IPCT

277. I refer to my comments at paragraphs 68 above. I have been asked how IPCT involvement can be improved and encouraged for future projects for the rebuilding of healthcare environments. I would reiterate that there simply aren't enough experienced staff (nursing or medical) with generic IPCT skills plus additional specialist training in the issues around the built environment to perform at the level that seems to now be expected by NHS Scotland Assure.

278. The NHS Scotland Assure Key Stage Assurance Review (KSAR) Workbook for instance requires the health boards who are submitting a project for review to

demonstrate IPCT involvement. For an IPCD this would require submission of:

- Evidence of qualifications held (without stipulating what qualifications are required)
- Previous experience supporting new build projects (making it hard for built environment projects to be taken on by newly appointed consultant microbiologists in an IPCD role)
- Produce evidence such as risk assessments of reviews of derogations and satisfaction that there is no impact on patient safety (it doesn't recognise that IPCT staff are only qualified to comment on infection risk rather than the entirety of patient safety and this activity takes substantial time to deliver comprehensively)
- Perform walk round audits during the construction phase (it's unclear what the perceived added benefit is of having a doctor and nurse do this role, which is essentially that of a clerk of works, when nurse staffing may be too low to provide safe nurse staffing on wards and there may be insufficient microbiologists to provide anything other than essential microbiology laboratory and clinical liaison services)
- Provide evidence that fixtures and fittings do not represent infection risks. (Traditionally this was previously all that was generally expected of IPCT in a building project and aligns best with the training and skills that IPCNs will bring to a project.)

279. In general, the time required to do this for one project is substantial and hard to deliver if the IPCD only has one or two programmed activities per week in their job plan (which also must be used to deliver all other aspects of the IPCD role that don't involve the built environment). If there is more than one project in progress at any time (as there is in NHS Lothian) then there just aren't staff who meet the required criteria to be involved or staff who can offer the time involved. In 2023, I have been asked to contribute to 20 different building projects within NHS Lothian many of which are refurbishments and a smaller number of capital projects with at least 3 that have been passing through the KSAR process requiring my input as our LIPCD with four less consultants providing IPCD sessions than were in post in 2022. In addition, NHS Scotland Assure regularly

request IPCD input to review their new literature reviews or draft guidance documents which are time consuming activities. These are done through good will but rarely seem to lead to changes in policy or guidance. An example of the resource impacts of this is a request to review information to inform national policy on respiratory protective equipment in November 2023 where IPCDs were issued with over 900 pages of information to process and give informed comments on.

280. The attrition in IPCT, microbiology and the broader group of experienced NHS staff through retirement and dissatisfaction post pandemic is alarming and continues each month. IPCT needs to be much better resourced and incentivised across the UK and there needs to be much more accessible training so that the disconnect between expectation and actual training, skill mix and competence doesn't persist. The role of IPCD needs to be much better defined and clear differentiation made as to what is the role and competence of a medical microbiologist alone, what is the role and competence of an IPCD (who is not necessarily a medical microbiologist) and where that IPCD role stops and what is better delivered by the role of an Authorising Engineer or a clerk of works, particularly in relation to issues of technical compliance which are much more clearly aligned with the skill mix of the authorising engineers.

281. Part of this problem is that "IPC" has been used in a generic sense but there are very few IPCTs who are particularly experienced in the built environment. Most IPCTs do not have the experience because they've never been involved in designing or commissioning a hospital before. There is disparity across the country of health boards' access to experienced IPCT staff or even qualified IPCT staff which is getting worse. At least one Scottish mainland health board had no IPCD at the end of 2023 and some island boards share the resource with a mainland board. I do not think that all IPCTs should necessarily have someone who specialises in the built environment, that is not feasible. As above, the focus should not be on training IPCT staff for involvement in assessing compliance with technical standards but more about the role of a clerk of works, the Authorising Engineers and that of specialist technical bodies such at NHS Scotland Assure. IPCT would continue to have a role in assessing risk of infection for their health board and require a more rudimentary understanding of principles to apply in a

multistakeholder discussion. Strangely a historical version of Scottish Health Facilities Note 30: version 3 " Infection Control in the Built Environment: Design and Planning" (published 2007) **(A33662182 - Scottish Health Facilities Note 30 Part 1 - Infection Control in the Built Environment Design and Planning – dated June 2007 – Bundle 13 - Volume 3 - Page 553)** was much less ambiguous regarding the role of IPCT in building projects with clear examples and lists of tasks to cover and a clearer description of IPCT role and skills in a Project Team and roles at different stages of the project than the current version from 2014 which now attributes many of these roles to the Project Team without them being explicitly within the remit of IPCT members.

282. It is a dangerous mistake to expect from IPCT the knowledge and skills that align with that of an Authorising Engineer or to attribute to medical microbiologists' knowledge and skills that relate to environmental or public health microbiology or microbial ecologists and expect them to perform faultlessly in an area they are not trained in. Compliance issues are in my opinion the remit of an experienced clerk of works and the Authorising Engineers. It may be that had the Authorising Engineers for water and ventilation been fully informed of what was happening they could have identified the ramifications earlier and flagged them with the project team and IPCT. The Authorising Engineers would identify a non-compliance and the IPCT should assess the risk it poses to patient safety from infection. If further input is required, then the Project Team can flag it with NHS Scotland Assure. Both need to work together to achieve a comprehensive risk assessment. Neither has the complete skill mix to do it alone. Perhaps the answer is also that Authorising Engineers should participate in the design stage and the role of a clerk of works needs to be explored. I understand though that NHSL did have Mott MacDonald attending meetings in a technical advisory role.

NHS Scotland Assure Role

283. I do not think that NHS Scotland Assure and the corresponding Key Stage Assurance Reviews will substantially assist in improving health boards' IPCTs involvement in new build projects. Quite simply there aren't enough people in IPCT teams to be involved to the level that NHS Scotland Assure expect or to retrain to demonstrate competences that are now expected for involvement in

such projects. Ironically, NHS Scotland Assure has generated some of that problem as experienced IPCNs have left health boards to fill posts in NHS Scotland Assure. My experience so far of NHS Scotland Assure is that it has increased my workload (through issuing of numerous draft documents for review by IPCDs, IPCNs and ICMs) not diminished it and it takes an excessive amount of time to receive a comprehensive answer that addresses the specific points of a question if a question is submitted. I have experienced that the Key Stage Assurance Review process delays projects unnecessarily.

284. To ensure IPCN and IPCD involvement is guaranteed to a sufficient degree for each building project, each health board would need to significantly expand their IPCN and IPCD capacity and have sufficient time allocated to them to be adequately trained and then time allocated for each building project either as part of their job description or with backfill to cover their other duties for the duration of the project. Another way would be standardise the designs for healthcare buildings and agree room data sheets so that at least at the design stage there is already a “once for Scotland” agreed design for all commonly encountered clinical areas. A dedicated IPCN and IPCD both need to be core members of the Project Team as they have different skill sets that they bring to assessment of HAI risk.

285. IPCNs generally come into infection prevention and control with experience and training of delivering care to patients (personal hygiene, environmental cleanliness assessment, optimal invasive device care and management) and often have had a senior nursing role in the running of a ward or and are familiar with processes for procurement, audits and inspections, liaison with domestic services and estates colleagues for repairs or cleaning as well as understanding the complex logistics of keeping wards running when needing to contain infections. IPCDs usually come to the role with some aspect of laboratory training and are more able to provide correct interpretation of laboratory results, arrange further testing of micro-organisms, liaise with reference laboratories or other infection related specialties (such as public health), have experience as prescribers and are more familiar with antimicrobial safe prescribing and antimicrobial stewardship, are involved in diagnosis and management of complex infections on a daily basis and are more likely to be tasked with leading incident

management teams and co-ordinating outbreak investigations for example.

286. There also needs to be clear understanding of what the role of an IPCT representative is and ensure the person doing that role can demonstrate competence and training to do so as an independent practitioner but also be clear that rubber stamping compliance with technical engineering guidance is not the IPCT role. The IPCT role is, in my opinion, to explain whether a design or actual building could facilitate transmission of infection and explain what measures need to be taken to prevent or mitigate that hazard.

Guidance

287. One further issue that may have contributed to the issues is the nature and interpretation of Guidance. Clearly, healthcare Guidance can be misinterpreted by people not familiar with the delivery of healthcare. In my view, it is fairly clear from SHTM 03-01, appendix 1, Table A that all bedspaces of critical care require 10 ac/hr although that interpretation was not shared by those who designed and installed the original ventilation to PICU. The presence of internal inconsistencies in some SHTMs or cross referencing to other guidance documents that lead back to the document you started with is not helpful in removing potential ambiguity.

288. But there are other aspects of the Guidance that can be open to different interpretations where guidance in Scotland has lagged behind that in other parts of the UK, for example differences between SHTM 04-01 and HTM 04-01 with regards to resolving *Pseudomonas aeruginosa* issues in healthcare water.

289. The Guidance is not fully comprehensive in that it does not cover every possible scenario for ventilation. For example, even with positive pressure isolated lobby single rooms (PPVL), there are caveats. A PPVL is able to provide either source or protective isolation. With a PPVL isolation room, you can provide protective isolation to a patient because there's a positive pressure air barrier between the bedroom and corridor and the air can be filtered to be ultra clean so the environment in the bedroom is protecting the patient form breathing in anything outside the room. But equally there's a negative cascade in the room because you're pumping air into the room and pulling it out through the en-suite toilet.

290. However, the PPVL room design is still not considered the safest for high consequence infectious disease and if you did have someone with HCID there are some caveats like the exhaust air from the toilet needs to be HEPA filtered or discharged at a certain height form the building so you don't discharge pathogens to the outside atmosphere and be at risk of them being drawn in to a window a few metres or so down the corridor and inhaled.

291. In Scotland, since 2008, the default design is a PPVL isolation room (as per SHPN 04 Suppl 1) but there isn't actually a design for a negative pressure isolation room in the Guidance. The English equivalent of this document is HBN 04-01 Suppl 1 which was updated and published in 2013 but there is still not prescriptive design guidance for a negative pressure isolation room in that either. I think this is relevant because NHSL decided during the remedial works phase (i.e. post July 2019) that for future proofing we should change one of the isolation rooms in the PICU to a negative pressure room. There was no Guidance in Scotland we could use. The design that we did end up using was based partly on Australian Guidance. So, while the Guidance is extremely important, strict adherence would not be workable. There needs to be scope to respond to different clinical scenarios, which will be specific to particular health boards and the patients they are likely to encounter.

292. To the best of my knowledge, the hospital was safe to accept patients at each of its eventual phased openings.

Declaration

293. I believe that the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

Scottish Hospitals Inquiry

Witness Statement of

Matthew Templeton

Introduction and Brief Background

1. I am currently employed by Dalmore Capital Limited (“Dalmore”). Dalmore is an independent fund management company that acquires, manages and holds infrastructure assets to deliver long term value for investors. Dalmore invests in a number of different privately financed infrastructure projects across the UK. One of the projects that Dalmore has invested in is the Royal Hospital for Children and Young People and Department for Clinical Neurosciences, Edinburgh ("RHCYP/DCN" or the “Project”).

2. I joined Dalmore in January 2019. Upon joining Dalmore, I became a director in their Social Infrastructure team where I am responsible for the asset management of a number of Dalmore’s PPP investments. Part of my responsibilities at Dalmore involves taking on directorship roles in the project companies on some of the privately financed projects that Dalmore has invested in. Responsibilities as a director on these assets, in addition to the fiduciary duties, include the following (although this is not an exhaustive list): annual budgeting and business planning oversight and review; monitoring financial performance on an ongoing basis, including review and approval of annual accounts, annual reports and dividend payments; oversight of any material legal disputes; ensuring the continued going concern of the business; and ensuring the appropriateness of the health and safety policies and procedures.

3. I became a director of IHS Lothian Limited (“IHSL”) on 15 January 2019. I am still a director of IHSL. IHSL is the special purpose vehicle (“SPV”) or sometimes referred to as the Project Company (“Project Co”) on the Project. The Project was procured by NHS Lothian (“NHSL”) using the Scottish

Government's non-profit distributing ("NPD") model. The NPD model was developed and introduced by the Scottish Government as an alternative to the traditional private finance initiative ("PFI") or Public Private Partnership ("PPP") model. The NPD procurement model (which has itself now been superseded) replaced the original PFI/PPP procurement model in Scotland.

4. By the time I joined Dalmore at the start of 2019, I had already been involved in the Project for around one year, from the start of 2018 onwards. Prior to joining Dalmore, I was an independent consultant working through my own consultancy business which I started in around 2014. I had been a consultant on the Alder Hey Children's hospital project (and before that I had been a board director for the Alder Hey SPV) and through that project I was introduced to a company called HCP. HCP (which is now known as Vercity) provides SPV management services to many different SPVs on different PFI/PPP projects in the UK, and I provided consultancy services to a few of those projects. HCP provided management services to IHSL on the Project pursuant to a Management Services Agreement (or "MSA"). HCP provided those management services as MSA provider to IHSL up until around 2019 (thereafter, a company called George Street was appointed to provide those management services).

5. I was brought on to the Project by HCP at the start of 2018 and I acted as a consultant engaged by HCP, although reported to and took instruction from the IHSL board of directors throughout 2018. HCP had been involved in the Project providing MSA services to IHSL from Financial Close, through construction and into the early stages of project operations up to November 2019.

6. I hold a BEng (Hons) in Civil and Transportation Engineering and an MBA from Edinburgh University Business School.

7. In my current role at Dalmore, I am also on the board of directors of SPVs on other hospital PFI/PPP projects as well as being a director for IHSL in relation to the RHCYP/DCN.

8. On PFI/PPP projects, the regular on-going operational services and financial management activities are undertaken on behalf of the SPV by the MSA provider. The SPV board itself does not carry out those day-to-day activities itself – the MSA provider does so on the board's behalf.

9. I give this statement in connection with my involvement with IHSL and the RHCYP/DCN.

10. The Inquiry legal team contacted IHSL's legal advisers on 13 November 2023 and invited IHSL to address the following limited issues (quoting from the Inquiry legal team's e-mail):

Settlement and Supplemental Agreement 1 (SA1)

11. Who drafted the agreed resolutions to the disputes over ventilation for four-bed and single rooms? Were the terms subject to negotiation or revision? Were they drafted under pressure of time?

12. Why did the agreed resolutions make provision for air change rates at all: NHSL's summons was concerned with the pressure cascades from multi-bed rooms and made no reference to air change rates?

13. The settlement agreement resulted in the certificate of practical completion being issued. It also triggered payment of the service charge. Why was this agreed to? NHSL started paying the monthly service charge when it was not in occupation of the hospital. Was this an issue that arose through the contract structure/financing mechanism?

Issues After Financial Close which CPs Contend Shed Light on the Evidence to Date

14. Ken Hall and Graeme Greer corresponded by e-mail on 26 May, 15 June and 22 July 2015 in terms indicating that both parties (through Multiplex

and Mott MacDonald) were proceeding on the understanding that the EM was only RDD to the extent of NHSL's 7 comments from the meeting of 11 November 2014, which were subsequently included in section 5 of Schedule Part 6 to the Project Agreement.

15. The design of the ventilation system – including AC, ductwork, air handling units and plant space being necessary to supply the AC number – was reviewed by NHSL and Mott MacDonald, including (i) during the RDD process, where NHSL's requirement for 4 ac/hr in Critical Care bedrooms was confirmed; (ii) during discussions in relation to the pressure regime for the multi bed wards, where in an e-mail of 18 April 2018 NHSL stated that they were "seeking a design for 4AC for all 14 rooms" – which included the multi-bed wards in Critical Care, and (iii) in the Settlement Agreement between NHSL and IHSL dated 22 February 2019.

16. After the agreed approach to the number of air changes per hour in Critical Care (HDUs) was questioned by IOM in IOM's first issues log, circulated by Brian Currie on 25 June 2019, NHSL approached IHSL to undertake additional work to achieve 10AC in Critical Care on the basis that this would be a Change in accordance with Schedule Part 16 (Change Protocol) to the Project Agreement.

17. Stewart McKechnie of TUV-SUD/Wallace Whittle referred in his evidence to having clarified that the rooms treated with 10AC and 10 pascals of pressure was a correct interpretation.

18. The Inquiry legal team also invited IHSL's response on certain matters raised in Mott MacDonald's closing submission, namely:

19. The alteration to Guidance Note 15 of the Environmental Matrix to make it reference isolation rooms only.

20. E-mails from 2016 which MML contends are relevant to understanding the evidence to date.

21. The January 2019 correspondence between Brian Currie and Wallace Weir of HCP.

22. Further correspondence between Brian Currie and Wallace Weir dated February and March 2019; and

23. What steps (if any) were NHSL taking to verify compliance with guidance? Were NHSL placing reliance on IHSL and the Independent Tester to ensure compliance, without any further verification by the health board?

24. I am unable to address all of the specific issues raised by the Inquiry. I cannot address the following issues: the correspondence between Multiplex and Mott MacDonald in 2016 (referred to in paragraph 14 above) as I was not involved in the Project at the relevant time; Mr McKechnie's interpretation of the guidance or ventilation requirements (referred to in paragraph 17 above); the alteration to Guidance Note 15 of the Environmental Matrix (referred to in paragraph 19 above) or the e-mails from 2016 (referred to in paragraph 20) as I was not involved in the Project at the relevant time.

25. In this statement, I limit my response to the following topics raised by the Inquiry legal team:

a) Those issues identified at paragraph 11 to 13 and 15. I have addressed those issues in this statement under the heading 'Settlement and Supplemental Agreement No.1 ("SA1")'. That section focusses on the parties' discussions from early 2018 around the ventilation in single bedrooms and the 4-bed rooms in the RHCYP/DCN and the drafting of the Agreed Resolution contained in SA1 (which was executed in February 2019). I also address my understanding of the 2019 correspondence between Brian Currie and Wallace Weir (referred to in paragraphs 21 and

22 above) under that of this statement although I was not directly involved in that correspondence.

b) NHSL's Change instruction to IHSL to carry out additional work in Critical Care and other areas (referred to in paragraph 16). I have addressed those issues in this statement under the heading 'Supplemental Agreement No.2 ("SA2")' which was entered into between NHSL and IHSL on 5 August 2020. SA2 implemented NHSL's High Value Change 107 ("HVC 107") which was issued by NHSL pursuant to the change provisions of the Project Agreement. NHSL issued HVC 107 following the issue of reports from the Institute of Occupational Medicine ("IOM") in June 2019 and the Scottish Government's decision to delay opening the RCHYP/DCN in July 2019.

26. Throughout this statement, I refer to certain exhibits in the form "MT1", "MT2", etc. Copies of these exhibits, ordered in accordance with that numbering system, are attached to my statement.

27. Insofar as the matters set out within this statement are within my own knowledge, I believe they are true. Insofar as they are not within my own knowledge, they are true to the best of my knowledge and belief.

Settlement and Supplemental Agreement (SA1)

28. I set out my comments in this section 2 of my witness statement on the parties' discussions regarding the Agreed Resolution in SA1.

29. My comments are necessarily focussed upon the specific issues around SA1 which IHSL have been invited to address by the Inquiry's legal team. There is the risk, however, that by limiting my comments to those specific issues that they do not fairly or accurately convey the challenges and the complexities involved in the parties' discussions to conclude SA1 or the complex technical issues that were resolved in SA1.

30. The discussions on SA1 encompassed technical resolutions for various technical issues which had arisen on the Project. However, given the length of time it took to conclude SA1, the "driving" technical issues changed through the passage of time as some issues were resolved through the course of the discussions and others came to light. At the outset of the discussions around March/April 2018, the key technical issues to be addressed were the 4-bed ventilation issue and other alleged issues which formed a list of 81 items in a List of Disputed Items **(A46409292 - Appendix 65 – Technical Schedule – Bundle 13, Volume 2 – Page 1308)**. However, Multiplex had undertaken the works to implement the 4-bed ventilation resolution and to resolve many of the other 80 disputed items at its own risk throughout the summer period of 2018. Those items had largely been resolved by September/October 2018; the drafting of the Agreed Resolution to be included in SA1 addressing those issues was agreed; and those 'original issues' no longer formed a significant part of the parties' discussions to conclude SA1 as they had been overtaken by other issues.

31. By September 2018 it was a different list of issues and different key NHSL's concerns that became the critical issues for settlement namely: drainage, void detection works, heater batteries and a list of 34 additional material items that NHSL had produced in the summer of 2018. A number of Technical Workshops were held throughout the second half of 2018 attended by all the relevant parties to try and reach a resolution of those technical issues on the different list.

32. In addition to the technical resolutions, the discussions around SA1 also involved complex commercial, legal and financing issues. The proposed resolutions also had contractual implications for the existing terms of the Project Agreement, Construction Contract, the Services Agreement (with BYES) and the finance agreements.

33. The discussions on SA1 also involved various different parties. The principal parties engaged in those discussions were NHSL, IHSL and Multiplex. Given the NPD model structure and IHSL's role as SPV on the Project, IHSL were

appointed as Project Co by NHSL under the Project Agreement and had appointed Multiplex downstream as the design and build contractor under the Construction Contract. IHSL's role was often a facilitative one, seeking to reach resolution on issues which were largely disputed between NHSL and Multiplex. IHSL had to ensure that any agreements it reached with NHSL upstream were similarly agreed by Multiplex downstream. Multiplex were also engaged in its own downstream dialogue with its own supply chain (e.g. its sub-contractors and design sub-consultants). When NHSL and IHSL entered into SA1 pursuant to the Project Agreement, IHSL and Multiplex entered into an equivalent settlement agreement pursuant to the Construction Contract which had been negotiated in tandem with SA1.

34. Other parties were also involved in the discussions around SA1. NHSL's Technical Advisers, Mott MacDonald Limited, were heavily involved in the discussions. IHSL's lenders were also heavily engaged in the discussions. IHSL was the SPV on the Project with lenders providing senior debt to finance the Project. IHSL was unable to enter into any commercial agreements with NHSL upstream or Multiplex downstream without the Lenders' prior consent.

35. The Independent Tester and the Lender's Technical Advisers were also involved at times in the discussions. Because of the significant legal and commercial issues involved the parties' respective legal advisers were involved in the discussions. Scottish Futures Trust were also engaged at certain times, in order to facilitate the parties' discussions at key moments and offering valuable assistance when matters reached an impasse. NHSL also had to submit a business case to the Scottish Government to be able to agree the terms of SA1.

36. The complexity of the discussions is perhaps demonstrated by the length of time that it took for parties to reach a concluded settlement. The parties had agreed in March 2018 to pursue commercial settlement discussions to try and resolve the disputed issues. I issued draft Heads of Terms for a settlement agreement in April 2018 with parties' expectations being that a settlement could be concluded shortly thereafter. In the event, however, the parties' discussions

continued throughout the rest of 2018 and into early 2019. SA1 was executed on 22 February 2019. It took just short of one year for SA1 to be agreed and concluded. The Certificate of Practical Completion **(A35384790 – Commissioning Completion Certificate from Arcadis on Re-provision of RHSC and DCN – 22 February 2019 – Bundle 4 – Page 222)** was issued by the Independent Tester that same day (approximately 18-19 months after the Completion Date envisaged under the Project Agreement).

37. The Inquiry legal team have specifically invited IHSL to address the following specific questions regarding SA1:

    i. Who drafted the agreed resolutions to the disputes over ventilation for four-bed and single rooms?
    II. Were the terms subject to negotiation or revision?
    III. Were they drafted under pressure of time?
    IV. Why did the agreed resolutions make provision for air change rates at all?
    V. The settlement agreement resulted in the certificate of practical completion being issued. It also triggered payment of the service charge. Why was this agreed to? NHSL started paying the monthly service charge when it was not in occupation of the hospital. Was this an issue that arose through the contract structure/financing mechanism?

38. Notwithstanding the complexities involved in concluding SA1 which I've tried to convey in the paragraphs above, the facts around the ventilation issues and how they came to be resolved in SA1 are capable of being explained very simply.

39. The issues regarding the ventilation in single bedrooms and in 4-bed rooms (sometimes referred to as multi-bed rooms because some of the rooms consisted of 3-bed bays, not 4) had been in dispute for some time between NHSL and Multiplex when in March 2018 NHSL threatened to raise legal proceedings seeking a court order compelling IHSL to design the ventilation system in the 4-bed rooms that NHSL wanted. Following dialogue, the parties agreed to pursue commercial settlement discussions to resolve the issues rather than pursuing formal dispute proceedings. The dispute regarding the ventilation in the 4-bed

rooms concerned the pressure regime in the rooms. NHSL wanted the 4-bed rooms designed with balanced/negative pressure relative to the adjacent corridor whereas Multiplex's understanding of the contract requirements was that rooms required to be designed having positive pressure and had constructed the spaces to this specification. The air change rates in the 4-bed rooms were not in dispute. The Environmental Matrix provided an air change rate of 4 air changes per hour.

40. NHSL had set out in the draft summons (and in the affidavit evidence which accompanied the summons) its clinical case for requiring all the multi-bed rooms to be balanced/negative to the adjacent corridor. NHSL's position was based on its clinical requirements and how it intended to use those rooms for the treatment of patients. NHSL wished to cohort infectious patients in the multi-bed wards and the negative/balanced pressure regime was required, NHSL said, to control the spread of infection.

41. In March 2018, Multiplex proposed three different options for addressing the 4-bed ventilation issue. NHSL agreed (although originally insisting that all 20 No. 4-bed rooms should have negative/balanced pressure, which was Multiplex's proposed Option 3) that the ventilation in 14 No. 4-bed rooms would be balanced/negative pressure at 4 ac/hr (the remaining six numbered 4-bed rooms being unchanged i.e. as-built at the time), which was Multiplex's proposed Option 2. Jim Crombie and Susan Goldsmith agreed they wanted Multiplex's proposed Option 2 at a meeting on 28 March. On 29 March Multiplex confirmed its understanding from the meeting of 28 March that NHSL wanted Option 2. That was when NHSL effectively instructed IHSL and, in turn, Multiplex to implement the 14 no. multi-bed rooms at 4 ac/hr with balanced/negative pressure relative to the adjacent corridor.

42. The first draft of the Technical Schedule containing the Agreed Resolution for the list of 81 items – including the 4-bed ventilation and single bedroom issues - was issued by NHSL's Brian Currie on 22 June 2018 **(A33393733 – NHSL Letter to IHSL 220618_Tech Schedule – 22 June 2018 - Bundle 13, Volume 9 – Page 5)**. I don't know who prepared the Technical Schedule for NHSL. Mott MacDonald

were NHSL's Technical Adviser on the Project, but NHSL were supported by a team of in-house engineers/NHS Estates professionals. That first draft of the Technical Schedule contained the description of the Agreed Resolution for 14 No. 4-bed rooms (including those in Critical Care) as being balanced/negative pressure at 4 ac/hr.

43. The draft Technical Schedule issued by NHSL in June 2018 **(A33393733 – NHSL Letter to IHSL 220618_Tech Schedule – 22 June 2018 - Bundle 13, Volume 9 – Page 5)** reflected what NHSL and Multiplex had already agreed in terms of the resolutions for the ventilation issues. In fact, Multiplex had already commenced the 4-bed ventilation works (those works commenced in May 2018) by the date NHSL issued the draft Technical Schedule. When the first draft of the Technical Schedule was issued by NHSL, therefore, it simply reflected a resolution which had previously been agreed between NHSL and Multiplex and which was already being reconstructed by Multiplex.

44. The Technical Schedule which listed the 81 disputed items **(A46409292 - Appendix 65 A – Technical Schedule – Bundle 13, Volume 2 – Page 1308)** was subject to revision and discussion between the parties throughout 2018. However, it had largely been agreed and finalised by September 2018, at which point the parties' discussions were focussed upon the technical issues appearing on NHSL's different list of issues.

45. The works in relation to the 4-bed ventilation revising the pressure regime from positive to negative/balanced in the 14 agreed rooms had been completed by Multiplex at their own risk by around September/October 2018. The discussions on SA1 were still heavily underway at that time and still had another 5-6 months to run before being concluded in February 2019.

46. There were undoubtedly times during the parties' discussions on SA1 when they were working under particular pressures and challenges. That pressure arose mainly from September 2018 onwards because parties had targeted Actual Completion for 31 October 2018 (the last date that NHSL would accept the

hospital in 2018 prior to winter pressures) and IHSL and Multiplex were working hard to meet that date.

47. By March 2018 the Project was approximately 8 months beyond the Completion Date defined in the Project Agreement and Completion couldn't be certified until the disputed issues had been resolved. In that sense, therefore, there were clearly pressures on the parties to get matters resolved. NHSL's threat of legal proceedings in March 2018 did escalate matters significantly and led parties to prioritise engagement to resolve the disputes. Although there were those general time pressures given the extent of delay on the Project and the significance of resolving the disputes to achieve Completion, the Agreed Resolutions in the Technical Schedule themselves were not drafted under pressure of time. On the contrary, the Agreed Resolutions had been discussed at length and were properly considered regardless of the background time pressures caused by the Project delay. The Agreed Resolutions for the 4-bed ventilation and single bedroom ventilation were agreed and constructed by September 2018 whilst the discussions on SA1 continued. The ventilation issues were effectively closed off and barely featured in the parties' discussions from September 2018 through to February 2019. If anything, the criticisms to be levelled at the discussions were that they took too long to complete (not that they were rushed).

48. I set out more detailed comments in the following paragraphs.

The Period from January 2018 to March 2018

49. When I started on the Project in early 2018, I quickly became aware that there were significant issues of difference between NHSL and Multiplex. One of those disputed issues related to the ventilation in the 4-bed rooms of the RHCYP/DCN.

50. One of the early tasks I undertook on the Project, in March 2018, was to review the relevant correspondence and positions advanced by NHSL and Multiplex on the 4-bed ventilation issue and to give the IHSL board of directors my views. The IHSL directors involved on the Project at that time included Andy Clapp of Dalmore, Richard Osborne of Macquarie and Tony Rose of Scottish Futures

Trust. Tony was the Public Interest Director ("PID") for IHSL at that time. I would refer the Inquiry to IHSL's paper prepared for the Inquiry dated 22 July 2021 **(A45180065 – Appendix to IHSL Response to PPP7 – Bundle 13, Volume 9 – Page 6)** which set out the structure of the parties and who was involved in the project (and when) in detail. The PID was a particular feature of the NPD model of procurement. A PID was appointed by the procuring authority, but nominated by the Scottish Futures Trust, to the board of the SPV in public projects procured using the NPD model. The PID at that time was a Scottish Futures Trust employee. The appointment of a PID was intended to represent the public's interest in the governance of the NPD structure which, in turn, was intended to increase transparency and accountability and to promote a more proactive and stable partnership between the public and private sectors on PFI/PPP-type infrastructure projects.

51. When I carried out that review of the 4-bed ventilation issue in early March 2018, I learned that the 4-bed ventilation issue had been on-going and discussed by the parties since 2016. The dispute concerned the pressure regime in the 4-bed rooms. NHSL wanted the pressure regime in all 4-bed rooms to be balanced/negative relative to the adjacent corridor. Multiplex understood the requirements for the pressure regime in the 4-bed rooms to be positive and had designed and built the ventilation accordingly. It was a long-standing issue and was clearly one that had been subject to detailed discussions between NHSL, IHSL and Multiplex. Both NHSL and Multiplex had obtained independent expert reports on the issue in late 2017. NHSL had obtained an expert report from a specialist mechanical and electrical engineer called David Rollason **(A33394885 – 3 November 2017 – David Rollason Report Final – Ventilation - Bundle 13, Volume 9 – Page 30)**. Multiplex had obtained an expert report from DSSR Consulting Engineers **(A36322651 – 4.2.24 G3062-DSSR-X-XX-RP-MEP-57001-Rev P3 - Bundle 13, Volume 9 – Page 73)**. Both NHSL and Multiplex had also obtained legal Opinions from leading QCs which supported their respective positions.

52. The issues around the 4-bed ventilation dispute were complex and I do not intend to address the parties' respective positions in this witness statement. The dispute involved (amongst other things): detailed analysis of the provisions of the Project Agreement between NHSL and IHSL; the room environmental requirements specified in the Environmental Matrix and its progress through the Reviewable Design Data procedure; whether a 4-bed room properly constituted a single bedroom or a ward (the guidance in Scottish Health Technical Memorandum SHTM 03-01 did not specifically recognise a 4-bed room as a defined area but referred to a general ward); the status and development of the Environmental Matrix; what relevance, if any, generic ADB sheets had to the Project; and ultimately whether what NHSL was asking for in terms of 4-bed ventilation constituted a change to the room requirements set out in the Project Agreement at Financial Close (entitling IHSL and, in turn, Multiplex to time and cost) or whether the Project Agreement already required it.

53. The 4-bed ventilation issue was not the only (or indeed the first) ventilation issue to have arisen on the Project. An earlier difference had arisen between NHSL and Multiplex in relation to the ventilation in the single bedrooms. This concerned the increase of dirty extract through the en suites and a mixed mode solution to achieve 6 ac/hr (mechanical ventilation at 4ac/hr supplemented by natural ventilation). The issues in the single bedrooms had been largely resolved by early 2018 although there were on-going discussions around the specific terms of the relevant change notices and derogation from guidance.

54. The main dispute between the parties by early 2018 concerned the ventilation in the 4-bed rooms. NHSL appeared to want the 4-bed rooms to be treated in the same way as single bedrooms. I am now aware through the work of the Inquiry of the e-mail correspondence between Brian Currie (NHSL) and Ian Storrar (HFS) in June 2016 (referred to by the Inquiry in its Provisional Position Paper 8 situated on the Inquiry website) when NHSL asked for advice on how HFS would interpret the application of the guidance to a 4-bed room and HFS advised that it would not be unreasonable to treat a multi-bed room as one would a single bedroom. I was not aware of that correspondence until this Inquiry. That correspondence may explain why NHSL applied the requirements for single

bedrooms to 4-bed rooms. Multiplex on the other hand considered that the requirements for a general ward applied to the multi-bed rooms.

55. By the time of my involvement in the Project in early 2018 the issue relating to the 4-bed ventilation had been on-going for over 18 months. Multiplex and its design sub-consultants, TUV Sud/Wallace Whittle, had made a number of technical proposals to NHSL throughout 2017 to the ventilation systems in the 4-bed rooms (sometimes referred to as the "multi-bed rooms") to achieve room balance. These proposals had been discussed at meetings between NHSL, Multiplex and TUV Sud/Wallace Whittle throughout 2017. IHSL and Multiplex had also made without prejudice proposals to try and resolve the issue. The crux of the dispute was whether that requirement for the pressure regime to be negative or balanced relative to the adjacent corridor was a Change under the Project Agreement (and, in turn, under the Construction Contract between IHSL and Multiplex). If it was a Change, it would have entitled IHSL and, in turn, Multiplex to time and cost relief for that Change. A change to the pressure regime in the (already constructed) ventilation system to the 4-bed rooms in the hospital would have involved a significant amount of design and construction work and considerable additional cost. Such significant works could not have been commenced by Multiplex until there was clarity around who was responsible for the issue. The matter of which party bore the time and cost consequences of the ventilation issue was therefore critically important.

56. The dispute regarding the ventilation in the 4-bed rooms related to the pressure regime in those rooms. The Environmental Matrix had provided for positive pressure relative to the en suite but was silent in relation to the pressure regime relative to the adjacent corridor. Multiplex had designed the ventilation system based on its understanding of the contract requirements so that the pressure regime in the 4-bed rooms was positive to the adjacent corridor. NHSL wanted the rooms designed so that the pressure regime was balanced or negative to the adjacent corridor. There was no dispute at that time that I was aware of around the relevant air change rates in the 4-bed rooms. The Environmental Matrix specified an air change rate of 4 ac/hr in the 4-bed rooms. The parties' independent experts had addressed the 4-bed ventilation dispute as being one

concerning the pressure regime (David Rollason's report specifically identified that he had not been instructed by NHSL to consider air change rates) **(A33394885 – 3 November 2017 – David Rollason Report Final – Ventilation - Bundle 13, Volume 9 – Page 30)**. Similarly, the parties' QCs' Opinions also addressed the dispute as being one concerning pressure regimes i.e. whether the pressure regime in the 4-bed rooms should be positive to the adjacent corridor or negative/balanced relative to the adjacent corridor.

57. Notwithstanding all the dialogue that had been undertaken between the parties throughout 2017 on their contractual positions, the procurement of independent expert reports, QCs' Opinions and the views offered by the Independent Tester, the issue of the ventilation pressure regime in the 4-bed rooms remained in dispute. NHSL's position for requiring the pressure regime to be balanced/negative to the adjacent corridor was ultimately based on its clinical case and its clinical requirements for the spaces.

58. NHSL, IHSL and Multiplex attended a facilitated workshop in February 2018 (which has also been referred at times to the 'mediation' or the 'Sheraton meeting') to discuss the 4-bed ventilation issue and the other disputed issues which remained unresolved at the time. The workshop resulted in draft proposals being issued by the facilitators (Richard Osborne and Tony Rose) to the parties to help resolve the disputed issues. Those proposals were issued to the parties for further discussion. Whilst I received a copy of the proposals, I was not in attendance at this meeting.

59. The dispute regarding the ventilation in the 4-bed rooms really came to a head in mid-March 2018. NHSL wrote to IHSL by letter dated 13 March 2018 stating that IHSL (in reality, Multiplex) had not confirmed that it intended to revise the ventilation system to the 4-bed rooms **(A47272786 – Letter from NHSL to IHSL dated – 13 March 2018 – Bundle 13, Volume 9 – Page 92)**. NHSL restated its position that the Project Agreement, Good Industry Practice (which was a defined term under the Project Agreement), and the Board's Construction Requirements all required the pressure regime in the 4-bed rooms to be negative/balanced to the adjacent corridor. NHSL stated in that letter that if they did not hear from IHSL

by Monday 19 March 2018 confirming its position NHSL would raise Court proceedings against IHSL seeking an interim order requiring IHSL to design the ventilation in all of the 20 relevant 4-bed rooms (including those in Critical Care) such that the design achieved a balanced/negative pressure regime relative to the adjacent corridor.

60. On 21 March 2018, Jim Crombie (Deputy Chief Executive of NHSL) wrote to IHSL stating that the ventilation in the multi-bed rooms was of critical importance to NHSL and required IHSL to confirm it would undertake what NHSL considered was the requisite ventilation works **(A47272785 – Letter from NHSL to IHSL dated 21 March 2018 - Bundle 13, Volume 9 – Page 96)**. Mr Crombie explained that to put any questions around NHSL's justification for its position beyond doubt, NHSL had shared a copy of the draft Court summons and supporting affidavit evidence which NHSL had prepared in contemplation of the court proceedings. NHSL advised that the clinical case for their position on the pressure regime in the 4-bedded rooms was set out in the draft summons and the affidavits which had been provided by Graeme Greer of Mott MacDonald and Janice Mackenzie of NHSL, the Project Clinical Director for the Project. NHSL's letter confirmed that NHSL had instructed its solicitors to delay lodging the summons with the Court together with the application for an interim order until 10am the following day, Thursday 22 March 2018.

61. The draft Court summons, amongst other things, sought an interim court order ordaining IHSL to submit a design which provided a ventilation system for the multi-bed rooms (which were specified in the first schedule annexed to the summons) that achieved a balanced or negative pressure relative to the adjacent corridor. The first schedule consisted of a Schedule of Rooms which included three multi-bed rooms in Critical Care (1-B1-063, 1-B1-031 and 1-B1-009). The summons explained that there were twenty multi-bed rooms in the RHCYP/DCN, nineteen of which were listed in the Schedule of Rooms. The twentieth room, 1-B1-065 (which was also located in Critical Care), had already been designed with pressure that was balanced or negative relative to the corridor through a previous NHSL instruction. The dispute concerned the other nineteen rooms.

62. The summons did not identify any issues relating to air change rates in the 4-bed rooms. The dispute described in the draft summons only concerned the pressure regime in the multi-bed rooms.

63. In the draft Court summons, NHSL explained its approach to infection control and explained that there were circumstances in which patients with an infection may be treated in multi-bed rooms. NHSL also explained that there was a national shortage of duly qualified staff and even if NHSL could recruit sufficient staff that would have budgetary implications. The summons stated that a balanced or negative pressure was necessary to inhibit the spread of infection from a room to adjacent areas and if that environment was not provided there was an unacceptable risk of infection spreading to other parts of the hospital. The summons also stated that other similar children's hospitals all had balanced or negative pressure relative to the adjoining space in their multi-bed rooms and this was what the industry would normally expect to inhibit the spread of infection from patients in multi-bed rooms. NHSL explained that having all multi-bed rooms balanced or negative pressure relative to the adjoining space was consistent current best practice and also Good Industry Practice. NHSL's position centred round its clinical requirements and the clinical use to which the multi-bed rooms would be put.

64. The summons did not identify that the guidance contained in Table A1 of SHTM 03-01 stated that areas in Critical Care were recommended to have positive pressure relative to the adjacent corridor. NHSL insisted upon a negative or balanced pressure regime in all the multi-bed rooms, including those in Critical Care. This would become significant later on in June 2021 when IOM required the multi-bed rooms in Critical Care to be +10Pa positive pressure.

65. The prospect of court litigation on the 4-bed room ventilation represented a significant escalation of events. IHSL and Multiplex were in discussions regarding the defence of the threatened court action. Given the provisions of the Project Agreement and the Construction Contract Multiplex would have defended the court actions in IHSL's stead. NHSL's solicitors wrote to Multiplex's solicitors with

the draft summons and affidavits which NHSL had anticipated instructing its solicitors to lodge on Thursday 22 March 2018.

66. On 22 March 2018, however, I issued an e-mail to Jim Crombie and Susan Goldsmith at NHSL attaching a letter from IHSL which, in turn, enclosed a letter from Multiplex and a proposal from Multiplex on which IHSL invited urgent engagement **(A47272784 – E-mail dated 22 March 2018 with the Multiplex proposal - Bundle 13, Volume 9 – Page 100) (A47272788 – Letter from IHSL to NHSL dated 22 March 2018 – Bundle 13, Volume 9 – Page 101) (A47272787 – Letter from MPX to IHSL dated 22 March 2018 – Bundle 13, Volume 9 – Page 104)**. The proposal from Multiplex adopted concepts to describe the disputed issues that had been previously used and discussed by the parties in the February workshop. The Multiplex proposal identified the significant matters as follows:

i. The “Without Prejudice Works” which consisted of items alleged by NHSL to be non-compliances which Multiplex agreed to address on a without prejudice basis.
ii. The “NHS Works” which was a list of issues that NHSL intended to carry out and complete post-completion of the works under the Project Agreement and, in turn, the Construction Contract. These issues included ATD Installations; fire strategy amendments; car park barriers; and MRI quench pipes; and
iii. The “Ventilation Works” which consisted of the 4-bed room ventilation changes.

67. The Multiplex proposal of 22 March 2018 set out a proposal which: sought to allow the hospital to open by limiting further delay; which allowed all work to be undertaken as part of a coordinated and managed process; and which avoided protracted and expensive litigation. The proposal also set out a suggested timetable for parties to be able to implement that proposed approach. That timetable provided, amongst other things, that by 3 April 2018 NHSL was to confirm to Multiplex its requirements for the ventilation of the 4-bed rooms in accordance with one of the 3 options listed in the attachment to the proposal.

The attachment entitled “Without Prejudice Ventilation Options” identified three options for the 4-bed room ventilation issue.

68. “Option 1” was described as being a proposal which had been previously discussed at length with NHSL and its advisers to achieve a negative or balanced pressure in 14 rooms. I was not aware of what that Option involved or what had been previously discussed between NHSL and Multiplex. “Option 2” was described as negative or balanced pressure in 14 rooms at 4 air changes per hour. “Option 3” was described as negative or balanced pressure in 20 rooms at 4 air changes per hour.

69. The mediation tracker document entitled “RHSC Mediation – Current Clinical Risk Items – 20th March 2018” which was issued by Multiplex along with its letter of 22 March identified (at point 7) that, regarding the 4-bed ventilation issue, NHSL had changed its position on what was acceptable and reverted to all 20 rooms at 4 ac/hr. NHSL and Multiplex had evidently had discussions around whether NHSL wanted negative/balanced pressure in 14 rooms at 4 air changes per hour (which constituted Option 2 in Multiplex’s proposal) or negative/balanced pressure in all 20 rooms at 4 air changes per hour (which constituted Option 3 in Multiplex’s proposal).

70. The proposal which was issued on 22 March 2018 averted the threat of the legal proceedings and formed the basis of the parties’ further discussions. A meeting was held on 28 March between representatives of NHSL and IHSL. Jim Crombie, Susan Goldsmith and Iain Graham attended that meeting for NHSL; Tony Rose, Andy Clapp and I attended on behalf of IHSL. The purpose of the meeting was to ensure that NHSL had properly understood the Multiplex proposal and whether there were any clarifications that IHSL could address. Jim Crombie advised us at that meeting that NHSL had taken the court action off the table for the time being.

71. Andy Clapp’s e-mail summarising that meeting **(A47272789 – Email from Andy Clapp dated 29 March 2018 - Bundle 13, Volume 9 – Page 110)** stated that Jim Crombie had advised that NHSL were very keen on fixing an

occupation date for first patients and that the last realistic date this could happen in 2018 was 31 October i.e. prior to winter pressures. Jim Crombie explained that if this date was missed, the move would be postponed to late February 2019 (post winter pressures).

72. With regards to the 4-bed ventilation issue, Andy's e-mail identified that Multiplex's three ventilation options had been discussed at that meeting. NHSL had advised that Option 1 was not acceptable and would not be considered. NHSL had concerns around the construction costs for Ventilation Options 2 and 3 but later in the discussion NHSL agreed to progress on the basis of Option 2 at the meeting of 28 March (as summarised in Andy Clapp's email) i.e. negative/balanced pressure in 14 rooms at 4 ac/hr. Andy's email also explains that NHSL requested that Ventilation Option 2 be worked up in more detail so that NHSL fully understood that it delivered the clinical requirements and also the commercial aspects that they required. In terms of the next steps, Andy's e-mail states that IHSL advised that they would brief Multiplex, develop the commercials around Ventilation Option 2 within a joint programme and reconvene on a call to include Multiplex which was indicated might take place later that day.

73. In advance of that planned call on 29 March 2018, Brian Currie issued an e-mail to Darren Pike (who was Multiplex's Project Director) dated 29 March 2018 attaching NHSL's thoughts on a collaborative framework moving forward **(A47272790 – Email from NHSL to MPX DATED 29 March 2018 - Bundle 13, Volume 9 – Page 113) (A47272792 – Collaborative Framework – Bundle 13, Volume 9 – Page 115).** Brian's e-mail notes that the attachment had been approved by Principals within NHSL's Board and suggested that it be shared within Multiplex. That "Collaborative Framework" includes (Item 1) jointly developing and agreeing a final programme to Actual Completion incorporating all Multiplex and NHSL activities as appropriate and practical to satisfy compliance with their contractual obligations and eventual sign off by the Independent Tester. These works were to incorporate agreed balanced/negative ventilation specification works to the multi-bed rooms, the

scope being 14 rooms at 4 ac/hr. That is the Ventilation Option 2 works set out in the Multiplex proposal.

74. After that call on 29 March 2018, Darren Pike sent an e-mail **(A47272793 – Email from MPX dated 29 March 2018 - Bundle 13, Volume 9 – Page 116)** to the NHSL team, the IHSL team (including myself) and the Multiplex team stating that it had been an action on Darren's part on the earlier call to circulate and confirm certain points. Darren sets out in that e-mail that it was Multiplex's understanding that 14 numbered 4-bed rooms were to have 4 air changes per hour at negative/balanced pressure and that this would satisfy NHSL's requirements for these spaces with regards to ventilation. Darren comments that the timeline on this was crucial and Multiplex's designers would need to start work on Tuesday 3 April in order to keep to the proposed programme. Darren stated that Multiplex wanted confirmation and instruction to commence design on this basis as soon as possible.

The Draft Heads of Terms – April 2018

75. IHSL's discussions on the commercial aspects of the Multiplex proposal continued with Multiplex and NHSL through to the end of March and into early April 2018.

76. The Inquiry has invited IHSL to comment specifically on an e-mail from NHSL to Multiplex dated 18 April 2018. The Inquiry has provided IHSL with a copy of the relevant document which I have now been shown. I see it is a copy of a communication sent from Ronnie Henderson of NHSL to Ken Hall of Multiplex sent through Aconex, which was the document management platform used on the Project. The communication is also sent to individuals from Mott MacDonald and Wallace Whittle. The communication was not sent to me or to any others at IHSL, so I had no personal involvement. The communication is from Ronnie Henderson and states that NSHL is seeking design for 4 air changes to all 14 rooms and asks for confirmation from Multiplex that this is the brief that has been given to Wallace Whittle. This appears to be consistent with the discussions addressed above between NHSL, IHSL and Multiplex in that time

period during which NHSL had confirmed that it wanted the ventilation to be designed having 4 ac/hr with negative/balanced pressure in 14 of the 4-bed rooms (not all 20) – that is, Multiplex's Option 2.

77. In April 2018, I prepared the first draft of Heads of Terms (sometimes referred to in the correspondence as ("HoTs") which I issued to Andy Clapp by e-mail dated 19 April 2018 **(A47272791 – Email dated 19 April 2018 - Bundle 13, Volume 9 – Page 119) (A47272794 – Heads of Terms – Bundle 13, Volume 9 – Page 120)**. The HoTs needed further development in terms of content, structure and the technical costs and schedules. There were clearly lots of gaps as the deal structure was not fully developed and so it was my intention that IHSL would share an early draft of the HoTs with Multiplex and NHSL and parties would jointly populate the document so that they had agreed HoTs within 2 weeks.

78. The draft HoTs anticipated that there would be a tripartite settlement agreement between NHSL, IHSL and Multiplex. That was the original intention (but ultimately NHSL and IHSL entered into SA1 pursuant to the Project Agreement and IHSL entered into an equivalent but separate downstream settlement agreement with Multiplex pursuant to the Construction Contract). The first draft of the HoTs state at paragraph 3.1.2 that NHSL had agreed that fourteen of the 4-bed areas required ventilation works to provide a balanced/negative pressure regime to the corridor and each 4-bed area will be provided with 4 air changes per hour.

79. I issued the draft HoTs to the NHSL team and the Multiplex team by e-mail dated 20 April 2018 **(A47272795 – Email dated 20 April 2018 - Bundle 13, Volume 9 – Page 128) (A47272799 – Email dated 20 April 2018 Attachment 1 – Bundle 13, Volume 9 – Page 129) (A47272800 – Email dated 20 April 2018 Attachment 2 – Bundle 13, Volume 9 – Page 138)**. I explained in my e-mail that following the technical and commercial meeting which had taken place on 12 April 2018, IHSL had drafted HoTs for an anticipated tripartite Settlement Agreement and that the draft HoTs set out IHSL's view of the proposal, but it was being issued to NHSL and Multiplex for their thoughts.

80. In addition to the draft HoTs, IHSL and NHSL commenced discussions around the financial elements of a commercial settlement.

81. On 26 April 2018, I sent an e-mail to Susan Goldsmith and the wider NHSL team concerning the suggestion of a face-to-face meeting of principals from NHSL, IHSL and Multiplex. My e-mail mentions that Multiplex would be issuing a draft programme detailing a planned completion by 31 October 2018. I mentioned that the development of this programme had highlighted that to achieve completion by that date of 31 October 2019, with respect to the 4-bed ventilation works Multiplex would be required to instruct their M&E sub-contractor (Mercury) on 7 May 2018. I advised that IHSL wished to discuss the form of instruction which could be provided to maintain the programme but recognising that such an instruction might come in advance of concluded HoTs or any formal agreement.

82. On 30 April 2018, I issued an updated draft HoTs to the NHSL team and the Multiplex team **(A47272797 – Without Prejudice email dated 30 April 2018 - Bundle 13, Volume 9 – Page 147) (A47272798 – Settlement Agreement HoTs Attachment – Bundle 13, Volume 9 – Page 149).** That draft incorporated the comments I had previously received from both NHSL and Multiplex. Paragraph 2.1.2 of that draft addressed the 4-bed ventilation works and identified that NHSL had agreed that fourteen of the 4-bed areas require ventilation works to provide a balanced/negative pressure regime to the corridor, where each 4-bed area will be provided with 4 air changes per hour.

83. The discussions on the draft HoTs continued into early May 2018. I had received comments from Michael Pryor at NHSL on the draft HoTs by e-mail dated 4 May 2018 and had discussions with him which allowed the draft HoTs to be developed further. In the draft HoTs issued by Michael on 4 May, NHSL had deleted the reference to the agreed ventilation solution set out in paragraph 2.1.2 and instead indicated that NHSL wanted it defined in a separate schedule. The updated draft HoTs which I had prepared as at 9 May 2018 still stated at paragraph 2.1.2 that NHSL had agreed that fourteen of the 4-bed areas required ventilation works to provide a balanced/negative pressure

regime to the corridor with each 4-bed rooms being provided with 4 air changes per hour.

84. The discussions regarding the finalisation of the HoTs for a settlement agreement were still on-going in early May when IHSL first instructed its solicitors to commence drafting the settlement agreement itself. IHSL had hoped at that stage that a settlement agreement might be capable of being concluded within approximately 4 weeks.

85. The draft HoTs were ultimately never concluded because they had been overtaken by the discussions on the draft settlement agreement.

The First Draft of the Settlement Agreement

86. On 21 May 2018 I issued the first draft of the proposed settlement agreement between NHSL and IHSL to Jim Crombie and Susan Goldsmith and the wider NHSL team and to Callum Tuckett and Ben Keenan at Multiplex **(A47272801 – Email dated 21 May 2018 - Bundle 13, Volume 9 – Page 157) (A47272802 – Attachment to email dated 21 May 2018 – Bundle 13, Volume 9 – Page 158)**. The first draft had been prepared by Pinsent Masons on behalf of IHSL. It was intended that a very similar back-to-back agreement would be developed between IHSL and Multiplex.

87. The first draft of the settlement agreement was a preliminary draft which was subject to review by Multiplex, the Lenders and NHSL.

88. On 25 May 2018, Brian Currie sent me an e-mail, copying Darren Pike at Multiplex and Graeme Greer at Mott MacDonald, attaching NHSL's half of the technical schedule for the settlement agreement which was described by Brian as "wip" which I understood to mean "work in progress" **(A47272805 – Email dated 25 May 2018 - Bundle 13, Volume 9 – Page 177) (A47272804 - Settlement Agreement Schedule dated 25 May 2018 – Bundle 13, Volume 9 – Page 179)**. Brian's e-mail explained that the "RAG tracker" (that is the red/amber/green tracker) showed the current status of the information available as NHSL saw it. It also explained that a combined Multiplex and NHSL version

of the technical schedule would be developed and issued to me the following week.

89. Item 7 of the draft technical schedule issued by Brian addressed the 4-bed ventilation issue. It stated in the "Description" column that NHSL believed that IHSL's design for ventilation was not compliant with the Board's Construction Requirements, Project Co's Proposals, SHTM Guidance and Reviewable Design Data comments at Financial Close. It also stated that the Board believed the intake air change rate and the extract air change rates were not compliant. The Description column continued by stating that, from a clinical perspective, the principal concern to NHSL in continuing with IHSL's proposed pressure regime design meant there was an unacceptable risk of the spread of bacterial airborne infection into corridors and surrounding patient rooms. NHSL therefore required the pressure regime to be balanced or negative to the corridor.

90. The first draft technical schedule issued by Brian Currie contained a list of 81 different items that were disputed between the parties. The 4-bed room ventilation issue was one of those items **(A46409292 - Appendix 65 A – Technical Schedule – Bundle 13, Volume 2 – Page 1308)**.

91. By June 2018, the parties' discussions on the "front-end" of the Settlement Agreement began to run in parallel with the discussions around the draft technical schedule which would form part of the back end of the Settlement Agreement.

The First Issue of the Technical Schedule and Agreed Resolution Issued by NHSL on 22 June 2018

92. On 12 June 2018, I received an e-mail from Susan Goldsmith at NHSL in which Susan stated that NHSL had the opportunity to reflect on progress towards finalisation of the Settlement Agreement and on the content of the revised draft which I'd circulated on 8 June **(A47272803 – Email from NHSL dated 12 June 2018 - Bundle 13, Volume 9 – Page 184)**. Susan stated that it had become clear to NHSL that there was a disconnect between progress of the

development of the commercial aspects of the settlement and the technical aspects. Susan reiterated NHSL's commitment to the resolution of the outstanding issues through a settlement agreement rather than through formal dispute proceedings and so had set out what NHSL considered to be their position on the Settlement Agreement and technical schedules.

93. Susan stated in her e-mail of 12 June that NHSL was required to objectively justify the funds to be injected into the Project and was required to present a business case to the Scottish Government that supported the proposed solution. The business case would seek to demonstrate that reaching a commercial settlement offered superior value for money that the potential risk adjusted cost to NHSL of court proceedings or contractual dispute resolution. Susan invited more details from IHSL on the financial aspects of the proposed settlement in order for NHSL to complete that business case.

94. With regards to the full and final settlement nature of the proposed settlement agreement, Susan advised in that e-mail that following discussions with NHSL's technical team there would be a move away from the current drafting in relation to the "Disputed Items", "Dispute", "Released Claims" and a move towards drafting which was more reflective of the Project Agreement structure. Susan explained that the current 81 issues were more akin to "Works in Progress" rather than "Disputed Items" given that a solution for each of the issues was now broadly agreed and it was recognised that both parties had further actions to implement to ultimately resolve the issues in line with the agreed solution.

95. As I've stated earlier, Multiplex had commenced the Ventilation Option 2 works at their own risk in May 2018 in order to retain the proposed programme of completion by 31 October 2018 (notwithstanding that HoTs or the settlement terms had not been agreed). Multiplex did so on the expectation that settlement terms would be agreed soon after they commenced those works to the ventilation in the 4-bed rooms.

96. On 22 June 2018, Brian Currie (NHSL's Project Director) wrote to IHSL enclosing the first draft of the "Technical Schedule". Brian explained in his letter

that this Technical Schedule set out what the "Agreed Resolution" was for each Disputed Item as well as describing the technical solution for each Disputed Item. Brian issued the letter and the Technical Schedule by e-mail dated 22 June 2018 **(A47272807 – Email from NHSL to IHSL dated 22 June 2018 - Bundle 13, Volume 9 – Page 187) (A47272806 - Letter from NHSL dated 22 June 2018 – Bundle 13, Volume 9 – Page 189) (A47272808 – Technical Schedule – Bundle 13, Volume 9 – Page 190)** to Wallace Weir but copied to Andy Clapp, Richard Osborne, Tony Rose and me along with the wider NHSL team (Jim Crombie, Susan Goldsmith, Iain Graham and Michael Pryor). The Technical Schedule listed the 81 Disputed Items. It contained columns entitled "Dispute", "Description of Agreed Resolution", "Project Co Obligations", "Board Obligations" and "Changes to Project Agreement".

97. Item 7 of that draft Technical Schedule addressed the issue of the 4-bed room ventilation. The description of the "Dispute" was a similar description to that contained in the draft technical schedule that Brian had issued on the 25 May 2018 (referred to in paragraph 2.61 above). The "Description of the Agreed Resolution" column stated that the design data noted in the description had been given status B through the Review Procedure and described the Agreed Solution as follows:

> *"The solution submitted through the Review Procedure is for 14 No. 4 bed rooms will be balanced or negative to the corridor at 4 ac/hr."*

98. The column headed "Project Co Obligations" stated as follows:

> *"Design, construct, test, commission and complete in accordance with the Agreed Resolution to meet the Completion Criteria and other terms of the Project Agreement as revised pursuant to this Agreement."*

99. The column entitled "Board Obligations" stated:

> *"Subject to Project Co complying with Project Co Obligations, this is an Approved RDD Item."*

100. It was not surprising that the air change rate was specified alongside the pressure regime in the Agreed Resolution in the Technical Schedule. The prior discussions around the 4-bed Room ventilation and written communications describing the solution had always quoted both together, as if they were intrinsically linked. Recognising the dispute around contract interpretation, I assumed both were included for completeness and to remove any ambiguity.

101. Item 13 of the draft Technical Schedule addressed the issue of the single bedroom ventilation air changes. The description of the "Dispute" was:

> *"Air change rates proposed by Project Co for single bedrooms are not in compliance with SHTM 03-01 and Board's comments. 4 ac/hr supply provided to the bedrooms instead of the required 6 ac/hr. The ensuite extract rate proposed in excess of 10 ac/hr where requirements of SHTM 03-01 is 3 ac/hr."*

102. The "Description of the Agreed Resolution" column stated:

> *"This agreed technical solution has been documented in the following Project Co Change which is now deemed an Approved RDD Item subject to and in accordance with the terms of this Agreement."*

Detail of Change

103. *Project Co are proposing to deviate from SHTM 03-01… Table A1.. column 3, ac/hr by:*

    i. *Decreasing the mechanical air change ventilation rates within single bedrooms from 6 air changes per hour (6 ac/hr) to 4 air changes per hour (4 ac/hr); and*

ii. increase the mechanical air change ventilation rate within single bedroom WCs from 3 air changes per hour (3 ac/hr) to 10 air changes per hour (10 ac/hr).

Reasons

"The design philosophy for ventilation within single bedrooms (and ensuites) is for a mixed mode operation where natural ventilation is encouraged, which is believed to provide both physiological and environmental benefit by allowing users partial control of their environment and reducing the loading on the mechanical ventilation system respectively. The strategy results in zero pressure differential regime within the room where supply and extract is balanced.

Additionally, the mechanical extract ventilation air change rate has been increased within the single bedrooms ensuite from 3 air changes per hour (3 ac/hr) to 10 air changes per hour (10 ac/hr) (minimum) to provide a fresh environment for patients. This ensuite extract provides a balanced air change rate to the bedroom.

The design intent and figures noted above are reflected within the environmental matrix previously submitted through RDD."

104. I do not know who drafted the Technical Schedule or the Agreed Resolution for NHSL which Brian Currie circulated on 22 June 2018. The draft Technical Schedule was issued following Susan Goldsmith's revised approach set out in her e-mail of 12 June 2018 **(A47272803 – Email from NHSL dated 12 June 2018 - Bundle 13, Volume 9 – Page 184)**. which Susan had explained had been discussed with NHSL's "technical team". NHSL's Technical Adviser was Mott MacDonald but NHSL was supported by a group of in-house engineers/NHS Estates professionals. NHSL also had access to the clinical teams.

105. It was clearly very helpful for all parties to have the Agreed Resolution to the 4-bed room ventilation issue and single bedroom ventilation set out in such clear terms in the Technical Schedule, both in terms of the pressure regime and air change rates, to ensure there was no ambiguity. By that stage in June 2018, however, there was no real controversy around the agreed resolution of the 4-bed ventilation issue or single bedroom ventilation. With regards to the 4-bed ventilation, the parties had discussed the Ventilation Options set out in Multiplex's proposal issued on 22 March and NHSL had confirmed that it wanted Multiplex to proceed with Ventilation Option 2 i.e. 14 rooms having negative/balanced pressure with 4 ac/hr. Multiplex had already commenced those ventilation works and so by 22 June 2018 when the Technical Schedule was issued it was doing little more than reflecting the ventilation works that had already been agreed and the reality that the resolution was already being implemented by Multiplex.

106. It is important to highlight here that Multiplex had already built the ventilation system in the multi-bed rooms (including in Critical Care) with a positive pressure regime before commencing the Agreed Resolution at risk. Multiplex were effectively undoing what it had already built in order to change the pressure regime to balanced/negative in the 14 no. rooms.

107. Following receipt of the Technical Schedule from Brian on 22 June 2018, I issued it to Multiplex that same day. I requested Multiplex to review the Technical Schedule and to provide comments as soon as possible. Brian had also issued a Microsoft Word version of the Technical Schedule to allow Multiplex to mark-up their comments.

Parties' Discussions on the Technical Schedule

108. In an e-mail dated 27 June 2018, Multiplex issued a version of the Technical Schedule reviewed and edited to "MPX view" (a Multiplex version of the schedule). In that e-mail Darren Pike advised that Multiplex saw no need for the final 3 columns in the Technical Schedule issued by Brian on 22 June and so

these had been deleted. These were the columns entitled “Project Co Obligations”, “Board Obligations” and “Changes to Project Agreement”. I asked Multiplex to mark up the draft Technical Schedule which was issued by Brian Currie on 22 June (which was why we’d asked for a Word version of it).

109. The draft Technical Schedule in the format issued by Brian on 22 June was revised by Multiplex in July 2018 and issued by their solicitors (Brodies) to IHSL’s solicitors (Pinsent Masons) by e-mail dated 18 July 2018. That mark-up of the Technical Schedule deleted the final 3 columns in NHSL’s original version so that it consisted only of the “Dispute” column and the “Description of the Agreed Resolution” column.

110. Multiplex made an amendment to the “Description of Agreed Resolution” column by adding to the description an additional sentence referencing the remaining 6 No. 4 bed rooms which were not subject to the Agreed Resolution **(A47272813 – Technical Schedule dated 5 July 2018 - Bundle 13, Volume 9 – Page 211).** Multiplex’s amendment clarified that those other 6 No. 4 bed rooms remained as per the Environmental Matrix and as built. Multiplex also made a minor adjustment to NHSL’s original text describing the Agreed Resolution so that it stated:

> *“The resolution submitted by Project Co through the Review Procedure is for 14 No. 4 bed rooms to be balanced or negative to the corridor at 4 ac/hr.”*

111. In relation to the item 13 dealing with the single bedroom ventilation, Multiplex simplified the “Description of the Agreed Resolution” so that it stated that NHSL and Project Co agreed that the item was closed and the agreed technical solution approved through RDD was 4 ac/hr within singled bedrooms and 10 ac/hr within ensuites.

112. By the end of September 2018, the Technical Schedule was agreed between NHSL, IHSL and Multiplex. The Technical Schedule had been exchanged

between the parties' respective legal teams. The agreed Technical Schedule contained the same text in respect of the 4-bed ventilation issue (which was item 7 in the Technical Schedule) as had originally been prepared and issued by NHSL on 22 June and amended on behalf of Multiplex (to reflect the other 6 No. 4- bed rooms that were not being changed) in July 2018.

Discussions from July 2018 and the Additional List of 34 Material Outstanding Items

113. The parties' discussions on the front-end draft Settlement Agreement continued through July 2018 onwards. This involved discussing complex legal, financial and technical issues.

114. What followed from July 2018 onwards was a further lengthy period of very complex and challenging negotiations (which continued right up to February 2019 when SA1 was ultimately executed). However, those discussions on SA1 did not concern the issue of the 4-bed ventilation resolution because that resolution had already been agreed and had been implemented by Multiplex at its own cost and risk. Likewise, the other 80 items on the Technical Schedule had largely been addressed and resolved by Multiplex.

115. Those complex discussions covered a wide range of commercial issues. Throughout July and August 2018 there were difficult discussions around the funding of the proposed commercial resolution and the different financial contributions and compromises to be made by each of the parties. At that time NHSL were still progressing their business case with the Scottish Government for approval of the commercial deal (NHSL completed their governance with the Scottish Government sometime in early August 2018). There were complex discussions around the extent of the waiver contained in the draft settlement agreement and the claims that were being released by way of settlement in the context of the 81 Disputed Items.

116. A key element for NHSL was for IHSL to achieve an Actual Completion Date on or by 31 October 2018. The parties were endeavouring to finalise the Project Agreement settlement agreement by late August in order to meet that targeted completion date. On 20 August 2018, Susan Goldsmith issued an e-mail to Stephen Gordon, Tony Rose and Richard Osborne advising that, despite the collective efforts and aspiration to get the settlement agreement finalised, it was NHSL's view that there was still a significant amount to do, both in relation to finalising the Settlement Agreement and reaching completion by 31 October 2018. Susan also mentioned in that e-mail that two of the key concerns that NHSL had were around drainage and cable calculations.

117. Then in a Technical Meeting on 23 August 2018 to discuss the 81 Disputed Items, Brian Currie made reference to a Material Outstanding Issues Schedule. Brian's view was that whilst the settlement agreement resolved the 81 Disputed Items it did not resolve all items required to achieve what NHSL considered to be a compliant completion. There were 34 further items on NHSL's list of Material Outstanding Issues. Examples of those issues included the drainage sump, the heater batteries and void detection. Each of those items had significant cost and programme implications which would preclude a completion by 31 October 2018. These issues had the potential to result in further disputes regarding completion criteria only six weeks prior to the targeted planned Completion Date of 31 October 2018.

118. In September 2018 there were still three main workstreams on-going in order to reach a concluded settlement. First, there was the legal workstream which essentially concerned the drafting of the front-end Settlement Agreement and involved the engagement of the parties' legal teams. Second, there was the financial stream which concerned the complex arrangements around the funding of the commercial settlement, for example IHSL's injection of additional sub-debt. Third, there was the technical workstream. Up to August/September 2018 the technical workstream had mostly addressed the 81 Disputed Items in the Technical Schedule. The agreed solution to those items had largely been agreed by September 2018. The key technical issues in September 2018 were

different issues relating to the cable calculations, the void detection works and drainage i.e. issues which had arisen through NHSL's additional list of 34 items on 23 August.

119. There were no on-going discussions on the 4-bed ventilation or single bedroom ventilation in that period because the ventilation works to provide a negative/balanced pressure regime with 4ac/hr for the 14 No. listed rooms had been completed by Multiplex.

120. IHSL was heavily engaged in discussions and meetings with Multiplex and NHSL throughout September 2018 because completion was still being targeted to take place on 31 October 2018. By mid-September, there were still a number of key commercial issues on the front-end Settlement Agreement still outstanding that required to be resolved. There was still work being done on the finance stream. In relation to the technical issues there was work being done on the cable calculations, the void detection works and the drainage. IHSL's view in mid-September 2018 was that, in order for a settlement to be reached in the timescales available, the drainage issue should be carved out from the existing proposed agreement and drainage should be dealt with in a separate settlement agreement. NHSL appeared to be in agreement with that proposal and agreed to carve out the drainage issue from the proposed settlement agreement and to deal with drainage separately.

121. NHSL issued a revised mark-up of the settlement agreement on 20 September 2018 which IHSL and Multiplex felt had included drafting and principles that had not previously been discussed between the parties. More particularly, it became even more evident that the drainage was now a particularly significant issue for NHSL. IHSL's and Multiplex's view was that the drainage issue should not impact upon the building being certified as complete by the Independent Tester and was capable of being resolved post-Completion but before the hospital was opened to patients. This was against the background where the Temporary Occupation Certificate (dated 10 September) had been issued by the Council's

Building Control team on 21 September 2018. The parties had been working on the basis that the drainage could be addressed in a separate agreement.

122. The parties (NHSL, IHSL, Multiplex and the Funders) were working very hard to find solutions to the outstanding issues and were engaged in intensive discussions. However, by 21 September 2018 the discussions had reached an impasse with the drainage being a fundamental issue between NHSL and Multiplex. IHSL circulated what it proposed as a compromise solution to re-engage the parties and progress matters. This included a proposal to deal with the drainage issue.

123. It was around this time in September 2018 that Peter Reekie of Scottish Futures Trust assisted with facilitating the parties' discussions and helped parties address the impasse. Peter provided valuable and constructive input to help the parties seek to bridge their divides. Peter's assistance helped the parties to move matters along and get the discussions moving again.

124. On 5 October 2018 Wallace Weir and I met with Multiplex and BYES to discuss Multiplex's revised drainage proposals. It was hoped that this proposal would move matters significantly forward and clear some paths towards the conclusion of the settlement agreement although there were still some commercial issues outstanding at that time. Multiplex and NHSL were engaged in direct discussions on the drainage proposal, with Multiplex addressing NHSL's queries and updating their proposal.

125. Meetings were arranged with NHSL in mid-October to discuss the technical updates (which included the drainage issue) with separate meetings teed up to discuss the outstanding commercial matters. A key technical meeting took place on 10 October 2018 at which the list of 81 Disputed Items contained in the Technical Schedule was discussed (the vast majority of those were agreed) as were the additional 34 items on the Material Outstanding Matters list. The key technical issues being discussed at that Technical Meeting on 10 October

remained the drainage, void detection, cable calculations and heater batteries and the additional 34-item list of Material Outstanding Matters list.

126. Towards the end of October 2018, it was evident that NHSL wanted absolute technical and programme certainty in relation to the main outstanding elements that were being proposed to be undertaken post completion, namely the void detection, heater batteries and basement sump drainage.

127. As we approached the 31 October 2018 target for Actual Completion, it was apparent that a settlement agreement was unlikely to be concluded by the targeted date.

128. The discussions around the drainage, heater batteries and void detection issues continued into November 2018. A further Technical Workshop was held on 5 November 2018 which was attended by representatives from NHSL, IHSL, Multiplex and BYES and a raft of other technical advisers to discuss those three key issues and other technical issues.

129. In around mid-November, given the delays in reaching a concluded settlement and the risk that the outstanding technical issues, particularly the drainage, could delay matters further, IHSL developed a further Commercial and Technical Proposal. That Proposal was first issued to NHSL on 13 November 2018. The proposal was further developed following meetings with NHSL where the drainage was again highlighted as a key concern. The revised proposal was issued to NHSL on 18 November 2018 and suggested that an agreement was entered into between NHSL and IHSL in relation to the sign-off of the 4-bed ventilation works. Confirmation that the works had been completed in accordance with the Agreed Resolution would be provided by the Independent Tester. On execution of that agreement, it was proposed that NHSL would pay the sum of £6M. Simultaneously, all parties would continue to work together to finalise the Settlement Agreement. Actual Completion would be triggered by the Independent Tester issuing the Certificate of Practical Completion when all the outstanding works had been completed, with the exception of the drainage,

void detection and heater batteries. NHSL would commence payment of the full Unitary Charge on the Actual Completion Date and BYES would commence provision of the Services on the Actual Completion Date.

130. It was proposed that this suggested 4-Bed Ventilation Agreement could be agreed and documented by 23 November with Funder consent requested by 30 November 2018. This was proposed by IHSL because the 4-bed ventilation works had all been completed and was potentially capable of resolution separately from the other issues which were holding up the wider settlement. IHSL's proposal in that form was not adopted.

131. On 5 December 2018 I sent an update to the IHSL team on the drainage issue. Multiplex had developed its proposal further and this proposal was being discussed with NHSL and BYES. There was discussion around making a concerted effort to get the technical solution on the drainage signed off before Christmas 2018.

132. A further Proposal Paper was in circulation in early December 2018 entitled "Final Commercial and Technical Proposal for Agreement" and dated 7 December 2018. This had been exchanged between the parties' respective legal teams and revised to reflect the on-going discussions. This was a high-level document which set out the key principles relating to the technical and commercial aspects of the settlement. In relation to the commercial issues, it provided that the Actual Completion Date would be triggered by the Independent Tester issuing the Certificate of Practical Completion when all outstanding works had been completed and certified by the Independent Tester pursuant to the provisions of the Project Agreement and Settlement Agreement except for the three outstanding material technical matters which were drainage, void detection and heater batteries. The Settlement Agreement would document, amongst other things, the technical solutions for those three outstanding material technical matters.

133. The terms of the Settlement Agreement could not be finalised, however, until the technical matters had been resolved. There was a drive to seek to agree the front-end Settlement Agreement prior to Christmas 2018. The Settlement Agreement would then be executed once the technical information had been finalised – which NHSL anticipated was likely to be January 2019.

134. I attended a further Technical Workshop on 12 December with NHSL and Multiplex attendees at which we discussed the "Material Outstanding Matters Schedule" which was also referred to as the "34 Item List". We discussed in that meeting how the list had been prepared by NHSL in the summer of 2018 to detail technical matters which were of a concern to NHSL and which were to be recorded in the Settlement but would sit outside of the "Agreed Resolution" (which applied to the 81 Item list). However, with the passage of time (bearing in mind we were now six months on), a number of the items were closed or no longer relevant. We therefore reviewed all items on the list of 34 items and agreed whether or not they required to be documented in the settlement agreement or whether they were appropriately covered elsewhere or no longer considered to be an issue. Of the 34-item list, we identified at that Technical Workshop that there were five items which required to be included in the settlement agreement. These were: basement pump sump drainage; heater batteries; void detection; external pump sump drainage; and RDD Status C items. We agreed how those five issues would be addressed in the settlement agreement.

135. I also circulated that same day (by e-mail dated 12 December 2018) an Information Deliverables Schedule to the NHSL and Multiplex teams which set out the recorded actions/information to be provided as discussed at the Technical Workshop. The Information Deliverables Schedule covered the external drainage sump, basement drainage sump and heater batteries. A separate Technical Workshop had been arranged for the following day to discuss the void detection works.

136. I was updating and briefing the Funders of the discussions at those Technical Workshops throughout this period.

137. On 19 December 2018, NHSL wrote to IHSL with: (i) two copies of an Amendment Agreement in relation to a one-month extension of the longstop date under clause 40.1.2 of the Project Agreement (the "Longstop Amendment Agreement"); and (ii) two copies of a "Final Commercial Technical Proposal dated 13 December 2018" (although the signed Proposal was actually dated 19 December 2018) between NHSL and IHSL which was to form the basis of agreeing a settlement agreement in respect of the Project in early 2019 **(A47272810 - NHSL Letter dated 19 December 2018 - Bundle 13, Volume 9 – Page 253).** The letter stated that NHSL had only entered into the Longstop Amendment Agreement because of the progress achieved between NHSL and IHSL as outlined in the non-binding Commercial and Technical Proposal. The Commercial and Technical Proposal was signed on behalf of NHSL by Susan Goldsmith.

138. The signed "Final Commercial and Technical Proposal" set out the principles on the technical and commercial issues to be reflected in the Settlement Agreement. The Proposal noted the following principles (amongst others) with regards to the commercial issues:

    i. The Actual Completion Date would be triggered by the Independent Tester issuing the Certificate of Practical Completion when all the outstanding works had been completed and certified by the Independent Tester pursuant to the provisions of the Project Agreement and the Settlement Agreement.
    ii. The Independent Tester's contract would be varied to enable the Independent Tester to issue the Certificate of Practical Completion based on the agreed technical solutions set out in the Settlement Agreement and certify when the technical solutions for the drainage, void detection and heater batteries had been constructed, tested and commissioned (referred to as "Final Certification".

iii. The Settlement Agreement would document the technical solutions for the drainage, void detection and heater batteries.

iv. The Settlement Agreement would introduce a new Event of Default entitling NHSL to terminate the Project Agreement in the event that Final Certification was not granted by the Independent Tester by an agreed longstop date.

v. The Settlement Agreement would provide milestones for payment of the Settlement Sum; and

vi. NHSL would commence payment of the full Annual Service Payment on the Actual Completion Date and BYES would commence the provision of the Services.

139. As noted above, the signed "Final Commercial and Technical Proposal" (and subsequently the signed SA1) provided for the Certificate of Practical Completion to be issued which triggered payment of the Service Charge. This was all in accordance with the terms of the Project Agreement. NHSL was in occupation of the hospital upon the Certificate of Practical Completion. NHSL may not have been accepting patients immediately upon the Certificate of Practical Completion but that was never the intention. There was always going to be a period of a few months between the Certificate of Practical Completion being issued and NHSL's "go live" date when the RCHYP/DCN would be open to patients. In that period, NHSL had planned to undertake its own works and commissioning. NHSL paid the Service Charge because the Project had been certified as complete and because IHSL and, in turn, BYES had commenced the provision of the Services. What SA1 did allow was for Multiplex to undertake the agreed technical resolution for the drainage, heater batteries and void detection to take place after the Certificate of Practical Completion had been issued and by a contractual longstop date because the parties had agreed that completion was not dependent on those works being completed. Those works were undertaken in parallel with NHSL's own works and commissioning in readiness for its go live date.

140. The Technical Workshop on the void detection works took place on 13 December 2018. I circulated an updated Information Deliverables Schedule complete with the noted actions for the void detection works by e-mail to NHSL and Multiplex dated 14 December 2018.

Discussions From Early 2019 to Execution of SA1

141. The parties' discussions continued in January 2019 following the Christmas and New year break.

142. On 14 January 2019, I issued the then current draft of the settlement agreement to the Independent Tester. NHSL and IHSL had agreed that it would be helpful if the Independent Tester was provided with an advanced copy of the settlement agreement to help the Independent Tester understand the proposed agreement and, in particular, the proposed amendments to the Independent Tester's appointment. I also gave the Independent Tester a copy of the draft Technical Schedule which addressed the list of 81 items. That draft was still dated September 2018 because those issues had all been agreed by that date the previous year.

143. In the parties' discussions in mid-January Multiplex proposed one minor amendment to Item 7 regarding the 4-bed ventilation in the Technical Schedule by deleting one of the "MPX Transmit" references. With that one minor exception the Agreed Resolution for the 4-bed ventilation had not changed since the previous summer.

144. As at 18 January 2019, the parties had targeted for all information including Technical Schedules to be completed and issued to the Funders by 25 January 2019 (this would initiate the Lenders' due diligence) and targeted the date for execution of the settlement agreement and Actual Completion Date (the issue of the Certificate of Practical Completion) to occur on 7 February (or before if possible).

145. The parties continued their discussions in order to meet those targeted dates.

146. I received the final agreed form of the Technical Schedule from NHSL's legal advisers on 28 January 2019. I circulated this to the Multiplex team and their legal advisers moments after receiving it. Item 7 of the Technical Schedule remained unchanged.

147. On 7 February 2019, the Independent Tester issued a letter to IHSL confirming that they were in a position to progress their Certificate of Practical Completion and Commissioning Completion in line with the Project Agreement as modified by the concluded SA1 provided that the signed copy of SA1 (which signed copy was to be provided to the Independent Tester in advance of the Certificates being issued) did not differ from the draft copy of SA1 that the Independent Tester had been given **(A47272812 – Letter from Independent Tester dated 7 February 2019 - Bundle 13, Volume 9 – Page 256).** The Independent Tester was ready to issue the Certificates on 7 February 2019 (whereas SA1 was not ultimately executed until 15 days later on 22 February).

148. The original targeted dates for concluding the documents and achieving the Actual Completion Date had been missed. Notwithstanding that the Certificate of Practical Completion was ready to be issued on 7 February, as late as 13 February NHSL requested changes to the drafting around the drainage and related deductions i.e. after the Lenders were a significant way into their credit approval process with final Technical and Legal reports being issued the same day as NHSL requested further changes. This led to further discussions with Susan Goldsmith at NHSL on 14 February.

149. SA1 was eventually executed by NHSL and IHSL on 22 February 2019. The Certificate of Practical Completion was issued by the Independent Tester in accordance with the terms of the Project Agreement as amended by SA1 that same day. IHSL and Multiplex also entered in an equivalent downstream settlement agreement pursuant to the Construction Contract on 22 February 2019.

150. The void detection, drainage and heater batteries works were all caried out after the Actual Completion Date and were completed before the longstop date contained in SA1.

The January 2019 Correspondence

151. I have been asked about the letter which NHSL issued to Wallace Weir at HCP dated 28 January 2019. That letter from NHSL attached a copy of the 'Director-General Health & Social Care and Chief Executive' letter dated 22 January 2019 (the "CEL Letter") which had been issued to NHS Chief Executives (and copied to Directors of Estates). I was not directly involved at the time in this correspondence or in preparing IHSL's response to it. I have subsequently become aware of it. I have read IHSL's Response to the Inquiry's Provisional Position Paper 6 and, in particular, section 7 of that Response. My understanding of the January 2019 correspondence accords with IHSL's comments in that Response.

152. To IHSL's Response I would add, however, that my understanding of the CEL Letter was that it was issued against the background of issues which had arisen at the QEUH in Glasgow, and particularly with the concerns around pigeon droppings and vermin in the plantrooms. The queries raised in the CEL Letter sought confirmation of certain control measures (mainly related to plantrooms) and added that, in addition to those control measures the Strategic Facilities Group had undertaken to share best practice on relevant Standard Operating Procedures and anti-pest management.

153. That correspondence was subsequently followed up in e-mail correspondence from Stuart Davidson (NHSL's Contracts Manager) to Wallace Weir dated 1 April 2021 **(A47272811 – Email from NHSL to IHSL dated 1 April 2021 - Bundle 13, Volume 9 – Page 257).** That e-mail stated that following reports of patient infection linked to fungus from bird droppings (at QEUH), HFS was asked by the Scottish Government Director General Health to produce guidance on steps to control the risk of fungal contamination of patient areas

from bird droppings in plant rooms and ventilation systems. Stuart's e-mail attached the proposed guidance and he explained that the guidance attempted to strike a risk based balance approach to managing the bird dropping risks associated with the many ventilation systems that NSHL had in operation.

154. IHSL and, in turn, BYES are not responsible for pest control at the RHYCP/DCN (that remains NHSL's responsibility).

155. I cannot comment on why some of the Core Participants might have suggested that this correspondence might shed light on the evidence that the Inquiry heard at the hearing in May 2022. The correspondence appears to me to have been issued in the context of the pigeon droppings in the air ducts at QEUH and anti-pest management. It does not relate to the design of the ventilation systems or to Multiplex's or IHSL's views on the interpretation of responsibilities under the Construction Contract or the Project Agreement.

Supplemental Agreement No.2 (SA2)

156. The Inquiry legal team have specifically invited IHSL to address the issues of NHSL's approach to IHSL to undertake additional work to achieve 10ac/hr with positive pressure in Critical Care.

157. IOM commenced independent validation testing and inspection on the ventilation systems on the Project around mid-June 2019. IOM produced a 'Ventilation Validation' report following their verification activities. As part of their inspection, IOM carried out various tests, including the airflow measurements at supply and extract grilles and pressure differential measurements. It appears from the contemporaneous e-mails at the time between Mott MacDonald and NHSL that IOM were checking the systems against the SHTMs and not the Project Agreement as amended by SA1 (and the Agreed Resolution contained in SA1).

158. IHSL was subsequently informed by NHSL that IOM had considered that the pressure regimes and the air change rates in the 4-bed rooms and single bedrooms in Critical Care did not meet national standards contained in SHTMs. I have commented in section 2 above on the terms of SA1 and the Agreed Resolution relating to the ventilation in the 4-bed rooms and single bedrooms.

159. IOM subsequently issued a report entitled 'Witnessing of theatre rebalancing and validation summary report' which was issued on 15 July 2019 **(A47272809 – MT18IH - Bundle 13, Volume 9 – Page 259).** At the foot of page 5 of the IOM report, under the section headed 'High Dependency areas', IOM stated that testing of the high dependency areas identified that the air change rates and pressure cascades did not meet the requirements. IOM stated that in early discussions with NHSL's Technical Advisers, Mott MacDonald Limited, IOM were advised that there was a derogation in place which reduced the requirements from 10 ac/hr to 4.

160. Following various joint meetings and workshops, at an all-party meeting on 2 July 2019 with NHSL, their Infection Control team, the Project Team and senior board members, an interim solution was reached for enhancing the ventilation in the Critical Care areas **(A47272814 – MT19IH - Bundle 13, Volume 9 – Page 281) (A47272821 – Air Change Options Critical Care 2 June 2019 – Bundle 13, Volume 9 – Page 284)**. That interim solution involved closing ventilation to the 4-bed bay "1-B1-063" and single bedroom "1-B1-037" and redistributing the air to the other patient locations within critical care to provide 7 ac/hr to 4 no. single rooms and 5 ac/hr to 2 no. 4-bed bays and 1 no. 3 bed bays. The RHCYP/DCN had greater capacity in Critical Care than the existing Victorian hospital at the Edinburgh Sick Kids Hospital. Even with closing two rooms the capacity at RHCYP would still have equalled that at the existing Sick Kids i.e. the RHCYP/DCN would still have been able to fully accommodate the patients from the Critical Care department at the existing Sick Kids.

161. Ordinarily in a PFI/PPP project, where the authority instructed a Change after Practical Completion and during the service delivery phase, that Change would

be instructed through the Project Agreement and would be implemented by the Services Provider through the Services Agreement. Following the IOM report, however, NHSL and IHSL commenced discussions with Multiplex to carry out the interim solution works. Multiplex were prepared to carry out these works (although they were not contractually obliged to do so). The interim solution works were expected to take place over 3 days beginning on 4 July 2019.

162. This interim solution was instructed by NHSL in an email from Brian Currie to Wallace Weir (HCP) and Darren Pike (Multiplex) dated 3 July 2019 **(A47272818 – MT20IH - Bundle 13, Volume 9 – Page 285).** NHSL instructed IHSL and, in turn, Multiplex to "proceed with adjusting the installed ventilation system in Critical Care to achieve air change rates" in order to provide a minimum of 7 air changes/hour in all single bedrooms (with the exception of room 1 B1 037) and 5 air changes/hour in all four bedded rooms (with the exception of room 1 B1 063).

163. Wallace Weir responded to NHSL that same day explaining that IHSL was fully supportive of NHSL's process to implement an interim and permanent solution to the ventilation challenges in the critical care areas. However, as part of that, Wallace also expressed some of IHSL's concerns, such as confirmation as to whether NHSL would cover the costs of implementing the interim solution and whether NHSL would commit to covering the costs of the design of the permanent solution.

164. On 4 July 2019, however, the then Cabinet Secretary for Health and Sport, Jeane Freeman, announced that the RHCYP would not open as planned.

165. I attended an all-party design meeting on 9 July 2019 where it was discussed that 4 no. 4-bed rooms and 5 no. single bedrooms in Critical Care (9 rooms in total) were to be changed to meet the guidance in STHM 03-01. NHSL were to confirm their design requirements regarding STHM 03-01 because they may have wished the pressure regime to remain negative/balanced whereas SHTM 03-01 stated it should be positive relative to the adjacent corridor. Multiplex

stated at that meeting that they would need absolute clarity on the technical scope/specification. NHSL were to undertake consultation on the design requirements internally and confirm their position. It was discussed at that meeting that NHSL planned to issue a Board Change but in doing so they would reserve their position.

166. Multiplex, IHSL and NHSL continued those discussions to review NHSL's requirements for the critical care ventilation. A programme of ventilation meetings was commenced after the delayed opening of RHCYP in July 2019.

167. IHSL had advised NHSL that no physical works could progress without a Board Change. As part of that, and in order to assist NHSL, IHSL in conjunction with Multiplex provided some options to NHSL about how the critical care enhanced ventilation works could be progressed. The three options proposed were as follows:

a) Option 1: High Value Change (Schedule 16 (Change Protocol))
b) Option 2: Amended Process by Agreement
c) Option 3: Depart from High Value Change Process

168. IHSL's and Multiplex's preference was Option 3 because they considered that a more flexible approach best achieved the overall objective to facilitate the migration of RHSC into the new facilities at the earliest opportunity. The Schedule 16 Change Protocol set out a fixed procedure for valuing and processing the Change which, in the circumstances, I thought was more likely to delay matters. With Multiplex already on board, the parties anticipated that the enhanced ventilation works to implement NHSL's change to the ventilation in Critical Care could be undertaken relatively quickly. By departing from the procedure in Schedule 16 and adopting a more flexible procedure for agreeing the scope and the design development and approval process of the Change, it was hoped that the works could be undertaken more quickly.

169. In mid-August, we had a positive meeting with NHSL and Multiplex. Susan Goldsmith presented a proposal to IHSL which helped with the design and installation of the Critical Care ventilation amendments. The key principles outlined by Susan Goldsmith included that:

    a) NHSL would take responsibility for costs associated with the requested amendments to the Critical Care.
    b) NHSL would acknowledge the Critical Care ventilation as designed and built and compliant with the contract; and
    c) NHSL would issue a Letter of Intent to allow the design works to commence.

170. On 30 August 2019, we received an initial draft Board Change relating to the paediatric critical care ventilation (High Value Change Notice 95 ("HVC 95") **(A47272819 – High Value Change Notice 095 dated 30 August 2019 - Bundle 13, Volume 9 – Page 288).** HVC 95 required the ventilation system or systems to "deliver 10 air changes/hour at +pa as per SHTM 03-01." In addition to the works to be undertaken in the Critical Care department, NHSL also took the opportunity to instruct works which enhanced the ventilation relating to the haematology and oncology department (also known as the "Lochranza Ward"). High Value Change 96 was issued on 6 September 2019 in relation to those works ("HVC 96") **(A47272820 – High Value Change Notice 096 dated 6 September 2019 - Bundle 13, Volume 9 – Page 290)**. The requirements here were also for the ventilation systems to "contain 10 air changes/hour at +10pa as per SHTM 03-01".

171. Generally, good progress was being made by all parties in resolving the issues that had been identified in relation the ventilation systems. In addition to the ventilation issues in the Critical Care department, Multiplex were also working though the IOM's list of issues that IOM had identified as needing to be addressed. The issues in those Ventilation Action Logs were being progressed and closed out by Multiplex in parallel to the discussions for procuring the works to implement HVC 95 (Critical Care) and 96 (Lochranza Ward).

172. Towards the end of August 2019, however, the discussions with Multiplex to undertake the enhanced ventilation works in Critical Care and the Lochranza Ward fell through. NHSL had originally agreed to provide certain protections but when these were subsequently removed Multiplex considered that it was unable to undertake the works without those protections being in place.

173. After the discussions with Multiplex fell through, IHSL commenced discussions with BYES to explore whether BYES could undertake the enhanced ventilation works in Critical Care and the Lochranza Ward. However, IHSL considered that BYES was busy enough with the service provision at the RHCYP/DCN without adding the responsibility of significant design and construction works to the ventilation systems to their workload. Those discussions with BYES came to an end and instead IHSL looked at third party providers.

174. IHSL's MSA Provider, George Street, contacted independent third parties to gauge market interest in carrying out the enhanced ventilation works in Critical Care and the Lochranza Ward. It was through those discussions with the marketplace that Imtech's name came up. IHSL commenced discussions with Imtech in late 2019. Imtech prepared a detailed Project Proposal which was presented to NHSL. It was agreed with NHSL that Imtech would deliver the works relating to the High Value Changes 95 and 96 (i.e. the ventilation works to Critical Care and the Lochranza Ward).

175. On 13 November 2019, we wrote to NHSL **(A47272822 – Letter from IHSL dated 13 November 2019 - Bundle 13, Volume 9 – Page 293)** stating that, following on from the productive discussions that had taken place, IHSL agreed with NHSL's proposal that High Value Changes 95 and 96 should be aligned. IHSL also noted that, in order to meet the challenging timetable set by the Scottish Government, it had been agreed that the most pragmatic way forward to progress the High Value Changes would be to agree the process and appropriate programme for the implementation of the High Value Changes, notwithstanding the provisions of Schedule 16 of the Project Agreement.

176. IHSL's proposal confirmed (amongst other points) that IHSL would appoint Imtech to deliver the works and Imtech, in turn, would appoint Hoare Lea as designer. BYES would support Project Co in the delivery of the works through facilitation once the works had been completed. At this point, Imtech were able to commence the survey and early design works within a week, subject to NHSL and IHSL entering into the "Initial Engagement Agreement". The Initial Engagement Agreement to be entered into between NSHL and IHSL would enable IHSL to instruct Imtech to immediately commence the survey and design work. IHSL's proposal also provided that NHSL and IHSL would work collaboratively and in good faith to enter into a supplemental agreement which would set out the requirements for the High Value Changes.

177. IHSL and NHSL did agree the Initial Engagement Agreement in relation to the ventilation works. This was signed by NHSL on 16 December 2019 and by IHSL on 17 December 2019 **(A47272817 – Initial Engagement Agreement dated 12 December 2019 - Bundle 13, Volume 9 – Page 297).** The Initial Engagement Agreement stated that it was NHSL's wish (but not an obligation) to appoint IHSL in respect of the "Ventilation Works" but that neither party was yet in a position to enter into a contract to instruct the Ventilation Works (anticipated to be by way of SA2). NHSL instructed IHSL through the Initial Engagement Agreement to commence the design and survey works (defined as the "Advance Design Works") which were required in order to prepare the detailed design for the Ventilation Works. NHSL undertook to pay IHSL its reasonable and properly incurred costs in carrying out the Advance Design Works.

178. The Initial Engagement Agreement allowed IHSL to instruct Imtech to commence the Advance Design Works.

179. IHSL had written to NHSL dated 26 November 2019 setting out a brief summary of the discussions that had taken place with Multiplex and with BYES but also highlighting that with IHSL's proposal to appoint Imtech, NHSL

accepted that the nature of the relationship with Imtech was through a standard construction industry form of contract **(A47272823 – Letter from IHSL to NHSL dated 26 November 2019 - Bundle 13, Volume 9 – Page 335).** The letter reflected that it had previously been agreed between NHSL and IHSL that given the nature and scale of the works, the limited market interest and challenging programme goals, it would not be possible to impose PPP/NPD levels of risk on a third-party contractor. Consequently, IHSL required NHSL to accept that Imtech's liabilities would be limited to standard NEC provisions.

180. On 5 December 2019, NHSL instructed a change to the works through High Value Change Notice 107 ("HVC 107") which provided that multi-bed rooms and singled bedrooms in Critical Care were to be positive pressure with an air change rate of 10 ac/hr. HVCs 95 and 96 were rolled into HVC 107 which instructed the changes to the ventilation systems within the Critical Care and the Lochranza Ward. The enhanced ventilation works were instructed as a High Value Change by NHSL through the Project Agreement because they changed the requirements of the Project Agreement as amended by the Agreed Resolution set out in SA1.

181. IHSL subsequently progressed the procurement discussions with Imtech and both parties entered into an Agreement for Ventilation Works which was based on the NEC4 Option E standard form of contract.

182. NHSL and IHSL ultimately entered into SA2 on 5 August 2020. SA2 essentially gave effect to HVC 107. SA2 reflected NHSL's instruction to amend the ventilation system from 4 ac/hr to 10 ac/hr with an associated change to the pressure regime (these were captured within HVC 107). IHSL had sought specific assurances from NHSL and its technical advisers to confirm that NHSL's requirements had been definitively addressed. The terms of SA2 reflect the assurances that IHSL had sought.

183. Once the SA2 ventilation works were complete, full patient services transferred into the new hospital in March 2021. It is worth noting that the hospital had a

phased occupation. During week commencing 20 April 2020, the DCN Outpatients department was handed over to NHSL. During week commencing 6 July 2020, the Clinical Administration Teams occupied the hospital. During week commencing 13 July 2020 the DCN Inpatient Teams occupied the hospital. On 15 and 16 July 2020 the DCN was open to patients. During week commencing 20 July 2020 Children's Outpatient Services commenced. The RHCYP/DCN became fully operational on 23 March 2021 (when the Childrens Services Inpatient and CAMHS department opened).

Declaration

184. I believe that the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

Scottish Hospitals Inquiry
Witness Statement of
Paul Winning

Witness Details

1. My name is Paul Winning

Qualifications

2. I am a Chartered Engineer with a BEng Honours in Building Design Engineering and a member of the Chartered Institute of Building Services Engineers (CIBSE)

Previous Roles and Experience

3. In September 1998 I started working for Hoare Lea based in Bristol. After about 6 years I moved to work for Hulley and Kirkwood, also in Bristol, where I stayed for another 3 or 4 years before moving back to Scotland in December 2006. I worked for Hulley & Kirkwood until 2007, with Buro Happold until 2009 and returned to Hulley & Kirkwood until December 2015. I moved to Hoare Lea in January 2016 to set up their Glasgow Office..

4. In that time, I have worked in a number of different areas within the construction industry including health, offices, education, science and custodial centres. One of Hoare Lea's major sectors is in healthcare and I have been involved in various projects including Dumfries and Galloway hospital, Queen Elizabeth in Birmingham and the Queen Elizabeth University Hospital, Glasgow. As a result, I have built up quite a bit of experience dealing in acute hospitals projects.

Current Role

5. I am currently the Director for the Glasgow office of Hoare Lea.

Initial Approach / Involvement

6. We had worked in the past with Dave Keenan, who (at the time of this project) was a Director at Imtech Engineering, and we had built up a good working relationship with him. In December 2019 one of the funders (Dalmore) from the RHCYP project approached Dave indicating they were looking for a team to look at the critical care ventilation and requested his assistance. Dave then approached Hoare Lea and asked if we could help as he knew that he could trust us and that we had the necessary expertise. We, in turn, had to create a practice profile, for NHS Lothian and Dalmore, to show we had the expertise, knowledge and the resource to do the work.

7. Imtech agreed the contractual terms. There were various drafts of the contract which after various exchanges and amendments, was agreed **(A47237743 – Consultant Agreement between IMTECH Engineering Services Central Limited and Hoare Lee LLP dated 24 February 2020 - Bundle 13, Vol 8 – Page 2232)**. Meanwhile while that was going on we started doing the initial briefing of the project and the initial concept design.

8. We were aware of the ongoing problems with ventilation as it was reported in the press but we didn't know the specifics. We did have an internal discussion within Hoare Lea as to whether we would carry out the work, as we knew there would be potentially a lot of politics and publicity, but we decided to proceed. We are a firm with culture of problem solving rather than getting into the politics of who why and what. We were appointed to establish the facts and use the findings to help us resolve the issues that complied with the regulations and ensure the hospital opened.

9. We had a number of workshops with NHS Lothian in order to obtain the design information for the hospital, which proved quite difficult due to the

online platforms that were being used for various stages of the project. This meant we had to spend time sifting through all the information to try and understand it. The hospital was originally designed in Revit (i.e.BIM), and there were 3D coordinated plans which we were able to utilise. It became clear that the main issue with ventilation was that the air changes within the Critical Care bedrooms was designed for four air changes per hour as opposed to the SHTM requirements **(A32354071 – SHTM 03-01 Principal Differences between SHTM and HTM -03-01 dated 20 October 2011 – Bundle 5 – Topic 5 The Works Under Supplementary Agreement 1 (SA2) – Page 1504)** of 10 air changes per hour.

10. There were a number of implications of trying to achieve the 10 air change compliance.. If you put in 10 air changes an hour as opposed to four air changes, its more than double the amount of air you're having to supply and extract. The knock-on effects of this was significant in that the existing ductwork infrastructure was too small, the air handling units weren't big enough, which resulted in plant space issues. Routes had to be found to bring in new and bigger duct work. We had to explain to the The more air flowing down a duct, the faster it goes. The faster it goes, the more noise it creates, which meant it had to be resized.

11. In the initial stages we had to establish what the requirements were and what the NHS and HFS (Health Facilities Scotland) would accept. For instance, ideally you would want an air handling unit to be located within the building, so that any maintenance could take place inside. However, it became clear that there was insufficient space within the building so we looked outside to locate some of the air handling units.

Original Air Handling Units / Ventilation System

12. It was quite clear that the original air handling units were not designed to deliver 10 air changes per hour. We discovered from the documentation that we had collated at the early stages that the design was based on four air changes, so, the system was commissioned to that. All the commissioning

records were based on four air changes. The environmental matrix **(A39032317 – RHCYP+DCN Environmental Matrix Rev 12 – Bundle 5 – Topic 5 The Works Under Supplementary Agreement (SA2) – Page 1446)** that the original design team worked from was based on four air changes; the air handling unit drawings and associated technical documentation were all design to deliver four air changes. All the documentation (design and commissioning) confirmed the ventilation systems were based on and delivered four air changes.

13. IOM were the independent testers who were instructed to examine and verify the system. They were to look at the requirements and determine whether the original design complied with the original brief (i.e. four air changes). IOM then identified that for the critical care areas the requirements should have been ten air changes and not four. It was at this point that the system was discovered to be non-compliant with SHTM 03-01 **(A32354071 – SHTM 03-01 Principal Differences between SHTM and HTM -03-01 dated 20 October 2011 – Bundle 5 – Topic 5 The Works Under Supplementary Agreement 1 (SA2) – Page 1504).**
14. A high value change notice (High Value 107) **(A34957602 – Appendix 4 – HVC 107 – Paediatric Critical Care and Haemonc Ventilation_SIGNED AND ISSUED_05_12_19 (3)(127055780.1 – Bundle 3 – The Works Under Supplementary Agreement 2 (SA2) – Page 1146)** completed by NHS Lothian and signed by Brian Currie on 5 December 2019, was provided to set out what was required order to achieve the 10 air changes per hour. It included a requirement to design and install a ventilation system to deliver 10 ac/hr at +10 Pa pressure to nine specified rooms in the paediatric critical care department and fourteen specified rooms in the haematology and oncology department. Our thoughts were “Did we have to get bigger ductwork into the hospital, did we have to strip out all the existing ductwork and put new in, or could we re-use elements of it?”

15. Initially we thought we might need to strip all of the supply and extract ductwork out and start again but realized that we could re-use elements of it. We made the decision, after looking at the plant space, ceiling void space,

and coordination, that re-using what was there would be beneficial. We therefore tried to use the existing air handling units to supply some of the non-critical care rooms, and designed new air handling units that was eventually located outside the building, dedicated to serve the isolation rooms requiring 10 air changes per hour.

16. From a co-ordination point of view, the ductwork was the first thing that we installed in the ceiling voids; below that was the electrical containment, then the pipe work, including the medical gases. This was a huge additional piece of work because to work on the ventilation system meant completely overhauling or tinkering with other MEP systems.
17. There was also a control issue with the cooling and heating of certain rooms, because each individual room was to be heated to either 18 or 28 degrees. This meant working closely with NHS Lothian, and the head clinicians, to establish how we could do this.

18. The bedrooms contained radiant panels. These were all removed as that aspect didn't comply with SHTM **(A32354071 – SHTM 03-01 Principal Differences between SHTM and HTM -03-01 dated 20 October 2011 – Bundle 5 – Topic 5 The Works Under Supplementary Agreement 1 (SA2) – Page 1504),** and the heating control was basically achieved via the supply air temperature. If 28 degrees in a room was required, approximately 33 degree air into that room would be required to offset any kind of heat losses in the winter, just to control that room to 28 degrees. It was all clinically driven with the clinicians specifying that that's what they needed for certain types of patients.

19. All this is contained in our Stage 4 report. **(A35683157 – Hoare Lea Final Report REP-2727164-08-SV-20200313-Stage 4 Report- Rev 07 dated 20 December 2020 – Bundle 3 – The Works Under Supplementary AGREEMENT (SA2) – Page 1440)**

Remedial Works Carried Out

20. As we were engaged by Imtech, we were part of their team, so we were heavily involved in the design and the installation decisions that were being made. It can be difficult when you're working off drawings to understand if the design is achievable. We did investigation works and decided that all the ceilings had to come down as a starting point. Then we looked at our proposed design and decided what was practically achievable, and what could be used and what couldn`t.

21. We carried out a structural assessment to make sure that the roof could take the extra load involved in accommodating the new plant. We did ductwork pressure tests because the ductwork had to be a certain classification and capable of the higher pressure.

22. This information is all contained within the completion criteria document. It provides all the documentation we had for the project. Appendix 1 is the Stage 4 design information, which contains everything in the Stage 4 report and all the appendices that go with it. There was a compliance tracker, RFI's, commissioning methodology, commissioning information, the sign off, building control and planning. This all had to be finalised for the client before sign off.

23. We also drafted various down-taking drawings. These are colour coded. The red sections show everything that we removed. New and existing designs, again colour coded, shows our designs for levels two and level four. Our scope from NHS Lothian was to change from four changes to 10 changes, and the positive 10 pascals for these rooms.

24. The existing ventilation plant rooms were located within the hospital, but there was insufficient space for us to utilise. There was an external energy centre which contained all the boilers, the CHP, medical gases, HV and LV. The ventilation plant rooms were on level two and level four where we looked at reusing the existing air handling units. However , we came to the conclusion

that we weren't capable of delivering all the additional air that we needed. Therefore, we replaced the existing air handling unit, utilized some of the existing ductwork, then stripped out and rejigged a lot of other areas of the ductwork.

25. There were two elements to this project. The Critical Care bedrooms with the air change issues and also the isolation rooms which, in addition to air change issues, also posed questions regarding the resilience of the systems serving those rooms.

26. The way the system was designed originally was with one air handling unit served four different isolation rooms. This design was criticised on the basis that if the air handling unit went down, for maintenance or because it broke down for example, you then had an issue that those isolation rooms wouldn't have enough air to keep sufficient positive pressure. I wouldn't say that design was wrong or non-compliant, but the implications of having that design made it difficult to achieve the requirements and created a clinical risk. After consultation with NHS Lothian, we decided to design individual air handling units, i.e. small air handling units, one of which served each of the isolation rooms. That also meant that you could have specific temperature control of different rooms. You could have one isolation room being shut down for maintenance purposes and it wouldn't affect the other three. That was another big piece of work that we included and this was part of High Value Change 107 **(A34957602 – Appendix 4 – HVC 107 – Paediatric Critical Care and Haemonc Ventilation_SIGNED AND ISSUED_05_12_19 (3)(127055780.1 – Bundle 3 – The Works Under Supplementary Agreement (SA2) – Page 1146)**. Although individual air handling units were not specified, we were to comply with the SHTM requirements, and our technical opinion was the best way to achieve that was a design in which an individual air handling unit supplied each of the isolation rooms.

27. The critical care rooms were heated by radiant panels, which we didn't think was right as there was no real temperature control with this type of system (i.e. to heat from 18 degrees to 28 degrees). We therefore included additional

heater batteries to make sure that each room could be controlled at a different temperature, by heating or cooling the air going into each room. The central air handling unit can do this if all the rooms had to be the same temperature, but if you needed one room at 23 degrees and another at 18 degrees then you needed to control the temperature of the air supplied to each bedroom. Each bedroom would have its own heater battery, which is basically just a coil in the ductwork. If a room required to be heated to 28 degrees, and it was 18 degree air in the duct, that coil would heat it up to 28 and it would be delivered into the room at 28 degrees.

28. Each air handling unit is bespoke because the air volume is specific to the building that you are designing. The cooling and heating loads are specific to the building and to the environment that you are trying to create.

29. A company called Daikin built the new air handling units. We have kept the technical information for the old air handling units and likewise for the new ones. We also have the technical drawings and we carried out a 3D reality photographic Matterport survey which is a kind of reality 360 degree survey so you can see a before and after images (you can also walk through the plantrooms).

30. The new units were marginally taller, wider and longer. They were tested within the factory then disassembled into small sections, a fan section and a filter section, then rebuilt on site. There were double doors into the plant room, so we had taken a site measure to see what was the biggest element that we could get safely through the doors. There was then another performance test on site to make sure it still delivered what it did in the factory.

31. The initial location for the new air handling unit was going to be within the Paru Garden. This created another issue as the Paru Garden was an outdoor garden space and the clinicians were against having a big air handling unit sitting in their nice garden potentially affecting its use by the patients.

32. It was eventually located on the first floor of the energy centre, which was extended so that all the new air handling units were contained within this and

was surrounded with a louvered screen so you couldn't visually see it. There was some ductwork across the sunken courtyard but we created a link bridge, which we turned into a bandstand, that made it more of a feature of the garden. We involved the Edinburgh Childrens charity and we got musical instruments and things like that to make it more of an interactive space for the patients. Using our in-house specialist lighting team, we assessed the perceived brightness of the space and eventually painted the wall in the ground floor bedroom accommodation that brightened it up and gave it a little bit of a lift.

33. There were two existing air handling units. One served the critical care on level three and the other served level one. Originally we were going to put one in the Paru garden but it was too big and again there was a problem when it came to maintenance access. We therefore decided to go back and replace that unit to deliver the 10 air changes and to also make necessary changes to the distribution rather than having something outside the building. It was only the isolation rooms that had the new air handling units located outside.

34. Most of the ductwork did not require to be changed but some had to be modified to allow resilience to the system if all four went down. This was done by having a structural engineer and contractor drill through the fourth floor plant area into the isolation room and reconnect onto the existing duct work.

35. Because we were increasing the heating to the air handling units, as they were bigger and delivering more air, their heating coils also had to be made bigger (i.e. larger load). Therefore, the heating pump also had to be larger to deliver the heat from the boilers to the heater battery.

36. All contractors working on any installation, be that ductwork or pipework, all complied with our workmanship specification issue sheet **(A35681002 – 20201221 – Hoare Lea Stage 4 Rev06 Specification Issue Sheet 20th Dec 2020– Bundle 3 – The Works Under Supplementary Agreement (SA2) – Page 1439)**. This was more to do with quality and made sure that we were all using the necessary fixings and fittings.

37. We were also conscious, at the time, that when you are not using the cold water system you may have bacterial growth which could result in a Legionella risk. This was a live hospital, so creating dead legs had to be avoided. Our design managed to incorporate and retain the existing cold water system without modifying the pipework in any way.

Commissioning / Testing and Validation

38. Before everything was signed off, a number of commissioning activities were carried out to verify that all the critical care bedrooms achieved 10 air changes. We also needed to confirm that we had achieved a positive pressure of 10 pascals between the room and corridor. This is actually quite difficult to do because if you have got lots of rooms with their excess air going into the corridors, you need to then remove that excess air when doors start opening and closing. This affects the pressure cascade, as we call it, and needs to be a very settled system.

39. We checked the pressure rating of the rooms, then we set the pressure of the ventilation, then we had to measure the air volumes and the air change rates going into the rooms to verify the 10 air changes.. If you have measured the volume of a room, and that volume gets replaced every hour, one can then measure the air in litres per second. SHTM requirements **(A32354071 – SHTM 03-01 Principal Differences between SHTM and HTM -03-01 dated 20 October 2011 – Bundle 5 – Topic 5 The Works Under Supplementary Agreement 1 (SA2) – Page 1504)** are based on air changes whereas most of the commissioning activities are based on a flow rate which is litres per second.

40. We were involved in all the commissioning checks and signed it off as designers. The NSE 4 supervisors, Watermans, also verified it and signed it off, then the independent tester, Arcadis, signed it off. IOM then did the final audit and fully signed it off.

Declaration

41. I believe that the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

Scottish Hospitals Inquiry

Witness Statement of

Ronald Henderson

Introduction

1. My name is Ronald Henderson. I am a Senior Capital Programme Manager for NHS Lothian (NHSL). I have been asked to provide a statement detailing my involvement with the Royal Hospital for Children and Young People and Department of Clinical Neurosciences (RHCYP/DCN) Project (the Project).

2. I have a Higher National Certificate (HNC) in Mechanical Engineering and a Masters in Facilities Management & Asset Maintenance Management (MSc with Distinction) from Heriot Watt University.

3. I joined NHSL in 1995 as a Maintenance Electrician at the Royal Hospital for Sick Children in Edinburgh. That role involved working on all types of plant and equipment whilst gaining appreciation of the work of other trades. I was appointed Maintenance Supervisor in May 1996 resulting in the supervision of all trades with the management of their workload becoming my direct responsibility. This responsibility, coupled with the acquisition of Mechanical Engineering qualifications, further enhanced my understanding and abilities in relation to other trades. I also participated in the estates management on call rota and, whilst employed as supervisor, provided cover for leave and absence of Estates Officers. This resulted in promotion to the post of Estates Officer in June 2002 with overall management responsibility for the estates function at the Royal Victoria Hospital and various sections of the Western General Hospital, both in Edinburgh. In June 2003 I took on additional responsibilities at the Western General Hospital and my areas of responsibility were expanded to include project management, management of minor works and measured term contractors. I also act as Authorised Person (AP) in several disciplines, but not

ventilation or water. An AP is responsible for managing work on the relevant system. This includes, for example, supervising operatives and contractors, updating and issuing documentation such as permits to work, equipment logs etc. I was not the AP for ventilation or water on the Project.

4. My current role in NHSL is a Senior Capital Programme Manager and I have been in that role since May 2021. My focus is on technical project management, in particular providing Mechanical and Electrical support to NHSL programme of major capital works to construct and commission a new National Treatment Centre, a replacement for the Princess Alexandra Eye Pavilion and for the Edinburgh Cancer Centre. Main duties include review of design information for compliance with Guidance, along with a team of technical advisers; participation in design meetings with the design team representing the Principal Supply Chain Partner; Coordination and management of AE input; and full participation in the briefing process. Part of my role is to input and review ventilation and water systems, but I do not have overall responsibility for them.

Role in RHCYP/DCN

5. I was involved with the RHCYP/DCN project from June 2016 to May 2021 on a seconded position of Commissioning Manager, Hard Facilities Management (Hard FM). Hard FM is a term used to describe the areas of maintenance. In the RHCYP & DCN most of the duties that fall under the heading Hard FM are carried out by a third party, namely Bouygues (BYES). BYES duties include maintenance of the building, its engineering infrastructure, and equipment installed by Multiplex as part of the initial build. They are also responsible for specialist sub-contractor management, project management, and minor works. NHSL Hard FM are responsible for elements such as grounds and gardens, soft landscaping maintenance, pest control, and equipment maintenance outwith the responsibility of BYES. In my role on the Project, I managed the interface between NHSL Hard FM and BYES Hard FM.

6. I had no responsibility in the commissioning of the water and ventilation system in the Project, that was the responsibility of Integrated Health Services Lothian (IHSL). As explained below, I did have some input, along with our technical advisors Mott MacDonald Ltd (MML), in witnessing some of the 'building commissioning' activities for ventilation systems carried out by Multiplex (MPX) and their sub-contractors. The commissioning by MPX was also witnessed by the Independent Tester (Arcadis) whose responsibility it was to approve or sign off on commissioning. MPX were responsible for commissioning the building services, including and its engineering systems. My commissioning role was the same as the other NHSL commissioning managers on the project, in that I was responsible to ready both (i) the new hospital for opening (for example by transferring hospital equipment) and (ii) the existing NHSL Estates Team at the old Royal Hospital for Sick Children (RHSC) for the specific areas of responsibility they had at the new site. As noted above, I had a role in liaising with the Hard FM provider (BYES) for the new site in relation to their maintenance activities and where demarcation of responsibility sat as between BYES Hard FM and NHSL Hard FM. This can be summarised as 'commissioning a service'.

7. Accordingly, when I refer to 'commissioning' in the bullet points below, I do <u>not</u> mean commissioning of the water and ventilation systems which IHSL and MPX had responsibility for. None of the bullet points should be taken to indicate NHSL has responsibility for items designed and installed by MPX, including water and ventilation systems. It was the responsibility of MPX and BYES to manage both water and ventilation during construction, commissioning, validation, and setting to work. It was BYES responsibility to manage, continuously validate appropriate systems, and maintain the built environment thereafter. In order that NHSL could be satisfied that BYES were carrying out their responsibilities in compliance with the relevant SHTM's, their systems and procedures were audited by NHSL's appointed Authorising Engineer (AE) for each discipline. As above, I was not the AE or AP for either water or ventilation. Arranging an AE to undertake independent validation of critical ventilation was the limit of my and therefore NHSL's responsibility. All of the other bullet points

relate to commissioning associated with the transfer of the in-house Estates Team and equipment (including procurement), and decommissioning of the old Royal Hospital for Sick Children. I had the following roles and responsibilities relating to the Project:

- Leading the planning and commissioning of Hard FM services for the new hospital to guarantee that the transfer of services to the Hard FM provider (BYES and the installation of equipment took place effectively).
- Leading the redesign of the services, the workforce planning and the development of suitable operational policies for the Hard FM services.
- Ensuring that appropriate levels of staff were in place to facilitate double running during the commissioning of the new hospital, ensuring no interruption to patient care in the existing sites, whilst delivering the services in the new site.
- Planning and implementing the decant and decommissioning process for Hard FM in the old hospital.
- Ensuring that systems and procedures were in place to make certain that the appropriate equipment was transferred, procured, and installed in the new hospital in accordance with the overall programme.
- Co-ordination of all activities around the transfer of assets.
- Co-ordination of Hard FM services between NHSL and Bouygues FM to ensure a seamless service to patients and staff alike.
- Ensuring that a comprehensive plan for the safe relocation of FM services in line with double running arrangements was developed for each area, taking into account any business continuity and resilience issues. Ensuring that the format was comprehensive and could be fed into the master plan for the project for use by all key parties.
- Ensuring existing service contracts were cancelled or amended as appropriate. Working with clinical areas and Soft FM to determine requirements for example, plant and equipment such as beds, hoists and trolleys.
- Participating in justification for proposed equipment on behalf of users to agree an `equipment to be purchased` list with capital planning managers

and procurement and proceed to purchase after completing due diligence within the agreed budget and user requirements.

- Leading on the specification of assets, systems and equipment working with HFS.
- Defining and developing the full training and orientation requirements of users and deliver the plan to meet the needs of the users.
- Ensuring that services and equipment `dovetail` together by critically appraising the Operational Policies of both hard and soft FM services, to ensure that the assets will support the delivery of the policies. This required close links with operational managers within the FM directorate to understand and address issues of a technical nature.
- Pro-actively minimising risk to the FM service delivery by ensuring that there was a robust process to identify risk areas at local level. Ensure such risks were actively addressed and managed.
- Developing a good working relationship with all third party organisations thus enhancing the NHS position throughout the project and in the future.
- Ensuring that clearly defined requirements were formed and agreed with Divisions to inform any necessary proposed change orders or additional works.
- Delivering high quality communication events or communications to support the implementation of the service transfer and equipment element of the project.
- Providing professional advice as appropriate.
- Acting as first aider to project team.

8. I had the following additional roles and responsibilities during the period of the RHCYP/DCN project but that were unrelated to the project:

- Providing out of hours on call cover at existing RHSC/ Princess Alexandra Eye Pavillion (PAEP); Lauriston Building Sites
- Acting as Authorised Person for various services at the Western General Hospital (WGH) including High Voltage (HV) / Low voltage (LV) / Medical Gas Pipeline Systems (MGPS).

Project Groups and Committees

9. In my role as Commissioning Manager throughout the RHCYP/DCN project, I regularly attended the following Groups and Committees. The information below is my own personal recollection of the activities of these groups. It is worth noting that there was at times significant crossover between information shared at each of the groups.

- Project Management Group (PMG). Before Handover in February 2019.
    - Discussion, input and updates on design issues, commissioning, and general progress. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of progress although other issues were raised and discussed.
- Operational Management Group (OMG). This group replaced the PMG after February 2019 handover.
    - Discussion, input and updates on design issues, commissioning, and general progress. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of progress although issues were raised and discussed.
- Reviewable Design Data (RDD) (Before handover in February 2019).
    - Assist Technical Advisors, MML, in design reviews and technical meetings. MML were the primary reviewers of Reviewable Design Data (RDD), i.e. design items submitted by IHSL / MPX for review, however I would also provide comments on drawings, design info,

documents etc. which MML would then, if relevant, incorporate into the response. NHSL were only responsible for operational functionality. On occasion these comments would be discussed with the clinical commissioning managers if clarification was required. This process did review ventilation items of interest to the inquiry. Relating to the 4 bed rooms issue, the reviews taking place focused entirely on achieving balanced pressure in the rooms that clinicians had identified as being required to cohort patients.

- Project Management Executive (PME). Before and after Feb 2019 handover)

    - Commissioning and decommissioning updates. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of progress although issues were raised and discussed.

- Joint Commissioning Group. Before and after Feb 2019 handover

    - Update on progress in relation to commissioning. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of NHSL service commissioning progress although issues were raised and discussed.

- Technical Commissioning Group. Before and after Feb 2019 handover

    - Discuss and agree programme for witnessing of technical commissioning and update on commissioning progress. This group did deal with the commissioning of systems of interest to the inquiry, however it is assumed this

commissioning was carried out using design information and values that were later discovered to be non-compliant. This was not identified at the time as commissioning values were not expressed in air change rates per hour.

- Internal Change/Technical Delivery Group. Internal change meeting was superseded by technical delivery group before 2019 handover

    - Input to proposed changes. This group did work on ventilation issues of interest to the inquiry. This groups' primary role was management of the contractors change process particularly in relation to wording of derogations. Issues were also raised and discussed.

- Project Management Team. Before and after Feb 2019 handover.

    - Internal project team matters relating to progress. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of progress although issues were raised and discussed.

- Demarcation Meetings. Before and after Feb 2019 handover.

    - Discussing provision of space and infrastructure for turnkey works mostly focused on radiology. This group did not directly work on any of the ventilation issues of interest to the inquiry. This groups' primary role was management of demarcation of responsibilities and identification of service provision for specific rooms in

radiology. Issues were raised and discussed.

- Design Team Meetings. Before and after Feb 2019 handover.

    - Discussion of technical proposals and drawings. This process did review ventilation items of interest to the inquiry. Relating to the 4 bed rooms issue, the reviews taking place focused entirely on achieving balanced pressure in the rooms that clinicians had identified as being required to cohort patients. Intention of the comments raised were in regard to achieving this result.

- Ventilation/Water/Electrical/Medical Gas/Fire/Drainage Groups. After Feb 2019 handover.

    - Managed meetings and workstreams to close out issues identified in NSS Scotland reports. These workstreams were directly involved in the identification and resolution of issues raised in relation to each of the engineering services and as such did deal with ventilation items of interest to the inquiry, including resolution of the non-compliant air change rates in Critical Care.

- High Value Change (HVC) & Medium Value Change (MVC) Remedial Works. After Feb 2019 handover.

    - Within the terms of the Project Agreement, HVC and MVC represented a change within a certain financial threshold. Input to design and progress meetings relating to works to rectify issue with critical care ventilation and to enhancement works in other areas. These workstreams were directly involved in the resolution of issues raised in relation to ventilation items of interest to the inquiry. HVC

107 dealt with the non-compliant air change rates in Critical Care and enhancement works to Haematology Oncology ventilation.

10. I liaised with, and reported to the following individuals and groups either routinely or on an ad hoc basis as part of the RHCYP/DCN project:

- Jackie Sansbury, NHSL, Head of Commissioning (line manager)
- Brian Currie, NHSL, Project Director
- Janice McKenzie, NHSL, Project Clinical Director
- Neil McLennan, NHSL, Project Manager
- Mike Conroy, NHSL, Radiology Equipment Manager
- Dougie Coull, NHSL, Radiology Equipment Manager

- Infection Prevention Control Team (IPCT) on an ad hoc basis:

  (i) Janette Richards, NHSL, IPC Nurse and HAI Scribe Nurse on Project until late 2018
  (ii) Sarah Jane Sutherland, NHSL, IPC Nurse and HAI Scribe Nurse on Project from late 2018 onwards
  (iii) Donald Inverarity, NHSL, Lead IPC Doctor
  (iv) Lindsay Guthrie, NHSL, Lead IPC Nurse

- NHSL Commissioning Managers:

  (I) Dorothy Hanley, NHSL, Women and Children
  (II) Fiona Halcrow, NHSL, DCN
  (III) Ashley Hull, NHSL, Theatres and Critical Care
  (IV) Callum Gordon, NHSL, General
  (V) Margaret DiMascio, NHSL, Radiology and CAMHS
  (VI) Sharon Rankin, NHSL, IT
  (VII) David Denholm, NHSL, IT
  (VIII) Patrick Macaulay, NSS Scotland Equipping Manager

- MML, our Technical Advisors (TA):

  (I) Graeme Greer, MML, Team Lead
  (II) Kamil Kolodziejczyk, MML, Project Manager
  (III) Kelly Bain, MML, Project Manager
  (IV) Colin Macrae, MML, TA Mechanical
  (V) Willie Stevenson, MML, TA Electrical
  (VI) Douglas Anderson, MML, TA Electrical
  (VII) Ian Brodie, MML, TA Ventilation
  (VIII) Iain Tinniswood, MML, Project Manager

- Estates and Facilities

  (I) Phil Christie, NHSL Estates Manager for RHSC
  (II) Brian Douglas, NHSL Head of Estates
  (III) George Curley, NHSL Director of Facilities

Expertise

11. I am not an expert or specialist in any area. I am an experienced Maintenance Manager with an electrical background. I also hold Mechanical Engineering qualifications as well as a Masters in Facilities Management. On a day to day basis, I used my experience to prepare the NHSL in house Hard FM Estates team for transfer to the new facility, ensuring that the workspaces were adequate to deliver the service. This included agreeing the workforce required to deliver the transfer of the service. Additionally, on a day to day basis, I used my experience to comment on and challenge issues as/when they arose that I considered were within my competence.

12. My competence in regards to ventilation includes knowledge pertaining to air change rates and pressure cascades as they relate to SHTM 03-01. I do not recall specifically raising any design issues, although I may have, but I was

involved in discussing and challenging items with the MPX design team, specifically:

a. Haematology Oncology – this led to the meeting with clinicians and IPC on 23 February 2017 to agree if the design proposal, which deviated from SHTM 03-01, would be acceptable in an operational environment. It was concluded that it would be (see paragraph 72 below).
b. Isolation Room Ventilation – this led to the proposal for a maintenance by-pass for areas where several isolation rooms could lose supply at the same time.
c. Single & Multi-Bed ventilation – this led to pressure cascade being balanced at the door to the corridor of single bed rooms and balanced within certain multi bed bays (discussed in more detail below).

Commissioning and Validation

13. I participated in commissioning witnessing activities on behalf of the board, along with the Board's technical advisors, MML and the Independent Tester. I would clarify that that the word "commissioning" has two meanings in relation to my role:

(i) Firstly, the primary purpose of my role as Commissioning Manager Hard FM was to ensure that the transferring team and the spaces they would occupy, as well as documentation relating to the activities they would perform, were ready by the time of occupation, e.g. input to the design of workshop areas, agree workforce plans and budgets, agree planned preventative maintenance activities, manage interface with Soft FM, demonstrate operation of equipment and systems in conjunction with MPX, and assist NHSL Hard FM in the procurement of any specialist sub-contractors. This is similar to the role performed by the clinical and other commissioning managers.

(ii) Secondly, part of my role as Commissioning Manager Hard FM was to

participate in the building, infrastructure, and systems commissioning carried out by and on behalf of IHSL. This spans the period from November 2016 to March 2021 and involved physical witnessing only of commissioning activities managed by MPX. Participation was on an as needs basis and was initially programmed in a look ahead, however more often than not these would be cancelled by MPX resulting in a build-up of commissioning required as handover approached. As a result, it was impossible to attend all commissioning even with assistance from Stuart Davidson (Contracts Manager) and someone from the MML technical team.

14. I have been asked to explain more fully what commissioning and validation as regards building systems such as ventilation entails. Commissioning and Validation are defined in SHTM 03-01 (2022 interim) (**A43258651 – SHTM 03-01 Part A: Interim Version 3.0 dated 1 February 2022 – Bundle 1, Page 2263)** as follows:

Commissioning

'11.1 Commissioning is the process of advancing a system from physical completion to an operating condition. It will normally be carried out by specialist commissioning contractors working in conjunction with equipment installers. Commissioning of the ventilation system will normally be the responsibility of the main or mechanical contractor who should coordinate the process.

11.2 Commissioning is often subdivided into sections (for example, air handling unit, automatic controls, air side balance, building fabric and fittings). Each section may be commissioned by its specialist installer, and they are often accepted in isolation' (**Page 2391**)

Validation

'12.2 Validation differs from commissioning in that its purpose is to look at the complete installation from air intake to extract discharge and assess its "fitness for purpose as a whole". This involves examining the fabric of the building being served by the system and inspecting the ventilation equipment fitted as well as measuring the actual ventilation performance. Validation is not a snagging exercise; see the Note after paragraph 12.30.

12.3 Validation is a process of proving that the system in its entirety is fit for purpose and achieves the operating performance originally specified. It will normally be a condition of contract that "The system will be acceptable to the client if at the time of validation, it is considered fit for purpose and will only require routine maintenance in order to remain so for its projected life."' (**Page 2402**)

15. In summary, the main distinction between the two is that sub sections of the system can be commissioned and accepted separately, whilst validation deals with fitness for purpose and acceptance of the system as a whole. An example would be the fire alarm system interfaces for closing the fire dampers and shutting down the AHU would be tested commissioned and accepted as part of the Fire Alarm System commissioning but it would not be until validation that it could be checked as part of a complete system.

16. The process followed for commissioning was that MPX commissioning manager would produce a 'look ahead' programme which would indicate the dates that certain commissioning activities would take place. It is worth stating here that these were often cancelled at the last minute by MPX resulting in a significant backlog and ultimately parallel, or multiple commissioning tasks being carried out at the same time.

17. The invitees would always include a representative from NHSL, MML, BYES, MPX Commissioning Managers, and the Independent Tester, Arcadis.

NHSL/MML were merely witnessing the tests on behalf of NHSL and the Independent Tester had final sign off or authority to accept. Due to the compressed nature of commissioning as a result of the backlog it was not always possible for a representative of NHSL to attend all commissioning activities, however as I understand, it was a requirement of the IT to attend all commissioning relating to critical systems, a percentage of commissioning of other systems, and to undertake a full review of test results and to sign off or accept these on behalf of NHSL and IHSL. It is my own view and was my understanding at the time that the commissioning should have taken place against the relevant guidance unless there was a specific derogation in place.

18. However, it is relevant to note that the outstanding works to be undertaken post-SA1 handover in February 2019 (see detail on SA1 below) were very disruptive. These works resulted in significant disruption to the fabric of the building, including the ventilation systems, which meant that, although the critical ventilation systems had been commissioned by MPX and signed off by the independent tester in 2018, it was not possible to validate the critical ventilation systems as at January/February 2019. In order to validate critical ventilation systems prior to patient occupation, you need to have a clean environment. As at January 2019, the completion date for the post completion works was unknown and it was therefore not possible to arrange validation for a 'possible' completion date that may not be met. However, as detailed below, we did arrange independent validation by IOM to take place after the post completion works had taken place and before anticipated patient occupation (**A35231006, A35231011, A35231011 and A35231029 – IOM Services Reports dated between 20 and 24 June 2019 – Bundle 6, Pages 202, 227 and 238**)

Supplementary Agreement 1 (SA1) (A32469163 – Settlement Agreement and Supplemental Agreement relating to the Project Agreement for the provision of RHSC and DCN between Lothian HB and IHS Lothian – 22 February 2019, Bundle 4, Page 11)

19. My understanding is that handover of the building from NHSL to IHSL occurred when Supplementary Agreement 1 (SA1) was signed on 22 February 2019. I cannot say how SA1 came about from a commercial or legal perspective. My understanding is that it was a Supplemental Agreement to the Project Agreement to allow a mechanism for resolution through the contract of the various issues that had arisen with the build during the construction period. SA1 provided a resolution for works that remained incomplete, known as the post-completion works or the outstanding works. SA1 also included a "technical schedule" which formally recorded resolutions that had been agreed to issues that had arisen during construction. This included the resolution to the dispute with IHSL as regards the balanced pressure that NHSL wanted in the multi-bedded rooms so as to allow the cohorting of patients with the same infection and the derogation from 6ACH to 4ACH for single bedrooms.

20. My involvement with SA1 was purely technical. I had been involved in some of the issues included in the technical schedule during the construction period. MML were managing the development of the technical schedule and advising NHSL as to the various items on it.

21. SA1 was not signed until February 2019 but some of the works to resolve the issues contained within SA1 were known about for some time; some were in progress prior to signing; and some were already complete. The ventilation system had already been installed and commissioned at the point of signing SA1 in February 2019 and the technical schedule was intended to reflect what had been agreed, and indeed what NHSL understood had been installed, in relation to the ventilation system.

Genesis of SA1 Technical Schedule

22. MML, IHSL and MPX drafted the agreed resolutions to the disputes over ventilation in four-bed and single rooms that are found in the SA1 Technical Schedule. I would estimate that this took around 12 months of ongoing negotiation and revision. The items in relation to ventilation were not particularly time pressured.

23. By way of background, on 20 and 21 February 2018, there was a RHSC + DCN Principals meeting at the Sheraton in Edinburgh **(A33393812 – Note for the Board 27 February 2018 - Bundle 13, Volume 8, Page 2250).** This entailed two days of negotiations between NHSL and MPX, facilitated by IHSL, in an effort to avoid court action by NHSL against IHSL in relation to the multi-bed dispute re pressure. I was at those meetings. Critical care was never specifically mentioned.

24. In advance of the negotiations, Graeme Greer of MML drafted a schedule of non-compliances **(A33393831 – 16 February 2018 – 160218 Confidential DRAFT RHSC + DCN - Bundle 13, Volume 8, Page 2257)** which listed around 25 non-compliances and defects in the Project, including ventilation in single bed and multi-bed rooms, for use at the Principals meeting. This schedule of non-compliances would have been reviewed by NHSL project team, including me, but I don't recall any specific comments in relation to critical care. During and after the Principals meeting at the Sheraton the list was expanded from 25 non-compliances and defects to eventually include 81 items.

25. Negotiations continued between IHSL and NHSL beyond 20 and 21 February 2018 which ultimately resulted in SA1 but I was not involved in the commercial or legal negotiations so cannot comment on that. The technical aspects of SA1 also continued to be tracked through the schedule of non-compliances, which I think eventually became the Disputed Works Schedule, Appendix 1 **(A35004560 - Disputed Works Schedule Appendix 1, Item 13 dated 12**

December 2018 - Bundle 10 Page 69) and then the SA1 Technical Schedule but MML would be better placed to advise on that.

26. MML revised the schedule of non-compliances and the later Disputed Works schedule to reflect any changes or agreements as between IHSL and NHSL. Graeme Greer of MML administered the revisions and is best placed to advise on the various versions. MML continued to circulate the Schedule of non-compliances / Disputed Works Schedule / SA1 Technical Schedule to the NHSL Project Team, including myself, for comment and incorporate any changes. Again, I don't recall any specific comments in relation to critical care.

27. We relied on advice from MML in relation to the agreed resolutions. The advice focused on the pressure issue in multi-bed rooms and that was the key issue we needed to get resolved. I cannot recall anyone from MML (or TUV SUD, MPX or IHSL) ever advising that, other than in isolation rooms, critical care had been designed (and installed) with an air change rate of 4ACH and that was a deviation from Guidance which required 10 ACH.

Item 7 – Multi-bed rooms

28. In relation to the multi-bed rooms, the item in the technical schedule (item 7) ensuring the pressure in multi-bed rooms was balanced, also allowed for a derogation to 4ACH. This was because I thought all the multi-bed rooms we were dealing with were in general wards. There was a clinical need for 14 of the multi-bed rooms to be balanced so as to allow for the cohorting of patients with the same infection. The clinical team decided on the 14 multi-bed rooms that required balanced pressure and my role was to ensure that those 14 rooms were all balanced at 4ACH. The reason I say 4ACH is because the multi-bed rooms were to be treated as if they were a "single bedroom" for ventilation requirements rather than a general ward (following advice from HFS – see paragraphs 38 and 39 below).

29. I was not specifically aware that 4 of 14 multi-bed rooms were in critical care. I

cannot explain why that was not spotted by me or anyone else at the time. I accept that 4 of 14 multi-bed rooms were located in critical care, but I did not appreciate that at the time. I was dealing in numbers rather than locations. At no point during the Project did anyone from MML, IHSL, MPX or TUV SUD ever specifically flag to me that 4 of the 14 multi bed rooms where we were seeking balanced pressure were actually located in critical care and should have had 10ACH and positive pressure and that accordingly item 7 was a derogation from those specific requirements. I was not knowingly derogating from those specific requirements and it was a shock to learn that 4 of the 14 bedrooms in item 7 were located in critical care and as a result were non-compliant with Guidance.

30. To clarify, item 7 refers to an agreement that 14 four-bed rooms be balanced or negative to the corridor at 4 ACH, and to the remaining 6 four-bed rooms remaining as per the environmental matrix **(A46496631 - Appendix 30 - Extracts from SA - Item 07 - G1547 Environmental Matrix Multi Bed Wards - Bundle 13, Volume 1, Page 784)**. I have been asked which part of the agreement determined the parameters for the rooms in critical care. Of the 14 four-bed rooms referred to, 4 were located in critical care, as indicated on the First Floor GA Ventilation Mark-up drawing **(A46457204 – Appendix 36 First Floor GA B1 Bedroom Mark up - Bundle 13, Volume 1, Page 835)** referred to. The rooms on this drawing were: 1-B1-065; 1-B1-063; 1-B1-031; and 1-B1-009. As above, I did not recognise these rooms at being located in critical care specifically at the time.

31. I have been asked to comment on an aconex transmission from me to Ken Hall, MPX, dated 18 April 2018 **(A39975863 - NHSL- GC-002953 Dated 18 April 2018, Bundle 13, Volume 7, Page 362)** which states as follows:

> *"I note the attached schedule rev 05 sill refers to Air Change rates between 2.7 and 3.5, we are seeking design for 4 Air Changes to all 14 rooms. Can you confirm that this is the brief to WW."*

As above, my understanding generally was that we were agreeing to 4ACH for the multi-bed rooms listed in the attachment. I think the attachment is a TUV SUD document called: General Ward – Ventilation Amendment Proposal to Achieve Room Balance (**A36322678 - 4.2.8. General Ward – Ventilation Amendment Proposal to Achieve Room Balance Again - Bundle 13, Volume 8, Page 2263).** I was not specifically aware that 4 of the rooms were located in critical care. What I was focusing on was ensuring we got balanced pressure and 4ACH, rather than anything less than that. I wasn't looking at the room locations specifically on the document. I was working on the (incorrect) assumption that these were all located in general wards. I didn't think any of those rooms required specialist ventilation because I thought we were looking at general wards. I wasn't checking room numbers, I was checking air change rates and pressure.

Item 13 – Single bedrooms

32. In relation to single rooms and the derogation from 6ACH to 4ACH in the technical schedule of SA1 (item 13), I understood this derogation applied to single rooms, but not to single rooms in critical care, which have their own specific requirements in terms of SHTM 03-01. Specifically, single rooms in critical care (indeed all rooms in critical care), require 10 ACH. As with other rooms in critical care, at no point during the Project did anyone from MML, IHSL, MPX or TUV SUD ever specifically flag to me or discuss with me that that single bed rooms in critical care had not been designed or installed to have the 10ACH as required by the Guidance. I did not and do not consider that this item in the technical schedule applies to single rooms in critical care.

33. Item 13 refers to an agreed technical solution being set out in Disputed Works Schedule Appendix 1, Item 13. I have been asked in what way it is said to apply to rooms in critical care. The supporting document for item 13 is Project Co Change 051, which provided for a derogation from 6ACH to 4ACH in the single bedrooms and an increase for single bedrooms WCs from 3ACH to 10ACH. I think it is an important point that single bedrooms in the RHCYP all

had en-suites (WCs). However, the single rooms in critical care did not have en-suites (WCs), which could be said to distinguish them from other standard single bedrooms in the facility. Multi-bed rooms and isolation rooms in critical care do not have WCs either. This is because patients in critical care are catheterised and cannot use the toilet independently.

34. I would add that at no point did IHSL, MPX, TUV SUD or MML advise that, in TUV SUD's view, the only rooms that required 10 ACH in critical care department were isolation cubicles. I disagree with this interpretation of the Guidance. In hindsight, SA1 reflects the approach of TUV SUD at the time, which was simply to treat all rooms in the facility, including critical care, in the same way, rather than distinguishing critical care as its own department with specific requirements in terms of SHTM 03-01. That distinction was clear on the Guidance Note of the EM, where it was specifically stated that critical care required 10 ACH, as per SHTM 03-01, table A, until IHSL changed it that Guidance Note to delete "critical care" and include "isolation rooms" only. They made that change to the Environmental Matrix without flagging it to us or MML. They made that change without flagging it to NHSL or MML even though there was an agreed protocol with them that all changes to the Environmental Matrix would be highlighted in red. MML did not highlight this change to us either. I think this was a key opportunity at which IHSL should have flagged the inconsistency as between the Guidance Notes, which required 10 ACH for all rooms in critical care; and the body of the EM, which contained the error, to NHSL for clarification. That they chose not to flag this inconsistency is very disappointing.

Mixed mode ventilation strategy

35. I thought the derogation at item 13 from 6ACH to 4ACH for single rooms was appropriate based on TUV SUD's mixed mode ventilation strategy, i.e. 4ACH mechanical supplemented by 2ACH natural. That would equate to 6ACH. I did not think that this applied to critical care.

36. On 27 November 2014 TUV SUD produced an Air Movement Report **(A42058268 - DS Enclosure 2 – TUV Sud – Wallace Whittle air movement report for single bedrooms (draft) 27 November 2017, Bundle 13, Volume 8, Page 2265)** with associated marked up drawings in support of this mixed mode ventilation strategy for single bedroom ventilation, circulated to NHSL on the 13th January 2015. The TUV SUD report and drawings specifically reference air movement and pressures in single bedrooms with en suites. I was not part of the Project Team at the time but I was aware of the mixed mode ventilation strategy and did not think it applied to critical care.

37. There are other documents which demonstrate that the focus of discussions in relation to air change rates did not envisage critical care:

- Hulley & Kirkwood Thermal Comfort Analysis Report **(A34225373 – Hulley and Kirkwood Thermal Comfort Analysis Report - Bundle 13, Volume 8, Page 2267)** which expressly excludes Critical Care at page 11 of the document*: "As such, Critical Care and HDU type ward rooms which receive air change rates in the region of 10 ACH have not been analysed in this study." (***Page 2277**) I was not involved in the Project at this time but it may be this is where TUV SUD's ventilation strategy for 4ACH mechanical + 2ACH natural stems from.

- In this diagram (**A34225605 – 2.7_0117_20170111 SHTM vs PCo diagram (1) – Bundle 13, Volume 8, Page 2301)** there is a comparison of an SHTM 03-01 design against Project Co Design. Both diagrams show the floor plan of rooms, with en suites. This was a diagram prepared by Colin MacRae of MML.

- In the Compromises Schedule between pages 14 and 17 of the document (**A33329538 – SFT – RHSC/DCN – Programme Board – Agenda and Meeting Papers – 24 July 2014 – Bundle 13, Volume 8, Page 2315**) is that a note that the discussion re "ventilation single bedrooms" expressly relates to single rooms with en suites. Rooms in critical care do not have en suites.

HPS/HFS Advice re multi-bed rooms

38. In June 2017 sought advice from Ian Storrar at HFS by way of telephone call and followed up by an email dated 23 June 2017 re whether multi-bed rooms should be treated as "single bedrooms" or "wards" in terms of ventilation with regards to the pressure issue. HFS advised that the multi-bedded rooms should be treated as one would a single bed ward with respect of ventilation. We posed the question: *What is Health Facilities Scotland's interpretation of the ventilation pressure requirements for four bed wards?* The answer was contained in an HFS report (incorrectly) dated 19 June 2016 by Iain Storrar **(A40072413 – NonRFI_0080_20160619 IAN STORRAR HV REPORT (+4 Bed) - Bundle 13, Volume 8, Page 2340)**, which dealt with HV issues and also address the question re 4 bed rooms. This was provided to me in an email from Ian Storrar on 23 June 2017. It is stated in the HFS report at paragraph 2.5 as follows: *SHTM 03-01 Part A, Appendix 1, Table A indicates the air change rates and pressure regime for clinical areas within healthcare premises. There is no four bed ward noted in Table A, however it would not be unreasonable to treat this area as one would a single bed ward with respect to ventilation as the measures for infection control would be the same. Therefore the room should be neutral or slightly negative with respect to the corridor.*" (**Page 2344**)

39. This is what lead to the dispute as between IHSL and NHSL re whether multi-bedrooms should be treated as single rooms or general wards, and accordingly the required pressure in the room. In a general wards in terms of table A1 of SHTM 03-01 you don't need any type of pressure regime at all, whereas in a single bedroom it should be balanced at the door.

Communication with Infection Prevention and Control Re Independent Validation

40. With reference to an email from Jackie Sansbury to David Wilson on requirements regarding theatre verification dated 4 January 2019 **(A40979097 – Email from Jackie Sainsbury – head virologist re theatre verification – 4**

January 2019 - Bundle 2, Page 65); an email from Ronnie Henderson to Donald Inverarity et al advising MPX will have carried out all test and validation required in the SHTM by handover dated 11 January 2019 **(A40988937 – Email from Ronnie Henderson to Donald Inverarity et al advising MPX will have carried out all tests and validation required in the SHTM by handover – 11 January 2019 - Bundle 4, Page 6);** and an email regarding theatre validation dated 10 May 2019 **(A40979123 – Email – FW: Theatre Validation – 10 May 2019 - Bundle 2, Page 1394)**, and the timing of validation (see above regarding the difference in timing between commissioning and validation), there was ongoing dialogue between myself, Jackie Sansbury, David Wilson (MPX Commissioning Manager) and IPCT, namely Donald Inverarity, Consultant Microbiologist and Lead Infection Control Doctor and Sarah Jane Sutherland, Infection Control Nurse, as to the content of the commissioning and validation information that would be provided by MPX and whether it would be adequate to satisfy the requirements of SHTM 03-01, or if we would also require separate independent validation after handover.

41. When I said that "this is in line with all projects carried out in NHSL", I meant that we would normally employ a contractor similar or identical to the one used to provide validation and evidence of compliance to MPX. The documentation would not always be in the form of the type of report issued by IOM but it would have the necessary information and a statement of conformity with SHTM 03-01. At RHCYP/DCN we, theoretically at least, had the additional layer of assurance provided by the independent tester review and sign off.

42. The contract to build the RHCYP/DCN was let as an NPD contract meaning the building does not belong to NHSL until the end of a concession period which I believe is 30 years from date of handover. Under that contract the SPV (IHSL) were to provide a fully compliant facility ready to occupy and put to use by NHSL. This, in my opinion, should have included validation to SHTM 03-01 and in this regard by handover MPX provided documentation to evidence that systems were commissioned, in addition this was witnessed and approved by

the Independent Tester.

43. As IHSL are the building owners it could be said that they were responsible for ensuring compliance and indeed they do have that responsibility to carry out verification on an annual basis now that the facility is operational. However, setting that aside, we wanted to ensure that our IPCT were satisfied that the documentation met their requirements and in light of concerns raised that it did not, we proceeded to engage IOM to carry out the validation.

44. To clarify, in my view, the contract had some bearing on who was required to carry out the validation and I had to give due consideration to whether IHSL as building owners should have arranged validation. The documentation provided by MPX and approved by the independent tester may have been deemed to have met the requirements of SHTM 03-01 as it pertained to the contract. The additional layer of approval by the independent tester could be interpreted as the independent element. It was an unusual set of circumstances that we were navigating. However, to ensure all parties were satisfied with the approach to be taken, I began dialogue with IPCT, and it was clear they were not happy with the format of the data from MPX and that we would need to arrange an independent tester in relation to validation.

45. In addition, handover does not necessarily need to occur after validation, and any issues found can be recorded as defects. In any case MPX had stated that they had carried out validation prior to handover and had IT approval of such.

Media Interest

46. I have been asked to comment on an email from Lindsay Guthrie to Annette Rankin regarding a Sunday Herald Article on ventilation issues at QEUH RHCYP dated 5 August 2019 **(A34010959 – Email from Lindsay Guthrie to Annette Rankin regarding a Sunday Herald Article on ventilation issues at QEUH RHCYP 5 August - Bundle 5 Page 27 to 39 inclusive)**. By way of

background, on 11 March 2019, Judith MacKay, NHSL Director of Communications, circulated an email in which she outlined that she expected media interest around the involvement of IPC staff in the design of the hospital given concerns arising at the Queen Elizabeth University Hospital (QEUH) in Glasgow. I was not copied into that email or aware of it t the time. We had been liaising with IPC throughout the Project including corresponding on issues relating to validation (**please see A40979097 – Email from Jackie Sainsbury – head virologist re theatre verification – 4 January 2019 - Bundle 2, Page 65 / A40988937 – Email from Ronnie Henderson to Donald Inverarity et al advising MPX will have carried out all tests and validation required in the SHTM by handover – 11 January 2019 - Bundle 4, Page 6 / A40979123 – Email – FW: Theatre Validation – 10 May 2019 - Bundle 2, Page 1394**). I was not aware of the email from Judith MacKay, however I was asked, along with Janice McKenzie, to participate in a site walk round with IPC and Alex McMahon on 20 March 2019 where items raised in the media were to be discussed.

47. The anticipated media interest had absolutely no influence on my involvement with NHSL IPC staff. I would, and did, proceed to arrange independent validation per SHTM 03-01 requirements had there not been this anticipated media interest. The validator and form of information to be provided on conclusion of the validation was an ongoing subject of dialogue with myself, Jackie Sansbury, IPC & MPX, irrespective of media interest.

48. It was felt that the documentation provided by MPX and approved by the IT did not provide the necessary assurance required. Subsequently it was collaboratively agreed with IPCT that additional independent validation should be arranged to provide documentation in a form acceptable to IPCT. It would not be accurate to say that the instruction of an independent tester to undertake validation prior to occupation was because Donald Inverarity insisted upon it, the decision was agreed in collaboration with the project team and IPCT.

Site Walk Round – 20 March 2019

49. As noted above, and with reference to **(A34010959 – Email from Lindsay Guthrie to Annette Rankin regarding a Sunday Herald Article on ventilation issues at QEUH RHCYP 5 August - Bundle 5, Page 27 to 39 inclusive)**, on 20 March 2019, I accompanied IPC staff on a visit to the new site. My recollection is that Janice MacKenzie and I were asked by Brian Currie to accompany Alex McMahon, Executive Director, Nursing, Midwifery and Allied Healthcare Professionals, and IPC on a site walk round to discuss issues highlighted in the press relating to QEUH. In attendance were Janice Mackenzie; Alex McMahon, Donald Inverarity (LICD); Sarah Jane Sutherland (lead HAI Scribe Nurse); and David Gordon (Bouygues).

50. As set out in an email from me to Donald Inverarity providing a summary of main points of discussion and evidence following a site visit of 20 March 2019 addressing concerns raised by IPC dated 21 March 2019 **(A40988839 - Email from Ronnie Henderson to Donald Inverarity providing a summary of main points of discussion and evidence following a site visit of 20 March 2019 addressing concerns raised by IPC – 21 March 2019 - Bundle 5, Page 44)**, during the walk round the general condition of the building was observed and it was evident that there was significant work ongoing. Janice and I explained that although handover had occurred there were still significant ongoing construction works affecting areas that would automatically result in a HAI Scribe failure in terms of NHSL being able to occupy the affected spaces clinically (discussed in more detail below).

51. It is recorded in the email that I explained the sampling process and current status of results and water management. IPC were shown the location of a known outstanding P. Aeruginosa positive and the implications were discussed.

52. It is also recorded in the email that I explained the commissioning that had

taken place for both isolation rooms and theatres and that records were available on the project data storage system. IPC were shown an isolation room, the theatre suite and a ventilation plantroom where David Gordon and I explained the ventilation philosophy for each area. IPC were shown external areas to view pest prevention measures and active measures to prevent ingress of pigeon droppings were demonstrated. IPC were shown room 1-L1-068 (this is not located in critical care) where Dr Inverarity had previously identified an openable window in an isolation room. Janice Mackenzie explained that this had been identified previously by the room review team and as demonstrated had now been resolved. Dr Inverarity was satisfied that this had been addressed.

53. I do not recall agreeing to independent validation of the ventilation system at this walk round in March 2019. MPX had not yet fully provided an example of their final documentation, which may have been in a format acceptable to IPCT, and so there was still ongoing dialogue between Jackie Sansbury, IPC, MPX, and myself at this time.

HAI SCRIBE

54. Dr Inverarity expressed concern during the walk round that this HAI Scribe audit had not taken place before handover, however Janice and I explained that this would have resulted in an automatic fail due to ongoing significant works. To explain further, ongoing works relating to snagging, defects, SA1 agreed works, and significant post completion works meant that building fabric such as ceiling tiles, ceiling hatches, wall panels, doors, and flooring were all removed or in the process of being altered. In addition, various engineering systems were isolated and also in the process of being altered including ventilation AHUs, electrical circuits, fire alarm circuits and equipment, and heating systems. All of this meant it would not have been possible to assess the HAI Scribe against a complete built environment. The same applies to validation, it was not possible to validate the ventilation systems unless there was a complete and clean built

environment. I have been asked whether the building was practically complete at this time. It could be said that the building was practically complete at handover on 22 February 2019 with the exception of prior agreed post completion works as contained in SA1, works to resolve issues contained in the technical schedule of SA1, outstanding works, and snagging & defects

55. In an ideal scenario, it would have been preferable to have carried out the HAI Scribe stage 4 assessment prior to handover of the building but the very nature of SA1 (i.e., dealing with ongoing works) meant that was not possible. Had the HAI Scribe taken place prior to handover it would have served only to highlight ongoing and outstanding works that would still need to be rectified by MPX and revisited. Additionally, any item picked up during the post-handover HAI Scribe visit would still also be required to be rectified by MPX prior to occupation regardless of whether building had been handed over or not.

56. I have been asked why in the circumstances handover was agreed. I had no influence on why handover was agreed, I was in no way a decision maker in that process. However I understand that it was agreed on the basis of all remaining works being included in SA1. I also had no input in to the decision to agree to the certificate of practical completion being issued in respect of SA1.

57. In the circumstances, the HAI Scribe had to be completed post-handover but in advance of patient occupation. In the meantime, all parties took actions to progress HAI Scribe as far as possible as a desktop exercise until it was possible to complete it on site. For example, results of water sampling were to be provided to IPC and IPC were to provide an example of a ventilation validation report that met their requirements.

Multiplex Commissioning Data

58. With reference to an email from Donald Inverarity to Ian Laurenson et al regarding Theatre Validation at RHSC and DCN dated 10 May 2019

(A40980996 – Email chain – RE: Theatre Validation – 10 May 2019 - Bundle 2, Page 1396); an email from Kerryann Little to Tracey Gillies acknowledging the response provided on Theater Validation at RHSC and DCN dated 13 May 2019 **(A40981038 – Email chain – RE: Theatre Validation – 13 May 2019 - Bundle 2, Page 1398);** an email from Ronnie Henderson to Donald Inverarity regarding Theatre Validation at RHSC and DCN dated 13 May 2019 **(A40981175 - FW: Infection control + Ventilation Issues from Sunday Herald Article on Glasgow QEH-RHCYP - Bundle 13, Volume 8, Page 2346);** and a Record of General Risk Assessment ventilation combinedrev300118 **(A40981178 - Record of General Risk Assessment ventilation_combindedrev300118 - Bundle 6, Page 14)**, the reports produced by Multiplex were, in my opinion, a collection of documents that could have constituted an acceptable format for validation. This opinion was based on the level of commissioning information available, the experience of the specialist contractors for UCV canopies, the fact that the company used by MPX for commissioning (H&V Commissioning) had previously been used for validation and commissioning by NHSL, and most importantly that the results had been independently verified by the independent tester (Arcadis). However, upon presentation of an example of an MPX validation report to IPC, ongoing e-mail discussions concluded that this was not in a format adequate to comply with SHTM 03-01 for their purposes. Dr Inverarity will be better placed to advise in relation to his view, but as far as I recall it did not contain information on air change rates and pressure cascades in a format recognisable to IPCT as these were held on the project data management system 'Zutec'. The statement of conformity also did not match the suggested concluding wording from SHTM 03-01. A more complete answer may be available from IPCT colleagues.

59. Dr Inverarity's email records some concerns with the MPX documents, including that it did not state what the air pressure or air changes were, and was not clear that, by 'conformity', it meant 'conformity to SHTM 03-01. I have been asked whether or not I agreed with Dr Inverarity's view. At the time, I considered that it might have but subsequently in dialogue with IPCT it was agreed that this did not meet the requirement of SHTM 03-01 in a format acceptable. Indeed, as set

out in my email to Dr Inverarity on 13 May 2019, I was clear that we would not accept anything that IPC were not 100% happy with and I would arrange independent validation through our AE. In terms of the decision to engage IOM, I sought approval from the Project Director, Brian Currie.

60. I have been asked whether, had IPC not indicated that they were unhappy with the validation information, whether the hospital (with the ventilation system that did not comply with SHTM03-01) have been accepted by NHSL. If IPCT had agreed that the information from MPX met their requirements, then that may have happened. In this scenario, it would likely have been discovered as a defect at the first annual verification.

61. The involvement of IPC was part of the consultation process when the project team were reviewing items that may have a bearing on infection control. As previously stated the sample documentation contained all of the results and information that would normally be required of a validation report but not in a report format. Furthermore the statement of conformity did not match the wording in SHTM 03-01.

Instruction of IOM

62. In terms of the engagement of IOM **(A40988908 – Part A 4.2.17 RE Independent Validation - Bundle 13, Volume 8, Page 2367)**, they were instructed to validate from SHTM 03-01 as opposed to the contractual specification (as conformed in SA1). At that time, as far as I was aware, there was no approved derogation for Critical Care, it was only when the issue came to light and upon reviewing documentation that it was noted that some of the multi bed bays in Critical Care had inadvertently been included in the derogation for air change rates for multi bed bays. As explained above, it is my opinion that the derogation for single bedrooms did not include Critical Care single rooms as these do not (i) have a starting point of 6ACH and (ii) contain en-suites and all of the supporting documentation for the single room derogation refers to rooms with en-suites.

63. I did not seek input or advice from any other party regarding the requirements of SHTM 03-01 insofar as independent validation was concerned. Once the decision was made that the MPX validation report was inadequate and I became aware our AE would not be available to undertake the audit, I sought advice and recommendations for other suitable qualified organisations from HFS. My recollection is that Ian Storrar from HFS referred me to BSRIA who in turn referred me to Malcolm Thomas, and eventually, through Malcolm I was referred to Jerry Slann of IOM who had availability to undertake the work.

Migration of Services

64. With reference to Meeting notes from the RHCYP & DCN Programme Board dated 13 May 2019 **(A32676909 – Meeting notes from the RHYCP & DCN Programme Board – 13 May 2019 - Bundle 6, Page 24)**, I do not recall the particular reasons why the Programme Board considered, as at 13 May 2019, that the migration of services would proceed as planned on 5 July 2019. I did not routinely attend the Programme Board. I do not recall the specific reason for my attendance on 13 May 2019 nor the actual meeting itself. I can only assume I was there for technical support to the Project Director and to update on progress under item 3, Project Dashboard / Post-Handover Activities. However, in my opinion, it may be the reason that the Programme Board considered the migration of services would proceed as planned was based on the fact the works were due to be completed by Multiplex by then and there were no known overarching issues of significance at that time. IOM had not yet been appointed and had therefore not started their validation. There was no reason to think that validation by IOM would identify any significant issues. Generally, it would be expected that validation may pick up a variety of issues such as the need to rebalance the ventilation in some theatres, or minor installation issues, but not usually a significant non-compliance with guidance.

65. I do not know the extent to which the issues raised by IPC staff relating to independent validation and the inclusion of validation on the risk register

factored into the decision to proceed with the migration of services on 5 July 2019. This is for members of Programme Board to answer. In my opinion, on the basis that the decision to instruct an external independent validation was made by 13 May 2019, and that the items described under the residual risks and risk register at item 10 are not specific to the validation works, it would be fair to assume that Programme Board did not anticipate a major issue to be uncovered by the validation exercise.

66. With reference to an email from John Rayner to Jamie Minhinnick advising he is unable to make the meeting on 23 May 2019 to witness the isolation rooms dated 20 May 2019 **(A40981181 – Email from John Rayner to Jamie Minhinnick advising he is unable to make the meeting on 24 May 2019 to witness the isolation rooms – 20 May 2019 - Bundle 6, Page 155)**, I was definitely aware that the requirements for independent validation in SHTM 03-01 applied to all critical systems rather than just theatres prior to receipt of this email from Jamie Minhinnick. When referring to "critical systems" it is common to focus discussion on theatres, indeed section 8(a) of SHTM 03-01 part A does that. However, I can confirm that I have always known that the definition is broader and includes critical care as defined in SHTM 03-01, at paragraph 4.7. I specifically included reference to all critical systems in my brief and instruction to IOM by email dated 30 May 2019 , which stated: *"As discussed we are looking for independent validation to SHTM 03-01 of 10 theatres (7 of which are UCV but can also be used as conventional), 19 isolation rooms, 1 angiography procedures room, 1 intra-operative MRI, and ITU/HDU/NNU."*

67. Mr Minhinnick's email also advises that "*You should also pass any agreed derogations with regards to ventilation systems to the engineers. Without this, they will be measured against the SHTM 03/01 criteria and not the design (which can often be very different).*" I did not pass any derogations to IOM as I was unaware any existed for any of the systems they were validating.

68. The fact Mr. Minhinnick raised this point in his email is of no consequence. Even if he had not, my brief to IOM would have included validation of all critical systems, including critical care, *"ITU/HDU/NNU"* as set out above. I confirm that ITU/HDU/NNU are all of the areas contained within Critical Care at RHCYP/DCN

69. It has been put to me by the Inquiry that SA1, on one view, derogated from SHTM 03-01 to the extent that derogations to air change rates covered critical care rooms and I've been asked why I would seek independent validation against SHTM03-01 in these circumstances. The simple answer is that I was not aware there were derogations in terms of air change rates in critical care.

Partially Completed HAI Scribe

70. **(A35230420 – SHFN 30 Part B form on Development stage 4 Review of completed project of 1 June 2019 – Bundle 5, Page 95)** is a partially completed HAI Scribe. It is not completed or signed off. As far as I am aware, a stage 4 HAI Scribe was not signed off prior to the delay in July 2019.

71. I am listed as part of the HAI Scribe Review Team, along with Lindsay Guthrie, Sarah Jane Sutherland, Dorothy Hanley and Janice Mackenzie. This HAI Scribe appears to relate to Lochranza (haemato-oncology); PiCU and DCN Acute care. There is a question at 4.26 which states *"Is the ventilation system designed in accordance with the requirements of SHTM 03-01 Ventilation in Healthcare Premises"* There is an asterisks which states: *"with derogation 4 ac/hr – single rm, risk assessed + approved"*. I did not write this but assume it relates to the derogation for single rooms (which did not include single rooms in critical care) or to 4ACH for Lochranza.

72. By way of background, NHSL had agreed a derogation as per Project Co Change 50 **(A35004487 – IHS00000513 - Bundle 13, Volume 8, Page 2373)** and item 4 of SA1 so that rooms in Lochranza had 4ACH (**A32469163 – Settlement Agreement and Supplemental Agreement relating to the**

Project Agreement for the provision of RHSC and DCN between Lothian HB and IHS Lothian – 22 February 2019, Bundle 4, Page 40). My recollection is that this was agreed in a meeting with IPC and clinicians at RHSC on 23rd of February 2017. It took place in a room at ward 2 at the RHSC. The attendees as far as I can remember were me, Janette Richards, Dr Pota Kalima (consultant microbiologist), Dorothy Hanley, Janice MacKenzie and two clinicians from the ward, Mark Brougham and Ann Cairney. It was agreed there that a standard operating procedure could be put in place to overcome any operational issues that arose as a result of the designed ventilation system, and that the clinical team and IPCN present were content with that solution.

73. Unlike Lochranza, we had not agreed a derogation to 4 air changes for single rooms in critical care and so I would not have said as such to the HAI Scribe review team. In my view, at this point in time, 10 air changes were required to be compliant with SHTM 03-01. IHSL never sought a derogation for single rooms in critical care so we were very shocked to discover that the rooms in critical care were non-compliant with SHTM 03-01.

Instruction of IOM

74. On 17 June 2019, IOM began their testing. The background to their instruction is that upon conclusion of e-mail dialogue with IPC around the suitability of the example report provided by MPX, I took the decision to ask our appointed AE, Turner PES, if they could carry out an audit. The decision was discussed with MML and the project director Brian Currie, as Turner PES were NHSL appointed AE it seemed most reasonable to ask them to carry out the work. Both Turner PES AEs, Jamie Minhinnik and John Rayner, had other commitments and were unable to provide the required time commitment. At this point I sought advice and recommendations for suitably qualified organisations from HFS on the understanding that there would be others on the HFS framework. As set out above, my recollection is that Ian Storrar, HFS, referred me to BSRIA who in turn referred me to Malcolm Thomas, and eventually,

through Malcolm I was referred to Jerry Slann of IOM who had availability to undertake the work.

75. On 30 May 2019 I sent an e-mail **(A40988908 – Part A 4.2.17 RE Independent Validation - Bundle 13, Volume 8, Page 2367**) briefing IOM on the areas that I wanted them to validate, which specifically include critical care. The e-mail is the entirety of the instruction, there would have been an accompanying purchase order with the same text however I cannot locate it. Further correspondence took place in the days following culminating in a site visit by Paul Jameson, AE for IOM, where I briefed him further on the scope of works. An order was subsequently placed to cover the appointment. In my email, I specifically instructed IOM to: *"Carry out independent validation to SHTM 03-01 of 10 theatres (7 of which are UCV but can also be used as conventional), 19 isolation rooms, 1 angiography procedures room, 1 intra-operative MRI, and ITU/HDU/NNU. There are also 3 standard MRI's, & 2 CT's, which are non-interventional, if these are required under 03-01"*

76. MML were involved in IOM testing to the extent that they were Technical Advisors to the Board. They were asked to accompany IOM, witness results, and assist where possible with facilitating the validation, but they had no role in the actual testing being carried out.

IOM Discovery of Ventilation Issue

77. I was on annual leave from 7th June 2019 returning to work on Wednesday 26 June 2019 and therefore had no awareness of the ventilation issues discovered by IOM until 26 June 2019. Upon returning to work on 26 June I was briefed by Brian Currie, Project Director, that IOM had produced an issues list (**A40988873 – IOM issues log on RHCYP – 25 June 2019 – Bundle 6, Page 255)** on the 25 June identifying where they were finding issues with ventilation. Brian Currie had requested an urgent meeting with MPX to discuss the issues flagged by IOM. I immediately began work to fully understand the situation.

78. At the time I first became aware of the issue, I did not immediately consider that the results would impede the planned migration date because I had no knowledge or understanding of how serious the issues were. The initial focus was on ventilation issues arising in theatres and we were trying to gauge the level of works required to rectify the issues ready for opening. We also reviewed the critical care ventilation system and were trying to gauge what the issues were and how they could be resolved. As I was just back from leave this was a very intense period of investigation work trying to double check the findings, understand the implications and give consideration to possible engineering solutions.

79. Investigations included additional tests carried out by IOM (and separately by MPX) to verify the original results. In some areas MPX were reporting back different readings to IOM. To resolve that conflict it was agreed that MPX and IOM testing would be carried out at the same time so readings could be verified by both parties on the spot. We were also checking the calibration of the measuring equipment itself to see if that was the problem. We were then triple checking calculations because the results were just so unexpected.

80. While these investigations were underway it was unknown to NHSL if there was a fundamental fault with the system that could be rectified easily to provide the required 10 ach or if there were more significant underlying reason for the issue. The meetings with MPX turned into small, focused workshops with Brian Currie and myself representing NHSL, and Colin Grindlay and Darren Pike representing MPX. I cannot recall if there were other attendees representing either party at specific meetings as the situation was very fluid.

81. The decision to escalate the ventilation issues to the Board's Executive team was not part of my remit. Any decision to escalate was the responsibility of the Project Director, Brian Currie. On the morning of Friday 28th June an escalation meeting took place to discuss IOMs findings with the NHSL Executives including Susan Goldsmith, Tracey Gilles and Alex McMahon and relevant members of the RHCYP team, including Brian Currie. I do not recall being at

this meeting but my understanding is that the main focus was ventilation in theatres. Critical care investigations were still ongoing at this point. It was decided to prioritise remedial actions to theatres pending the result of the Critical Care workshop meetings with MPX.

82. Later on Friday 28th June, there was discussion between IHSL, IOM and the NHSL Executives about the Critical Care air change rates. My recollection is that MPX were asked by NHSL to re-check and re-calculate the absolute maximum ACH that could be achieved by the system over the weekend and advise NHSL accordingly.

83. It is my recollection that on Monday 1 July 2019, IOM confirmed verbally to Brian Currie that in their opinion, the equipment serving critical care was not capable of delivering 10 ACH. IHSL and MPX also confirmed verbally to Brian Currie on 1 July 2019 that the Critical Care ventilation equipment was not capable of delivering 10 ACH. I understand after receipt of this confirmation from IHSL, IOM and MPX, the issue was then escalated by Tracey Gillies, Medical Director, to the NHSL Board (**A40988883 – PART A 4.2.22 20190701 RE Summary email or critical care ventilation - Bundle 13, Volume 8, Page 2376)**.

84. On Tuesday 2 July 2019, a meeting was held in the Clinical Management suite which I attended with Brian Currie for NHSL and Darren Pike and Colin Grindlay for MPX. MPX presented a spreadsheet with three options (A, B and C) for utilising the existing system to improve the air change rate in critical care. Later that day a meeting was held by senior Board personnel to discuss the ventilation performance in theatres, to verify the status of the isolation rooms, and to discuss the options proposed by MPX as an interim solution to the critical care ventilation issue. I cannot recall if I was at that second meeting or not.

85. I understand there was also a meeting on Tuesday 2 July 2019 between the Board's Chief Executive in which the NHSL Chair briefed the Director General

of Health & Social Care and the Chief Performance Officer at NHS Scotland on the situation and the options, but I was not there. The outcome of the meeting was that NHSL would develop, as one possible option, a plan for a phased move of services that would take place over coming weeks and months. That included using MPX option A as an interim solution for critical care. The work for option A involved blanking off the air supply to 1no. 4 bed bay and 1no. single bed cubicle and redistributing the air to provide 5ACH to the remaining multi bed bays and 7ACH to the remaining single bed cubicles. This excluded the isolation rooms which were already receiving compliant air change rates and pressures

86. On Wednesday 3 July at 10am, Brian Currie emailed Wallace Weir and Darren Pike at MPX (I was copied in) instructing them to proceed with option A. MPX had indicated that they would complete the works on Saturday 6 July **(A45059063 - 2.7.20 RHCYP+DCN – Little France – Critical Care Ventilation - Bundle 13, Volume 8, Page 2378)**.

87. On the same day, Wednesday 3 July, I understand there was a meeting held between NHSL personnel, Health Facilities Scotland, and the Scottish Government and that major concerns were raised about the risks of doing the permanent works with patients in situ. In addition, scepticism was raised in relation to timeframes and the simplicity of the remediation works proposed by IHSL. Again, I was not at the meeting **(A40988901 - PART A 4.2.27 20190703 FW RHCYP+DCN – Little France – Critical Care Ventilation - Bundle 13, Volume 8, Page 2381)** and **(A40988971 - PART A 4.8.10 20190703 FW RHCYP+DCN – Little France – Critical Care Ventilation, 3 July 2019, Bundle 13, Volume 8, Page 2384)**.

88. On Thursday 4 July, the Scottish Government issued a media release announcing the postponement of the move to RHCYP & DCN**.**

89. From Thursday 4 July – Saturday 6 July Multiplex carried out the adjustments detailed in the interim solution option A and email instruction of 3rd July

completing works on Saturday 6th July. The works were completed but never fully tested as this solution was superseded by the Cabinet Secretary's decision to postpone the move.

Declaration

90. I believe that the facts stated in this witness statement are true. I understand that this statement may form part of the evidence before the Inquiry and be published on the Inquiry's website.

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