COMMISSION OF INQUIRY INTO THE CONSTRUCTION WORKS AT AND NEAR THE HUNG HOM STATION EXTENSION UNDER THE SHATIN TO CENTRAL LINK PROJECT

WITNESS STATEMENT OF DR PETER EWEN

FOR

MTR CORPORATION LIMITED

I, Dr Peter Ewen, of MTR Corporation Limited, MTR Headquarters Building, Telford Plaza, 33 Wai Yip Street, Kowloon Bay, Hong Kong, **WILL SAY AS FOLLOWS**:

1. I am Engineering Director of MTR Corporation Limited ("**MTRCL**") and have been in that position since February 2016. I am duly authorised by MTRCL to make this statement on its behalf in response to the requests made by the Commission of Inquiry (the "**Commission of Inquiry**") established to look into the Construction Works at and near the Hung Hom Station Extension under the Shatin to Central Link Project ("**SCL Project**") as set out in three letters dated 22 March 2019 in relation to NAT, SAT and HHS ("**NAT Letter**", "**SAT Letter**" and "**HHS Letter**" respectively) from Messrs. Lo & Lo, Solicitors, who I understand are the solicitors acting for the Commission of Inquiry.

[BB1/1-22 & 23-33 & 34-44]

2. My academic background is as follows: -

   (1) Diploma (Management Studies) from the Council for National Academic Awards in October 1985;

   (2) Diploma (Administrative Management- Consultancy Practice) from Civil Service College in April 2000;

   (3) Bachelor Degree (Engineering Management) from Lincoln University in July 2004;

(4) Doctor Degree (Philosophy) from International Management Centres Association in April 2008; and

(5) Graduate of the UK Government's Major Projects Leadership Academy run by University of Oxford in May 2015.

3. I also possess the following professional qualifications: -

(1) Fellow of the Royal Aeronautical Society since January 2005;

(2) Chartered Engineer in Engineering Council since December 2005;

(3) Companion in International Management Centres Association since April 2008; and

(4) Registered Practitioner in APM Group since August 2008.

4. The matters raised in the three Letters which I will deal with in this witness statement are those listed as Request Nos. 1.21.7, 1.29, 2.23, 3.12, 3.13.1, 3.13.2, 4.2, and 4.3 of the NAT Letter, 2.12, 2.13.1, 2.13.2, 3.2 and 3.3 of the SAT Letter, and 2.12, 2.13.1, 2.13.2, 3.2 and 3.3 of the HHS Letter. I do not set these questions out again in this statement to avoid repetition but for convenience they are set out in Appendix I hereto.

5. While I am generally familiar with the matters raised in the said Requests and I confirm that this statement is true to the best of my knowledge and belief, there are occasions when I can only speak to such matters by reference to MTRCL's documents, in which case I believe the contents of the same to be true and accurate.

6. Broadly speaking, I understand the Requests cover two separate aspects of what might be properly described as MTRCL's project management functions and responsibilities, namely:-

(1) A retrospective review concerning issues arising out of the SCL Project: by which MTRCL is invited to answer questions or respond to concerns regarding what are described as various project management issues arising in relation to the works in NAT, SAT and HHS; namely: (i) the 3 defective Stitch Joints in NAT; (ii) the defective Shunt Neck Joint in NAT; (iii) the lack of RISC forms, inspection records

and deviations at NAT, SAT and HHS (or otherwise defined as Issues 1, 2, and 3 in the three letters), and whether there is any evidence showing that hold point inspections were carried out in those areas; and

(2) A prospective commentary: by which MTRCL is invited to answer questions and provide explanations regarding what steps MTRCL has already taken and will take to improve its project management systems with a view to addressing the issues identified under paragraph 6(1) above.

7. In relation to the first part of the Requests, as Engineering Director, I have not had in the past and do not currently have any direct involvement in the rebar fixing and concreting works in NAT, SAT or HHS under Contract 1112. At the time when the works for the 3 Stitch Joints and the Shunt Neck Joint were carried out in 2017, as Engineering Director, I had the responsibility for Check and Balance and Assurance of Projects Costs and Schedules.

8. I would also like to mention that while I have had an opportunity to review: (i) the Report of Defective Works Identified at Tunnel Stitch Joints **[BB1/162-201]**; and, (ii) the Shunt Neck Incident Report at 1111/1112 Interface of NAT Structure **[DD1/38.61-38.79]**, and I am generally aware of the issues relating to the works at the 3 Stitch Joints and the Shunt Neck Joint, I was not involved in the preparation of those reports or personally privy to the subject matter of the same and, accordingly, without the benefit of reviewing all of the relevant evidence I am not in a position to comment upon any specific project management issues arising from the works in NAT, SAT or HHS.

9. Notwithstanding, I am in a position, with reference to an exercise conducted by an external consultant retained by MTRCL (as detailed below), to respond to certain aspects of the Commission of Inquiry's specific questions regarding evidence of inspections.

10. With respect to the second aspect of the Requests, I have had substantive involvement as Engineering Director in the measures taken to date or to be implemented by MTRCL to improve its project management systems and I am in a position to provide more detailed responses and commentary on those matters.

I. Evidence showing that hold point inspections were in fact carried out despite the absence of RISC forms

11. MTRCL has engaged WSP, an internationally renowned consultancy firm, as an independent audit consultant to carry out an audit of, amongst other things, the structures at NAT, SAT and HHS to check if the construction works were properly inspected.

12. As the exercise carried out by WSP is directly relevant to the Requests by the Commission of Inquiry, I shall briefly explain below the methodology adopted by WSP.

13. WSP has produced an audit report for [Item 43 of 3rd List] [BB11/7625-7647.2923] NAT dated 15 May 2019 (the "**NAT Report**") and an audit report for [Item 65 of 3rd List] SAT dated 15 May 2019 (the "**SAT Report**") [BB13/9199-9219.1949] setting out the latest findings of the WSP audits for NAT and SAT respectively. For details of the WSP audits, I refer to the NAT and SAT Reports, and I shall not repeat the same in my witness statement. Due to the very large area covered by HHS and the number of hold point inspections involved in such area, it has not been possible for WSP to produce its audit report for HHS at the time of filing this statement. However, a copy of the audit report for HHS will be disclosed to the Commission of Inquiry as and when it is available to MTRCL, hopefully by the end of June 2019.

14. The audit includes a detailed review of the RISC documentation for "essential" hold points identified in the ITP documents pertaining to the reinforced concrete slabs and walls (namely, the fixing of reinforcement and the pre-pour check) that are the focus of the audit.

15. Insofar as NAT is concerned, the audit scope covers the new stitch joints completed in 2018 but not the initial stitch joint construction nor the foundation and piling works for Contract 1112.

16. The RISC documentation for "essential" hold points for the NAT and SAT structures has been audited in the following ways:-

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(1) By identifying RISC forms that were not presented for audit and reviewing any inconsistencies in the RISC forms that were provided. In reviewing each available RISC form, WSP checked the following: (i) whether the title, description of work and number are correct; (ii) whether all required parties have signed off the form where necessary; (iii) whether the date of the request for inspection, the inspection date and the endorsement dates are consistent and reasonable; and, (iv) where warranted and necessary, whether a suitable attachment is included. It should be noted that the audit team applied a '7-day rule' which acknowledges that, if the RISC form is received within 7 days of the activity referred to thereon being inspected, it is deemed acceptable;

(2) By evaluating the nature and extent of the supplementary documentation and information that is available in circumstances where RISC forms were unavailable for audit or where the forms contained significant inconsistencies. The purpose of this evaluation was to determine whether there was sufficient and satisfactory evidence of site inspection of the hold point in question. The supplementary materials include site photos, site diaries as well as other supporting materials, such as WhatsApp messages/email and test reports. After evaluation by the WSP audit team, each essential hold point for the NAT and SAT structures was assigned a colour (red, yellow, or green) signifying the audit outcome:-[1]

(i) Red: Where there was no relevant supporting material to evidence or RISC form for the relevant hold point inspection;

(ii) Yellow: Where there were relevant supporting materials but such materials were deemed insufficient to evidence that site inspection of the relevant element of the works and hold point had taken place such that it could be accepted in lieu of the RISC form being presented for audit or where the form contained significant inconsistencies;

(iii) Green: Where there were relevant supporting materials and such materials were deemed sufficient by WSP to evidence that site inspection of the relevant element of the works and hold point had taken place such that it

~~[Item 43 & 65 of 3rd List]~~

[1] See Figures 8 and 9 of the NAT and SAT Reports respectively for a flowchart summarising the evaluation process adopted by WSP. [BB11/7625-7647.2923][BB13/9199-9219.1949]

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could be accepted in lieu of the RISC form being presented for audit or where the form contained significant inconsistencies.

17. My role as Engineering Director was to act as sponsor of the WSP audit exercise, independent of the Projects Division team who worked with WSP to identify independent measures of verification of inspection. As such, I cannot speak to the exercise with first-hand knowledge, but I understand from the latest findings of the WSP audits for NAT as contained in the NAT Report [Item 43 of 3rd List] [BB11/7625-7647.2923] that for the essential inspection hold points on key structural elements of the NAT construction works, WSP has assigned "Green" audit results for most of the RISC form inspections. For details of the findings, I refer to the NAT Report. [Item 43 of 3rd List] [BB11/7625-7647.2923]

18. I also understand from the latest findings of the WSP audits for SAT as contained in the SAT Report [Item 65 of 3rd List] [BB13/9199-9219.1949] that for the essential inspection hold points on key structural elements of the SAT construction works, WSP has assigned "Green" audit results for all of the RISC form inspections. For details of the findings, I refer to the SAT Report. [Item 65 of 3rd List] [BB13/9199-9219.1949]

II. MTRCL has taken significant steps to improve its project management systems

19. In relation to the second aspect of the Requests, I note in particular what is stated in §397 of the Commission of Inquiry's Interim Report, namely, that MTRCL had previously engaged Turner & Townsend Limited ("**T&T**"), a leading management consultancy, to carry out a review to assist MTRCL in updating and improving its project management systems. I also note the October 2018 recommendations made by T&T following its review align substantially with the recommendations made by the two independent project management experts, Steve Rowsell ("**Rowsell**") and Steve Huyghe ("**Huyghe**"), engaged by the Commission of Inquiry and MTRCL respectively, who previously gave evidence before the Commission of Inquiry. As a result of the above and in accordance with its commitment made to the Commission of Inquiry, MTRCL has already established an implementation group to take forward T&T's recommendations, which the Commission of Inquiry opined represented a clear indication of MTRCL's desire to achieve continuous improvement in its project management processes.

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20. As mentioned above, I am not in a position to comment on the specific project management issues within the scope of the Inquiry under the Expanded Terms of Reference, a matter which I consider is best left to be dealt with by the project management expert(s) in due course. Notwithstanding, I do explain in this statement the steps that MTRCL has taken and which are being taken to implement T&T's recommendations to improve its project management systems, which are relevant to the potential project management issues identified by the Commission of Inquiry in each of the NAT, SAT and HHS Letters. [BB1/1-22 & 23-33 & 34-44]

21. I also note at the outset that it was the joint opinion of Rowsell and Huyghe, with which I respectfully agree, that:-

(1) MTRCL is a very experienced organisation with extensive experience and capability in the planning, delivery and operation of railway networks and systems in Hong Kong;

(2) MTRCL has a proven track record in delivering many major railway projects; and

(3) It is common that some mistakes or oversights will inevitably be made in the performance of the works of such scale and complexity. However, procedures should be in place to mitigate errors and enable the works to be executed in a professional manner.

(*see* Joint Statement of Project Management Experts ("**Joint Statement**") at §§3-5 **[ER1/9/T-1]**)

22. Against the background of the above remarks, in my experience there is no project management system that can avoid any and all mistakes that are inevitably made during the construction process (such as mistakes which might be found to have occurred during the carrying out of works at the 3 Stitch Joints and the Shunt Neck Joint). However, it is the obligation of the project manager to put in place a project management system to minimise, as far as possible, the occurrence or re-occurrence of such mistakes. In this respect I emphasise that to my own knowledge MTRCL is a 'learning' organisation which makes continuous efforts to develop and enhance its

management systems and that MTRCL has a track record of learning not only from its many successes, but also from the many challenges faced in its projects.

MTRCL's project management system

23. MTRCL's project management system has already been explained by Carl Wu in his witness statement dated 13 September 2018 at §§8-40 **[B1/471-479]** in the context of responding to the Commission of Inquiry's request regarding MTRCL's system and measures in place for the rebar fixing works at the diaphragm walls and track slabs in HUH under Contract 1112. The same project management system was used in the rebar fixing and concreting works at NAT, SAT and HHS under Contract 1112. I shall briefly set out below the project management system in place at the material time, before moving on to explain the improvement measures implemented and to be implemented by MTRCL.

24. MTRCL has established and put in place a Project Integrated Management System ("**PIMS**"). The PIMS is a set of project management documents setting out the procedure and practices for MTRCL staff to follow and has been used in managing MTRCL's railway projects for over 20 years. I set out below my understanding of the operation of the PIMS. For further details, I would refer the Commission of Inquiry to the witness statement of Carl Wu as noted above.

25. Since 1994, MTRCL has followed the PIMS and successfully delivered many major rail projects, including the Airport Express Line, the Tseung Kwan O Line, the Disneyland Resort Line, the West Island Line, the Kwun Tong Line Extension, the South Island Line and the Express Rail Link, all of which are operating safely and efficiently. This demonstrates the adequacy, suitability and effectiveness of the PIMS for railway projects that is tried and tested.

26. The PIMS has been designed to be in compliance with ISO 9001 international standards of quality management systems which set out requirements including, but not limited to, design and development, design verification and validation, control of design changes, control of non-conforming products, corrective/preventive actions and training of personnel.

27. Apart from certification to international standards, the robustness of the PIMS has also received endorsement from independent organisations. As highlighted in the Commission of Inquiry's Interim Report at §46, in a document prepared by Lloyd's Register Rail (Asia) Limited reviewing the institutional arrangements for implementation of the Express Rail Link Project, it is commented that:-

"*MTRCL's processes are known to be robust and in line with industry best practice. They are regularly reviewed and audited by outside bodies and have been proven and refined through the delivery of many high-quality railway projects by MTRCL in Hong Kong and abroad.*"

28. The general set of the PIMS is not specific to any one project. In this regard, it is noted that it was the joint opinion of Rowsell and Huyghe that the PIMS provides a robust basis for the development and implementation of project specific plans. (*see* Joint Statement at §8 **[ER1/9/T-2]**).

29. For the SCL Project, I understand that there is a Project-specific Management Plan entitled SCL/PIMS/MPS/01 "*Project-Specific Management Plan*" **[B3/1774-1824]**, which, amongst other things, identifies how standard practices defined in the PIMS will be applied to SCL specific requirements (including the requirements of the Government as the client), and sets out the documents which define the SCL objectives and requirements and the standards and specifications used to facilitate the achievement of such objectives.

30. While I do not have a day-to-day working knowledge, it is my understanding that there are three tiers of PIMS documents: the top tier "*Manuals*", which explain the reasons why MTRCL does certain things; the second tier "*Procedures*", which explain what should be done; and, the third tier "*Practice Notes*", which explain how the relevant work should be done and what type of records should be kept. The scope of "*Procedures*" includes wide ranging areas such as staff resource management, risk management, planning, the environment, construction management, design management, testing and commissioning of railway systems, and statutory compliance. The PIMS documents are listed in the "*Master List of PIMS Documents*" **[B2/1048-1057]**, which is updated from time to time.

31. In accordance with the requirement of ISO 9001, the PIMS Steering Group (which I do not participate in) ("**PIMSSG**") should review the PIMS at least once every year to confirm its continuing suitability, adequacy and effectiveness, and to assess opportunities for improvement and whether changes to the Project Integrated Management policy, objectives, or the PIMS documentation are required. The PIMSSG is chaired by the Projects Director or his delegate and its members include the General Managers of the Projects Division, the Head of Project Engineering and the Project Quality Manager.

32. I understand further details of the site inspection and control system and processes that occurred in Contract 1112 will be provided by Kit Chan (the former Construction Manager) in his witness statement, who is better placed than I am to explain these systems and processes, as he was involved in the day-to-day implementation of these systems and processes.

The T&T Interim Report

33. By Letter of Appointment dated 12 July 2018 **[B17/24412-24420]**, MTRCL and T&T entered into a service agreement for the provision of professional consulting services to support the Capital Works Committee ("**CWC**") to review MTRCL's project management and monitoring system.

34. On 15 October 2018, T&T issued its Interim Report v.1 on "*MTR Corporation Limited Process & Procedure Review*" ("**T&T Interim Report**") **[B17/24421-24476]**. The T&T Interim Report included recommendations for enhancing quality control management and inspection across MTRCL's projects. The recommendations in the T&T Interim Report can be broadly broken down into 6 categories:-

(1) Processes & Procedures;

(2) Organisation;

(3) Commercial & Contract Strategy;

(4) People & Capability;

(5) Quality Planning & Reporting; and

(6) Tools & Technology.

35. CWC took action immediately to implement the T&T Interim Report by recommending that a structured approach to the adoption of appropriate recommendations from T&T should be introduced to track the progress of their implementation into both existing and future contracts. MTRCL's Executive Committee endorsed this approach in November 2018 and set up a Special Taskforce to oversee the implementation process.

36. The membership of the Special Taskforce was drawn deliberately from both MTRCL's Projects and Engineering Divisions and includes representation from the design, construction, quality assurance, contracts and procurement sections and the Intelligent Portfolio Office, namely:-

(1) Stephen Hamill (Project Manager- Technical Support) – Chairman
(2) Neil Ng (Project Manager- SCL Civil - NSL)
(3) Tim Edmonds (Procurement & Contracts - High Speed Rail)
(4) Carl Wu (Coordination Manager - SCL)
(5) CK Yeung (Senior Quality Assurance Engineer)
(6) Henry Yu (Senior Manager - Intelligent Portfolio Office)

37. The cross-disciplinary nature of the Special Taskforce is crucial to its success. This is because whereas members from the Engineering Division can propose solutions, members from the Projects Division can offer practical feedback from the end-user perspective to ensure the effective implementation of the recommendations on site and in practice.

38. I understand the Special Taskforce is undertaking the following work:-

(1) To establish a high level implementation programme for addressing T&T's recommendations;

(2) To identify and appoint individual owners to champion or support implementation of T&T's recommendations;

(3) To seek the Executive's direction on strategic related recommendations prior to implementing detailed actions;

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(4) To provide guidance to drive action owners to ensure recommendations are appropriately addressed in a timely manner; and

(5) To provide regular progress updates to the Executive.

39. It is important to note, however, that T&T's recommendations cannot all be implemented immediately into the existing SCL contracts. This is because they are a mix of short, medium, and long term initiatives that will need to be introduced over a number of years. For instance, the T&T Interim Report at Note CC3 recommends the introduction of more collaborative forms of contract **[B17/24449]**. While this recommendation cannot be implemented for the existing SCL contracts, it has already been taken on board by MTRCL and different forms of contract will very likely be adopted for future projects. By way of example, MTRCL is currently preparing tender documentation for a contract to be awarded later this year using the NEC4 PSC form of contract.

40. MTRCL has already taken steps to action each and every one of the recommendations contained in T&T's Interim Report. For a summary of the actions that MTRCL has already taken, I refer to Appendix II, a copy of T&T Recommendations with Action Taken/ To Be Taken as of 17 May 2019.

41. For the purpose of enhancing co-ordination in the implementation of T&T's recommendations, a Project Transformation Steering Group is currently being developed. This group will also be cross-disciplinary and be co-chaired by the Projects and Engineering Directors, and will be tasked to oversee the works by the various groups established to implement the T&T recommendations.

42. As part of the continued efforts to improve its project management systems, MTRCL has also invited T&T to return to Hong Kong in or around May 2019 to undertake an "*interim health check*" to:-

(1) review how MTRCL has progressed with the recommendations made in the T&T Interim Report; and

(2) provide suggestions on how MTRCL may amalgamate T&T's recommendations and the recommendations of the Commission of Inquiry,

in order to implement the recommendations in a more effective and holistic way, with an objective to verify whether these recommendations could reduce the risk of quality issues to an acceptable minimum, and to provide the assurance that the necessary checks and balances are in place to identify any instances where the quality system is not being correctly applied.

43. As part of the abovementioned exercise, T&T has already compiled in or around early May 2019 a cross referencing list of T&T's recommendations against the Commission of Inquiry's recommendations contained in the Interim Report, identifying which of the Commission of Inquiry's recommendations overlap and which are not covered by T&T recommendations.

44. For the purpose of this witness statement, I shall focus on explaining the following steps that MTRCL has already taken and which are being taken which, in my view, address the risk of any re-occurrence of Issues 1, 2, and 3 (as described in the NAT, SAT and HHS Letters [BB1/1-22 & 23-33 & 34-44]):-

(1) Digitalisation of the site inspection process and the adoption of BIM[2];

(2) Enhanced training of frontline staff for better implementation of PIMS;

(3) Enhancements to the quality assurance system; and

(4) Fundamental revision of PIMS.

(A) Digitalisation of the site inspection process and the adoption of BIM

45. One of the major findings of the T&T Interim Report was that the adoption of digital management tools within the site management environment could play a major role in both ensuring that: (1) the site team are always working from the latest approved design documentation; and, (2) the site team can efficiently and in 'real time' keep management informed of any quality issues as they develop on site. In particular, it is noted in the T&T Interim Report that:-

[2] BIM is an acronym for Building Information Modelling.

"*The site teams have a need to communicate quickly and efficiently. In the absence of simple and usable digital technology, they are using what is readily available to them (for example WhatsApp). This does not provide traceability or governance, nor is it sustainable as a long term solution. We recommend that the long term digital solution contains an effective communication method that can be [sic] captures and records communications of site based activities*" **[B17/24430]**

"*A major factor when dealing with large and complex projects is the capture of data and the tracking of 'day to day' defects. This is an issue that faces the entire construction industry. There is a major movement in the industry to move to a digitalised data capture environment, where the activities on site are managed digitally rather than by a paper based system*" **[B17/24442]**

"*Traceability and transparency is critical and in a digitalised system the level of governance is high, preventing missing records or selective reporting*" **[B17/24443]**

"*When a digitalised system is fully integrated with design, the Inspection Test Plans (ITPs) can be kept fully up to date with potential design change, field change design (FCD), requests for information (RFIs), and design waivers. Without this integration, changes to design on site are difficult to control and the ITPs can quickly become out of date and not aligned with the approved design changes*" **[B17/24454]**

46. In particular, the T&T Interim Report at Note TT1 recommends the introduction of digitalised data capture of NCR, RISC and Field Change Requests with asset data aligned to BIM strategy **[B17/24456].**

47. The need for digitalisation to enhance project management was recognised by MTRCL in or around late September 2018, when MTRCL's Projects Division established a Project Digitalisation Task Force ("**PDTF**"). This was before the T&T Interim Report was issued in mid-October 2018.

48. The PDTF reports to the PIMSSG. The objective of the PDTF is to define the scope and requirements for digitalisation tools to be procured in order to enhance the quality management processes and site communications including the capture of site records. The membership of the PDTF is primarily drawn from the Projects Division, but covers

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many departments within it, including the Design, Construction, Safety and Quality departments. The original membership comprised:-

(1) Ken Wong (General Manager- Projects) – Chairman
(2) Patrick Cheng (Construction Manager - SCL Civil)
(3) Kevin Man (Construction Manager - Operations Civil & Major PedLinks)
(4) David Chiu (Senior Construction Engineer- System Integration)
(5) Daniel Chong (Senior Design Management Engineer - Civil)
(6) Marco Li (Senior Construction Engineer – Permanent Way)
(7) Jessica Cheng (Manager - Project Administration and Development)
(8) Lobo Lo (Construction Specialist)
(9) CK Yeung (Senior Quality Assurance Engineer)
(10) Hilbert Wong (Quality Assurance Engineer II)
(11) Henry Yu (Senior Manager- Intelligent Portfolio Office)
(12) Joe Wong (Intelligent Portfolio Office Manager)
(13) Kevin Kwong (Analyst - Intelligent Portfolio Office)
(14) Sebastian Kong (Technical Assistant to Projects Director)

49. I understand the PDTF meets on a bi-weekly basis to monitor progress of the implementation of digitalised systems on site (the first meeting was held on 3 October 2018) and it reports to PIMSSG on a regular basis.

50. I understand that with the support of the Engineering Division, the PDTF has, to date, overseen the introduction of several initiatives: in particular, the introduction of "iComm" (Intelligent Communication for Projects) and "iSuper" (Intelligent Supervision for Projects). I understand that bespoke user manuals for iComm and iSuper will be developed for use by MTRCL in due course.

51. iComm is an instant messaging tool (similar to WhatsApp) provided by TeamNote, a Hong Kong company, which closely resembles messaging applications found on smart phones. Importantly though, it allows site staff to communicate on a secure platform the status of works on site via texts, videos and photos, and all communications are time and date stamped and archived with details of both to whom and when they were issued. Distribution lists are also set up to ensure that important information is getting to the correct people quickly and efficiently.

52. Both Design Management ("**DM**") team members and contractors can be included in the distribution lists to facilitate decisions that need to be taken when issues develop on site. Decisions taken through iComm can be recorded in a controlled environment for

follow up action and MTRCL, as the administrator, can extract all past communications through the database.

53. iSuper is an intelligent supervision tool provided by SnagR, a UK company. This tool has been used for the digitalisation of the RISC form process and also includes an element of process control. The tool will also be used for managing NCR and site diary. One of the major issues identified in the NAT, SAT and HHS Letters [BB1/1-22 & 23-33 & 34-44] is that the RISC forms, signed by all parties, which should have documented the relevant hold points, were in many instances not available for review. With so much pressure to achieve the deadlines set out in the programme and to open the railway on time, site team members are under significant pressure and digitalisation of the inspection process (as detailed below) would significantly simplify the works that site team members are required to carry out, enabling them to conduct the actual inspections and to complete all the necessary recording and filing works more efficiently under such a high pressure working environment.

54. Another issue as I understand the situation was that there were a number of approaches adopted across different works areas for circulation and archiving of RISC forms, instead of having a unified project wide process. Further, even where RISC forms were properly signed, they could not always be located. The iSuper framework is designed to overcome these problems.

55. While I do not have any direct involvement in its implementation, my understanding from the General User Guide prepared by SnagR dated 3 May 2019 ("**General User Guide**") [Item 45 of 3rd List] [BB12/7653-7698] is that the RISC form process under the iSuper framework (which is available to users in both Chinese and English) is as follows[3]:-

	Role	Activity	Platform
1	Contractor Engineer	Fill out Part A of the RISC form and submit the same	SnagR website or mobile application
2	SIOW	Receive notification	Email or mobile application notification
3	SIOW	Fill out Part B of the RISC form - (i) confirm receipt,	SnagR website or mobile application

[3] For more details I refer to the General User Guide [Item 45 of 3rd List] [BB12/7653-7698]

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		and (ii) assign inspector or engineer to conduct the inspection by "tagging" the relevant personnel	
4	The relevant MTRCL IOW/ AIOW/ SConE/ ConE/ Surveyor/ Design Management Team being tagged	Receive notification	Email or mobile application notification
5	The relevant MTRCL IOW/ AIOW/ SConE/ ConE The relevant MTRCL Surveyor/ Design Management Team	Conduct inspection Review details of the Contractor's submissions	
6	The relevant MTRCL IOW/ AIOW/ SConE/ ConE who carried out the inspection The relevant MTRCL Surveyor/ Design Management Team who reviewed the RISC form	Fill out Part B of the RISC form recording the outcome of the inspection. Fill out Part B of the RISC form recording the outcome of the review	SnagR website or mobile application
7	SIOW	Receive notification	Email and mobile application notification
8	SIOW	Fill out Part C of the RISC form and attach photos or documents as appropriate	SnagR website or mobile application
9	The relevant MTRCL and contractor users	Receive notification	Email or mobile application notification
10	Contractor Engineer	Fill out Part D of the RISC form acknowledging the inspection result	SnagR website or mobile application
11	All SIOW of the specific discipline and area and Administrative Assistants	Receive notification	Email or mobile application notification
12	The relevant MTRCL IOW/ AIOW/ SConE/ ConE	Comment and attach photos if any and fill out Part E of the RISC form	SnagR website or mobile application

56. One of the most significant improvements brought about by iSuper in the inspection process is that the process can now be carried out by the frontline staff themselves (and instantaneously archived), as opposed to relying on office based colleagues to complete the documentation. In doing so, iSuper substantially reduces the risk of inspection records being missed.

57. I understand that in order to address the risk of works being checked against the incorrect design data without the knowledge of the DM team, a new digital format of the RISC form has been introduced to also require permission from the DM team before the works can proceed beyond the relevant hold points.

58. The iSuper programme tracks this entire process. There is also a dashboard function in iSuper showing, amongst other things, the following:-

(1) How many RISC forms were submitted;

(2) When they were submitted; and

(3) How many submitted RISC forms still require MTRCL staff's action.

59. The Intelligent Portfolio Office of MTRCL's Engineering Division is currently working on a new initiative on RISC forms underpinned by iSuper, known as iRISC. The main purpose of this initiative is to keep track of the number of RISC forms that are necessary for the contractor to submit.

60. The intended operation of iRISC would be as follows:-

(1) The Inspection and Test Plan ("**ITP**") submitted by the contractor should include the estimated number of RISC forms required for the works. After receiving the ITP, MTRCL's CM team would review, amongst other things, the estimated number of RISC forms required for the works contained in the ITP. This information would then be put into the iSuper database.

(2) The estimated number of RISC forms required will be regularly re-visited and updated during the construction phases.

(3) As the construction progresses, the number of RISC forms actually submitted by the contractor will be checked against the number of RISC forms that should have been submitted by the relevant construction stage (based on the estimate of the CM team). If any RISC form is missing, an explanation by the contractor will be demanded. This will minimise the possibility of any RISC form inspection being missed, as well as overcoming the problem of missing forms. This will also serve as part of the independent quality assurance audit process.

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61. Similarly, I understand that a full digital register across each project for managing NCRs is currently being developed as part of iSuper. When the digital system for NCR is formally launched, all NCRs raised by MTRCL thereafter will be maintained in the digital register. MTRCL's management and other necessary stakeholders will have access to the digital system and will be kept fully informed of the status of NCRs. Each contractor will also be able to view all NCRs under its contract in the digital system.

62. In addition, the Projects Division will develop digital management tools for other regularly used forms, such as RFIs, Site Queries and Site Diaries, all of which will be designed to allow the site teams to spend more time on site managing the works without compromising the flow of information to management and the controlled record-keeping of the works. A dashboard reporting system to capture the reporting on site is under development with Key Performance Indicators for key activities such as RISC forms and NCR management being recorded for review by management and stakeholders.

63. Both iComm and iSuper are licensed to MTRCL on an annual subscription basis. iComm has already been formally launched across all ongoing SCL contracts and PDTF has been receiving and evaluating feedback from MTRCL and contractors' staff.

64. iSuper has also been piloted on some of the SCL contracts – namely, Contracts 1123 and 1128. The PDTF has been receiving and evaluating feedback from MTRCL and the contractors' staff on those two contracts.

65. Turning to a different, but related, topic I note that in §428-437 of its Interim Report the Commission of Inquiry makes reference to the fact that BIM was not used on the SCL Project, and records the view of the independent expert witnesses that the adoption and use of BIM is one way of materially improving communications within an organisation.

66. BIM is a process that delivers an integrated set of geometric models, data and documentation that builds and captures all knowledge related to an asset. A software model of the asset is developed and shared within a common data environment ("**CDE**"), thereby increasing transparency between the parties. BIM provides clarity regarding the asset requirements at each phase of the project life cycle. Data from all parties is linked, allowing all parties to collaborate, understand and make informed

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decisions. In principle, this can assist in making sure the project is kept on schedule and on budget.

67. BIM has been employed by MTRCL in part on the Kwun Tong Line Extension, the West Kowloon Terminus and the SCL Project since 2009, delivering benefits such as understanding the construction sequencing, 3D visualisation, clash avoidance and interface collaboration.

68. In 2017, the MTRCL Executive approved the adoption of BIM as the primary means of design and project management for the future RDS2014 Projects. Funding was approved to set up a CDE capable of managing federation of models across all disciplines during the design and construction of new works, as well as managing all data required for the design, construction and future maintenance of new projects, including quality management.

69. A contract to design and install the CDE was awarded to BIM Academy in the second quarter of 2018 and the first phase of the CDE, which was capable of managing the design phases of future projects, was completed and went 'live' at the end of 2018. The bespoke design of the CDE will be owned and managed by MTRCL and its use will be mandatory for all future projects, from preliminary design to construction and to future facility management. Staff of all consultants, contractors and MTRCL will be given training on how the CDE works and they will be required to ensure all future works will be carried out using BIM.

70. One important development that is planned by MTRCL is to link BIM to other digital management tools being adopted for enhanced site management and inspection, such as iComm and iSuper. With this in mind, when awarding contracts for iComm and iSuper, one of MTRCL's specified requirements was that these digital management tools should either be compatible with BIM or be modifiable to become BIM compatible. The vendors of each of the systems adopted by MTRCL (namely, SnagR and TeamNote) both confirmed that their systems could be modified such that they could link directly with BIM to ensure that works being checked or managed on site would always be referenced back to current designs. The compatibility upgrade has not yet

commenced, but will be ready in time for the first construction contract fully designed in BIM next year.

71. Training is a key component of MTRCL's BIM strategy going forward. All Engineering and Construction staff will need to know how to use the new technology to varying degrees. Site staff will need to know how to access the latest design data for site inspections and DM staff will need to know how to carry out compatibility and clash analysis of the federated models. To facilitate this, an initial set of training modules, concentrating mainly on the design phases and roles of the DM and CM teams, are being prepared. These should be ready for implementation by the end of the second quarter of 2019 for training to commence.

72. Contract No. C11081 for the design of a Sports Complex at Ma Chai Hang Recreation Ground for the Leisure and Cultural Services Department has been chosen to be a pilot project, which will be fully designed using BIM. Tender Documentation for this Contract, which also includes the use of the NEC4 PSC form of contract will be ready for issue within May/June 2019, subject to approval from the Government, and the contract award is anticipated to be made in the fourth quarter of 2019. Staff engaged in this project will all receive BIM training.

73. In addition, MTRCL is presently conducting preparatory works for the Preliminary Design of several RDS2014 Projects. It is anticipated that approval to proceed with these projects will be received in late 2019/ early 2020. These design contracts will also adopt BIM technology and the NEC4 PSC form of contract. It is anticipated that this will enhance project management control, particularly with respect to quality management.

74. With a common information platform, all relevant parties would have access to the most up to date information during the construction process. It is my confident expectation that the adoption of BIM would greatly reduce communication issues such as those concerning structures at contract interfaces.

75. Generally speaking, I am of the firm view that enabling project management staff to do their jobs more effectively with appropriate use of technology is critical and the above initiatives are all designed for this purpose.

(B) ***Enhanced training of frontline staff for better PIMS implementation***

76. While I was not personally involved, I understand that the Projects Division has taken significant steps in implementing enhanced PIMS training for frontline staff. I set out below my understanding of the progress made thus far.

77. The Projects Division Quality Working Group ("**PDQWG**") was established under the PIMSSG with the stated objective to promote a sustainable quality culture amongst frontline construction teams for a high degree of compliance with statutory requirements and PIMS requirements in the areas of communication and site inspection.

78. I understand PDQWG has instigated an introduction to PIMS training module which all frontline Projects staff have attended between the first quarter of 2018 and the first quarter of 2019. This training module explains what PIMS are, where to find them, and how they should be used and implemented. This has been followed up by more job specific training for frontline staff on the specific PIMS that relate to their current roles on site.

79. In addition, I also understand a training programme on PIMS for staff is being developed for use later in 2019 based on the programmes of works that will be carried out across all SCL contracts. For example, as the major excavation works at the Exhibition Centre Station progress into concreting and Architectural Builders Works and Finishes works later this year, the site teams will be given PIMS training on their changing roles as they relate to the new activities. This mapping of duties versus activities on site is now complete and ready for implementation across SCL contracts in 2019.

80. Finally, I understand the PDQWG is in the process of developing staff competency mapping and training for specific roles that the Projects staff members perform. MTRCL already has a model for staff training competency mapping that has been used by the Operations Division for many years. The PDQWG is working to develop one that is suitable for the Projects Division.

(C) Enhancements to the quality assurance system

81. MTRCL has reformulated and enhanced the "3 Lines of Defence" policy for quality management of projects to be introduced in 2019 as follows:-

(1) The 1st line of defence: The Quality Management Team will continue to carry out audits on the works and the processes of contractors on a regular basis. The site team will continue to manage the day-to-day activities on site with inspections and reporting processes being enhanced by the use of new digital technology. They will continue to report to the Project Director.

(2) The 2nd line of defence: This will be formed under the leadership of a newly appointed Quality Manager who will report independently through a General Manager to the Engineering Director. His team will be split into two divisions. There will be an M&V (Monitoring and Verification) Section who will be based permanently on site. This team will have the authority to carry out both quality control and quality assurance checks on site at any time. They will particularly be charged with ensuring that quality assurance processes and procedures are being adhered to and that adequate checks are being carried out on the quality of the works on site. In addition, an auditing section will be established and managed by the Engineering Division. This Section will be office based and will carry out a rolling programme of audits on the implementation of MTRCL processes and procedures across all contracts. Both Sections will have the power to suspend works which are not in compliance with MTRCL processes and procedures and will have the authority to audit all and any works on site.

(3) The 3rd line of defence: MTRCL's Internal Audit Office will continue to carry out an overview of all MTRCL's activities, including those of the Projects and Engineering Divisions.

82. In relation to the 2nd line of defence, the Engineering Division Quality Manager, Andy Yeung, reported for duty on 3 May 2019. He is a highly experienced quality professional who has experience across multiple industries, including transportation,

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having spent many years in senior quality roles on the Crossrail Project in the UK. His initial remit is to develop the roles and responsibilities of this new section, carry out initial recruitment and commence the preparation of audit plans and programmes for SCL.

83. At the initial stage, this new team will consist of 10 staff members (in addition to the existing Projects Division Quality team). Each of the EWL M&V Team, the NSL M&V Team and the office-based audit team will consist of one Senior Quality Management Engineer and two Quality Management Engineers. The line of reporting will be from the Quality Manager through a General Manager to the Engineering Director. It is envisaged that as more projects come online the Quality Team will grow to meet the demand.

84. Until such time as the new quality team is fully constituted (and as mentioned in paragraph 11 above), the Engineering Division has enlisted the support of WSP to provide a team of auditors to carry out audits on SCL contracts. This team commenced service in December 2018 and will remain until recruitment commences for the permanent staff.

(D) Fundamental revision of PIMS

85. The following recommendations are made in the T&T Interim Report in relation to PIMS:- **[B17/24442]**

(1) Note PP2 - PIMS requires simplifying in regards to Project Quality Management to allow access and ease of use for all MTRCL employees and to provide a "Golden Thread of Quality from Board of Directors to Site";

(2) Note PP3 - A specific Project Quality Management Plan document to be written to act as a guide to the quality expectations within PIMS;

(3) Note PP4 - Simplified guidance and flow charts in English and Chinese for on-site monitoring procedures and the proposed new NCR procedure. Digital forms to be in both English & Chinese; and

(4) Note PP5 - Introduce yearly review of PIMS by the review panel and capture feedback from those on site regularly to drive "bottom up" improvement.

86. MTRCL has taken on-board and is implementing the recommendations made and has set up a PIMS Review Panel for these purposes. However, MTRCL has also taken a step further in that the Executive Committee has approved the award of an External Consultancy Contract to carry out a complete overhaul of the PIMS. The scope of this review is still being discussed as at the date of this witness statement. It is important that it has a clear and unambiguous scope that will help in terms of delivering a new set of PIMS that not only addresses the recommendations made by T&T, but that also adopts 'world best practice' in project management. It is anticipated that this External Consultancy Contract will be awarded in the second half of 2019, with a target for the review to be completed.

87. All in all, I trust that it is clear from what is set out above that MTRCL has already taken significant steps and is in the process of taking yet further steps to improve its project managements systems. As mentioned earlier, MTRCL is a 'learning organisation' which makes continuous efforts to develop and enhance its management systems. MTRCL welcomes and looks forward to receiving any further recommendations by the Commission of Inquiry in the Final Report at the end of the Inquiry.

88. Finally, I would like to mention that in preparing this witness statement I have acquainted myself with the matters in question by reference to various hard copy and electronic documents and materials. I understand these materials were retrieved by MTRCL's Legal Department, with the assistance with MTRCL's external lawyers, Mayer Brown.

Dated 17 May 2019

Dr Peter Ewen

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