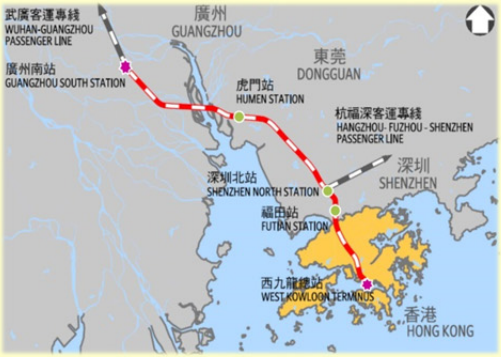

Report of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link Independent Expert Panel

December 2014

CONTENT

1. Introduction

1.1 When complete, the Hong Kong section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (the 'XRL Project') will connect with the Mainland's National High-speed Railway Network, enabling passengers to travel between Hong Kong and Mainland cities at speeds of up to 200 km/hour. It is a project of strategic importance that will enhance Hong Kong's status as a gateway to the Mainland.

1.2 In January 2010, the Government of the Hong Kong Special Administrative Region (the 'SAR Government') entered into an agreement of entrustment with the MTR Corporation Limited (the 'MTRCL') to oversee the construction and commissioning of the XRL Project. In terms of the agreement, the MTRCL was to deliver the Project for a cost of HK$65 billion with the planned completion date being 4 August 2015.

1.3 On 15 April 2014, following an announcement by the Secretary for Transport and Housing that there would be a substantial delay in the completion of the XRL Project, the MTRCL announced that the completion date would have to be extended to an unspecified date in 2017. There had been no earlier public announcement of any extension to the scheduled completion date of the Project.

1.4 The news caused widespread public concern, not only at the abrupt announcement of such an extended delay, a delay which had seemingly caught the Government itself by surprise[1], but also at what many feared would result in extensive cost overruns. This in turn appears to have given rise to questions as to the MTRCL's ability to oversee the balance of construction and commissioning in accordance with the high professionalism it had displayed in earlier railway projects and to Government's ability to provide appropriate oversight.

[1] On 15 April 2014, during the course of meeting with the press, the Secretary for Transport and Housing was reported to have said: "*I have to say I was totally caught by surprise by such information, and obviously I felt very disappointed and deeply concerned about the delay*."

1.5 On 16 May 2014, recognizing 'widespread public concern' and expressing Government's own concerns, the Secretary for Transport and Housing announced the establishment of this Independent Expert Panel (the 'Panel') to examine both the project management systems and cost control mechanisms of the MTRCL in overseeing the XRL Project and the monitoring processes of the Government.

1.6 The Hon Mr Justice Michael Hartmann, GBS was appointed Chairman of the Panel, the two Members being Dr Peter Hansford and Professor Andrew J. Whittle. Biographical sketches of the Panel Members are set out in Annex 1 to this report.

1.7 The terms of reference given to the Panel are as follows:

i. to review the project management, monitoring, and cost control mechanisms of the MTRCL on the implementation of the XRL Project – covering relevant systems, processes, practices and modus operandi of the Corporation;

ii. to review the monitoring mechanism adopted by the SAR Government over the delivery of the XRL Project – covering the interface between MTRCL and the Highways Department over the XRL Project; the system, processes, practices and modus operandi of the Highways Department in supervising the implementation of the XRL Project; as well as the overseeing role and modus operandi of the Transport and Housing Bureau; and

iii. to identify systemic and any other problems involved in project implementation and supervision, and to make recommendations on measures for improving the above systems, processes and practices, where appropriate.

1.8 For the avoidance of doubt, it is to be emphasized that the Panel was not established to conduct a commission of enquiry (i.e. a judicial inquisitorial process in terms of which public hearings are conducted). The mandate given to the Panel has required it to conduct an administrative enquiry in order to report on the terms of reference given to it and is limited to those terms.

1.9 As two of the Members of the Panel are based outside of Hong Kong, the Panel has collaborated remotely by video conferencing, and has come together in Hong Kong for programmes of meetings on 12 to 14 June, 11 to 15 August, 10 to 14 October, and 13 to 17 November.

1.10 On these occasions, the Panel has conducted a number of site visits during which Members have received in-depth briefings from MTRCL staff. In addition, the Panelists have interviewed key personnel from the MTRCL management and Project Team, Government officials from the Transport and Housing Bureau and Highways Department, as well as staff from Jacobs China Limited, the company that provides monitoring and verification services to the Government for the XRL Project. A schedule of meetings and site visits is provided in Annex 2.

1.11 In order to assist the Panel in fulfilling its mandate, PricewaterhouseCoopers ('PwC') Advisory Services Limited was employed. PwC is a network of firms delivering professional services. For this report, it assembled a team of capital projects and consulting specialists to support the work of the Panel. PwC and the Panel have collaborated in preparing the document entitled 'Factual Annexure' which is attached as Annex 3.

1.12 That being said, the stated conclusions and expressions of opinion contained in this report are those of the Panel only.

Acknowledgments

1.13 The Panelists wish to thank all of the parties involved for their cooperation and assistance to the Panel.

1.14 Finally, the Panelists wish to acknowledge the exemplary professionalism of the members of the Secretariat established by Government to support the work of the Panel and of PwC.

Structure of this report

1.15 In compliance with the terms of reference, the Panel has structured this report in the following format:

i. Introduction;
ii. Background;
iii. Project management, monitoring and cost control mechanisms of MTR Corporation Limited;
iv. Monitoring mechanisms adopted by the Hong Kong Special Administrative Region Government;
v. Overseeing role of the Transport and Housing Bureau;
vi. Systemic and other problems identified; and
vii. Recommendations.

1.16 This report is written in English, with a Chinese translation (except the Annexes) prepared separately. While the best effort has been made to ensure semantic consistency between the two versions, in case of any discrepancies, the meaning of the English version should be adopted.

2. Background

2.1 As stated in the Introduction, on 26 January 2010, the Secretary for Transport and Housing, acting as the representative of the Government entered into an Entrustment Agreement ('EA2') with the MTRCL[2]. Under the terms of EA2, MTRCL is entrusted by Government to oversee the construction and commissioning of the XRL Project.

2.2 Prior to XRL, all railway projects in Hong Kong had been financed under the 'ownership approach', under which MTRCL (and its corporate predecessors[3]) had been responsible for the funding, design, construction and operation of the

[2] An earlier Entrustment Agreement (EA1, 2008) enabled MTRCL to carry out site investigations and prepare designs.
[3] MTRCL merged with the Kowloon-Canton Railway Corporation ('KCRC') in 2007.

projects. The ownership approach has proved highly successful. Since 1998, MTRCL and KCRC have delivered 10 major rail projects all within their original budgets and with only small schedule overruns[4].

2.3 However, the Government adopted a new 'concession approach' for construction of the XRL Project and consequent operation of the high-speed rail service to the Mainland. Under the concession approach (incorporated in EA2), the Government owns the railway assets, pays for the Project and assumes the construction risks. For its part, MTRCL is 'entrusted' by Government to manage all aspects of the Project: design, construction, testing and commissioning of the railway. Upon completion and handover of the Project, the Government is expected to invite MTRCL to operate the railway service under a separate concession agreement with both parties sharing operational risks.

2.4 Prior to the signing of EA2, the Railway Development Office within the Highways Department commissioned Lloyd's Register Rail (Asia) Limited ('Lloyd's Register') to prepare a review of the institutional arrangements for implementation of the XRL Project. In its report of April 2008, Lloyd's Register was of the opinion that MTRCL's project management processes and controls "*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.*" Largely on the basis of this report, EA2 specified that MTRCL's pre-existing project management and control processes would be used to deliver the XRL Project, with 'amendments to allow Government oversight'.

2.5 The 2008 Lloyd's Register report recognised the responsibility of the Highways Department (working through the Railway Development Office) as the agent of the Government responsible for the cost, programme and quality of the delivered XRL Project. The report identified the key role of the

[4] Data reported by MTRCL's Independent Board Committee independent experts (October 2014) for ownership projects with budgets exceeding HK$0.5 billion.

Railway Development Office to monitor and verify that MTRCL fulfils its obligations under EA2, that is, to 'check the checker', and 'verify that MTRCL is implementing its [own] processes as specified.' In August 2010, this task was contracted by Government to a Monitoring and Verification (M&V) Consultant, Jacobs China Limited.

2.6 XRL is a very large and complex project, the world's first all-underground high-speed railway project. When completed, it will consist of a Terminus situated in West Kowloon ('the Terminus') to enable passengers to arrive in and depart from the heart of the city. The Terminus itself will have a footprint of 110 000 m², the approximate size of 15 football pitches. It will consist of a ground floor set beneath a steel-framed atrium and beneath that there will be four further levels, the lowest housing 10 railway platforms (with provision for a further five). The total gross floor area will be 380 000 m². The trains will run in parallel tunnels, which will extend underground to Shenzhen, a distance of some 26 km.

2.7 Understandably for a project of such magnitude and public cost, the XRL Project aroused considerable public interest including a fair degree of controversy, much of it related to the location of the Terminus in a dense urban environment in the centre of Kowloon and its impact on external stakeholders. Although the front-end planning process (prior to EA2) was accomplished in less than two years, there were subsequent delays in obtaining site access due to protests from several groups.

2.8 Under the terms of EA2, MTRCL was engaged to deliver the XRL Project for a Project Control Total cost of HK$65 billion, which provided for approximately 10% of the construction cost as contingency[5]. In February 2010, MTRCL calculated that the budget included a contingency of HK$2.55 billion (representing only 4.4% of project construction cost), a level it considered 'inadequate' for the risks associated with such a complex project.

[5] Legislative Council Public Works Subcommittee Paper referenced PWSC (2009-10) 68 and 69.

It indicated there was a strong possibility of reverting to Government for additional funding at a later stage.

2.9 EA2 specified that the Project would be completed and handed over to Government by 4 August 2015. MTRCL set this planned completion date and sought assurance from third party consultants regarding the achievability of this timeline. The Corporation was advised by external consultants[6] (2009) that the schedule was achievable but dependent on production rates for certain key activities. In particular, it was emphasised that completion of the Terminus could only be achieved using 'unusually high rates of output' and the programme was 'extremely tight'.

2.10 In addition to XRL, MTRCL is currently responsible for four other major railway projects under construction in Hong Kong. Three[7] of these are being built under the ownership approach while a fourth, the Shatin to Central Link, uses a concession approach.

2.11 The XRL Project and current expansion of the Hong Kong rail network have been handicapped by a shortage of skilled labour. MTRCL was aware of this problem from the outset of the XRL Project. For example, the 2009 report by Arup and Atkins warned that "*construction resources, particularly skilled labour……are no longer available in the same quantities as was the case during the last major expansion of infrastructure that took place*". Similarly, Maunsell-Aedas warned of "*insufficient skilled labour*" available in the market in its risk register of September 2009, prior to the signing of EA2.

2.12 From the outset, the XRL Project has faced mounting programme challenges:

i. Late site possession delayed the start of two major contracts (C823A and C823B), while the late arrival of Tunnel Boring Machines ('TBMs') from the Mainland has affected progress on a third contract (C826). Tunnel boring has been hampered by the poor performance of TBMs and unexpected ground conditions which have led to low

[6] Reports by Maunsell and Aedas Joint Venture, Arup and Atkins (2009).

[7] West Island Line, South Island Line East and Kwun Tong Line Extension.

productivity rates for tunnel excavation.

ii. Works at the Terminus involve an extraordinarily complex sequence of excavation and underground construction. Four major contracts (C810A, C810B, C811A and C811B) were delayed by relocations of surface roads and utilities, and by low productivity rates in constructing perimeter diaphragm walls in preceding contracts. There have also been a large number of design changes (associated with both temporary and final works) for the Terminus.

2.13 MTRCL has instructed its contractors to develop and implement Delay Recovery Measures ('DRMs') in order to mitigate delays on individual construction contracts. Most of these relate to changes in construction methods. To date, more than 50 DRMs have been implemented on the four main Terminus contracts.

2.14 In May 2013, three years into the construction process, articles were published in the Hong Kong media to the effect that there would be a delay of one year or more before project completion, with an estimated cost overrun of more than HK$4 billion. The articles appear to have been based on information received from contractors. At that time, the press allegations were refuted by MTRCL and the Government, who asserted that the Project would be completed on time and within budget.

2.15 Although EA2 provided for extensions of the date for completion of the Project, prior to March 2014, MTRCL did not formally seek permission from Government for any such extension nor did it make any public announcement that such an extension was inevitable.

2.16 In September 2013, however, under pressure of mounting delays, MTRCL proposed to the Highways Department a 'partial or phased opening' plan for XRL (the so called 'Minimum Operating Requirement'). According to this scenario, passenger service would begin by December 2015, but only six long-haul platforms (out of 15 long- and short-haul platforms) would be operational at the Terminus. The remaining works would then be completed by mid-2016.

The Highways Department requested MTRCL to provide further information so that a full report could be made to the Secretary for Transport and Housing.

2.17 In November 2013, the Transport and Housing Bureau informed MTRCL that it planned to inform the Legislative Council Subcommittee on Matters Relating to Railways (the 'LegCo Subcommittee on Railways') about potential delays in commencing XRL passenger service (beyond 2015). The leadership of MTRCL (the Chief Executive Officer ('CEO') and the Projects Director) remained adamant that the Project could still be delivered on time and committed to provide a full assessment for Government (the Transport and Housing Bureau and the Highways Department) by April 2014. Subsequently, the Transport and Housing Bureau informed the LegCo Subcommittee on Railways that major works of the XRL Project could be completed in 2015 and thereafter, 'testing and trial runs would be conducted' (a process requiring six to nine months). Hence, XRL passenger service would only commence in mid-2016.

2.18 On 12 April 2014, the XRL Project Team briefed the Executive Committee ('ExCom') of MTRCL that a 2015 completion date was unachievable and that completion was now expected in 2017[8]. This information was relayed immediately to Government. The briefing was influenced by three intervening factors: i) mounting delays in several key construction contracts; ii) feedback from contractors working at the Terminus site (on C810A) that a partial opening scenario in 2015 was not feasible; and iii) a black rainstorm event on 30 March 2014 that caused severe damage to one of the TBMs producing a concomitant nine-month delay for C823A.

2.19 On 15 April 2014, MTRCL announced publicly that the completion of the XRL Project would have to be put back to an unspecified date in 2017.

[8] Jay Walder, the CEO of MTRCL, informed the Panel that he was surprised by this briefing. He elaborated that what became apparent subsequently was that the Project Team had been raising concerns about delivery of the Project but these concerns had not been passed on to himself, ExCom or the MTRCL's Board of Directors.

2.20 On 29 April 2014, the Board of Directors of the MTRCL established an Independent Board Committee ('IBC') consisting of six independent non-executive directors. The IBC was given a dual mandate. The first was essentially historical, to identify the reasons for the delayed completion. The second was forward-looking, advising on the manner in which the MTRCL can best ensure a transparent and timely completion of the XRL Project in accordance with its obligations under EA2. To assist it in fulfilling its second mandate, the IBC appointed two independent experts.

2.21 The IBC's first report, seeking to identify the reasons for the delayed completion, was published in July 2014. Its second report, containing the report of the two independent experts, was published in October 2014.

2.22 The Panel has considered both of these reports in the process of reaching its own independent conclusions.

3. Project management, monitoring and cost control mechanisms of MTR Corporation Limited

Project management systems and processes

3.1 EA2 has prescribed that MTRCL should implement its own pre-existing project management and control processes to deliver the XRL Project with 'amendments to allow Government oversight' [9]. These processes are encapsulated in a series of documents (project manuals and practice notes) referred to as the Project Integrated Management System ('PIMS'). PIMS is compliant with international standards for quality management (certified by ISO 9001), and project compliance is evaluated through internal audits.

[9] As stated earlier, this is in accordance with the findings of the 2008 review of institutional arrangements for the XRL Project conducted by Lloyd's Register for the Highways Department: see paragraph 2.4 of this report.

3.2 In its 2008 report, Lloyd's Register advised that MTRCL's PIMS was 'robust' and 'in line with industry best practice'. Independent assessments in 2009 (by Ernst and Young and by Scott Wilson Business Consultancy) also found that MTRCL's project controls were appropriate, but recommended the need to improve risk management processes. The independent assessments specifically recommended the use of quantitative risk assessments so that Government would have a better understanding of the risks and impacts of delay. MTRCL did not address these matters.

3.3 PIMS[10] prescribes that MTRCL should establish a master programme for the XRL Project to be used as a baseline for progress monitoring and reporting, with the objective of meeting the overall programme of the Project. The Panel's review has found that MTRCL was not fully in compliance with its own internal PIMS in this regard[11]. This led to a number of adverse consequences:

i. It impaired MTRCL's ability to understand inter-dependencies between contracts, to clarify the critical path for the Project and hence, to prioritise resources for mitigation and recovery.

ii. Project progress reports (for MTRCL management and Government) lacked information on the forecast dates for completion of key events and for the overall Project.

3.4 The Panel's review has also found that PIMS does not cover all processes and procedures that would be expected for a large and complex capital project. The Panel suggests that there are four specific areas of risk management that are missing from PIMS and could be adopted to provide assurance of project delivery to internal and external stakeholders:

i. Schedule Risk Assessments ('SRAs') to provide regular updates on the probability of achieving the committed project completion date. This

[10] PIMS/P/08/A1.

[11] PIMS specifies that the master programme should be developed using Primavera™ software. Post-facto, MTRCL has provided five master plans (dated January 2011 to August 2013) to the Panel. However, the Panel has seen no evidence that the plans were updated to forecast project completion (taking account of delays in construction), or that this information was shared with the Project Team and upper management of MTRCL or with Government (Highways Department).

should be done using well-established quantitative assessment tools (sensitivity analyses, etc.).

ii. Cost impacts of delays: MTRCL's periodic Cost Risk Analyses should take full account of the latest forecast timelines and completion dates based on quantitative SRAs. These estimates should include statistical calculation of potential costs of risk in relation to all contracts for the revised completion dates, including the cost of contractor prolongation and delayed access. This should be used to estimate the range of final project costs; whether the remaining contingency is adequate; and the probability of completing within the committed budget.

iii. The project delivery risk register to include time impact assessments on the overall programme in the event a risk occurs.

iv. Trend analysis to be used more widely for risk forecasting.

Projects organisation

3.5 Pursuant to MTRCL's organisational arrangements, the Projects Director is accountable to the CEO and the Board for the delivery of all major capital projects including XRL.

3.6 The Projects Director heads the Projects Division, which currently comprises some 2 800 direct staff employed by MTRCL. This is organised into dedicated project teams for each of the five major rail projects. Approximately 800 staff work in the XRL Project Team. Central resources provide services across multiple major projects.

3.7 A senior General Manager is appointed to take overall control of each major project. In the case of XRL, this senior General Manager has a small number of other General Managers reporting to him (the number has varied from one to three), each with responsibility for major sections or disciplines within the Project. It follows therefore that the General Manager heading the XRL Project – GM-XRL – should be the 'single point of accountability' for the delivery of the Project.

3.8 It is common for the individual who holds single point of accountability for a major project, particularly of the scale and complexity of XRL, to be identified as the Project Director or similar title. A job title of this nature signals to all parties where accountability lies. This has not been the case with XRL and such lack of clarity may have contributed to confused accountabilities within MTRCL. Furthermore, it is evident that there were overlapping responsibilities of the GM-XRL and the Projects Director, particularly in relation to reporting.

Programme Management Office

3.9 MTRCL's projects organisational arrangements are missing an independent project control function that is typically found within other large capital projects. This is usually denoted as the Programme Management Office ('PMO')[12].

3.10 The independent function of a PMO fulfils two key roles: i) it holds the project team to account by validating the data that is reported to senior management (e.g. the achievability of a planned completion date); and ii) it provides strategic direction to ensure consistency and best practices are used to control projects.

3.11 The Panel's review suggests that, although there were good communications among the managers within the XRL Project Team on technical matters, overall project delays and forecast completion dates were not clearly communicated in the monthly project progress reports (submitted to the MTRCL's ExCom) or Project Supervision Committee reports (submitted to the Highways Department). As a result, the interpretation of the likelihood of achieving the planned project completion date relied on the judgment of the Projects Director. The absence of an effective PMO has exacerbated the

[12] The organizational structure of the MTRCL's Projects Division does include a General Manager, Projects Management Office, who is the line manager for a number of the central resources including the Chief Programming Engineer. This department however does not fulfil the independent project control function of a typical PMO.

inability to provide constructive challenge.

Initial baseline

3.12 As stated earlier, under the terms of EA2, MTRCL was engaged to deliver the XRL Project for a Project Control Total cost of HK$65 billion. This is significantly less than prior estimates by MTRCL (in 2009), but in line with project costs estimated independently by Jacobs China Limited for the Highways Department (June 2009). As also stated earlier, in February 2010, shortly after EA2 was signed, MTRCL calculated that the budget included a contingency of HK$2.55 billion (representing 4.4%[13] of project construction costs), a level it considered 'inadequate' for the risks associated with such a complex project.

3.13 As to the provision in EA2 that the XRL Project would be completed and handed to Government by 4 August 2015, MTRCL set this planned completion date and sought assurance from third party consultants regarding the achievability of the timeline. MTRCL was advised that the schedule was extremely tight but achievable and was dependent on unusually high production rates for certain key activities, notably the Terminus. In addition, MTRCL had been made aware of potential shortages of skilled labour resources[14].

3.14 Although MTRCL generally acknowledged the risks identified by its consultants, no SRAs or sensitivity studies were carried out at the time of establishing EA2 or the initial baseline to estimate the probability that the Project could be completed by the specified date. The Panel believes that such analyses would have shown that the 2015 opening date for XRL was overly optimistic.

[13] The Government allowed for approximately 10% of the construction costs as contingency in the Project Control Total cost of HK$65 billion.

[14] See paragraph 2.11 of this report.

Mitigation and recovery measures

3.15 MTRCL actively mitigates delays occurring within individual construction contracts by instructing its contractors to develop and implement DRMs. Most DRMs relate to changes in construction methods. To date, more than 50 DRMs have been implemented on the four main Terminus contracts.

3.16 The Panel's review has identified instances where the XRL Project has benefited through DRMs[15]. However, in the absence of an integrated master programme [16], it is highly probable that other DRMs that have been implemented addressed delays that were not on the critical path, and therefore would not have affected the overall project completion.

3.17 The Panel has also found instances where MTRCL was over-optimistic about the viability of proposed DRMs. Its proposal of September 2013 for partial opening of XRL[17] assumed the workability of certain perceived time saving benefits before their viability was confirmed.

3.18 Despite the heavy reliance on DRMs to bring the overall Project back onto programme, the Panel has found no evidence that MTRCL has a process to measure the benefits of DRMs. The fact that many contracts have continued to fall into further delay after implementation of DRMs has raised further questions about their effectiveness.

3.19 It is the Panel's view that the implementation of DRM solutions provided false confidence to stakeholders such as the Highways Department. It appears that MTRCL's XRL Project Team communicated high optimism of success for such measures, without demonstrating their benefits.

[15] The clearest examples are the decisions to procure an additional TBM for tunnelling for C823A and the removal of piles obstructing tunnelling activities for C820.
[16] One that serves the functions described in paragraph 3.3 of this report.
[17] See paragraph 2.16 of this report.

Reporting to stakeholders

3.20 Reporting channels between the XRL Project and stakeholders are in compliance with EA2. The ExCom of MTRCL (chaired by the CEO) meets on a monthly basis to discuss the five major railway projects (including XRL), and receives monthly progress reports prepared by the XRL Project Team and edited by the Projects Director. The Project Team also submits monthly reports to the Highways Department that are discussed by the Project Supervision Committee chaired by the Director of Highways.

3.21 This review has found that some reporting on the Project was not 'fit for purpose'. There was a high reliance on written reports to communicate the status of the Project. The monthly progress reports comprise a set of summary headline issues, detailed narratives and dashboard summaries for each of the major contracts. However, the reports lack single-source (i.e. independently verified) data or forecasts on completion dates, and rarely offer any conclusions. The reports do not forecast a project completion date, or quantify overall project delay.

3.22 The Panel finds that there was a strong reliance on assurances made by MTRCL regarding DRMs. Neither the upper management of MTRCL nor the Highways Department mandated changes in the reporting system to provide clarity on the impacts of these DRMs.

3.23 The Panel has also found that MTRCL was late to recognise and forecast delays on individual contracts. This, coupled with the absence of an integrated master programme[18], meant that it was not possible to understand which contracts were critical to the project completion date.

3.24 MTRCL's first IBC Report (July 2014) identifies instances of individuals in key positions failing to communicate what they knew in respect of the significance of delays to XRL. This may be partly due to the culture within

[18] One that serves the functions described in paragraph 3.3 of this report.

MTRCL that apparently discouraged the elevation of bad news without solutions and partly due to unfounded optimism within the Project Team. Either way, this failure in communication left senior officers in MTRCL and Government unsighted as to the true severity of delays.

3.25 In summary, reporting to stakeholders has fallen below the standard considered appropriate for a project of this importance.

Corporate oversight

3.26 MTRCL's ExCom and Board, supported by the Audit Committee, provide corporate oversight to projects undertaken by the Corporation. This has been dependent on reports and briefings provided by the Projects Director.

3.27 In the absence of an 'independently verified' source of information regarding the status of individual projects, the ExCom, Board and Audit Committee are afforded limited opportunity to fulfil their roles of scrutiny, challenge and support.

3.28 Consequent upon the first and second IBC Reports, MTRCL has committed itself to strengthen its corporate oversight of projects, specifically by the establishment of a Capital Works Committee and a Risk Committee, and the identification of key reporting milestones and key performance indicators to be reported to the Board.

4. Monitoring mechanisms adopted by the Hong Kong Special Administrative Region Government

The Railway Development Office of Highways Department

4.1 The Railway Development Office is one of four divisions within the Highways Department and is responsible for the implementation of new

railway projects in Hong Kong and for planning associated with expansion of the rail network. In this role, Railway Development Office acts as the day-to-day coordinator/liaison among the Government agencies and project stakeholders to resolve interface issues and approvals needed for the completion of new rail projects.

4.2 XRL is one of five new railway projects currently under construction and is the first to be carried out under an entrustment arrangement that involves public funding for a railway project.

4.3 In order to fulfil its obligations with respect to the XRL Project, the Director of Highways serves as the Controlling Officer, responsible for all expenditures of public funds; while Highways Department/Railway Development Office is responsible for monitoring and verifying that MTRCL fulfils its obligations in accordance with EA2 for the design, procurement, construction, testing and commissioning of the Project.

4.4 Railway Development Office has 13 staff members working on XRL. 10 of the 13 are assigned primarily to managing interfaces, with three staff assigned full-time to monitoring project progress.

Monitoring and Verification Consultant

4.5 Following recommendations contained in the 2008 Lloyd's Register report, Government appointed Jacobs China Limited as an independent M&V consultant to monitor and audit the XRL Project in accordance with MTRCL's pre-existing project management and control procedures.

4.6 In its role of 'checking the checker', the M&V Consultant reviewed MTRCL documents, carried out monthly site visits (jointly with Railway Development Office staff), and conducted process and technical compliance audits to identify any major risks to the cost, programme, safety and quality of the XRL Project. The M&V Consultant presented monthly reports to Railway

Development Office and six-monthly 'Interim Reports' for the Transport and Housing Bureau.

4.7 The M&V Consultant has a team of 20 to 22 full-time staff assigned to XRL.

4.8 The purpose of the M&V Consultant is to provide Government with the assurance that MTRCL's obligations under the Entrustment Agreements (EA1 and EA2) are being properly fulfilled. In this role, the M&V Consultant is required to monitor and audit the activities and processes of MTRCL, and verify that these are carried out in accordance with MTRCL's management and control procedures. It is also required to identify any major risks to the cost, programme, safety and quality of the XRL Project.

4.9 The Panel's review has found that the M&V Consultant fulfilled its remit for the XRL Project through its review of MTRCL documents, monthly site visits and participation in the monthly Contract Review Meetings. Although the M&V Consultant did not attend the monthly Project Supervision Committee meetings, it provided regular briefing reports for Highways Department so as to enable the Director of Highways to raise matters of importance with MTRCL.

4.10 In its monthly reports to Highways Department, the M&V Consultant reported delays on individual construction contracts and estimated impacts on the overall project programme. From December 2011 (and at monthly intervals thereafter), the M&V Consultant alerted Highways Department that delays in individual construction contracts were likely to jeopardize the overall project completion date. In March 2012, the M&V Consultant reported that "*there is no sign yet that the situation will improve, nor that the Delay Recovery Measures and Supplemental Agreements implemented to date have started to have any meaningful impact*". Beginning in May 2012, the M&V Consultant recommended that MTRCL "*undertake a complete appraisal of the overall project programme and the current delay situation*", a recommendation repeated over the next three months.

4.11 In July 2013, the M&V Consultant estimated a "*potential delay of almost 11 months to the Completion Date*" (i.e. July 2016). There is no indication that the Highways Department acted upon this information to request MTRCL for an in-depth review on XRL Project progress.

Processes, practices and modus operandi

4.12 Highways Department/Railway Development Office has extensive prior experience working with MTRCL (and previously with KCRC) on new railway projects constructed under the ownership approach. This experience led to a high level of confidence in the technical and managerial abilities of MTRCL, which informed the creation of the Entrustment Agreements for XRL.

4.13 The general framework of communications between MTRCL and Government agencies for XRL was established in accordance with recommendations from the 2008 Lloyd's Register report. This includes multiple channels of communications among the various parties including four regularly scheduled meetings between MTRCL and Government:

i. Monthly Project Supervision Committee meetings chaired by the Director of Highways, and attended by senior members of the MTRCL Project Team (including the Projects Director and General Managers). Project Supervision Committee meetings review the XRL Project monthly reports, prepared by MTRCL, covering project progress (percentage completion of individual contracts), areas of concern (including DRMs) and cost reporting.

ii. Monthly Project Coordination Meetings ('PCMs') co-chaired by the Assistant Director of Highways and GM-XRL. PCMs are attended by MTRCL General Managers and Project Managers and aim to resolve technical and logistic issues affecting the implementation of the XRL Project.

iii. Monthly Contract Review Meetings, chaired by Railway Development Office, with MTRCL site supervision staff and attended by the M&V

Consultant. These meetings cover progress for all individual active contracts.

iv. Weekly MTRCL Project Control Group meetings chaired by the Projects Director and attended by representatives from Railway Development Office. These meetings cover all five new railway projects and focus on cost controls, consultancies and other contract procurements, reviews of proposals, strategic issues and project risks.

4.14 Regular meetings within Highways Department include weekly discussions on issues related to the XRL Project, and bi-weekly progress reports to the Director of Highways, who provides updates for the Transport and Housing Bureau at monthly Head of Department meetings.

4.15 Railway Development Office received monthly reports from MTRCL and independently from its M&V Consultant. The project monthly reports (presented through the Project Supervision Committee) contain extensive narrative detail and depth on each of the major contracts. While the reports highlight important delay events, they give little information to forecast how current progress could affect the completion date of the overall Project. In general, the Project Supervision Committee reports tend to focus on progress and optimistic assumptions about the effectiveness of DRMs.

4.16 The Panel's review finds that Railway Development Office was aware of the significance of delays on individual contracts and expressed its concerns to MTRCL. However, the institutional arrangements for the XRL Project make no provision for measuring the performance of MTRCL in fulfilling its duties and obligations with respect to the delivery of the completed Project. From January 2013 onwards, MTRCL repeatedly deferred to respond to Highways Department/Railway Development Office's requests for a presentation on the 'overall project master programme'. Highways Department/Railway Development Office did not challenge MTRCL to prove the effectiveness or impact of DRMs on overall completion of the Project.

4.17 The Panel is of the view that Highways Department/Railway Development Office was not well prepared for its role of monitoring and verification of the Entrustment Agreements for the XRL Project. At the outset, there was no documented plan detailing the roles and responsibilities of the main parties (Transport and Housing Bureau, Highways Department and MTRCL). Similarly, EA2 did not provide any metrics of performance for MTRCL's delivery of the XRL Project (e.g. with respect to cost, schedule or reporting). As a result, there was no mechanism for Highways Department to intervene in the delivery of the Project for reasons related to poor performance.

4.18 The Panel's review finds that Highways Department frequently challenged MTRCL regarding the progress of the Project. In response, MTRCL consistently reassured Highways Department that delays on individual contracts could be recovered through DRMs and that the original project completion date would still be achieved.

4.19 In the Panel's opinion, Highways Department could have done more to validate MTRCL's opinions by demanding regular updates on: i) the forecast for overall project completion; and ii) the effectiveness of DRMs. This was not done.

4.20 The Panel has found no evidence of Highways Department exercising independent insight to plan, programme, forecast, etc. at any time prior to its review in April 2014.

Reporting to Transport and Housing Bureau

4.21 The Director of Highways reports regularly to the Secretary for Transport and Housing and the Permanent Secretary for Transport and Housing (Transport) at monthly Head of Department meetings. In addition to these meetings, the Permanent Secretary has periodically requested briefings on the XRL Project from Highways Department and MTRCL.

4.22 While there are no formal notes from the Head of Department meetings, the briefing notes prepared by Highways Department indicate that discussion of the XRL Project has focused primarily on stakeholder interface and operational matters. The briefing notes before October 2013 did not report delays to the project completion date. Similarly, the briefing notes before March 2014 did not report potential project budget overrun.

5. Overseeing role of the Transport and Housing Bureau

5.1 The Transport and Housing Bureau is responsible for setting policy and direction for Hong Kong's transportation sector. It oversees the operational arrangements for major capital projects and is responsible for briefing the LegCo Subcommittee on Railways on all matters relating to XRL. The Bureau was responsible for the original feasibility studies (carried out jointly with the Mainland authorities), preparing and submitting the funding applications, and managing public concerns. Since April 2010, the Bureau (with inputs from Highways Department and MTRCL) has prepared six-monthly reports for the LegCo Subcommittee on Railways on the progress and financial situation of the XRL Project.

5.2 Within the Bureau, the Permanent Secretary reports to the Secretary for Transport and Housing on all transport-related matters. The Permanent Secretary is supported by a Deputy Secretary in charge of a Division that handles the planning and implementation of all land-transport related capital projects[19].

5.3 The Transport and Housing Bureau relies on Highways Department to implement, monitor and verify progress on the XRL Project. The Secretary and the Permanent Secretary receive regular reports on the Project from the Director of Highways through the Head of Department meetings. A Principal Assistant Secretary attends the monthly Project Supervision Committee

[19] This currently includes five major rail projects, as well as strategic highway projects including the new Hong Kong-Zhuhai-Macao Bridge.

meetings chaired by the Director of Highways in order that the Bureau can be alerted to major issues arising on the Project that may require the attention of Government.

5.4 The Transport and Housing Bureau has operated largely in the background during the implementation phase of the XRL Project, attending principally to interface matters with Mainland authorities. However, it has intervened in response to: i) press reports of delays and cost overruns in the XRL Project (May 2013); and ii) reported delays in the cross-boundary tunnelling works and proposals by MTRCL for a partial opening scenario (November 2013). In the former case, the Bureau was assured by MTRCL that the project completion date would not be affected by contract delays. In the latter case, the Bureau was persuaded to allow MTRCL further time to review the effectiveness of DRMs before informing the LegCo Subcommittee on Railways of the expected delay in project completion.

6. Systemic and other problems identified

6.1 The Panel has identified a number of systemic problems which have been grouped under the following headings: i) shortcomings in EA2; ii) lack of robustness of MTRCL's project management; and iii) clarity of communications and their fitness for purpose. These are set out in the following paragraphs.

Shortcomings in EA2

6.2 The Government and MTRCL have a long and productive relationship in the development and implementation of new railway projects in Hong Kong. In many respects EA2 builds on this relationship, placing a high degree of confidence on MTRCL to deliver the Project (on time and on budget) using its pre-existing project management practices and processes.

6.3 The Panel believes that many of the problems associated with the delivery of the XRL Project are systemic to the provisions (or lack thereof) in EA2:

i. At the outset, there was no overall delivery strategy document describing the obligations, duties, roles and responsibilities of the respective parties (MTRCL and Government). The institutional arrangements do not define measures of performance for each of the parties.

ii. The terms of EA2 provide no mechanisms for Government intervention on the basis of poor performance. The Panel believes this may explain why Highways Department accepted re-assurances by MTRCL that the Project would be delivered on time, even when this was contrary to the warnings raised by its own M&V Consultant.

6.4 The baseline time estimate for the XRL Project was unrealistic. The Panel's review suggests that if MTRCL had performed a SRA at the outset, it would have realised there was a low probability of achieving the planned completion date in August 2015.

Lack of robustness of MTRCL's project management

6.5 It is apparent to the Panel that MTRCL's project management systems and practices are primarily designed to manage discrete contracts. Indeed, the Panel is of the view that MTRCL's contract management is exemplary.

6.6 MTRCL normally monitors interfaces between individual tunnelling and other infrastructure contracts by reference to an overall Track Related Installation Programme. Each infrastructure contract has built into it a date by when access is due to be provided to others for track-related activities. MTRCL's Project Managers are able to sequence track-related activities to best achieve the target completion date for the Project.

6.7 However, it appears that this approach to schedule management has not worked on XRL. The Panel believes that there are two contributing causes for

this: i) XRL has suffered so many delays on so many contracts that the critical paths to completion have become obscured; and ii) the interfaces between adjacent infrastructure contracts are considerably more complex than would normally be the case.

6.8 The Terminus alone comprises eight major civil engineering contracts (including piling and diaphragm walls). These contracts are interdependent at multiple interfaces, most of which are not related to track installation. It is very difficult, if not impossible, to grasp the critical relationship between these contracts through any purely intuitive means. Delays on one contract are likely to impact other adjacent contracts, and in turn may delay overall completion. Managing this complexity requires an integrated master programme, which demonstrates the critical paths to completion of the Terminus.

6.9 When delays occur, different elements may become critical. Similarly, as delay mitigation measures are implemented, the critical paths to completion may change.

6.10 By focusing and reporting on progress of the individual contracts, rather than progress of the overall project, the MTRCL's XRL Project Team inadvertently provided its senior management and Government stakeholders with a confusing and misleading picture of the overall status of the XRL Project.

6.11 In summary, the Panel's view is that MTRCL's project management systems and practices, which have worked very well on projects with less complex interfaces, have come under severe stress on XRL. This is due primarily to complexity of contract interfaces and multiple delays on adjacent contracts. The absence of reporting against a fully integrated, whole-project master programme has left Government in the dark.

Clarity of communications and their fitness for purpose

6.12 The Panel has found that communication channels between the various stakeholders in the XRL Project, by way of written reports and oral communications at scheduled meetings, were established in broad compliance with the recommendations of the 2008 Lloyd's Register report and the requirements of EA2. The Panel is satisfied that these channels of communication would have been sufficient if employed efficiently; that is, if information was clear in its meaning, backed by the appropriate level of verified data and was fit for purpose, enabling those in receipt of the communications to make decisions appropriate to their roles and responsibilities in the management and oversight of the Project.

6.13 However, as indicated earlier in this report, the Panel is of the view that, for a project of such size and complexity, there were significant failures in oral and written reporting. While there was no evidence of inaccurate reporting, there was evidence of the following, namely:

i. the use of largely narrative styles, that were often difficult to follow or to compare with earlier reports, tended to obscure important indicators as to overall progress and was liable to misinterpretation;

ii. important indicators as to matters such as the effectiveness of DRMs and overall progress were not clearly signposted;

iii. reports were not supported by consistent and verified data nor did they contain clearly stated conclusions; and

iv. reports were not focused (i.e. edited) sufficiently to enable recipients at different levels (and thereby with different responsibilities) to have a ready understanding of matters important to them and therefore to be able to make informed decisions.

6.14 The Panel has already noted that the absence of reporting against a fully integrated, whole-project master programme left Government (and other parties) in the dark[20]. In the Panel's view, this failure was compounded by the

[20] See paragraph 6.11 of this report.

failures in communications just outlined.

6.15 The lack of effective communication was evident at source; that is with the MTRCL's Project Team itself. The Project Team has been responsible for preparing a detailed monthly XRL Project progress report, which is distributed to key members of the Project Team and the MTRCL's Projects Division and is copied to the Railway Development Office. However, the report (which has averaged 200 pages) has not included an overall summary of the project delay status or forecast a likely completion date. In an email sent out by the Projects Director to the Project Team in November 2013, the Director said: "*I have had a number [of] occasions trying to come to some clearer understanding with all the progress and challenges associated with XRL. But I have totally failed*."

6.16 With unclear reporting at source, it has been inevitable that further communications, both within MTRCL and with external stakeholders, should be equally challenged.

6.17 As indicated earlier, it is the Panel's view that, in light of MTRCL's success in its earlier railways projects, the lack of clear reporting on the XRL Project data led to an over-reliance both within MTRCL and by Government on unsubstantiated assurances given by key individuals.

6.18 The lack of clear reporting further resulted in Government placing an over-reliance on unsubstantiated assurances from MTRCL in respect of the effectiveness of DRMs in moving the Project towards completion. For example, between March and June 2012, the Project Supervision Committee reports prepared by MTRCL all reported similar assurances in respect of the Terminus, namely: "*Critical delays are still occurring in contracts 810B, 811B, 822 and the Mainland section. Recovery measures are being developed to mitigate impacts of these delays to the XRL Project programme.*" The Panel would have expected such reports to place the intended use of DRMs into a clearly stated context: the nature of the DRMs; the amount of delay they were intended to recover; and the level of confidence MTRCL had in their effectiveness. No such details were given nor is the Panel aware of

discussions on the effectiveness of DRMs at the Project Supervision Committee meetings.

7. Recommendations

7.1 The Panel offers its recommendations on measures for improving the systems, processes and practices for Government funded railway projects, as set out below.

Recommendation 1: Improve institutional arrangements for concession agreements

7.2 The Panel believes it is important to set up robust institutional arrangements to assure delivery of large, public infrastructure projects such as XRL. The Panel recommends that, at the outset, the Government develops a master delivery strategy document that defines the obligations, duties, roles and responsibilities of all parties (Government agencies, project manager, etc.). The document should provide metrics of performance for each of the parties that can be checked and verified throughout the course of the project. These metrics would include high-level milestones and key cost triggers appropriate to the different stakeholders. Future entrustment agreements should include appropriate incentives and penalties linked to the performance metrics. There should also be provisions to allow step-in arrangements to allow Government to take over the project or replace the project manager in the case of unsatisfactory performance.

7.3 The role of the Railway Development Office as the project client needs to be enhanced. Specifically, the Panel recommends:

i. Monitoring and verification functions should be strengthened. There should be a formal feedback mechanism requiring the Government and project manager to address concerns from monitoring and verification audits.

ii. Government control systems should be established to provide remedies

and intervention mechanisms in the event there are performance issues related to project delivery.

7.4 The Panel further recommends that quantitative risk analyses ('QRAs') (schedule and cost) should be carried out as part of the process for establishing the baseline parameters for the project. This would ensure more robust and achievable budgets and timescales, including adequate contingency to cover foreseen and unforeseen risks for highly complex projects such as XRL.

Recommendation 2: Adopt internationally recognized best practices for complex projects

7.5 The Panel recommends that, in accordance with best practice, the project manager (MTRCL or other entity) should establish a project controls and oversight function, independent from the line management of individual projects. This function is to review and validate project-derived data; provide constructive challenge to the project delivery teams; and maintain a 'single source of truth' for each Government funded project entrusted to the project manager for delivery.

7.6 Further, the project manager (MTRCL or other entity) should develop and maintain an integrated master programme, covering the whole scope of the project, as a baseline for progress monitoring and reporting. The integrated master programme is to show, *inter alia,* all significant contracts, interfaces, handovers, contract completions, overall project completion and dates when the railway will enter passenger service. The critical path or paths to overall project completion are to be highlighted. Production output rate trends for key activities should be used to forecast completion date. The integrated master programme is to be updated at regular intervals (normally monthly) to show the forecast impact of actual progress, change and mitigation measures. A high-level summary of the integrated master programme, derived directly from the more detailed integrated master programme, should be included in regular (normally monthly) reports to senior management and Government

stakeholders.

7.7 QRAs, covering cost and schedule risks, are to be carried out for the whole project at (normally) three-monthly intervals. These are to involve representatives of the Government's monitoring team in the identification of risks. A summary of the cost implications to budget (including adequacy of remaining contingency) and time implications to overall project programme, arising from the most recent QRA, should be included in monthly high-level reports.

7.8 The anticipated impact of committed and proposed DRMs should be demonstrated by reference to the latest updated integrated master programme.

Recommendation 3: Enhance progress reporting

7.9 The Panel recommends that reporting practices should be reviewed, more particularly:

i. Reports should be designed to make use of appropriate quantified metrics and dashboards to enable stakeholders to have a clear and ready understanding of current and forecast project status, enabling them to challenge performance, and should focus on risk and mitigation. The format of such reports and the information contained in them should be agreed with stakeholders.

ii. Reports should be designed so that they are fit for purpose, enabling those who receive them to make decisions appropriate to their roles and responsibilities.

Recommendation 4: Suggestions of immediate application to the XRL Project

7.10 The IBC and its independent experts (IBC Reports, July 2014 and October 2014) have already made a series of recommendations to enhance project management and budget control for the XRL Project, as well as reporting processes for key project milestones. The Panel endorses these proposals and suggests that there are several additional measures that can be taken within the

framework of the existing contractual obligations, as set out below.

7.11 The Panel recommends that for the XRL Project, MTRCL:

i. reports against an integrated master programme;

ii. performs regular quantitative SRAs and uses these to input into cost risk assessments for the remainder of the Project; and

iii. reviews the effectiveness of its reporting practices.

7.12 The Panel further recommends that Government and MTRCL provide enhanced access for the M&V Consultant to perform its duties. Specifically, this should include participation of the M&V Consultant in monthly meetings of the Project Supervision Committee.

Recommendation 5: Government's external scrutiny of its portfolio of infrastructure projects

7.13 The SAR Government may be contemplating embarking on a portfolio of publicly funded railway and other infrastructure projects. In that event, the Panel recommends that consistency should be applied across the portfolio, where appropriate.

7.14 To aid consistency, consideration should be given to creating a small, independent advisory group that is deployed when required to provide strategic advice to Government on its portfolio of railway (and possibly other infrastructure) projects. The group should comprise experienced professionals of standing in the infrastructure community.

7.15 Such an advisory group would maintain a high-level overview of projects within the portfolio, thereby promoting a consistency of approach. As necessary, and with the specific agreement of Government, it could carry out 'deep dive' reviews or interventions to investigate areas of concern.

7.16 The independent advisory group should report at the highest level of Government.

- End -

Annex 1

Membership of Independent Expert Panel

Chairman

The Hon Mr Justice Michael Hartmann, GBS served in the Hong Kong Judiciary for over 20 years, retiring as Justice of Appeal in the summer of 2012. He remains a Non-Permanent Judge of the Court of Final Appeal and chairs two tribunals that assist in the governance of Hong Kong's securities industry: the Securities and Futures Appeals Tribunal and the Market Misconduct Tribunal. He has also (from its inception) chaired the Higher Rights Assessment Board. Prior to his retirement from the Court of Appeal, Mr Justice Hartmann specialised in public and administrative law.

Members

Dr Peter Hansford was appointed as the UK Government's Chief Construction Adviser in December 2012. In this role he works with government and industry to transform the UK's construction sector and to ensure that it is equipped with the knowledge, skills and best practice needed to transition to a smarter and more efficient industry and to support a low carbon economy. Prior to this, he was engaged in strategic consulting and advising on infrastructure developments and capital investment programmes. He has over 35 years' experience in the development and delivery of major infrastructure and building projects. He is a Fellow of the Royal Academy of Engineering; a Fellow of the Institution of Civil Engineers; and a Fellow of the Association for Project Management. He served as President of the Institution of Civil Engineers from November 2010 to November 2011. Dr Hansford is appointed to the Panel in his personal capacity.

Professor Andrew J. Whittle is the Edmund K. Turner Professor of Civil and Environmental Engineering at the Massachusetts Institute of Technology and a member of the US National Academy of Engineering (2010). He is a geotechnical engineer with particular expertise in the modelling of soil behaviour and analyses of soil-structure interactions who has worked extensively on urban excavation and tunnelling projects. He has authored more than 170 publications and won numerous awards for his research. He is a licensed Professional Engineer in New York State and has consulted on more than 40 major onshore and offshore construction projects. He has previously served as an expert reviewer on the performance of Hurricane Protection Systems in New Orleans during Hurricane Katrina, and on a stem-to-stern safety review of the Metropolitan Highway System in Boston. He is currently a member of the Board of Directors for the Massachusetts Department of Transportation.

Annex 2

Schedule of Meetings and Site Visits

During the course of review, the Panel and/or its consultant met the following stakeholders –

Date	Interviews with stakeholders
12 June 2014	Highways Department ● Mr Lau Ka Keung, Peter, JP, Director of Highways ● Mr Chan Chi Yan, Henry, JP, Principal Government Engineer/Railway Development ● Mr Chan Choi Wai, Alex, Chief Engineer/Railway Development ● Mr Leung Wai Chiu, Jason, Senior Engineer/XRL ● Mr Szeto Hon Yin, Senior Engineer/XRL ● Mr Leung Ka Chung, Tony, Senior Engineer/XRL ● Mr Ho Kwok Fai, Godfrey, Senior Engineer/XRL
12 August 2014	Transport and Housing Bureau ● Mr Lai Yee Tak, Joseph, JP, Permanent Secretary for Transport and Housing (Transport) Jacobs China Limited ● Mr Richard Ko, Project Director ● Mr Tony King, Deputy Project Director (Programme and Verification) ● Mr Tony Lam, Deputy Project Director (Financial Monitoring) ● Mr William Ng, Project Manager

Date	Interviews with stakeholders
13 August 2014	MTR Corporation Limited ● Mr Jay H Walder, former Chief Executive Officer ● Mr Simon Tang, General Manager – XRL ● Mr T M Hui, Engineering Manager – SCL Geotechnical Transport and Housing Bureau ● Professor Anthony Cheung, GBS, JP, Secretary for Transport and Housing
14 August 2014	MTR Corporation Limited ● Mr Antonio Choi, former General Manager – XRL ● Mr Alvin Luk, General Manager – XRL Electrical and Mechanical ● Mr Steve Griffin, General Manager – Procurement and Contracts Transport and Housing Bureau ● Miss Wong Ming Wai, Winnie, Principal Assistant Secretary for Transport and Housing (Transport)
15 August 2014	MTR Corporation Limited ● Dr Raymond Ch'ien, GBS, JP, Chairman ● Mr T C Chew, former Projects Director ● Mr Henry Young, Chief Programming Engineer Transport and Housing Bureau ● Ms Pun Ting Ting, Rebecca, JP, Deputy Secretary for Transport and Housing (Transport)
23 September 2014*	MTR Corporation Limited ● Mr Henry Young, Chief Programming Engineer ● Mr Bernard Chui, Programming Manager – XRL
9 October 2014*	MTR Corporation Limited ● Mr Henry Young, Chief Programming Engineer ● Mr Bernard Chui, Programming Manager – XRL

Date	Interviews with stakeholders
10 October 2014	MTR Corporation Limited ● Mr Patrick Lun, General Manager – Projects Management Office
10 October 2014*	MTR Corporation Limited ● Mr Henry Young, Chief Programming Engineer ● Ms Daphne Kee, Project Development Manager – XRL
13 October 2014	Transport and Housing Bureau ● Mr Yau Shing Mu, JP, Under Secretary for Transport and Housing Highways Department ● Mr Chan Chi Yan, Henry, JP, Principal Government Engineer/Railway Development
13 October 2014*	MTR Corporation Limited ● Mr Nelson Hung, Chief Internal Audit Manager ● Mr Carl Wu, Project Quality Manager
14 October 2014	Highways Department ● Mr Lau Ka Keung, Peter, JP, Director of Highways
15 October 2014*	Highways Department ● Mr Chan Chi Yan, Henry, JP, Principal Government Engineer/Railway Development ● Mr Tam Hon Choi, Government Engineer/Railway Development ● Mr Chan Choi Wai, Alex, Chief Engineer/ Railway Development ● Mr Leung Ka Chung, Tony, Senior Engineer/XRL ● Mr Chan Chi Tak, Engineer/XRL ● Ms Chan Yim, Lania, Engineer/XRL MTR Corporation Limited ● Mr Scott Mackenzie, Procurement and Contracts Manager – Projects

Date	Interviews with stakeholders
17 October 2014*	Jacobs China Limited ● Mr Tony King, Deputy Project Director (Programme and Verification) ● Mr Tony Lam, Deputy Project Director (Financial Monitoring) ● Mr Raymond Chan, Deputy Project Manager
7 November 2014*	MTR Corporation Limited ● Mr Henry Young, Chief Programming Engineer

* Meetings between consultant and stakeholders only

Interviews aside, the Panel conducted a number of site visits −

Date	Site visits
12 June 2014	Construction sites of Contracts 823A and 823B
13 June 2014	Construction sites of Contracts 810A, 810B and 811B and XRL Project Visitor Centre at Austin MTR Station
11 October 2014	Construction sites of Contracts 810A, 810B and 811B and XRL Project Visitor Centre at Austin MTR Station

Annex 3

Factual Annexure:

Supporting Information to the Independent Expert Panel on the XRL Project Review

CONTENT

The preparation of this Factual Annexure has not included a complete review of all Project information. It does not make any representations with respect to the completeness, reliability or accuracy of any information provided to us. It has been prepared solely in support of the Panel's work and it may not be relied upon by any other party ("Third Party").

In the course of the Independent Expert Panel's investigation, we looked into contractors' information and commercially sensitive information has been redacted.

The information contained in the Factual Annexure has been released by the Independent Expert Panel to the Chief Executive.

1. Overview of Roles – MTRCL, Highways Department and Transport and Housing Bureau

1.1. Introduction

1. The XRL Project is the first railway project in Hong Kong to be constructed under a 'concession approach' (as opposed to the 'ownership approach'), [1] whereby the HKSAR Government (the Government) pays for the construction of the railway and bears the construction risk, but 'entrusts' the construction and management of the Project to MTR Corporation Limited (MTRCL).

2. Upon completion, the ownership of the railway assets will remain with the Government, while it is understood that MTRCL will be invited to undertake the operation of the railway under a concession agreement. [2]

3. This Section aims to provide an overview of the risks set out in the Entrustment Agreement and the key roles of the following stakeholders in relation to the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (XRL) Project, as shown in Figure 1.

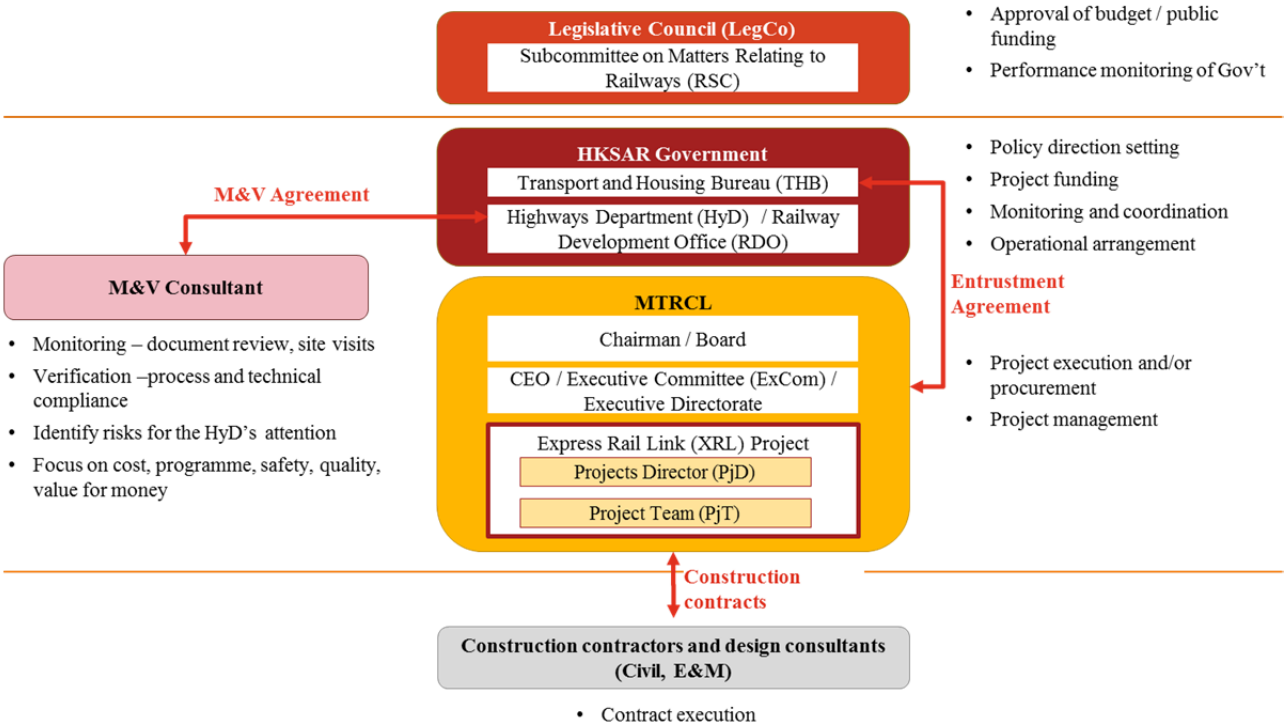

Figure 1: Overview of structure and roles in relation to the XRL Project delivery

[1] Lloyd's Register Report, pg. 2, 24 April 2008: Previously railways were funded, built, owned and operated by the railway corporations under the 'ownership approach'. The rail merger between MTRCL and Kowloon-Canton Railway Corporation in 2007 made provision for the Government to choose between the 'ownership approach' and a new model for railway development in Hong Kong called the 'concession approach' according to the circumstances of the project.

[2] Pursuant to Clause 15.1 of the EA2.

1.2. Overview of Risk Ownership under Entrustment Agreement

4. Government maintains the time and cost risk of the Project. The Entrustment Agreement for the Construction and Commissioning of the Express Rail Link dated 26 January 2010 (EA2) defines that risks associated with increases in the cost of the Project are held by the Government. [3] In holding these risks, Government has an incentive to deliver the Project within the financial authorities set out in EA2. EA2 additionally provides for the adjustment of the completion date for the Project under specific circumstances.

5. Government retains ownership of the railway assets, and consequently has an incentive to deliver assets that are fit for purpose.

6. MTRCL's obligations in respect of the XRL Project are defined in EA2. Should MTRCL fail to deliver on its obligations, any financial liability of MTRCL is limited to the value of its fees. MTRCL is incentivised to deliver its obligations via fees payable from Government for its services, in addition to an implied incentive to protect its reputation as a leader in railway projects and operations.

7. On the basis that the Chief Executive announced in 2008 that MTRCL would be invited to undertake the operation of the Hong Kong Section of the XRL, MTRCL has additional incentives to specify and deliver railway assets that meet its own performance requirements for the operational railway.

Ownership of risk related to changes to the Project

8. Change is a common characteristic of construction projects. EA2 defines that the Government shall bear the costs of delivering the Project. [4] EA2 anticipates the forecast costs for delivering the Project (referred to as the 'Entrustment Costs') will be subject to change during the period of delivery, as a consequence of:

    - Variances between the forecast cost and actual cost for delivering the Project scope; [5] and / or

    - Changes to the scope of the Project. [6]

9. Additionally, in the event the Entrustment Cost is forecast such that the financial authority (referred to as a Project Control Total) is exceeded for the Project, [7] EA2 states the Government shall take all reasonable steps to obtain an increase (referred to as the "Additional Amount") or propose an alternative solution. [8]

10. EA2 sets out mechanisms for modifications to the delivery timeline of the XRL Project (referred to as the Entrustment Programme) as a consequence of change, including, *inter alia*, due to justifiable contractor delays that result in Extensions of Time for the contractors to deliver their

[3] EA2, Clauses 2.3 and 8.1, 26 January 2010
[4] EA2, Clause 2.3, 26 January 2010
[5] EA2, Clause 2.5, 26 January 2010
[6] EA2, Clause 8.1, 26 January 2010
[7] EA2, pg. 7, 26 January 2010: The financial authority for the XRL Project is defined in EA2 as the Project Control Total.
[8] EA2, Clause 2.6, 26 January 2010

obligations. It follows that Government carries the impact of such delay to the start of railway operations, subject to MTRCL having exercised its obligations under the agreement (EA2). [9]

11. EA2 defines MTRCL's role in respect of modifications to the cost and time for delivery of the Project. MTRCL has an obligation to exercise the skill and care reasonably expected of a professional and competent project manager. [10] In respect of changes to the Entrustment Programme, MTRCL has express obligations to seek to avoid or mitigate the effects of change on the completion date. [11] In respect of costs, MTRCL has duties to forecast changes to the Entrustment Costs [12] and agree with Government the cost impacts of any modifications to the Project scope. It further has obligations to forecast if, when and by how much the forecast Entrustment Costs will exceed the Project Control Total [7] set out in EA2. [13]

12. MTRCL has an obligation under EA2 to forecast and report cost contingencies for the Project. [14] EA2 does not specifically set out the mechanisms for the forecasting or management of contingencies but EA2 [15] states MTRCL shall act in accordance with its management systems and procedures for project management and control.

13. Contractors absorb the cost and time risks associated with delivering the scope defined in the contracts. Where the scope in those contracts is varied in the form of design changes or unforeseeable conditions, contractors may seek additional time and costs. The precise apportionment of risks that contractors hold in relation to design changes and unforeseen conditions has not been investigated in detail for this review.

1.3. Overview of Roles and Responsibilities

14. The respective roles and responsibilities as described are based on review of the key contractual agreements, relevant documents such as the Terms of Reference and official responses to the Independent Expert Panel (Panel) from the stakeholders. Where appropriate, the information sources are referenced.

1.3.1. Legislative Council and the Panel on Transport Subcommittee on Matters Relating to Railways

15. The Legislative Council (LegCo) is the law-making body of the HKSAR, comprising 70 publicly elected members, under geographical, functional and occupational-based constituencies. Apart from its law-making function, LegCo also controls public expenditure (i.e. examines and approves budgets) and monitors the work of the Government.

16. The LegCo Panel on Transport Subcommittee on Matters Relating to Railways (Railways Subcommittee) sits under the Panel on Transport, which is one of 18 panels under LegCo that was formed to follow-up on various issues relating to the planning and implementation of new railway projects, and the operation of existing railways.

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[9] EA2, Clause 8.2, 26 January 2010
[10] EA2, Clause 5.1, 26 January 2010
[11] EA2, Clause 8.2, 26 January 2010
[12] EA2, Clause 2.5 & Appendix G, 26 January 2010
[13] EA2, Clause 2.5, 26 January 2010
[14] EA2, Appendix G, 26 January 2010
[15] EA2, Clause 4.6 (C), 26 January 2010

Terms of Reference for LegCo Railways Subcommittee

17. According to the Fifth LegCo (2012 - 2016), the LegCo Railways Subcommittee's Terms of Reference under the "planning and implementation of new railway projects," [16] as it relates to the XRL Project, is as follows:

    - Planning and financing of new railway projects;
    - Environmental impact assessment of new railway projects;
    - Resumption of land arising from the implementation of new railway projects under the Railways Ordinance (Cap. 519);
    - Progress update on the implementation of new railway projects;
    - Provision of supporting public infrastructure for new railway projects; and
    - Co-ordination of public transport services arising from the commissioning of new railway lines.

Approval of XRL Project funding

18. LegCo Railways Subcommittee endorsed the funding application for the Project of HK$ 66.8 billion. [17] The funding applications for the construction of the railway and non-railway works of the XRL Project were submitted by the Government to the LegCo's Finance Committee in November 2009, [18] and were formally approved in January 2010. [17]

19. In approving the funding application, LegCo and LegCo Railways Subcommittee held a series of meetings between end of October and mid-November 2009 to discuss and question the Government on issues relating to the XRL Project funding arrangements, such as: the detailed breakdown of cost estimates; economic benefits and operational viability; arrangements for co-location of boundary control facilities; location of West Kowloon Terminus and its supporting facilities; and reprovisioning for Choi Yuen Tsuen villagers and compensations for affected residents. [19]

20. The LegCo Railways Subcommittee also asked to view the results and findings of two third-party review reports on the overall XRL Project costs (conducted by Jacobs China Limited) and XRL Project Management Costs (PMC) conducted by PYPUN Engineering Consultants Ltd.

Ongoing monitoring of the progress and financial position of the construction of the Project (the Half-yearly Reports to LegCo Railways Subcommittee)

21. Subsequent to the approval of Project funding, LegCo and LegCo Railways Subcommittee's roles have been to monitor the ongoing progress and financial position of the XRL construction,

[16] LegCo RSC website: http://www.legco.gov.hk/general/english/panels/yr12-16/tp_rdp.htm

[17] Meeting minutes of the LegCo Finance Committee meeting, 15 & 16 January 2010

[18] Paper submitted to the Public Works Subcommittee under LegCo Finance Committee [PWSC(2009-10)68 & PWSC(2009-10)69]: http://www.legco.gov.hk/yr11-12/english/fc/pwsc/papers/pwsc_d.htm, 2 December 2009

[19] Papers submitted for the discussion in LegCo RSC and the corresponding meeting minutes: http://www.legco.gov.hk/yr11-12/english/panels/tp/tp_rdp/papers/rdp_g.htm

representing the public interest, and to facilitate better communication and transparency between LegCo members and the Government / MTRCL. Government / MTRCL submit Half-yearly Progress Reports to the LegCo Railways Subcommittee. [20]

22. The scope and issues covered in these half-yearly reports include the following:

- Overall progress of the XRL Project, divided into three categories: Railway tunnels, West Kowloon Terminus, and Electrical and Mechanical (E&M) Works;
- Pre-construction preparatory works and interface issues;
- Employment opportunities; and
- Updated financial position of the XRL Project.

1.3.2. The Government

23. Under EA2, the Government's role in the XRL Project is broadly defined as covering the following key obligations:

- **Project funding and payment**

  i. The Government shall bear and finance the full amount of the Entrustment Cost and the Direct Costs,[21] as well as any agreed changes to the Project Scope, Entrustment Activities and Entrustment Programme that gives rise to an overrun in the original Entrustment Cost; [22]

  ii. The Government needs to bear the costs of any third party claims made under the Railways Ordinance, and / or any other ex-gratia allowances that have been determined to be payable by the Government; [23] and

  iii. The Government needs to pay Project Management Costs to MTRCL (HK$ 4.59 billion) in accordance with the payment schedule in EA2.

- **Land provision:** The Government shall obtain all land required and bear all costs (including land acquisition, clearance and related costs) arising from the implementation of the XRL Project. [24]

- **Facilitation of Mainland interfaces:** The Government shall endeavour to provide assistance of a non-financial nature to enable MTRCL to meet its obligations under the EA2 – including but not limited to liaising with relevant authorities and regulators in the Mainland (including their respective contractors and subcontractors). [25]

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[20] Paper submitted for the discussion in LegCo RSC and the corresponding meeting minutes: http://www.legco.gov.hk/yr09-10/english/panels/tp/tp_rdp/papers/tp_rdp0416cb1-1573-4-e.pdf; and http://www.legco.gov.hk/yr09-10/english/panels/tp/ tp_rdp/minutes/rdp20100416.pdf, 16 April 2010

[21] EA2, Clause 2.3, 26 January 2010

[22] EA2, Clause 8.1, 26 January 2010

[23] EA2, Clause 11.4, 26 January 2010

[24] EA2, Clauses 11.1 and 11.2, 26 January 2010

[25] EA2, Clause 7.1, 26 January 2010

24. In addition to the EA2 obligations, the Government, through the Transport and Housing Bureau (THB), Highways Department and the Monitoring and Verification (M&V) Consultant engaged by Highways Department, undertakes a monitoring role in relation to the execution of the XRL Project. This monitoring role involves a series of regular meetings with MTRCL and other relevant parties throughout the XRL Project to review project progress; monitor procurement activities, post-tender awards and cost controls; and help review and assess contractual claims. Details of such meetings (i.e. Project Supervision Committee, Project Control Group, Contract Review Meetings, etc.) are set out in Section 3: Project Governance, Reporting and Communications.

25. EA2 did not specify in detail the obligations and risks individual Government entities (i.e. THB or Highways Department) hold. The following Sections set out the roles assumed in practice by these two key Government bodies in relation to the XRL Project.

1.3.2.1. Transport and Housing Bureau

26. THB is responsible for policy setting and direction for Hong Kong's transportation and housing sectors. It is one of the 12 bureaux under the HKSAR Chief Executive, and one of nine that sit under the Chief Secretary for Administration under the Chief Executive. There are five departments under THB, of which Highways Department is one. [26]

27. THB's role in relation to the planning and implementation of the XRL Project is three-fold, including policy, general monitoring and overseeing the operational arrangement.

Policy in relation to planning and implementation of the XRL Project

28. THB's role in its policy capacity is to brief the LegCo Railways Subcommittee on all matters related to the XRL Project, ranging from preparing and communicating the feasibility studies at the pre-inception stages, preparing and submitting the funding applications at the inception stage, managing public concerns and objections of the Project, to the regular reporting of the XRL Project progress and financial situation to the LegCo Railways Subcommittee from 2010 till present.

29. The key LegCo Railways Subcommittee briefings that THB has conducted are: [27]

- A 2005 feasibility study conducted jointly with the Mainland authorities (Joint Expert Group with the former Ministry of Railways in the Mainland and a technical subgroup) to investigate the urgency, functions, regional transport needs, possible alignments, locations of stations, boundary crossing points, patronage forecast and technical options of the XRL Project;

- A 2005 feasibility study compiled by Kowloon-Canton Railway Corporation (KCRC) submitted to Government recommended two alignment options;

- Submission and objection cases received subsequent to the gazettal of the XRL railway scheme and communication of Government's follow-up actions (December 2008);

[26] Organisation Chart of HKSAR Government: http://www.gov.hk/en/about/govdirectory/govchart/

[27] THB's response to Panel's questions, 13 June 2014

- Planning of the West Kowloon Terminus (May 2009);
- Site selection for the Emergency Rescue Station and Stabling Sidings;
- Choi Yuen Tsuen villagers; and
- Funding applications to LegCo Finance Committee (November 2009).

General monitoring [28]

30. THB has carried out a role in monitoring Project progress through attending various regular meetings where information regarding progress of the Project can be communicated to the Secretary for Transport and Housing. Such meetings include the Project Supervision Committee's monthly XRL Project Meeting and the regular 'Head of Department' meetings. There may be other meetings of which we are not aware.

31. THB prepares and submits half-yearly progress reports, based on information submitted by MTRCL and vetted by Highways Department and its M&V Consultant, to LegCo Railways Subcommittee.

Overseeing operational (and pre-operational) arrangement [29]

32. THB has undertaken a role in overseeing the operational arrangements of the Project, including pre-operational matters and matters in relation to the future vesting of the XRL.

33. In November 2013, MTRCL requested Government's authorisation to carry out certain pre-operational works that were, in the view of MTRCL, outside the scope of the EA2. These included the recruitment and training of XRL train captains, commencement of the tender process for the grant of operation licences, and a facility management services contract.

34. THB has been chairing pre-operational meetings with Highways Department and MTRCL since January 2014 to discuss various matters. Including the latest one held on 22 October 2014, there have been a total of seven meetings. The meeting is scheduled to be held on a monthly basis; therefore, two more meetings are expected to be held before the end of the year.

35. THB takes a role in the facilitation of discussion and preparation on cross-boundary issues in relation to the XRL Project, which includes regular meetings with the relevant Mainland counterparts, including the former Ministry of Railways, the Guangzhou-Shenzhen-Hong Kong Passenger Transportation Company Ltd (GSG) and the Guangzhou Railway (Group) Corporation, for discussion on XRL construction and operational matters.

1.3.2.2. Highways Department and the Railway Development Office

36. Highways Department sits under the THB and has the responsibility for implementing new railway projects in Hong Kong.[30] In addition to the XRL Project, there are four other major railway projects currently under construction. [31]

[28] THB's response to Panel's questions, 13 June 2014

[29] THB's response to Panel's questions, 13 June 2014

[30] Highways Department's response to the Panel's questions, 12 June 2014

37. The Railway Development Office is one of the four offices under Highways Department and is responsible for the day-to-day coordination and facilitation of the various Government departments in all matters relating to the XRL Project. Railway Development Office acts as the main point of contact for most matters involving Government. [32]

38. According to a written response to the Panel from the Highways Department, [33] with reference being made to a Controlling Officer Report by the Director of Highways under the 2014 Budget, the key roles of the Highways Department/Railway Development Office in the implementation of the XRL Project are summarised below:

- To oversee the overall implementation of the XRL Project and the prudent use of public funds allocated for this Project – the Director of Highways, who is the Controlling Officer for the XRL Public Works Programmes shall be responsible and accountable for all expenditure for the XRL (according to the Public Finance Ordinance);

- To monitor and verify that MTRCL properly fulfils its obligations in accordance with the Entrustment Agreements entered between Government and MTRCL for the design, procurement, construction and testing and commissioning of the XRL Project. Note that the Highways Department appointed an external M&V Consultant to undertake this role together with them;

- To provide technical support to THB in the implementation of the XRL Project;

- To plan, monitor, and coordinate various activities associated with the implementation of new railway projects;

- To liaise with the MTRCL to develop detailed schemes for the railways, undertake necessary route protection, preparatory work and statutory procedures, and resolve interface issues arising from the implementation of these projects; and

- To coordinate with other departments for approval of infrastructure layout design for various new railways and their interface arrangements with other projects, and take part in site liaison for traffic diversion and other construction matters, as well as issues on the commissioning and operation of the railways.

1.3.3. Monitoring and Verification Consultant

39. An agreement between the M&V Consultant and the Government was signed on 19 August 2010 (the 'M&V Agreement'), whereby the Principal Government Engineer of the Railway Development Office signed for and on behalf of the Government.

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[31] The other railway projects include the West Island Line (WIL), the South Island Line East (SILE), the Kwun Tong Line Extension (KTE), and the Shatin to Central Link (SCL).

[32] The other three offices under the Highways Department are: 1) the Headquarters and two Regional Offices, namely Urban and the New Territories Regions; 2) Major Works Project Management Office; and 3) HK-Zhuhai-Macao Bridge HK Project Management Office.

[33] Role of HyD and M&V Consultant in the XRL project, pg. 1, 28 July 2014

40. The purpose of the M&V Consultant is to provide Government with the assurance that MTRCL's obligations under the Entrustment Agreements have been properly fulfilled. [34]

41. The scope of work of the M&V Consultant comprises monitoring and verification of the works carried out by MTRCL during the construction, testing and commissioning phases, including E&M systems (including the submissions by its consultants, agents or contractors). [35]

42. Specifically, the M&V Consultant is required to appraise, monitor and audit the activities / processes of the MTRCL, verify these activities / processes are carried out in accordance with the MTRCL's management and control procedures and in compliance with the design or construction phase EA, and that value-for-money is achieved through setting and complying with procedures. [36] It is also required to identify any major risks to the cost, programme, safety and quality of the XRL Project.

Contractual arrangement and fees / risks

43. The M&V Consultant was to be paid a fixed lump sum fee of HK$ 83.8 million according to a payment schedule based on key project milestones (i.e. contract signing, submission of Interim Report, submission of monthly progress report, etc.). [37]

44. In the event of delays, additional payments were to be determined by negotiation. [38]

45. In order to conduct its work and fulfil its roles, the M&V Consultant was invited to attend the Contract Review Meeting where progress of each contract and areas of concerns of the key contracts are communicated by MTRCL to the Railway Development Office and M&V Consultant. The M&V Consultant is not required / invited to attend the Project Supervision Committee's monthly XRL Project Meeting chaired by the Director of Highways, nor is it required / invited to attend the Project Control Group Meetings chaired by the Projects Director or the General Manager Cost Control Meetings. Further details of the communication channels and meetings between the parties will be covered under Section 3: Project Governance, Reporting and Communications.

Monitoring role

46. The M&V Consultant is responsible for assembling a comprehensive Monitoring Plan that should entail document review, site inspections and other necessary processes throughout the construction, testing and commissioning phases of the Project. [39] This Monitoring Plan should be updated from time to time to ensure the objective of the M&V assignment is satisfactorily met.

47. As part of its monitoring role, the M&V Consultant is required to review a list of key project documents [40] in relation to the XRL Project [41] and submit a report on the review findings which

[34] M&V Agreement , Clause 3.1 and 6.1.9, 19 August 2010
[35] M&V Agreement, Clause 4, 19 August 2010
[36] M&V Agreement, Clause 6.1.7, 19 August 2010
[37] M&V Agreement, Schedule of Fees, 19 August 2010
[38] M&V Agreement, Clause 7, 19 August 2010
[39] M&V Agreement, Clause 6.3.1, 19 August 2010
[40] M&V Agreement, Clause 4.1, 19 August 2010: Documents include: post contract award design changes; detailed designs of the permanent works under design and built contracts forms; construction programmes; testing,

would include any major observations or comments; identify any major risks to the cost, programme, safety and quality of the Project; and include recommendations on the course of action to be taken to minimise the risk or address the issues. [42]

48. The approach required under the agreement by the M&V Consultant is risk-based with focus on cost, programme, safety and quality aspects. [43] Specific processes or areas that the M&V Consultant monitors are:

- Progress of works against the progress reports and project programmes, and advising the Government of any slippages and other implications;
- Expenditures and cost related processes which include payments, claims, variation orders and commercial settlements and identifying any significant changes of costing which would affect the Total Project Cost estimate; [44]
- Major changes of Engineer's design, contractors' alternative designs, major temporary works, waste management, environmental, blasting and spoil disposal plans;
- Method statements, proposals and any relevant documents that are of project wide significance or are of significant public concern;
- Quality of works – including the quality of materials and workmanship against standards;
- The set up and records of site monitoring regime including existing ground movements, buildings, water levels, etc.;
- Building submissions and their compliance with the building safety standards of the project;
- Site progress by taking regular and professional photographs of the site;
- Public opinion on the XRL and submission of a bi-weekly report on these comments (from social networking websites, microblogs, etc.); and
- Documentation in relation to Project handover process.

Verification role

49. The M&V Consultant's verification role entails process and technical compliance audits (verification audits) that aim to check the processes used by MTRCL comply with:

- MTRCL's internal management control and procedures; and

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commissioning and system acceptance plans; services standards and operation-related proposals; method statements and proposals bearing major implications and significance to the project in terms of cost, programme, safety and quality; issues arising from submissions for Station and Transport Integration Committee (STIC), Trackside Safety etc.; other key documents relating to the XRL Project.

41 M&V Agreement, Clause 4.1, 19 August 2010

42 M&V Agreement, Clause 6.2.2, 19 August 2010

43 M&V Agreement, Clause 6.3.4, 19 August 2010

44 M&V Agreement, Clause 6.3.4(a) and 6.3.4(b), 19 August 2010

- The requirements and standards stipulated in the EAs' design and construction phase.

50. The audits are to be selected and proposed by the M&V Consultant based on the assessment of risks in the areas of safety, quality of works, cost implications or programme delay. [45]

51. Specifically, the M&V Consultant shall carry out verification by auditing each of the following financial processes:

    - Payments to MTRCL's consultants / contractors / agents under MTRCL's contracts;
    - Changes, modifications and variations with cost implication;
    - Claims; and
    - Commercial settlements.

52. If the Government, at any time, suspects the MTRCL is in material or persistent breach of any material obligations under EA2, the Government may ask the M&V Consultant to carry out a verification audit. The M&V Consultant would be required to propose the methodology and criteria for this verification audit work for Government's approval.

Assessment of building submissions

53. The M&V Consultant is required to assess the building submissions submitted by the MTRCL and / or its consultants/ agents (which may include building plans and proposals, structural plans and proposals, method statements), and provide input on compliance with the building safety standards. [46]

1.3.4. MTRCL

54. MTRCL was entrusted by the Government with the implementation and overall project management of the XRL Project based on its track record of delivering successful projects and its reputation in the industry as a leading railway organisation. It is also understood MTRCL is to be invited to participate in the operation of the XRL Project upon completion, under a concession arrangement.

55. Under EA2, MTRCL's roles and obligations are broadly:

    - **Procurement and award of contracts** – MTRCL will let all contracts with Third Parties in accordance with its management systems and procedures; [47]
    - **Third party settlements** – In reaching any settlements with Third Parties, MTRCL shall seek to ensure that such settlements are in the best interests of the XRL Project; [48]
    - **Warranty on skill and care** – In the provision of project management service, design services and construction activities, MTRCL shall carry out such services with the skill

[45] M&V Agreement, Clause 6.4.5, 19 August 2010
[46] M&V Agreement, Clause 6.6 and 6.6.3, 19 August 2010
[47] EA2, Clause 4.6 (A) and (C), 26 January 2010
[48] EA2, Clause 4.6 (B), 26 January 2010

and care reasonably to be expected of a professional and competent manager; a professional and competent design engineer; and a competent workmanlike construction contractor, respectively; [49] and

- **Use of best endeavours** – MTRCL shall use its best endeavours to complete the Entrustment Activities [50] in accordance with the Entrustment Programme. [51]

56. MTRCL is also obliged to provide information concerning any matters relating to the XRL Project as requested by the Government. These include both regular reports as well as all matters that, in the opinion of MTRCL, are likely to have a material impact on the Scope of Railway Works, [52] the Entrustment Activities, and the Entrustment Programme, [53] which includes monthly progress reports [54] and cashflow forecasts. [55]

[49] EA2, Clause 5.1, 26 January 2010
[50] EA2, Appendix B, 26 January 2010
[51] EA2, Clause 16.4, 26 January 2010
[52] EA2, Appendix B, 26 January 2010
[53] EA2, Clause 17.1A, Appendices A, B and C, 26 January 2010
[54] EA2, Clause 17.4, 26 January 2010
[55] EA2, Clause 17.8, 26 January 2010

2. Identification of Significant Events and Factual Account of Test Events

2.1. Significant Delay Events

2.1.1. Approach and Limitations

57. The XRL Project has been subject to significant delays. By June 2013, eight of the 12 major civils contracts were recording delays of over nine months compared to the original contractual completion dates. [56] Ultimately these delays led to the planned Project completion of 2015 being delayed to 2017.

58. MTRCL does not have an integrated schedule that it uses to report the impacts of change and current delays on the Project completion. [57] We would have expected to use this to understand what was critical to the Project at any point in time. As a result, our review of the most significant delay events has been conducted through an investigation of the contractors' schedules, along with some ad-hoc programme presentations and Schedule Risk Assessments completed by MTRCL.

59. It is recognised that relying on contractors' schedules alone is not likely to portray a complete picture of the critical path and forecast completion of contracts because contractors are likely to have different approaches and tactics to scheduling. However, in the absence of other data on programme forecasts, the contractors' reports are an appropriate means of gaining insight to what may have been critical.

60. The review does not specifically aim to cover the period after March 2014 as our work aims to focus on the project management practices prior to the announcement in April 2014 that the Project would not be completed in 2015.

61. We have had sight of some data post-March 2014 that is of use in interpreting delays and we have specifically identified this information in the sections below.

62. To understand the likely critical path at any given time we have relied on the programmes submitted by the contractors to MTRCL as part of their monthly report, against the following key contractor milestones:

- **Degree 1 milestone dates**. These dates describe the completion of railway tunnels (and relevant station areas) to a suitable degree to allow access for follow-on activities related to railway trackwork (permanent way), traction power (Over Head Line, (OHL)) and other railway systems.

- **Whole of the Works milestone dates.** These dates typically describe the completion of all works associated with a contract. In the case of tunnel contracts, these typically

[56] Refer to paragraph 404 of this report

[57] Refer to section 4.4.3 of this report for details on MTRCL's schedule management

relate to all Works including, for instance, ventilation buildings and vacating the site. For station contracts, these relate to the completion of an operational station.

63. We have not set out to complete a rigorous cause and effect analysis to determine the impact of each delay on contracts or the overall Project. This Section focusses on the causes of delay which were reported by the contractors. Where other sources of information have been relied upon, this has been referenced.

64. This Section has been divided as follows:

- Critical tunnelling delays;
- Critical West Kowloon Terminus delays; and
- Project wide critical delays.

2.1.2. Critical Tunnelling Delays between August 2010 and March 2014

65. The following information has been extracted from the contractors' master programmes and MTRCL's XRL Progress Reports, presented and collated in Table 1 below. This aims to provide an indication of the most significantly delayed tunnelling contracts on the XRL Project:

- **Percent complete of tunnel excavation** – Although other activities (such as tunnel lining, invert or shaft construction) are required to complete the tunnelling contracts, excavation typically drives the rate of progress for tunnelling contracts. Where the percentage complete of excavation falls significantly behind plan, it likely indicates that significant delays have occurred to that contract.
- **Forecast completion** – Contractors submit monthly programme updates as part of the monthly reports. These form the contractors' plans to complete the scope of Works and include a forecast completion date. The latest forecast completion date is an indication of the delay that contract may cause to completion of the Project as a whole. [58]
- **Quantity of delay** – Some tunnelling contracts had different contractual milestone dates, agreed between MTRCL and the contractors, against which progress was measured during delivery of the Works. We have not established the reasoning for tunnelling contracts having different completion dates, but it is likely that these were different because of MTRCL's planned sequence of works following achievement of Degree 1 milestone dates, including the sequence of trackwork installation. The quantity of delay provides an indication of the delay that contract may cause to the completion of the Project as a whole. [59]

[58] However the sequence of subsequent activities should also be considered where possible, as delay to a contract does not always have the same impact on the Project as a whole. A larger delay to a contract may not necessarily cause critical delay to the Project as a whole.

[59] Refer to Figure 6 in this report

Contract	Tunneling construction method	Percent complete of excavation (March 2014) [60]	Forecast Degree 1 completion (March 2014) [61]	Contractual completion (week/year)	Forecast Delay to Degree 1 completion in March 2014 (calendar days)
(A)	**(B)**	**(C)**	**(D)**	**(E)**	**(F=E-D)**
826	TBM	8% [62]	8 May 2015	06/2014	392
823A	TBM	45% [63]	23 March 2015	13/2014	358
820	TBM	76% [64]	11 June 2015	33/2014	298
825	TBM	73% [65]	4 October 2014	06/2014	237
821	Drill and Blast	100%	N/A	N/A	N/A
822	Drill and Blast	100%	3 June 2014	39/2013	247
824	Drill and Blast	71% [66]	N/A	N/A	N/A
823B	Cut and Cover	100%	8 May 2014	13/2013	403

Table 1 – Delays to tunneling contracts

66. The information presented in Table 1 above shows that by March 2014, Contract 826 was the least progressed tunnelling contract on the Project; reported the second greatest quantified delay to Degree 1 completion; and had the second latest forecast Degree 1 completion date. Contracts 823A and 820 appeared to be the next most significantly delayed tunnelling contracts on the Project. Contracts 826, 823A and 820 have been assessed in more detail below. Although Contract 823B had the largest delay at this time, it was close to complete and therefore has not been considered further in this Section.

67. MTRCL carried out a Schedule Risk Assessment in November 2013 which stated that contracts 826, 823A and 820 had the latest forecast completion dates for Degree 1 track access, compared to all other tunnelling contracts. [67]

[60] MTRCL's monthly XRL Project Reports: Established with progress information available

[61] Contractors' monthly Progress Reports: Established from the master programmes submitted by the contractors.

[62] MTRCL's monthly XRL Project Reports: Contract 826: (0.231km (D/T) + 0.010km (U/T))/(1.473km (D/T) + 1.473km (U/T)) = 8%

[63] MTRCL's monthly XRL Project Reports: Contract 823A: (0.805km (North D/T) +0.343km (South D/T)) / (0.864km x 2 (North D/T + U/T) + 0.408km x 2 (South D/T + U/T)) = 45%

[64] MTRCL's monthly XRL Project Reports: (2.012km x 2 (North D/T & U/T) + 2.356km (South D/T) + 0.291km (South U/T)) / (2.012km x 2 (North D/T & U/T) + 2.356km x 2 (South D/T & U/T)) = 76%. The TBM drives for Contract 820 includes the excavation of a portion of Contract 821. This calculation for Contract 820 includes this portion of Contract 821.

[65] MTRCL's monthly XRL Project Reports: Contract 825: (2.453km (D/T) + 1.146km (U/T)) / (2.455km (D/T) + 2.455km (U/T)) = 73%

[66] MTRCL's monthly XRL Project Reports: Contract 824: (1.905km (D/T) + 1.809km (U/T)) / (2.603km x 2 (D/T & U/T)) = 71%

68. Figure 2 shows the forecast Degree 1 completion dates for these three selected contracts. Figure 3 shows the forecast delays against contractual deadlines. Figure 2 and Figure 3 are based on dates being reported by the contractors to MTRCL during the Project. [68]

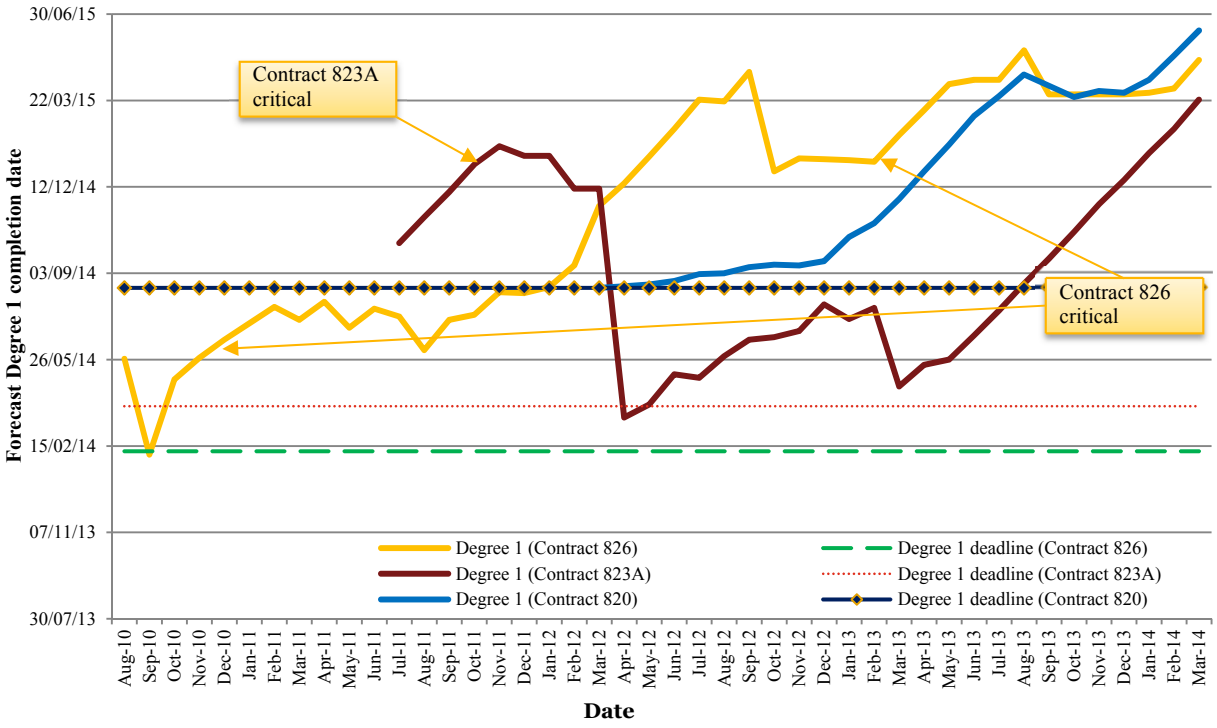

Figure 2: The contractors' forecast achievement of Degree 1 completion date for contracts 826, 823A and 820

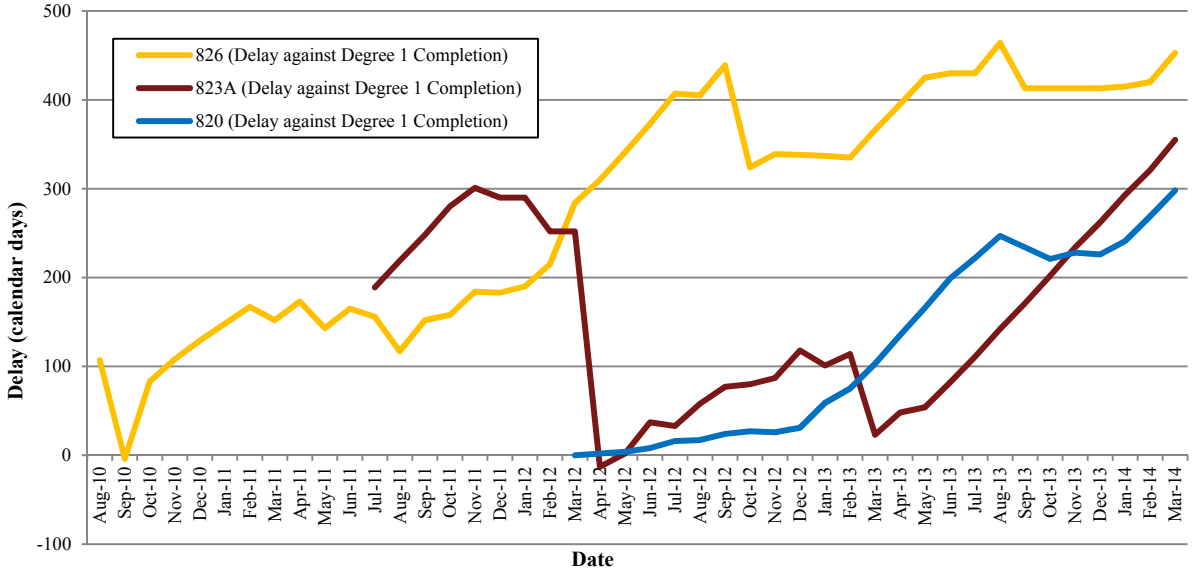

Figure 3: The contractors' forecast delays (against original contractual deadlines) for achievement of Degree 1 for contracts 826, 823A and 820

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[67] MTRCL's Schedule Risk Assessment, issued by the Chief Programming Engineer, 19 November 2013, page 3, MTRCL's Track Related Installation Programme (TRIP), dated 31 October 2013.

[68] Contractors' monthly Progress Reports: Established from the master programmes submitted by the contractors for Contracts 823A, 826 and 820.

69. Figure 2 and Figure 3 indicate that in July / August 2011 Contract 823A became the most critical tunnelling contract on the Project, but in February / March 2012 the contractor for Contract 823A appeared to recover delays and Contract 826 became critical and broadly remained the most critical tunnelling contract until March 2014. Contract 820 appeared to be near critical between August 2013 and February 2014. By March 2014, Contract 823A became near critical and the rate of delay was higher than the other contracts.

2.1.3. Critical West Kowloon Terminus Delays: between August 2010 and March 2014

70. Figure 4 below shows the forecast completion dates for West Kowloon Terminus contracts reported by contractors to MTRCL during the Project. The contractual milestones for Whole of the Works completion have been shown for contracts 810A, 810B, 811A and 811B. The Whole of the Works completion milestones are considered informative for West Kowloon Terminus contracts because the contractors would have planned, at least initially, to complete all the station works in order to commence operations of the railway. Degree 1 completion has been shown for contracts 811A and 811B. [69]

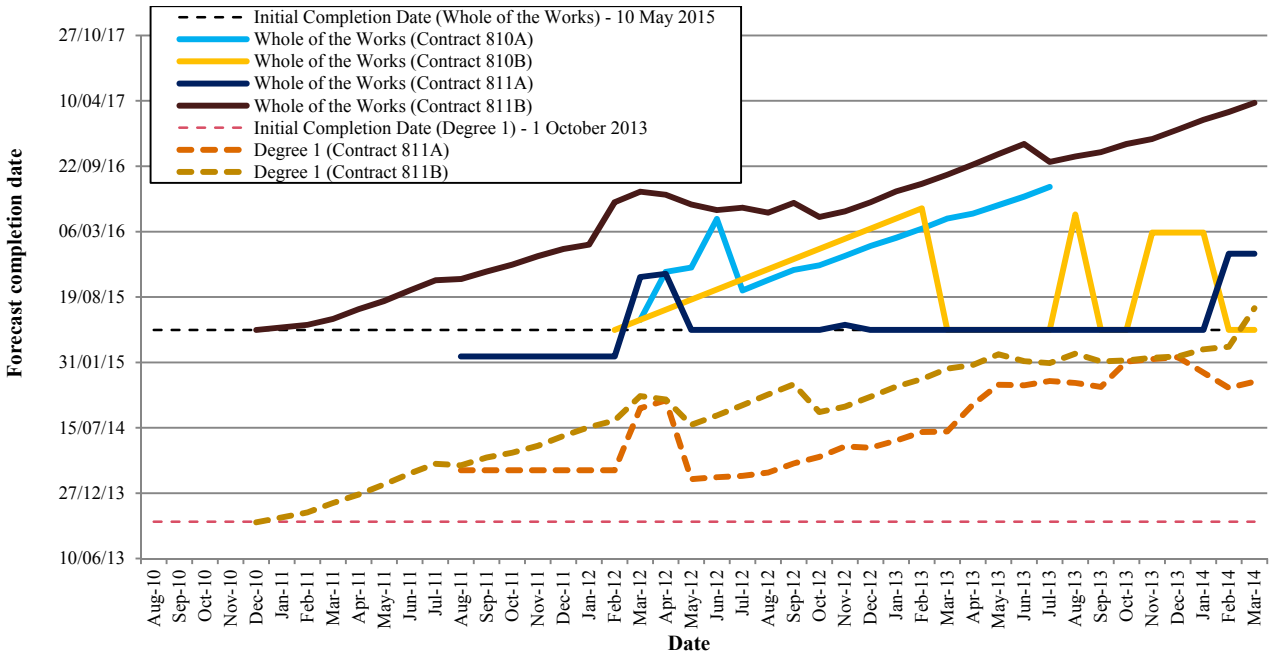

Figure 4: The contractors' forecast completion dates for WKT contracts

71. Figure 5 shows the forecast delays to contracts 810A, 810B, 811A, 811B compared to Whole of the Works completion and Degree 1 (where available) contractual milestones.

[69] Degree 1 completion milestones have not been included in the master programme updates provided in the Contractors' Monthly Reports to MTRCL for contracts 810A and 810B and therefore have not been included.

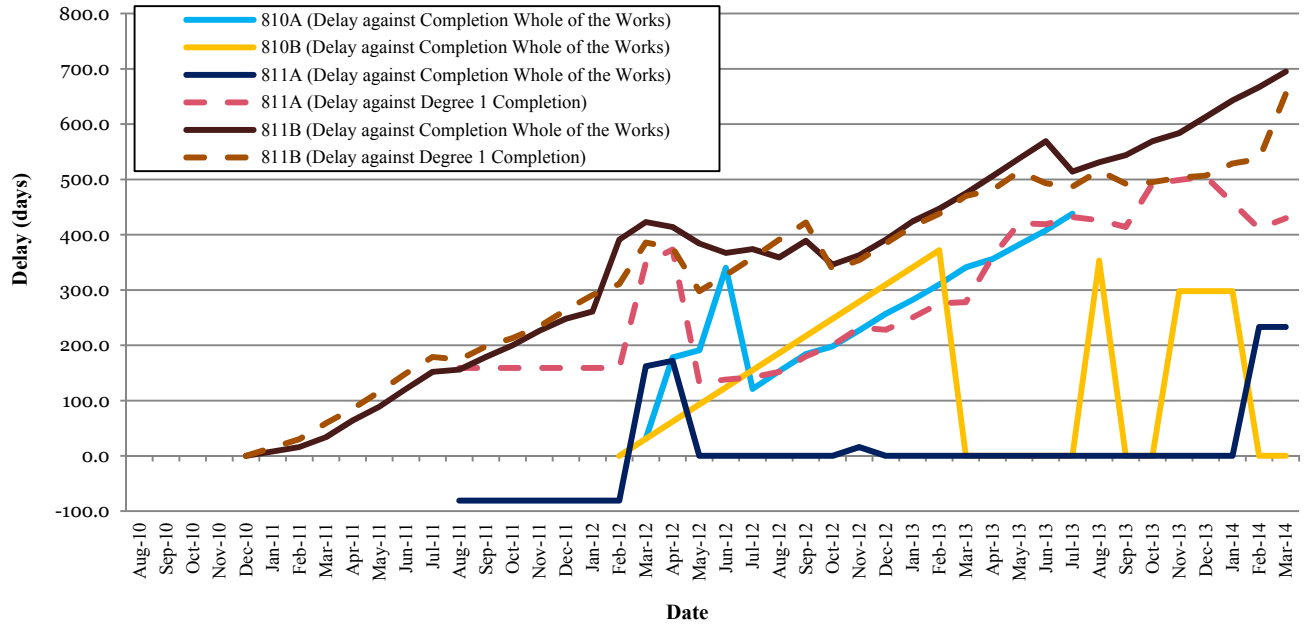

Figure 5: The contractors' forecast delays (against original contractual deadlines) for WKT contracts

72. Figure 4 and Figure 5 above show that, based on the information provided by the contractors, Contract 811B suffered the most extensive delays and was likely more critical than the other contracts, for both Whole of the Works completion and Degree 1 completion milestones.

73. Contract 810A appeared to be near critical. However the following evidence suggests that this contract may have actually been more critical than the contractor indicated in its Monthly Reports:

- MTRCL's Chief Programming Engineer issued within MTRCL a Schedule Risk Assessment on 7 June 2013 which stated that *"810A is currently the most critical of all XRL Civil Works Contracts."* The subsequent Schedule Risk Assessment in November did not include an assessment of West Kowloon Terminus contracts. The final Schedule Risk Assessment in December 2013 did not provide any clear conclusions regarding which contract was critical but the information contained suggested Contract 810A was the most critical West Kowloon Terminus contract to operation of the railway.

- It appears that from a review of a selection of the contractor's monthly reports, the contractor on Contract 810A implemented a significant number of Delay Recovery Measures.

- The contractor for Contract 810A stopped issuing programme updates from July 2013. The reason for this is unknown. The contractor continued to report delays to the Works after this date.

74. Paragraphs 72 and 73 point to contracts 811B and 810A having been the most critical West Kowloon Terminus contracts throughout the Project and having suffered the most significant delays.

2.1.4. Project-Wide Critical Delays: between August 2010 and March 2014

75. Figure 6 compares the forecast delays to Degree 1 completion milestones for contracts 826, 823A and 811B with those for Whole of the Works completion milestones for contracts 810A and 811B, which have each been assessed above to have suffered the most extensive delays and to be the most critical contracts on the Project. Figure 6 is based on the programme information that MTRCL was receiving from its contractors.

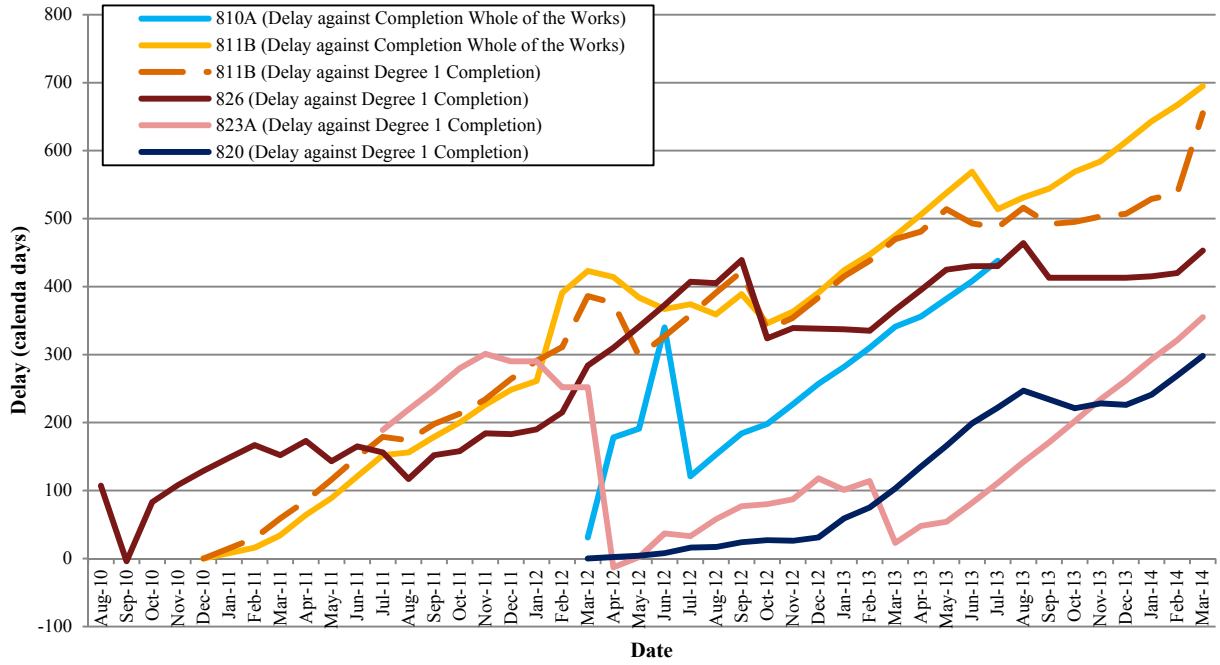

Figure 6: Contractors' forecast delays (against original contractual deadlines) for contracts 810A, 810B, 811B, 826, 820 and 823A

2.1.5. Project-Wide Critical Delays: MTRCL's Schedule Risk Assessment

76. The Schedule Risk Assessment issued by the Chief Programming Engineer in June 2013 [70] stated that Contract 810A was critical to completion of the Project. This is not consistent with Figure 6 which shows that contracts 826 and 811B were more critical at that time. The MTRCL Schedule Risk Assessment does, however, show that the most critical (latest forecast to complete) tunnelling contract on the Project was Contract 826, which is consistent with Figure 6.

77. The Schedule Risk Assessment developed in November 2013 [71] did not include any West Kowloon Terminus contracts but it concluded that the latest forecast completion, therefore most likely critical, tunnelling contract was Contract 826, followed closely by Contract 823A. However, this was only based on MTRCL's optimistic forecast. It has been noted that from the June 2013 to the November 2013 Schedule Risk Assessment, the forecast Degree 1 completion milestone dates for Contract 823A differed considerably. In June, the range was reported as 20 April 2014 (optimistic) to 8 March 2015 (pessimistic), whereas in November it was reported as 26 June 2015 (optimistic) to 21 July 2016 (pessimistic).

[70] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 20 June 2013

[71] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 November 2013

78. The Schedule Risk Assessment developed in December 2013 [72] relied on the same information provided in the November 2013 assessment for the tunnelling contracts but provided updated information for the West Kowloon Terminus contracts. MTRCL did not provide any conclusions in its December 2013 assessment as to the critical path to the Project. Contracts 826, 823A and 810A had the latest Degree 1 track access dates which were in June 2015.[73] MTRCL has since informed us that it considers Contract 810A was critical at this time.

79. MTRCL's December 2013 Schedule Risk Assessment provided a forecast completion for contracts 810A and 811B and introduced a new milestone of substantial completion for operation of the railway, in addition to Whole of the Works completion. The introduction of this new milestone was because MTRCL was working towards a partial opening scenario, known as the Minimum Operating Requirement (MOR). [74] Substantial completion for operation of the railway for Contract 811B was estimated as between January 2016 and September 2016. [75] The Whole of the Works completion for Contract 811B was estimated as between August 2017 and January 2018.

2.1.6. Project-Wide Critical Delays: Additional Insights from Reports post March 2014

80. We have had sight of more recent contractor reports for some contracts and have reviewed the master programmes submitted by the contractors (dated 30 September 2014 / 1 October 2014) for the most extensively delayed contracts (810A, 826, 823A and 811B). The aim of this was to establish how the critical path may have changed since the events of April 2014, including the flooding delays to Contract 823A and acknowledgment by MTRCL that the Project will not be complete in 2015. The results are shown in Table 2 below.

Contract	Forecast achievement of Degree 1 track access	Forecast achievement of WoW
810A	28 April 2016	16 August 2017
826	2 December 2015	3 May 2018[76]
823A	20 August 2015	30 June 2016
811B	17 October 2015	16 June 2017

Table 2: Forecast Degree 1 and WoW from contractors' programmes on 30 September / 1 October 2014

81. Table 2 above shows that, based on the information provided by the contractors, Contract 810A had the latest forecast achievement of Degree 1 track access in September / October 2014, indicating that this contract was likely to have been critical to railway operation at that time. Contract 826 had the next latest Degree 1 forecast achievement, indicating that this contract may have been near critical to railway operation.

[72] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 December 2013

[73] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 December 2013, page 9.

[74] Refer to section 6 for more information on the partial opening proposal

[75] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 December 2013

[76] Refer to paragraph 82

82. Contract 826 had the latest forecast achievement of Whole of the Works completion. It is not clear to us what physical works drove this forecast completion, so this has not been regarded as a valid completion date for the purpose of our review. Contract 810A was the next latest, indicating that this contract was critical or near critical to Whole of the Works completion.

2.1.7. Project-Wide Critical Delays: Factual Account of Significant Delay Events by Contract

83. The factual accounts of delay have been largely extracted from contractors' reports for periods when the contracts were demonstrably on or near the critical path as determined from paragraphs 65 to 82 above in this Section. Where other sources of information have been used to develop the factual accounts of delay, these have been identified below.

84. We have not set out to complete a rigorous cause and effect analysis to determine the impact of each delay on contracts or the overall Project.

Contract 826

85. The most significant contributor to the delay of Contract 826 was the delayed launching and subsequently delayed boring of the two Tunnel Boring Machines (TBMs) in the Mainland which led to the late arrival of the TBMs at the Hong Kong border.

86. Contract 826 was dependent on the progress of two TBMs, operated by the Mainland contractor, to excavate from the Huanggang Park Shaft in China to the Hong Kong border. Upon reaching the border, the TBMs were to be handed over to the Hong Kong contractor to continue excavation to Mai Po Shaft.

87. The contractual deadline for the two TBMs to arrive from the Mainland for handover to Contract 826 was 29 July 2012 for TBM #1 and 30 September 2012 for TBM #2. [77] TBM #1 was actually handed over on 27 November 2013 [78] (16.0 months [79] delayed), whilst TBM#2 was handed over on 22 March 2014 [80] (17.7 months [81] delayed).[82] These were the delayed launching of the two TBMs at Huanggang Park Shaft and slow progress of the TBMs boring to the border.

88. In addition to the delays on the Mainland side, MTRCL's monthly XRL Project Report in April 2014 cited insufficient manpower resources to support both down-track (DT) and up-track (UT) TBM drives on the Hong Kong side, thereby causing further slippage. [83]

89. According to the Second IBC Report on XRL, Contract 826 was also delayed due to a severely damaged TBM, with the damage only discovered upon handover from the Mainland. [84]

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77 Contract 826 Contractor's Monthly Report (No. 6), master programme, August 2010

78 Contract 826 Contractor's Monthly Report (No. 45), November 2013

79 27 November 2013 – 29 July 2012 = 486 calendar days = 16.0 months

80 Contract 826 Contractor's Monthly Report (No. 49), March 2014

81 22 March 2014 – 30 September 2012 = 538 calendar days = 17.7 months

82 First IBC Report on XRL, July 2014: The delay to commencement of the TBMs for Contract 826 was delayed by up to 15 months, which is not consistent with this calculation.

83 MTRCL's monthly XRL Project Report, April 2014

84 Second IBC Report on XRL, pg. A28, 28 October 2014

Contract 823A

90. The contractor reported the following events delayed the excavation of the North Launching Tunnel and, therefore, the launching of the TBM for the North tunnel:

    - Delay in possession of the site at the North tunnel area due to the Shan Tsuen Road and Kam Tin River diversion works, which resulted in delayed construction of Box 6 cut and cover tunnel and the East Stream Culvert.

    - The existing rock profile was found to be higher than in tender information, which resulted in increased rock quantities and, therefore, delayed the diaphragm wall construction at the North Tunnel.

91. In November 2011, the procurement of an additional TBM was instructed by MTRCL to mitigate the delays. This enabled the North and South tunnels to be excavated in parallel. According to contractor's reports, 265 calendar days of delay [85] was mitigated in April 2012 when a new master programme was issued, which incorporated the additional TBM for the excavation of the South Tunnel. [86]

92. In its monthly reports between October 2012 and March 2014, the contractor had been reporting manpower shortages in relation to Contract 823A. [87]

93. The Second IBC Report on XRL stated that Contract 823A was further delayed due to the tunnel drive encountering unforeseen ground conditions of shallow soft, mixed ground and air leaks. Breakdowns of the north TBM was also recorded as a cause of delay. [88]

94. The contractor reported that on 30 March 2014, a black rain storm occurred which caused the North Tunnel to flood causing damage to the TBM. [89] In May 2014, MTRCL reported to Railway Development Office that the damaged TBM was undergoing repairs and was anticipated to be ready for continued excavation in December 2014.[90] This indicates that, at this time, the contractor forecast that this event would cause eight to nine months of delay to Contract 823A.

95. The Second IBC Report on XRL indicates that this event caused four months of delay because repairs were completed in July 2014 and breakthrough was achieved in August 2014.[91]

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85 10 December 2014 – 20 March 2014 = 265 calendar days

86 Contract 823A Contractor's Monthly Report, April 2012

87 Contract 823A Contractor's Monthly Report: *"Due to lack of manpower recourse in the current market [affecting] the current progress of work…[the contractor] is continuous[ly] [recruiting] the staff and [employing] difficult subcontractor to fulfill the need of the project at the moment."* A similar remark could be found in every monthly report up to March 2014.

88 Second IBC Report on XRL, pg. A27, 28 October 2014

89 The Contractor's Monthly Report of March 2014 for Contract 823A is the last report that we have access to. At that time, the contractor had not yet assessed the impact of this event.

90 XRL Monthly Progress Report, May 2014

91 Second IBC Report on XRL, pg. A29, 28 October 2014

Contract 820

96. Contract 820 encountered problems before August 2013 on the Southern D/T drive regarding the discovery of unchartered H-piles. Some of the piles were problematic due to a "*mushroom effect*" [92] of the piles creating difficulties to pull them out of the ground from the surface and required the piles to be cut. One pile was found to be driven diagonally and had to be cut in sections with the TBM having to advance forwards to reach the upper portion. Ground instability issues were encountered caused by large cavities which had to be filled with grout, drilled and pumped from the surface.

97. In May 2013, the contractor provided an assessment of the Extension of Time (EoT) for the delays caused by unchartered H-piles of -- days. By February 2014, it is reported by the contractor that no Extension of Time had been awarded for this delay. MTRCL has informed us that this matter was covered by a Supplemental Agreement in March 2014.

98. Slow progress was again apparent on the Southern U/T drive which started on 15 December 2013 caused by the TBM encountering several different steel pieces (H-pile parts, casing parts, steel pieces) and high volumes of concrete in the ground. [93]

Contract 810A

99. Contract 810A was delayed by several different events. The events that are considered to be the most significant, largely based on a review of the contractor's monthly reports, are described below. Where other sources of information have been used, these have been specifically referenced.

Delay to contract award

100. In September 2009, Maunsell Aedas proposed a tender award date for Contract 810A of 10 December 2010. [94] However, Contract 810A was actually awarded approximately 10.5 months later than originally planned and the contract commenced on 24 October 2011. The M&V Consultant raised concerns that the programme had been compressed, which could impact safety and quality. [95] According to the Second IBC Report on XRL, this delayed contract award was caused by scope change in Contract 810A as a result of delays to interfacing contracts 803A, 803D, 811B and 810B. Contracts 803A and 803D were delayed by the unexpected presence of boulders during construction of the diaphragm wall for the West Kowloon Terminus site for Contract 810A. [96]

101. Due to the late commencement, Contract 810A was required to be completed in approximately 3 years and 6.5 months for Whole of the Works completion. [97] The Second IBC Report on XRL

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[92] The contractor's monthly reports for Contract 820 refer to the "*Mushroom Effect,*" which is understood to be when the pile has been deformed.

[93] Contract 820 Contractor's Monthly Reports, December 2013, January 2014 and February 2014

[94] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.4B), Civil and Structural Scheme Design Report, pg. 13 to 17, September 2009

[95] M&V monthly Progress Report, January 2012

[96] Second IBC Report on XRL, pg. A26 and A28, 28 October 2014

[97] 10 May 2015 – 24 October 2011 = approximately 3 years and 6.5 months

stated that this was *"an extremely ambitious, if not impossible, schedule from the outset, in the judgement of the Independent Experts"*. [98]

Delays to excavation of the north top-down area

102. Delays to the diaphragm walls on Contract 811B led to MTRCL instructing a Delay Recovery Measure to divert Jordan Road to the South of the existing road, which was in the north top down area of Contract 810A. This temporary road diversion was in place from 12 February 2012 to 16 September 2012 and caused delays to excavation of the north top-down area. [99] The Second IBC Report on XRL stated that excavation productivity at Contract 810A was limited by available space for excavating and removing soft ground and rocks. We have not sought to verify the extent to which this was understood when the contract was let. The report also indicated that this was a critical issue and that productivity was expected to increase in future once "diaphragm action" is achieved at the B3 level of the north top down area and the use of explosives would also de-risk this critical activity. [100] In the submission made to LegCo RSC in May 2014, MTRCL stated that *"[t]his [Contract 811B] had a knock-on effect to handing over of the north top-down works area to Contract 810A and in particular, the Works Area 13.61, which was only handed over to Contract 810A in November 2013"*. [101] The contractor for Contract 810A stated in March 2014 that the north top-down area civils works were of the greatest concern to the critical path. [102]

Site handover delays from 810B to 810A

103. Between March and May 2012, the 810A contractor reported that several site areas were not handed over from Contract 810B to 810A as planned. This subsequently impacted the excavation and slab casting rates for the 810A contractor in the affected areas. The 810A contractor advised MTRCL in April 2012 that this was the primary reason for the delay to completion of Contract 810A reported at the time.

Instructed change

104. The contractor for Contract 810A reported that by June 2013, 355 Engineer Instructions had been received for Contract 810A, which included 13,513 revised drawings and 1,594 Requests for Information. [103] Changes reported by the contractor included layout changes, which affected slab design, additional H-piles and changes to the structural steelwork. The contractor reported in August 2013 that change management remained a significant challenge and MTRCL had implemented a revised change management process with the intention to address and mitigate the impact of change on the Project.

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[98] Second IBC Report on XRL, pg. A29, 28 October 2014

[99] Refer to paragraph 116 of this report

[100] Second IBC Report on XRL, page A9, 28 October 2014

[101] LegCo Paper (CB(1)1354/13-14(01)), pg 9, May 2014

[102] Contract 810A Contractor Monthly Report, March 2014

[103] Information regarding number of EIs and RFIs was not included in the Contractor's Monthly Report of July 2013 for Contract 810A. From August 2013 onwards, the Contractor's Monthly Reports have been divided into two parts and the second part has not been provided.

Instructed change

105. The Second IBC Report on XRL stated that Contract 810A had been delayed by the progress of designing temporary work structures.

Delays to steelwork design

106. Between May 2012 and February 2013, the 810A contractor reported that design changes and delayed resolution of design queries were causing significant delays to the structural steelwork. This included the requirement to provide an additional thick steel plate and changes to the mega column heads. The first mega column was erected in December 2013.

Coupler issue

107. The contractor reported that from 10 August 2013, all concrete works were suspended due to issues found regarding the sampling procedure for the concrete reinforcement couplers. The concrete works recommenced on 21 September 2013, and from this time onwards, additional on-site sampling was required.

Excessive movement in the diaphragm walls

108. The contractor reported from November to December 2012 that works had been instructed to TAM [104] grout the diaphragm wall on the West side of the site to strengthen the soil and prevent further movement of the diaphragm wall. These works were reported as delaying the earthworks at the Station Box.

109. The contractor reported that during June 2013, MTRCL instructed the contractor to stop excavation works due to movements in the Eastern diaphragm wall, likely caused by unforeseen ground conditions.

Other delays

110. The contractor reported other delays which reduced productivity on site, such as insufficient availability of barges, insufficient site area for excavated materials and excessive cobbles and boulders.

111. The contractor reported that numerous Delay Recovery Measures were implemented throughout Contract 810A. In July 2012 for instance, when Contract 810A was near critical, [105] the contractor indicated it had mitigated delays and released a revised programme. [106]

112. In August 2013, the contractor did not submit its master programme in its monthly reporting and stated that it was working closely with MTRCL to establish priority areas to be completed by the target date of December 2015. In November 2013, the contractor reported that the process of

[104] Tube A Manchette, which is a sleeved tube that enables multiple re-injections of grout at the same locations.

[105] Refer to Figure 6 of this report

[106] It is not clear which recovery measures were implemented to mitigate the delay following a review of the Contractor's Monthly Reports for Contract 810A.

developing the Minimum Operating Requirement was continuing together with MTRCL, which was a strategy to partially open the railway. [107]

Contract 811B

113. The scope of Contract 811B included the construction of diaphragm walls on the east and west sides of the site, which would form an envelope for the construction of the building. From a review of the contractor's Monthly Reports, the major delays to the contractor's Works were delays to the diaphragm walls, which have been detailed below.

114. The contractor reported between December 2010 and August 2013 that significant delay to progress of the diaphragm wall was apparent due to the discovery of extensive utilities and unforeseen ground conditions. Utilities were required to be decommissioned, slewed or diverted (e.g. gas mains, power cables and water mains), required frequent interfaces with utility operators and these issues were a commonly reoccurring theme in the contractor's Monthly Reports. The contractor reported that the depth of the diaphragm wall had to be increased due to unforeseen ground conditions and the presence of boulders and breakwater obstructions also hampered progress.

115. The contractor reported in July 2011 that it was "*becoming clear that the current works programme has now reached a stage where it is of little value as a tool to manage the project. We are continuing to lose approx. 2 weeks in every month due to adverse ground conditions affecting d-wall installation and this is likely to continue until the d-walls are substantially complete.*" [108]

116. The contractor reported in March 2011 that these delays would affect the Jordan Road diversion later that year to the north of the existing road. In September 2011 the contractor reported the most likely scheme to mitigate delays to the Works would be to divert Jordan Road to the south of the existing road. This Delay Recovery Measure was instructed in November 2011 as an Engineer's Instruction (EI), and the diversion was completed on 12 February 2012. Jordan Road was then diverted to the north of the original road on 16 September 2012. It appears that the presence of the south Jordan Road diversion, and the delayed diaphragm wall in Contract 811B, delayed excavation of the north top down area for Contract 810A.

117. The contractor reported that instructed change was a concern, both for changes in design and the implementation of Delay Recovery Measures, and the contractor frequently raised concerns about whether it would be compensated for these changes. The contractor reported [109] that the number of EIs was increasing from November 2010 but in August 2013 the contractor reported *"grave concern that EI's are being issued some weeks/months after the work has been carried out. This places us in a difficult position as we are not sure of the measures by which we will be compensated."* In December the contractor reported that the *"management of change is becoming a serious issue as the release of drawings is both haphazard, uncontrolled with the design detailing incomplete and of a poor standard."*

[107] Refer to Section 6 of this report for details on the Minimum Operating Requirement (MOR)
[108] Contract 811B Contractor's Monthly Report, July 2011
[109] Contract 811B Contractor's Monthly Reports , November 2010 to August 2013

118. The contractor reported in October 2012 that the *"need to constantly address "what if" scenarios in the hope of recovering time"* was causing major delays. The contractor was concerned it would not be fairly compensated for these Delay Recovery Measures. [110] In January 2014, a subcontractor of Contract 811B withdrew from the Project citing the changed circumstances of the Project, including design changes, had adversely affected its viability to an extent that it could no longer fulfil its obligations. [111]

119. The contractor continually requested MTRCL to urgently address its Extension of Time entitlement from July 2011. Two years later, in July 2013, the contractor reported that MTRCL verbally agreed to award an Extension of Time of -- days to Degree 1 completion and -- days to Whole of the Works completion. By March 2014, no formal Extension of Time had been awarded. MTRCL has subsequently informed us that as Delay Recovery Measures had been instructed, award of Extension of Time will not be granted.

120. The Second IBC Report on XRL stated that Contract 811B was delayed by high rock heads, weak seams and boulders north of Jordan Road during diaphragm wall construction. [112]

Multiple Contracts

121. The XRL Project was planned with a shortened front-end for the acquisition of right of way and addressing objections regarding social and environmental impact prior to the start of construction. Construction was planned to start immediately after the Entrustment Agreement was signed and therefore the XRL Project actually completed the front end process in a fast tracked 22 months compared to a quoted benchmark average of 37 months stated in the Second IBC Report on XRL, which we have not verified. The XRL Project was subject to protests and delayed site possessions which demonstrated that, due to the fast tracking, objections of external stakeholders had not been fully addressed. [113]

122. We have identified evidence of reports of manpower shortages in reports for several contractors, and a more widespread shortage of labour being reported by MTRCL in its six-monthly labour reports. [114] We have set out a case study on manpower shortfalls in Section 4.2.4 of this report.

123. The Second IBC Report on XRL stated that labour shortages in Hong Kong caused delays on the XRL Project. [115] According to MTRCL's overall labour summaries, MTRCL experienced approximately 21% labour shortages across its five concurrent projects (West Island Line, South Island Line, Kwun Tong Line Extension, Shatin to Central Link and XRL) in 2013. [116]

2.1.8. Summary of Significant Delay Events

124. In Table 3, we have summarised the most Significant Delay Events from the factual investigation outlined in the preceding subsections.

[110] Contract 811B Contractor's Monthly Report, December 2013
[111] Contract 811B Contractor's Monthly Report, January 2014
[112] Second IBC Report on XRL, pg. A26-A27, 28 October 2014
[113] Second IBC Report on XRL, pg. A25-A26, 28 October 2014
[114] MTRCL's Overall Labour Summary (Civil and E&M) for 2012, 2013 and 2014. Refer to Figure 14 of this report
MTRCL's Presentation to CIC on Contractor Manpower Management System, 9 September 2013
[115] Second IBC Report on XRL, page A30, 28 October 2014
[116] MTRCL's Overall Labour Summary (Civil and E&M) for 2013

No.	Delay	Contract
1	Late arrival of TBMs from Mainland	826
2	Delayed site handover from 810B to 810A	810A
3	Instructed Change	810A
4	Structural Steelwork design delays	810A
5	Coupler issues	810A
6	Movement in E&W diaphragm walls	810A
7	Slow production rates in WKT	810A
8	Delayed start of TBM in North Tunnel	823A
9	Black Rain TBM Flooding	823A
10	Unchartered H-piles and other steel pieces	820
11	Delays to diaphragm walling	811B
12	Damaged TBM	826
13	Delay to contract award	810A
14	Delay to excavation of the north top-down area	810A
15	Unforeseen ground conditions	823A
16	Breakdown of north TBM	823A
17	Fast tracked public consultation	Project wide
18	Manpower shortages	Project wide

Table 3: Summary of Significant Delay Events

2.2. Significant Cost Events

2.2.1. Introduction

125. The January 2010 EA2 authorised the HK$ 65 billion XRL Project. We are aware that shortly afterwards, MTRCL produced a reconciliation of the EA2 Project Control Total with cost estimates prior to EA2. This was reported in the Project Control Group Paper on 23 February 2010 and used as a reference baseline by MTRCL throughout the Project. This is further detailed in Section 4.1 of this report.

126. We are also aware that MTRCL began reporting an Estimated Final Cost [117] in February 2010, and continued to update this Estimated Final Cost throughout the Project at monthly intervals. The February 2010 'XRL Monthly Design/Construction Cost Report' by MTRCL detailed the breakdown of Project Control Total between different cost categories as at January 2010, summarised in Table 4. It reported Estimated Final Cost for January 2010 as HK$ 59.0 billion

[117] Estimated Final Cost (EFC) is the best estimate for the completion of works, including contract value, agreed changes and potential changes. It excludes Risk (P90) and contingency.

apportioned to construction costs and HK$ -- billion to contingency. MTRCL was awarded HK$ 4.2 billion for project managing the delivery of works on behalf of Government.

Cost category	Baseline cost budget [118] (HK$ million)	As at January 2010 (HK$ million)
Construction costs		
Terminus – EFC	--	--
Alignment - EFC	--	--
System-wide E&M Works - EFC	--	--
Other Construction Costs - EFC	-- [119]	-- [120]
Total	***57,665***	***59,027***
On costs		
Corporation costs	4,247	4,247 [121]
Contingencies	2,548	--
Contractor's all risks and third party liability insurances	--	--
Total	***7,335***	***6,023***
Total costs	***65,000***	***65,050***

Table 4: XRL cost estimate for EA2 at January 2010 and February 2010 baseline cost budget [122]

127. Figure 7 sets out the changes in reported Estimated Final Cost, forecast Risk (P90), [123] MTRCL project management fees, and the residual contingencies over the period of January 2010 to May 2014.

128. As illustrated in Figure 7 the Project Control Total equals HK$ 65 billion, [124] except for January to March 2010 where total costs exceeded the Project Control Total by up to HK$ 50 million;

[118] Project Control Group Paper, 23 February 2010

[119] XRL Monthly Design/Construction Cost Report, February 2010: Included HK$ 400 million related to Enabling Works within Kowloon Southern Link (KSL). These have been excluded from our analysis for consistency, as MTRCL excluded this value from March 2010. EA1 scope of HK$ 123 million from Other Construction Costs is excluded.

[120] XRL Monthly Design/Construction Cost Report, January 2010: Included HK$ 400 million related to Enabling Works within KSL. These have been excluded from our analysis for consistency, as MTRCL excluded this value from March 2010. Our analysis includes HK$ 50 million related to Independent Monitoring Contractor, which was in the January 2010 report but not in the February 2010 report. EA1 scope of HK$ 123 million from Other Construction Costs is excluded.

[121] HK$ 4.59 billion includes EA1 and EA2 figures, consisting of EA1 (HK$ 0.34 billion) and EA2 (HK$ 4.247 billion)

[122] MTRCL's XRL Monthly Design/Construction Cost Reports, January 2010 and February 2010

[123] Risk P(90): An estimate of the forecast cost of identified risks, based on probabilistic modelling. In the case of MTRCL's reporting, Risk (P90) contingency is based on a 90% likelihood that it will be adequate to cover the modelled risks.

[124] The PCT is the sum of: EFC; Risk (P90) contingency; Contractor's all risks insurances and third party liability insurances; MTRCL costs; and the balancing (unassigned) contingency

April 2011 to August 2011 exceeded the Project Control Total by approximately HK$ 104 million to HK$ 586 million; and August 2013 to September 2013 when it again exceeded the Project Control Total by approximately HK$ 102 million. [125] Every period, MTRCL estimates the Estimated Final Cost of each contract (awarded and not awarded), being the best estimate of the final outturn of a contract including all approved and potential changes.

129. During the period January 2010 to December 2011, the Estimated Final Cost of construction costs reduced from HK$ 59.0 billion [126] to HK$ -- billion. [127] Estimated Final Cost increased thereafter to HK$ -- billion [128] in May 2014.

This Figure on movements in Project costs over time has been redacted for reasons of commercial sensitivity.

Figure 7: XRL Project costs from January 2010 to May 2014

130. From December 2010, MTRCL calculated risk contingency at a probability of 90% (forecast Risk (P90 Values)), as well as reporting a separate contingency amount, which we understand to be the balancing unassigned amount within the Project Control Total.

131. Figure 8 sets out the cumulative change in Estimated Final Cost in the period January 2010 to May 2014 together with the cumulative change in forecast Risk (P90) contingency. The close

[125] Due to the scale of the chart in Figure 7, costs exceeding HK$ 65 billion are not visible.
[126] MTRCL's XRL Monthly Design/Construction Cost Report, Project Cost Estimate, February 2010
[127] MTRCL's XRL Monthly Design/Construction Cost Report, EA2 EFC Summary, December 2011
[128] MTRCL's XRL Monthly Design/Construction Cost Report, EA2 EFC Summary, May 2014

correlation between the periodic changes in Estimated Final Cost and Risk (P90) contingency indicates that changes in Estimated Final Cost are funded largely by Risk (P90) contingency.

132. The review has not attempted to track the movement of actual cost over time. MTRCL's monthly forecast Estimated Final Cost is understood to take account of incurred cost to date.

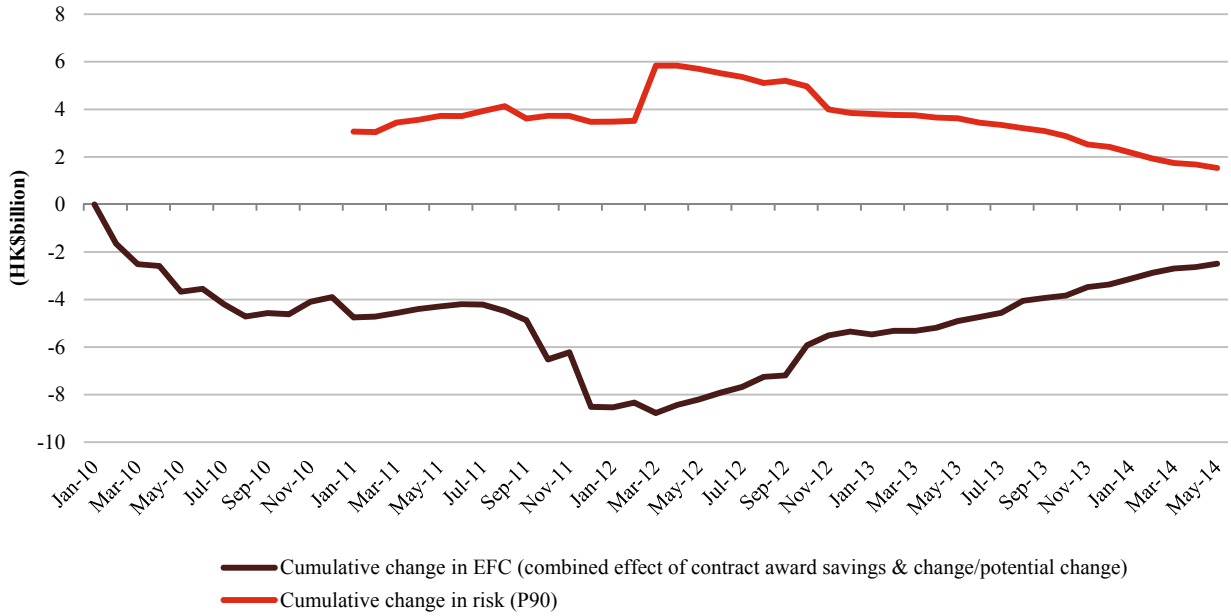

Figure 8: Cumulative change in EFC and Risk (P90) contingency

2.2.2. Significant Changes in Estimated Final Cost in the Period January 2010 to May 2014

133. We have reviewed MTRCL's XRL Monthly Design/Construction Cost Reports for the period January 2010 to May 2014 to determine Significant Cost Events. These Significant Cost Events are defined as those which significantly changed the Project Estimated Final Cost.

134. Our review using the MTRCL's Monthly Design/Construction Cost Reports which provide summary details of change order forms (C-Forms), the notices that set out the basis of a change to Estimated Final Cost. Given the relationship between Estimated Final Cost and Risk (P90) contingency demonstrated in Section 2.2.1, these changes also provide a view as to the movements in Risk (P90) contingency.

135. Our review looks at changes to Estimated Final Cost that were implemented or forecast prior to the award of contracts and those that were made after the award of contracts. More detailed review of the impact of the procurement of contracts is set out in Section 4.3.

136. Figure 9 presents the monthly changes in Estimated Final Cost over time, and separates those movements that are understood to have been associated with changes from those understood to have been through savings or losses due to contract prices being less or greater than the amount provided for in the Estimated Final Cost at the time.

This Figure on Monthly changes in EFC over time has been redacted for reasons of commercial sensitivity.

Figure 9: Monthly changes in EFC over time

2.2.3. Summary of Significant Cost Events

137. Table 5 summarises the most Significant Cost Events from movements in Estimated Final Cost.

Test Event	Selection Method	Contract No.	Description
1	Periodic changes to EFC, excluding the impact of contract award	822	The movements in Estimated Final Cost have been redacted for reasons of commercial sensitivity.
2	Periodic changes to EFC, excluding the impact of contract award	810A	
3	Periodic changes to EFC, excluding the impact of contract award	Not specified	
4	Periodic changes to EFC, excluding the impact of contract award	810A	
5	Periodic changes to EFC, excluding the impact of contract award	810A	
6	Periodic changes to EFC, at the time of contract award	810A	

Table 5: Summary of Significant Cost Events

2.3. Test Events

138. Based on our review of delay and cost we have selected matters for further validation in Sections 3, 4, 5 and 6 of the Report. Table 6 summarises the events selected as Test Events.

[129] MTRXL's XRL Monthly Design/Construction Cost Report, Project Cost Estimate for EA2 (Alignment), October 2012
[130] MTRCL's XRL Monthly Design/Construction Cost Report, Project Cost Estimate for EA2 (Terminus), October 2012
[131] MTRCL's XRL Monthly Design/Construction Cost Report, Project EFC Summary, March 2010
[132] MTRCL's XRL Monthly Design/Construction Cost Report, Changes to Project Cost Estimate, November 2010
[133] MTRCL's XRL Monthly Design/Construction Cost Report, EA2 EFC Summary, August 2013
[134] MTRCL's XRL Monthly Design/Construction Cost Report, EA2 EFC Summary, October 2011

Description of Significant Event	Section of the Report: Section 3 Governance	Section 4.1 - 4.2 Initial Estimates	Section 4.3 Procurement	Section 4.4 Project Controls	Section 5 Government	Section 6 Mitigation
Late arrival of TBMs from Mainland (826)	●	●		●		
Delayed start of TBM (823A)						●
Manpower delays (823A, 826 and more widely)		●				
Delays to diaphragm walling (811B)		●		●	●	
WKT delays and the Minimum Operating Requirement DRM	●					●
EFC changes due to contract award (810A)			●			

● Test Events

Table 6: Sample Test Events used to understand project management practices

139. The Test Events, identified in Table 6 above have been tested in subsequent Sections of this report for the following purposes:

- **Section 3: Project Governance, Reporting and Communications –** We have reviewed the communication of matters between committees as described in reports and project minutes. We have reported who knew what, and when, with regards to each event.
- **Section 4.1 - 4.2: Initial Cost Estimates and Initial Time Estimates –** We have reviewed the methodology adopted by MTRCL when developing Initial Estimates.
- **Section 4.3: Procurement and Movement in Project Cost**– We have reviewed the procurement and contracting chronology of Test Events.
- **Section 4.4: Project Controls** – We have reviewed MTRCL's project controls in the cost, risk, change, schedule and reporting functions. We have reviewed in detail how each Test Event was processed through functions.
- **Section 5: Government Oversight, Supervision and M&V** – We have reviewed the oversight and control activities performed by Transport and Housing Bureau, Highways Department and the M&V Consultant. We have reviewed in detail how each Test Event was processed.
- **Section 6: Mitigation and Recovery by MTRCL –** We have assessed MTRCL's efforts to mitigate significant delays, through review of the actions and decisions concerning our Test Events.

3. Project Governance, Reporting and Communications

3.1. Communications and Reporting Channels

140. Figure 10 provides an overview of the actual reporting and communication channels adopted by the stakeholders and the key reports stakeholders receive as their regular sources of Project information.

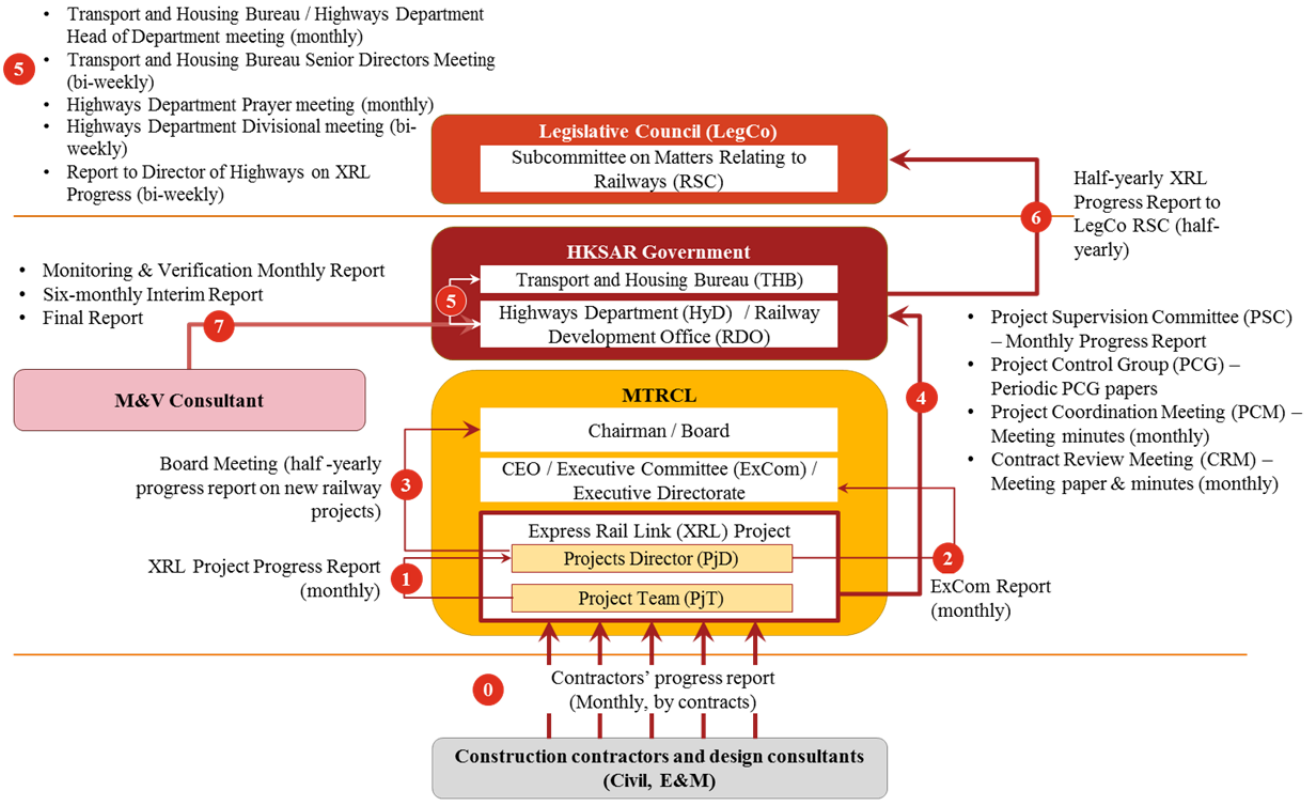

Figure 10: Actual communications and reporting framework adopted on the Project

141. The Project's meeting timetable and attendees have been established in accordance with the 2008 Lloyd's Register Report recommendations and the requirements of the Entrustment Agreements. Table 7 summarises the key meetings and communication channels in place for the Project, the frequency of these communications and attendees and chairpersons.

			Project Team			MTRCL ExCom and Board				Government and M&V		
Meeting name	**Short name**	**Frequency**	**Projects Director**	**XRL GM**	**XRL Project Team**	**CEO**	**Chairman**	**Board**	**ExCom**	**THB**	**HyD / RDO**	**M&V**
Project Supervision Committee*	Project Supervision Committee	Monthly	√	√	√	x	x	x	x	√	**C**	x
Project Coordination Meeting*	PCM	Monthly	x	**C**[135]	√	x	x	x	x	x	**C**[136]	x
Contract Review Meeting*	CRM	Monthly	x	x	√	x	x	x	x	x	**C**[137]	√
Project Control Group	PCG	Weekly	**C**	√	√	x	x	x	x	x	√[138]	x
MTRCL Board Meeting	Board	Half-yearly for XRL[149]	√	x	x	√	**C**	√	√	√[139]	x	x
MTRCL ExCom Meeting	ExCom	Monthly for XRL[148]	√	√	x	**C**	x	x	√	x	x	x
Transport and Housing Bureau Head of Department M**eetings**	HoD	Monthly	x	x	x	x	x	x	x	**C**	√	x
Transport and Housing Bureau Senior Directors Meeting	SDM	Bi-weekly	x	x	x	x	x	x	x	**C**	x	x
Highways Department/Railway Development Office Prayer Meetings	PM	Monthly	x	x	x	x	x	x	x	x	**C**	x

Note: C = Chair meeting, √ = Attend meeting; X= do not attend meeting. * = Exclusive to discussing matters relating to XRL Project

Table 7: Summary of meetings covering XRL and attendees

[135] First IBC Report on XRL, pg. 39, July 2014: The monthly Project Coordination Meeting is co-chaired by the Assistant Director of Highways Department and XRL General Manager

[136] Refer to footnote 135 in this report

[137] First IBC Report on XRL, pg. 39, July 2014: MTRCL's monthly Contract Review Meeting Presentation is chaired by Chief Engineer of Railway Development Office.

[138] Highways Department / Railway Development Office (RDO) is not a member of the Project Control Group but RDO representatives are invited to attend the Project Control Group meetings when the Project is addressed in the meetings. Copies of the Project Control Group Papers are provided to RDO and RDO provides comments on relevant papers, while MTRCL responds to RDO's comments either at the Project Control Group meeting or in subsequent Project Control Group meetings.

[139] Transport and Housing Bureau is represented by the Secretary of Transport and Housing or its alternative Government Directors at the MTRCL Board meeting.

3.2. Design of the Project's Governance, Reporting and Communications Framework

142. The communication channels (as outlined in Figure 10), and the opportunities these present for the transfer of knowledge and information (as outlined in Table 7) are reviewed below in relation to the design of the Project's governance, reporting and communications framework.

3.2.1. Communication Channels between MTRCL's Projects Director and MTRCL's Project Team

143. The Projects Director is responsible for the delivery of MTRCL's five major railway projects. On a weekly basis the Projects Director met all the Project Managers and General Managers together to share information. [140]

144. The Projects Director also holds a weekly 2-hour meeting with the XRL Project General Managers and XRL Project Managers in the Headquarter's Projects Division to get an overall update of the XRL Project progress and discuss key issues. The Projects Director also communicates to the Project General Managers and Project Managers on matters discussed with the Executive Committee (ExCom) in relation to the XRL Project. [141]

145. The Project Team prepares the MTRCL's monthly XRL Project Report, which is issued by the Technical Secretary and distributed to the XRL Project General Manager (GM-XRL) and Highways Department, and copied to the Projects Director. This report then becomes the consolidated source of project progress information for the Project, and is used to prepare different versions of reports for the Project Supervision Committee, ExCom and the MTRCL Board.

146. It was noted in the Panel Meeting that the Projects Director stopped attending the formal monthly Project progress meeting because *"he could no longer afford to*" [142] and delegated this task to the GM-XRL.

3.2.2. Communication Channels between MTRCL's Projects Director and MTRCL's CEO and ExCom

147. We understand the Projects Director had a good relationship with the CEO. They regularly met informally, at least two to three times a week, and had the opportunity to discuss the Project. [143] We understand these informal meetings were not documented.

148. On a monthly basis, the ExCom receives the 'XRL Project Report', [144] a summary report on the progress of the Project, prepared by the Project Team and edited by the Projects Director. This is less detailed than the XRL Project Progress Report that the MTRCL Project Team prepares for Projects Director and copied to Railways Development Office. The XRL Project Report is

[140] Panel Meeting minutes, TC Chew, paragraph 14, 15 August 2014
[141] Panel Meeting minutes, TC Chew, paragraph 15, 15 August 2014
[142] Panel Meeting minutes, TC Chew, paragraph 16, 15 August 2014
[143] Panel Meeting minutes, TC Chew, 15 August 2014
[144] MTRCL Progress Report to ExCom: The XRL Project Report is a summary report to ExCom.

presented to ExCom every month, with the General Manager of XRL and the Projects Director presenting on alternate months. [145]

3.2.3. Communication Channels between MTRCL's Projects Director and MTRCL's Chairman and Board

149. MTRCL Board Meetings are held regularly to review and discuss reports on MTRCL's different businesses and financial matters. [146] The Project is discussed during the Board's Half-yearly meeting, under agenda item: "New Railway Projects – Half-Yearly Updates."

150. The minutes of the Panel's meeting with the MTRCL Chairman on 15 August 2014 record "*a myriad of important business and strategic issues (including the Hong Kong property development pipeline and overseas projects) to be handled and decided on at each Board meeting, normally the Board would discuss and resolve these issues first before receiving regular reports from the Executive Directors. The Projects Director normally would have about 10 to 15 minutes to cover his whole project portfolio in each Board meeting, and a few minutes would be spent on the reporting of the XRL project.*" [147]

151. The New Railway Projects – Half-Yearly Updates are considered by the ExCom meeting before submission to the Board.

152. In addition to the New Railway Projects – Half-Yearly Updates, the Project is also covered in MTRCL Board Meetings when major contracts are being awarded. Board Meetings were held 15 times in 2013; 10 times in 2012; 11 times in 2011; and 11 times in 2010 (MTRCL Annual Reports 2010 - 2013). According to MTRCL, the Projects Director's Reports were presented in every Board Meeting, though the Board Meeting minutes may not record every Projects Director's Report. Based on the Board minutes available for review[148], the Board has discussed the Project five times in 2013, three times in 2012, six times in 2011 and six times in 2010. [149]

3.2.4. Communication Channels between MTRCL and the Government (Highways Department and Transport and Housing Bureau)

153. The key communication channels for MTRCL to report Project progress and status to Government is through the regular meetings set out in Table 8.

[145] Panel Meeting minutes, Jay Walder, paragraph 9, 13 August 2014. "*On a bi-monthly basis, GM of each project would present their reports to the ExCom, and the Projects Director would present reports in the alternate months.*"

[146] MTRCL Board Meetings (regular and special meetings) have been held: 15 times in 2013; 10 times in 2012; and 11 times in 2011 and 2010 as per MTRCL Annual Reports 2010-2013.

[147] Panel Meeting minutes, Raymond Ch'ien, paragraph 6, 15 August 2014

[148] We were informed by MTRCL that not every Project Director's Report discussion may be recorded in the Board meeting minutes.

[149] MTRCL Board Meeting minutes which discussed the XRL Project, 05 August 2008 to 06 March 2014

Stakeholders communication channels	Sources of information about XRL Project	Formal documents / reports available for review
Project Team/Projects Director to Government (Transport and Housing Bureau and Highways Department/Railway Development Office)	• **Project Supervision Committee** – Monthly Project Supervision Committee Meeting chaired by Director of Highways with attendance from Highways Department/Railway Development Office, Transport and Housing Bureau and MTRCL (including Projects Director and GMs XRL) covering project progress and cost reporting.	• Project Supervision Committee meeting papers (i.e. Project Supervision Committee Monthly Progress Report and meeting minutes)
	• **Project Control Group** – Weekly Project Control Group Meeting chaired by MTRCL Projects Director with attendance from Highways Department/Railway Development Office covering cost, consultancies and other contracts procurement, proposal review, strategic issue review and project risk summary report review. (Note: meeting is not exclusive to discussing XRL Project matters.)	• Project Control Group papers and minutes • Monthly design / construction costs report
	• **Contract Review Meeting** – Monthly Contract Review Meeting chaired by Highways Department/Railway Development Office Chief Engineer with attendance from Highways Department/Railway Development Office, MTRCL Site supervision staff for major civil and E&M works, and M&V Consultant covering project progress for all civil works and third party contracts for tunnels and West Kowloon Terminus.	• Contract Review Meeting papers and meeting minutes
	• **Project Coordination Meeting** – Monthly Project Coordination Meeting co-chaired by the Highways Department Assistant Director and General Manager for XRL with attendance of the Railway Development Office team, and General Managers and Project Managers from MTRCL covering land matters, resolution of third party contracts, key design and construction, issues, environmental matters with impact on progress, and interfacing issues with other projects.	• Project Coordination Meeting minutes

Table 8: Key communication channels for MTRCL and Government

154. At least three regular meetings (i.e. Project Supervision Committee, Contract Review Meeting and Project Coordination Meeting) are in place between MTRCL and the Government to communicate on Project matters.

3.2.5. Communication Channels between Highways Department and Transport and Housing Bureau

155. The key communication channels within Highways Department/Railway Development Office to discuss Project progress and report status to Transport and Housing Bureau are set out in Table 9.

Stakeholders communication channels	Sources of information about XRL Project	Formal documents/reports available for review
1. Highways Department/Railway Development Office to Transport and Housing Bureau	• Head of Department Meeting – Monthly meetings between Transport and Housing Bureau and Highways Department to chiefly discuss Project progress, coordination issues with the Mainland, compensation to the affected villagers, etc.	• Transport and Housing Bureau Head of Department Meetings - Notes prepared in advance of meeting to facilitate discussions between Transport and Housing Bureau and Highways Department. [150]
2. Within Transport and Housing Bureau	• Senior Directors Meeting – Bi-weekly meetings for senior directorate officers of Transport and Housing Bureau to meet and discuss issues related to the Transport Branch of Transport and Housing Bureau. Division 1 of Transport and Housing Bureau presents updates on the Project. Highways Department not regularly invited to attend.	• Transport and Housing Bureau Senior Directors Meeting – meeting minutes
3. Within Highways Department/Railway Development Office (Transport and Housing Bureau not involved)	• Monthly Prayer Meeting – Highways Department and Railway Development Office – discuss key Project matters • Bi-weekly Divisional Meeting – XRL Project • Bi-weekly meeting and progress reports on all railway projects – with the Director of Highways	• Meeting notes for the three meetings

Table 9: Key stakeholder communication channels – Highways Department/Railway Development Office to Transport and Housing Bureau

156. As shown above, there are multiple channels of communication between Highways Department / Railway Development Office and Transport and Housing Bureau. However, none of the meetings in Table 9 above are solely dedicated to the Project.

157. In addition to the above internal Government meetings, the Director of Highways also chairs the Project Supervision Committee with MTRCL where a representative from Transport and Housing Bureau is present / invited (usually the Principal Assistant Secretary or Assistant Secretary for Transport and Housing).

[150] Transport and Housing Bureau Head of Department Meeting notes which covered the XRL Project, 11 January 2010 to 17 March 2014: No meeting minutes were taken to record the actual discussions

3.2.6. Communication Channels between Government and MTRCL to LegCo Railways Subcommittee

158. The Government is required, as per agreement at the April 2010 LegCo Railways Subcommittee meeting, to report to LegCo Railways Subcommittee every six months on the Project's progress and financial situation. These reports are prepared by the Government (Transport and Housing Bureau / Highways Department) with information provided by MTRCL.

159. In addition to the regular six-monthly reports, LegCo members also write letters to the Chairman of Railways Subcommittee to inquire about Project progress, to which the Government / MTRCL need to formally respond.

3.3. Test Event 1: Communication of Overall Delay

160. We have reviewed the reporting of overall delay on the Project, seeking to answer the following:

- Was information about the 'overall Project delay' communicated to stakeholders in a timely manner, and if so, to what extent was overall delay quantified and the impact to the 2015 opening date made transparent and clear?
- How was reported information used by the receiving stakeholders?

3.3.1. Communications between MTRCL's Project Team and MTRCL's Projects Director

161. MTRCL Project Team prepares a detailed monthly XRL Project Progress Report which is distributed to key members within the Project Team and MTRCL Projects Division and copied to Highways Department / Railway Development Office.

162. The monthly XRL Project Progress Report is approximately 200 pages. [151] The Report refers to overall Project progress in two Sections: Section 1, 'Project-level KPI Report'; and Section 5, 'Programming.' This is further described in the following paragraphs.

163. The 'Project-level KPI Report' is a one-page dashboard summary for the overall Project, using traffic light indicators to indicate high level performance in six 'key performance' areas, including safety, project payment, programme, environment, stakeholder management and quality. [152]

164. In the Project-level KPI Report section, the dashboard summary under 'Programme' [153] provides the planned and actual percentage complete of physical progress for 1) overall Project, 2) civil and 3) E&M contracts in three separate line graphs.

165. The 'Programming' section [154] sets out the physical progress of the EA2 activities in terms of actual versus planned completion percentage. This is followed by detailed description of progress for each contract in tabulated summaries and narrative format. A schedule is appended

[151] MTRCL's monthly XRL Project Report, 15 November 2013
[152] Safety and health, Project payment schedule, Programme, Environment, Stakeholder management and Quality
[153] MTRCL's monthly XRL Project Report, Section 1 Project-level KPI Report, pg. 6, 6 September 2013
[154] MTRCL's monthly XRL Project Report, Section 5 Programming, pg. 131, 6 September 2013

to the Programming section [155] indicating the delays to each contract using a time-now line. It also has a table[156] that sets out, by individual contracts, the delay in weeks against the current Master Programme (and Target Programmes in some instances).

166. The report does not include overall Project delay status and in all reports, up to May 2014, an XRL opening date of August 2015 is shown despite the escalating delays to contracts shown by the time-now line. The May and June 2014 XRL Project Progress Reports[157, 158] indicated a revised schedule which stated the 'opening' date to be end-October 2017.

167. MTRCL has stated that it was not a requirement to report a forecast completion date for the Project in the Monthly Progress Report. Meeting minutes for the interview of the Projects Director with the Panel, record "*given that they have to work on the basis of an approved baseline programme in order to track delays and control the project, Mr. Chew was half and half on whether the existing way of reporting must be changed."* [159]

168. It is unclear whether the Projects Director was receiving the information he needed on the forecast Project completion date. In a November 2013 email from Projects Director to Project Team, the Projects Director stated he did not have a clear view of the Project status to support the delivery timeline of 2015. His email stated:

- *"I have had a number [of] occasions trying to come to some clearer understanding with all the progress and challenges associated with XRL. But I have totally failed";* and
- *"Is Dec [ember] 2015 real or not, I would very much like to have another small group review amongst all of us".*

3.3.2. Communications between MTRCL's Projects Director and MTRCL's CEO and ExCom

169. From February 2010 to September 2011, the ExCom Reports documented an overall increase in delay on the Project from four to 10 weeks. For example, the September 2011 report noted *"The overall progress of EA2 activities is 11.9% (actual) against 14.9% (planned), which is equivalent to approximately 10 weeks behind programme."* [160]

170. By October 2011, the ExCom Reports stopped quantifying delays to overall Project and less precise statements were included, for example, stating that *"localised delays are occurring in contracts 822, 823A/823B, 810B and 811A/B. Delay recovery measures are being developed to mitigate impacts of these delays to the master programme."* [161]

[155] MTRCL's monthly XRL Project Report, Section 5 Programming, pg. 144, 6 September 2013
[156] MTRCL's monthly XRL Progress Report, Annex C, Physical Progress % of Construction Contracts
[157] MTRCL's monthly XRL Project Report, pg. 148, 28 April 14 to 1 June 2014
[158] MTRCL's monthly XRL Project Report, pg. 132, 2 June 2014 to 29 June 2014
[159] Panel Meeting minutes, TC Chew, paragraph 56, 15 August 2014
[160] MTRCL Progress Report to ExCom, September 2011 and October 2011
[161] MTRCL Progress Report to ExCom, pg. 2, paragraph 3.1.1, October 2011

171. From January 2012 onwards, the ExCom Reports began to use the term *"critical delays."* [162] In the reports, critical delays are noted as being addressed by: "*Delay recovery measures are being developed to mitigate impacts of these delays to the master programme."*

172. A review of ExCom monthly progress meeting notes has identified limited discussion concerning the Project. In addition, in the ExCom Report, 'matters requiring executive action' has been blank for the 17 ExCom reports that we have reviewed.

173. During the Panel Meeting with Projects Director on 15 August 2014, the following was noted on his communication with the CEO/ExCom: [163]

- *"Mr Chew admitted that on three or four earlier occasions he could have made it clear to the CEO that 2015 was out of question but he had left it to the programme and writing in the monthly progress reports to tell the situation of the project."*
- *"He opined that there were clear indications on the problems encountered in the Project and it was up to the senior executives on what questions should be raised or asked."*

3.3.3. Communications between MTRCL's Projects Director and MTRCL's Chairman and Board

174. The papers to the Board referred to as 'New Railway Projects – Half-yearly Updates' are typically no more than five pages each and cover updates on all five major MTRCL railway projects. [164] For XRL, there have typically been five to 15 paragraphs of narrative describing progress for selected contracts in each report. Reports did not typically state overall progress of the Project, an example extract of the paper for the MTRCL Board Meeting on 25 April 2013 is provided below: [165]

- *"Excavation of WKT is well behind schedule, although more than half of the total volume has been excavated. Mitigation measures are in place. Concrete casting for the terminus structure is progressing at the south with Basement 1 and 2 levels already being cast (total 4 Basement levels) while concreting works are also proceeding at various locations for the main station with the ground level slab for the future taxi lay-by at the east side of the terminus being substantially completed."*

175. The minutes of the MTRCL Board Meeting on 25 April 2013 recorded that Mr Chew commented "*while there were some slippages from a programme perspective, all projects remained generally on target and that, from a budget perspective, the contingency balances were generally appropriate. He reiterated that safety remained the Corporation's core priority with programme being a secondary consideration. He assured the Board that the interfaces between the projects and the operating railway were being carefully managed and that the Corporation*

[162] MTRCL Progress Report to ExCom, pg. 2, paragraph 3.1.1, January 2012 to March 2012
[163] Panel Meeting minutes, TC Chew, paragraph 63, 15 August 2014
[164] The five major railway projects include: West Island Line (WIL), XRL, South Island Line (East) [SIL(E)], Kwun Tong Line Extension (KTE) and Shatin to Central Link (SCL)
[165] MTRCL Board Meeting minutes, 25 April 2013

was continuing to attract good contractors at reasonable prices, despite the construction market being saturated. He added that labour resources remained an issue." [166]

176. When the Projects Director was questioned by independent non-executive directors of the Board at the MTRCL Board Meeting on 22 August 2013 about the progress of the Project, he responded that the Project would be delivered on time and within budget. [167]

177. In the December 2013 MTRCL Board Meeting, the following discussions were recorded in relation to the planned completion date of the Project communicated by the Secretary for Transport and Housing, as well as the Projects Director, to other Board members:

    - Professor Anthony Cheung (Board Member and Secretary for Transport and Housing) reminded the Board in relation to the projected opening date of XRL "*the actual opening date would depend on the completion date of the construction works, given another six months would be required for the testing and commissioning process.*" [168]

    - Meanwhile, the Projects Director mentioned that the *"opening date of the XRL would be subject to more clarity to be obtained over the testing and commissioning issue as mentioned by Professor Cheung earlier at the Meeting."* [169]

    - Other Board members, namely Mr Shek and Mr Edward Ho, [170] raised questions to Projects Director about the Project cost and progress, and Projects Director confirmed at the end the *"XRL Project works would be completed by end of 2015."*

178. By February 2014, the Project Team had been informed verbally by the Contract 810A contractor that it would be difficult to achieve the Minimum Operating Requirement. MTRCL has informed us that it was at this point that the Minimum Operating Requirement by the end of 2015 had become '*not achievable*.' [171]

179. In the MTRCL Board Meeting of 6 March 2014, Projects Director reported to the Audit Committee that "all five new lines were progressing within approved budget and contingency funds" and "in relation to XRL, the number of claims was expected to increase as the Project move forward." [172] The Projects Director did not emphasise the reason behind the expected increase in the number of claims, which commonly indicates that contracts are experiencing significant change or unforeseen circumstances.

180. According to the meeting notes of Projects Director's interview with the Panel, "*He [Projects Director] chose to report [to the Audit Committee/Board] that they were still working on the Delay Recovery Measures because the team was still waiting for the final input from contractors which finally led to the 12 April 2014 presentation to the ExCom. Mr Chew did know that they*

[166] MTRCL Board Meeting minutes, 25 April 2013

[167] MTRCL Board Meeting minutes, 22 August 2013: In response to a Board member's question about keeping to budget, "*Mr Chew said he believed that there was a programme in place to complete the key elements of the XRL for opening in 2015 and within the budget set, although some non-essential works may have to be completed at a later date.*"

[168] MTRCL Board Meeting minutes, paragraph 1,774, December 10, 2013

[169] MTRCL Board Meeting minutes, paragraph 1,781, 1(b), 10 December 2013

[170] MTRCL Board Meeting minutes, paragraph 1,781, 4(b), 10 December 2013

[171] Panel Meeting minutes, Antonio Choi, paragraph 23, 14 August 2014

[172] MTRCL Board Meeting minutes, paragraph 1,816 (1), 6 March 2014

were in difficulties at that point and he opined that he could have shared the difficulties and reported about a month earlier than 12 April 2014 that 2015 could not be achieved." [173]

181. It was noted by the MTRCL Chairman in his interview with the Panel "*it would be helpful if the reports on the XRL project to the Board were presented in easier to view dashboard format such that the essential points and warning signs could be clearly put across to the Board."*

3.3.4. Communications between MTRCL and Government (Highways Department, Railway Development Office and Transport and Housing Bureau)

182. The formal reporting between MTRCL and Government with regards to Project progress comprise:

- XRL Project Progress Report;
- Project Supervision Committee meeting and reports;
- Contract Review Meetings; and
- Specific briefings to the Secretary for Transport and Housing and the Permanent Secretary.

183. The content of the XRL Project Progress Report and copied to Railways Development Office in relation to the communication of overall Project delay is covered in Section 3.3.1.

184. Project Supervision Committee Reports, submitted by MTRCL to Highways Department/ Railway Development Office and Transport and Housing Bureau, quantified delays to the Project in the XRL Progress Report, but has not continuously done so:

- Between August 2010 and September 2011, reports and minutes quantified delays reaching a maximum of 10 weeks to the overall Project;
- Between October 2011 and April 2013, neither reports nor minutes record any reference to delay to the overall Project; and
- From the 28 June 2013 meeting onwards, minutes indicate delays to the overall Project of 6 to 7 months for May 2013 and escalating 9.5 months for December 2013. These delays were not reflected in the corresponding written reports.

185. The reports also included an appendix with a bar chart with a 'time-now line' from which it is possible to interpret the delay (in weeks or months) for individual key Entrustment Activities. In all Project Supervision Committee Reports up to the report of 28 February 2014, [174] the "Estimated Handover Date" on these charts remains at 04 August 2015. From 31 March 2014, [175] MTRCL indicates the Entrustment Programme in these reports was '*under review'*.

186. In all reports, physical progress for the Project as a whole was reported as actual percentage complete against planned percentage, in both the report narratives and an S-curve chart.

[173] Panel Meeting minutes, TC Chew, paragraph 51, 15 August 2014
[174] Project Supervision Committee XRL Project Meeting Report (No. 49), as at 28 February 2014
[175] Project Supervision Committee XRL Project Meeting Report (No. 50), as at 31 March 2014

187. Our review of Project Supervision Committee minutes identified uncertainty in relation to overall Project progress, including, for example:

- In the February 2012 Project Supervision Committee minutes, MTRCL reported in the Executive Summary that "*Delay Recovery Measures are being developed for 811B, 823A and 810B to mitigate impacts of their current delays to the project master programme*". [176] The then GM-XRL (Mr Paul Lo) mentioned in the meeting that "*overall site progress was running 2 to 3 months behind schedule, however, Delay Recovery Measures would be deployed to recover the delay.*" [177] It was not clear if the two to three months delay was in reference to a particular site or contract, or overall Project delay. It was also not clear what Delay Recovery Measures were being deployed.

- MTRCL has informed us that Testing and Commissioning is a period of six months and immediately precedes Whole of the Works completion. A period of three months trial running follows Whole of the Works completion and immediately precedes railway opening. In the 22 March 2013 Project Supervision Committee meeting, the GM-XRL stated*, "Based on this programme, most of the works would be completed by August 2015 ready for Testing and Commissioning (T&C)."* It was later communicated by GM-XRL E&M in the same meeting *"they engaged China Academy of Railway Services (CARS) as their consultants to carry out T&C. [CARS] viewed that 9 months of T&C and trial run (i.e. 6 months of T&C and 3 months for Trial run) would be normally required. MTRCL would keep close monitoring on this matter."* It is unclear from the statements in the meeting minutes[178] if, at this time, MTRCL envisaged August 2015 would be the start of nine months of testing, commissioning and trial running, which would have resulted in a 2016 opening date for the railway.

188. During the Project Supervision Committee meeting on 30 May 2013, the Chairman (Director of Highways) reminded MTRCL that *"If the delay rendered the current target project completion not achievable, Highways Department should be informed as early as possible*." "*[GM-XRL] confirmed they would do so and said that they would continue to keep close monitoring of the situation."* [179]

189. From June 2013 to January 2014, increasing attention and focus was put on the overall Project completion date during the Project Supervision Committee meetings. In response to a request by Director of Highways during the Project Supervision Committee meetings, MTRCL began reporting overall Project delay in June 2013 during these meetings (however, such information was not included in the written reports). In June 2013 the delay was reported as being six to seven months, increasing to 10 months by January 2014. Examples of the reporting of delay are set out below:

- In the 28 June 2013 Project Supervision Committee Meeting, upon the chairman's enquiry on the delay and associated recovery measures, GM-XRL said "*the overall*

[176] Project Supervision Committee XRL Project Meeting minutes (No. 21), 24 February 2012
[177] Project Supervision Committee XRL Project Meeting minutes (No. 21), 24 February 2012
[178] Project Supervision Committee XRL Project Meeting minutes (No. 33), 22 March 2013
[179] Project Supervision Committee XRL Project Meeting minutes (No. 35), 30 May 2013

programme was about 6 to 7 months delay, and the critical paths were at WKT and Contract 826 tunnels."

- In the 18 July 2013 Project Supervision Committee Meeting minutes, [180] [Programming Manager] said *"the overall programme was about 7.5 month delay. To catch up the programme, various measures were being implemented under WKT and tunnel contracts to mitigate current delays".* GM-XRL further reassured, *"it was their target to complete the tracks at the middle of WKT (i.e. long haul platform) together with sufficient public area and entrances ready for XRL opening by end 2015"*

- In the 29 August 2013 Project Supervision Committee meeting, [181] Programming Manager reported on the latest XRL Programme status that there was an overall delay of about eight months.

- By 29 October 2013, [182] Programming Manager reported nine months delay in general and about 11 months delay in the cross-boundary tunnelling works. He also mentioned that measures were being considered to mitigate the current delays.

190. In the October 2013 Project Supervision Committee meeting, [183] the meeting records noted that the Chairman (Director of Highways) was again concerned about the progress of works and requested MTRCL to provide details on the 25% difference between the actual progress and planned programme.

    - The Chairman requested MTRCL to provide information on the roadmap towards the proposed XRL opening scenario for monitoring against the actual progress.

    - In the next Project Supervision Committee Meeting on 29 November 2013, [184] GM-XRL responded to the Chairman about the roadmap towards the proposed XRL opening, "*Project Team had developed a roadmap towards the proposed target opening scenario, which set down the target dates for completion of all civil works and E&M works by June 2015 for testing and commissioning."*

    - When the Principal Government Engineer/Railway Development Office questioned if the target dates were achievable, GM-XRL Tunnels confirmed that the timeframe was achievable.

191. In the 24 January 2014 Project Supervision Committee meeting, [185] the XRL Programming Manager reported that overall delay was about 10 months. He also presented the roadmap towards "*substantial completion in end 2015*". It is unclear from the meeting minutes whether the meaning of *"substantial completion"* was consistent with the commitment for "*all civil works and E&M works by June 2015"*, in the November 2013 meeting.

[180] Project Supervision Committee XRL Project Meeting minutes (No. 37), 18 July 2013
[181] Project Supervision Committee XRL Project Meeting minutes (No. 38), 29 August 2013
[182] Project Supervision Committee XRL Project Meeting minutes (No. 40), 29 October 2013
[183] Project Supervision Committee XRL Project Meeting minutes (No. 40), paragraph 5, 29 October 2013
[184] Project Supervision Committee XRL Project Meeting minutes (No. 41), 29 November 2013
[185] Project Supervision Committee XRL Project Meeting minutes (No. 42), 24 January 2014

192. We are not aware of meeting minutes for any Contract Review Meetings. Briefings prepared for Contract Review Meetings include quantified delays (in weeks) for individual contracts. No reporting on overall Project delay is provided in the briefings that we have reviewed. [186] In briefings between June 2010 and August 2013, numerous bar charts with 'time-now lines' were included and the "Estimated Handover Date" or "XRL Opening" date on these charts remains at August 2015. From September 2013 bar charts were not included.

193. On 8 November 2013, Highways Department and MTRCL were invited to brief the Permanent Secretary for Transport and Housing (Transport) about the latest progress. The Permanent Secretary for Transport and Housing (Transport) was informed that the tunnelling works could only be completed by the latter part of 2015. As testing and trial runs of XRL (which would normally take six to nine months) could only commence after the completion of the tunnelling works, Transport and Housing Bureau considered that there was a possibility that the 2015 target commissioning date could not be achieved.

194. Based on the assessment of works progress then, the Secretary for Transport and Housing contemplated making it public at the Railways Subcommittee meeting of the LegCo scheduled for 22 November 2013 that XRL might only commence operation after 2015.

195. On 21 November 2013, prior to the LegCo Railways Subcommittee meeting, the MTRCL CEO called the Secretary for Transport and Housing, expressing disagreement with reporting to LegCo Railways Subcommittee that the target for commencing operation in 2015 could not be met. The CEO stressed that it was still feasible to complete all the works and that the XRL could commence operation by end-2015. [187]

Communications between Government and LegCo

196. From our review of the seven 'Half-yearly Reports' [188] prepared by Government and submitted to LegCo Railways Subcommittee, and the associated meeting minutes, we found no evidence that these reports have mentioned information related to delay, either on a contract level, or overall Project level. An example of the reported progress of the West Kowloon Terminus as extracted from the Half-yearly Reports is shown in Table 10.

Half-yearly Report on the Construction of the XRL Project	**Reported progress on WKT from the Half-yearly Report**
7th Report **Period: January to June 2013** **Meeting: 22 November 2013**	WKT – Over 60% of the excavation works for the Terminus structure have been completed. Structural works at the southern end of the Terminus reached the lowest level B4 (a total of four levels from B1 to B4), and the concrete structure of the first two levels (B1 to B2) was also completed. Concrete structural works for the platform level (B4) and B3 level of the Terminus continued in the bottom-up approach.

[186] Contract Review Meetings - Briefings to RDO from June 2010 to June 2014.

[187] LegCo Paper (CB(1)1328/13-14(03)), paragraph 44, 5 May 2014

[188] The First Half-yearly Report covered the period January to June 2010, while the 7th and latest Half-yearly Report covered the period January to June 2013. There has not been a Half-yearly Report for July to December 2013.

6th Report **Period: July to December 2012** **Meeting: 24 May 2013**	WKT – Excavation works for the main structure of the Terminus have been completed by about 45%. Underground structural works at the southern end of the Terminus have reached level B3 (a total of four levels from B1 to B4). For the main structure of the Terminus, the excavation works have reached the lowest level B4, i.e. the platform level of the Terminus.
5th Report **Period: January to June 2012** **Meeting: 15 October 2012**	WKT – Excavation works for the main structure of the Terminus have been completed by 29%. Works for underground concrete structure are underway at the southern part of the Terminus.
4th Report **Period: July to December 2011** **Meeting: 22 May 2012**	WKT – Diaphragm wall works and piling works of the Terminus have been completed. Major excavation works for the Terminus are underway for the construction of the underground station.
3rd Report **Period: January to June 2011** **Meeting: 27 September 2011**	WKT – Diaphragm wall works are almost completed, and over 90% of the piling works have been completed. The works are expected to be completed in the third quarter of 2011. Moreover, as the WKT is an underground station, major excavation works for the station commenced in April 2011.
2nd Report **Period: July to December 2010** **Meeting: 18 March 2011, 20 May 2011**	WKT – 70% of the foundation works, including piling and diaphragm wall works, has been completed as scheduled. The temporary roads for the second stage of Temporary Traffic Management Scheme (TTMS) were completed and open to public on 2 January 2011. The section of Wui Cheung Road, which is between Lin Cheung Road and Wui Man Road, has been closed for the contractor to conduct the remaining foundation works.
1st Report **Period: January to June 2010** **Meeting: 6 July 2010, 20 September 2010**	West Kowloon Terminus (WKT) – the foundation works, including piling and diaphragm wall works, are progressing on schedule and will continue in the next reporting period. The detailed design of the terminus building is being finalised.

Table 10: Government's Report of WKT Progress to LegCo Railways Subcommittee

197. The 6th Half-yearly Report was presented at the 24 May 2013 LegCo Railways Subcommittee meeting. [189] Given the May 2013 media reports stating the progress of the Project might be delayed and over budget, a number of LegCo members expressed concerns about Project progress and the penalty for MTRCL if they were unable to complete the Project on schedule.

198. In response to queries about the Project progress and schedule, Government responded: [190]

- "*…to complete XRL project on time was not only the Administration's subjective wish, but was also based on objective assessment. The Administration would spare no effort to ensure that the implementation of XRL project was within the approved project estimate and on schedule.*"

- "*Besides, XRL project had been implemented in an orderly manner. As at 31 March 2013, over 70% of the excavation works for the tunnels and WKT had been completed. The construction work was still targeted for completion in 2015.*"

[189] LegCo Railways Subcommittee 6th Half-yearly Meeting minutes (CB(1)1870/12-13), 24 May, 2013
[190] LegCo Railways Subcommittee 6th Half-yearly Meeting minutes (CB(1)1870/12-13), 24 May, 2013

199. It is unclear from this latter point whether the 'construction work' refers to all work required for the operational railway, or whether this refers to only the physical work excluding testing and commissioning.

200. Furthermore, in a written response from Government dated May 2013 explaining the progress and financial situation of the Project, Government once again reassured LegCo members of the 2015 timeline – mentioning the programme slippage due to 'unforeseeable ground conditions' would be recovered: [191]

- *"For the northern part of the WKT, unforeseeable ground conditions were encountered, the MTRCL and the contractors have been exploring feasible measures to catch up with the programme so that the completion of construction of the XRL will not be affected."*
- *"According to current projections, the amount claimed can be fully covered by project contingencies."*
- "*The construction is targeted for completion in 2015. We spare no effort in monitoring the works entrusted to MTRCL to ensure that the implementation of the XRL project is within the approved project estimate, of good quality and on schedule.*"

201. In the 7th Half-yearly Report [192] presented by Government on 22 November 2013, XRL and West Kowloon Terminus's progress was again reported with no indication of delay and with confidence that the Project would be managed and delivered on schedule and budget. According to the 7th Half-yearly Report: "*We will continue to monitor the progress of the project to ensure that it is within the approved budget and will be completed as scheduled with high quality*." [193]

202. After the Railways Subcommittee Chairman specifically enquired about the progress of the Project, what measures were being taken to recover the proposed schedule, the schedule for conducting various testing and commissioning works for Hong Kong Section of XRL, the latest progress of the procurement of the signalling systems and the interfacing issues of the systems, the Government replied, "*it would in general take 6 to 9 months to conduct various tests and trial run."*

203. According to the official minutes of the meeting, Government stated *"(a) apart from the cross-boundary section, some of the construction works in the remaining HKS of XRL were also lagged behind the schedule and as such, various measures were adopted to catch up the schedule"*.

204. It was noted in the Panel interview with the Under Secretary for Transport and Housing[194] that the Transport and Housing Bureau had been prepared to provide more details of the Project's delay and the potential risk to a 2015 opening date during the 22 November 2013 LegCo Railways Subcommittee meeting. The following points indicate the Transport and Housing Bureau was not required to explain further that the Project completion in 2015 was at risk:

[191] LegCo Paper (CB(1)1072/12-13(03)), paragraph 2, 3, and 12, 24 May 2013
[192] LegCo Paper (CB(1)81/13-14(01)), 22 November 2013
[193] LegCo Paper (CB(1)81/13-14(01)), paragraph 21, 22 November 2013
[194] Panel Meeting minutes, Mr Yau Shing-mu, 13 October 2014

- Government stated "*the construction works of HKS of XRL were expected to be completed in 2015 as scheduled. After that, it was estimated that it would take several months' time for MTRCL to conduct various tests and trial run for railway operation and seek approval from the relevant departments...*"
- After listening to the Government, the Railways Subcommittee Chairman remarked that the XRL would open in 2016. [195]
- No other members commented and subsequently the focus of Railways Subcommittee meeting discussion shifted to the labour shortage.

3.4. Test Event 2: The Delay in West Kowloon Terminus Contracts – Contracts 810A and 811B

205. Figure 11 sets out the delay for West Kowloon Terminus contracts 811B and 810A as reported by contractors to MTRCL and as reported by MTRCL in its monthly XRL Project Reports that were copied to Railway Development Office.

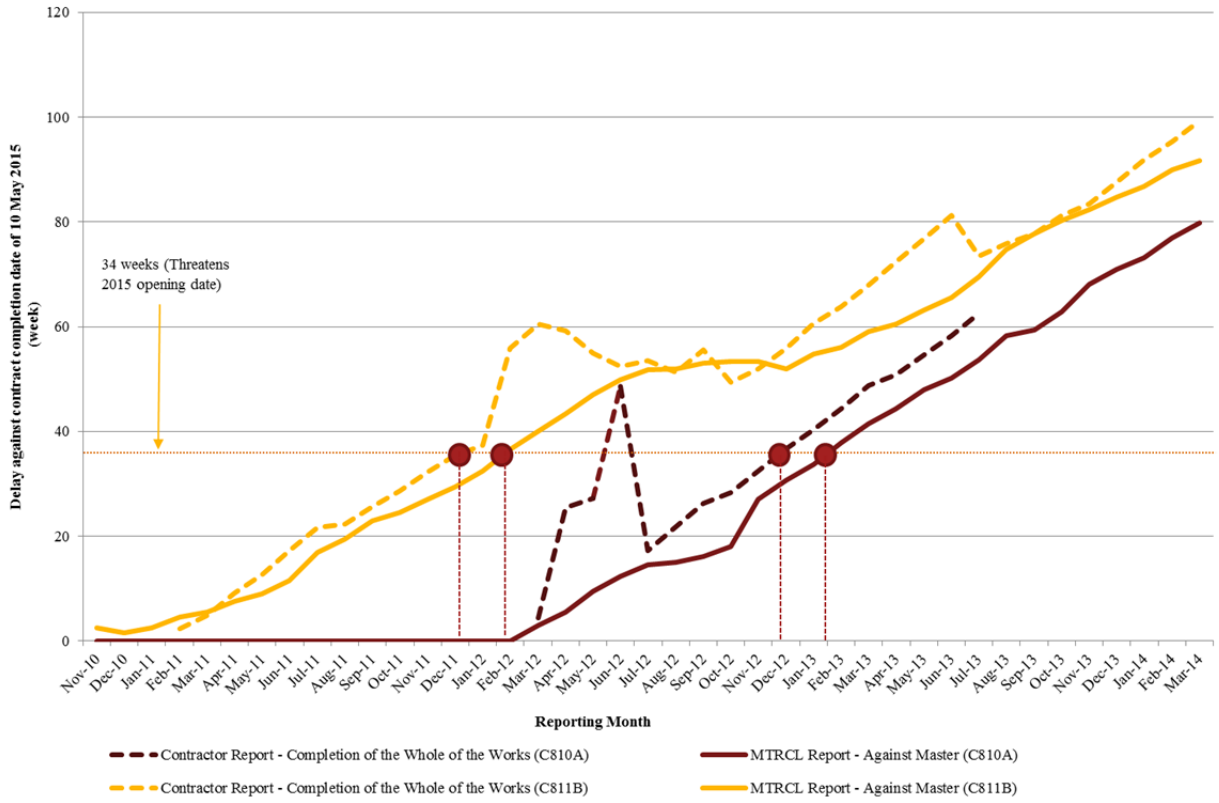

Figure 11: WKT (contracts 810A and 811B) delays reported by contractors and MTRCL

206. MTRCL does not report which delays to contracts are critical to the Project completion and therefore readers of the reports do not have information as to when delay to these contracts

[195] Panel Meeting minutes, Mr Yau Shing-mu, paragraph 14, 13 October 2014

began threatening a 2015 completion date for the overall Project. However, MTRCL has explained to us that it considered Contract 810A to have always been critical to the Project.

207. Readers of MTRCL XRL Project Progress Reports could only rely on quantified delays for each contract as reported by MTRCL. Although the quantity of delay does not itself inform criticality to Project completion, in the absence of any reporting of criticality by MTRCL, delays of large magnitude should have raised concerns amongst readers. On this basis, delays of the magnitudes greater than 34 weeks on Contracts 810A or 811B should have raised concerns amongst readers of the reports that there was a real threat to the achievability of the 2015 completion date. Given both contracts 810A and 811B have a planned completion date of 10 May 2015, a delay greater than 34 weeks would likely result in the completion date running into 2016.

208. Figure 11 indicates the reporting of delay is largely consistent between MTRCL and the contractors.

209. In December 2011, the contractor first reported delays to Contract 811B of over 34 weeks. This could have been interpreted by readers of the reports as threatening a 2015 completion date. At this time, MTRCL was reporting 29.5 weeks delay. By February 2012 MTRCL were reporting delays to Contract 811B of 36.6 weeks.

210. For Contract 810A, by December 2012, the contractor reported 36.7 weeks of delay; while MTRCL reported similar delays (33.7 weeks) by January 2013, which could have been interpreted by readers of the reports as threatening a 2015 completion date.

Severity of delay in MTRCL's progress report

211. In the January 2012 Project Supervision Committee Report, [196] MTRCL reported in the Executive Summary "*Delay Recovery Measures are being developed in Contracts 822, 823A/823B, 811B and 810B to mitigate impacts of their current delays to the project master programme*." The then GM-XRL (Mr Paul Lo) mentioned in the meeting that "*overall site progress was running 2 to 3 months behind schedule, however, Delay Recovery Measures would be deployed to recover the delay*." [197]

212. Under the 'Overall Progress' section in the same January 2012 Project Supervision Committee Report, it was reported in a table with a column titled '*Status against approved works program*' that the three activities under Contract 811B were each reporting delays of more than 26 weeks (and up to 41 weeks delay for H Piles activities). [198]

213. In the February 2012 issue of the Project Supervision Committee Report, there is no explicit mention of Contract 811B being in delay. Furthermore, a similar "Overall Progress" table to that appeared in the January 2012 Project Supervision Committee Report was provided in the February 2012 Report, however the '*Status against approved works program*' (i.e. weeks delayed) column in the table was removed in the February 2012 Project Supervision Committee

[196] Project Supervision Committee XRL Project Meeting Report (No. 21), 24 February 2012
[197] Project Supervision Committee XRL Project Meeting minutes (No. 21), 24 February 2012.
[198] Project Supervision Committee XRL Project Meeting Report (No. 20), pg. 7, 31 January 2012

Paper, showing only information such as 'actual to date' (in quantity or %, not time), and 'completed last month / this month' against key activity of the contracts. [199]

214. In addition, qualitative statements were made in this report in respect of positive progress on Contract 811B such as "*work on DWalls have started*", "*diversion on Jordan Road completed successfully*".

215. From March 2012 to June 2012, the Project Supervision Committee Reports all reported similar statements on the West Kowloon Terminus contracts, specifically, *"Critical delays are still occurring in contracts 810B, 811B, 822 and the Mainland section. Recovery measures are being developed to mitigate impacts of these delays to the XRL project programme."*

216. According to the minutes, a plan from the contractors was promised to be submitted by June 2012.

217. From July 2012 onwards, MTRCL's internal records of delay reported in its internal XRL Progress Report on the two contracts (810A and 811B) continued to increase.

218. The Project Supervision Committee reports do not explain the extent to which the Delay Recovery Measures, that MTRCL had committed to in the January 2012 Project Supervision Committee meeting, were expected to recover delays or whether they were successful in doing so.

3.5. Test Event 3: The Delayed Arrival of TBMs from the Mainland

219. Figure 12 sets out the delay for Contract 826 as reported by the contractor to MTRCL and as reported by MTRCL in its monthly XRL Project Progress Reports that were copied to Railway Development Office.

[199] Project Supervision Committee XRL Project Meeting Report (No. 21), pg. 6, 24 February 2012

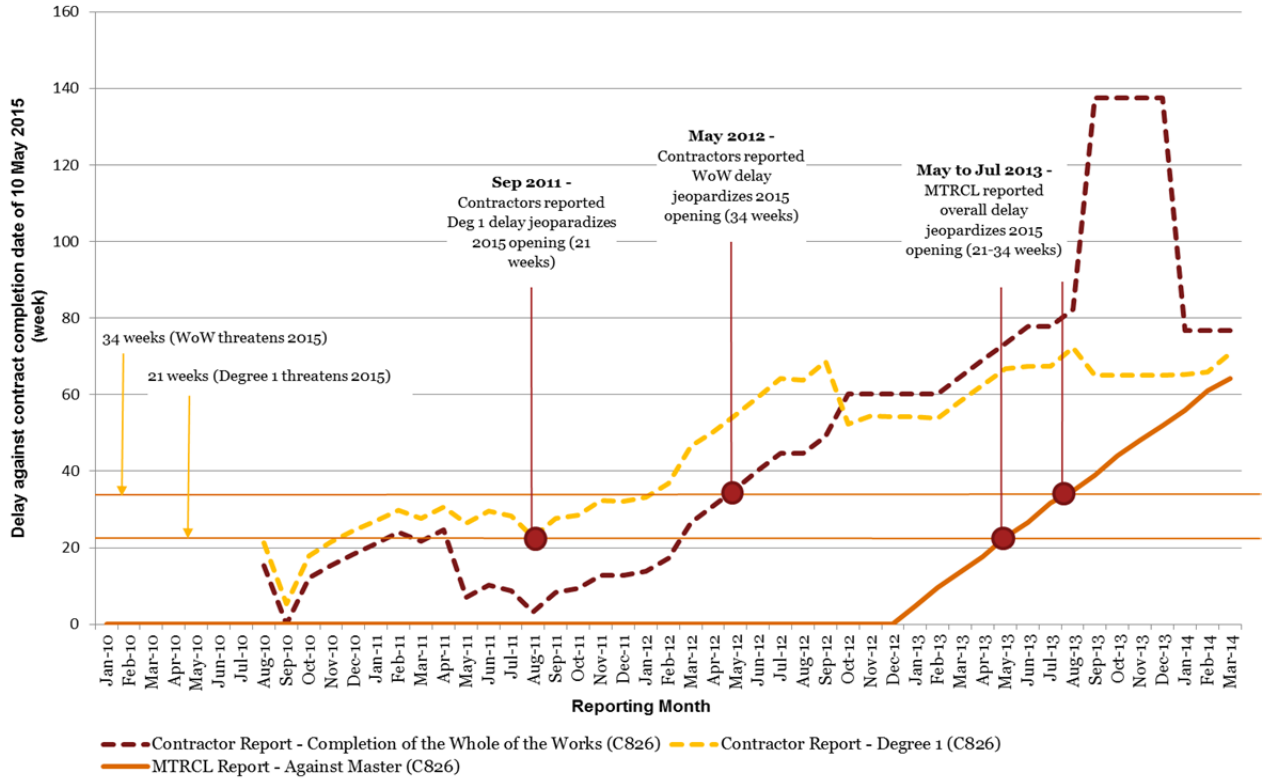

Figure 12: Contract 826 delay (weeks) as reported by 826 Contractor and MTRCL

220. MTRCL does not report which delays to contracts are critical to the Project completion and it is therefore difficult to comment on precisely when delay to Contract 826 began threatening a 2015 completion date for the overall Project.

221. Readers of MTRCL XRL Project Progress Reports could only rely on quantified delays for each contract as reported by MTRCL. Although the quantity of delay does not itself inform criticality to Project completion, in the absence of any reporting of criticality by MTRCL, delays of large magnitude should have raised concerns amongst readers. On this basis, delays of the magnitudes set out in the bullets below could have indicated to readers that Contract 826 was potentially threatening Project completion in 2015.

- Delays to the Contract 826 milestone for Whole of the Works completion. The original Contract 826 milestone for Whole of the Works completion was 10 May 2015. [200] A delay of greater than 34 weeks would result in this milestone being pushed beyond the end of 2015.

- Delays to completion of tunnel works to Degree 1 that permits the handover of those tunnels to the trackwork contractor (Contract 830). If the Contract 826 Degree 1 milestone that was established at the start of the Project is assumed to have initially being planned as critical to the Project completion, a delay greater than 21 weeks to this milestone would result in the Project completion being pushed from 04 August 2015 to beyond the end of 2015 (a period of 21 weeks).

[200] Contract 826 Contractor's Monthly Report, master programme with progress Update – updated on 1 September 2010, August 2010

222. It is evident from Figure 12 that by September 2011, both the Contract 826 contractor and the M&V Consultant were reporting forecast delays to Contract 826 that could be interpreted as threatening the completion of the Project in 2015. Although MTRCL was, at that time, acknowledging delays on the Mainland side in its reported narratives, it was not acknowledging any delay to the completion of Contract 826 as follows. MTRCL has explained to us that it does not quantify forecast delays, but reports only actual delay that has already been incurred.

- Figure 12 indicates that as early as November 2010, the Contract 826 contractor was reporting to MTRCL that progress to the Degree 1 milestone was more than 21 weeks delayed (potentially sufficient to threaten a 2015 opening date for the railway if the original Contract 826 milestone had been forecast as critical to the commencement of operations on 04 August 2015). [201] Although the contractor initially reported worsening delay followed by some recovery in early 2011, its forecast delay remained greater than 21 weeks from November 2010 onwards. From August 2011, the contractor consistently reported progressively worsening delay in excess of 22 weeks.

- By September 2011, MTRCL's internal XRL Monthly Report was reporting no delay to Contract 826 in its schedule of delays presented in Annex C. [202] Furthermore, the Project Supervision Committee Report that MTRCL shared at the Project Supervision Committee meeting with Railway Development Office recorded no mention of delays to Contract 826 in that month. MTRCL's Contract Review Meeting Presentation of 21 September 2011 reported that Contract 826 was "on program," although the "remarks" section commented that the Mainland section was 14 weeks behind.

- In the same period, and specifically in its August and September 2011 reports, the M&V Consultant reported that the forecast delay to the arrival of the TBMs to the Hong Kong boundary was reported to be about seven months late (approx. 29 weeks).

223. By mid-2012, both the Contract 826 contractor and the M&V Consultant continued to report delays to tunnels that could threaten the completion of the Project in 2015. MTRCL continued to acknowledge delays on the Mainland side, but maintained its position that Contract 826 was 'on schedule'. Relevant facts are set out in the bullets below:

- By May 2012, the Contract 826 contractor was reporting that the Contract 826 Whole of the Works completion milestone was delayed by over 34 weeks. Such a delay would have postponed the original milestone from 10 May 2015 to 13 January 2016. [203] It was also reporting that the Degree 1 milestone was delayed by over 54 weeks, which could have foreseeably postponed the follow-on contracts and potentially led to a delay to the overall Project completion into mid-2016.

- In the same month, MTRCL's internal XRL Project Progress Report reported no delays to Contract 826 in its schedule of delays. The Project Supervision Committee Report shared with Railway Development Office at the Project Supervision Committee

[201] EA2, Appendix C, 26 January 2010

[202] MTRCL's monthly XRL Project Report, Annex C, September 2011

[203] Contract 826 Contractor's Monthly Report (No. 27), revised master programme with progress update – updated on 31 May 2012, May 2012

meeting contained a footnote in an appendix stating "*826 on schedule but subject to 4 months current delay in Mainland section.*" [204]

- In August 2012, the M&V Consultant reported delays of approximately seven months to Contract 826, albeit it was being reported that a four-month delay was expected against a revised programme that had already extended the Contract milestones by three months. [205] The M&V Consultant did not quantify the delay for Contract 826 in the significant delay table under its "Key Issues." However, numerous other contracts were reported under its Key Issues, and reported being in significantly greater delay (namely contracts 822, 824, 825, 810A, 810B, 811A, 811B), with Contract 811B having the greatest delay of 47.0 weeks.

224. In November 2012 there is evidence of MTRCL explicitly acknowledging in the Project Supervision Committee meetings that the delays on the Mainland side would have an impact on Contract 826, although it did not quantify the forecast delays to Contract 826. There is evidence delays were being communicated to and within Transport and Housing Bureau. Relevant facts are set out below:

- By September 2012, the M&V Consultant reported eight months (approx. 33 weeks) delay against the approved Master Programme in the commencement of the second TBM drive and also highlighted the following matters in relation to the Contract 826 delay:

  i. *"The current tunnel progress rate on the Mainland side was only 25% of the planned rate"; and*

  ii. *"The increasing delays on the Mainland side would be bound to impact the Contract 826 programme and given the relatively short lengths of tunnel on the Hong Kong side (about 1km in each drive), would be challenging to recover."* [206]

- In the period of May to September 2012, MTRCL continued to report no delay to Contract 826 in its internal XRL Project Progress Report schedule of delays presented in Annex C, [207] and continued to do so up to and including December 2012. [208] MTRCL has confirmed that it did not report delay because the planned TBM arrival dates in Hong Kong were not yet due. In the Project Supervision Committee Reports tabled in the Project Supervision Committee meetings to Railway Development Office in this period, MTRCL recorded that that Contract 826 was "*on schedule*" but "*subject to delay on the Mainland side*" increasing from four to six months.

- In its reports at the time, MTRCL did not detail any Delay Recovery Measures to explain the difference in its reporting compared to the views of the contractor and the M&V Consultant.

[204] Project Supervision Committee XRL Project Meeting minutes (No. 25), entrustment programme, 29 June 2012
[205] M&V Monthly Progress Report (No. 23, Volume 1 of 3), Section 4.3, August 2012
[206] M&V Monthly Progress Report (No. 24, Volume 1 of 3), Section 2.3, September 2012
[207] MTRCL's monthly XRL Project Report, Annex C, September 2012
[208] MTRCL's monthly XRL Project Report, Annex C, December 2012

- In late November 2012, MTRCL reported in the Project Supervision Committee meeting that "*the current delay to the tunnelling in the Mainland side would cause an impact on the work programme for Contract 826*". MTRCL did not quantify the forecast impact on Contract 826.

- There is evidence that at the end of November 2012 Transport and Housing Bureau and Highways Department were aware of the delays that had occurred in the cross-boundary tunnel, where it was reported in the Transport and Housing Bureau Senior Directors meeting *"the completion of Huanggang-HK border tunnel section may experience a 12-month delay and be deferred to December 2013…. These delays may affect the overall completion date of the XRL Project."* [209]

- From February 2013, Transport and Housing Bureau was advised by Highways Department that "*a more realistic timetable regarding the Huanggang tunnel delay will be available in mid-2013*." [210]

225. MTRCL Projects Director gave assurances at the MTRCL Board Meeting in March 2013 that Contract 826 did not threaten a 2015 completion date. This was consistent with the internal reported delays for Contract 826 of 13.7 weeks at the time. It was not consistent with the significantly greater delays being reported by the contractor and the M&V Consultant.[211]

    - By March 2013 the following facts are apparent:

        i. The contractor for Contract 826 was reporting delays of 58.3 weeks to the Degree 1 completion milestone and 64.7 weeks to the Whole of the Works completion milestone.

        ii. The M&V Consultant was reporting 52 weeks delay to Contract 826 and was reporting Contract 826 in its 'Key Issues' list and as being on the critical path to Project completion.

        iii. MTRCL was reporting delay in its internal XRL Project Progress Report of 13.7 weeks.

    - On 07 March 2013, the MTRCL Projects Director confirmed to the MTRCL Board that the Project was on target from both a cost and time perspective. [212]

    - Track Related Installation Programme (TRIP) produced by MTRCL for internal use indicate that in June 2013, the delays to Contract 826, and in particular the delay to the Degree 1 tunnel milestone, were absorbing the 8.5 month dynamic testing period whilst still indicating a 2015 opening date. MTRCL has clarified that the purpose of this programme was to identify where problem areas existed.

226. In some instances, the quantified delays to contracts in MTRCL's XRL Project Progress Reports are reported against "Target" programmes as well as the Original Master Programmes. Delays to

[209] Senior Directors Meeting minutes, 30 November 2013
[210] Senior Directors Meeting minutes, 30 November 2013
[211] We have been informed by MTRCL that it did not have access to the M&V Consultant's reports
[212] First IBC Report on XRL, July 2014, paragraph 4.21, July 2014

Target programmes are typically less than to Original Master Programmes. MTRCL's XRL Project Progress Reports do not specify or explain Target programme completion dates, so it is not possible from the reports alone to understand when Target programmes have completion dates consistent with the Project completion date of 04 August 2015. However, the source documents for the Target programme are footnoted in the reports. In June 2013, for Contract 826, MTRCL began intermittently reporting delay against a Target programme in addition to reporting against the Original Master Programme. [213] The M&V Consultant reported in December 2010 that three months of Extension of Time had been approved by the Project Control Group due to delay in the Mainland tunnelling contract and had already been granted. [214] The reported delay against the Target programme differed significantly from the delay reported against the Master Programme, being 12.1 weeks against 26.7 weeks respectively in June 2013 for Contract 826.

227. Between December 2012 and March 2014, MTRCL acknowledged in its Project Supervision Committee meetings and reports that the delays on the Mainland Section would impact the Hong Kong Section. It provided information that was inconsistent with its own internal reporting, and in a less transparent format:

- From December 2012, MTRCL began to quantify delay in its Project Supervision Committee reports, and from January 2013 it began to quantify delay in its internal XRL Project Progress Reports. The impact of the Mainland delays on the Hong Kong Section were confirmed by MTRCL in the January 2013 Project Supervision Committee when it stated that the "*current delay for the first TBM drive was about 1 year behind schedule and would impact on the programme of works for Contract 826*."

- From December 2012 to March 2014, MTRCL consistently reported in a footnote in its Project Supervision Committee Monthly Progress Report that "*826 subject to 8-10 months delay in the mainland section*." However, it additionally provided a status line on its marked-up Entrustment Programme that indicated progressively increasing delays growing from two months (8 weeks) in December 2012 to 16 months (69 weeks) in February 2014.

- This reporting was not consistent with that being reported in MTRCL's internal XRL Project Progress Reports which ranged from 4.7 weeks in January 2013 to 64.3 weeks in March 2014. In its January 2012 Contract Review Meeting Report (issued on 22 February 2012), MTRCL reported 8.7 weeks of delay, and stated that there was a "*Direct impact on the Hong Kong Section*" and needed to be "*escalated to senior management*."

228. The rate of delay being reported in MTRCL's internal XRL Project Progress Reports between January 2013 and March 2014 represents one month delay in each month. This is consistent with MTRCL's statement that it reports actual delay to contracts, not forecast delay, and that the TBMs had not arrived at the Hong Kong border in late 2012 as anticipated. By March 2014, MTRCL's reported delay had reached levels similar to that reported by its contractors and the M&V Consultant. MTRCL reported delays of 64.3 weeks. By this time, the Contractor was

[213] MTRCL's monthly XRL Project Report, Annex C, June 2012

[214] M&V Monthly Progress Report No. 3, Section 5.3, December 2010

reporting delays of 70.7 weeks to Degree 1 milestone and 76.7 weeks to Whole of the Works completion. The M&V Consultant was reporting delay of 64.3 weeks.

229. MTRCL reported quantified delays on Contract 826 reached levels that could be interpreted as threatening a 2015 opening date in mid-2013. This was approximately 20 months after the contractor had started consistently reporting similar magnitudes of delay.

230. In May 2013 MTRCL reported delays of 22.7 weeks to Contract 826. A reader of the reports could have inferred from this delay that Degree 1 completion of Contract 826 could threaten a 2015 opening date for the railway if it was critical to the Project as a whole. No other information on the criticality of these delays was reported (refer to paragraph 221).

231. In August 2013, MTRCL reported delays of 35.0 weeks to Contract 826. A reader of the reports could have inferred from this delay, that the completion of the Contract would be delayed from its planned date of 10 May 2015 to January 2016 (refer to paragraph 221).

232. Project Team gave assurances to Railway Development Office in November 2013 that completion of all civil and E&M work was achievable by June 2015, but without stating whether that would satisfy a 2015 opening date. This was inconsistent with MTRCL's internal reporting of delay having reached 44 weeks, and was inconsistent with the indications from internal Schedule Risk Assessments that MTRCL had carried out on 20 June 2013 and 19 November 2013, which indicated Degree 1 milestones would be most likely be achieved in September 2015.

- On 20 June 2013, MTRCL undertook a study to test the sensitivity of the programme to production rates (referred to by MTRCL as a Schedule Risk Assessment). In respect of Contract 826, this study used 'optimistic' production rates of 160m/month for UT and DT tunnels, 'most likely rates of 140m/month and 'pessimistic' rates of 120m/month for UT and DT tunnels. It forecasted an optimistic Degree 1 milestone completion date of March 2015, a most likely date of September 2015, and a pessimistic date of December 2015.

- At that time, as recorded in the June Project Supervision Committee Report as tabled at Project Supervision Committee meeting, production rates on the Mainland for the DT were 140m/month and only 32m/month for the UT. The rate being achieved for the UT was significantly below MTRCL's pessimistic rates. It also forecast further risks associated with the need for approval for Mainland labour for the Hong Kong Section of tunnel.

- By 11 October 2013, internal correspondence between MTRCL Chief Programming Engineer and Projects Director indicated Contract 826 had been subject to three months further slippage and that the dates shown in MTRCL's 20 June 2013 Schedule Risk Assessment were no longer current.

- On 19 November 2013, the results of a further Schedule Risk Assessment were issued internally within MTRCL which indicated an amended 'optimistic' Degree 1 milestone date of June 2015, but retained a 'most likely' date in September 2015 and a 'pessimistic' date in December 2015. The pessimistic dates represented a delay of 96

weeks against the original completion date and 83 weeks against the revised Contract completion date after the award of a three months Extension of Time in 2012.

- At this time, MTRCL's internal XRL Project Progress Report for October stated delay had reached 44 weeks whilst the contractor was reporting over 65 weeks delay.

- In the Project Supervision Committee Meeting of 29 November 2013, MTRCL gave Railway Development Office assurances as to forecast progress. In respect of Contract 826, MTRCL stated that the target to have all Civil and E&M work completed by June 2015 to commence Testing and Commissioning was achievable. This was based on MTRCL's expected ground conditions and production rate. It is unclear from these meeting minutes whether this represented an operational date before or after the end of 2015.

4. MTRCL's Project Management

4.1. Initial Cost Estimates

4.1.1. MTRCL's April 2009 Cost Estimate

233. Prior to the budget approval by LegCo on 16 January 2010 of HK$ 66.8 billion (Money of the Day (MOD)), MTRCL had performed the initial cost estimates for XRL. [215] These estimates were based on references to MTRCL's rate book and past projects/contracts. The timeline of changes in cost estimates are shown in Figure 13. [216]

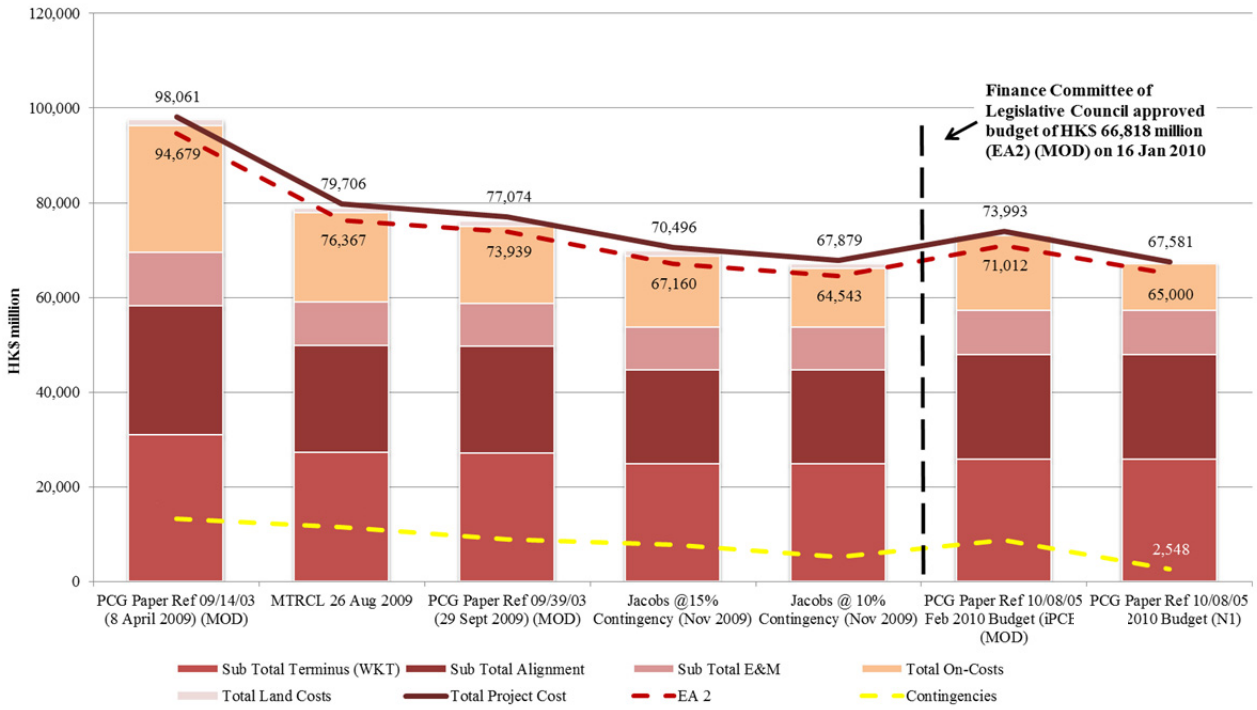

Figure 13: Timeline of Initial Cost Estimates for XRL

234. MTRCL's cost estimates were reduced leading up to the approval of 16 January 2010. MTRCL's initial cost estimates (EA2) for XRL was HK$ 94.7 billion [217] in April 2009, reducing

[215] Project Control Group Paper, paragraph 2.3.3, 29 September 2009: Initial Cost Estimates from September 2009 adopt the Government Money-of-the-Day factor – 8% for 2009, 9% per annum for 2009 to 2013 and 3% per annum for 2014 thereafter.

[216] Project Control Group Paper, paragraph 3.9, 8 April 2009: All costs are in Money-of-the-Day prices. Initial Cost Estimates as at April 2009 are based on Money-of-the-Day prices in accordance with the Project Cost Control Procedures, hence adopting escalation assumptions of 12% for year 2008, 5% for year 2009 to 2014 and 2.5% thereafter. Money-of-the-Day factors used in Public Works Subcommittee Paper (2009-10) are 2% per annum for 2009-2013 and 3% per annum for 2014 thereafter.

[217] Project Control Group Paper (Ref 09/14/03), pg. 6 Table 3.2, 8 April 2009: Table 3.2 provides the Total Project Cost, which includes EA1 and EA2. Although this table does not provide the separation in cost between EA1 and EA2, based on our review of the Project Control Group Papers and Monthly Design/Construction Cost Reports, we are able to determine the separation of the cost items into EA 1 and EA2. Hence we have assumed that the cost for Land (HK$ 1,286 million) and Design (HK$ 2,097 million) are part of EA1 cost estimates (HK$ 94,679 million = HK$ 98,061 million – HK$ 1,285 million – HK$ 2,097 million).

to HK$ 73.9 billion [218] in September 2009. The Project Control Group Paper of 29 September 2009 records the following items as being amongst the reasons that the cost was able to be reduced

- Reduction in the number of TBMs from total of nine to six;
- Optimisation of the number of turnouts [219] and utilisation of permanent diaphragm walls;
- Change of Vent Building (VB3) to an Emergency Access Point;
- Deletion of Platform Screen Doors; and
- Decreased allowance for Rolling Stock based on recent market information.

235. The most significant changes in estimate between April and September 2009 were in contingencies and the corporation's costs. In April 2009, the cost estimate included contingencies of --% (HK$ -- billion), [220] which were reduced to --% in September 2009 (HK$ -- billion). [221] The corporation's cost reduced from HK$ -- billion [220] in April 2009 to HK$ -- billion [221] in September 2009.

236. On 29 September 2009, Project Control Group approved Paper 09/39/03 on the updated Project Cost Estimate in the total amount of HK$ 73.9 billion [218] (EA2). On this basis, Railway Development Office with the support of Transport and Housing Bureau submitted a series of Papers seeking funding approval from LegCo.

4.1.2. M&V Consultant June 2009 Cost Estimate Review

237. Highways Department commissioned the M&V Consultant in June 2009 to conduct an independent assessment on MTRCL's estimated construction costs for XRL. The M&V Consultant's cost review was based on the following MTRCL cost estimates:

- MTRCL's Updated Project Cost Estimate (dated 26 August 2009) - Project Cost Estimate (EA2) as at 26 August 2009 was HK$ 76.4 billion; and
- MTRCL's Updated Project Cost Estimate (dated 29 September 2009). The Project Cost Estimate (EA2) as at 29 September 2009 was HK$ 73.9 billion.

238. In its review, the M&V Consultant made a number of recommendations that further reduced the MTRCL Project Cost Estimates of August 2009 and September 2009. As part of its recommendations, it put forward that contingency should be reduced from 15% to 10%. The

[218] Project Control Group Paper (Ref 09/39/03), Appendix A, 29 September 2009: Appendix A provides the Total Project Cost, which includes EA1 and EA2 (HK$ 77,074 million). Based on our review of the Project Control Group Papers and Monthly Design/Construction Cost Reports, we are able to determine the separation of the cost items into EA 1 and EA2. Hence we have assumed that the cost for Land (HK$ 1,038 million) and Design (HK$ 2,097 million) are part of EA1 cost estimates (HK$ 73,939 million = HK$ 77,074 million – HK$ 1,038 million - HK$ 2,097 million).

[219] Turnouts are points or switches that allow the train to move onto a new track/route.

[220] Project Control Group Paper (Ref 09/14/03), Appendix A3, 8 April 2009

[221] Project Control Group Paper (Ref 09/39/03), Appendix A, 29 September 2009

M&V Consultant put forward the following revised Project Cost Estimates (EA2) based on different contingency levels:

- HK$ 67.2 billion [222] – at 15% contingency; and
- HK$ 64.5 billion [223] – at 10% contingency.

239. After rounds of discussions, endorsements from LegCo's Railways Subcommittee and Public Works Subcommittee were sought and the funding applications were approved on 16 January 2010 for HK$ 66.8 billion. [224]

4.1.3. MTRCL's Board Consideration of EA2

240. There are records from the MTRCL Board Meeting of 8 December 2009 that show interest by the Board in the adequacy of the cost contingency (and time) for the Project. There is evidence that MTRCL had sight of Government's proposed budget for EA2. The Projects Director explained that Government had used 10% and MTRCL normally adopted --%. The Board was advised that *"if the Project eventually costed more, it would be at the cost of the Government."* [225]

241. The LegCo Finance Committee approved the funding for the construction of the XRL Project in the total amount of HK$ 66.8 billion.

242. From this amount, the sum of HK$ 65.0 billion was allocated by Government to MTRCL to carry out the construction and commissioning of the XRL Project under the EA2. The difference of HK$ 1.8 billion was retained by Government for Project monitoring, Government facilities and other works associated with the Project not under the responsibility of the MTRCL.

243. Following approval by LegCo of HK$ 66.8 billion, MTRCL performed an exercise to reconcile its initial cost estimates to the LegCo approved budget.

244. Project Control Group Paper of 23 February 2010 record that the adjustment made by Railway Development Office to MTRCL's estimate of HK$ 77.1 billion dated 29 September 2009 to HK$ 74.0 billion comprised the following: [226]

- Reduction in contingency allowance from --% to 10%;
- Application of approximately 7% reduction to the construction costs;
- Exclusion of costs for land resumption and administration due to being in a separate budget; and

[222] To compare the M&V Consultant's recommended costs to EA2 costs in the Project Control Group Papers, we have added the Corporation Costs of HK$ 4,247 million to the M&V Consultant's recommended costs (HK$ 67,160 million = HK$ 62,913 million + HK$ 4,247 million).

[223] To compare the M&V Consultant's recommended costs to EA2 costs in the Project Control Group Papers, we have added the Corporation Costs of HK$ 4,247 million to the M&V Consultant's recommended costs (HK$ 64,543 million = HK$ 60,296 million + HK$ 4,247 million).

[224] Project Control Group Paper, paragraph 2.1 and 2.2, 23 February 2010

[225] MTRCL Board Meeting minutes, 08 December 2009

[226] Project Control Group Paper, paragraph 2.3, 23 February 2010

- Inclusion of items of Government's direct expenditure for employment of consultants and equipment purchase, not part of EA2.

245. In February 2010, MTRCL continued to make further adjustments to its estimates of September 2009. An interim Project Cost Estimate was prepared and presented in the Project Control Group Paper of 23 February 2010. This took into account approved changes, the awarded contract sums and submitted tender totals as at February 2010. MTRCL's interim Project Cost Estimate was calculated as HK$ 71.0 billion (EA2). [227]

246. MTRCL directed the Project Team to perform a reconciliation exercise between MTRCL estimates of September 2009 to the LegCo approved budget of HK$ 65.0 billion for EA2. In order to reconcile the interim Project Cost Estimate with the approved budget for EA2 of HK$ 65.0 billion, MTRCL suggested reducing the Contingency allowance, from HK$ -- billion to HK$ 2.55 billion. [228, 229] This represented a reduction in contingency from --% in its estimates of September 2009 to approximately 4.4% [230] (for EA2) of Total Construction Costs (which included construction costs for West Kowloon Terminus, Alignment, Electrical and Mechanical (E&M) (including rolling stock) and other construction costs).

247. MTRCL identified in the Project Control Group Meeting of 23 February 2010 that the revised interim Project Cost Estimate contingency level of 4.4% [231] (for EA2) was inadequate for a Project like XRL and that there was a strong possibility of going back to Government for additional funding at a later stage. In this Project Control Group Meeting, Railway Development Office was appreciative of MTRCL's efforts to reduce the Total Project Cost, but stressed that MTRCL should continue their efforts to work together with Railway Development Office to further reduce the Total Project Cost as far as possible. [232]

4.2. Initial Time Estimates

4.2.1. Introduction

248. This Section reviews the development of the initial time estimate for the Project prior to EA2. In particular, it aims to assess the extent to which a sample of significant risks that have arisen on the Project were foreseen at the time the initial Project timeline was being established and how these risks were provided for in the timeline.

249. This Section does not seek to independently establish whether the initial timeline was achievable or to opine on what might have been a more suitable completion date for the Project.

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[227] Project Control Group Paper, paragraph 3.1, Table 3.1, 3.2 and 3.3, 23 February 2010

[228] Project Control Group Paper, paragraph 3.6, 23 February 2010: The total contingency amount (EA1 and EA2) is HK$ -- million as presented.

[229] MTRCL's XRL Monthly Design/Construction Cost Report, February 2010: Our review shows that contingencies are HK$ -- million and HK$ 2,548 million for EA1 and EA2, respectively.

[230] Contingencies of HK$ 2,548 million are for EA2 only. The 4.4% was derived as follows: (contingencies for EA2 / construction costs) which equals to (HK$ 2,548 million / HK$ 57,665 million). Project Control Group Paper, paragraph 3.6 23 February 2010 reports contingency reduced to 4.6%, which represents contingency for EA1 (HK$ -- million) and EA2 (HK$ 2,548 million).

[231] Refer to footnote 283 of this report

[232] Project Control Group Meeting minutes, pg.5 and 6, 23 February 2010

250. Further to public announcements in April 2014, it is now known that the original completion date of 04 August 2015 as established in EA2 will not be achieved. It is understood that the inability to achieve this timeline stems from:

- Lower productivity rates than planned;
- Design change during the course of the delivery; and
- The occurrence of other risks and uncertainties such as ground conditions, late site access and flooding.

251. We have selected a sample of three risks that are reported to have had a significant and critical impact on the Project at some point in time during the delivery phase. These significant risks are presented in this Section as Test Events and are:

- Test Event 1: Forecast Productivity Rates for the Mainland and Contract 826 TBM Drives were Lower than Forecast;
- Test Event 2: Forecast productivity Rates for Contract 811B Foundation Works were Lower than Forecast; and
- Test Event 3: Manpower Shortages.

252. We have not been able to establish the origins of the initial time estimate for the XRL Project. However, we understand that several Project completion dates had been considered during the early Project development stages, including by KCRC. For instance, in KCRC's project proposal to the Government in 25 June 2007, a January 2015 commencement of service date was indicated in the preliminary programme. [233] In September 2009, MTRCL was working to a date for revenue service by 30 June 2015.[234] EA2 proposed by MTRCL on 26 January 2010 set completion of test and trial running to 4 August 2015. [235]

253. There is evidence that MTRCL established a completion of date of 30 June 2015, which was based on LegCo approval of funding on 18 December 2009 and contract commencement on 21 December 2009. [236] However, debate by the LegCo Finance Committee had resulted in deferral of funding approval. As a result, six construction contracts had to be withheld. [237] Due to slippage from the start, the completion date of test and trial running was set to 04 August 2015, in the EA2 agreed on 26 January 2010.

254. We have not had sight of any evidence during this study that indicates Government put pressure on MTRCL to tighten the delivery schedule prior to EA2, although we understand from MTRCL that Government was keen to complete the Hong Kong Section as early as possible and discussions were held between Railway Development Office and MTRCL on this topic.

[233] Project Proposal to Government Northern Link and Express Rail Link – KCRC, 25 June 2007

[234] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.4B), Civil and Structural Scheme Design Report, Appendix 15.3, September 2009

[235] EA2, Appendix C, 26 January 2010

[236] Project Control Group Meeting minutes, January 2010: Revised project programme

[237] Project Control Group Meeting minutes, January 2010: Revised project programme

255. MTRCL sought assurances from its design consultants on the achievability of the timeline in 2009, during both the "Preliminary design" and "Detailed design" stages. In respect of programme, it is understood from these studies that these consultants were asked by MTRCL to:

- Develop construction programmes for contracts; and
- Advise on construction methods (production rates, programme allowances, construction logistics and potential constraints).

256. Maunsell and Aedas Joint Venture (Maunsell-Aedas) carried out studies [238] in respect of the West Kowloon Terminus, whilst Arup and Atkins carried out studies [239] for the XRL Tunnels and Associated Structures. [240] More specifically, Arup covered the North section of the tunnels and associated works from Huanggang to the Pat Heung Ventilation Building (PHVB), while Atkins reported on the remaining South section from PHVB to West Kowloon Terminus.

257. These consultants were requested to develop construction programmes for major civils contracts, and not to independently recommend achievable Project completion dates. There are indications that consultants were asked to work to a timeline for Project completion and other electrical and mechanical activities set by MTRCL. [241] For example, in relation to the West Kowloon Terminus construction programme, Maunsell-Aedas stated it had incorporated *"certain qualifications and limitations…including: re-development of work sequences, and the adoption of higher rates of output in critical areas of foundation work, excavation and structural work…to [shorten] the programme duration, to be accommodated within the time constraints."* [242]

4.2.2. Test Event 1: Forecast Productivity Rates for the Mainland and Contract 826 TBM Drives were Lower than Forecast

258. In its Project Delivery Risk Register issued in March 2009, Arup highlighted risks in relation to the Hong Kong Section and specifically that the Contract 826 TBMs might run into large caverns in the marble features around Mai Po, which could *"slow TBM progress"* or even lead to *"TBM operations halted."* [243] Arup rated the initial and current risk of encountering marble at P2 under

[238] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.4B), Civil and Structural Scheme Design Report, September 2009
Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.3D), Update of Project Risk, September 2009

[239] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) (Deliverable No. 2.1D), Works Programme, May 2009
Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) (Deliverable No. 2.3A), Project Delivery Risk Register, March 2009

[240] Associated Structure includes ventilation buildings shafts and adits, road works, drainage and other necessary advance works.

[241] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.3D), Update of Project Risk, Section 15.1 and 15.2, September 2009

[242] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus (Deliverable No. 2.3D), Update of Project Risk, Section 20.14, September 2009

[243] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) – Deliverable No. 2.3A, Project Delivery Risk Register, Appendix B, March 2009

MTRCL's risk rating systems, with the likelihood of occurrence and consequential severity both rated at 3. [244]

259. This represents the likelihood of the risk occurring as >10%, with a consequential severity if the risk materialises of "critical", indicating a potential financial impact of around HK$ 1 billion to HK$ 10 billion. There is no indication of the impact on time should the TBM activity be slowed or halted due to voids in the marble. MTRCL's risk matrix on which risks are categorised does not contain mechanisms for assessing the potential time impacts of risks.

260. Arup warned of the risk of insufficient skilled TBM operators, which it highlighted could lead to deviation from tunnel alignment as well as cause additional stress and breakage on TBMs. The consultant concluded that the TBM drives on Contract 826 could be susceptible to delays. Arup rated the initial and current risk of insufficient skilled TBM operators at P2, with the likelihood of occurrence and consequential severity both rated at 3. [245] This represents the likelihood of the risk occurring is possible at >10% and the consequential severity if the risk materialises as critical, indicating the potential financial impact of around HK$ 1 billion to HK$ 10 billion. Again, there is no indication of the impact on time should the TBM drive be affected by the lack of skilled TBM operators. MTRCL's risk matrix on which risks are categorised does not contain mechanisms for assessing the potential time impacts of risks.

261. Arup did not identify the risks of slow productivity associated with the Mainland tunnelling works. In its review of the programme schedule, Arup focussed on the Hong Kong Section and assumed the TBMs could be procured from another section of the Mainland tunnel or be purchased specifically for Contract 826 works. According to the consultants, "*the current contract award date of 10 December 2010* [as of May 2009] *allows sufficient time to procure two new TBMs."* It appears that, at this time, the anticipated sequence of work meant that Arup was treating Contract 826 as independent of the works and progress of works in the Mainland. [246]

262. MTRCL did consider the risks of delays on the Mainland side, although we do not have evidence that these risks were considered prior to EA2. In its initial XRL Project Delivery Risk Register produced after EA2 and dated 31 January 2010, [247] MTRCL did recognise the potential for programme and interfacing delays on the Mainland side, specifically owing to limited availability of suitably qualified experts for mixed face TBM tunnelling works in the Mainland. [248] Only from December 2010 onwards did MTRCL explicitly make reference to the risks of delays to the Hong Kong Section (and specifically Contract 826) as a consequence of risks of late completion on the Mainland side.

263. With regards to the risk of potential delays to Contract 826 due to the TBMs entering marble rock around Mai Po and encountering slower than expected drive rates, MTRCL's Project Delivery Risk Register of 31 January 2010 additionally highlighted consequences including:

[244] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) – Deliverable No. 2.3A, Project Delivery Risk Register, Appendix B, March 2009

[245] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) – Deliverable No. 2.3A, Project Delivery Risk Register, Appendix C, March 2009

[246] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structures (North) – Deliverable No. 2.1D, Works Programme, Section 7.5, May 2009

[247] XRL Project Delivery Risk Register, Issue 2, 31 January 2010

[248] XRL Project Delivery Risk Register – Issue 2, reference C.2, 31 January 2010

TBM sinking into voids in the marble, loss of tunnel alignment as well as grand collapse of the tunnel. However, MTRCL also reduced Arup's risk rating from P2 to P3. It increased the likelihood of occurrence to a rating of 4, meaning the risk was more likely to occur at a likelihood of >25%. Meanwhile the consequential severity of the risk, should it materialise, was lowered to a rating of 1 – "significant" — indicating a potential financial impact of around HK$ 10 million to HK$ 100 million.

264. Although MTRCL's Project Delivery Risk Register does acknowledge programme delays in relation to this risk, it did not quantify the potential time impact of the risk on the contract or the Project schedule.

265. In respect of the risk of insufficient skilled labour for the TBM drives due to extensive tunnelling and excavation scope as well as global competition for construction expertise as reported by MTRCL, the "initial risk" [249] was rated at P2, and the "current risk" rating was lower at P3. The initial likelihood of occurrence increased to a rating of 4 compared to 3 adopted by Arup, meaning the risk is more likely to occur at >25%. After proposing several risk mitigation actions including divisional recruitment efforts, streamlined training processes, industry consultation and imported labour, MTRCL reduced the current likelihood of occurrence to a rating of 2, meaning the risk is less likely to occur at >1%. Meanwhile the consequential severity of the risk, should it materialise, was lowered to a rating of 2 – "major" – meaning a potential financial impact was expected to be less severe and cost around HK$ 10 million to HK$ 100 million.

266. Again, MTRCL's Project Delivery Risk Register does acknowledge programme delays in relation to this labour risk, but does not attempt to quantify the impact on the Project.

267. MTRCL's Project Delivery Risk Register did not comment on the overall TBM productivity rates assumed by Arup.

268. There is no evidence that the time related impacts of any of the above risks on the Project as a whole were assessed in a Schedule Risk Assessment at this time.

269. A review of a more recent example of MTRCL's Project Delivery Risk Registers – namely the 27 January 2014 issue – reveals that the risk rating in relation to the risk of progress delays due to potential collapse of marble cavities during TBM drives has increased from P3 to P2. [250] Whilst the likelihood of occurrence was unchanged from that reported in the risk register of January 2010, the consequential severity of the risk, should it materialise, was increased to a rating of 2 – "major". This represents that the potential financial impact of delays caused by the marble features around Mai Po is expected to be more severe and cost around HK$ 100 million to HK$ 1 billion.

270. MTRCL's Project Delivery Risk Register of January 2014 highlighted slow advance rates and delay in tunnel completion. It still did not quantify the potential time impact on contract or the Project completion.

[249] The Initial Risk is that assessed prior to proposed mitigation actions, whereas the Current Risk is the assessed residual risk if the proposed mitigation actions are implemented.

[250] XRL Project Delivery Risk Register, reference 826-03, 27 January 2014

271. In MTRCL's Project Delivery Risk Register of January 2014, the risk profile regarding insufficient skilled TBM operators is unchanged from that of January 2010.

272. MTRCL's Project risk matrix used in January 2014 still does not take into account time impacts in the categorisation of risk.

273. Table 11 below summarises the above mentioned risks in relation to C826 TBM drive productivity as reported by Arup and MTRCL.

	Arup Reports (2009)	*MTRCL Risk Register (31 January 2010)*	*MTRCL Risk Register (31 January 2014)*
TBM productivity rates	Yes	Not referenced	Not referenced
Schedule risk analysis	Comments on the sensitivity of production rates on overall Project programme	None	Understood to have separately been undertaken by MTRCL in June, November and December 2013
Risk related to marble layer in Mai Po			
Initial Risk	P2	P3	P2
- Likelihood rating	3	4	4
- Consequence rating	3	1	2
Current Risk	P2	P3	P2
- Likelihood rating	3	4	4
- Consequence rating	3	1	2
Risk of insufficient skilled TBM operators			
Initial Risk	P2	P2	P2
- Likelihood rating	3	4	4
- Consequence rating	3	2	2
Current Risk	P2	P3	P3
- Likelihood rating	3	2	2
- Consequence rating	3	2	2

Table 11: Risk reporting summary of C826 TBM drive productivity

4.2.3. Test Event 2: Forecast productivity Rates for Contract 811B Foundation Works were Lower than Forecast

274. Contract 811B was awarded on 13 August 2010. According to a review of the contractor's Monthly Reports, significant delays to Contract 811B progress were a result of slower than expected D-wall construction due to discovery of obstructing utilities and unforeseen ground conditions. The contractor reported in March 2011 that these delays would affect the Jordan Road diversion later that year to the north of the existing road. A mitigation measure was put in place to divert the road temporarily to the South, which in turn caused delays to excavation of the north top-down area for Contract 810A.

275. In July 2013, the contractor reported that MTRCL orally agreed to award an Extension of Time of -- days to Degree 1 completion and -- days to Whole of the Works completion, as a consequence of delays.

276. Maunsell-Aedas studies of September 2009 were based on a Contract 811B award date of 01 July 2010 [251] and a Project completion date of 30 June 2015. [252] Although the actual award date for Contract 811B was approximately one and a half months later, on 13 August 2010, the completion date of the Project was similarly moved by approximately one month from 30 June 2015 to 04 August 2015. [253]

277. Maunsell-Aedas studies of September 2009 were based on a Contract 811B completion date of 21 August 2014, whereas the completion date for Contact 811B at the time the contract was awarded was 10 May 2015. This represents an increase in the duration of Contract 811B from approximately 50 months at the time of Maunsell-Aedas studies to 60 months at the time of EA2. It is unclear whether or not this increase in duration represented a real relaxation of productivity rates because although MTRCL increased the time for the overall delivery of Contract 811B, it did not increase the overall Project delivery period.

278. Maunsell-Aedas concluded in its Civil and Structural Scheme Design Report of September 2009 that the construction programme for West Kowloon Terminus as a whole was "*extremely tight*" and allows for "*very limited float anywhere.*" It went on to state that an end date of June 2015 could only be achievable by assuming "*unusually high rates of output*" across the contract duration. The construction programme indicated that "*the works [could] be practically completed by individual contractors within the time constraint…[,yet contractors were expected to] mobilise large amounts of plant, equipment and human resources in to deliver on schedule*." [254]

279. Maunsell-Aedas stated that in developing the construction programme it had assumed no limits would be applied to the supply of concrete, materials, plant and equipment which contractors could mobilise. [255]

280. Specifically in relation to West Kowloon Terminus foundation works, Maunsell-Aedas highlighted a key concern regarding the ability of contractors to source the required number of rigs. [256]

281. Maunsell-Aedas noted D-wall construction, bored piles, and H-piles at Contract 811B cannot be accessed for the majority of the Top Down Construction area until the Jordan Road was diverted, thus potentially affecting programme criticality. Similarly, "*the foundation works, watermain*

[251] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Appendix 15.4, September 2009

[252] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Appendix 15.4, September 2009

[253] EA2 Appendix C, 26 January 2010

[254] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.1 and 20.14, September 2009

[255] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.3.1, September 2009

[256] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.6.1, September 2009

diversions and TTM [temporary traffic management] for Jordan Road Diversion are at the start of the critical activities" for Contract 811B. [257]

282. The approach Maunsell-Aedas undertook to arrive at the foundation works productivity for Contract 811B referenced industry norms and previous project experience, which are summarised in Table 12.

283. Maunsell-Aedas adopted a D-wall production rate of 20m^2 per day per rig in soft material. The D-wall production rate for West Kowloon Terminus was considered "*aggressive*" by the consultant, as the common rate quoted is about 15-20m^2 per day per rig in soft material. Maunsell-Aedas further adopted a D-wall rig efficient operational area of 50m (or about eight panels). The consultant again considered the programme to be "*aggressive*" when compared to the norm, which is quoted to range between 65-100m (or about ten to fifteen panels) per D-wall rig efficient operational area. [258]

284. Bored piling production rates were assumed by Maunsell-Aedas to vary from 13 to 16 days per pile per rig, depending on pile diameter. The durations were noted to be "*longer*" than usual as rock sockets averaged around 4m to 6m in length. According to the consultants, the proposed production rates for bored piles were "*optimistic*" based on previous project experience. [259]

285. Production rate for H-piling was generally set at 3 days per pile per rig. Along the seawall of the West Kowloon Cultural District (WKCD) area, Maunsell-Aedas lowered the H-piling production rate to about 3.5 to 4 days per pile per rig to account for potential encounter with boulder. [260] However, "*no allowance has been made in the foundation programming rates for the delays due to existing old seawalls and other unforeseen obstructions.*" [261] In addition, the consultant did not comment on the appropriateness of the proposed H-piling production rates.

	Productivity	**Consultant Remark**	**Benchmarking**	**SRA**
D-wall				
- Soft material	20m^2/ day/rig	Aggressive	Norm	None
- Operational area	50m (~8 panels)	Aggressive	Norm	None
Bored piles				
- General	13-16 days/pile/rig	Optimistic	Experience	None
H-piles				
- General	3 days/pile/rig	None	None	None

[257] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.6.3, September 2009

[258] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.3.4, September 2009

[259] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.3.4, September 2009

[260] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.3.4, September 2009

[261] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 15.4.5, September 2009

- Seawall	3.5-4 days/pile/rig	None	None	None

Table 12: Summary of foundation works productivity of C811B as reported by Maunsell-Aedas

286. Maunsell-Aedas produced a separate risk register. [262] This risk register identified the following key risks relevant to D-wall at Contract 811B:

- Major utilities obstructing the West Kowloon Terminus site and potentially affecting foundation works progress of Contract 811B. Programme could be delayed by the need to work around the utilities or wait for diversion approvals. Maunsell-Aedas rated the initial risk of utility obstructions at P2, and the current risk at P3. [263] The initial likelihood of occurrence was rated at 4, but reduced to 2 in the current likelihood rating after several broadly-defined risk mitigation measures were suggested. [264] Under the MTRCL risk matrix, the likelihood of this risk occurring was decreased from "likely" at >25% to "unlikely" at >1%. The consequential severity, if the risk materialises, is "major," indicating a potential financial impact of around HK$ 100 million to HK$ 1 billion. There is no sign of the impact on time should the obstructing utilities have slowed or halted the foundation works of Contract 811B.

- Maunsell-Aedas also warned of failure to secure adequate number of piling rigs and other essential materials and plants to perform the Contract 811B foundation works due to limited availability in Hong Kong. Maunsell-Aedas rated the initial risk of equipment shortage at P2, and the current risk at P3. [265] The initial likelihood of occurrence was rated at 4, but reduced to 3 in the current likelihood rating after a few broad risk mitigation controls were suggested. [266] The likelihood of the risk occurring was decreased from "likely" at >25% to "possible" at >10%, or approximately once every five to ten years. The severity was stated as "major", indicating an expected cost of HK$ 100 million to HK$ 1 billion. There is no sign of the impact on time should contractors fail to procure the required materials and / or plants to perform the foundation works of Contract 811B.

287. Maunsell-Aedas did not specifically address a risk in relation to the rock levels and ground conditions impacting the time for completing D-walls at Contract 811B.

[262] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.3D, Update of Project Risk, September 2009

[263] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.3D, Update of Project Risk, Appendix A, D.14, September 2009

[264] Measures proposed to mitigate the major utilities obstructing WKT construction site include: 1) Comprehensive utility site investigation and identify locations of existing utilities; 2) Detecting and/or relocating the existing utilities prior to excavation as advance works; 3) Physical support of utilities, ground treatment, monitoring; 4) replacement / upgrading of existing pipes / utilities; 5) Proper design of the utility alignment to place utilities outside excavation footprint; 6) Monitor utility diversion works; 7) Seek Government support on expediting problematic utility companies; and 8) New pumping station for sewer.

[265] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.3D, Update of Project Risk, Appendix A, D.28, September 2009

[266] Measures proposed to mitigate construction equipment procurement failures include: 1) Multiple suppliers; 2) Pre-ordering plan/ arrangement; and 3) Early industry consultation.

288. MTRCL's early Project Delivery Risk Register of 31 January 2010 inherited the Maunsell-Aedas identified risks pertaining to utility obstructions and failure to procure sufficient construction equipment that would affect the foundation works of Contract 811B. It also adopted the risk rankings for these risks as put forward by Maunsell-Aedas (refer to Table 13 of this Report). [267]

289. MTRCL's Project Delivery Risk Register did not quantify the potential time-impacts of these risks. MTRCL's risk assessment matrix does not include a provision for the assessment of time impacts.

290. MTRCL's Project Delivery Risk Register did not incorporate risks in relation to the uncertainty over the ability to achieve the D-wall, bored piling and H-piling productivity rates assumed by Maunsell-Aedas.

291. MTRCL's Project Delivery Risk Register as of 31 January 2010 did not specifically address a risk in relation to the rock levels and ground conditions impacting the time for completing D-walls at Contract 811B.

292. Only from June 2010 onwards did MTRCL begin reporting unforeseen obstruction risk in the West Kowloon Terminus area during D-wall construction and piling as a result of harder bedrock than planned, thereby potentially imposing construction difficulties and causing programme delays. The risk was given a P2 rating up to June 2010, with an initial likelihood of occurrence rating of 4, a current likelihood of occurrence rating of 4 which downgrades to a 3 from January 2011 onwards and a consequential severity rating of 2 should the risk materialise.

	Maunsell-Aedas Reports (2009)	***MTRCL Risk Register (31 January 2010)***
Foundation works productivity rates	Yes	Not referenced
Schedule risk assessment	Draws high-level references to industry norms and previous project experience	None
Major utilities obstructing the WKT site		
Initial Risk	P2	P2
- Likelihood rating	4	4
- Consequence rating	2	2
Current Risk	P3	P3
- Likelihood rating	2	2
- Consequence rating	2	2
Failure to secure construction equipment / resources (i.e. piling rigs, plant)		
Initial Risk	P2	P2
- Likelihood rating	4	4

[267] XRL Project Delivery Risk Register – Issue 2, 31 January 2010

- Consequence rating	2	2
Current Risk	P3	P3
- Likelihood rang	3	3
- Consequence rating	2	2

Table 13: Risk reporting summary of Contract 811B foundation works productivity

4.2.4. Test Event 3: Manpower Shortages

Evidence of manpower shortages arising on the Project

293. MTRCL forecast early in the Project that it was expected to reach a peak of approximately 11,000 workers in 2013, which was broken down to 9,200 construction workers and 1,800 technical and professional staff. [268]

294. In as early as July 2010, the MTRCL Board had been updated on the risks of manpower. According to the MTRCL Board Meeting minutes dated 9 July 2010, TC Chew noted *"staff recruitment was generally fine and there was no problem with hiring senior staff."* He went on to forewarn *"local construction workers might be a concern in future."* [269]

295. In the MTRCL Board Meeting minutes dated 18 October 2011, TC Chew confirmed *"the supply of general workers was a lesser concern to the industry compared to skilled construction workers."* Mr. Shek (Independent Non-executive Director of MTRCL) further commented *"a lot of skilled construction workers were not in the job market."* [270]

296. Analysis of MTRCL's Half-yearly Reports to LegCo between June 2010 and June 2012 suggests the XRL Project appeared to meet its planned staffing levels for technical and professional staff during this period. However, it showed that levels of construction workers fell short of planned levels in June 2011 and June 2012 by 7.7% and 13% respectively (refer to Table 14 of this report). [271]

[268] 1st Half-yearly Report for the Period ending 30 June 2010 to the LegCo Railways Subcommittee

[269] MTRCL Board Meeting minutes, 9 July 2010

[270] MTRCL Board Meeting minutes, 18 October 2011

[271] 1st, 2nd, 3rd, 4th and 5th Half-yearly Report for the Period ending 30 June 2010, 31 December 2010, 30 June 2011, 31 December 2011 and 30 June 2012 to the LegCo Railways Subcommittee

	1st Half-yearly Report (30 June 2010)	2nd Half-yearly Report (31 December2010)	3rd Half-yearly Report (30 June 2011)	4th Half-yearly Report (31 December 2011)	5th Half-yearly Report (30 June 2012)
MTRCL's employment statistics submitted to LegCo					
Actual in current period					
Construction workers	1,200	2,310 (↑ 1,110)	2,440 (↑ 130)	3,200 (↑ 760)	3,900 (↑ 700)
Technical and Professional staff	250	770 (↑ 520)	1,250 (↑ 480)	1,600 (↑ 350)	2,100 (↑ 500)
Plan for next period					
Construction workers	1,870	2,600	3,100	4,500	-
Technical and Professional staff	670	900	1,300	1,700	-
Calculated surplus / shortfall (not part of the LegCo submission)					
Surplus%/(Shortfall%) against plan from previous period					
Construction workers	-	24%	(7.7%)	3.2%	(13%)
Technical and Professional staff	-	15%	39%	23%	24%

Table 14: Employment statistics from MTRCL's Half-yearly Reports to LegCo Railways Subcommittee [272]

297. In addition to the LegCo reports, MTRCL produces a Civil and E&M Labour Summary for the XRL Project and its other projects, which presents the planned and actual skilled and general labour statistics as reported by the contractors and reports the shortfall. The actual figures were submitted on a monthly basis into MTRCL's Construction Manpower Management System. Meanwhile, the planned figures were submitted every six months. MTRCL's construction team validated the inputs and generated reports including the Civil and E&M Labour Summary. [273]

298. The forecast figures have been updated to reflect the contractors' plans on a frequent basis every six months, although these forecasts may not have fully accounted for reduction in labour demand from delays to the Project that subsequently occurred within the reporting period due to other causes. Labour shortfalls may therefore be over-estimated, particularly later in the reporting periods.

299. According to MTRCL's Overall Labour Summary between 2012 and 2014, the Project had already begun to experience civil and E&M labour shortfall of approximately 16% [274] in January 2012. As construction works progressed, the reported manpower gap between actual and planned number of civil and E&M labourers widened, particularly during 2013. Manpower shortage

[272] 1st, 2nd, 3rd, 4th and 5th Half-yearly Report for the Period ending 30 June 2010, 31 December 2010, 30 June 2011, 31 December 2011 and 30 June 2012 to the LegCo Railways Subcommittee

[273] MTRCL's Presentation to CIC on Contractor Manpower Management System, 9 September 2013

[274] MTRCL Overall Labour Summary 2012 (Civil and E&M) – August 2013 reported actual number of 2,880 versus planned number of 3,444

peaking at a 33% [275] relative shortfall against planned figures in August 2013 and a 2,665 [276] absolute manpower shortfall against planned figures in December 2013 (refer to Figure 14 of this Report).

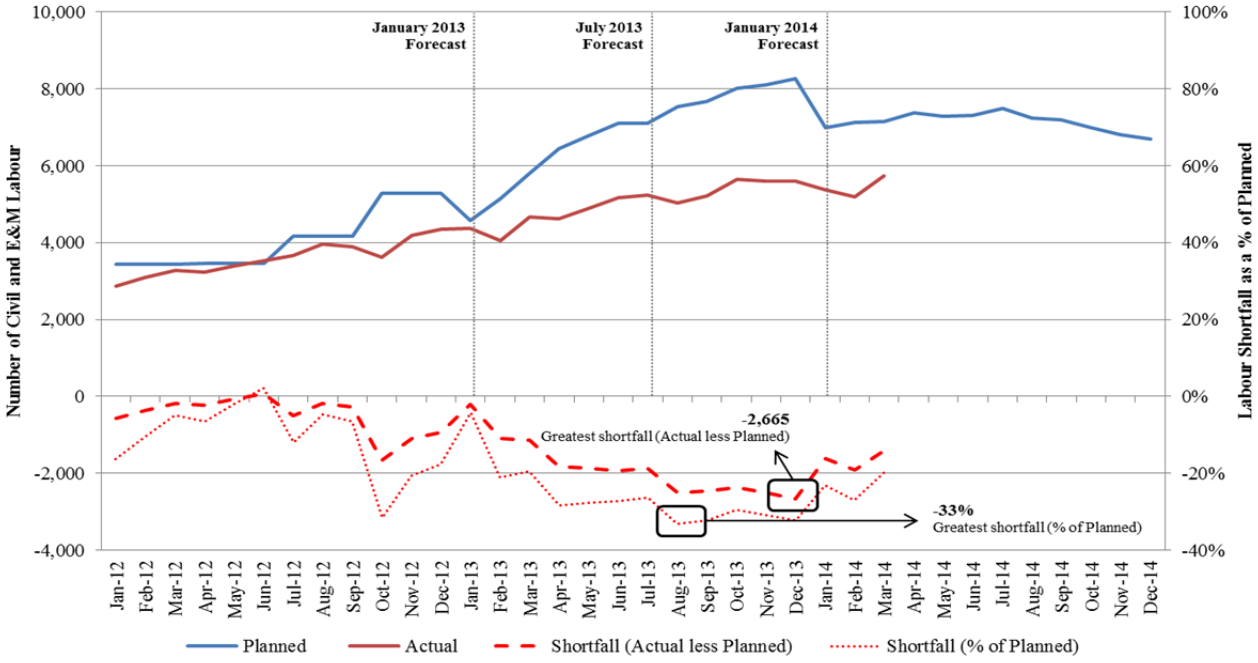

Figure 14: MTRCL's Overall Labour Summary 2012, 2013 and 2014 (Civil and E&M) [277]

300. There is evidence of contractors and MTRCL reporting some instances of challenges with recruitment of labour and consequential delays. We have provided samples of this evidence for in relation to three major tunnel contracts below:

- **Contract 823A**

  i. In October 2012, the Contractor reported *"due to lack of manpower recourse in the current market [affecting] the current progress of work…[the contractor] is continuous[ly] [recruiting] the staff and [employing] difficult subcontractor to fulfill the need of the project at the moment."* [278] A similar remark could be found in every monthly report up to March 2014. [279]

[275] MTRCL Overall Labour Summary 2013 (Civil and E&M), August 2013: Reported actual number of 5,032 versus planned number of 7,538

[276] MTRCL Overall Labour Summary 2013 (Civil and E&M), December 2013: Reported actual number of 5,598 versus planned number of 8,263

[277] MTRCL's Overall Labour Summary (Civil and E&M) for 2012, 2013 and 2014: January 2012 to December 2012 forecast based on contractors' input of November 2011; January 2013 to June 2013 forecast based on contractors' input of January 2013; July 2013 to December 2013 forecast based on contractors' input of July 2013; January 2014 onwards forecast based on contractors' input of January 2014; and all actual figures based on Construction Manpower Management System inputs by contractors.

[278] Contractor Monthly Report No. 28, October 2012

[279] Contractor Monthly Report No. 45, March 2014

ii. Project Supervision Committee's XRL Project Meeting (No. 28) in September 2012 reported *"…due to lack of welders to complete the erection of the reaction frame, it was expected that the start of the first TBM drive from the north launching shaft to Tai Kong Po shaft would be deferred to the end of September 2012 after completion of the T&C process."* [280]

iii. In March 2014, the contactor was reporting *"due to the current staffing and manpower demand in the Hong Kong construction industry, [the contractor] is continuously recruiting staff and manpower to suit the needs of the project."* [281]

- **Contract 824**

i. MTRCL Progress Report to ExCom for April to June 2012 cited *"insufficient tunnelling resources including skilled workers and experienced tunnel superintendents have impacted on tunnel progress."* [282]

ii. Project Supervision Committee's XRL Project Meetings (No. 25) in June 2012 reported *"due to the poor rock quality encountered and insufficient workforces, the progress of tunnel excavation was slow."* [283]

iii. MTRCL Progress Report to ExCom for March 2014 cited *"Progress of the permanent tunnel lining remains slow due to insufficient resources and poor logistic planning."* [284]

- **Contract 826**

i. MTRCL's Monthly Progress Report to Railway Development Office in April 2014 cited insufficient resources to support both DT/UT TBM drives, thereby causing further slippage. [285] In response, Herrenknect, the TBM supplier, arranged for five more on-site technicians. [286]

301. In September 2013, TC Chew reported in the Project Supervision Committee's XRL Project Meeting that *"there was a shortage of labour experienced in the on-going railway projects...[but MTRCL was] looking for ways to tackle the problem with a view not to [affect] the productivity."* [287]

302. Programme delays due to limited labour resources were described by MTRCL in November 2013. In its paper to LegCo, MTRCL stated *"the current labour supply is, to say the least, tight… an adequate supply of skilled labour will certainly help to reinforce timely delivery."* [288]

[280] Project Supervision Committee XRL Project Meeting minutes (No. 28), 28 September 2012
[281] Contractor report No. 45 for Contract 823A, March 2014
[282] MTRCL Progress Report to ExCom, 30 April 2012 to 3 June 2012
[283] Project Supervision Committee XRL Project Meeting minutes (No. 25), 29 June 2012
[284] MTRCL Progress Report to ExCom, March 2014
[285] MTRCL's monthly XRL Project Report, April 2014
[286] MTRCL's monthly XRL Project Report, June 2014
[287] Project Supervision Committee XRL Project Meeting minutes (No. 39), 27 September 2013
[288] MTRCL's Paper on Construction and Commissioning of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link, 5 May 2014

303. Government's Census and Statistics Department reports construction labour vacancies on a quarterly basis. There is evidence industry leaders believe the reports underplay the severity of the shortfalls in the construction sector. The quarterly report issued in July 2013 reported 1,025 vacancies in construction site workers, whereas the president of the Hong Kong Construction Association identified that a survey by his organisation several months earlier found a vacancy rate of 15% - meaning a shortfall of more than 10,000 workers. [289]

Identification of manpower risks prior to EA2

304. During the design stage of the XRL Project, MTRCL had been advised of potential labour shortage by its design consultants – Arup, Atkins and Maunsell-Aedas. More specifically, Arup and Atkins warned MTRCL "*the Hong Kong construction industry has been contracting significantly over the last decade. Consequently, construction resources, particularly skilled labour and construction plant and equipment, are no longer available in the same quantities as was the case during the last major expansion of infrastructure that took place.*" [290, 291] Similarly, Maunsell-Aedas warned of "*insufficient skilled labour*" available on the market in its risk register of September 2009. [292]

305. Although these consultants cautioned MTRCL of the risks associated with the supply of labour, we have not seen evidence that the production rates adopted by the consultants when assessing the Project timeframe made any allowances for potential shortages. Arup and Atkins stated its work programme *"makes the assumption that the construction industry's resource capability will be able to meet [the demands] and match the requirements of the programme…Resource shortages will affect production rates achieved on site and have the potential to delay the works."* [293, 294] Maunsell-Aedas warned of the importance that *"the project cost assessment, and in particular the unit rates of work elements be adjusted accordingly."* [295]

306. There is evidence that the consultants advised MTRCL to require the contractors bidding for XRL contracts to demonstrate it could provide the required resources. Arup and Atkins suggested *"the Tender Document must require the tenderer to identify his own view of resource requirements and to demonstrate his ability to secure them"* [296]. We have not sought to confirm whether MTRCL adopted this requirement in its tenders.

[289] Article titled "Industry leaders warn of serious manpower shortage in Hong Kong" from South China Morning Post, 18 November 2013.

[290] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structure (North)– Deliverable No. 2.1D, Works Programme – Revision A, Section 8.4, May 2009

[291] Consultancy Agreement No. C802, Express Rail Link – Detailed Design for Tunnels & Associated Structure (South)– Deliverable No. 2.1D, Works Programme – Revision A, Section 2.4, April 2009

[292] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.3D, Update of Project Risk, Appendix A, C.5, September 2009

[293] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structure (North)– Deliverable No. 2.1D, Works Programme – Revision A, Section 8.4, May 2009

[294] Consultancy Agreement No. C802, Express Rail Link – Detailed Design for Tunnels & Associated Structure (South)– Deliverable No. 2.1D, Works Programme – Revision A, Section 2.4, April 2009

[295] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 20.14, September 2009

307. The consultants also advised MTRCL to pass potential manpower risk of the XRL Project onto contractors. In relation to tunnels, Arup and Atkins stated "*the Contract Documentation must place requirements on the Contractor to resource the works adequately…it may be considered necessary to detail specific minimum resource requirements within the Contract."* [296] Similarly, with respect to West Kowloon Terminus, Maunsell-Aedas cautioned *"it is expected that tenderers will impose a high premium to account for the need to mobilise large amounts of plant, equipment and human resources to deliver the program."* [297]

308. Consistent with the consultants' recommendations on manpower risk of the XRL Project, the following clauses could be found in MTRCL's Conditions of Contract for Civil Engineering and Building Works Construction in Relation to the Express Rail Link Entrustment Agreement:

    - **Clause 10.1:** *"The Contractor shall with due diligence…proceed at all times with the Execution of the Works with expedition and without delay [and] subject to the provisions of the Contract provide all labour, including the supervision thereof, Contractor's Equipment, Plant and Materials."*

    - **Clause 47.1**: *"The Contractor shall make his own arrangements for the engagement of all labour local or otherwise skilled and unskilled as may be required for the Execution of the Works…"*

    - **Clause 47.3**: *"If the Contractor is unable to obtain all the skilled and unskilled labour required…by employing residents of Hong Kong he shall make his own arrangements to obtain suitable persons outside Hong Kong and shall obtain the approval of the Immigration Department for the employment of every such person."*

309. We have not established whether the clauses identified above were included by MTRCL in response to the consultants' recommendations on manpower risk or commonly employed by MTRCL as part of its normal contract conditions.

310. Table 15 below summarises the risk ratings reported by Arup, Atkins and Maunsel-Aedas prior to Project commencement, and compares these ratings with those adopted by MTRCL in its risk register of January 2010, at the start of the Project.

311. Across all consultants and MTRCL, there was agreement that the consequence of risk occurring in relation to shortage of labour was "major," indicating a potential financial impact of HK$ 100 million to HK$ 1 billion.

312. The consultants reported varying likelihood of occurrence, ranging from >10% to >50%. MTRCL's adopted a likelihood of "unlikely", representing a likelihood of >1%.

313. MTRCL's significantly lower assessment of the likelihood of the risk made reference to a number of mitigation controls, namely: [298]

[296] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structure (North)– Deliverable No. 2.1D, Works Programme – Revision A, Section 8.4, May 2009

[297] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.4B, Civil and Structural Scheme Design Report, Section 20.14 , September 2009

[298] MTRCL's XRL Project Delivery Risk Register, reference C.1, 31 January 2010

- Divisional recruitment effort (internal resources);
- Use Division 2 Contractors for Drill and Blast tunnelling;
- Cooperate with MinesD on forecast usage of Drill and Blast tunnelling expertise;
- Streamlined training processes;
- Industry consultation;
- Imported labour;
- Women engineers in tunnels; and
- TBM crews from the Mainland on C826.

	Arup (March 2009) [299]	*Atkins (March 2009)* [300]	*Maunsell-Aedas (September 2009)* [301]	*MTRCL (31 January 2010)* [302]
Area	Tunnels	Tunnels	WKT	Project
Acknowledgement of competition for skilled construction expertise	Yes	Yes	Yes	Yes
SRA to reflect impact on initial time estimate	None	None	None	None
Limited availability of skilled labour				
Initial Risk	P1	P1	P2	P2
- Likelihood rating	5	5	4	4
- Consequence rating	2	2	2	2
Current Risk	P2	P1	P3	P3
- Likelihood rating	4	5	3	2
- Consequence rating	2	2	2	2

Table 15: Summary of manpower risk rating by MTRCL, Arup, Atkins and Maunsell-Aedas prior to EA2

MTRCL's response to manpower shortages

[299] Consultancy Agreement No. C803, Express Rail Link – Detailed Design for Tunnels & Associated Structure (North)– Deliverable No. 2.3A, Project Delivery Risk Register, Appendix D, reference C45, March 2009

[300] Consultancy Agreement No. C802, Express Rail Link – Detailed Design for Tunnels & Associated Structure (South)– Deliverable No. 2.3A, Project Delivery Risk Register Update, Appendix A, reference C41, March 2009

[301] Consultancy Agreement No. C801, Express Rail Link – Detailed Design for West Kowloon Terminus – Deliverable No. 2.3D, Update of Project Risk, Appendix A, reference C.1, September 2009

[302] MTRCL's XRL Project Delivery Risk Register, reference C.1, 31 January 2010

314. In July 2010, TC Chew commented *"local construction workers might be a concern in future and the Company [MTRCL] was working with the industry and Government on identifying any areas where shortages could be mitigated.*" [303]

315. MTRCL collaborated closely with the Hong Kong Construction Association and the Construction Industry Council to spread awareness of available opportunities as well as to attract newcomers. MTRCL was also active in organising recruitment events like job fairs and exhibition panels. [304]

316. Specifically, in June 2010, MTRCL joined the pledge with the Construction Industry Council Training Academy to support an "Enhanced Construction Manpower Training Scheme" which was designed to attract newcomers into the construction industry. [305] MTRCL further reached-out to the market by hosting two labour fora with contractors in June and August 2010, participating in the Construction Industry Fun Fair organised by the Construction Industry Council in July 2010, and hosting large-scale job fairs in February and October 2011. [306]

317. In March 2012, there were already indications *"contractors might apply for importing foreign workers in light of the labour shortage."* [307]

318. In March 2013, TC Chew shared with Highways Department, Transport and Housing Bureau and other MTRCL senior members *"there was in general a labour shortage of about 10% to 15% across the on-going projects and [MTRCL was] tackling the issue by several ways, including contractors' resources re-organization, provision for on-the-job training and application for labour importation under the Supplementary Labour Scheme."* [308]

319. It is unclear from the documents we have had sight of as to the extent to which the Supplementary Labour Scheme was successfully implemented in the early stages of the Project.

320. It is understood that Contract 826 had always anticipated importing Mainland Chinese labour. [309] This process was understood to have been lengthy, with the contractor warning in May 2010 "*JV's for China staff and workers may cause delay to the commencement of works.*" [310] By June 2012, the Contractor continued to express concern that "*documentation requirements for Contractor's China workers may cause delays to commencement of the works including potential immigration department restrictions*." [311] By June 2013, the approval process was not yet complete and MTRCL reported in its XRL Progress Report presented at the Project Supervision Committee's XRL Project Meeting that "*an approval for the Mainland labour*

[303] MTRCL Board Meeting minutes, 9 July 2010

[304] 1st, 2nd and 3rd Half-yearly Report for the Period ending 30 June 2010, 31 December 2010 and 30 June 2011 to the LegCo Railways Subcommittee

[305] 1st Half-yearly Report for the Period ending 30 June 2010 to the LegCo Railways Subcommittee

[306] 2nd, 3rd and 4th Half-yearly Report for the Period ending 31 December 2010, 30 June 2011 and 31 December 2011 to the LegCo Railways Subcommittee

[307] Project Supervision Committee XRL Project Meeting minutes (No. 22), 30 March 2012

[308] Project Supervision Committee XRL Project Meeting minutes (No. 32), 1 March 2013

[309] MTRCL's XRL Project Delivery Risk Register, reference C.1, 31 January 2010

[310] Contract 826 Contractor's Monthly Report No. 2, 5 May 2010

[311] Contract 826 Contractor's Monthly Report No. 27, 5 June 2012

application under the Supplementary Labour Scheme is urgently required." [312] The Labour Department approved the application in August 2013.

321. More recently, in 2014, there is evidence of further demands by MTRCL to adopt the supplementary Labour Scheme. In the Project Supervision Committee's XRL Project Meeting dated 28 February 2014, Simon Tang (General Manager of XRL Tunnel works) mentioned that MTRCL was "*working with [the Development Bureau] and [Construction Industry Council] on streamlining the process of application for labour importation through the Supplementary Labour Scheme (SLS)… if the streamlining proposal was endorsed by Labour Advisory Board (LAB), the contractors intended to submit SLS applications for about 400 nos. of workers under the XRL project mainly on E&M trades."* [313] Similarly, in the Project Supervision Committee's XRL Project Meeting dated 7 May 2014, Alex Chan (Highways Department - Chief Engineer/Railway Development) continued to stress *"the labour resources should be increased to boost the production rate."* [314]

322. MTRCL did not adjust its risk ratings in its risk registers in response to the labour shortage reportedly materialising (see Table 16). The current risk likelihood remained at "unlikely," representing >1% probability of occurrence, and the consequential severity remained at "major," indicating a financial impact of around HK$ 100 million to HK$ 1 billion. There is no evidence of the time impact of labour shortage being considered by MTRCL until its Schedule Risk Assessment of June 2013, which remains optimistic about production rates despite referencing labour shortages.

	31 January 2010	***22 January 2011***	***17 January 2012***	***23 January 2013***	***27 January 2014***
Limited availability of skilled labour					
Initial Risk	P2	P2	P2	P2	P2
- Likelihood rating	4	4	4	4	4
- Consequence rating	2	2	2	2	2
Current Risk	P3	P3	P3	P3	P3
- Likelihood rating	2	2	2	2	2
- Consequence rating	2	2	2	2	2

Table 16: MTRCL Project Delivery Risk Register for the XRL Project [315]

323. The M&V Consultant had also been monitoring the availability of skilled labour risk and periodically reporting to MTRCL in its systematic risk assessment register. As presented in Table 17, the M&V Consultant had raised its skilled labour shortage risk rating over time, between 22 March 2011 and 17 December 2013, as the risk was materialising – particularly over

[312] Project Supervision Committee XRL Project Meeting minutes (No. 36), 28 June 2013
[313] Project Supervision Committee XRL Project Meeting minutes (No. 43), 28 February 2014
[314] Project Supervision Committee XRL Project Meeting minutes (No. 45), 7 May 2014
[315] MTRCL's XRL Project Delivery Risk Register, 31 January 2010, 22 January 2011, 17 January 2012, 23 January 2013 and 27 January 2014

a few critical areas. [316] The risk ratings were calculated based on the M&V Consultant's own risk algorithm, where a higher figure indicates greater risk.

	WKT Foundation [317]	*Obstruction Removal* [318]	*TBM Tunnels (Urban)* [319]	*TBM Tunnels (Rural)* [320]	*D&B Tunnels*[321]	*C&C Tunnels*[322]	*WKT Civil* [323]
Availability of skilled labor							
22 March 2011	13	39	133	133	189	45	119
4 May 2011	70	90	120	120	234	50	154
7 November 2011	70	54	120	120	168	50	154
23 May 2012	70	90	120	120	120	50	198
7 November 2012	70	126	120	120	168	50	198
17 January 2013	70	126	120	120	168	50	198
8 July 2013	70	90	120	168	168	50	198
17 December 2013	14	54	72	120	120	50	198

Table 17: The M&V Consultant's Systematic Risk Assessment Register [324]

4.3. Procurement and Movement in Project Cost

324. During the procurement of contracts for the delivery of the Project, MTRCL has stated that it saved significant amounts over its budget expectations due to market conditions, and these savings supplemented the contingency of the Project. [325]

325. This Section sets out relevant facts relating to the savings made during procurement and aims to review:

- The key reasons that procurement savings were achieved and whether MTRCL had visibility of likely savings at the time it agreed to EA2; and

[316] Critical areas of relevance include: *TBM Tunnels (Rural)* – Contract 823A, Contract 825 and Contract 826; *D&B Tunnels* – Contract 821, Contract 822 and Contract 824; and *WKT Civil* – Contracts 810A and Contracts 810B

[317] Includes C803A, C803B, C803C and C803D

[318] Includes C802 and C805

[319] Includes C820 and C821

[320] Includes C823A, C825 and C826

[321] Includes C821, C822 and C824

[322] Includes C811A, C811B and C823B

[323] Includes C810A and C810B

[324] The M&V Consultant's Systematic Risk Assessment Register, 22 March 2011, 4 May 2011, 7 November 2011, 23 May 2012, 7 November 2012, 17 January 2013, 8 July 2013 and 17 December 2013

[325] 2nd Panel Meeting with Steve Griffin, 14 August 2014

- How these procurement savings have impacted on MTRCL needing to go back to Government for an increase in the Project Control Total under EA2.

Key reasons for savings against cost estimates

326. MTRCL's set a baseline cost budget in its Project Control Group Paper of 23 February 2010, in which it reported an estimated cost of HK$ 57.7 billion [326] and contingency of HK$ 2.55 billion.[327] This budget was one of several estimates reported around the time that EA2 was signed, and was stated as being a reconciliation between MTRCL's estimates prior to EA2 and the Project Control Total set out in EA2 in January 2010.

327. We have not had sight of the detailed workings behind this budget or of MTRCL's estimates prior to EA2. It is consequently unclear whether MTRCL's budget held contingencies in its base costs in addition to the explicit HK$ 2.55 billion [328] contingency outside of base-costs. A study by Jacobs China Limited prior to EA2, although likely to have been undertaken on a different estimating basis, indicated that the budget held around 10% contingency.[329]

328. MTRCL has reported [330] that it achieved significant savings primarily due to the prevailing market conditions at the time, reflective of contractors' appetites for work at the time, rather than through any intentional exclusions of scope from the contract packages at the time of award.

329. We have reviewed a sample of 49 major contracts that represent 96% of all the contracts awarded in terms of their initial baseline cost budget of 23 February 2010. [331] The analysis presented in the rest of this Section is based on this sample.

330. When contracts were awarded to contractors, MTRCL updated its Estimated Final Cost forecasts accordingly, adopting an Initial Contract Control Total in its forecasts for all contracts, on top of which it periodically (monthly) added potential and actual changes to each contract. In some instances, potential changes were included in the Estimated Final Cost forecast at the time of contract award. These are thought to represent instances where it was known at the time that the

[326] Project Control Group Paper, 23 February 2010: Included HK$ 400 million related to Enabling Works within KSL. These have been excluded from our analysis for consistency, as MTRCL excluded this value from March 2010. EA1 scope of HK$ 123 million from Other Construction Costs is excluded.

[327] Project Control Group Paper, paragraph 3.6, 23 February 2010: The total contingency amount (EA1 and EA2) is HK$ -- million as presented in this Project Control Group Paper. Our review of MTRCL's XRL Monthly Design/Construction Cost Report – February 2010 shows that contingencies are HK$ -- million and HK$ 2,548 million for EA 1 and EA2 respectively.

[328] Refer to paragraph 246 in this report

[329] Refer to paragraph 244 in this report

[330] 2nd Panel Meeting with Steve Griffin, 14 August 2014

[331] Major contracts that are referenced in this subsection represents 96% (HK$ 55,221 million / HK$ 57,665 million) of the total February 2010 baseline cost budget and consist of: (a) 40 major contracts as identified in the document titled "XRL – List of Major Contracts Awarded (Awarded contract sum value > HK$ 50 million)" provided by the Panel in August 2014; and (b) 9 additional contracts which initial estimates (Project Control Group Paper, 23 February 2010) are grouped with one of the major contracts listed on XRL – List of Major Contracts Awarded. In terms of initial estimates, the 49 major contracts represent 96% of all the contracts awarded in terms of their initial baseline cost budget of 23 February 2010. The original 40 major contracts are as follow: 802, 805, 820, 821, 822, 823A, 823B, 824, 825, 826, 830, 803A, 803B, 803C, 803D, 810A, 810B, 811A, 811B, 815A, 815F, 816A, 816B, 816C, 816D, 840, 841A, 841B, 843, 846, 847, 848, 849, 850, 851, 852, 853, 855, 856, 861A. The additional 9 contracts are as follow: 812, 815B, 815C, 815D, 841C, 861, 861B, 861C, 861D.

Initial Contract Control Total did not account for all scope or costs that were anticipated for a contract. MTRCL has stated that the EFC immediately after contract award does not take account of all Provisional Sums and price fluctuation adjustments and that these were included as EFC at a later time.

331. The sum of the Initial Contract Control Totals for the sample of 49 contracts stated above was HK$ 41.5 billion, HK$ 13.7 billion below the HK$ 55.2 billion in the baseline cost budget of 23 February 2010.

332. We have not been able to determine the savings due to market prices. Although the difference between MTRCL's Forecast costs (Estimated Final Cost) immediately prior to and immediately after contract awards could be indicative of such savings, MTRCL has advised that the Estimated Final Costs immediately after contract awards do not account for all Provisions sums and price fluctuations.

333. There is evidence that at the time contracts were awarded, MTRCL allowed for potential changes in its Estimated Final Cost forecast of approximately HK$ -- billion.[332] In some instances, this represents scope that was intentionally held back at the time of contract award. Our review of Contract 810A as a sample reveals that the most significant allowances were for work that would be executed later in the Project. [333]

334. We do not have visibility as to whether the strong market appetite had been anticipated in MTRCL's baseline cost budget or initial estimates.

335. In January 2010 alone, the same month as EA2 was signed, MTRCL awarded six major contracts. [334] MTRCL's Estimated Final Cost forecasts immediately after award was HK$ -- billion [335] less than its Estimated Final Costs forecasts immediately prior to award. We have not been able to determine whether this difference was due to market savings alone, or other factors. Although we do not have sight of the dates on which these tender prices were opened by MTRCL, it is likely that MTRCL had some indications at the time of signing EA2 that market prices may be lower than its estimates.

336. We understand that all contracts were tendered competitively and the majority of major civils contracts:[336]

- Required MTRCL to provide detailed designs to the contractors for most assets;
- Were lump sum, meaning the contractors committed aggregate prices to undertake the agreed scope of work and cover all risks accepted by the contractors; and

[332] This is calculated as follows (for the 49 contracts): [Difference between EFC immediately after contract award and initial contract control total] = [HK$ -- billion - HK$ -- billion] = HK$ -- billion

[333] MTRCL's XRL Monthly Design/Construction Cost Report, October 2011: The biggest potential change on Contract 810A is "*expenditure of prime cost sums for JSSC works – conglomerate stone floor and wall cladding, metal wall cladding, suspended ceilings and internal glazing"* with an estimated cost of HK$ -- million.

[334] XRL – List of Major Contracts Awarded (Awarded contract sum value >$ 50M), January 2010: The six contracts awarded in January 2010 are: 802, 805, 825, 803A, 803C, 803D.

[335] Based on the cumulative change in the EFC (the difference between MTRCL's forecast costs at immediately prior to and immediately after contract awards) due to the award of the 6 major contracts.

[336] Meeting with MTRCL, 15 October 2014

- Were fixed-price, meaning that the contactors' prices were not subject to fluctuations in the market prices of labour and/or materials.

Impact on the need to go back for increase in Project Control Total

337. From the time of the baseline cost budget in February 2010 up to May 2014, incurred change [337] on the 49 major contracts had totalled HK$ 9.29 billion. [338] In May 2014, prior to MTRCL making an announcement that the cost of the Project would exceed the Project Control Total in EA2, MTRCL were reporting forecast risk (P90) of HK$ 3.85 billion. The combined total represented about 23.79% [339] of MTRCL's initial baseline cost budget and is broadly in line with MTRCL's initial estimates in April 2009, prior to EA2, of --% contingency. [340]

338. Had the market not provided savings over MTRCL's baseline cost budget, and contractor prices had been consistent with MTRCL's budgets, the contingency of HK$ 2.55 billion [341] in its budget of February 2010 would have been fully used early in the Project and by approximately April 2012 since the cumulative change in overall Estimated Final Cost due to change/potential change between January 2010 and April 2012 would have exceeded that contingency amount. [342]

339. Between the time of the award of contracts and May 2014, change had occurred on the Project so as to increase the Estimated Final Cost by approximately HK$ 9.0 billion. This equates to 20% [343] of the Estimated Final Cost immediately after contract awards. It is unclear what proportion of this HK$ 9.0 billion was foreseen by MTRCL and provided for in the risk (P90) allowance, or what was unforeseen. Figure 8 in Section 2.2.1 indicates that changes in Estimated Final Cost are funded largely by Risk (P90) contingency.

340. The total change that has occurred and the risk that is forecast to occur from contract awards to the end of the Project equates to 29.6% [344] of the Estimated Final Cost at the time of award.

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[337] Incurred change refers to both instructed change to contractors and specific potential change that have been identified and quantified but not yet instructed, and these will cover risk mitigations, delay recovery measures, escalation, design changes, variations and additions to contract scope, amongst other possibilities.

[338] This is calculated by (for the 49 contracts): [(difference between EFC immediately before and after contract award + difference between baseline cost budget and May 2014 EFC)] = (HK$ -- billion - HK$ -- billion) = HK$ 9.29 billion

[339] This is calculated by (for the 49 contracts): [(difference between EFC immediately before and after contract award + difference between baseline cost budget and May 2014 EFC + Risk (P90)) / initial baseline cost budget of the 49 contracts] = [(HK$ -- billion – HK$ -- billion + HK$ -- billion) / HK$ 55.22 billion] = 23.79%

[340] Project Control Group Paper, Appendix A3, 8 April 2009: -- % contingency is shown

[341] MTRCL's XRL Monthly Design/Construction Cost Report, February 2010

[342] Cumulative change in EFC due to change/potential change of approximately HK$ -- billion in April 2012 (combined change in EFC in April 2012 of HK$ -- billion – difference between EFC immediately prior to and immediately after major contract awards between January 2010 and April 2012 of HK$ -- billion = HK$ - billion) exceeded the budget contingency (per February 2010 baseline cost budget) of HK$ 2.55 billion. Note that this analysis treats Provisional Sums and price fluctuations (that MTRCL has stated were excluded from EFC after award) as change/potential change.

[343] This is calculated by (for the 49 contracts): (sum of the differences between EFC immediately after award and EFC as at May 2014 for the 49 contracts / sum of EFC immediately after contract award for the 49 contracts) = HK$ 8.99 billion / HK$ 44.34 billion = 20%

[344] This is calculated by (for the 49 contracts): [(difference between EFC immediately before and after contract award + difference between baseline cost budget and May 2014 EFC + Risk(P90) as at May 2014) / EFC immediately after contract award] = [(HK$ -- billion - HK$ -- billion + HK$ -- billion) / HK$ 44.34 billion] = 29.6%

341. Figure 15 illustrated the cumulative change in Estimated Final Cost, overall physical progress, risk (P90) and overall contingency over the period of January 2010 to May 2014.

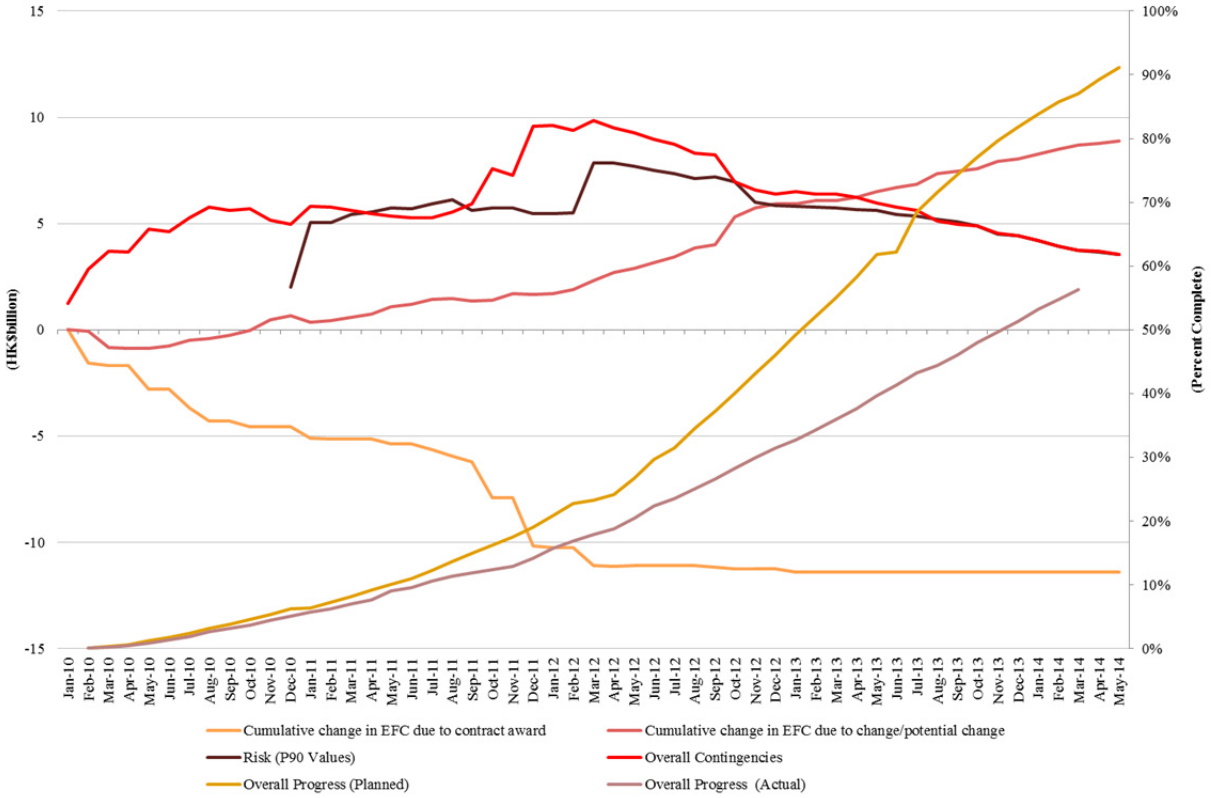

Figure 15: Cumulative change in EFC, physical progress, P90 risk and overall contingency [345]

4.3.1. Case Study on the Impact of Procurement and Occurrence of Change and Risk on Contract 810A

This Case Study on the Impact of Procurement and Occurrence of Change and Risk on Contract 810A has been redacted for reasons of commercial sensitivity.

[345] MTRCL's XRL Monthly Design/Construction Cost Reports, December 2010 thereafter: Risk is not shown as part of the Project Cost Estimate for EA2 (Summary)

This Case Study on the Impact of Procurement and Occurrence of Change and Risk on Contract 810A has been redacted for reasons of commercial sensitivity.

This Figure on Change in cost for Contract 810A (contract awarded in October 2011) has been redacted for reasons of commercial sensitivity.

Figure 16: Change in cost for Contract 810A (contract awarded in October 2011)

4.4. Project Controls

4.4.1. Lloyd's Register's Recommendations and the Entrustment Agreement

346. The 2008 Lloyd's Register Report made a number of recommendations in relation to MTRCL's project management of the Project. [346] This Section of the report will summarise these recommendations and subsequently consider whether they were reflected in the EA2 between MTRCL and Government, seeking to identify any gaps that may exist.

347. The Lloyd's Register Report noted "*one area of concern regarding the concession approach is with respect to which procedures, MTRCL or Government, would be used to deliver the railway project."* [347] It goes on to state 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.*" [348]

348. The 2008 Lloyd's Register Report recommended "*Government should give approval for MTRCL to follow their internal project management procedures with adaptations to allow Government*

[346] Lloyd's Register Report, Section 11, Recommendations, 24 April 2008
[347] Lloyd's Register Report, Section 1.1.4, 24 April 2008
[348] Lloyd's Register Report, Section 1.1.5, 24 April 2008

representation in key control processes such as tendering, cost and change control. Agreements reached should be referenced in the entrustment agreement." [349]

349. More specifically, the 2008 Lloyd's Register Report recommended "*as the Government still retains ownership of the risk, clear oversight and approval is required of those funds managed on the Governments[sic] behalf by MTRCL. It is proposed [...] that this is achieved by integrating Government representation into MTRCL processes. [… T]he key points are as follows*:

    - *Government representation on the MTRCL Executive Tender Panel;*
    - *Access and co-operation for monitoring and verification activities, including real time review and comment on C forms;*
    - *Consideration of Government representation at the Project Control Group meeting, as a minimum, Government should be invited to present objections to MTRCL C forms when necessary;*
    - *Monthly presentation of cost data for retrospective approval by Government, within the authorised expenditure;*
    - *Maintain requirement for Government's prior approval for changes impacting upon the project scope or authorised expenditure; and*
    - *Maintain established Government processes for changes initiated by third parties or other external influences."* [350]

350. The above recommendation is reflected in the Entrustment Agreement, it requires *"in performing its obligations under this Agreement the Corporation shall […] act in accordance with the Corporation's management systems and procedures, as such may be amended from time to time, in each of the following areas:*

    - *Organisation and management responsibilities;*
    - *Project management and control;*
    - *Relevant project management and procurement procedures […];*
    - *Commercial settlement procedures; and*
    - *the appointment of external legal advisers […]*

    a copy of each of which shall be provided by the Corporation to Government on request." [351]

351. In relation to Cost Management, the 2008 Lloyd's Register Report stated that "*MTRCL should hold and manage the project contracts.*" [352] This requirement is reflected in the Entrustment

[349] Lloyd's Register Report, Section 11, Recommendation 1, 24 April 2008
[350] Lloyd's Register Report, Section 1.6.7, 24 April 2008
[351] EA2, Clause 4.6, 26 January 2010
[352] Lloyd's Register Report, Section 11, Recommendation 29, 24 April 2008

Agreement, which requires that "*In performing its obligations under this Agreement the Corporation shall let all contracts with Third Parties under the Corporation's conditions of contract.*" [353]

352. Regarding processes relating to Commercial Settlement, the 2008 Lloyd's Register Report recommended that "Requirements for Government consultation and approval of all commercial settlements and payment of incentives should be specified in the Entrustment Agreement." [354] Regarding commercial settlements, the Entrustment Agreement states that the Corporation should follow existing procedures for commercial settlements, and that the Corporation "shall in a timely manner consult the Project Supervision Committee in respect of any proposed commercial settlement before such settlement is considered by the Project Control Group (or such other relevant approval authority)." [355]

353. The 2008 Lloyd's Register Report made the following recommendation in relation to reporting: "*The Monthly Project Progress Report prepared by MTRCL should replicate the information submitted to the MTRCL project progress meeting. The status of the MTRCL project risk register should also be reported. The Cost report should be prepared by MTRCL and meet requirements detailed in Section 5.6.7.5*" [356] These requirements are: "*Government should give retrospective approval of changes at monthly cost report meetings. Government should ratify changes approved via the MTRCL system and included in the formal cost report made by MTRCL to Government. Details of the presentation should be agreed. The suggested content of the presentation is given below:*

- *Executive Summary Comparison with previous month of Budget, Committed Cost (contracts awarded plus approved change orders), Forecast outturn cost and payment made;*
- *Overall brief narrative of movements since last report;*
- *List of contracts awarded since last cost report;*
- *List of change orders (C-Form) approved since the last cost report;*
- *List of change orders raised but pending approval;*
- *List of claims and other notifications received since last report;*
- *List of any special provisions made for anticipated changes or possible claims since last report;*
- *List of tenders received since the last report compared to budget and anticipated date of award;*
- *Cost Centre Financial Summary;*

[353] EA2, Clause 4.6, 26 January 2010
[354] Lloyd's Register Report, Section 11, Recommendation 39, 24 April 2008
[355] EA2, Clause 4.6, 26 January 2010
[356] Lloyd's Register Report, Section 11, Recommendation 40, 24 April 2008

- *Updated Cash Flow forecast; and*
- *The cost presentation should be capable of being supported in detail for each cost element within each cost centre if so required."* [357]

354. The requirements for reporting as set out in the Entrustment Agreement stated "*the Corporation agrees to provide to Government, by the end of each calendar month, a report on the Entrustment Activities which were carried out in the immediately preceding calendar month*" [358] and goes on to say that this report "*shall be in a format agreed between Government and the Corporation and shall include, without limitation, the items listed in Part I of Appendix G.*" [359] These items are:

    - the Cashflow Forecast prepared by the MTRCL;
    - MTRCL's estimate of the total amount of the Entrustment Cost (inclusive of the cost of all known and anticipated variations, contingencies, escalations and anticipated claim settlements);
    - a summary of the payments made during the calendar month immediately preceding the date of the report, together with a brief narrative in respect of such movements;
    - a summary of progress against the Entrustment Programme;
    - a list of contracts awarded during the calendar month immediately preceding the date of the report;
    - details of any other major issues arising in relation to the Express Rail Link project which the Corporation determines is relevant for the purposes of the report;
    - the Project Control Total; and

    such other information as may be reasonably required by Government. [360]

355. In relation to the tendering process, the 2008 Lloyd's Register Report recommended: "Government should review and approve the tender procurement strategy and selection criteria. The overall procurement strategy, package allocation, form of contract etc. should be established in the early stages in conjunction with MTRCL." [361] Our review of EA2 did not identify a clause relating to review and agreement of an overall tendering strategy between Government and MTRCL.

356. Regarding management of project contingency, the 2008 Lloyd's Register Report recommended: "*Agreement on the allocation and management of contingency should be reached between Government and MTRCL, based upon the allocation of risk and ability to control it. It is recommended that MTRCL is given authority to expend up to the authorised expenditure for the*

[357] Lloyd's Register Report, Section 5.6.7.5, 24 April 2008
[358] EA2, Clause 17.4, 26 January 2010
[359] EA2, Clause 17.5, 26 January 2010
[360] EA2, Appendix G, 26 January 2010
[361] Lloyd's Register Report, Section 11, Recommendation 31, 24 April 2008

project as a whole without seeking further approval from Government. The authorised expenditure would include a pre-agreed sum for contingency for the risks identified and apportioned to MTRCL for management. If contracts are awarded at less than the budgeted amount, the unspent balance will defer to the general contingency held by MTRCL. The general contingency should have a maximum limit. If by deferring monies as described this limit is exceeded the authorised expenditure should be adjusted downward accordingly." [362]

357. Our review of EA2 did not identify a clause relating to management of project contingency. The Highways Department has confirmed to us that under EA2, MTRCL is responsible for the financial management of the Entrustment Cost in accordance with their project management systems. MTRCL has full authority to manage the contingency under the Entrustment Cost or any "additional" contingency resulting from lower awarded contract prices. In addition, the Highways Department has their own contingency beyond the Project Control Total of HK$ 65 billion.

4.4.2. Independent Views of MTRCL Project Controls and Best Practice

358. We have reviewed independent assessments of MTRCL's project controls from the following sources:

- Ernst & Young report on project control systems, processes and procedures in January 2009;
- Scott Wilson Business Consultancy report on project management systems for railway projects in May 2009; and
- MTRCL Internal Audit reports from December 2012, July 2013 and December 2013.

Ernst & Young Review

359. Reporting in January 2009, Ernst & Young performed an *"Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL."* [363]

360. In the course of the study, Ernst & Young:

- *"Evaluated* [MTRCL's] *internal controls…relative to the terms of the Entrustment Agreement.";*
- *"Assessed and advised on potential internal control gaps and/or control design weaknesses."*; and
- *"Performed a process walk-through"* [364]

[362] Lloyd's Register Report, Section 11, Recommendation 35, 24 April 2008

[363] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," 22 January 2009

[364] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," Section 2.1, 22 January 2009

361. The report finds that *"Within the scope of our procedures, we did not note any significant weaknesses in the Corporation's internal controls procedures documentation or record keeping,"* [365] further noting *"we have assigned an overall rating of 'Well-Controlled'"*

362. While not reporting any significant weaknesses, the report does make some *"Low"* and *"Moderate"* priority findings and recommendations. The *"Moderate"* findings relate to:

- Lack of written procedure for cashflow forecasts preparation and approval process; [366]
- Insufficient procedures for making Government aware of risks that may cause project delay when reviewing the master programme in the early stage; [367]
- Lack of clarity regarding Operation and Maintenance responsibilities on the railway; [368]
- Procedures and standards for connection with Mainland Section not yet specified; [369] and
- Development of Project Definition Documents noted as behind schedule. [370]

363. The finding in relation to making Government aware of programme risks notes that *"Without highlighting potential risks of delay to Government in the early stage, it may cause disagreement between Government and the Corporation on the project programme,"* [371] with the report recommending that MTRCL *"set up an early warning system, which should cover the following areas:*

- *Identify all risks which may cause delay in the project programme.*
- *Inform Government in the Project Control Group Meetings."*

364. The Management Response to this recommendation states *"If that's the case, there will be presentations (audience will include Railway Development Office ("RDO")) on Project programme during which the programme risks will be presented. Also in our monthly reports to RDO, programme risks and issues are also discussed."*

[365] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," Section 2.3, 22 January 2009

[366] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 14, 22 January 2009

[367] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 20, 22 January 2009

[368] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 21, 22 January 2009

[369] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 22, 22 January 2009

[370] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 23, 22 January 2009

[371] Ernst & Young, "Evaluation of Internal Control Systems, Processes & Procedures for Railway Concession Projects: SCL and XRL," pg. 20, Detailed Finding 1.2, 22 January 2009

Scott Wilson Review

365. Scott Wilson Business Consultancy performed a *"Review of the MTR Corporation Project Management Systems for Railway Projects,"* [372] reporting in May 2009. This consisted of a review of MTRCL's PIMS documented procedures, as well as interviews with key staff. [373]

366. The overall finding of this review was that *"PIMS was found to be fit for purpose with no significant shortfalls or omissions,"* [374] achieving the highest rating of *"Good"* in the area of *"Completeness*", with the report noting that *"PIMS supports all of the principal dimensions for good project management of large capital projects."* [374]

367. The PIMS are also rated in the highest rating ("*Good*") under the category *"Robustness*", with the report noting that *"PIMS is a mature system. It is generally well regarded, has recently been reviewed by senior staff and brings together the best practice from across the MTRC."* [374]

368. In a *"Comparison with Best Practice* "category, PIMS is again rated as "Good", with the report stating *"PIMS compares well with other organisations and is rated at 8/10 on a scale of Best Practice."* [374]

369. One area where recommendations are made by Scott Wilson is in relation to Risk Management, with the report noting that *"Existing risk management processes are applied well but are predominantly qualitative and assign cost somewhat subjectively."* [375] The report goes on to state *"The application of Quantitative Risk Assessment techniques across MTRC projects is not considered to be worthwhile by MTRC. This is contrary to best practice and consideration should be given to adopting a more systematic approach to calculating contingency and risk allowances throughout the life cycle of projects."* [375]

370. The report points out that *"There is an increasing trend to use QRA to counter the tendency of project teams to be optimistic and to provide a robust and auditable rationale for the calculation of contingency allowances"* [375] and recommends that MTRCL should adopt the *"Use of QRA to determine contingencies from statistical analysis, repeated as projects pass from stage to stage."* [376]

371. The report also recommends improvements to MTRCL's reporting, advising that they adopt *"More concise reporting,"* [376] specifically *"Provide a high level summary sheet allowing a quick and comprehensive review of project status, trends in cost, programme, quality, safety, risks, stakeholder issues etc. (e.g. dashboard approach)".* [376]

[372] Scott Wilson Business Consultancy, "Review of the MTR Corporation Project Management Systems for Railway Projects: Assessment Report – Final", 8 May 2009

[373] Scott Wilson Business Consultancy, "Review of the MTR Corporation Project Management Systems for Railway Projects: Assessment Report – Final", Section 2.2, 8 May 2009

[374] Scott Wilson Business Consultancy, "Review of the MTR Corporation Project Management Systems for Railway Projects: Assessment Report – Final", Section 1, 8 May 2009

[375] Scott Wilson Business Consultancy, "Review of the MTR Corporation Project Management Systems for Railway Projects: Assessment Report – Final", Section 4.3, 8 May 2009

[376] Scott Wilson Business Consultancy, "Review of the MTR Corporation Project Management Systems for Railway Projects: Assessment Report – Final", Appendix E, 8 May 2009

372. The report also notes the lack of integration between cost and schedule functions, stating that *"Project teams monitor programme and Finance monitors cost."* and recommending that MTRCL should *"Manage programme and cost more closely."* [376]

MTRCL Internal Audit Reports

373. We have reviewed MTRCL Internal Audit Reports from December 2012, June 2013 and December 2013.

374. The December 2012 report [377] focused on reviewing *"Management of tendering process"* and *"Payment, cost control and reporting"*, concluding that *"Based on the results of our audit, we consider that the internal controls over the above key processes are generally adequate and effective."* [377] The report gives an overall rating of 4 (out of 5), noting just one minor audit finding in relation to preparation of claims reports.

375. The June 2013 report [378] focused on reviewing *"Programme development and revision"* and *"Programme monitoring and reporting."* The report gives an overall rating of 4 (out of 5), noting that *"We have observed that internal controls over the project governance, project/programme management, progress monitoring and reporting were generally adequate and effective. However audit findings were noted in respect of the following areas:*

- *Control over revision of Contract's Completion Obligations.*
- *Processes of assessing Contractor's claims and completion of a Supplementary Agreement.*
- *Standardisation of reports for progress monitoring and reporting*
- *Reporting and close out of key issues in Monthly Project Progress Meeting."* [378]

376. Specifically, audit findings relating to progress monitoring and reporting included issues with consistency of S-curve definition, noting *"The S-curve is compiled for both planned and actual progress. The overall contract level S-curve is derived from the progress of individual key activities with a weighting factor applied. We noted that the method (e.g. basis to measure works achievement and to determine weighting factor) used to prepare the S-curve have not been defined. This resulted in inconsistent methods being used to prepare contract-level S-curves for the three audited contracts."* The report goes on to state that *"Without standardising the preparation of S-curves, there is a risk that management/readers may mis-interpret the contract progress."* [378]

377. With respect to Contract 810B (one of the contracts considered in the audit sample), it was noted that the *"basis of measurement [of the S-curve] was unknown because there was no documentation on how the percentage of achievement was determined."* [378]

378. Audit findings relating to standardisation of reports noted: *"No standard format has been adopted and different information was provided in the Situation Report in the three audited*

[377] MTRCL Internal Audit Report: Audit on Express Rail Link Project, 28 December 2012

[378] MTRCL Internal Audit Report: Audit on Railways Projects Programming – West Island Line, Express Rail Link and South Island Line (East), 6 June 2013

contracts. For example, a section on causes of potential delay could only be found in the Situation Report of Contract 771." [378] The report further noted that *"Without a standardised template and interpretation guidelines, there is a risk that the key items may not be reported, or if reported, not in a uniformed and consistent basis for the understanding of readers"* [378]

379. The December 2013 report [379] again focused on reviewing *"Management of tendering process"* and *"Payment, cost control and reporting"*, concluding that *"Based on the results of our audit, we consider that the internal controls over the above key processes are generally adequate and effective."* [379] The report gives an overall rating of 4 (out of 5) noting minor audit findings "*in respect of technical assessment of tenders and the approval of the changes to the General Manager Fund."* [379]

4.4.3. Schedule Management Process

Contractor to MTRCL schedule monitoring and reporting

380. The General Specification and General Conditions of Contract Clause [380] requires civils contractors to submit to MTRCL the following:

- Preliminary Master Programme;
- Three Month Rolling Programme;
- Preliminary ABWF[381] and building services programmes;
- ABWF programme and building services programme;
- Time chainage programme; and
- Others (i.e. Utilities service programme).

381. The Preliminary Master Programme is to be submitted for approval within 60 days of the date of the Letter of Acceptance. The three month rolling programme is to be submitted within 14 days of receipt of the Letter of Acceptance. Thereafter, the contractor is required to submit a new three month rolling programme every month.

382. The General Specification for Civil Engineering Works specifies that contractors shall submit monthly progress reports to MTRCL which include a written review of progress with reference to the activities detailed on the contractors' approved programmes.

383. On this Project, contractors provided MTRCL with progressed schedules for the contract works, based on the original master programme, or the contractually agreed revised programme where an Extension of Time or time related Supplemental Agreement had been agreed between the contractor and MTRCL. These schedules provided updated forecast dates for key contract milestones, and provided a comparison with the original (or agreed) milestone dates.

[379] MTRCL Internal Audit Report: Audit on Express Rail Link Project, 17 December 2013
[380] General Specification and General Conditions of Contract Clause, December 2008
[381] Architectural Builders Works and Finishes

384. Contractors' schedules generally reported master programmes in monthly reports to MTRCL using slightly different formats as follows:

- Some schedules showed total float by activity which helps to give an indication of the critical path (i.e. activity paths with the least float). However, this was not consistently reported by contractors because some did not report total float, therefore the critical path is not clear.
- Some contractors provided a summarised updated master programme (e.g. Contract 810A), which showed summary bars rather than individual activities.
- Contractors used different Work Breakdown Structures in their schedules, and there are some instances in those contractor reports that we have reviewed where the contractor had not reported contract milestones in its programme submissions to MTRCL.

MTRCL's internal schedule controls and reporting

385. The PIMS documents set out processes and procedures relating to programme and progress management.[382] These PIMS documents sets out the procedures for establishing a Master Programme to form the framework for determining Project key dates and to be used as a baseline for future progress monitoring and reporting. These PIMS documents specify:

- The Master Programme shall be developed using Primavera software and forms a baseline for monitoring progress. The Master Programme shall be based on realistic and robust durations, and shall be endorsed by the Project Manager and Projects Director.[383]
- *"The actual progress of the works shall be reviewed monthly against the approved Master Programme. The intention is to enable early identification of variance in progress against planned and more importantly potential delay to Project Dates or any Completion Obligations so that appropriate actions can be taken immediately."*[384]
- *"Following the award of all contracts to which the Master Programme relates, the Master Programme shall be reviewed against the consultants' or contractors' programmes and revised accordingly to reflect the current intended sequence of the works."*[385]

386. MTRCL produced five integrated schedules during the course of the Project (the P6 Project Master Programmes) and these are dated January 2011, October 2011, July 2012, February 2013 and August 2013.[386] These indicated forecast completion dates for contracts. We have not seen evidence that these dates were reported as part of formal reporting. Furthermore, these P6 Project Master Programmes did not include forecast completion dates for the overall Project. We have

[382] MTRCL PIMS – Programme Management (P/08/A1), 25 February 2008
[383] MTRCL PIMS – Programme Management (P/08/A1), Section 5.3.2, 5.4.1, 25 February 2008
[384] MTRCL PIMS – Programme Management (P/08/A1), Section 6.2, 25 February 2008
[385] MTRCL PIMS – Programme Management (P/08/A1), Section 5.4.3, 25 February 2008
[386] MTRCL's XRL Project Master Programmes dated January 2011, October 2011, July 2012, February 2013 and August 2013. MTRCL explained these Project Master Programmes were not shared with the Project Team outside the XRL Project Programming Team, and these programmes were not required to be endorsed or approved.

also not seen evidence that these P6 Project Master Programmes were used as basis for monitoring or reporting.

387. MTRCL reviews contractors' reports on a monthly basis and compiles schedule information into its monthly XRL Project Reports. That report is compiled by the Project Team and issued to the Projects Director. It reports progress of the Project in the following ways:

- MTRCL reports delay (in weeks) for each contract against an original plan or target plan. However, we understand that delay is not measured by comparing planned completion dates against current forecast completion dates, but is measured by comparing actual progress to planned progress, for individual contracts. Where one contract was delayed by a preceding contract, MTRCL did not always report delays to the subsequent contract, despite delays to the subsequent contract being foreseeable.

- MTRCL does not report overall delay to the Project as a whole.

- MTRCL reports a percentage complete individually for each of its 50 [387] major contracts it has with suppliers/contractors. MTRCL also reports percentage complete for the overall Project and separately for civils works and E&M works. This is done using a cost-weighted or quantity-weighted approach. [388]

- MTRCL also monitors progress by comparing actual and planned production rates by key work in each contract. For example, MTRCL monitors planned and actual volume of excavation and volume of concrete constructed for West Kowloon Terminus contracts each month.

388. MTRCL does not, in its formal reporting (internal or external), forecast completion dates for key milestones by contract, nor does it report which contracts or Works are critical to completion of the Project. MTRCL does not formally report an integrated view as to how delays within contracts impact other contracts or the Project as a whole, nor does it report forecast completion of the Project as a whole.

389. MTRCL adopted some internal tools, in the form of intermittent time-chainage diagrams, referred to as Track Related Installation Programme (TRIP). TRIP summarises trackwork, track related systems installation, pedestrian works, as well as track related testing and commissioning activities leading to energisation of overhead lines in tunnels. TRIP was not intended to cover the full scope of the Project. Through the documents we have had sight of, the key characteristics of these diagrams are detailed below:

- MTRCL has produced two versions of time-chainage diagrams of differing levels of detail. The first, and more simplistic, tracks Degree 1 completion milestones for civils contracts, and has a window of time for follow on E&M works, testing and commissioning. The more detailed version of this diagram provides details within the

[387] MTRCL's monthly XRL Project Report, Annex C, January 2013
[388] Meeting with MTRCL, 9 October 2014

periods for E&M, testing and commissioning. We have had sight of five [389] of the simplistic version and 18 [390] of the more detailed version.

- The diagrams have been updated on an intermittent basis as and when MTRCL programmers felt it was necessary. They were not produced on a regular basis as part of normal project management and reporting practices on the Project. In respect of civils contracts, they are limited to tracking Degree 1 completion milestone dates for track-related works. They do not track completion of all Works to achieve an operational railway, such as Works for West Kowloon Terminus outside of the running tunnels within the station.

- Of those diagrams we have had sight of, the 18 detailed time-chainage diagrams [390] provide details as to how the E&M works need to be resequenced in response to delays in Degree 1 track access completion milestones for the Project. The five simplified time-chainage diagrams [389] track delays to Degree 1 track access completion milestones for the Project. They do not always indicate the impact on E&M contracts or indicate whether these delays can be overcome. For example, in the ad hoc programme presentation [391] to the Projects Director on 7 June 2013, a TRIP summary dated May 2013 was included. It did not show time for testing and commissioning for Contract 810A and indicated that track and Over-Head Line (1st and 2nd fix) was planned to be complete after completion of trial running. [392] We understand from MTRCL that the purpose of this TRIP was to demonstrate where the problem areas existed rather than forecast the overall Project completion date.

390. The circulation of the simplistic and detailed versions of these diagrams is set out below:

- Five simplistic versions [389] of the time-chainage diagram were used in internal communications from May 2013 onwards in respect of the Schedule Risk Assessments and ad hoc programme presentations carried out by the planning team. Circulation was to the Projects Director and the General Managers of the XRL Project. An uninformed reader would be unlikely to be able to infer a critical path from these diagrams.

- The 18 detailed versions [390] of the time-chainage diagrams were produced from September 2009 onwards. MTRCL has informed us that the 18 detailed versions were prepared for planning purposes and involved the E&M construction teams in their

[389] The five simplistic time-chainage diagrams have been provided from the following sources: Express Rail Link (Hong Kong Section), Programme Update, 8 May 2013 (includes three diagrams dated Original, July 2012 and April 2013); Express Rail Link Programme Status, presentation to the Projects Director on 7 June 2013 (diagram dated May 2013); and MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 November 2013 (diagram dated 31 October 2013).

[390] Eighteen detailed versions of time-chainage diagrams were dated as follows: 8 September 2009, 20 August 2010, 8 August 2010, 13 October 2010, 20 January 2011, 21 February 2011, 10 June 2011, 11 July 2012, 25, October 2011, 6 March 2012 7 December 2012, 13 March 2013, 28 March 2013, 4 June 2013, 25 July 2013, 20 February 2014, 22 May 2014 & 22 August 2014.

[391] Express Rail Link Programme Status, presentation to the Projects Director, 7 June 2013.

[392] Interview with Alvin Luk, E&M General Manager, 14 August 2014: This is contrary to information provided by Alvin Luk, who confirmed that he would never compress the nine months for testing, commissioning and trial running because it was safety critical.

development. We have not seen evidence to suggest that these were circulated or reported.

391. The M&V Consultant asked, in its issue list in April 2012, if MTRCL intended to prepare an integrated programme for West Kowloon Terminus civil works to show the overall impacts on E&M works and overall West Kowloon Terminus delay.[393] This remained on the M&V Consultant's Issue List up to March 2013, noted as needing to be kept in view. The issue was removed after March 2013. During the course of our review, we have seen no evidence that the integrated programme for West Kowloon Terminus civil works was developed by MTRCL.

392. We understand that a significant number of Delay Recovery Measures were assessed and implemented on the Project. MTRCL's internal reporting (through the XRL Project Progress Reports or any other documents we have sight of) does not list Delay Recovery Measures under consideration by MTRCL or assess the effectiveness of implemented Delay Recovery Measures. From MTRCL's reporting, it is not clear how effective the Delay Recovery Measures were at mitigating cost and time. The M&V Consultant has expressed that it was unable to determine the overall effectiveness of the Delay Recovery Measures implemented on the Project: *"There is no sign yet that the situation will improve, nor that the Delay Recovery Measures instructed and Supplemental Agreements implemented to date have started to have any meaningful impact."*[394]

MTRCL's schedule reporting to Railway Development Office and Highways Department

393. Ernst & Young reported, in its independent review of MTRCL's internal control framework in January 2009, that MTRCL had "*insufficient procedures for making Government aware of the risks that may cause project delay when reviewing master programme in the early stages*." One of the recommendations was for MTRCL to "*set up an early warning system*." In its management response to this recommendation, MTRCL stated *"[i]f that's the case, there will be presentations (audience will include Railway Development Office ("RDO")) on Project programme during which the programme risks will be presented. Also in our monthly reports to RDO, programme risks and issues are also discussed*".

394. MTRCL's primary reporting routes to Railway Development Office in respect of schedule are through the Project Supervision Committee's monthly XRL Project Meetings and Contract Review Meeting and accompanying reports. The Railway Development Office received a copy of MTRCL's XRL Monthly Progress Report every month.

395. In its XRL Progress Report presented at the Project Supervision Committee's monthly XRL Project Meetings from April 2014 onwards, MTRCL reported progress as percentage complete individually for each of its circa 50 [395] major contracts it has with suppliers/contractors contracts. MTRCL did not report this information at this forum prior to April 2014. [396]

396. MTRCL has reported quantified delays to the Project in its XRL Progress Report presented at the Project Supervision Committee's monthly XRL Project Meetings, but has not continuously done so:

[393] M&V Consultant's Issue List, pg. 10, up to 5 April 2012
[394] M&V monthly Progress Report (No.18, Volume 1 of 3), Section 2.3, March 2012
[395] Project Supervision Committee XRL Project Meeting minutes (No. 47), 27 June 2014
[396] Project Supervision Committee XRL Project Meeting minutes, Appendix A, March 2014 and April 2014

- Between August 2010 and September 2011, reports and minutes quantified delays reaching a maximum of 10 weeks to the overall Project;
- Between October 2011 and April 2013, neither reports nor minutes record any reference to delay to the overall Project; and
- From the 28 June 2013 meeting onwards, minutes indicate delays to the overall Project of 6 to 7 months for May 2013 and escalating 9.5 months for December 2013. These delays were not reflected in the corresponding written reports.

397. The XRL Progress Report presented at the monthly Project Supervision Committee meeting also provides a "time-now line" diagram to indicate the delay to key activities. It is possible, from this diagram, to identify the most significantly delayed activities. This diagram does not report the impact of these delays on the Project, or to which contract milestones the reported delay is being measured. In all Project Supervision Committee reports up to 28 February 2014, [397] the "Estimated Handover Date" on these charts remains at 04 August 2015. From 31 March 2014, [398] MTRCL indicates the Entrustment Programme in this report was '*under review'*.

398. In its briefings to the Contract Review Meetings, MTRCL provides quantified delay against contracts. No reporting on overall Project delay is provided in the briefings we have reviewed. [399] In briefings between June 2010 and August 2013, numerous bar charts with a 'time-now line' were included and the "Estimated Handover Date" or "XRL Opening" date on these charts remains at August 2015. From September 2013 no bar charts were included.

399. MTRCL's reporting to Railway Development Office does not list the Delay Recovery Measures under consideration by MTRCL or assess the effectiveness of implemented Delay Recovery Measures. Railway Development Office has sight of instructed Delay Recovery Measures at the Project Control Group meeting or through the Project Control Group papers.

400. Railway Development Office receives schedule information from the M&V Consultant. In the absence of an integrated view of the schedule from MTRCL, the M&V Consultant uses current Project progress to attempt to forecast (using a simple S-curve approach) the overall Project completion date.

MTRCL's Schedule Risk Assessment

401. Schedule Risk Assessment is an industry recognised approach to estimating the impact of risk and uncertainty on the time for delivery of a project.

402. With reference to Section 2.1 of this Report, the XRL Project has evidently experienced the following types of delay:

    - Lower productivity rates than planned;
    - Design change during the course of the delivery; and

[397] Project Supervision Committee XRL Project Meeting Report (No. 49), as at 28 February 2014
[398] Project Supervision Committee XRL Project Meeting Report (No. 50), as at 31 March 2014
[399] Contract Review Meetings - Briefings to RDO from June 2010 to June 2014.

- The occurrence of other risks and uncertainties such as ground conditions, late site access and flooding.

403. MTRCL undertook a Schedule Risk Assessment for the first time on the Project in June 2013. A Schedule Risk Assessment was further undertaken in November and December 2013. These analyses are summarised in Section 2.1.5.

404. By June 2013, MTRCL were reporting that eight out of 12 major contracts were in delay in excess of 9 months. [400]

405. In its review of MTRCL's project management systems for railway projects, the study by Scott Wilson Business Consultancy in May 2009 made recommendations in respect of statistical risk analysis and concluded that "*Opinions are split within MTR regarding the adoption of QRA techniques but comparison with best practice indicates that adoption of these should be considered. There is an increasing trend to use QRA to counter the tendency of project teams to be optimistic and to provide a robust and auditable rationale for the calculation of contingency allowances.*"

406. MTRCL's Schedule Risk Assessment was not a quantitative probabilistic assessment of schedule risk and uncertainty, but rather tested the impacts of three scenarios, namely "Pessimistic", "Most likely" and "Optimistic." Each scenario adopted different production rates for key activities. The sources of the production data for testing these scenarios was not clearly identified in the studies. There is evidence that even the pessimistic production rates were, in some cases, greater than those rates that were currently being achieved on the Project [401] and no logic was provided for the expected increase in productivity assumed.

4.4.4. Risk Management Process

407. MTRCL set out their risk management strategy in PIMS/P/04/A2, which is applicable to all MTRCL projects. MTRCL classify risk within the project environment at three levels according to the nature of their potential impact. These are:

- **Enterprise Risks** – A risk with a potentially significant impact on the corporate business (e.g. construction accident resulting in multiple fatalities, significant programme delay and media pressure on the Corporation; serious disruption to passenger services arising from works interfacing with the operating railway). [402]

- **Project Delivery Risk** – A risk with potential impact on or resulting from project delivery (e.g. late design changes resulting in additional cost and programme delay). These risks are categorised in the following risk areas (Health, Safety & Environment; Business Disruption; Business Viability; Project Complexity; Cost Over-run;

[400] Delay measured from Degree 1 original contractual milestones to MTRCL's optimistic estimated completion of the Degree 1 milestones for contracts 826, 825, 824, 823A, 823B, 822, 821, 820, 811A, 811B, 810A and 810B.

[401] Refer to paragraph 232 of this Report.

[402] MTRCL PIMS – Risk Management (P/04/A2), Section 2.1, 09 March 2012

Programme Delay; Political/ Public/ Media Pressure; Technical Difficulty; Meeting Customer Expectations; Recovery/Crisis Management. [403]

- **Operational Hazard** – A risk with a potential impact on the safety or service performance of the future or existing operating railway (e.g. infringement of structure gauge by newly installed trackside E&M equipment, leading to collision). [404]

408. Key points relating to Project Delivery Risk Management include:

- The General Manager/Project Manager shall ensure that risk management processes are adequately applied throughout the relevant project stages, in accordance with the associated Practice Notes and Operational Division Procedures. [405]

- Project delivery risks and mitigation measures shall be identified through a series of workshops and reviews, commencing in the feasibility stage. Stakeholders, with relevant expertise shall be involved in the workshops and reviews and shall include consultants and contractors, where appropriate. [406]

- Focused workshops for specific high-risk systems/contracts shall be conducted as necessary during subsequent project stages, commencing during preliminary design. [407]

- Regular reviews shall be arranged by the General Manager/Project Manager at least once per project stage, throughout the project to identify further project risks and mitigation measures and to update the identified risks. A typical project cycle would require at least one review during each of the following stages: feasibility; preliminary design and specification; detailed design; construction; testing and commissioning. [408]

- Project delivery risks shall be rated before and after mitigation, using the Project Delivery Risk Matrix, and shall be recorded and updated in the respective risk register, which shall be maintained as a summary of project delivery risk throughout the project, from feasibility stage to testing and commissioning. [409]

- Risks shall be allocated to Risk Owners for the purpose of implementing and monitoring mitigation. [410]

- Risk status reports shall be made by the Risk Owners, via one or more Risk Coordinator(s) to:

    i. The General Manager/Project Manager, in the relevant monthly progress report and meeting; and

[403] MTRCL PIMS – Risk Management (P/04/A2), Section 2.2, 09 March 2012
[404] MTRCL PIMS – Risk Management (P/04/A2), Section 2.3, 09 March 2012
[405] MTRCL PIMS – Risk Management (P/04/A2), Section 5.4, 09 March 2012
[406] MTRCL PIMS – Risk Management (P/04/A2), Section 6.3, 09 March 2012
[407] MTRCL PIMS – Risk Management (P/04/A2), Section 6.4, 09 March 2012
[408] MTRCL PIMS – Risk Management (P/04/A2), Section 6.5, 09 March 2012
[409] MTRCL PIMS – Risk Management (P/04/A2), Section 6.6, 09 March 2012
[410] MTRCL PIMS – Risk Management (P/04/A2), Section 6.7, 09 March 2012

ii. Project Control Group, via Senior Engineer – Project Risk, on a 6-monthly basis, or with a frequency agreed with the respective group. [411]

409. Similar procedures are noted for identification and management of Operational Hazards. [412]

410. Operational hazards and hazard mitigation measures shall be identified through design reviews, review of contractors submissions (i.e. system-level hazard logs, application of past project experience and formal workshops) plus:

- Hazard controllers within the team shall be assigned to monitor the status of mitigation implementation and maintain updated hazard records for assigned hazards throughout the project.
- Hazards shall be rated before and after mitigation, using the Risk Matrix for operational hazards and shall be recorded and updated in the project operational hazard log, which shall be maintained as a summary record of hazard and mitigation status throughout the project, from preliminary design to testing and commissioning.

411. The procedure for flagging and control of Enterprise-level risks is summarised as:

- General Manager/Project Manager shall ensure that relevant enterprise risks in the divisional Enterprise Risk Register are reviewed and given due consideration during preparation of the project delivery/ Design for Safety and Constructability (DSC) risk registers, and the operational hazard logs, to help ensure coverage of relevant high consequence risks. [413]
- The Project Risk Co-ordinator / Senior Engineer – Project Risk shall organise a regular meeting, on a quarterly basis, to review with the General Manager/Project Manager on any high risk items (e.g. P1/P2 risks, or severity class "Critical" or "Catastrophic") and determine whether they should be flagging up as enterprise risks. The status of the existing enterprise risks shall also be reviewed. The Enterprise Risk Matrix shall be followed. Senior Engineer – Project Risk shall arrange to submit the updated existing enterprise risks and the potential enterprise risks requiring corporate attention to the Enterprise Risk Committee (ERC). [414]

412. A procedure is also outlined in relation to design risks, stating "*A design for safety and constructability review process shall be followed in each design stage to engage competent reviewers with experience of constructing similar works to review and identify the construction risks associated with the design. All hazards identified shall be recorded in a construction hazard file for review in the subsequent design stages. These hazards shall be designed out or otherwise maintained in the construction hazard file for incorporation into the construction contracts for the contractors to manage under their safety management system.*" [415]

[411] MTRCL PIMS – Risk Management (P/04/A2), Section 6.8, 09 March 2012
[412] MTRCL PIMS – Risk Management (P/04/A2), Section 7.2 – 7.5, 09 March 2012
[413] MTRCL PIMS – Risk Management (P/04/A2), Section 9.1, 09 March 2012
[414] MTRCL PIMS – Risk Management (P/04/A2), Section 9.2, 09 March 2012
[415] MTRCL PIMS – Design Management (P/09/A2), Section 9.3, 24 January 2011

413. Regarding Risk Review during the construction period:

- "*The [Construction Manager/Senior Construction Engineer] shall continuously review and update the risk register throughout the Project life in order to mitigate the delays and minimise additional costs to the Project as a result of all potential risks associated with the works such as unforeseen ground conditions, inclement weather and specific construction method-related hazards." […]*

- *"To control and manage the outturn cost of the project, costs will be assigned to the significant risks identified in the risk review process and measures taken to mitigate them if possible. Review of the risks and budgetary figures allocated is to be undertaken at regular cost review meetings to provide control of costs and growing certainty on the outturn price*."[416]

414. In relation to reporting of risks, it is noted that the Project Control Group should "*receive the project risk summary reports and review the trend in significant project risks for the projects*" [417]

415. The procedures also describe the role of the Project Risk & System Assurance Section, which, amongst other things, "*is responsible as a centre of expertise in Project Delivery Risk Management (PDRM). This section is responsible for ensuring that full and proper consideration has been given to PDRM during design, construction and commissioning phases of new railway projects.*" [418]

416. Based on our discussions with MTRCL, [419] we understand that the following risk quantification occurs:

- Each period, contract risk registers are reviewed by the cost management team. Those risks (P90) in the register which have a cost impact are extracted for inclusion in the quantified risk register;

- On a periodic basis, the risks are reviewed and updated, and a Monte-Carlo simulation is run to generate a range of cost impacts. The risk (P90) value is recorded in the Project cost report; and

- Contingency is calculated as the budget/authority less the Estimated Final Cost and risk (P90). MTRCL do a sense check of the value of contingency by comparing it to the cost of proposed Delay Recovery Measures not yet in the programme and potential claims pipeline.

4.4.5. Completion Date Assumption and Quantification of Cost Risks

417. MTRCL calculates the cost to complete the Project on the latest available anticipated programme to complete. The cost to complete against different completion dates is not carried out as part of normal business. However, in the event that the completion date changes, MTRCL produces cost to complete calculations on the proposed changed date. Our review has not sought

[416] MTRCL PIMS – Construction Management (P/11/A3), Section 6.4, 23 March 2012
[417] MTRCL PIMS – Project Management and Control (MAN/005/A3) , Appendix C/2, 02 March 2012
[418] MTRCL PIMS – Organisation and Management Responsibilities (MAN/004/A4), Section 3.5.5, 13 April 2012
[419] Meeting with MTRCL, 15 October 2014

to identify the extent to which the cost increase announced by MTRCL on 11 August 2014 [420] is associated with its announcement (in April 2014) that the Project opening date will be delayed from 2015 to 2017.

4.4.6. Cost and Change Management Process

418. The key MTRCL document in relation to Cost & Change control is P/P&CD/003 – Project Cost Control procedure, [421] which sets out in detail the use of C-Forms for approving costs which vary from the initial Project Capital Cost Estimate.

419. These procedures are described as being to: [422]

- Identify and compare the cost of proposed changes with the Project Capital Cost Estimate and thereby enable the Corporation, with an understanding of the causes, to decide whether to accept, modify or reject the changes. Proposed changes may arise due to:
    i. Revisions to scope and/or estimates;
    ii. Amendments to design;
    iii. Transfer of items between Control Centres;
    iv. Introduction of additional works and/or new Control Centre items;
    v. Changes in rates, prices and/or quantities;
    vi. Changes in programme;
    vii. Claims; and
    viii. Alteration to the terms of Contracts and Consultancies.
- Obtain the prior approval of the Project Control Group or the Executive Committee (as appropriate) to all significant changes and thereby control each change to the Project Capital Cost Estimate.
- Obtain the retrospective approval of the Project Control Group for minor changes falling within specified cost limits and thereby control the cumulative effects of such changes on the Project Capital Cost Estimate.
- Identify and submit for approval, potential cost savings and scope alterations which can be used to offset adverse impacts.
- Provide a mechanism for the application and approval of commitment to expenditure during the post-contract stage.

[420] According to an article dated 08 September 2014 from South China Morning Post, "*the price tag for the project would increase 10 per cent to HK$71.5 billion. This did not, however, include related works such as footbridges, which would bring the new total to an estimated HK$73.5 billion"*

[421] Meeting with MTRCL, 15 October 2014

[422] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 1.2, February 2009

420. The Project Capital Cost Estimate is divided into individual Control Centres and each Control Centre has an assigned Control Total. Cost Control is related to the Control Totals as revised from time to time by authorised additions and deductions. [423]

421. Authorisation for revisions to a Control Total shall be obtained by the submission and subsequent approval of a C-Form for each individual change greater than or equal to HK$ 1.0 million. Retrospective approval only is required for changes less than HK$ 1.0 million and shall be obtained by the submission of a single C-Form when the accumulative amount reaches HK$ 5.0 million or HK$ 1.0 million, respectively, under a Construction Contract or Consultancy. [424]

422. Potential changes which are identified by Cost Controllers in monthly cost reports submitted to the Project Monthly Cost Control Meeting and subsequently included in the Monthly Project Capital Cost Estimate Report, shall be confirmed by the submission of a C-Form to the Project Control Group (and then Executive,[425] as appropriate) within one month, unless the potential change is pending further justification. [424]

423. The commencing Control Totals as derived from the approved Project Capital Cost Estimate are referred to as Initial Control Totals. After revision by an authorised addition or deduction, a Control total is referred to as the Current Control Total. Upon award of Consultancies and Works Contracts the associated Control Totals are referred to as Initial Consultancy Control Totals and Initial Contract Control Totals, respectively, and following subsequent revision by an authorised addition or deduction, a control total is referred to as the Current Consultancy Total or Current Contract Control Total. [426]

424. All changes affecting an awarded Works Contract or Consultancy require authorisation by the submission and subsequent approval of a C-Form. When the principle of a claim has been accepted, the value assessed and payment recommended, a C-Form shall be raised providing a summary report on the claim. The C-Form shall include a statement that the full claims report has been reviewed and found to be acceptable or otherwise. It should be noted that in all cases approval is required under the C-Form procedure before any payment is certified against claims. [427]

425. C-Form approval shall be obtained to any proposal under Contract to instruct delay recovery measures or to enter into a Supplementary Agreement. C-Form approval is also required for amendment to Milestone Dates or Interim Payment Schedules. [428]

426. No instruction shall be given to a Contractor or Consultant (unless the estimated expenditure is less than the authorised change limit for retrospective approvals) without C-Form approval. In the event that there is a change in the estimated value of an item for which a C-Form has

[423] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.1, February 2009
[424] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.3, February 2009
[425] Executive is as cited in the referenced Project Cost Control Procedure (P/P&CD/003); Refer to footnote 424 of this report
[426] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.4, February 2009
[427] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.11-4.12, February 2009
[428] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.13, February 2009

previously been approved in principle, then when the value is in excess of the change limit for retrospective approval, a new C-Form shall be raised to report the increase or decrease. [429]

427. C-Forms submitted to the Project Control Group or Executive [430] may be approved, noted or rejected and the relevant parties will be advised accordingly by the Cost Control Administrator, with reasons given in the event that a C-Form proposed is rejected. [431]

428. Where a proposed change is likely to have a programme implication, input and signature shall be obtained from the Projects Programming and Land Manager [432] and the C-Form input box titled "*Potential Programme or Other Effects*" duly completed to state either "*nil programme effects*" or "*programme effects – see attached comments*." [433]

429. Responsibility for initiating the C-Form process shall remain with the designated Cost Controller who shall obtain the unique C-Form Reference number from the Cost Control Administrator irrespective of the Proposer. Before submission to the Project Control Group, each C-Form proposal shall be signed by the Contracts Administration Manager, Cost Controller, Reviewer, Manager – Estimating, Cost Control & Logistics and Financial Controller – Projects. [434]

430. The Cost Control Administrator shall prepare a combined list of C-Forms to be presented at each Project Control Group Meeting and then forward the list, the C-Forms and appropriate number of copies, after all reviews have been completed, to the Secretary and to the Project Control Group at least one (1) full working day before the meeting to allow sufficient time for distribution and review by members of the Project Control Group prior to the meeting. [435]

431. The Cost Controller shall ensure that each C-Form submission is accompanied by the required information, which includes: [436]

    - The appropriate completed and fully signed C-Form;
    - A detailed description of the change including drawings and/or sketches as appropriate;
    - Reasoned argument in support of the proposal, including discussion in outline of alternatives investigated if relevant. In cases where the cost and/or programme implications of not approving a C-Form exceed the cost of the proposed variation, it is essential that this is fully addressed in the justification;
    - A cost estimate of the change in outturn prices expressed in HK$ millions to one decimal place;

[429] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.16-4.17, February 2009
[430] Executive is as cited in the referenced PIMS (P/P&CD/003); Refer to footnote 431 of this report
[431] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 4.19, February 2009
[432] Projects Programming and Land Manager are as cited in the referenced Project Cost Control Procedure (P/P&CD/003); Refer to footnote 433 of this report
[433] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 5.4, February 2009
[434] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 5.7,5.11, February 2009
[435] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 5.13, February 2009
[436] MTRCL – Project Cost Control Procedure (P/P&CD/003), Section 6, February 2009

- A list of the potential changes included in the monthly Project Capital Cost Estimate Report being dealt with under the C-Form;
- Appraisal of the likely effects on the Project Programme;
- Time scale for approval/rejection of C-Form proposal, if urgent;
- The sources from which input has been obtained shall be identified; and
- In the event retrospective approval is being sought, a statement to the effect shall be included in the description of the change on the C-Form. Where retrospective approval is sought for a change in excess of the cost change limit, the reasons are to be stated in the C-Form justification.

4.4.7. Reporting in Accordance with the Entrustment Agreement

432. As previously noted in Section 4.4.1, the 2008 Lloyd's Register Report and the subsequent Entrustment Agreement placed a series of requirements on the items to be included in MTRCL's monthly reporting to Government.

433. Table 18 lists each of the requirements found in the Entrustment Agreement in relation to the contents of MTRCL's monthly XRL Project Reports and summarises how the required information is presented in the actual XRL Progress Report presented at the Project Supervision Committee's monthly XRL Project Meetings.

EA2 Requirement [437]	**Included in actual MTRCL's monthly XRL Project Reports**
The Cashflow Forecast prepared by the Corporation.	Detailed cashflow data.
The Corporation's estimate of the total amount of the Entrustment Cost (inclusive of the cost of all known and anticipated variations, contingencies, escalations and anticipated claim settlements).	Appendix E: Summary of Cost Estimates, Expenditure and Forecast contains data on Estimated Final Cost, a summary of payments and a brief description of major changes approved in the preceding month.
A summary of the payments made during the calendar month immediately preceding the date of the report, together with a brief narrative in respect of such movements.	
A summary of progress against the Entrustment Programme.	Percentage progress included for overall project and major contracts.
A list of contracts awarded during the calendar month immediately preceding the date of the report.	Procurement summary included with details of contract awards in List of Major Contracts Awarded.
Details of any other major issues arising in relation to the XRL Project which MTRCL determines are relevant for the purposes of the report.	Brief summary included of "Areas of Concern."
The Project Control Total.	Included in Cashflow & Expenditure summary.

[437] EA2, Appendix G, 26 January 2010

Such other information as may be reasonably required by Government.	Reports also include brief updates on Site Safety, Land Matters and Community Liaison, contractual claim status, photos of site progress and tunnel progress diagrams.

Table 18: Comparison of EA2 reporting requirements with actual reporting

434. Project Supervision Committee's monthly XRL Project Meetings are chaired by the Director of Highways (controlling officer responsible for the XRL Project). They are attended by representatives of Transport and Housing Bureau and MTRCL. The purpose of the meeting is:

- To review project progress, cost, procurement activities, post tender award cost control and resolution of contractual claims; and
- To provide direction on any matters that may affect the progress of the XRL Project.

435. Discussions at the Project Supervision Committee's monthly XRL Project Meetings are based on MTRCL's monthly XRL Project Reports, which are provided by MTRCL for the members of the Project Supervision Committee in accordance with the requirements of EA2. In May 2014, this was a 109-page report, of which 26 pages are a summary narrative, supported by detailed appendices. The summary analysis includes the following:

- **Executive Summary:** The Executive Summary provides a statement of progress against plan and the programme to complete. In addition, detail of the status of critical contracts and other major contracts is provided.
- **Safety Status:** A summary of the safety status of the programme and specific contracts. Data for the prior 12 months is provided, demonstrating trends in performance.
- **Programme Status:** Detail of progress of the tunnelling and terminus works is provided, supported by physical quantities for key contracts, such as cubic metres excavated on Contract 810A. Metrics provide actual performance data only, not planned data. Further analysis of each contract is provided, reporting matters for consideration. Issues are raised in the report as factual statements, these are not supported by details of the impact and action being taken to resolve. Details are provided of the average headcount per contract that worked in the past month, no planned data is provided. The written narrative is supported by a detailed appendix, which includes XRL Project progress S-curves, measuring actual performance against the EA2 plan and the plan to complete. Appendices include planned data, allowing actual performance to be considered. Detail of delays in weeks is also provided, against the plan to complete.
- **Procurement and Contracts:** A summary of contracts procured in the month is provided. The narrative also states the change in the number of claims received. The statement does not include financial data, nor does it provide a statement of claims agreed and rejected. The narrative is supported by an appendix of contracts awarded and their award value. Summary details of claims received, assessed and awarded are provided in the detailed narrative.

- **Cashflow and Expenditure:** Short narrative is provided, stating the authority of the project and referencing the latest cashflow and expenditure data in the appendices.
- **Land Matters:** A statement of the current status of land is provided.
- **Community Liaison:** A statement of community affairs is provided by geographical area.
- **Areas of concern:** A statement is provided of new areas for concern. Statements made provide information on an issue, but they do not provide detail of the impact or remediation action.

436. The summary analysis is then followed by extensive and detailed Appendices covering:

- **A1:** Status of Entrustment Programme;
- **A2:** Physical Progress S-Curve;
- **B:** List of Major Contracts Awarded;
- **C:** Contractual Claim Status;
- **D:** Cashflow Forecast and Expenditure Profile;
- **E:** Summary of Cost Estimates, Expenditure and Forecast;
- **F:** Progress Photos; and
- **G:** Tunnel Progress Diagram.

4.4.8. Project Controls Test Event: Contract 826

437. We have reviewed Contract 826 Delay Event, [438] the delayed arrival of the two TBMs from the Mainland, to test the application of MTRCL's project management procedures, mainly:

- Risk Management process;
- Change Control process; and
- Internal MTRCL meetings.

Project Delivery Risk Register

438. Our review of the Project Delivery Risk Register considered the late arrival of the two TBMs from the Mainland. We selected the first instance this risk was recorded on the Contract 826 risk register, and how that first risk changed over time. Subsequently, we considered whether any other associated risks were recorded on the Project Delivery Risk Register and how these changed over time. We did not consider the complete risk registers and periodic changes to these.

[438] Refer to Section 2 of this report

439. The risk of the delayed arrival of TBMs from the Mainland, for Contract 826, was first identified and captured on the Project Delivery Risk Register, in December 2010. [439] The risk register described the risk as "*Late completion of the cross boundary section"* caused by *"Delay in completion of the mainland section."* The major consequences are noted as *"Programme delay in completion of Contract 826 & 830 as well as System-wide E&M."*

440. The risk is rated with a likelihood rating of 4 (denoting *"Likely; >25%; 1/1-5 yrs"*) and a consequence severity rating of 1 (denoting *"Significant: $10M - $100M"* - note that the rating system in use in the Project Delivery Risk Register does not quantify the schedule impact of risks). In accordance with the project delivery risk matrix, this gives an initial overall rating for the risk of P3 (denoting *Medium Risk – Should be mitigated if it is cost effective to do so"*). [440]

441. The risk register notes the controls for this risk as including *"apply pressure on China section," "optimize the design and shorten the drill and blast section", "regular meeting with GSG to monitor the progress",* and *"make contingency in Pway and other RS E&M tender document to allow the possible delay."* [439]

442. This risk appears in each subsequent risk register up to the last available register dated 23 June 2014. It is still noted as an open risk, and has not been modified or updated since it was first identified. The current and residual ratings of the risk are unchanged from the initial P3 rating and no notes are recorded regarding progress/status of mitigating actions. [441]

443. In addition to the risk discussed above, a further risk was included in the contract-specific section of the Project Delivery Risk Register. This risk, numbered 826-06 was added to the register on 17 April 2012 and described as relating to "Delay in Mainland section." caused by delays in launching the TBMs and slower than expected progress rates. The contractual deadlines for the arrival of the two Mainland TBMs were 29 July 2012 and 30 September 2012 respectively, with actual handover occurring on 27 November 2013 and 22 March 2014 respectively.

444. The risk is initially rated as a P2 risk, with a likelihood score of 5 and a consequence score of 1. Mitigating actions are noted which include close coordination with the Mainland contractor and escalation to Transport and Housing Bureau / Railway Development Office. Unlike the generic risk identified above, this risk entry was updated in the register. The risk rating was raised from P2 (likelihood 5, consequence 1) to P1 (likelihood 5, consequence 2) on 24 September 2013 and lowered again to P2 (likelihood 5, consequence 1) on 5 November 2013. The risk does not appear on the last risk register we reviewed, dated 19 June 2014. Instead an additional risk is included for the first time on this register, numbered 826-07, and described as relating to "Delay in Hong Kong section."

445. Within MTRCL's PIMS, it is noted that *"The SE-PR/SSAM shall generate a consolidated project delivery risk summary report from all projects, summarizing the status of high risk items*

[439] XRL Project Delivery Risk Register, Risk D3.45, 30 December 2010

[440] XRL Project Delivery Risk Register, Project Delivery Risk Matrix, 30 December 2010 – as an example

[441] XRL Project Delivery Risk Register: 21 January 2011, 26 June 2011, 23 January 2013, 24 June 2013, 13 December 2013, 28 January 2014 and 23 June 2014

(e.g. Residual P1/P2 risks, or severity class 'Critical' or 'Catastrophic').'' [442] Risk rated as P3 are not individually mentioned within the project risk summary reports.

Contract-specific Cost Risk Register

446. As well as being recorded in the Project Delivery Risk Register, quantified cost risks relating to this test event are also captured in the contract-specific cost risk register for Contract 826 included in the monthly Cost Reports.

447. Two separate risks are identified in the cost risk register corresponding to the Contract 826 Test Event. The first is described as *"Potential delay claim in Mainland Section due to outside* [the contractor's] *control"* and the second described as *"Allowance for claim for delay due to unforeseen ground and further delay in Mainland Section."* Both risks appear in the first available cost risk register for Contract 826, dated April 2013. [443]

448. Table 19 compares the generic risk from the Project Delivery Risk Register with those corresponding risks identified within the cost risk register, showing how each risk varies over time. It can be seen that while the project delivery risk is not updated after its initial identification, the quantified cost risks within the cost risk register are periodically updated, both in terms of the detailed description of the risk and the quantification values associated with it.

449. It can also be seen in Table 19 that while the cost impact of the project delivery risk (in the range HK$ 10 million – HK$ 100 million) does correspond to the total cost impact of the cost risks, the recorded likelihood is significantly higher within the cost risk register. This higher likelihood, if reflected in the Project Delivery Risk Register, would cause this risk to be elevated from a P3 (*"Medium Risk"*) to a P2 (*"High Risk"*) event. [440]

Risk Description	Notes	Date	Likeli-hood	Impact (HK$ millions)		
				Min	Most Likely	Max
Project Delivery Risk Register:						
Late completion of the cross boundary section caused by delay in completion of the Mainland section	Consequences: Programme delay in completion on Contract 826 & 830 as well as System-wide E&M.	December 2010	Rated 4 (Likely; >25%)	Rated 1 (Significant; HK$ 10 million – HK$ 100 million)		
		June 2014	Rated 4 (Likely; >25%)	Rated 1 (Significant; HK$ 10 million – HK$ 100 million)		
Contract-specific cost risk register:						
Affects arising from delay by Designated Contractors or Interfacing Contractors	Prolongation Claim due to Revised Degree 1 Completion of Tunnels (3 Months Later)	August 10	70%	5.0	9.0	12.0
		October 2010	70%	2.0	3.5	5.0
		July 2011	[Removed after this date]			
	Delay Completion of Launching Shaft at Huangguan	July 2010	70%	TBA	TBA	TBA

[442] MTRCL PIMS – Project Delivery Risk Management (PN/04-1/A2), paragraph 5.3.5, March 2012

[443] XRL Monthly Design/Construction Cost Report, Contract 826 Section – Huanggang to Mai Po Tunnels, April 2013 and June 2014

	Further Delays of 2 Months to Huangguan Shaft and Mainland Section of Tunnels	August 2010	70%	4.0	6.0	8.0
	Unforeseen Ground Conditions at TPK Shaft Allowance	May 2011	70%	4.0	6.0	8.0
	Further Delays of 2 Months - 7 Months to Huangguan Shaft and Mainland Section of Tunnels	July 2011	70%	6.0	10.5	21.0
	Further Delays of 4 Months - 8 Months to Huangguan Shaft and Mainland Section of Tunnels	March 2012	70%	12.0	20.4	24.0
	Potential delay claim in Mainland Section due to events outside contractor's control.	November 2012	70%	18.0	26.4	30.0
		August 2013	70%	16.0	18.6	21.2
		June 2014	70%	16.0	18.6	21.2
Affects arising from Claims pursuant to any clauses entitling the Contractor to claim other than clause 80 (valuation of Variation)	[No description]	January 2011	50%	10.0	17.8	36.0
	Generic Allowance	April 2012	50%	10.0	17.8	36.0
	Allowance for claim for delay due to unforeseen ground and further delay in Mainland Section	November 2012	50%	10.0	17.8	36.0
		July 2013	50%	20.0	34.05	48.1
		August 2013	50%	20.0	25.6	31.2
		June 2014	50%	20.0	25.6	31.2

Table 19: Summary of risks identified by MTRCL relating to Test Event for Contract 826

Internal MTRCL discussion

450. For a comprehensive discussion of the reporting of delays to Contract 826 by the contractor and by MTRCL to Government, see Section 3. This Section will consider only discussions recorded at internal MTRCL meetings.

451. A review of all MTRCL Board Meeting minutes and ExCom minutes identified minimal discussions within these groups regarding the delayed arrival of TBMs from the Mainland. At the ExCom meeting on 24 October 2013, it was noted in relation to the XRL Project that *"further delay has been seen in the cross-boundary construction programme as advised by the mainland contractor, and the first TBM under the latest forecast would only reach the boundary by end of November. This has posed a significant impact on the overall timetable for completing the XRL by 2015."* [444]

452. At the New Railway Projects – Half-yearly Updates for MTRCL Board Meeting on 10 December 2013, it was recorded that, in relation to the Project's progress, *"The two TBMs procured under the Hong Kong section continue to excavate north of the Shenzhen River. The progress of these two TBMs is significantly behind the agreed programme, and putting a serious*

[444] MTRCL Progress Report to ExCom, 24 October 2013

risk on the project 2015 programme." Despite this remark, the meeting concludes that *"With the current construction progress, overall master programmes of all projects could still be achieved. Various Delay Recovery Measures are in place to mitigate the delays."* [445]

Change control procedure

453. At the Project Control Group Meeting on 20 January 2011, two proposed changes relating to the Test Event for Contract 826 were submitted and approved. The first was a proposal to revise completion obligations on Contract 826 due to *"3 month deferral of TBM arrival at Boundary by Mainland Contractor."* [446] Regarding the cost implication of this change, a redacted contractor's cost estimate is described as being under review along with the statement *"The Project team will negotiate and agree with the Contractor at a mutually agreeable cost in accordance with the Contract."* [446] Regarding the programme implication of this change it is noted that *"There will be no impact on the overall XRL Project Programme."* [446]

454. The second relevant Project Control Group Paper, presented at the same meeting of 20 January 2011, is a closely related proposal relating to a *"Revision of Construction Sequence and Three Months Deferral of TBM Tunnel breakthrough by Contract 826."* [447] The paper proposes *"adoption of a revised construction sequence under which the southbound (downtrack) TBM tunnel will be constructed first followed by the northbound (uptrack) TBM tunnel and a 3 month delay in the breakthrough to the TBM shaft by Contract 826."*[447] [447] Regarding cost implication, it is noted that *"The Contractor has indicated an additional cost of HK$ 2.3M to cover disruption, resource idling and prolongation costs associated with the above changes, which is now under review."* [447] In relation to this cost estimate, it is noted that *"The Project team will negotiate and agree with the Contractor at a mutually agreeable cost in accordance with the Contract."* Regarding programme implication it is noted that *"There will be no impact on the overall XRL Project Programme."* [447]

455. It is not noted within either of the Project Control Group Papers referred to in paragraphs 453 and 454 above that these changes relate to the occurrence of a previously identified Project delivery risk. It is not noted whether the acceptance of these changes mitigates or closes out a risk on the Project Delivery Risk Register.

4.4.9. Project Controls Test Event: Contract 811B

456. We have reviewed Contract 811B Delay Event, [448] the delays associated with construction of the diaphragm walls within the West Kowloon Terminus site, to test the application of MTRCL's project management procedures, mainly:

- Risk Management process;
- Change Control process; and
- Internal MTRCL meetings.

[445] MTRCL Board Meeting minutes, 10 December 2013
[446] Project Control Group Paper, pg. 1 and 3, 20 January 2011
[447] Project Control Group Paper, pg. 1 and 4, 20 January 2011
[448] Refer to Section 2 of this report

Project Delivery Risk Register

457. The risk of delays associated with D-wall construction relating to Contract 81B was first identified and captured within the Project Delivery Risk Register, in June 2010. [449] The risk register described the risk as "*Unforeseen obstruction during D-Wall construction & piling. Bedrock harder than planned."*[449] The main causes were noted as the fact that the *"WKT area was formed by reclamation over various stages and the old seawall, piers and breakwaters might likely be left in place without removal [,] "* [449] as well as *"Conflict between as-built information and actual seawall condition along WKCD seaside footpath."* [449]

458. The potential major consequences are noted as:

- *"The presence of armour rock and corestones will impose difficulty in D-Wall & piling construction;*
- *Collapse of sidewall owing to existing loose corestones. Minor ground settlement might result;*
- *Settlement or collapse of public roads; and*
- *Programme delays."* [449]

459. The risk is rated with a likelihood rating of 4 (denoting *"Likely; >25%; 1/1-5 yrs"*) and a consequence severity rating of 2 (denoting *"Major: $100M - $1B"* - note that the rating system in use in the Project Delivery Risk Register does not quantify the schedule impact of risks.) In accordance with the Project Delivery Risk Matrix, this gives an initial overall rating for the risk of P2 (denoting "*High Risk – Should be mitigated if it is reasonably practical to do so"*). [450]

460. The risk register notes the controls for this risk as being:

- *"Mark out the possible obstruction and make known to the contractor*
- *Pre-boring/pre-excavation might be required to ascertain the extent of obstruction during D-Wall & piling construction*
- *Consider specified pre-treatment in specific areas where obstructions are close to sensitive structures."* [450]

461. The risk is noted as having a residual rating (the forecast rating after completion of mitigating actions) for likelihood of 3 (denoting *"Possible; >10%; 1/5-10 yrs"*) and for severity of 1 (denoting *"Significant: $10M - $100M"*), giving an overall residual rating of P3 (denoting "*Medium Risk – Should be mitigated if it is cost effective to do so"*).

462. Table 20 summarises the changes to this risk recorded in the Project Delivery Risk Registers over time. A review of the risk registers has identified that, while this risk is actively updated over time, the reasons for these changes in rating are not explicitly noted. MTRCL has advised that the reason for the change in rating is because mitigation actions were taken, reducing the

[449] XRL Project Delivery Risk Register, Risk D3.37, 30 June 2010

[450] XRL Project Delivery Risk Register, Project Delivery Risk Matrix, 30 December 2010 – as an example

risk rating in 2011. Further, MTRCL has advised that the risk was removed in 2013 as all works related to this risk were completed.

463. As previously noted in relation to the Contract 826 Test Event, the change in rating from P2 to P3 would have resulted in this risk no longer being mentioned within the project risk summary reports.

Register Date	Current Rating			Residual Rating			Review finding
	Likeli-hood	Severity	Rating	Likeli-hood	Severity	Rating	
June 2010	4	2	P2	3	1	P3	First appearance on register as item D3.37.
December 2010	4	2	P2	3	1	P3	Detail added to description of consequences and mitigating actions. Reference changed to 811B-01.
January 2011	3	2	P3	3	1	P3	Current rating reduced. No explanation of reason for reduced rating.
December 2012	3	2	P3	2	2	P3	Status of mitigating actions updated as completed and/or ongoing. Residual rating reduced.
December 2013	-	-	-	-	-	-	Risk removed from register.

Table 20: Summary of changes to risk relating to Contract 811B Test Event

Contract-specific Cost Risk Register

464. As well as being recorded in the Project Delivery Risk Register, quantified cost risks relating to this test event are also captured in the contract-specific cost risk register for Contract 811B included in the monthly Cost Reports.

465. From the January 2014 Cost Report, it has been possible to determine that the contract-specific cost risk register contains a risk described as *"Costs arising from extension of time for completion note tendered by DRM,"* [451] with a further note stating that the particular risk relates to *"Miscellaneous cost arising from extension of time (D-Wall)."* [451] The risk is quantified with a likelihood of 50%, a minimum cost impact of HK$ -- million, a most likely cost impact of HK$ -- million, and a maximum impact of HK$ -- million. [451]

466. This rating suggests that the risk rating in the main Project Delivery Risk Register significantly under-estimates both the likelihood and severity of this risk. The quantification observed in the cost risk register would indicate that this risk should be rated as 5 for likelihood (denoting *"Very likely; >50%;>1/yr"*) and a rating of 2 for severity (denoting *"Major; HK$ 100 million – HK$*

[451] XRL Monthly Design/Construction Cost Report, Contract 811B Section – West Kowloon Terminus Approach Tunnel (South), January 2014

1 billion"), giving an overall rating of P1 (denoting *"Very High Risk – Must be assessed as soon as possible").*

467. Had the Project Delivery Risk Register rated this risk as P1, rather than P3 (the latest observed rating), it would have gone from being not mentioned at all in project risk summary reports to being one of the top risks to the Project.

Internal MTRCL discussion

468. For a comprehensive discussion of the reporting of delays to Contract 811B by the contractor and by MTRCL to Government, see Section 3. This Section will consider only discussions recorded at internal MTRCL meetings.

469. A review of MTRCL ExCom and MTRCL Board Meeting minutes has found almost no record of discussion of this risk in either of these groups. It is noted in the ExCom meeting minutes for October 2013 that *"Mr Leong asked about the progress of the West Kowloon Terminus recovery plan and Mr Antonio Choi, General Manager – XRL, replied that there were still issues due to unforeseen complications. Mr Chew added that the new issues were being looked into and solutions would be formulated accordingly."* [452]

Change control procedure

470. At the Project Control Group Meeting on 21 April 2011, a proposal was submitted in relation to Contract 811B *"to allow smoothening of diaphragm wall alignment and rationalization of the diaphragm wall panel lengths."* [453] This technical change was requested by the contractor, and it is noted that *"there will be no additional costs arising from the Change proposal"* [453] and also that *"there is no programme implication."* [453]The submission further notes that *"The requested change will allow better utilization of the Contractor's diaphragm wall equipment, thereby enhancing the programme security on the critical diaphragm wall works."* [453]

471. A further submission to the Project Control Group in May 2011 contains a further change proposal relating to Contract 811B consisting of a *"proposal for realignment of diaphragm wall panels."* [454] It is noted that the purpose of the paper is *"to order a pre-agreed variation to Contract 811B…to adopt an alternative alignment for the diaphragm wall panels"* [454] and that *"Confirmation was obtained from the tenderer (now the 811B Contractor) that the alignment would have no effect on price and programme to its tender and the alignment was incorporated into the Contract."* [454]

472. Regarding the risk impact of the change it is noted that *"The Employer's risk contingency can be reduced. It is considered that the benefits in the reduction of the Employer's risks including, abortive works and the alignment re-design outweigh the Employer's expenditure for the Variation."* [454] Regarding programme implications, the Project Control Group submission states *"The alternative scheme will provide increased programme surety to Contract 811B, even though there is an additional activity which will take 3 weeks to complete, as the risk of delay associated with the construction difficulties and possible future re-alignment are significantly*

[452] MTRCL Progress Report to ExCom, 24 October 2013
[453] Project Control Group Paper, 21 April 2011
[454] Project Control Group Paper, pg. 1 and 3, 19 May 2011

reduced." [454] It is noted that *"A comparison giving the programme of works for the original contract scheme and the alternative scheme recommended by this Paper is detailed in Appendix B."* [454] The programme referred to consists of a very basic chart showing just three tasks for the original scheme and four tasks for the revised scheme. Durations are indicated but no actual dates are shown, and there is no indication of interactions/dependencies on other elements of the Project.

473. A further submission to the Project Control Group in September 2011 serves to:

- *"advise PCG or the delays to the southern section of Contract 811B; and*
- *seek PCG's approval to recommend to the Employer to instruct interim DRM to recover part of the delay."* [455]

474. The paper notes a 96-day delay to the Contract 811B completion and states *"At this time there is insufficient information available to assess the delay of the notified events on those parts of the Works where there is not a direct and immediate impact, the ER considers that a detailed and more meaningful assessment can only be carried out when more information becomes available as the Works progress."* [455] It is further noted that *"This proposal does not eliminate all of the delay and a review is currently in progress to identify other solutions to address the residual delay which is estimated to increase to approximately seven months."* [455] The proposal *"will allow an early start to the installation of the diaphragm wall under the existing Jordan Road and reduce the criticality of the original diversion north where delay in the installation of diaphragm wall continues."* [455]

475. Regarding the risk management/mitigation relating to this change proposal it is noted that with the implementation of this Delay Recovery Measure, the allowance included in MTRCL's risk contingency can be reduced.

476. Regarding programme implications, it is noted that a delay-impacted programme and a Delay Recovery Measure-incorporated programme are included in an appendix, which has been redacted. The paper states *"An XRL project-wide programme impact assessment has been carried out to analyse the benefit of the DRM proposed above and concludes the proposed DRM is necessary to reduce the ultimate delay predicted for the commencement of the testing and commissioning and Test Running.*" [455]

[455] Project Control Group Paper, 15 September 2011

5. Government Oversight, Supervision and M&V Consultant

5.1. Introduction

477. This Section considers the role of Government and its M&V Consultant in overseeing the delivery of the Project. Our review has sought to answer the following:

- Were the duties and obligations of each party documented?
- Were systems and processes developed by each party to fulfil their duty?
- Did the M&V Consultant raise matters of concern with Government?
- Did Government use the data available to them effectively with respect to delay?

478. We performed a review of each party:

- **Section 5.2 - Transport and Housing Bureau:** The Transport and Housing Bureau's Head of Department briefing notes to check if key matters had been communicated to Transport and Housing Bureau.
- **Section 5.3 - Highways Department**: The 2008 Lloyd's Register Report and Entrustment Agreement to determine what role was expected of respective parties. We met with members of Railway Development Office to understand what processes and procedures they followed, and what Government did with the data available to them to hold MTRCL to account.
- **Section 5.4 - The M&V Consultant:** The obligations of the M&V Consultant under the M&V Agreement to analyse the quality of the M&V Consultant's reporting. We reviewed what the M&V Consultant reported about overall Project delay, walked through its progress report in relation to Contract 811B D-wall delays and reviewed its Issue List in relation to a sample of events.

479. Our detailed findings are set out in the remainder of this Section.

5.2. Transport and Housing Bureau

5.2.1. THB Head of Department Briefing Notes

480. On a monthly basis, briefing notes are prepared by the Railway Development Office, which are approved by the Director of Highways, for discussion at the Head of Department meetings. We considered a sample of matters reported by the M&V Consultant and MTRCL to Highways Department Railway Development Office, to determine if these were escalated to the Director of Highways and subsequently discussed at the Transport and Housing Bureau's Head of Department meeting. Please see the findings of this review in Table 21.

Ref:	Event	Findings from the Head of Department briefing notes
1	**Overall delay** In March 2012, the M&V Consultant reported: "… We have not yet seen how the DRM programmes will recover the individual contracts delays or how the revised master programmes impact the overall Project Master Programme (PMP)." [456] "…Unless effective mitigation measures are implemented in the civil works contracts and special measures instructed in some of the follow-on E&M contracts, achievement of the planned Completion Date of May 2015 will remain at risk." [457] "We would strongly recommend that the MTRCL now undertakes a complete appraisal of the overall Project Programme and the current delay situation…" [458]	The matter of overall progress and likelihood of achieving the overall Project completion date was not covered. [459]
2	**Contract 826** The contractual deadline for the two TBMs to arrive from the Mainland was 29 July 2012 (TBM#1) and 30 September 2012 (TBM#2). [460]	The slow progress of the construction of the cross-boundary tunnel on the Shenzhen side was not covered. Government continue to attend weekly TBM Advisory Panel Meetings and the launch of the first TBM was recorded as being delayed to 27 June 2012. [461] The delay was not quantified and the impact on the completion date of the overall Project was not covered.
3	**Contract 810A** Between March and May 2012, the 810A contractor reported several site areas were not handed over from Contract 810B to 810A as planned. [462]	Delays on Contract 810A, or WKT, were not covered in the April [463] or May 2012 [464] THB Head of Department Meetings briefing notes.
4	**Contract 811B** In July 2011, the contractor reported that it was becoming clear that the current programme of works had reached a stage where it was of little value as a tool to manage the project. [465]	Delays on Contract 811B, or WKT, were not covered at the May 2011 THB Head of Department briefing notes. [466]

Table 21: Sample review of Transport and Housing Bureau's Head of Department briefing notes

5.3. Highways Department

5.3.1. Duties and Obligations

481. Railway Development Office set out their role in the monitoring of the design, construction and cost of the XRL Project in their presentation to the Panel on 12 June 2014. [467] In summary, their role encompasses: [468]

[456] M&V monthly Progress Report (No. 21, Volume 1 of 3), Section 2.3, June 2012
[457] M&V monthly Progress Report (No. 21, Volume 1 of 3), Section 2.3, June 2012
[458] M&V monthly Progress Report (No. 21, Volume 1 of 3), Section 2.3, June 2012
[459] Major On-going Issues Projects Under Construction, Highways Department, 16 April 2012
[460] Contract 826 Contractor's Monthly Report, master programme, August 2010
[461] Major On-going Issues Projects Under Construction, Highways Department, 4 July 2012
[462] Refer to Section 4.2.7, paragraph 103 of this report
[463] Major On-going Issues Projects Under Construction, Highways Department, 16 April 2012
[464] Major On-going Issues Projects Under Construction, Highways Department, 21 May 2012
[465] Refer to Section 4.2.7, paragraph 115 of this report
[466] Major On-going Issues Projects Under Construction, Highways Department, 11 May 2011

- **Design process:** High level review of design documents, review of design issues, and check of project cost estimate;

- **Construction process:** High level review of construction documents, monthly and ad-hoc site visits, monthly project progress updates, attendance at Project Supervision Committee's monthly XRL Project Meetings and briefing on specific construction issues; and

- **Cost-control process:** Monthly cost meeting, Project Control Group Meeting and, attendance at Project Supervision Committee's monthly XRL Project Meetings to review commercial settlements.

482. On 28 July 2014, Highways Department further described their role as: [469]

- Overseeing the overall implementation of the Project and the prudent use of public funds allocated for the Project;

- Monitoring and verifying that MTRCL properly fulfils its obligations in accordance with the Entrustment Agreements; and

- Facilitating the implementation of the Project by liaising and coordinating with MTRCL and other departments.

5.3.2. Documented Policies and Procedures

483. In order to review the design of Project Management Functions for the control of risk, cost, programme and change, we requested written documentation setting out the processes followed by Railway Development Office to fulfil their duties and obligations. The following Sections set out our findings in relation to the established/documented procedures.

Project Management

484. The Railway Development Office's detailed procedures on various tasks are detailed in ISO9001 Quality Management System Documents and various papers to the Establishment Subcommittee of LegCo. However, there appears to be no procedural manual, or equivalent, that detail Railway Development Office's duties and obligations with respect to the project management of the Project and the roles staff should perform. The basis of our programme management procedure review is derived from written responses to questions set by the Panel.

485. With respect to delays, and MTRCL's mitigation of these, Railway Development Office has stated [470] that they perform a 'check the checker' role. Railway Development Office, supported by the M&V Consultant, review proposed Delay Recovery Measures and provide their professional views to MTRCL. Where Railway Development Office are not satisfied with proposals, they require MTRCL to provide additional information to justify proposals, and possibly raise objections where appropriate.

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[467] Presentation to Independent Expert Panel on Guangzhou-Shenzhen-Hong Kong Express Rail Link, Highways Department, 12 June 2014

[468] Presentation to Independent Expert Panel on Guangzhou-Shenzhen-Hong Kong Express Rail Link, Highways Department, Part 2 Slide 14, 12 June 2014

[469] HyD's response to Panel's second batch of questions (raised on 12 June 2014), pg.2, 28 July 2014

[470] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department, response to question 12, 23 June 2014

486. Railway Development Office has stated [471] that, whenever possible, for tunnelling contracts it would carry out assessments on progress delays and production rates required to mitigate and recover delays, based on data captured at site visits and provided to Railway Development Office by MTRCL. For West Kowloon Terminus contracts, such assessments were made through information gathered during joint inspections with the M&V Consultant.

Risk Management

487. We have seen no evidence of formal documentation of Railway Development Office's duties and obligations with respect to risk management. The basis of our risk management procedure review is written responses to questions set by the Panel.

488. Railway Development Office stated [472] that in accordance with ETWB TC (W) circular No. 6/2005, systematic risk assessments for public works projects exceeding HK$ 200 million are required. As the Project is an entrustment project, risk assessments are performed by MTRCL as part of their obligation under the Entrustment Agreement.

489. In addition to MTRCL's risk management, Railway Development Office stated [473] they undertake their own risk management procedures. In addition, Railway Development Office appointed the M&V Consultant to perform systematic risk management processes in order to identify and assess the potential impact of risk on the Project. Each month, the M&V Consultant provides Railway Development Office with a schedule of critical issues. Railway Development Office reviews these with the M&V Consultant and forwards to MTRCL for review and comment. [474]

490. Railway Development Office also informs Transport and Housing Bureau of significant risks on a monthly basis. In addition, Transport and Housing Bureau attends the Project Supervision Committee's monthly XRL Project Meetings where key risks are discussed. As part of a regular monthly report, Railway Development Office submits to Transport and Housing Bureau the significant issues and risks on each of the capital projects being delivered, including XRL. A bi-monthly report is also issued to the Mega Infrastructure Projects Monitoring Committee[475], chaired by Development Bureau, setting out costs, progress and key issues. [476]

Cost and Change Management

491. In written responses to the Panel, Railway Development Office referred to MTRCL's PIMS in respect of the management of cost and change on the Project. [477]

Review meetings

[471] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department, response to question 12, 23 June 2014

[472] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department, response to question 14, 23 June 2014

[473] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department, response to question 14, 23 June 2014

[474] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department, response to question 14, 23 June 2014

[475] This meeting is not attended by THB

[476] HyD's response to Panel's follow-up questions on its first batch of questions, Highways Department, response to question 15, 10 July 2014

[477] HyD's response to Panel's first batch of questions (raised on 4 June 2014 and 9 June 2014), Highways Department Response to question 14, 23 June 2014

492. Railway Development Office undertook monitoring of the XRL Project through site visits and participation at the following meetings:

- Project Supervision Committee's XRL Project Meetings;
- Project Coordination Meeting; and
- Cost Control Meeting.

493. In addition to chairing its own meetings, Railway Development Office also attended MTRCL's Project Control Group. [478]

Meeting with Railway Development Office

494. A meeting [479] was held with members of the Railway Development Office team to discuss the activities they perform each month. Table 22 summarises the key discussion points at this meeting.

Area of discussion	Key points
Team role	The Railway Development Office team is responsible for: • Overseeing the overall implementation of the Project; • Monitoring and verifying that MTRCL fulfils its obligations under EA2; and • Facilitating the implementation of the Project. The team consists of 13 members, of which 3 are focused on risk and monitoring activities, including schedule and risk management. More than 50% of the team's time is spent on facilitating the delivery of the Project through interaction with other stakeholders. The team acknowledged they do not have written procedures. They did state that given the size and proximity of the team, this is not an issue. Each member of the team can cover someone else's work, providing cover for illness and holiday. Key members of the team do not take holiday at the same time, and detailed hand over occurs where a team members leaves the team.
Use of M&V Consultant's data	The M&V Consultant provides four key pieces of data to Railway Development Office: • Monthly progress reports; • Site visit reports; • Audit reports; and • Issue List. Each month the M&V Consultant presents to Railway Development Office a summary of the findings of their monitoring activities and key issues identified. This meeting provides an opportunity for the M&V Consultant and RDO to discuss matters of concern and update the Issue List for communication to MTRCL. All data received from the M&V Consultant is shared amongst all members of the RDO. With respect of RDO's Risk and Monitoring role, the three responsible officers review data and ensure it is consistent with their understanding of progress based on site visits and review of data provided by MTRCL. On an ad-hoc basis, the team will perform specific reviews such as forecasting the expected completion date (e.g. of Contract 826) based on actual production rates.

[478] HyD's response to Panel's second batch of questions (raised on 12 June 2014), pg.6, 28 July 2014

[479] RDO round table discussion held on 15 October 2014

Issue escalation	The small RDO team shares an office, facilitating informal transfer of knowledge. On a monthly basis, issues and concerns are shared with MTRCL via the Issue List. All of the RDO XRL team meet on a bi-weekly basis, at the Division Meeting, to discuss important XRL matters. Different RDO teams meet on a monthly basis, for example at the prayer meeting, to discuss the issues of all the on-going railway projects and those under planning. There are regular meetings between RDO and the Director of Highways on a bi-weekly basis, at the Director's meeting, where key matters are discussed. On a monthly basis, a formal briefing note is prepared for discussion at external meetings, such as the Project Supervision Committee's monthly XRL Project Meetings.

Table 22: Summary of RDO discussion on 15 October 2014

5.3.3. Performance Measures for MTRCL as a Project Manager

495. A review of EA2 [480] found no performance measures for MTRCL in its role as Project Manager.

5.3.4. Entrustment Agreement Levers

496. EA2 [481] sets out the detailed obligations of MTRCL and Government with regards to the Project, including areas such as funding, insurances, land acquisition, operation and maintenance of the XRL, consultation, monitoring and verification, termination and payment. More specifically, EA2 outlines the responsibilities and duties of the two parties for type and frequency of reporting and attendance at meetings, and makes provision for use of additional consultants to verify MTRCL's fulfilment of its obligations. However, EA2 does not provide any measurable means of assessing MTRCL's performance with respect to cost, schedule or reporting. Further, EA2 does not enable Government to intervene in the delivery of the Project if they are not satisfied with MTRCL's performance, except in the instance of a contractual breach of MTRCL's obligations whereby Government can notify MTRCL in writing of the breach (Clause 17.11) and potentially terminate the EA2 (Clause 20.3 A).

5.3.5. Reassurance by MTRCL

497. We have reviewed the minutes of the Project Supervision Committee's monthly XRL Project Meetings and noted the Railway Development Office challenging MTRCL on the progress achieved on the Project. MTRCL's responses generally indicated that through the use of Delay Recovery Measures, the delays would be recovered and the planned completion date achieved. [482] During the Panel meeting with Mr KK Lau, the Panel questioned what leverage Highways Department had to ensure that MTRCL addressed Highways Department's requests. The response received was:

    - *'HyD could provide some suggestions but could not instruct MTRCL to implement any particular measures because it would otherwise be taking over the liability of MTRCL under the EA.'* [483]

[480] EA2, 26 January 2010

[481] EA2, 26 January 2010

[482] Project Supervision Committee XRL Project Meeting minutes (No. 41), 29 November 2013: For example, upon Henry Chan's enquiry on whether the target dates for completion of all civil works and E&M works by June 2015 are achievable, Simon Tang said that the proposed timeframe was achievable.

[483] Panel Meeting minutes, KK Lau, 14 October 2014

498. During a meeting with the Railway Development Office [484], we discussed what analysis they performed to challenge the information and re-assurances being provided by MTRCL. The Railway Development Office informed us that, when they identified the Contract 826 delay as critical to the Project, they began monitoring production rates to predict an end date and to challenge and verify the data. However, similar analysis was not performed for other contracts on a periodic basis. Railway Development Office did not carry out, or request from MTRCL, analysis on the effectiveness of Delay Recovery Measures to validate the reassurances being provided by MTRCL.

5.4. The M&V Consultant

5.4.1. The M&V Agreement

499. Highways Department appointed Jacobs China Limited as their M&V Consultant to undertake risk based sampling and to confirm if MTRCL's obligations as stated in the Entrustment Agreements had been fulfilled, [485] via:

- Reviewing MTRCL's documents to identify any major risks to cost, programme, safety and quality of the Project;
- Conducting site visits;
- Monitoring progress of works against the project programme and advising of any slippages;
- Monitoring the expenditure and cost related processes including claims, variations and commercial settlements; and
- Conducting process and technical compliance audits.

500. We have performed a review of the M&V activities proposed in the 2008 Lloyd's Register Report and this was compared to the clauses included in the M&V Agreement. The purpose of this review was to ensure that, at a minimum, the final agreement between Highways Department and the M&V Consultant covered all monitoring activities suggested in the 2008 Lloyd's Register Report. This review demonstrated that the M&V agreement covered all the recommendations in the 2008 Lloyd's Register Report. [486] [487]

5.4.2. M&V Agreement Reporting Requirements

501. A review of the documents provided by the M&V Consultant in accordance with the M&V Agreement was performed. The review found all documents set out in the agreement had been received. Our review of information did not cover the adequacy of information provided, just whether relevant material was provided.

[484] RDO discussion held on 15 October 2014

[485] Presentation to Independent Expert Panel on Guangzhou-Shenzhen-Hong Kong Express Rail Link, Highways Department, Slide 16, 12 June 2014

[486] Lloyd's Register Report, pg. 2, 24 April 2008

[487] M&V Agreement, 19 August 2010

502. During an interview with members of the Railway Development Office team on 15 October 2014, the team stated they were satisfied the M&V Consultant had provided all the information required of them, and that it was appropriate for them to fulfil their role.

5.4.3. M&V Reporting of Overall Delay

503. Since October 2010, the M&V Consultant has provided Railway Development Office with a monthly 'Monitoring and Variation for Construction, Testing and Commissioning Phase – Investigation Report' ('M&V Monthly Progress Report'). The report consists of three volumes, including a monthly progress report and associated appendices. [488]

504. We reviewed the M&V Monthly Progress Report to identify the statements made with regard to the August 2015 proposed completion date.

505. From October 2011, the M&V Consultant reported to Railway Development Office concerns over the achievability of the Project's August 2015 completion date. In December 2011, the M&V Consultant reported the overall completion date was seriously under threat. In March 2012, the M&V Consultant reported that "*there is no sign nor that the Delay Recovery Measures and Supplemental Agreements implemented to date have started to have any meaningful impact*". In May 2012, the M&V Consultant recommended that *"the MTRCL now undertakes a complete appraisal of the overall Project Programme and the current delay situation."* In May 2014, prior to MTRCL issuing the revised programme to complete the Project, the M&V Consultant reported a projected 12.5 month delay to the original EA2 Programme. [489]

5.4.4. Test Event: M&V Reporting of Contract 811B diaphragm-wall delays

506. Contract 811B included the construction of diaphragm walls on the east and west side of the associated West Kowloon Terminus site. Delays to the diaphragm walls were selected as a Significant Delay Event for further review. With respect to reporting by the M&V Consultant, we have considered quarterly reports from September 2010 and ad-hoc months identified as important in our Significant Delay Event review. Our review considered reporting of progress on Contract 811B and the impact of delays on the overall Project.

507. The M&V Consultant reported diaphragm wall delays in January 2011, noting that the works in December 2010 were behind schedule. The M&V Consultant noted the delay was not a major concern and that a study concerning Jordan Road had commenced. [490]

508. In February 2011, the M&V Consultant quantified the delay as at January 2011 for Contract 811B and reported that the initial delays varied between 1 and 4 weeks, but these were not deemed significant. The M&V Consultant noted in their technical and financial audit on 20 January 2011 that MTRCL had advised that the contractor was 1 to 2 weeks behind the critical path. [491]

[488] M&V monthly Progress Report (No. 46, Volume 1 of 3), July 2014
[489] M&V monthly Progress Report (No. 46, Volume 1 of 3), July 2014
[490] M&V monthly Progress Report (No. 4), Section 4, January 2011
[491] M&V monthly Progress Report (No. 5), Section 4 and 5, February 2011

509. The M&V Consultant reported in April 2011 that the overall progress of Contract 811B was 5.5 weeks behind schedule. Furthermore, the M&V Consultant reported an emerging delay on the southern section of Contract 811B that was impacting the diversion of Jordan Road. [492] In May 2011, the M&V Consultant noted that wider impact of the diversion of Jordan Road was under review, and that a revised work programme was expected from the contractor in May 2011. In August 2011, the M&V Consultant noted the delays to the diaphragm walls were critical and would delay the diversion of Jordan Road. The M&V Consultant noted the estimated delay of between 16 and 26 weeks would need to be considered in the procurement of Contract 810A. [493]

510. In October 2011, the M&V Consultant noted that MTRCL proposed to recover a significant portion of the delay by diverting Jordan Road to the south to allow piling and diaphragm wall works to progress within the existing road plan area by early 2012. [494]

511. In December 2011, the M&V Consultant noted the continued delay in Contracts 811A and 811B- in one month the delay had increased by 2.5 weeks to a total of 27 weeks. The M&V Consultant stated that any continued delay would result in the contracts becoming critical to the overall Project Completion Date if the trend was not arrested and delays recovered. [495]

512. The M&V Consultant reported in February 2012 that given the problems associated with diaphragm wall progress, there was a high risk that the delay trend would continue in the existing Jordan road area due to high core stones, especially in the east diaphragm wall. The southerly diversion of Jordan Road into the area of Contract 810A was implemented in February 2012. [496]

513. In May 2012, significant delays in Contract 811B continued. The M&V Consultant noted that there was a high possibility of delays occurring in the diaphragm walling works in the existing Jordan Road zone. In addition, high core stones in the bulk excavation may also arise, causing further delay to the programme. [497]

514. In May and September 2012 the M&V Consultant reported the delay in Contract 811B would cause potential delays to contracts 810A and 811A. The M&V Consultant reported progress in the Jordan Road northern diversion would result in a six week delay to the handover of the Jordan Road south flip works area to 810A. [498] In September 2012, the M&V Consultant reported that there were discussions continuing between MTRCL and its contractors for contracts 810A, 811B and other contracts toward developing Delay Recovery Measures and/or best endeavour programmes to mitigate against the accruing delays. [499]

515. The M&V Consultant reported in December 2012 that the contractor had issued a further revision to the Delay Recovery Measure programme which was under review by MTRCL. [500]

[492] M&V monthly Progress Report (No. 7, Volume 1 of 3), Section 4, April 2011
[493] M&V monthly Progress Report (No. 11, Volume 1 of 3), Section 4 and 5, August 2011
[494] M&V monthly Progress Report (No. 13, Volume 1 of 3), Section 4, October 2011
[495] M&V monthly Progress Report (No. 15, Volume 1 of 3), Section 2, December 2011
[496] M&V monthly Progress Report (No. 17, Volume 1 of 3), Section 4, February 2012
[497] M&V monthly Progress Report (No. 20, Volume 1 of 3), Section 2, May 2012
[498] M&V monthly Progress Report (No. 23, Volume 1 of 3), Section 2, August 2012
[499] M&V monthly Progress Report (No. 24, Volume 1 of 3), Section 2, September 2012
[500] M&V monthly Progress Report (No. 27, Volume 1 of 3), Section 2, December 2012

5.4.5. The M&V 'Issue List'

516. In accordance with the M&V Agreement, the M&V Consultant issued Railway Development Office a monthly issue list for consideration. This was a supplement to the Monthly Progress Report, detailing specific matters for consideration. The list formed matters for discussion between the M&V Consultant and Railway Development Office, and once reviewed each period, was shared with MTRCL. For the purpose of our review, we have selected a sample of events, and considered whether these were escalated as issues by the M&V Consultant in the 'Issue List'. Please see the findings of this review in Table 23.

Ref:	Event	'Issue List' reporting
1	**Contract 826** The contractual deadline for the two TBMs to arrive from the Mainland was 29 July 2012 (TBM#1) and 30 September 2012 (TBM#2).	The 'Issue List up to 12 July 2012' reported that the M&V Consultant had visited the Mainland site on 12 July 2012 and that the first TBM was under assembly within the approach tunnel, with a 10 June 2012 planned launch date. The M&V Consultant gave a view that they did not believe the launch date would be met. [501]
2	**Contract 810A** Between March and May 2012, the 810A contractor reported several site areas were not handed over from Contract 810B to 810A as planned.	The 'Issue List up to 5 April 2012' reported that the delays to the end of February in Contract 810B amount to over 7.5 months. The M&V Consultant question whether MTRCL intend to prepare an integrated schedule for WKT to show the overall impact of the delay. [502]
3	**Contract 811B** In July 2011 the contractor reported that it was becoming clear that the current programme of works had reached a stage where it was of little value as a tool to manage the project.	The 'Issue List up to 5 April 2012' raised the delayed progress of works due to corestones and questions MTRCL's plan to recover the delay. [503]

Table 23: Sample review of M&V 'Issue List'

[501] M&V Issue List up to 12 July 2012
[502] M&V Issue List up to 5 April 2012
[503] M&V Issue List up to 5 April 2012

6. Mitigation and Recovery by MTRCL

6.1. Introduction

517. The following Section provides a review of MTRCL's approaches to mitigate and recover delays, through testing of the following two specific mitigation/recovery events on the XRL Project:

- **Test Event 1:** Review of Process followed for the Delay Recovery Measure to Procure an Additional TBM for Contract 823A; and
- **Test Event 2**: Review of Process followed in the Development of the Minimum Operating Requirement at West Kowloon Terminus.

6.2. Test Event 1: Review of Process followed for the Delay Recovery Measure to Procure an Additional TBM for Contract 823A

518. The original programme for Contract 823A at the time of contract award was prepared on the basis that four tunnel drives would be completed by one TBM. The key planned sequence for the TBM was as follows:

1. Launch the TBM at the North launching shaft;
2. Excavate the North tunnels, northbound followed by southbound;
3. Dismantle, relocate and re-launch the TBM to the South launching shaft; and
4. Excavate the South tunnels, southbound followed by northbound. [504]

519. Due to delays described in paragraph 90 of Section 2.1.7, a second TBM was procured to enable the excavation of the South tunnels before the North tunnels were completed. The key facts in relation to the procurement of this second TBM are set out in paragraphs 520 to 532 below.

520. In June 2011, MTRCL and the contractor for Contract 823A were in discussion regarding measures to recover the delays to the contract. [505]

521. In August 2011, MTRCL confirmed in its XRL Project Report that different options for delay mitigation were being considered at the time together with the contractor, including: revising the TBM driving sequences; purchasing an additional TBM; or use of Contract 825's TBM. The contractor worked with MTRCL to carry out cost/time benefit analyses for each option and submitted Delay Recovery Measure programmes with associated cost estimates. [506]

522. In September 2011, *"Considering of a 2nd TBM option"* was included for the first time in MTRCL's Project Delivery Risk Register as a possible mitigation to the risk of delays to the TBM tunnels. Another mitigating option was included to obtain the application for a blasting permit to accelerate the shaft excavation. *"[F]ailure to complete [the] project on time"* was

[504] Contract 823A Contractor's Monthly Report, August 2011: Planned sequence of TBM drives obtained
[505] MTRCL's monthly XRL Project Report, 30 May 2011 to 3 July 2011
[506] MTRCL's monthly XRL Project Report, 1 August 2011 to 4 September 2011

listed as a possible impact of the risk occurring, as well as delays to interfacing contracts; and adverse media, public and political attention. [507]

523. On 23 September 2011, MTRCL stated at the Project Supervision Committee's monthly XRL Project Meeting [508] that it *"would review the need for an additional TBM under Contract 823A in October/November 2011."*

524. MTRCL sought approval from the Project Control Group on 3 November 2011 [509] for the procurement of an additional TBM. The Project Control Group Paper described the potential time saving to Contract 823A and associated costs for two other options, but concluded that procuring an additional TBM was the best option largely because of the potential significant time saving to the contract. The two other options considered were to use Contract 825's TBM and to resequence the TBM drives for Contract 823A.

525. The paper did not describe what was critical to the completion of the Project and potential time savings were described on a contract basis only.

526. On 15 November 2011, MTRCL instructed [510] the contractor to procure and deliver to site an additional TBM with the associated equipment in order to mitigate the delays to Contract 823A. Discussions regarding the revised programme for Contract 823A were in progress during November 2011. [511]

527. This risk of delays to the TBM tunnels for Contract 823A was downgraded from a P2 risk to a P3 risk in November 2011, following the procurement of the additional TBM.

528. In December 2011, the contractor issued a draft Delay Recovery Measure programme [512] to MTRCL, which included the additional TBM. Discussions continued between MTRCL and the contractor regarding the programme development to January 2012. [513]

529. On 10 January 2012, MTRCL issued the confirmation letter for the procurement of an additional TBM. [514]

530. In March 2012, the contractor had submitted a revised recovery programme and MTRCL had reviewed and accepted the proposed key dates for the permanent way access and the detailed review of individual activities was ongoing. [515] By April 2012, the contractor stated it had submitted its approved revised master programme which mitigated 265 [516] calendar days of delay to Degree 1 access for Contract 823A.

[507] MTRCL's monthly XRL Project Report, 5 September 2011 to 2 October 2011
[508] Project Supervision Committee XRL Project Meeting minutes (No. 17), 23 September 2011
[509] Project Control Group Paper, 3 November 2011
[510] Engineer's Instruction for Contract 823A to procure an additional TBM, 15 November 2011
[511] MTRCL's monthly XRL Project Report, 31 October 2011 to 4 December 2011
[512] MTRCL's monthly XRL Project Report, 5 December 2011 to 1 January 2012
[513] M&V monthly Progress Report, January 2012, December 2011 and January 2012
[514] MTRCL's monthly XRL Project Report, 2 January 2012 to 29 January 2012
[515] MTRCL's monthly XRL Project Report, 5 March 2012 to 1 April 2012
[516] Contract 823A Contractor's monthly Progress Reports, August 2011 to February 2012: Forecast Degree 1 access date from the contractor's programme in March 2012 was 10 December 2014 and this was reduced to 20 March 2014. (10 December 2014 – 20 March 2014 = 265 calendar days)

531. According to the programmes submitted by the contractors, Contract 823A was reporting more delay than the other significantly delayed tunnelling contracts to the contractual Degree 1 track access dates between August 2011 and February 2012. [517]

532. The contractor subsequently procured the additional TBM for the South tunnels, which was launched in April 2013 and completed 12 rings in the same month. [518]

6.3. Test Event 2: Review of Process followed in the Development of the Minimum Operating Requirement at West Kowloon Terminus

533. In July 2012, MTRCL's monthly XRL Project Progress Report was reporting 51.8 weeks delay for Contract 811B and commenced reporting delay on a "target" programme" of 8 weeks' delay. In December 2012, MTRCL's monthly XRL Project Progress Report was reporting 30.7 weeks' delay for Contract 810A, and commenced that month to report delays of 2.2 weeks on a "target" programme. It does not report details of these "target" programmes to understand whether these met a 2015 opening date for West Kowloon Terminus.

534. On 17 April 2013, the contractor for Contract 810A informed MTRCL that it could no longer achieve a 2015 completion as it presented [519] its programme to completion of its works showing a completion date for Whole of the Works completion of 30 June 2016.

535. MTRCL produced an internal TRIP summary diagram in May 2013 [520] that indicated a Degree 1 milestone of end of September 2015. It also showed that trial running was planned to be complete before track and OHL first fix was planned to be complete for Contract 810A, although it did not explain how this could be achieved. The diagram showed no time allowance for testing and commissioning for contracts 826, 820, 811A and 811B, when it is understood a minimum of six months was required. [521] We understand from MTRCL that the purpose of this TRIP was to demonstrate where the problem areas existed rather than forecasting the Project completion.

536. A presentation was given to the Projects Director on 7 June 2013 [522] which advised that Contract 810A had the latest forecast Degree 1 track access date of September 2015 for the XRL Project and MTRCL stated this contract was critical. [523] It indicated that a December 2015 opening date was still possible but was only based on a Minimum Operating Requirement approach. MTRCL's presentation explained that this phased opening would still provide passenger services in 2015, but only six long-haul tracks (track numbers four to nine) would be operational. A TRIP in this presentation showed that the tracks planned to be opened for the Minimum Operating Requirement (numbers four to nine) were forecast to achieve Degree 1 track access by April 2015, whereas all other tracks planned to achieve Degree 1 access by September 2015.

[517] Refer to Figure 2 and Figure 3 of this report
[518] Contract 823A Contractor's Monthly Report, April 2013
[519] MTR XRL Contract 810A, programme to complete, 17 April 2013
[520] Express Rail Link Programme Status, presentation to the Projects Director, 7 June 2013
[521] Interview with MTRCL's E&M General Manager, 14 August 2014: Confirmed that he would never compress the nine months for testing, commissioning and trial running because it was safety-critical
[522] Express Rail Link Programme Status, presentation to the Projects Director ,7 June 2013
[523] MTRCL's Chief Planning Engineer confirmed on 20 June 2013 that Contract 810A was critical to the XRL Project.

537. In MTRCL's monthly XRL Project Report of June 2013, MTRCL indicated a reduction in the reported delay of both Contract 811B and Contract 810A against "target" programmes. In Contract 811B, delay reduced from a peak in April 2013 of 17.8 weeks to 1.5 weeks in June 2013. In Contract 810A, it was reduced from a peak of 7.1 weeks in April 2013 to 1.9 weeks in June 2013. It continued to report escalating delay against original programmes.

538. MTRCL first proposed the Minimum Operating Requirement to Railway Development Office at a presentation [524] on 13 September 2013 in which MTRCL confirmed that the six priority tracks for the Minimum Operating Requirement would be handed over to the trackwork contractor by April 2015 and that the Minimum Operating Requirement opening date was December 2015. Railway Development Office did not approve or reject this proposal. [525] The presentation offers no explanation as to how MTRCL could complete all trackwork, E&M and nine months' [521] testing, commissioning and trial running between April 2015 and December 2015.

539. MTRCL's Chief Planning Engineer emailed the Projects Director on 11 October 2013 to state that several contracts had been further delayed since the previous programme presentation [520] of 7 June 2013 and consequently *"[c]learly commencement of Dynamic Testing and hence opening will be affected."* The Chief Planning Engineer stated that based on past production data, it was evident that several contracts had not and would not achieve planned production outputs. He stated that he had started preparation of the data for a detailed Programme Risk Assessment using a Monte-Carlo simulation. It is not clear to us whether this was completed.

540. The Projects Director responded on the same day [526] stating *"I am concern[ed] about XRL now reaching a point of impossibility for [the] end [of] 2015"*.

541. MTRCL developed a TRIP [527], dated 31 October 2013, which showed that Degree 1 track access could be achieved for Contract 810A by the end of July 2015 for the six priority tracks and the completion of TRIP and "OHL power on" at the end of September 2015. MTRCL has separately advised that a period of nine months [521] is required for testing, commissioning and trial running, which would indicate a forecast track operation date of the XRL Project in June 2016.

542. This TRIP did not indicate other forecast dates for the follow-on platforms, but the access date was consistent with the Degree 1 access dates shown in the presentation to Railway Development Office on 13 September 2013 for the six long-haul platforms under Minimum Operating Requirement. The same TRIP was included in MTRCL's Schedule Risk Assessment of 19 December 2013 [527] which was distributed to the Projects Director and the General Managers for the Project Team.

543. The Projects Director emailed the General Managers of the XRL Project and the Chief Programming Engineer on 11 November 2013 stating *"I have had a number of occasions trying to come to some clearer understanding with all the progress and challenges associated with XRL. But I have totally failed."* He asked *"[i]s Dec[ember] 2015 real or not"* and requested the General Manager for XRL to consult with the senior team and revert back to him.

[524] Express Rail Link Programme Status, 13 September 2013

[525] LegCo Paper, pg. 20, May 2014

[526] Email from the Projects Director to MTRCL's Chief Planning Engineer, 11 October 2013

[527] MTRCL's Schedule Risk Assessments, issued by the Chief Programming Engineer on 19 November 2013: Included a TRIP summary programme (dated 31 October 2013)

544. The Chief Programming Engineer of MTRCL stated by email on 14 November 2013 *"I'm so sorry I do not have any good news for you. We need a major turnaround of events on 810A to open to Public MOR in mid 2016"*. [528] It appears that at this time MTRCL's Chief Programming Engineer recognised, that even with the Minimum Operating Requirement, the earliest the railway could be operational was mid-2016.

545. The contractor for Contract 810A continued to report that the Minimum Operating Requirement scheme was in development with MTRCL, between November 2013 and February 2014 and that it was developing several programmes in support of the overall Minimum Operating Requirement programme. [529]

546. We have had sight of a programme [530] that we understand was developed by the contractor for Contract 810A, in support of the Minimum Operating Requirement which was dated 1 December 2013, but it is not clear when this programme was provided to MTRCL. The programme included completion milestones which differentiated the scope of works which were required for the Minimum Operating Requirement from the remaining scope for Contract 810A. A completion milestone was included in the programme labelled *"COMPLETE MOR TRACKS T5-T8*" [531] which was planned to be completed on 29 February 2016. Several activities were planned to be completed in order to achieve this milestone and the latest planned completion of these predecessors were activities in the north top-down area. Subsequent to this completion milestone [531] in the programme was a 15-month activity [532] to enable the completion of the permanent way, overhead lines, power, communications, signalling and testing and commissioning which were all planned to be completed on 31 May 2017.

547. In February 2014, the contractor for Contract 810A indicated to MTRCL that there would be no track access until June 2016 for the prioritised tracks included in the Minimum Operating Requirement. [533]

[528] Email from MTRCL's Chief Planning Engineer to the Projects Director, 14 November 2013

[529] Contract 810A Contractor's Monthly Report: November 2013, December 2013, January 2014 and February 2014

[530] Programme title: XRL_L2_MOR_Rev_B (810A XRL TERMINUS – Level 2/3 MOR Programme (*review in conjunction with engineering assumptions)), 1 December 2013

[531] Full activity description: *"COMPLETE MOR TRACKS T5-T8 AREAS OTE DUCTS & REMOVE SCAFFOLDS,"* activity ID: 1017

[532] Full activity description: *"T5-T8 - PWAY/OHL/T_Power/Comms/Signaling/T&C - 15 months period following OTE completion, as advised by MTR),"* activity ID: KD03

[533] LegCo Paper, pg. 22, May 2014

Appendices

Appendix A. - Glossary of Terms

Term	Description
ABWF	Architectural Builders Works and Finishes
Alignment	The railway route and specifically used to describe the route in tunnels, cuttings or at grade that is outside of WKT
Baseline	The defined cost and time on which delivery of a project is measured for a period of time
C-Form, C Form, Form C	Change Form / Change Order
Chainage	A measure of distance, measured along the centerline of the rail track or tracks from a single point and used to identify positions along the alignment
Construction Costs	Sum of Terminus; Alignment; Electrical and Mechanical Works; and Other Construction Costs EFCs
Contingency	A term used to describe cost reserve. In the case of MTRCL's reporting, this term is used to describe the difference between the forecast EFC and the Project Control Total prior to December 2010 and used to describe the difference between the sum of EFC+Risk (P90) contingency and the Project Control Total after December 2010
Coupler	A steel connector used to connect steel bars that are embedded in concrete to provide reinforcement to the concrete
Critical	An activity or series of activities that are forecast to be driving the completion date of the Project
Degree 1	The completion of railway tunnels (and relevant station areas) to a suitable degree to allow access for follow-on activities related to railway trackwork (permanent way), traction power (overhead line, OHL) and other railway systems
Delivery Partner	A private sector body with assigned responsibility for the management and supervision of a project
Delivery Phase	The period of construction of the project after procurement
Diaphragm Walls, D-wall	A concrete wall that is constructed in the ground from the surface in a series of adjacent panels and later forms a foundation or retaining structure
Drill and Blast	A tunnelling technique using blasting to excavate normally in hard rock
DRM	Delay Recovery Measure
DT, D/T	Down-track tunnelling drive
E&M	Electrical and Mechanical
EA	Entrustment Agreements including EA1 and EA2

Term	Description
EA1	Entrustment Agreement for the Design and Site Investigation of the Express Rail Link between MTRCL and the Secretary for Transport and Housing (THB) dated 24 November 2008
EA2	Entrustment Agreement for Construction and Commissioning of the Express Rail Link between the Secretary for Transport and Housing and MTR Corporation Limited, dated 26 January 2010
EFC	Estimated final cost is the best estimate for the completion of works, including contract value, agreed changes and potential changes. It excludes Risk (P90) and contingency
EI	Engineer Instructions
EOT, EoT	Extensions of Time
ExCom	Executive Committee within MTRCL
GSG	Guangzhou-Shenzhen-Hong Kong Passenger Transportation Company Ltd
HKS	Hong Kong Section of the XRL
IBC	Independent Board Committee
IBC (First Report)	First Report by the Independent Board committee on the Express Rail Link Project, July 2014
IBC (Second Report)	October Report by the Independent Board committee on the Express Rail Link Project, October 2014
ICCT	Initial Contract Control Total
ICT	ICT is understood to be the Initial Control Total. Further investigation is required to understand the relationship (if any) between the ICT and the contract award values.
Initial Cost Estimate, Initial Estimate	An estimate made prior Entrustment Agreement for the total cost and time to deliver the project
KCRC	Kowloon-Canton Railway Corporation
Key Events	A sample of events which we will use to test processes and procedures
LegCo	Legislative Council, HKSAR
Lloyd's Register Report	Report titled "Review of Institutional Arrangements for the Hong Kong Section of the XRL" prepared by consultant Lloyd's Register in April 2008 for Highways Department's Railway Development Office (RDO)
M&V Agreement	The Agreement between the Highways Department Railway Development Office (RDO) (for and on behalf of Government) and the M&V Consultant – dated 19 August 2010
M&V Consultant, M&V	Monitoring and Verification Consultants, subcontractor to Highways Department, Jacobs China Limited
Major Contracts	Contracts awarded with contract sum value > HK$ 50 million
Maunsell-Aedas	Maunsell and Aedeas Joint Venture

Term	Description
MOR	Minimum Operating Requirement, which was a partial opening strategy for WKT
Non-critical	An activity or series of activities that are forecast to be able to accommodate some slippage without driving the completion of the Project
OHL	Overhead Lines
P-way, Pway	Permanent way
PCCE	Project Capital Cost Estimate
PCG	Project Control Group of the XRL Project
PCT, Project Control Total	The financial authority held by Government for the delivery of XRL and defined in in EA2
PIMS	Project Integrated Management System of MTRCL
PM	Personnel who holds the title "Project Manager" in MTRCL
PMC	Project Management Costs
PMP	Project Master Programme
Primavera, Primavera P6	Project Management software by Oracle
Programme	A chart depicting a series of past and future activities, commonly logic-linked. “Programme” is used interchangeably with “Schedule”
QRA	Quantitative Risk Assessment
RDO, HyD/RDO	Railway Development Office
Risk (P90) contingency	An estimate of the forecast cost of identified risks, based on probabilistic modelling. In the case of MTRCL’s reporting, Risk (P90) contingency is based on a 90% likelihood that it will be adequate to cover the modelled risks
RSC, Railways Subcommittee	LegCo Panel on Transport – Subcommittee on Matters Relating to Railways
S-curve	A project management tool which consists of a display of cumulative costs, labour hours or other quantities plotted against time
Schedule	A chart depicting a series of past and future activities, commonly logic-linked. “Schedule” is used interchangeably with “Programme”
SCL	Shatin to Central Link, MTRCL
Scott Wilson	Scott Wilson Business Consultancy
Shaft	An opening to the surface from a tunnel beneath, often used to access the tunnel for either: temporary access for launching or recovering tunnelling equipment; or for the purposes of construction of a permanent opening such as for ventilation or emergency access
Significant Cost Events	Those events that significantly changed the Project EFC
Significant Delay Events	Those events that significantly delayed the Project

Term	Description
Significant Events	Described both Significant Delay Events and Significant Cost Events
SRA	Schedule Risks Assessment
T&C	Testing and Commissioning
TAM grouting	Tube A Machete, which is a sleeved tube that enables multiple re-injections of grout at the same locations
TBM	Tunnel Boring Machine
THB	Transport and Housing Bureau
Time-Chainage Diagram	A diagram with one axis representing time and the other axis distance
Top-down	A construction technique whereby a permanent tunnel structure (or underground building) is constructed progressively from the top as excavation proceeds. This technique is normally preceded by construction of deep foundations from the surface. This is contrasted with bottom-up construction, whereby the permanent structure is constructed after excavation to the formation level
TOR	Terms of Reference
Total project costs	Sum of: EFC; Risk (P90) contingency; Contractor's all risks; Third party liability insurances; MTRCL costs; and the balancing contingency
TRIP	Track Related Installation Programme
UT, U/T	Up-track tunnelling drive
WKCD	West Kowloon Cultural District
WKT	West Kowloon Terminus
WoW	Whole of the Works completion

Appendix B. - List of Key XRL Contracts

Contract	Description
Tunnels	
801	Tree Transplanting
802	Nam Cheong Property Foundation Removal & Reprovisioning
805	Sham Mong Road Obstruction Removal
820	Mei Lai Road to Hoi Ting Road Tunnels
821	Shek Yam to Mei Lai Road Tunnels
822	Tse Uk Tseun to Shek Yam Tunnels
823A	Tai Kong Po to Tse Uk Tseun Tunnels
832B	Shek Kong Stabling Sidings and Emergency Rescue Sidings
824	Ngau Tam Mei to Tai Kong Po Tunnels
825	Mai Po to Ngau Tam Mei Tunnels
826	Huanggang to Mai Po Tunnels
827	Supply and Installation of Cross Passage Doors
WKT	
803A	West Kowloon Terminus Diaphragm Wall (Site A)
803B	West Kowloon Terminus Piles (Site A - North)
803C	West Kowloon Terminus Piles (Site A - South)
803D	West Kowloon Terminus Diaphragm Wall and Piles (WKCD)
810A	West Kowloon Terminus Station (North)
810B	West Kowloon Terminus Station (South)
811A	West Kowloon Terminus Approach Tunnel (North)
811B	West Kowloon Terminus Approach Tunnel South)
815F	Public Toilet Fit-out Works for West Kowloon Terminus
E&M	
816A	WKT - Environmental Control System
816B	WKT - Building Services Control System
816C	WKT - Electrical Installation
816D	WKT - Fire Services, Plumbing & Drainage
830	Trackworks and Overhead Line System
840	Rolling Stocks

841A	Signalling System - Trackside Equipment
841B	Signalling System - Trainborne Equipment
841C	Point Monitoring System
843	Tunnel Environmental Control System
845	Traction Power Supply System
846	Trackside Auxiliaries
847	Lifts
848	Escalators and Moving Walkways
849	Radio Communications System
850	Passenger Mobile Communications System
851	Fixed Communications System
852	Ticketing System
853	Main Control System
854	Security Access Management System
855	Building Services for Tunnel Ventilation Buildings and Emergency Rescue Siding
856	Building Services for SSS
860A	Depot Equipment for Shek Kong Stabling Sidings - Train Wash Plant
860B	Depot Equipment for Shek Kong Stabling Sidings - Overhead Crane
860C	Depot Equipment for Shek Kong Stabling Sidings - Train Sewage Suction System
860D	Depot Equipment for Shek Kong Stabling Sidings - Wheel Monitoring System
860F	Depot Equipment for Shek Kong Stabling Sidings - Bogie Drop
861A	Locomotives & Flat Wagons
861B	OHL Maintenance Vehicles
861C	Rail Maintenance Vehicles
861D	Ultrasonic Inspection Vehicles and Multi-Purpose Rail/Road Vehicle