立法會交通事務委員會 鐵路事宜小組委員會

廣深港高速鐵路香港段 建造工程和啟用

引言

香港鐵路有限公司(下稱「港鐵公司」)經謹慎評 估餘下的工程所面對的挑戰後,於 2014 年 4 月 15 日公佈了廣 深港高速鐵路香港段(下稱「高鐵香港段」)新修訂的工程時 間表。新的時間表是以高鐵香港段於 2017 年底為乘客提供服務 為目標。

 立法會鐵路事宜小組委員會(下稱「小組委員會」)主席 於 2014 年 4 月 23 日要求港鐵公司提交進一步資料,包括:一) 延誤的關鍵要素;二)最新估計的工程延誤時間和超支金額;
 港鐵公司向當局的彙報機制及四)港鐵公司與政府之間的 索償機制。本文件旨在提供小組委員會要求的上述各項資料、 近期先後發生的事件,以及回應公眾對高鐵香港段建造工程進 度的查詢。

3. 在此檢討前,十分重要的是,港鐵公司就今年4月前,未能就 高鐵香港段項目的可行的完工日期向政府、立法會及公眾提供一個 最新評估,表示抱歉。港鐵公司確實應該在項目進行期間作更好的 溝通,披露各項挑戰及所採取的應對措施。港鐵公司就延誤了向大 家提出一個修訂的工程時間表表示抱歉。 摘要

 港鐵公司明白高鐵香港段對本港社會有著策略上的重要性, 並抱歉因工程團隊在建造期間所面對的多項挑戰,需要將開通 時間押後。

5. 大型及複雜項目有延誤及影響成本的事件並非不尋常,負責工 程項目的團隊往往需要尋找減少延誤所產生的影響,與及令項目成 本可以維持在原先估算的水平。港鐵公司的工程團隊過去數年就高 鐵項目曾經面對着不少困難和挑戰,也一一透過實施補救措施成功 地將影響減至最低。

6. 高鐵香港段項目工程確實十分複雜,極具挑戰性。項目初期便 出現各項挑戰,我們亦採取各種緩解措施以追趕進度。為克服各項 可見的和未能預料的困難,港鐵公司工程團隊一直專注研計可行的 應對方案,以期追回落後的工程及維持項目成本。不少措施均取得 正面成果。

7. 經過多次成功追回一些工程進度後,加上團隊領導們憑藉過往 在重要鐵路項目獲取的經驗作出專業判斷,工程團隊傾向太自信地 認為各項應對措施的成效能追補工期延誤。儘管顯示由數份合約合 共累積的延誤已令到 2015 年底完工的目標未必能達到的證據確鑿, 工程團隊持續一段時間仍向港鐵董事局及政府匯報項目於 2015 年底 竣工的目標。

 縱使工程團隊已盡全力,在項目的三個關鍵環節:西九龍總站 (合約編號 810A)、元朗段七星崗至大江埔隧道(合約編號 823A)
 及跨境段(合約編號 826),累計的延誤而使港鐵公司須修訂項目完 工的日期(關於高鐵香港段項目面對的嚴峻挑戰之詳情,請參閱<u>第</u> <u>21-46 段</u>。)

9. 港鐵公司抱歉在 2014 年 4 月 15 日公佈修訂工程時間表時,令 公眾誤會元朗段隧道的鑽挖機受損是主要原因。這只是其中一個因 素,但仍有其他原因而令高鐵香港段的開通日期需要押後至 2017 年 底。

10. 港鐵公司檢討了引致需於 2014 年 4 月 15 日作出公告的各項情況,以及未能及早就導致項目延誤及可能影響整體項目成本作出溝通的原因。本文件會陳述何時得知合約編號 810A、823A 及 826 遇到可能引致整個項目延誤的情況,亦列出曾建議項目具備局部開通條件而讓高鐵香港段於 2015 年按原定時間投入服務。與當局的討論及期後隨即引致 2014 年 4 月 15 日公佈修訂項目時間表的事件詳列於 第 52 段。

11. 目前項目仍有很多工作需繼續進行,所提出的修訂工程時間表 將高鐵香港段完工投入服務訂及於 2017 年底,切合實際情況。(有 關高鐵香港段項目整體工程進度的詳情,請參閱<u>第 55-65 段</u>。)

12. 展望將來,港鐵公司承諾會改善項目管理過程,以確保當遇到 任何延誤、困難或挑戰,而關乎修訂工程時間表,以及任何對成本 的影響,都會及時匯報並且作出處理。

13. 港鐵公司會採取更開放及透明的匯報系統,以確保政府、小組 委員會及公眾人士能全面得知項目的發展,包括工程進度、遇到的 任何延誤、建議的應對方案、若未能追補延誤而可能引致的後果, 以及最新的項目財政狀況。為此,港鐵公司會設置資料室存放主要 文件,供立法會議員於工程進行期間參閱。存放於資料室的文件詳 列於附件 15。

14. 港鐵公司董事局已成立獨立委員會,成員全部為獨立非執行董 事,就公司在高鐵香港段項目的管理方針進行全面檢討。獨立委員 會亦獲授權對外聘請獨立顧問及專家協助進行檢討。

15. 就工期延長方面,港鐵公司亦明白外界關注到,根據公司與政府所簽定的委託協議,是否需要額外撥款。原本項目工程預算是按 財務委員會批出的 668 億當中之 650 億,其中有 54 億元為應急費用。

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截至 2014 年 3 月 31 日,應急費用餘額是港幣 37 億 4 千 9 百萬元。 (有關高鐵香港段項目的財務詳情,請參閱第 66 至 86 段。)

16. 港鐵公司會不時就將來可能出現的事件及改變,與其在不同景況下有機會對成本造成的影響進行內部評估。最近傳媒流傳一份未經許可而發放的內部初步評估文件,指最終支出約為 684 億元。這是我們現時最佳的估算。港鐵公司現仍就 2017 年為乘客提供服務為目標的新修訂工程時間表作最終項目成本估算。根據現有資料及至目前為的財務分析,相信最新的工程成本預算不會與港幣 684 億元的估算相差太遠。詳細的估算預計於七月完成,並會提交公司董事局及政府審閱。

17. 接著下來,港鐵公司會繼續努力將項目成本維持最低的水平, 按照修訂的時間表完成工程,並確認會根據委託協議承擔責任。

18. 港鐵公司一直致力服務香港市民,亦會積極解決高鐵香港段所 面對的嚴峻挑戰及將開支減至最少,並於 2017 年底將這條策略性鐵 路投入服務,配合香港交通需求。

工程延誤

19. 截至 2014 年 3 月 31 日,高鐵香港段的整體工程進度為百 分之五十六。42 份已批出的主要合約中(合約總額超過港幣 5 千萬)(<u>附件二</u>),有 16 份是對工程竣工至為關鍵的土木工程 合約。雖然每份合約都面對不同程度的困難,當中 4 份合約 (合約編號 803A, 803B, 803C, 803D)已經完成,另外 9 份合約 (合約編號 810B, 811A, 811B, 820, 821, 822, 823B, 824, 825) 的進展令人滿意,其進展列於<u>附件三至十一</u>(只備有英文版本)。

 然而,如何克服尤其嚴峻的三個環節的挑戰,是高鐵香港 段順利完成的關鍵。這三個地點為西九龍總站北(合約編號 810A)、元朗連接七星崗和大江埔的隧道段(合約編號 823A)
 及跨境段隧道(合約編號 826)。本文件以下部分會概述這三個

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關鍵地點所面對的困難,以及港鐵公司及承建商所採取的對應 方案。這三份合約的詳細資料列於<u>附件十二至十四</u>(只備有英文 版本)。

合約編號 810A 西九龍總站北

 西九龍總站的建造工程自施工以來一直面對重大挑戰及延 誤,也影響整體項目進度。西九龍總站分為四份主要土木工程 合約,由總站北面的連接隧道及總站主體結構。

22. 西九龍總站位於填海區,西面是九龍站,東面是柯士甸站, 而南面是維多利亞港,亦是多條主要道路的交匯點,包括柯士 甸道西、連翔道及佐敦道。相關工程亦包括將柯士甸道西及連 翔道的行車路改建於地底,以使總站南端開闢更多的休憩空間。



西九龍總站的鳥瞰圖,顯示工地分為四份工程合約。

23. 西九龍總站佔地 11 公頃,是四層的龐大地底車站,最底 層深入地底 30 米。總站設有 15 個長途及短途高速列車的月台、 旅客離港及抵港大堂以及售票大堂。車站中庭有大型鋼架結構 屋頂。

24. 西九龍總站工地兩旁是營運中的鐵路,四週是高樓大廈及 繁忙交通主幹道,增加了工程的複雜性。自工程一開展便有滯 後的情況出現,但憑藉與承建商共同努力,港鐵公司多番執行 對應措施以追回工程進度。然而,面對人手短缺的情況,西九 龍總站工程並不能簡單依靠增加資源就能提升施工效率。因此, 措施包括調整工程設計、修訂施工工序及同步施工等加快工程 進度,而這些措施亦是港鐵公司其他工程項目的慣常使用的做 法。

25. 高鐵西九龍總站其中一個挑戰是在總站北面採用由上而下建造的一個地點,該處是十五條軌道匯聚入兩條隧道的部分(合約編號 810A 及 811B)。這部分位於將會作重置的佐敦道位置,需要先行建 造總站 B1 樓層以鞏固及支撐已建成的地下連續擋土牆,防止地面出 現不可接受的沉降,方能展開在該處下面的挖掘工作。

26. 以下是導致合約編號 811B 工程有延誤的原因,也是影響了合約編號 810A 的工程進度:

 (a) 為防止工地外地面沉降、水土流失,以及保護鄰近設施 及樓宇的安全,須於總站挖掘及建造工程展開前興建穩
 固深入地下的連續護土牆。西九龍總站是以地下連續擋土 牆環繞整個總站。



於西九龍總站建設的地下連續護土牆切面圖。 連續護土牆以綠色標示。

- (b) 高鐵總站工程開展前,土質勘探工作已於 2008 至 2009 年 不同階段於工地內進行。勘探鑽孔逾 600 個,平均每隔 14.4 米便抽取土質樣本,不但符合政府相關指引,密度 亦較業界標準為高。雖然土質勘探工作已於城市高爾夫 球會其他位置進行,但在收得工地前,有關的勘探工作於部 份位置,包括佐敦道、位於柯士甸站及九龍站的公共運 輸交匯處及城市高爾夫球會中央位置仍然受到限制。由於 涉及需封閉部分公用設施而會對公眾做成極大不便,土質勘 探工作亦沒有在繁忙的道路及公共運輸交匯處進行。此 外,佐敦道底下有廣泛的公共管綫裝置,在接管該處前未能 清晰理解有關地下設施的難度。
- (c) 地下連續護土牆是其中一個須於早期展開的工程,但由 於在佐敦道一帶遇到未有記錄的大型孤石、孤石群及不 平均的基岩層等困難的地質情況,令連續護土牆的竣工 日期延遲超過一年。



西九龍總站困難的地質情況

- (d) 合約編號 811B 因為佐敦道北地下連續擋土牆的建造延誤, 直接影響佐敦道向北移的時間表,未能騰出空間建造總站周 邊的地下連續擋土牆。
- (e) 為了減輕所帶來的影響,港鐵公司指示了合約編號 811B 承 建商先把佐敦道向南移,並於 2012 年 2 月完成。而合約編號 811B 可取得佐敦道餘下大部分的地下擋土牆的空間,但非所 有全部。一直到佐敦道最後在 2012 年 9 月完全向北移,合約 編號 811B 承建商可取得所有餘下擋土牆的空間。
- (f) 餘下地下擋土牆工程受到在佐敦道範圍內不能預見的石層及 公共管綫所延誤,對合約編號 810A、北面由上而下建造部分 產生連鎖影響,特別是工地編號 13.61 範圍,一直要到 2013 年 11 月才移交合約編號 810A 承建商進行工程。
- (g) 維持和遷移錯綜複雜的地下公共管綫,亦令工程比預期 的更具挑戰及耗用更多時間。雖然從記錄得悉地下設有 公共管綫(包括電纜、電線、光纖、水管、煤氣管及雨 水和污水等)存在於西九龍總站工地內,但直至接收工 地後才可確定其確實配置、分佈、走綫、接駁位置以至 其相互關係。
- (h) 為配合地下連續護土牆建造工程,這些公共管綫須與佐敦道同步遷移。在大部分情況下,遷移管綫工作只能在有限的空

間進行,而且在工程期間,亦須加強保護這些管綫措施,以免其受到損毀而影響到鄰近的樓宇。



挖掘時露出佐敦道地底錯綜複雜的地下公共管綫。

27. 除了合約編號 810A 受到工地移交延誤所影響外,還因為已規劃的工程進展及工序安排原因而受到非常大的延誤:

- (a) 不能遇見的地質情況;
- (b) 總站站頂設計、設計的改變與及其他的設計改變;
- (c) 其他引致延誤的事件。

28. 工程師代表向承建商表示,截至 2013 年 3 月 31 日有十二項已 知會的延誤事件,合約編號 810A 工程進展可伸延多 259 日時間。承 建商亦已就 2013 年 3 月 31 日後的情況提出申索,並正在評估之中。

29. 合約編號 810A 有一部分工地以由下而上的建造方法挖掘至總站結構 B4 樓層,而北面以由上而下建造方法興建的部分仍需移除 100,000 立方米的岩石,其中有 78,000 立方米是全新基岩,移除後始 全面抵達 B4 水平。

30. 港鐵公司一直尋求可行的方案以追回西九龍總站工程不同 方面的進度,合約編號 810A 採取的措施包括於北面由上而下 建造的地方採用額外的鑽孔方法安裝鋼柱、增加臨時工字樁柱 以推進 B3 層主要機房的建造、種入額外的工字樁柱及鑽孔樁以加 快施工、加入鋼鐵支柱以促進頂部的建造、橫跨 B2 層頂板增建額外 支柱以提早提供側向支撐。但這些措施亦未能為我們全面追回整 體的工程延誤。

31. 跟著下來,港鐵公司已制定方案,令一些合約承建商,特 別是機電工程承建商可以分階段提早進駐北面由上而下建造範 圍內的一些需優先施工的關鍵地方,讓機電工程盡快展開及與 土木工程同步開展。港鐵公司亦正與承建商落實一個更切合實 際情況的工程時間表,包括改用其他施工方法以提升挖掘效率 及制定一個每月混凝土澆灌量可達至二萬立方米的目標。

32. 西九龍總站所有主要結構工程訂於 2016 年 12 月完成,以 便可於 2017 年年底投入服務。港鐵公司會在下一次向小組委員 會的報告中匯報挖掘進度、混凝土澆灌量及修訂施工工序等有 關資料。

33. 此外,為進一步提高西九龍總站建造工程的效率,港鐵公司亦正考慮其他方案:

- (a)公司正與相關政府部門研究全綫封閉介乎柯士甸道西與 佐敦道之間的一段連翔道北行綫,以便騰出更多空間進 行連翔道地下通道的工程。為避免影響西九龍區的繁忙 交通,現時部分路面交通會改道至九龍站西面的雅翔道。
 上述臨時交通管理措施會先諮詢鄰近居民;及
- (b) 另一個考慮的方案是以爆破方式取代機械挖掘,處理總站北面由上而下建造的地方的基岩層,此舉有助直接加快工程的進度。在爆破工作進行前,港鐵公司必須向相關政府部門申請爆破牌照及諮詢區內持份者。港鐵公司正進行申請前的程序。如申請獲批,港鐵公司將盡量減少對周邊居民相關的影響。

34. 經修訂的建造時間表並沒有計算上述的改善措施。

35. 如 2013 年 11 月在小組委員會會議中所述,高鐵香港段項目的土木工程正進入施工高峰期。項目現時已聘用接近 8,500 名建造業工人及技術/專業人員,比項目預計的 10,000 少 1,500 人;因應機電工程合約的情況,預計對熟練機電工人的需求亦 會上升。考慮到現時有共有五個鐵路項目同步進行,加上其他 本地大型項目,目前的勞動市場的供應可以說是比較緊張。港 鐵公司相信如能聘用足夠的合資格工人,將有助項目及時完工。 港鐵公司會繼續與有關政府部門及建造業界緊密協調,在有充 分理據時作出補充勞工計劃申請。不過,2017 年經修訂的工程時 間表是按目前勞工情況將在項目推展時不變而制訂的。

合約編號 823A 元朗隧道段

36. 合約位處前菜園村,基於收地問題,進駐工地的時間有所 延誤。因土地業權人及其他關注團體的強烈反對,收地所需的 時間大大超出原先預計,由 2010 年 11 月延至 2011 年 5 月。這 亦限制了合約招標前的勘探工作和範圍。

37. 因遇到高於岩土基綫報告中所預期的基岩石層,承建商因而需修改隧道豎井的臨時工程的設計及施工方案,令工程由 2012年10月至2013年4月期間出現多次延誤。

38. 雖然按原先合約,此段隧道工程只須用一部隧道鑽挖機, 但為追回已延誤的工程,港鐵公司必須指示承建商提供第二部 隧道鑽挖機。

39. 儘管使用多一部鑽挖機,承建商在追趕工程進度時仍一直 遇到不少困難,種種原因包括可移除的隧道泥石量受工地條件 所限,以及受制於鑽挖機機械問題。 40. 為減低有關收地及較預期高的基岩面水平的問題,港鐵公司與承建商簽訂承建商首份附加協議,以制定多項減少延誤及 追回工程時間的措施。

令情況更惡化的是 2014 年 3 月 30 日的一場黑色暴雨,將 41. 合約編號 823B 工地内 4 米高斜坡的大量泥土沖入附近的工地。 該斜坡由承建商管理,而非由政府土木工程拓展署管理,因此 當局的報告並未提及相關的泥土坍塌。斜坡的泥土和碎石淤塞 地面去水渠, 並沖毀位於此段明挖回填隧道段內、過往颱風及 暴雨期間亦一直發揮作用的 400 毫米高堤圍,雨水及碎石不斷 積聚滿瀉至明挖回填隧道,再流入隧道鑽挖機施工的隧道。在 密封式隧道安裝了電泵,以控制地下水滲漏及由豎井流入的雨 水,然而電泵並非設計作應付沖破防洪措施而大量湧入的積水。 惡劣天氣導致承建商的(並非中電香港的)電力分配系統運作中 斷,電泵未能操作達 30 分鐘,令水浸情況加劇。即使電泵未曾 停止操作,亦未能避免隧道内的水浸情況。雨水於是由 823B 的 明挖回填隧道繼續湧入,再流入 823A 已大部分以鑽挖機施工 的隧道,將隧道鑽挖機淹沒。鑽挖機的設計未有預計水會由後 方進入,水浸令鑽挖機無法運作,須全面更換電力和電子零件 方能重新操作。



元朗隧道內的隧道鑽挖機組件因水浸而損毀

42. 港鐵公司、承建商和隧道鑽挖機生產商探討不同方法,以 期完成鑽挖餘下 52 米受影響的隧道。最新評估認為,最切實可 行的方法是在鑽挖機原位進行維修,到目前為止,須更換約 2,000 件組件,檢查仍在進行。據悉部分零件需要長達五個月才 可製成及運抵香港,訂購程序及維修準備工作經已展開。預計 損壞的鑽挖機經維修及測試後,可於 2014 年 12 月重新運作。

43. 由於現有防洪設施明顯不足以抵禦 3 月 30 日的嚴重黑雨, 工程人員已加強各項對應方案,包括在 823A 及 823B 的隧道豎 立臨時防洪牆,強化現有防洪系統,以及在有機會受暴雨威脅 的位置安裝鞏固防洪板。

44. 此外,作為改善日後鑽挖機的運作的額外措施,鑽挖機會 以雙加壓倉代替現時單加壓倉,以提高更換鑽挖機刀頭及維修 效率,並安裝一套高效的移除泥石系統(豎井型螺旋輸送帶)。 同時亦已採購一個全新刀盤,以應付一些在先前鑽挖隧道曾遇到難以應付的地質情況。

合約編號 826 - 跨境段隧道



穿越保護區的高鐵香港段工程跨境段隧道

45. 跨境段隧道段地質情況複雜,港鐵公司工程人員須以極之 謹慎的方式去處理這段工程。鑽挖機由深圳開始起動,直至鑽 挖到香港邊境位置,才會交由合約編號 826 接手管理及監督工 程。由於在深圳的建造期間亦遇上種種困難,負責工程的南行 及北行鑽挖機分別於 2013 年 11 月及 2014 年 3 月由黃崗抵達香 港邊境,較預期時間滯後達十四個半月。

46. 在位於米埔的走綫一段長 200 米的大理石層會有溶洞。由 於該處有不少魚塘及受《拉姆薩爾濕地公約》保護的濕地,工 程人員未能透過傳統勘察方法取得有關溶洞準確位置及面積的 資料。為確保鑽挖機安全運作,工程隊伍會在鑽挖機進入大理 石層前,先以鑽挖機前端作超前鑽探,從而掌握更多溶洞資料。 當發現溶洞時,工程人員須暫停運作鑽挖機,並以水泥灌漿注 滿溶洞,鑽挖機才可繼續推進。由於有需要先探測溶洞的位置 以確保運作安全,鑽挖機須以極緩慢速度運作,與鑽挖一般沒 有溶洞的石層比較,鑽挖大理石層需時超過兩倍時間。有見及此,工程隊伍已在原來計劃的鑽挖時間中預留時間鑽挖大理石層,然而由於鑽挖機較預期遲由內地抵達香港,抵銷了部分緩 衝時間,令工程人員處理不可預期的突發情況的空間受到限制。



跨境段隧道鑽挖機前方的大理石層

主要事件的時序

47. 就本文件以下部分所述,直至今年 4 月 16 日港鐵公司董事局 才得知合約編號 810A、826 及 823A 受延誤,而項目將未能於 2015 年完成。

48. 就客觀檢討數份工程合約的延誤,以及承建商在 2013 年第四 季及 2014 年初期未能趕工追回工程進度,顯示有需要在較早時候宣 佈工程延誤。港鐵公司必須強調從沒意圖隱瞞有關工程狀況的事實。 在過去數年,工程隊伍一直盡力追趕項目延誤,以期讓工程可以按 預算並如期完成。

49. 公眾關注的兩個議題是港鐵公司於何時意識到項目的嚴重延誤 及是否延遲交代有關延誤。如此規模的項目,特別是大型複雜的建 造工程,出現事故而引致工程延誤及影響成本的情況並非不尋常。 項目管理正是要尋求各種方法應對此等延誤及控制建造成本不超出 原來預算。自高鐵香港段項目工程開展以來,出現了不少狀況及未 能預見的情況,引致出現調整時間表及成本的可能性。然而,在大 多數情況下,港鐵公司透過項目管理都能克服有關困難及未能預見 的因素,按時完工。

50. 然而,隨著時間過去,有鑑於 810A、823A 及 826 三份工程合約的情況,不論港鐵公司工程隊伍的努力,以及各項減低工程延誤及成本增加的紓緩措施,工程亦未能在預定時間內完成。

51. 我們已就相關的三份工程合約,以及引致公佈高鐵香港段延誤的因素及紀錄展開調查。

- 52. 主要事件時序概括如下:
 - (a) 2013 年 2 月,工程總監向審核委員會報告隧道建造工程遇上 重大延誤,工程面對多項挑戰,但進度仍然良好,朝 2015 年 按值完工。
 - (b) 追溯至 2013 年 3 月,項目策劃團隊指兩份工程合約編號 810A 及 826 的進度雖較預期時間表明顯落後,但當時仍然不 會影響項目 2015 年底開通的時間表。於 2013 年 3 月 7 日, 工程總監確認所有項目將可如期及按預算完成。
 - (c)於2013年4月17日與工程合約編號810A承建商進行工作坊, 分析進度及追回工程進度的可行措施,承建商當時預計西九 龍總站竣工日期將為2016年6月。項目經理於席間或其後短 時間內指示承建商盡快尋找方案以追及西九龍總站的2015年 的完工日期。
 - (d) 於 2013 年 6 月,根據項目策劃團隊新修訂的工程時間表(基於 2013 年 4 月底已知的風險),表示 2015 年底投入服務的時間表仍然可行但只限於局部開通。2013 年 3 月底開始以此模式展開工程。此模式與全面通車有以下不同之處:西九龍總

站內 15 條行車軌中 6 條行車軌投入服務、同時運行兩條跨境 隧道及推遲若干非必要的建造工程。如不採用局部開通模式 進行,項目將不能如期完成並推遲至 2016 年 9 月。

- (e)於 2013年7月13日,最新的工程時間表結合局部開通模式, 連同項目較佳的預計開支 651 億元的方案向港鐵公司執行總 監會成員簡介並得到同意。2013年7月31日於執行總監會 會議上提到項目仍然面對多項挑戰,但仍可達預期開支及時 間表。
- (f) 於 2013 年 8 月 14 日審核委員會會議中,工程總監報告項目 可按原定時間及預算完成,但仍要克服多項挑戰及採取追回 工程進度的措施。
- (g) 在 2013 年 8 月 29 日舉行的項目監管委員會會議上,會議主 席對項目規劃進度及實際進展的差異表示關注,特別是西九 龍總站的工程進度。
- (h) 工程團隊於 2013 年 9 月 13 日向路政署鐵路拓展處簡介局部 開通的模式。路政署鐵路拓展處成員以 2015 年 12 月投入服 務的基礎下就局部開通提出多項關注,但未有就此模式表示 同意或不同意。另外,就工程合約編號 810A 因應物料延期 致混凝土澆灌進度較預期滯後進行詳細討論。
- (i) 三份工程合約編號 810A,826 及 823A 工程進度仍然滯後於 新修訂的時間表。延誤的情況亦因應西九龍總站及工程合約 編號 826 深圳段隧道工程出現延誤而進一步推遲。項目主要 的工程人員亦於 2013 年 10 月開始關注工程合約編號 823A 的 進度。
- (j) 於 2013 年 10 月港鐵公司以局部開通模式正式向西九龍承建 商建議,並要求承建商基於局部開通模式及以項目於 2015 年 年底完成為目標提供項目計劃作回應。於 2013 年 10 月 24 日 港鐵公司執行總監會會議中,工程總監指出項目因多個合約

出現關鍵的延誤,影響整體項目的時間表。以局部開通模式, 項目仍可以按原來日期和預算完成。

- (k) 自 2013 年 11 月始,主要的工程合約仍維持低生產力,工程 總監要求各相關項目經理審視及確認,可否達到現時時間表 嚴重是否存疑。於 2013 年 11 月 8 日,工程團隊高層成員與 運輸及房屋局進行會議,向運輸及房屋局報告(i)工程合約編 號 826;及(ii) 修訂的工程時間表等最新情況。修訂後的工程 合約編號 826 時間表顯示,該段工程不可於 2015 年底前趕及 完成建設軌道及測試。修訂的時間表與 2013 年 7 月向港鐵公 司執行總監會成員提交的一致,顯示項目以局部開通模式於 2015 年投入服務的可能性(未有更新 2013 年 4 月後其他合 約延誤的資料)。
- (1) 於 2013 年 11 月工程進度時間表中,工程團隊高層可見到當 中尤以工程合約編號 810A,823A 及 826 仍要面對多項艱巨 的挑戰,生產率未能達到趕及 2015 年投入服務所需的水平。
- (m) 2013 年 11 月 21 日,運輸及房屋局及港鐵公司高層透過電話通話及會議。會上港鐵公司向運輸及房屋局提及高鐵項目於"放寬"的局部開通概念基礎下仍有可能達到 2015 年的目標。
 "放寬"的局部開通模式乃由局部開通模式加上於跨境段使用一條(而不是兩條)行車隧道雙向行車(以便於稍後時間完成第二條行車隧道)。運輸及房屋局明顯質疑"放寬"的局部開通概念及不表贊同。
- (n)於2013年11月22日立法會鐵路事宜小組委員會會議,並未 有提及局部開通模式或"放寬"的局部開通模式,但有討論 合約延遲完成及實施多項追回進度的措施。會上確認項目建 造工程將於2015年竣工,西九龍總站及基礎接待設施將準備 投入服務。政府並回應測試及試運行需時六至九個月以確保 營運安全。

- (o) 在 2013 年 11 月 29 日舉行的項目監管委員會會議,港鐵公司因應會議主席的提問,解釋了建議如何達到局部開通模式的情景。
- (p) 於 2013 年 12 月 10 日港鐵公司董事局會議中曾討論項目的工程進度、緩解措施及追回進度的計劃,工程總監確認項目將於 2015 年底前竣工。
- (q) 公司內部 2013 年 12 月最新西九龍總站工程進度顯示,就算 以局部開通模式作標準,西九龍總站將不能於 2015 年投入服 務。
- (r) 2014 年 1 月,根據西九龍總站工程進度及港鐵公司項目其他 內部評估,工程推算將於 2016 年竣工。
- (s) 於 2014 年 1 月 24 日項目監管委員會會議上,會議主席提問 建議 2015 年局部開通模式有何把握,港鐵公司回應將會於 2014 年 4 月對整體工程方案情況作檢討,並會知會政府相關 當局。
- (t) 2014年2月,810A承建商向公司的工程團隊非正式表示,按 其最新計算,即使以港鐵公司所建議之局部開通模式進行工程,直至推算需於2016年6月,才會完成軌道工程。同月, 在審核委員會會議上,工程總監並未就2015年開通提出關注。
- (u) 2014 年 3 月期間,工程總監因應多個合約工程的延誤情況嚴重,於 2014 年 4 月初安排向港鐵公司執行總監會匯報項目於2017 年通車運營之預期時間表。同期間,公司內部對此修訂的時間表作初步評估項目開支預算約為 684 億元,此未經許可發放資料其後為媒體轉載。
- (v) 2014 年 3 月 30 日的黑色暴雨導致元朗段隧道內的隧道鑽挖 機受到嚴重水浸,進一步影響該合約的完工時間。

- (w)於2014年3月31日,西九龍總站的承建商正式向港鐵公司 匯報,就2013年10月向其提交的局部開通模式建議,表明 完成日期為2017年。港鐵公司工程總監表示需要在排除局部 開通模式下,重新評估整個項目。
- (x)於 2014年4月12日,新修訂的工程時間表及開支提交港鐵 公司執行總監會。緊隨其後於2014年4月15日,向公眾公 佈項目修訂的時間表。
- (y) 在 2014 年 4 月 16 日,港鐵公司董事局獲知會有關情況。

項目管理

53. 高鐵香港段是極具挑戰及複雜的工程,自工程開展以來, 一直遇到各種不同情況及挑戰,追回因延誤而落後的時間的措施在各階段均有需要。這些措施包括增加額外資源、交叉作業、 安排不同合約同步施工。

54. 對於一些可以造成顯著延誤的挑戰,積極及主動的項目管理是可以成功作出應對,例子包括(詳見<u>附件一</u>):

合約編號 823A	
問題	延遲進駐工地
可能延誤時間	5個月
紓緩方案	要求承建商從日本提供第二部隧道鑽挖機
效果	追回因遲了進駐工地所造成的延誤
合約編號 802	
問題	變了形的工字型樁柱阻礙隧道鑽挖機
可能延誤時間	21 個月
紓緩方案	採用另一種拔樁方法-「旋轉楔子工法」
效果	緩解對整體工程時間表造成的延誤

合約編號 811B	
問題	在佐敦道地底建造連續護土牆
可能延誤時間	6個月
紓緩方案	要求承建商實施額外的臨時交通管理措施
效果	西九龍總站北面的地下連續護土牆建設工程可提
	前6個月展開。

未來目標

55. 目前項目仍有很多工作需要繼續進行,修訂後的工程時間 表將為高鐵香港段完工及於 2017 年投入服務,提供更實際的時 間表。高鐵香港段能否於 2017 年通車,關鍵取決於合約編號 810A、合約編號 823A 和較小程度上的合約編號 826,下文將 會詳細闡釋這三份合約的修訂方案。

合約編號 810A - 西九龍總站

56. 合約編號 810A 西九龍總站北端,包括總站的核心區和北面由上而下的主體建造工程,預期於 2016 年 12 月竣工。連翔道的隧道工程、車站大樓的鋼結構站頂及外牆工程,預計於 2017 年 4 月完成。然而,同於 2017 年 4 月完成的連翔道隧道工程及車站入口大樓,這兩部分工程並不影響鐵路系統的測試 及試運行。

57. 此合約的關鍵之處在於北面由上而下的主體建築物能否完成,以進行安裝路軌、架空電纜、與路軌相關的機電系統,以 及重要的機電房設施,以安裝鐵路系統、測試與試運行,及進 行法定檢測的工程。這些工程對於按原訂計劃展開全綫測試及 試運行至為重要,測試旨在確認列車系統的安全及為乘客提供 可靠的服務。按計劃進行測試及試運行,列車須通過三個月的 動態測試、三個月的調試及三個月的試運行。



合約編號 810A 工程進度表

合約編號 823A 元朗隧道段

58. 合約編號 823A 下行軌道北段部分的隧道鑽挖機因為 2014 年 3 月的水浸事故而無法運作,這部隧道鑽挖機預計於 2014 年 12 月才能全面恢復運作,上址餘下的 52 米鑽挖工程,預計需 要約一個月才能完成。而下行隧道南段部份的鑽挖工程,預計 於 2014 年 5 月左右完成。當大部份的橫向通道、行人通道和隧 道倒置等工程完成後,便可分階段鋪設下行軌道隧道的路軌。

59. 當完成下行軌道鑽挖工作後,隧道鑽挖機將在豎井重組, 供上行軌道使用。兩部隧道鑽挖機分別為上行軌道的南面及北 面鑽挖,預期分別於 2015 年 5 月和 2016 年 2 月完成,因此, 上行軌道可分兩階段於 2015 年 8 月及 2016 年 9 月鋪設路軌。

60. 合約編號 823A 隧道段由軟石層及硬石層組成,有關工程的開挖率是參考毗連下行軌道的實際開挖率而設定。

			隧道工程完成 鋪設路軌	
北段隧道	下行軌道	1/2015	7/2015	2/2016
	上行軌道	2/2016	9/2016	12/2016
	下行軌道	5/2014	9/2014	2/2016
	上行軌道	5/2015	8/2015	12/2016

合約編號 823A 工程進度

合約編號 826 - 跨境段隧道

61. 合約編號 826 跨境段隧道走綫需要穿越 200 米的溶洞區, 工程是假設隧道鑽挖機每月可鑽通 60 米的溶洞區,當中已包括 額外的探索及灌漿工作,而隧道鑽挖機鑽探其他地質時,可以 達到每月 160 米的速度。兩部鑽挖機預計分別於 2015 年 2 月及
5 月,可貫通米埔走綫,當橫向通道、行人通道和隧道底板等 工程完成後,便可於 2015 年 9 月展開鋪設路軌工程。

62. 合約編號 826 兩項隧道工程的完工時間,會早於合約編號 823A 上行軌道,因此,若遇到任何比預期更惡劣的地質情況, 仍可以有緩衝時間。

		隧道工程完成 鋪設路軌	架空電纜通電 準備調試及測試
下行軌道	2/2015	9/2015	2/2016
上行軌道	5/2015	9/2015	12/2016

合約編號 826 工程進度

整體情況

63. 就高鐵香港段的整體時間表而言,認為將通車時間訂為 2017 年年底,是切合實際情況和可行性。大部分工程合約設有 緩衝時間,其中合約編號 810A 西九龍總站及合約編號 823A 隧 道段的工程仍然最具挑戰性。

64. 高鐵香港段的整條下行軌道和由石崗至南昌的上行軌道即 將建成,並準備在 2016 年第二季度內進行的列車和信號系統的 初始動態測試,這項為期約八個多月的測試,於 2017 年初進行, 旨在加強及證明列車相關系統的安全性及可靠性。

65. 全綫試運行計劃於 2017 年 8 月展開, 2017 年年底預計可 提供客運服務。



高鐵香港段 工程進度表

造價

立法會已批撥款

66. 立法會財務委員會於 2008 年 7 月 4 日通過撥款 27.83 億港元, 用作高鐵香港段工程之設計與工地勘察的工作。

67. 在此筆款項當中,政府根據 2008 年 11 月 24 日所簽署的高鐵 香港段設計與工地勘察委託協議,撥出 25.81 億港元予港鐵公司,以 展開高鐵香港段工程所必須的設計與工地勘察的工作。 68. 於 2010 年 1 月 16 日,立法會財務委員會通過撥款 668.18 億港元興建高鐵香港段工程。(不包括 67 段所提及的 25.81 億港 元)整體預算分配如下:

鐵路項目開支

建造費用	港幣 436.15 億元
工程管理	港幣 32.61 億元
應急費用*	港幣 44.46 億元
鐵路工程總數	港幣 513.22 億元

非鐵路項目開支

相關建造費用	港幣 91.37 億元
項目管理	港幣 6.99 億元
應急費用*	港幣 9.54 億元
非鐵路工程總數	港幣 107.9 億元

監測與政府設施	港幣 3.33 億元
價格調整準備	港幣 43.73 億元

立法會已批撥款

港幣 668.18 億元

* 總應急費用= 44.46 億港元+9.54 億港元= 54.0 億港元

工程預算分配

69. 此筆撥款當中,根據 2010 年 1 月 26 日所簽署的建造及投入服務委託協議,政府撥出 650 億港元予港鐵公司用作建造、測試及試行運作高鐵香港段。

70. 政府則保留餘下的 18.18 億港元以應付項目之監管、政府設施及其他與高鐵香港段工程相關而非由港鐵公司負責的工程。 此項款額會一直由政府控制和管理。

採購/預算/成本管理

71. 港鐵公司擁有超過三十年建造本地鐵路的經驗,加上吸收 國際作業方式,故此在其所有工程項目方面,均有一套完善的 程序,為採購、合約行政事宜及成本控制上建立控制及管治框架。

72. 採購工作乃遵照世界貿易組織/政府採購協定,按具透明 度及客觀的制度,以全球公開投標者資格預審形式進行。按照 港鐵公司投標委員會的條款,若合約的價值超過公司百分之 0.2 的資產淨值,該合約批出決定須經由公司董事局批准。

73. 港鐵公司設有一系列相關程序及在合約中訂明條款,以落實合約行政管理。至於控制各項已批出合約的開支方面,則由港鐵公司的項目監控小組,按執行總監會賦予的權力負責。

最初工程項目總額

74. 根據港鐵公司項目成本管理程序,高鐵香港段工程之建造 費用以撥款當日預算為 650 億元(最初工程項目總額),所有成 本亦按付款當日價格計算,並以此為所有成本控制及與項目相 關的財務報告的基礎。

75. 按照程序,如合約批出的總額少於預算,剩餘的款額會退 還作應急款項,反之亦然。當所批出之合約需要額外開支,例 如須應付不可預見的情況、人為的障礙或設計改動,有關開支 將會由應急款項中支付。 預算現況

76. 截至 2014 年 3 月,共 42 項主要工程合約已被批出(合約 金額超過港幣 5 千萬元)。而批出合約總金額為 446 億 3 千萬 元。

77. 批出合約的總金額反映透過全球公開招標與競爭,從而達 致節約採購開支。這些被節省的採購款項會預留用作應急費用, 以應付因不可預見的情況而引致的額外開支,而這些開支根據 公司的合約條款均不屬承建商之責任。

78. 港鐵公司為管理及緩解高鐵項目所面對的挑戰而實施的措施,包括採購另一部隧道鑽挖機、採用新方法去移除變形工字型樁柱,對開支有重大影響。所有額外的開支均按照港鐵公司工程支出控制程序獲得審批、記錄和監管,並取自應急費用。

79. 截至 2014 年 3 月,在獲批預算 650 億元內,應急費用的 餘額為 37 億 4 千 9 百萬元。該筆款項可用於支付將來項目,包 括未知或目前未有預留的開支。

完工時開支

80. 港鐵公司不時常會就未來可能發生或未知的項目及其在不同情況下對開支的影響進行評估,去預測餘下的應急費用是否足夠。

81. 傳媒早前刊載未經許可發出的文件(2014年3月10日高 鐵項目超支預算(草稿))是評估工作的一些資料,這是一個持 續性的評估,並有待核實。這評估其後再發展,反映出完成項 目的基礎費用為 684 億元(較港鐵公司已獲批的預算港幣 650 億元高出 34 億元)。

82. 如第 65 段所述,基於高鐵香港段的工程進度有所修訂,評 估也會相應進一步修正。有關項目最新估算會於日後評估工作 完成後提供。港鐵公司預計該評估會於 2014 年 7 月完成,並會 向港鐵公司董事局及政府匯報。值得注意的是,由於這評估是 建基於未來情況的預測,以及尚有多項未用開支,因此該評估 始終是一個估算。

83. 因此,截至今日,雖然工程很有可能未必能夠在原定工程 預算 650 億元內完成,日後的評估亦有可能與 684 億元有所出 入。但基於現時的資料及截至現在的分析,日後的評估與此金 額應該不會有太大的差異。

84. 倘日後在進行工程開支評估時,發現工程的開支有可能超出 原定的工程預算 650 億元,港鐵公司會根據委託協議正式知會 政府,包括估計工程會超出預算多少。港鐵公司亦會估計額外 款項需要到位的時間。

85. 跟著下來,在根據修訂計劃進行工程的同時,港鐵公司會 盡量將工程支出維持至最低,並會繼續監察工程開支,根據港 鐵公司工程支出控制程序去管理任何開支變動,並會向政府及 小組委員會定期匯報支出評估的最新進展。

86. 雖然根據委託協議,政府負責撥款興建高鐵工程,但在委託協議下,港鐵公司對政府亦有不少責任,包括對技術和謹慎 行事的保證。港鐵公司確認將會繼續按委托協議書履行其責任。

項目報告

87. 為了確保適時匯報及資料具透明度,港鐵公司與政府成立了匯 報機制。港鐵公司與路政署的鐵路拓展處(鐵路拓展處)緊密聯繫, 鐵路拓展處被政府委以就有關鐵路發展事宜包括新鐵路建造與相關 政府部門協調的任務。鐵路拓展處並監察高鐵香港段項目的推展及 交付。

88. 路政署署長為最高領導人,帶領一個由高級職員組成、跨部門 的項目監管委員會,每月與港鐵公司及相關政府部門舉行會議,緊 密監察工程進度及成本控制。項目監管委員會作為決策性的機關, 引領任何可影響高鐵香港段項目進度的事宜。

89. 在項目推展層面,港鐵公司邀請鐵路拓展處代表,出席由高鐵 項目總經理主持的每月工程進展會議,以商討任何主要工地及項目 相關事宜。港鐵公司的項目監控小組監察項目的成本控制,而每週 舉行的項目監控小組會議亦會邀請鐵路拓展處代表出席,參與審議 及通過由港鐵公司執行總監會授權的成本更改的工作。

90. 高鐵香港段項目推展工作亦會經由政府委任的獨立顧問作定期 審核。該獨立顧問負責監察及核對項目所有由設計、建造至測試階 段,而由港鐵公司負責的設計、建造工作及成本的工作。

91. 港鐵公司並向立法會及公眾作定期滙報,每半年會向鐵路事宜 小組提交半年度工程進展報告,報告涵蓋高鐵香港段項目建造的最 新進展及財務情況。

92. 在港鐵公司內部,工程團隊就高鐵項目的進展向執行總監會、 董事局及審核委員會定期匯報。

總結

93. 我們會加強有關高鐵香港段項目的溝通,讓政府、立法會 及公眾全面掌握工程進度、所面對的困難及相關的應對方案, 以及項目的財務狀況和其他社會關注的事項。有關資料的報告 會製備文件,將存於此項目的資料室。

94. 由港鐵公司獨立非執行董事組成的小組將會就公司在高鐵 香港段項目的管理方針進行全面檢討,並會對外聘請獨立顧問 提協助,提供客觀的第三者意見。 95. 港鐵公司一直致力服務香港市民。我們會積極解決高鐵香港段項目現正面對的嚴峻挑戰,並且會善用公共資源,繼續盡量減低開支完成項目。

96. 與此同時,港鐵公司會盡全力按照經修訂的工程時間表完成項目,期望這個策略性鐵路項目可於 2017 年底投入服務,為 整個香港社會帶來效益。

港鐵公司 二零一四年五月

此報告由香港鐵路有限公司編制,向立法會交通事務小組委員會報告就廣深港高速鐵路香港段 項目(高鐵香港段項目)的建造和測試事宜,任何本報告所載不損害任何香港鐵路有限公司就 高鐵香港段項目的法律或合同權利。

附件一

高鐵香港段項目成功追回進度的措施

透過積極主動的項目管理措施,大部分有可能出現的重大延誤 均獲成功解決,例如:

合約編號 823A	
問題	延遲進駐工地
可能延誤時間	5 個月
紓緩方案	要求承建商從日本提供第二部隧道鑽挖機
效果	追回因遲了進駐工地所造成的延誤

合約編號 823A 的隧道工程和合約編號 823B 的石崗列車停放處 及緊急救援處的建造工程,由於接收位於元朗的工地比原定計 劃延遲,因而延誤了 5 個月。在此合約下,原已訂購一部隧道 鑽挖機,港鐵公司已立即指示承建商由日本訂購另一部鑽挖機, 以追回因延遲收地所造成的延誤。此延誤所造成的影響,包括 訂購額外隧道鑽挖機,令工程須因而增加 3 億 9 千萬元開支。



第二部隧道鑽挖機於 2013 年 3 月展開鑽挖工程 以追回元朗段隧道的延誤。

合約編號 802	
問題	變了形的工字型樁柱阻礙隧道鑽挖機
可能延誤時間	21 個月
紓緩方案	採用另一種拔樁方法-「旋轉楔子工法」
效果	緩解對整體工程時間表造成的延誤

合約編號 802 須在南昌站移除約三百支工字型樁柱,工程十分 複雜,令該合約須進行額外 21 個月的工程。這些是早於多年打 入該處地底,與高鐵工程無關。在移除工程進行期間,發現樁 柱已經變形,正常的拔樁方法並不適用,故須轉而採用「旋轉 楔子工法」和訂購新款機器以進行拔樁工程。為追回此項延誤, 包括增添設備及機械以移除變形樁柱的額外開支為 4 億 8 千 3 百萬元。透過交叉作業,工程團隊終能解決難題而追回原訂的 工程時間表,並沒有導致整個項目延誤。



在南昌站工地被移除已變形的椿柱。

合約編號 811B	
問題	在佐敦道地底建造連續護土牆
可能延誤時間	6個月
紓緩方案	要求承建商實施額外的臨時交通管理措施
效果	西九龍總站北面的地下連續護土牆建設工程可提
	前6個月展開。

在合約編號 811B,港鐵公司要求承建商在 2012 年 2 月實施額 外的臨時交通管理措施,將佐敦道暫時南移,這項交通改道的 措施令西九龍總站北面的地下連續護土牆建設工程可提前六個 月展開。這項措施令原來計劃將佐敦道北移的關鍵性減低,讓 西九龍總站周邊的地下連續護土牆可在原有佐敦道的地底完成。



額外的交通改道使合約編號 811B 的連續護土牆 建造提早了六個月展開。

高鐵	(香港段)	總值五千萬以上的已批合約	(截至 2014年3月)
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合約編號及內容	承包商/承建商	批出合約總
		值
		(港幣百萬元)
802 南昌物業地基移除及	新昌營造廠有限公司	334
重置		
803A 西九龍總站垂直隔	法國地基建築公司	461
牆(地盤甲)		
803B 西九龍總站樁柱	泰昇地基工程有限公	497
(地盤甲-北)		
803C 西九龍總站樁柱	惠保-俊和聯營公司	321
		0.1.0
803D 西九龍總站垂直隔	法國地基建築公司	819
<u> </u>		1.00
805 涂吐迫障礙牣移除	保華建築有限公司	160
810A 西九龍總站(北)	禮頓-金門聯營	8,910
810B西九龍總站(南)	聯歐沃-新昌-保華聯 營	3,321
811A 西九龍總站連接隧 道(北)	Bachy Soletanche - Laing O'Rourke Joint Venture	1,040
811B 西九龍總站連接隧 道(南)	金門-禮頓聯營	2,883
815A 鐵門、門框及五金 供應	怡和機器有限公司	99
815F 西九龍總站公眾厠所 裝修工程	宏宗建築有限公司	53
820美荔道至海庭道隧道	寶嘉一布依格聯營	3,669
821 石蔭至美荔道隧道	寶嘉一布依格聯營	1,384
822 謝屋村至石蔭隧道	禮頓建築(亞洲)有 限公司	3,235
823A 大江埔至謝屋村隧 道	前田一中國建築聯營	1,502

823B 石崗列車停放處及 緊急救援處	前田一中國建築聯營	3,218
824 牛潭尾至大江埔隧道	Kier - Kaden - OSSA Joint Venture	1,515
825米埔至牛潭尾隧道	五洋建設株式會社	1,684
826皇崗至米埔隧道	中國鐵道建設(香港)有 限公司-新昌營造廠 有限公司-中鐵十五 局集團有限公司聯營	1,691
816A 西九龍站-環境控 制系統	新菱冷熱工業株式會 社	783
816B 西九龍站-樓宇設 備監控系統	江森自控香港有限公司	60
816C 西九龍站-低壓供 電系統	新菱冷熱工業株式會 社	550
816D 西九龍站-消防、 供水及排水系統	Leighton - Chubb E&M Joint Venture	664
830 軌道及接觸網系統	俊和-中國中鐵-昆士 蘭鐵路聯營	1,169
840 動車組	南車青島四方機車	1,744
841A 信號系統軌旁設備	北京和利時系統工程 有限公司	308
841B 信號系統車載設備	北京和利時系統工程 有限公司	182
842A 廣深港客運專綫内地 段與香港段機電系統及軌道 接口	廣深港客運專綫有限責 任公司	94
843 隧道環境控制系統	英昌龍聯營公司	260
84411kV供電系统	中華電力有限公司	89
846 軌旁設備	新菱冷熱工業株式會 社	295
847升降機	通力電梯(香港)有限公 司	175

848 自動扶梯與自動人行	蒂森克虜伯電梯(香港)	91
道	有限公司	
849 無綫電通信系統	英國通用一中國智能交	244
	通聯營公司	
850乘客移動通信系統	京信通信有限公司	105
851 固定诵信系统		273
852 票務系統	同方威視技術股份有	166
	限公司	
853 主控系統	北京和利時系統工程	66
	有限公司	
855 隧道通風設施及緊急	安樂工程有限公司	297
救援處樓宇設備系統		
856 石崗列車停放處樓宇	安樂工程有限公司	140
設備		
861A 軌道機車及軌道平	江蘇今創車輌有限公	78
車	司	
總數:42	總值:	44,630
<u>附件三</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 810B WEST KOWLOON TERMINUS SOUTH

LAING O'ROURKE - HSIN CHONG - PAUL Y JOINT VENTURE

2 MAY 2014

<u>Scope</u>

- 1.1 The Contract was awarded to Laing O'Rourke-Hsin Chong-Paul Y JV in January 2011 on 17 January 2011. The works include:
 - (a) excavation of the southern section of the WKT station box and the initial excavation within the main station north terminus area,
 - (b) construction of the southern section of the WKT structure (a four-level basement structure),
 - (c) Austin Road West underpass and a noise mitigation deck.

In addition to this significant additional work has been instructed for the construction of the transfer and ground floor slabs of the West Kowloon Cultural District (WKCD) interface works and the associated changes required to the WKT sea water cooling intake facilities.

- 1.2 The terminus structure is constructed within a diaphragm wall cofferdam, installed by an advance works foundation contractor. The works interface directly with the WKCD and design changes to these facilities have caused frequent changes to the construction to accommodate their requirements. The contractor has been advised of an entitlement to Extension of Time (EoT) of up to 491 days and of the Employer's intention to recover delay through the implementation of Delay Recovery Measures. The anticipated completion date for the Whole of the Works is currently the end of December 2015. Overall ccompletion at 31 March 2014 is 57.7%.
- 1.3 The main civil works are targeted for substantial completion around the end of 2014, excluding the WKCD interfacing works at B1 and G/F levels. Excavation is progressing and the only area remaining after May 2014 will be the southern area adjacent to the diaphragm wall where a significant amount of rock is present.
- 1.4 Access for E&M contractors commenced in March 2013 and deliveries have commenced for the chillers, large diameter pipework, electrical equipment and CLP equipment. Transformers

will be delivered at the end of April 2014. However, large areas remain to be completed and handed over to the E&M contractors.

- 1.5 WKCD is impacting significantly on the WKT works and in particular the request for the redesign of the slab at basement level B1. The resultant reduction in the depth of the slab necessitated substantial structural re-design and statutory resubmissions to BD. The Contractor was prevented from pouring the B1 non-core slab until the design was approved and consent granted. The WKCD Authority's future development above Contract 810B works imposes substantial constraints on construction.
- 1.6 Contract 810B is also required to co-ordinate with Designated Contract 810A in the design of the demarcation wall TWS9a/9b. Due to the award of Designated Contract 810A later than originally scheduled, Contract 810B's design of the demarcation wall was delayed resulting in some considerable delay to the installation of demarcation walls.
- 1.7 Higher than predicted movements in diaphragm wall panels in the Designated Contract 810A area, affected the Contractor's works due to their close proximity and were subject to a work suspension order as a safety precaution. As a consequence, the Contractor was prevented from progressing his excavation in the northern core area until two months later than the originally scheduled date of November 2012.

Delay Recovery Measures

- 1.8 The constraints on this site have restricted the Contractor's options in respect of delay recovery measures. The Contractor has considered various options to mitigate delays wherever opportunities have been identified. Examples of these measures include:
 - a. Installation of additional access ramps to provide extra capacity for spoil removal
 - b. Changing to 'system formwork' to provide reduced turnaround times and increased mobility

- c. Changes to reinforcement design of slabs to facilitate early removal of back propping
- d. Re-sequencing of works and traffic management arrangements to obtain earlier access

Programme

- 1.9 The main structural works continue to be in delay according to the master programme.
- 1.10 A continuous interface with both the WKCD and the Designated Contract 810A will continue to affect those common areas requiring close management by both the Corporation's and Contractor's site teams.
- 1.11 The priority remains the granting of access to the E&M contractors and building services installers. Whilst access commenced in March 2013, the focus on achieving phased access as rooms and plant areas come available will be maximized as the structural works progress.
- 1.12 The experience from the past year will continue to be exploited in order to minimize the installation programmes of the follow-on contractors so far as is safe and practicable.

附件四

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 811A WEST KOWLOON TERMINUS APPROACH TUNNEL (NORTH)

BACHY SOLETANCHE – LAING O'ROURKE JOINT VENTURE

2 MAY 2014

Scope

1.1 The West Kowloon Terminus includes the cut and cover approach tunnel Contract 811A, one of the four main civil contracts and four foundation contracts. Contract 811A will construct a 302m long cut-and-cover tunnel linking Contract 820 to the North with Contract 811B to the South, a temporary retrieval TBM shaft, the Mongkok West Ventilation Building (MKV)) plus, demolition of existing road bridges and provision of two replacement bridges. There is a complex interface with the operating West Rail Line (WRL). Where the XRL alignment passes beneath the WRL tunnels their existing foundations will be transferred to the new XRL tunnel box.

- 1.2 Contract 811A was awarded to Bachy Soletanche Laing O'Rourke Joint Venture on 3 May 2010 with completion scheduled for 10 May 2015. Due to additional instructed requirements this was extended to 31 December 2015. Although there has been some slippage to the Contract 811A programme, it is targeted to complete in line with the revised master programme. There is approximately 3 weeks delay to the MKV but re-sequencing of the works is under review to ensure achievement of the Degree 1 date. Actual overall completion at 31 March 2014 is 81.9%.
- 1.3 The major Contract 811A challenges involved: exposing and underpinning the WRL - an operating railway tunnel, formation of a 30 metre deep cofferdam with only 5 metre clearance to the CLP Lai Cheung Road Substation and working within limited headroom conditions adjacent to existing over-bridges.
- 1.4 Following a Value Engineering (VE) workshop between MTR Corporation and the 811A Contractor a detailed analysis of all technical issues for the reuse of existing WRL barrettes was done. By connecting the XRL tunnel structure to the eight existing WRL barrettes, the introduction of a transfer slab and installation of three bored piles, and enlarging the diameters of six adjacent bored piles to jointly support the XRL tunnel structure, a programme saving of 6.5 weeks to the critical path was achieved. This also increased programme certainty for Contract 811A as the construction risks

and difficulties were substantially reduced, as were risks of structural damage to the WRL operating tunnel.

- 1.5 Further VE was carried out in respect of re-assessing the thickness of the XRL base slab at the crossover area. At around 3 metre thickness it was required to act as a transfer structure to distribute the loads of both the WRL and XRL tunnels onto the foundations. The Corporation's team reviewed the approved design in an effort to mitigate time, costs and construction risks. In the event, 2 weeks was removed on the critical path and the slab thickness was reduced by 1 metre. Simultaneously, a review of the backfill sequencing North of WRL was performed. By de-linking (from a programme perspective) construction of the MKV from the relief jacking operation the MKV was commenced 2 months earlier.
- 1.6 Contract 811A has faced other significant challenges in carrying out the works in close proximity to existing infrastructure such as major highways and bridge structures. In what should have been bulk excavation for the cut and cover tunnels, they have encountered numerous uncharted obstructions, mainly remnants from previous construction activity that were abandoned, but not recorded. The Contractor has proceeded diligently, working during non-traffic hours in the case of those obstructions adjacent to the WRL, to remove these artificial obstructions whilst minimising delays to its Completion Obligations.

Delay Recovery Measures

- 1.7 Contract 811A has, and continues to work collaboratively with the Corporation's management team. Where required, amendments to the proposed works have been instructed by means of Engineer's Instructions (EI) in order not to delay implementation of recovery actions. Where the Contractor considers that he has entitlement to additional costs, then in accordance with the Contract, claims notifications have been lodged. These will be considered in line with the Contract provisions and will be agreed with the Contractor's team where entitlement exists.
- 1.8 The Contractor has demonstrated a willingness to take the initiative, as evidenced by its decision to construct a computerized building information model of the MKV. This has been done at its own cost in a concerted effort to rationalize the design of what was a

complex structure with a view to accelerating construction of the building.

Programme

- 1.9 Despite the challenges of working adjacent to live railway tunnels and highways, as well as in old reclamation areas, the Contractor has successfully worked to overcome those challenges and has readily adopted alternative designs and modified construction practices in order to keep the contract on programme.
- 1.10 Evidence of just how successful this has proved can be seen by the current state of progress on this Contract, with current completion running at 81.9% and only approximately 3 weeks of delay against the Revised Master Programme.

<u>附件五</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 811B - WEST KOWLOON TERMINUS APPROACH TUNNEL (SOUTH)

GAMMON LEIGHTON JOINT VENTURE

2 MAY 2014

Scope

- 1.1 West Kowloon Terminus, (WKT) is being delivered by four main civil contracts and four foundation contracts (completed), including Contract 811B. The Works include:
 - (a) construction of a 600m long cut and cover tunnel,
 - (b) three new footbridges,
 - (c) a public transport interchange (PTI) and
 - (d) West Kowloon Plant Building (WKP).

- 1.2 Contract 811B was awarded to Gammon Leighton Joint Venture on 13 Aug 2010 with the specified contractual completion date for the whole of the works by 10 May 2015. The cut and cover tunnel is formed within a diaphragm wall cofferdam, the construction of which was severely impacted by numerous uncharted obstructions that were significantly more than stated in the Geotechnical Baseline Report (GBR). Follow-on activities for the main sections of the project have suffered consequential delays arising from these events. Further, delays due to abandoned utilities within the Jordan Road area and the abandoned typhoon shelter breakwater were greater than anticipated. Actual overall Contract completion at 31 March 2014 was 46.7%.
- 1.3 Substantial delays, the majority of which are linked to construction of the diaphragm walls forming the cofferdam and arising from unforeseen ground conditions, including high rock head and core stones were encountered. The Contractor has been advised of an entitlement to 449 days Extension of Time (EoT) for delays arising from these combined events.
- 1.4 At the Engineer's request, Contract 811B submitted his Delay Recovery programme, "APR7A" which he has been working to and monitoring progress against since October 2013. There has been some further slippage against the programme (APR7A) but

the Contractor has recently issued a working programme which is being used to monitor the works on site. The planned activities are now being achieved and excavation rates have improved at the north end of the approach tunnel. One area of the tunnel box structure has slipped and additional resources are being deployed to resolve this. Excavation is approximately 60% complete and the base slab construction is being cast progressively as formation comes available.

1.5 West Kowloon Plant Building (WKP) is more critical as this area is highly congested and continual monitoring of production rates to ensure target completion dates are achieved is being applied.

Delay Recovery Measures

- 1.6 The variable rock head levels around the perimeter of the cofferdam would have required excessive rock excavation based upon the original founding criteria. A revised set of founding level criteria, coupled with modifications to the permanent works design has enabled the level of the panels to be raised thereby reducing the amount of rock excavation with a consequential reduction to the panel installation programme.
- 1.7 Where the cofferdam is constructed beneath the existing Jordan Road (JOR) the original plan allowed for switching of JOR to a temporary alignment on top of the completed panels, allowing those panels within the existing alignment of JOR to be constructed. Delays to the north section diaphragm walls, as a result of core stones, would have substantially increased the programme activity if this plan was adhered to. Instead a southern temporary diversion of JOR was instructed, enabling concurrent diaphragm wall construction activity within the JOR area and recovering 190 days of delay.
- 1.8 Jordan Road is a major utility corridor with substantial services laid in the road and footpaths. Over time these have been overlaid many times resulting in a complicated array of abandoned and live services with inadequate slack or space for slewing or movement. To overcome the utility conditions and uncharted obstructions at the JOR area, an extensive utilities hanging scheme was implemented to protect and manage these fixtures and to facilitate the obstruction removal whilst recovering delay to the B1 slab.

1.9 The Contractor has taken numerous other delay recovery actions to deal with the difficulties encountered whilst carrying out these works in this highly congested corridor. The Contractor is maintaining efforts to mitigate delays on an ongoing basis and as circumstances demand. As excavation progresses the frequency of delay events and obstacles is anticipated to reduce and further slippage on the revised completion obligations will be substantially minimised.

Programme

- 1.10 This Contract has been confronted by a large number of unforeseen and unexpected events ranging from ground conditions to artificial obstructions and incorrect and incomplete records of existing services and structures.
- 1.11 The Contractor has been systematically working through these as they have encountered them and has worked closely with the Corporation's management team to re-sequence and amend construction activities wherever practical.

<u>附件六</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 820 MEI LAI ROAD to HOI TING ROAD TUNNELS

DRAGAGES-BOUYGUES JOINT VENTURE

2 MAY 2014

Scope

1.1 Contract 820 was awarded to Dragages-Bouygues Joint Venture on 12 May 2010. The works involve construction of 9 km of twin bored tunnels, including 14 cross passages, between Mei Lai Road and Hoi Ting Road, a ventilation building, a 160 metres long, 33 metres deep Tunnel Boring Machine ("TBM") launch shaft and cut and cover tunnels for the cross over tracks. In addition, the scope includes the foundation and structural works for a new housing development, plus advance piling works for three Government proposed footbridges. Contractual completion date for the Whole of the Works is 10 May 2015.

- 1.2 Three of the tunnel bores, including concrete lining, are now complete, with access provided to follow-on Designated Contractors. Overall completion of Contract 820 is 81% as at 31 March 2014. The fourth tunnel bore is 13% complete, the cut and cover tunnel is 34% complete and Ventilation Building No. 7 is 88% complete.
- 1.3 Contract 820 includes substantial enabling works to facilitate construction of the twin running tunnels. These involve the removal of around 120 existing piles supporting live and abandoned facilities obstructing the path of the TBM. Advance ground treatment, required to protect structural integrity of adjacent buildings and structures along Sham Mong Road, Hoi Wang Road and Tai Kok Tsui, and were done ahead of tunnel boring.
- 1.4 Protection measures for the 'live' MTR Tsuen Wan Line tunnels were also necessary as the XRL tunnels were bored across the existing line and in close proximity to the tunnels invert. The Contractor provided its own alternative engineering solution for the advanced protection measures necessary to satisfy the Operation Division Railway Protection Team. All activities were planned and executed with precision, in accordance with stringent protection requirements necessary to ensure the safety and structural integrity of the Tsuen Wan line.

- 1.5 The Down Track (DT) and Up Track (UT) bored tunnels are constructed by four separate TBM drives, all commencing from the central launch shaft, two driven south towards Yaumatei and two driven north towards Kwai Chung.
- The original construction sequence was frustrated by delays 1.6 experienced under Contract 802 advance works contract where difficulties in extracting old H piles installed many years earlier, but now in the path of the XRL tunnels, were proceeding behind programme. Actions by the Contract 820 Contactor to revise the proposed sequence of tunneling, thereby avoiding the potential delays arising from the 802 works, were implemented at an early This pre-emptive and proactive approach involving stage. substantive modifications to the TBM manufacture was able to Contract construction protect 820's programme from uncertainties arising from Contract 802 advanced works.
- 1.7 Once tunneling had commenced on the South Down Track the TBM encountered unforeseen obstructions impeding the TBM advance. Twenty one abandoned H-piles in Hoi Wang Road (North), subsequently identified as remnants of works by Civil Engineering Development Department, as well as isolated steel obstructions within Contract 802's site were encountered at separate times on this tunnel bore. The TBM cannot bore through such obstructions without incurring damage to the cutter heads. Consequently, the TBM had to be halted whilst specialist compressed air contractors were brought in to carry out the manual cutting and removal of abandoned piles. Removal of these unforeseen obstructions stopped TBM progress for 7 months in the case of the H-piles, and a further 11 weeks for the Contract 802 site obstructions.

Delay Recovery Measures

1.8 Delay recovery measures on Contract 820 have been proactively managed by the Corporation and the Contractor working in close cooperation throughout this contract. Timely notifications in the event of difficulties encountered coupled with a good degree of technical competence on the Contractor's side has resulted in timely resolution of challenges.

- 1.9 Generally, all measures to overcome delays and obstacles have been negotiated between the Corporation and the Contract 820 Contractor and were formalized under an Engineer's Instruction. Subsequently, these have been combined by incorporating them into a Supplementary Agreement to ensure the contractual entitlements are agreed and correctly recorded and the Contract Completion Obligations are reset.
- 1.10 Currently, 3 Supplementary Agreements have been signed with the Contractor and endorsed through MTR's own internal control procedures.
- 1.11 The Contractor has worked, and continues to work, closely with the Contract 821 contractor to the North and the Contact 811A contractor to the South. The Contract 820 TBMs require reception chambers to enable TBM dismantling at the end of the tunnel drives. The Contract 820 Contractor has negotiated the transfer of these reception chamber works into its contract to prevent any knock-on delaying effects as a consequence of Contract 820 delays.

Programme

- 1.12 The linear construction sequence for tunneling means unforeseen obstructions inevitably result in irrecoverable delays to progress. Prompt actions by the Contractor have, minimized these delays so far as is practicable.
- 1.13 The fourth and final tunnel drive, the South Up track, continues, with breakthrough currently planned for October 2014 after which works to complete Degree 1 will follow.

<u>附件七</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 821 – SHEK YAM TO MEI LAI TUNNELS

DRAGAGES-BOUYGUES JOINT VENTURE

2 MAY 2014

<u>Scope</u>

- 1.1 Contract 821 was awarded to Dragages–Bouygues Joint Venture on 12 July 2010.
- 1.2 The works comprise:
 - (a) construction of 3.6 km of main running tunnels from Shek Yam to the Mei Lai Road;
 - (b) the Kwai Chung Ventilation Building (KCVB); and
 - (c) a combined ventilation and vehicular access adit (KCVA) extending between the ventilation building and the main tunnels are also included.
- 1.3 Works commenced in July 2010.

- 1.4 Tunnel breakthrough to Contract 822 was on 1 March 2013. The tunnel lining for the main tunnel, including partition walls and walkways are 100% complete. Access to the drill and blast (D&B) section of the main running tunnel for Designated Contractors (DC's) for rail, electrical and mechanical installation works was achieved on 21 July 2013, and access to the remaining tunnel boring machine (TBM) drive will be achieved in May 2014. The KCVA structural works were completed on 28 March 2014, although early access for the DC has been available since 2 April 2013. The civil and ABWF works in the KCVB were completed on 31 October 2013 in line with the Completion Obligations. The non-critical external road and landscaping works will be completed by May 2014. At March 2014 over 99% of the structural works are complete.
- 1.5 Construction has involved commencing excavation at the Kwai Chung Vent Adit (KCVA) Portal, completing the adit to the junction with the main running tunnels (MRT) followed by excavation simultaneously northwards and southwards, followed

up by lining and internal structures works. At the southern boundary, Contract 821 constructed a receiving chamber for the Contract 820 TBM, which originally extended 660 metre into Contact 821's tunnel.

- 1.6 The actual construction works have generally followed this sequence. However, Contract 821's Contractor, recognising that the bifurcation works were significant, excavated two separate bypasses, the North Bypass and the South Bypass, either side of the junction of KCVA and the running tunnels. Further, increasing the extent of the Contract 820 TBM Works to 860 metres has reduced the amount of (slower) drill and blast works by about 200 metres, reducing risk on the MRT South excavation and the TBM chamber preparation works.
- 1.7 Works by the follow-on contractors for rail installation and electrical and mechanical installation works are now advancing in line with the programme. All non-critical outstanding works not impacting the Designated Contractors will be completed by end of May 2014.

Delay Recovery Measures

- 1.8 No Delay Recovery Measures have been instructed under contract 821.
- 1.9 Where the contractor has faced challenges relating to completion of Degree 1 works in the tunnels, or with Completion Obligations in respect of the ventilation buildings, he has taken action to negotiate a phased handover of access so as to minimise the delay to follow-on contractors such as track laying and overhead line and building services installation.
- 1.10 The Contract 821 Contractor has, in order to secure the achievement of Completion Obligations in the tunnel section, borne the cost of excavating two temporary by-pass tunnels of nearly 100 metres each, in order to minimise risks to his spoil removal activities.
- 1.11 Similarly, Contract 821 has worked cooperatively with the adjacent Contract 820 team to re-sequence works at the contract interface and modified the location of the bi-furcation chamber and agreeing to a larger extent of TBM tunnelling by the Contract 820 TBM

beyond the contract interface. This has facilitated the mitigation of delays caused by the re-sequencing of the Contract 820 TBM drive and permitted track laying at an earlier date to the northern section of Contract 821 tunnels.

Programme

- 1.12 Impacts to the Contract 821 programme have been resolved in the Supplementary Agreement No.1.
- 1.13 All substantial structural works under Contract 821 are complete.

<u>附件八</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 822 TSE UK TSUEN to SHEK YAM TUNNELS

LEIGHTON CONTRACTORS (ASIA) LIMITED

2 MAY 2014

Scope

- 1.1 Contract 822 was awarded to Leighton Contractors (Asia) Limited in March 2010. It comprises the main running tunnels and associated ventilation and access structures between Tse Uk Tsuen in Kam Tin and Shek Yam (SY) in Kwai Chung. The Works include:
 - (a) a 7.6 km drill & blast main tunnel beneath Tai Mo Shan;
 - (b) a deep ventilation shaft;
 - (c) ventilation and access adits; and
 - (d) ventilation buildings at Pat Heung (PH) and Shing Mun.
- 1.2 The Contract also includes a temporary barging point at Tsing Chau Tsai for spoil disposal, plus construction of two temporary explosive storage magazines, at Tai Shu Ha and So Kwun Wat.

- 1.3 Works construction have generally followed the original planned sequence, but with some exceptions due to accessibility constraints linked to the conservation area (CA) at Pat Heung and encroachment by the tunnel works into the CA.
- 1.4 The main running tunnels were excavated from both ends and breakthrough was achieved on the 1 March 2014. Drilling and blast excavation are now 100% complete. The main tunnel lining is continuing with around 95% complete and all tunnel internal works to Degree 1 by September 2014. The Pat Heung Vent Building (PHVB) is complete, and the majority of the Shing Mun Shaft and Vent Building will be completed within 3Q2014. The Building Services installation contractors will be granted access progressively to the Shing Mun Vent Building structure from week 35/2014. During this phase the remaining structural works within the Shing Mun Shaft and Vent Building will continue in parallel to the fit-out and building services works. Overall completion is 88.3% at the end of March 2014.
- 1.5 The majority of delays have occurred in the main tunnel excavation and

Shing Mun Shaft. For the main running tunnel these arise primarily from Conservation Area (CA) encroachment, restricted blasting times, ground & groundwater inflow exceeding Geotechnical Baseline Report (GBR) indications, and the Contractor's inefficiencies at not achieving planned excavation progress and lining rates.

- 1.6 At the Shing Mun Vent Building (SMVB) & Shing Mun Shaft,(SMS) delays have arisen due to a combination of ground conditions, additional tree transplanting, design variations and delays arising from inefficient working.
- 1.7 Three areas still causing programme concerns include the main tunnel lining junctions, the PHVAA completion and Shing Mun Shaft due to recent Slipform-related delays. Mitigation measures are being implemented or are undergoing development to overcome these delays.

Delay Recovery Measures

- 1.8 Combined efforts by Corporation and the Contractor to mitigate all delays have been made in critical areas. For example, construction of a temporary adit was instructed connecting the PHVA to the PHVAA and allowing PHVAA excavation to progress without waiting for the approval and issue of the variation to the Environmental Permit (VEP).
- 1.9 At the Shing Mun Vent Building and Shaft work site the proximity of a densely populated public housing estate presented a challenge to carrying out noisy drill and blast works while minimizing noise and dust nuisance to the stakeholders. The Contractor decided to construct a large noise enclosure completely containing the Shing Mun Construction site. This permitted 24 hour working, whilst containing dust and noise nuisance. As a further demonstration of environmental consideration the enclosure has been partially painted green to blend in with the natural hill slope behind it.
- 1.10 To mitigate tunnel lining delays, whilst also expediting the provision of access to the track laying contractor it was proposed to add one extra Type M and associated wall and (overhead vent duct) shutters which it was estimated could recover over 100 Days delay.
- 1.11 Overall, the Contractor has taken initiatives including: optimization of

spoil removal logistics to neighbouring XRL barging points, pursuing rates of concreting via extended working hours (CNPs), carrying out design modifications for use of precast elements, using specialized concreting plant, such as slipform pavers, and reducing impacts on excavation works affected by blasting times, via close communication/notifications with nearby residents.

Programme

- 1.12 The works remain in delay against the master programme and in the particular locations highlighted above. Mitigation measures are continuing to limit any further slippage and initiatives to allow joint working in the tunnels by the follow-on contractor (track and overhead lines) are being trialled.
- 1.13 Similarly, on the ventilation building at Pat Heung phased handover of rooms is being implemented to advance access for the E&M contractors.

<u>附件九</u>

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

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CONTRACT 823B SHEK KONG STABLING SIDINGS AND EMERGENCY RESCUE SIDING

MAEDA – CHINA STATE JOINT VENTURE

2 MAY 2014

Scope

- 1.1 Contract 823B was awarded to Maeda-China State Joint Venture (the 'Contractor') in October 2010 and includes
 - (a) the construction of the Emergency Rescue Siding (ERS), cut and cover tunnels to the north and south of the ERS;
 - (b) the approach tunnels for the SSS; and
 - (c) the shunting tunnel plus the Shek Kong Stabling Sidings (SSS) all located at Kam Tin Valley and the former village of Choi Yuen Tsuen.
- 1.2 Two tunnel ventilation plant buildings located at either end of the ERS are also included within Contract 823B. The SSS provides at grade stabling sidings and running maintenance tracks facilitating routine inspection to trains, including train washing facilities. Several maintenance buildings within the SSS site will support infrastructure maintenance for the line.

- 1.3 Structural works to all the buildings in the SSS are complete. The North Plant Building is 64.8% complete and the South Plant Building is 68.8% complete. Access to the whole of running tunnel (1.2km) was given to the Permanent Way and Over Head Line contractor on 8 April 2014 whilst 75% of the track area at the SSS has been handed over for track laying. The Approach tunnel is scheduled to be completed by early June 2014. Actual overall completion was 77.5% at 31 March 2014. Substantial completion is programmed for 10 May 2015.
- 1.4 Contract 823B has faced three major delay events not foreseeable at Contract award, namely:
 - (a) the possession of Works Areas due to the Choi Yuen Tsuen issue;

- (b) unforeseen ground conditions at Tai Lam Fault Zone, and
- (c) additional scope to suit revised operation needs instructed during the Contract.
- 1.5 There have been other events during construction that have all impacted upon progress. For instance, the land resumption for the site was eventually completed in May 2011, some five months later than the specified in the Contract. Prior to this, the Contractor was unable to secure the Work Site due to the disruption and demonstration by protestors. Primarily for safety reasons, the Contractor was severely constrained in carrying out its works during this period.
- 1.6 Geotechnical conditions at the Tai Lam Fault Zone and its adjacent areas also created substantial challenges to diaphragm wall, H piles and bulk excavation. Only limited site investigation (SI) works were completed during design stage due to difficulties in gaining access to the land prior to project commencement. Subsequent SI works carried out during construction indicated that geotechnical conditions were far more complex than originally predicted, resulting in the need to amend designs with consequential extension of planned construction durations.
- 1.7 Due to the changes in operational requirements, additional works scopes were instructed as variations to the 823B Contractor including:
 - (a) the OCC (Operation Control Centre);
 - (b) Floor Wheel Lathe system at the SSS; and
 - (c) substantial additional noise barriers,
- 1.8 As these were instructed during the construction phase they resulted in the need to grant further time under the Contract to the Contractor for him to complete. The impact of all these events has affected access dates to the Designated and Interfacing Contracts who are responsible for installing the railway system and building services installations required for operation and commissioning the railway.

Delay Recovery Measures

1.9 The handover of the works site has been the single biggest delaying event on Contract 823B and is entirely beyond the control of the Corporation or the Contractor. However, the two parties have worked closely to re-assess the Completion Obligations under the Contract and in recognition of this a Supplementary Agreement (SA No.1) was approved by the Corporation and was executed on 10 January 2013. The agreed measures to mitigate the delays have included:

(a) overtime working;

- (b) increased plant for diaphragm wall construction;
- (c) H-pile and SI works.
- 1.10 Further, alternative construction methods have been implemented which increase the extent of formwork and temporary works requirements envisaged in the original tender submission. There have been no specific instructions issued by the Corporation relating to delay recovery measures since the issue of SA No.1. The Contractor is, however, working diligently to implement any instructed variations within the contractual Completion Obligations.
- 1.11 Whilst carrying out the works the Contractor has encountered complex geological conditions which have affected the original designs, in particular the bearing strata beneath the tunnels have required increased amounts of reinforcing steel to be installed. All such adverse geological conditions have been logged by the 823B Contractor and assessment in accordance with the Contract will be carried out by the Corporation in due course. Any entitlements under the Contract will be advised to the Contractor once assessment, in accordance with the Conditions of Contract, have been completed by the Engineer's Representative the 823B Contractor will be notified formally.

Programme

1.12 As at April 2014, overall progress of the Contract 823B works were 33 weeks behind the date shown in the revised Master Programme and included in the SA No.1. This is due to a combination of further instructed works additional to the original scope, changes in the design of the works arising from changed geological conditions and also (in the Corporation's view) due to under performance by the Contractor's labour force.

附件十

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 824 NGAU TAM MEI TO TAI KONG PO TUNNELS

KIER KADEN OSSA JOINT VENTURE

2 MAY 2014

Scope

- 1.1 Contract 824 was awarded to Kier-Kaden-Ossa Joint Venture (the "Contractor") in August 2010 and includes:
 - (a) construction of 2.3 km twin bored single track tunnels in rock, with cross passages, between Ngau Tam Mei and the Tai Kong Po;
 - (b) a tunnel crossover approximately 350 metres long;
 - (c) a ventilation building at Ngau Tam Mei Ventilation Building (NTV); and
 - (d) the Tai Kong Po Plant Building (TKP).
- 1.2 Major temporary works include:
 - (a) widening of sections of Chi Ho Road and Kong Tai Road;
 - (b) a temporary barging facility at Lung Kwu Sheung Tan; and
 - (c) operation of an explosive magazine at Tai Shu Ha.

- 1.3. Both running tunnels are still under construction, with the remaining section from the TKP bifurcation to Cross Passage 16 (CP16) remaining. The tunnels and crossover cavern from NTM shaft to CP16 is complete. Overall contract completion at 31 March 2014 is 59.7%.
- 1.3 Tunnels are being excavated using drill and blast methods. Two shafts, one at Ngau Tam Mei shaft, the other at Tai Kong Po shaft, were constructed to provide access for the start of tunnel blasting which at tender time, was envisaged as being constructed 50/50 from the NTM and TKP sides.
- 1.4 At Ngau Tam Mei shaft, commencement of site clearance works was

delayed due to the late identification of underground utilities and issue of the Tree Removal Application ("TRA"). The Contractor considered there could be a programme advantage by adapting his alternative design and this was agreed. Unfortunately, statutory approvals under the Instrument of Compliance (IoC) took longer to complete than anticipated and in the event, delays did occur.

- 1.5 Unforeseen ground conditions contributed to further delays to shaft excavation at both Ngau Tam Mei and Tai Kong Po including, unexpected amounts of cobbles, boulders and core stones all affecting excavation rates. Other factors such as high water inflows, late procurement of the Blasting License from Mines Division and discharge water not meeting the Discharge License requirements contributed to delays.
- 1.6 Tunnel excavation commenced at NTM and TKP shafts. At NTM, the crossover cavern has experienced high water inflows and substantial grouting works have been required. Re-sequencing of excavation to suit the geological conditions has been implemented but an inevitable knock-on delay to commencement of NTV permanent building works has occurred.
- 1.7 At the TKP shaft tunnels comparatively poor rock quality was experienced at the initial sections from the TKP shaft, requiring installation of temporary steel ribs to provide support at the weakest zones. Excavation of the bifurcation tunnels is now complete. The running tunnels to NTM near CP16 are progressing steadily to achieve tunnel breakthrough on both tunnels.
- 1.8 The Corporation considers that the contractor has suffered continuously from insufficient resources including plant, equipment and manpower, combined with inadequate supervision, poor planning and frequent plant/equipment break downs which combined have contributed to delays on both tunnel excavations and tunnel lining works. In addition, Labour Department suspended a section of tunnel works following a fatal accident that occurred on 17 September 2013.
- 1.9 NTM access roads have been delayed due to stakeholder complaints and objections from local villagers. Relocation of the new access roads to within the Contractor's existing site facilities at Ngau Tam Mei site has caused disruption, as the Contractor now needs to relocate his installations before construction can commence. At TKP villager's

complaints on compensation for alleged building damage from the works has disrupted the completion of the Chi Ho Road and the TKP Access Road has been redesigned to avoid working outside the villagers property.

Delay Recovery Measures

- 1.10 In order to achieve 24 hour working for spoil removal, the Contractor has constructed a temporary Second Access Shaft (SAS) with a noise enclosure next to the TKP shaft. This SAS has also allowed early commencement of tunnel excavation as it was completed before the TKP shaft.
- 1.11 Currently, two tunnel lining formworks systems (D/T and U/T) are being employed. Further formwork systems are being fabricated in China and are targeted to be delivered to the site in early May 2014 facilitating the accelerated progress to lining of the running tunnels.
- 1.12 To mitigate delays from the late start of the TKP shaft permanent works, the Corporation held workshops with the Contractor to redesign the TKP building to reduce its original completion period. The redesign effort included converting internal non-load bearing concrete walls to block work walls to simplify construction works.
- 1.13 The Contractor stopped the tunnel excavation at CP16 from the NTM side in October 2013 removing a severe constraint to constructing the ventilation building due to delays to the tunneling excavation. All remaining tunnel excavation is now be progressed from the TKP shaft end.

Programme

1.14 Despite the implementation of delay recovery measures and resequencing initiatives, the contractor remains in delay against the original Master Programme.

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REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

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CONTRACT 825 MAI PO to NGAU TAM MEI TUNNELS

PENTA OCEAN CONSTRUCTION COMPANY LIMITED

2 MAY 2014

<u>Scope</u>

- 1.1 Contract 825 was awarded to Penta Ocean Construction Limited. Works commenced on 1 February 2010. Contract 825 Mai Po to Ngau Tam Mei Tunnels will construct:
 - (a) twin 2.4km running tunnels between Mai Po and Ngau Tam Mei Ventilation Buildings,
 - (b) the Mai Po Ventilation Building,
 - (c) a TBM launch shaft,
 - (d) tunnel cross passages
 - (e) other associated surface related external works.

- 1.2 Excavation of the Down Track is complete. Track laying access for the Down Track tunnel will commence end of May 2014. Up Track TBM breakthrough is expected at end of July 2014. Track access will be the end of November 2014. Overall contract completion to the end of March 2014 is currently 85.03%.
- 1.3 During TBM launch shaft and Down Track tunnel excavation the contractor encountered several challenges that impacted upon planned rates of progress. These include:
 - (a) unsatisfactory pumping test results on the launch shaft,
 - (b) unforeseen ground conditions along the Down track tunnel;
 - (c) delays arising from the formation of a sinkhole above the Down Track tunnel.
- 1.4 To mitigate the risk to TBM mining at the adverse ground zones, the tunnel mining mechanism was adjusted with the use of thickened

bentonite. Recognising the potential for knock-on delays from using only one TBM, the Contractor proposed an additional machine for construction of the 2nd tunnel (the Up Track tunnel) in Sept 2012. This 2nd TBM was commissioned in Jul 2013, and was also equipped with the modified cutter head set up to facilitate excavation through the difficult ground conditions encountered by the first TBM drive.

- 1.5 Contract 825 has incurred delays to both tunnel drives, as a consequence of unforeseen physical ground conditions and artificial obstructions along the alignment. Although slowing the advance of the TBM drive, the contractor has succeeded in progressing without adverse impact on the permanent works. All adverse conditions have been logged with the Corporation's site team and, where entitlement exists, claims for the delay and additional cost have been lodged. These are under review by the parties and any entitlement will be assessed in accordance with the Contract.
- 1.6 The Engineer has issued instructions throughout the course of the works. For example, on the Mai Po Ventilation Building, delays to the completion of the structural works have been incurred as a consequence of instructed variations. However, these are not the sole cause of the delays and any entitlement to delay and additional costs will be assessed by the Engineer under the Contract.

Delay Recovery Measures

- 1.7 Contract 825 has encountered numerous challenges not foreseen at Contract award. The Contractor has worked collaboratively and proactively with the Corporation's team to overcome those challenges.
- 1.8 Several delay mitigation initiatives have been implemented, the procurement of a second TBM being the most substantial measure, to overcome delays.
- 1.9 Simultaneously, measures to facilitate access to the tunnels for track laying contractors and for delivery of equipment by other E&M contractors have also been taken, including two temporary openings in both Up and Down tracks cut and cover section to facilitate delivery of rail welding sets for the track laying contractor, eliminating knock on delays from Contract 825.
1.10 In response to poor ground conditions, modification of the permanent Works design, as in the case of relocating Cross Passage CP14 and CP13, has been carried to pre-empt further delays.

Programme

- 1.11 Despite taking delay recovery measures the Contractor has sustained delays to some of the Contract Completion Obligations.
- 1.12 However, the Contractor has proactively facilitated access to follow-on contractors in order to mitigate delays to the overall project completion and these measures are continuing.

附件十二

REPORT TO THE LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG KONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 810A – WEST KOWLOON TERMINUS NORTH

LEIGHTON GAMMON JOINT VENTURE

2 MAY 2014

This report has been prepared by MTR Corporation Limited for the purpose of reporting to the Legislative Council Panel Transport Subcommittee on Matters Relating to Railways in relation to the construction and commissioning of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (the "XRL Project") and anything stated in this report is without prejudice to any of MTR Corporation Limited's legal or contractual rights in respect of the XRL Project.

1 EXECUTIVE SUMMARY

Contract 810A

- 1.1 In October 2011, MTR Corporation Limited (the "Corporation") awarded Contract 810A to Leighton Gammon Joint Venture (the "Contractor").
- 1.2 Contract 810A relates to works for the construction of the West Kowloon Terminus Station North, which forms part of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link ("Express Rail Link").
- 1.3 Contract 810A is by far the largest civil contract on the West Kowloon Terminus, and also the most complex.

Scope of works under Contract 810A

- 1.4 The works to be completed under Contract 810A include both railway-related works and non-railway-related works as listed below.
- 1.5 The major railway-related works under Contract 810A include the following:
 - (a) Excavation for northern portion of West Kowloon Terminus;
 - (b) West Kowloon Terminus structures (northern portion, approximate length 400m) and West Kowloon Terminus up ramp to Road D1;
 - (c) Station Entrance Building;
 - (d) Footbridges 1, 2 and 5;
 - (e) Pedestrian Link to Footbridge 5;
 - (f) two subways connecting West Kowloon Terminus station to Austin Station and Kowloon Station Development and associated modification works at the connections;
 - (g) all builder's works associated with Building Services and Systemwide Electrical and Mechanical Engineering

Designated Contracts;

- (h) Architectural Builder's Works and Finishes works in West Kowloon Terminus station, including those with the adjacent Contracts 810B and 811B;
- (i) hard landscape for West Kowloon Terminus, including the deck on Austin Road West Underpass in Designated Contract 810B:
- (j) signage in carpark and access ramp in Designated Contract 810B;
- (k) Safety and Warning Signs in West Kowloon Terminus Back of House Areas;
- (1) supply and delivery of Maintenance Access Platforms; and
- (m) Footbridge 6.
- 1.6 The major non-railway-related works under Contract 810A include the following:
 - (a) Lin Cheung Road, Road D1A(S) and Road D1 (Road D1 known as "Wui Man Road") and associated works;
 - (b) Lin Cheung Road Underpass;
 - (c) Noise barriers along Lin Cheung Road and Road D1A(S);
 - (d) Footbridge 3;
 - (e) Electrical and Mechanical Engineering works for the full Lin Cheung Road /Austin Road West Underpass system including the sections constructed by the adjacent Contracts 811B and 810B;
 - (f) diversion of Utilities Services and laying of water mains, drains and sewers;
 - (g) Covered walkways to Austin Station, Elements and Kowloon Station Subway; and
 - (h) Government accommodation Architectural Builder's Works and Finishes fit-out works.

Estimated completion date

- 1.7 Contract 810A states that the Contractor is to complete the whole of the Works by May 2015.
- 1.8 The Corporation, based on the most recent Contractor's programme forecast (as at April 2014), currently estimates that the whole of the Works under Contract 810A will be completed by mid-2017.

Current overall Contract status

- 1.9 Below is a summary of the Contract 810A status as at 31 March 2014:
 - (a) Time Elapsed = 68.6%
 - (b) Master Programme Planned Completion = 86.8%
 - (c) Delay Recovery Measures Rev. 2 Programme Planned Completion = 38.8%
 - (d) Actual Completion at 31 March 2014 = 22.4%
- 1.10 A substantial section of the Contract 810A south core (built bottomup from B4 level) has been completed up to ground floor. The sequence of works now dictates connection with the two external diaphragm walls to the east and west sides. This will be achieved progressively during quarters 2 and 3 of 2014. This will allow the remainder of the Contract 810A south core structure to be completed.
- 1.11 The critical area of the Contract 810A structure is the north topdown section interfacing with the approach tunnel structure of Contract 811B. Here the top slab of the terminus has been substantially completed between the diaphragm walls, and excavation down to the next slab levels will commence. This is the area with a significant volume of rock to be removed below the B3 level.
- 1.12 Steelwork fabrication for the station entrance building roof is in progress in both Mainland China and Thailand. There have been fabrication delays within the Mainland and to date the overall status of fabrication stands at approximately 30%.

1.13 Procurement of all the fit-out materials has continued and these will in the main be stored ready for use when areas of the structure can be made available.

Delays encountered on Contract 810A

- 1.14 Delays have been encountered from the award of Contract 810A. Substantial delay has impacted the planned programme and sequence of Contract 810A. The delay has in turn affected the access dates to the Designated and Interfacing Contracts which are necessary to complete the West Kowloon Terminus such that it is ready for operation.
- 1.15 The Engineer's Representative has advised the Contractor that it has entitlement of 259 days extension of time to the Contract 810A works as a result of 12 notified delaying events assessed up to 31 March 2013. The Contractor has made additional claims relating to the period following 31 March 2013 that are currently under assessment.
- 1.16 The delays to the Contract 810A works have resulted from, amongst other things:
 - (a) delays to initial access to the site due in part to the delays encountered under Contract 811B;
 - (b) unforeseen ground conditions;
 - (c) design changes to the roof, design development and other design changes; and
 - (d) other miscellaneous delaying events.
- 1.17 The main delays to the Contract 810A works relate to three critical paths within the contract:
 - (a) North Top-Down area;
 - (b) Station Entrance Building; and
 - (c) Lin Cheung Road.
- 1.18 Examples of the delays for each of the three critical paths, together with the delay recovery measures implemented, are set out in this report.

2 CONTRACT AND PROGRAMME ASSESSMENTS

April 2013 – Delay Recovery Measures programme

- 2.1 In April 2013, at the request of the Corporation, representatives of the Contractor gave a presentation to senior management of the Corporation and Contractor. At the presentation, the Contractor:
 - (a) described how and when Contract 810A was estimated for completion, taking into account the delays encountered and the status of the Contract; and
 - (b) presented the Delay Recovery Measures DRM2 programme, which relied on the implementation of various delay recovery measures to expedite critical areas of construction and recover delay.
- 2.2 The DRM2 programme demonstrated that civil works could be completed to allow track access progressively from May to September 2015, with the completion of the whole of the Contract 810A works in mid-2016.
- 2.3 The Contractor formally submitted the DRM2 programme in June 2013.

May to July 2013 – Programme review

- 2.4 Between May and July 2013, the Corporation's planners undertook a review of the Contractor's DRM2 programme. In carrying out this review, the Corporation considered what was required to maintain a 2015 opening of the railway.
- 2.5 During the review, the Corporation considered the concept of opening the railway with "Minimal Operating Requirements". The concept started from the premise that, whilst not all the West Kowloon Terminus facilities and surrounding infrastructure could be delivered within 2015 as intended, the railway could still be opened.

July 2013 to March 2014 – Minimum Operating Requirements exercise and programme assessment

2.6 In the second half of 2013, the Corporation undertook a Minimum Operating Requirements exercise to assess the criticality of individual elements of the West Kowloon Terminus and undertake an assessment of:

- (a) what a reasonable and realistic programme to completion would show;
- (b) what elements of the works would not be complete within 2015; and
- (c) whether the West Kowloon Terminus could be ready for opening within 2015 with the elements of works outstanding.
- 2.7 Designers, E&M Engineers and Corporation planners, together with the Contractor, undertook the Minimum Operating Requirements exercise.
- 2.8 In addition, during the second half of 2013, the Corporation (as a result of further challenges and notably lower-than-planned productivity compared against previous programmes, including DRM2):
 - (a) made an assessment that the further slippage would push track access in the north top-down area towards the end of 2015. Even with the implementation of available mitigations, the ongoing challenges render the completion dates given in the April 2013 presentation unachievable; and
 - (b) requested a revised programme to complete (in parallel with the Minimum Operating Requirements exercise, which itself couldn't have accounted for recently identified challenges).

March to April 2014 – Revised Completion Expectations

- 2.9 On 31 March 2014, the Contractor presented the results of the Minimum Operating Requirements exercise (although the completion dates for the station box were made available late February). The exercise identified that:
 - (a) completion of the Contractor's works was now estimated to be completed end of March 2017;
 - (b) tracks 4 to 9 were estimated to be ready for Revenue Operation by end September 2017; and
 - (c) all tracks were estimated to be ready for Revenue Operation by December 2017.
- 2.10 On 7 April 2014, the Contractor presented an updated programme

for completion of the whole of the works (DRM rev 2B) to the Corporation.

2.11 Both the Minimum Operating Requirements and DRM2B programmes showed significant slippage beyond the dates presented in April 2013. This reflected the effects of various delaying events and took account of lower than previously planned production rates. At this point, the remaining durations were considered insufficient to recover the additional slippage.

3 MAIN CAUSES OF DELAY / DELAY RECOVERY MEASURES

Initial access to the site

- 3.1 There were delays to the diaphragm walling to the north of Jordan Road which affected the date which the contractor for Contract 811B could divert the road northwards. To mitigate the effect, the Corporation instructed the 811B contractor to divert Jordan Road southwards - this was done in February 2012. The 811B contractor then had access to most of the remaining diaphragm wall panels in Jordan Road, but not all. These remaining panels had delays due to unforeseen rock and utilities within the ex-Jordan Road area. The Jordan Road was diverted northwards in September 2012, allowing the 811B contractor to access to all of the remaining panels. These too were affected by delays due to unforeseen rock and utilities.
- 3.2 This all had a knock-on effect to handing over of the north topdown area to 810A and in particular, the Works Area 13.61, which was only handed over to 810A in November 2013.

Design issues

- 3.3 Design changes and development of design have impacted Contract 810A.
- 3.4 In the initial stages of the contract works, there were changes to the roof as a result of the very complex nature of the design. These have been resolved for a considerable time and the main issues now revolve around the Contractor's erection methodology and its temporary works designs.
- 3.5 Design concerns on the main reinforced concrete structure have arisen from changes to temporary works that rely on the permanent works designs, missing information and coordination between the

various design disciplines. These are being closely controlled and teams are working ahead of the Contractor to prevent delay to construction activities.

North Top-Down Area

- 3.6 In the Engineer's programme, there was a period from July 2012 to December 2013 (Track Access Completion Obligation 4.4A week 52/13) for the structural works in the north top-down area.
- 3.7 In the Contractor's master programme, there was an incorrect assumption (Access to Works Area 13.61 shown in July 2012, 5 months early) and faulty logic which would have caused a delay to this Track Access date.
- 3.8 Added to this there were major delay events which include:
 - (a) Extension of Time Claim 033: Delayed Possession of Works Areas (including Works Area 13.61);
 - (b) effects of Engineer's Instruction 120: Demolition of Jordan Road Southern Diversion; and
 - (c) Supporting and slewing of existing cables / utilities.
- 3.9 This would then have delayed further the Track Access date.
- 3.10 At 31 March 2013, the reported actual delay to Contract 810A was 341 days. An entitlement to 259 days Extension of Time has since been acknowledged by the Corporation for the period up to 31 March 2013. This included an entitlement to an Extension of Time against Completion Obligations in the north top-down area of 291 days.
- 3.11 On 17 April 2013, the Contractor presented the Delay Recovery Measures DRM2 programme, which showed a revised completion date for the north top down area of June 2016.
- 3.12 Since 1 April 2013, there have been further major delaying events which include:
 - (a) Extension of Time Claim 043: Delayed Access to Works Area 13.61 (continued);

- (b) Extension of Time Claim 058: Unforeseen Conditions existing pipe (and other non-notified obstructions encountered);
- (c) Extension of Time Claim 061: Suspension of Concrete Works due to Coupler Issues; and
- (d) issues related to changes in design for temporary or permanent works.
- 3.13 The application of Delay Recovery Measures in the north topdown area included Delay Recovery Measure 004. The benefits of Delay Recovery Measure 004 are minor at the B4 level, comprising increased working space and maneuverability in areas with cruciforms versus those areas formerly with bracing. However, it will provide a faster excavation down to B4 as layerby-layer excavation and bracing is not required.
- 3.14 An additional future Delay Recovery Measure is to excavation continuously, rather than wait for Nondestructive Testing weld tests on bracing layer-by-layer. This will also speed up excavation to B4 level.
- 3.15 The greater benefits of Delay Recovery Measure 004 are at B3 level, where non-structural walls and Degree 1 works can commence after casting of the B3 slab and can continue whilst excavating below to B4. This is means it is not required to wait for the excavation to B4, casting B4 and bottom-up columns B4 to B3 and B3 to B2, and the removal of temporary stanchions and bracing.
- 3.16 Delay Recovery Measure 004 in fact caused some further delay to the commencement of B1 slab works in the area, partially offset by the faster excavation down to B4. Overall, this may have delayed further the Track Access date, but will provide earlier access to B3 E&M rooms which will benefit the overall commissioning of the station.
- 3.17 The Contractor's subsequent performance and programmes show reduction in planned productivity in the north top-down area, which will further delay the Track Access date.
- 3.18 In April 2014, the Contractor presented the Delay Recovery Measure DRM2B programme, which showed a revised completion date of mid-2017. This programme takes account of the delay

encountered, Delay Recovery Measures applied to-date and the more realistic production rates for works yet to be completed.

- 3.19 There are additional future envisaged steps to expedite and Delay Recovery Measures under consideration in the north top-down area. These further enhancements include:
 - (a) reduced raking struts B3 to B4;
 - (b) observational monitoring (and appropriate soil parameter modelling);
 - (c) muck-shifting via Contact 811B;
 - (d) vertical mucking-out via mole-holes;
 - (e) intermediate excavation to move berms northwards;
 - (f) simplification of top-down column rebar / cruciform details;
 - (g) reducing staggered laps and formation of Construction Joints;
 - (h) changes to pile cap sequence and details;
 - (i) reduced numbers of layers of rebar;
 - (j) B3 flat slabs to eliminate column-drops; and
 - (k) thinner B4 slab where resting on rock.
- 3.20 In order to speed up the rock removal, a proposal to use blasting below the constructed concrete slabs is also being progressed with the statutory authorities.
- 3.21 The DRM2B programme does not rely upon the further enhancements listed above.

Station Entrance Building

3.22 The Engineer's design of the Station Entrance Building comprises the full design of the permanent structural steelwork and the architectural envelope which defines the spatial layout of the External Wall System. The External Wall System is a design and build element for the Contractor to complete, while the Engineer provides the design intent for the External Wall System and the inservice design wind load.

- 3.23 Overall, the Contractor has the responsibility to provide the erection method and erection analysis, fabrication and site erection for the Station Entrance Building works.
- 3.24 The Contractor has submitted 12 notifications of delay. Ten of these are related to the Engineer's design changes to the permanent structural steelwork that have delayed the completion of shop drawings, erection phase analysis and the fabrication of the structural steel work. The Contractor's claims include:
 - (a) Extension of Time Claim 810A/018: Mega Column Head Alignment; and
 - (b) Extension of Time Claim 810A/030: Design Changes to the Roof Structural Steel.
- 3.25 There have been several Delay Recovery Measures implemented which, whilst not all directly involving the Station Entrance Building itself, will facilitate earlier erection of key elements and de-propping of the Station Entrance Building. These include:
 - (a) Delay Recovery Measure 020: Strutting Action B4/5 to B3 for Wind Loading
 - (b) Delay Recovery Measure 023: Commencement of Fabrication of Mega Column Heads prior to Completion of Erection Phase Analysis and Additional Working Hours in the Fabrication Yards.
- 3.26 The Corporation has acknowledged that the Contractor has an Extension of Time entitlement against Completion Obligations in this area of 307 days for the period up to 31 March 2013.
- 3.27 The Contractor's DRM2B programme shows a longer than previously planned erection sequence for the Station Entrance Building, and these periods are now considered within the realistic construction programme.

Lin Cheung Road

3.28 The scope for the permanent traffic scheme around the West Kowloon Terminus includes a three level traffic underpass for Lin Cheung Road between the terminus box structure and the existing Kowloon Station development. The existing Lin Cheung Road currently sits on a temporary traffic deck, and construction of the permanent works is to be completed below this deck.

- 3.29 The excavation and temporary works support system for this section of work is dependent on the temporary works for the Contract 810A core structure achieving diaphragm action between the east and west diaphragm walls.
- 3.30 There has been significant delay to the works within the Contract 810A footprint and this has impacted the commencement of the works for Lin Cheung Road. Added to this there are specific major delay events which include:
 - (a) Extension of Time Claim 810A/002: Additional Socketted H-piles;
 - (b) Extension of Time Claim 810A/032: Unforeseen Physical Obstruction at Lin Cheung Road; and
 - (c) Extension of Time Claim 810A/039: Additional Ground Strengthening Works Adjacent to Diaphragm Wall.
- 3.31 The Corporation has acknowledged that the Contractor has an Extension of Time entitlement against Completion Obligations in this area of 279 days for the period up to 31 March 2013.
- 3.32 To reduce the time to complete the works, further enhancements are being explored. These include the following:
 - (a) Closing Lin Cheung Road (northbound) and diverting the traffic around the Kowloon Station development. This would significantly improve construction access and greatly improve the efficiency of work.
 - (b) The Contractor is reviewing the temporary works excavation and lateral support system for the Lin Cheung Road excavation to try and reduce the scope of temporary work, again reducing the time required in this area.
- 3.33 Neither of these further enhancements has been taken into account in the revised construction programme.

附件十三

REPORT TO THE LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG KONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 823A – TAI KONG PO TO TSE UK TSUEN TUNNELS

MAEDA - CHINA STATE JOINT VENTURE

2 MAY 2014

This report has been prepared by MTR Corporation Limited for the purpose of reporting to the Legislative Council Panel Transport Subcommittee on Matters Relating to Railways in relation to the construction and commissioning of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (the "XRL Project") and anything stated in this report is without prejudice to any of MTR Corporation Limited's legal or contractual rights in respect of the XRL Project.

1 EXECUTIVE SUMMARY

Contract 823A

- 1.1 On 12 July 2010, MTR Corporation Limited (the "Corporation") and the Maeda-China State Joint Venture (the "Contractor") executed Contract 823A.
- 1.2 Contract 823A concerns the construction of tunnels between Tai Kong Po and Tse Uk Tsuen in the New Territories. The tunnels form part of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link ("Express Rail Link").

Scope of works under Contract 823A

- 1.3 The Contractor's scope of works under Contract 823A includes the construction of two sections of twin tunnels with cross passages. The approximate length of the tunnels is:
 - (a) 1,050 metres for the northernmost tunnels ("North Tunnels"); and
 - (b) 590 metres for the southernmost tunnels ("South Tunnels").
- 1.4 The scope of works also includes ancillary and temporary works required for the construction of the tunnels.
- 1.5 In order to construct the tunnels, the Contractor is required to, among other things:
 - (a) excavate shafts to enable the launch of a custom-built Tunnel Boring Machine; and
 - (b) excavate the North and South Tunnels using the Tunnel Boring Machine. In total, there are four tunnel "drives" – two for each set of twin tunnels.

Estimated completion date

- 1.6 Contract 823A states that the Contractor is to complete the whole of the works by 10 May 2015.
- 1.7 The Corporation, based on the most recent Contractor's programme forecast (11 April 2014), currently estimates that the whole of the

works under Contract 823A will be completed by July 2017.

Current overall Contract status

- 1.8 The current status of the North Tunnels based on the most recent Contractor's programme forecast drives is as follows:
 - (a) The first drive is 93% complete (410/440 rings) and is estimated to be completed to Degree 1 by July 2015.
 - (b) The second drive is estimated to complete by September 2016 to Degree 1.
- 1.9 The current status of the South Tunnels drives is as follows:
 - (a) The first drive is 89% excavated (189/213 rings) and is estimated to complete to Degree 1 by September 2014.
 - (b) The second drive is estimated to complete by August 2015 to Degree 1.

Main causes of delays

- 1.10 Contract 823A experienced progressive delays from the commencement of the Contract. The main causes of the delays include:
 - (a) delays in obtaining access to the site due to land resumption issues;
 - (b) unforeseen ground conditions (higher than anticipated rock head levels);
 - (c) poor performance of the Tunnel Boring Machines;
 - (d) air and slurry leakages;
 - (e) a sinkhole;
 - (f) restrictions on working hours in the South Tunnels; and
 - (g) a Black Rainstorm, which caused flooding to the North Tunnel and damage to a Tunnel Boring Machine.

Delay mitigation and recovery measures

- 1.11 Throughout the progress of Contract 823A, the Corporation has taken active steps to mitigate and recover delays to the extent possible. Those steps have included:
 - (a) execution of a Supplementary Agreement with the Contractor prescribing numerous delay recovery measures, including the addition of a second Tunnel Boring Machine to accelerate the works;
 - (b) regular reviews by the Engineer's Representative's construction team of possible mitigation measures to reduce delay and the subsequent updating of the working programme in order to closely monitor and manage delay; and
 - (c) actively exploring options to resolve issues arising from damage to the Tunnel Boring Machine which occurred during the Black Rainstorm.

2 MAIN CAUSES OF DELAY

2.1 Below are summaries of the main causes of delay.

Land resumption

- 2.2 In order to undertake the Contract 823A works, it was necessary to compulsorily resume several Lots of land in Hong Kong.
- 2.3 Landowners and other interested parties strongly objected to the land being resumed. Lengthy negotiations with the landowners were required. As a result, the land resumption process took significantly longer than originally anticipated.
- 2.4 The land resumption delays occurred during the period between November 2010 and May 2011.
- 2.5 The Contractor claimed that the prolonged land resumption process caused delays to the Contract 823A works because:
 - (a) the works areas were handed over on a piecemeal basis; and

- (b) the Contractor was unable to access the works areas until the land resumption was complete.
- 2.6 The Engineer's Representative carried out a detailed assessment of the Contractor's delay claims in relation to the land resumption. The Engineer's Representative determined that the Contractor had an entitlement to an extension of time. Combined with the delays referred to under the heading **Unforeseen ground conditions** below, the Contractor was awarded an extension of time in a combined award of 307 days to completion of the works under Contract 823A.

Unforeseen ground conditions (Rock head levels)

- 2.7 The Contractor has claimed that, in excavating the North and South Tunnel shafts, it encountered rock head levels that were than higher than anticipated in the Geotechnical Baseline Report.
- 2.8 The Contractor claimed that the higher rock head levels resulted in delays to the excavation of the shafts, because:
 - (a) the Contractor was required to redesign the diaphragm walls of the shafts;
 - (b) as a result of the redesign of the diaphragm walls, the Contractor was required to undertake additional construction work; and
 - (c) the hard rock meant that the excavation took longer than anticipated.
- 2.9 The unforeseen ground condition delays occurred during the period between October 2012 and April 2013.
- 2.10 The Engineer's Representative carried out a detailed assessment of the Contractor's delay claims in relation to the unforeseen ground conditions. The Engineer's Representative determined that in accordance with Contract 823A the Contractor had an entitlement to an extension of time of 307 days (as referred to above).

Poor performance of the Tunnel Boring Machines

2.11 Excavation by both Tunnel Boring Machines of the North and South Tunnels has failed to achieve the planned rate of advancement.

- 2.12 Examples of issues regarding the Tunnel Boring Machines that have caused delay include the following:
- (a) **Site constraints**: As a result of site spatial and logistical constraints, the Contractor revised his sequence for launching the Tunnel Boring Machine which required him to set up and operate the Tunnel Boring Machine in sequential stages. This resulted in a number of technical stoppages that resulted in delay to the full Tunnel Boring Machine operation and delayed the planned advance rate.
- (b) **Wear and tear of disc cutters**: Excessive wear and tear of the disc cutters of the Tunnel Boring Machine resulted in repeated shutdowns to carry out repairs and maintenance.
- (c) **High temperatures at cutter head**: The geometry of the cutter head and arrangement of the disc cutters generated slow discharge of excavated material causing high temperatures to be generated at the cutter head of the Tunnel Boring Machine. Maintenance work to the cutters then took additional time whilst the equipment was allowed to cool.
- (d) **Screw conveyor**: Issues concerning the selection of the screw conveyor type resulting in blockages and damage to the screw conveyor.
- (e) **Back-up cars**: Poorly-designed back-up cars leading to twisted frames, and failure of the running wheels of the back-up cars caused significant plant breakdown. Subsequently, these were modified by the manufacturer to overcome the deficiencies.
- 2.13 A second Tunnel Boring Machine purchased and utilized by the Contractor experienced many of the same issues as the first Tunnel Boring Machine.
- 2.14 The delays due to poor performance of the Tunnel Boring Machines have occurred at various times from February 2013 to the present.

Air and Slurry leakages

2.15 The Contractor experienced delay due to substantial air and slurry

leakage in the South Tunnels between 13 November and 1 December 2013. Leakage comes from the cutter head, which is under pressure and seeps through fissures and voids in the surrounding ground.

Sinkhole

2.16 On 16 February 2014, a sinkhole in the South Tunnels led to a requirement to carry out backfilling work. In order to prevent reoccurrence of a similar issue, the Contractor undertook ground improvement works. The Tunnel Boring Machine in the South Tunnels did not operate during the period of the works, namely between 21 February to 16 March 2014. This caused delays to the excavation during that period.

Restrictions on working hours in the South Tunnels

2.17 It has not been possible to obtain a Construction Noise Permit to allow work in the South Tunnels to proceed on a 24-hour basis. Accordingly, the Contractor has been restricted to working between 07:00 to 19:00 hours each day.

Black Rainstorm

- 2.18 On 30 March 2014, a Black Rainstorm and a series of connected failures resulted in flood waters entering the downtrack North Tunnels. The Tunnel Boring Machine was inundated.
- 2.19 Among other things, the flooding damaged the electrical systems of the Tunnel Boring Machine. As a result, the Tunnel Boring Machine is not currently operating. This has impacted the progress of the North Tunnels works.
- 2.20 The following measures were in place to prevent flooding of the tunnel:
- (a) **Drainage**: The slopes surrounding the site included surface water drainage channels that were designed to drain water away from the slopes.
- (b) **Parapet wall**: A diaphragm wall incorporating a 1.2m high parapet wall, constructed around the whole Emergency Rescue Station Box.
- (c) **Pumps**: 14 pumps in the station box and the tunnels were rated to

deal with rainwater falling directly into the structure from above and groundwater.

- 2.21 Despite the above measures, floods in the North Tunnels occurred due to a combination of the following:
- (a) **Drainage**: The drainage slopes failed, causing blockage to the surface water drainage channels. This led to overtopping of the drain and flooding to the adjacent areas within the Contract 823 site.
- (b) Parapet wall: As at 30 March 2014, works to the Emergency Rescue Station box were being carried out. A section of the diaphragm parapet wall had been removed to facilitate the works. Whilst temporary flood bunds were erected, these were overwhelmed by the volume of water spilling from the breach in the site drainage. Water was able to cascade into the Emergency Rescue Station and into the downtrack North Tunnel.
- (c) **Pumps**: There was a local site power failure during the rainstorm which affected the operation of the pumps. However, power supply was quickly recovered and this did not contribute to the flooding of the tunnels

3 DELAY MITIGATION AND RECOVERY MEASURES

3.1 The Corporation has taken a number of measures to mitigate and recover delays on Contract 823A as far as possible, including as set out below.

Supplementary Agreement No.1

- 3.2 On 10 January 2013, the Corporation and the Contractor executed Supplementary Agreement No. 1, which sets out numerous measures to mitigate and recover delays experienced up to and including 30 November 2012. Those delays included delays caused by the prolonged land resumption process and higher than anticipated rock head levels.
- 3.3 The most significant delay recovery measure was the purchase and utilization of a second Tunnel Boring Machine for the works. This enabled the simultaneous driving of both the North and South Tunnels. It was originally anticipated that only one Tunnel Boring Machine would be used to complete the works.
- 3.4 Other delay recovery measures included:
- (a) overtime working;
- (b) additional site supervision; and
- (c) re-sequencing of the works and the procurement of additional earthworks lateral support equipment and formwork materials in an effort to increase the number of available work fronts.

Regular reviews and progress meetings

- 3.5 The Corporation's construction team:
- (a) conducts regular reviews of possible mitigation measures to reduce the effects of delay;
- (b) regularly updates of the working programme in order to monitor and manage delay; and
- (c) holds daily progress meetings with the Contractor's senior staff to discuss problems associated with the daily tunnel production and how these problems can be resolved or mitigated.
- 3.6 The Corporation and Contractor hold regular meetings to discuss

strategies to speed up the progress of the works and mitigate delays. Those meetings include meetings at the highest level between the Corporation's Project Director and the Contractor's Board members.

Project management

- 3.7 The Corporation identified what it considered to be weaknesses in the performance of the Contractor's site management team.
- 3.8 Following a period during which the Contractor's performance failed to demonstrate any marked improvement, and in order to improve the management of the project, the Corporation:
 - (a) took steps to replace the Contractor's Project Director, Project Manager and Engineering Manager; and
 - (b) proposed to the Contractor that he employ an experienced superintendent, foremen and seek technical support from the Tunnel Boring Machine supplier (Hitachi). The Contractor took action in support of this proposal.

Reduction of delay impact on Contract 824

- 3.9 Delays to the completion of the North Tunnels have the potential to cause consequential delay to Contract 824. The Contractor has taken the following steps to mitigate any potential impact on Contract 824:
 - (a) De-linking (from a programming perspective) the Tunnel Boring Machine for the North Tunnels from the Tai Kong Po plant building and tunnels.
 - (b) Directing the 824 Contractor to construct a niche at the Tai Kong Po Shaft (up-track Tunnel breakthrough area) (Engineer's Instruction 107). This will enable the Tunnel Boring Machine to be dismantled within the niche preventing obstruction to the tunnel internal structural works.

Black rainstorm

3.10 The Corporation, the Contractor and the Tunnel Boring Machine supplier have been working intensively to assess the extent of the damage and determine the appropriate course of action to recover operation of the damaged Tunnel Boring Machine as soon as possible. It is currently estimated that the Tunnel Boring Machine will be repaired by the end of June 2014. Following procurement, installation of new parts and testing and commissioning it is expected that the TBM will be able to resume full operation in December 2014

附件十四

REPORT TO LEGISLATIVE COUNCIL PANEL ON TRANSPORT SUBCOMMITTEE ON MATTERS RELATING TO RAILWAYS

CONSTRUCTION AND COMMISSIONING OF THE HONG KONG SECTION OF THE GUANGZHOU-SHENZHEN-HONG KONG EXPRESS RAIL LINK

MTR CORPORATION LIMITED

EXPRESS RAIL LINK

CONTRACT 826 – HUANGGANG TO MAI PO TUNNELS

CRCC-HSIN CHONG-CRCC 15TH BUREAU JOINT VENTURE

2 MAY 2014

This report has been prepared by MTR Corporation Limited for the purpose of reporting to the Legislative Council Panel Transport Subcommittee on Matters Relating to Railways in relation to the construction and commissioning of the Hong Kong Section of the Guangzhou-Shenzhen-Hong Kong Express Rail Link (the "XRL Project") and anything stated in this report is without prejudice to any of MTR Corporation Limited's legal or contractual rights in respect of the XRL Project.

1 EXECUTIVE SUMMARY

Contract 826

1.1 On 15 March 2010, the Corporation and China Railway Construction Corporation-Hsin Chong-China Railway 15th Bureau Group Joint Venture (the "Contractor") executed Contract 826 to construct the Mai Po to Huanggang Park section of the Express Rail Link for the Contract Sum of HK\$1.7 Billion. CRCC and Hsin Chong are constructing the Hong Kong section and CRCC 15th Bureau, the Mainland section.

Scope of works under Contract 826

- *1.2* The Contractor's scope of works under Contract 826 includes:
 - (a) provision of two Tunnel Boring Machines for construction of two cross border tunnels from Huanggang to the Boundary to be undertaken by the Mainland contractor. The Up Track tunnel is 1864 metres long and the Down Track tunnel is 1856 metres long;
 - (b) construction of twin tunnels from the Boundary to Mai Po ventilation building shaft using the same Tunnel Boring Machines in (a). The Up Track tunnel is 1482 metres and the Down Track Tunnel is 1478 metres.
 - (c) six cross passages on the Hong Kong side.

Estimated completion date

- *1.3* Contract 826 requires the contractual completion of the whole of the works by 10 May 2015.
- 1.4 The Corporation currently estimates that the Degree 1 completion for the tunnels will be completed by December 2015. The reasons for this delayed completion are due to a combination of events,

details of which are set out below.

Main causes of delay

- 1.5 The works under Contract 826 are complicated by the cross boundary nature of the contract, with the direct interconnection to the tunnels on the Mainland side that connects with the national high speed network at Futian. The Mainland works have experienced progressive delays from the start both at the works site located in Shenzhen and in the tunnels between the Huangggang Shaft and the Boundary. The main delays include:
 - (a) slow progress with excavation and construction of the Huanggang shaft due to ground conditions;
 - (b) a fatal reinforcement collapse during construction of the Huanggang Cavern;
 - (c) delayed assembly and launching of both Tunnel Boring Machines;
 - (d) lower than planned Tunnel Boring Machine excavation production rates.
 - (e) unavailability of experienced operatives to drive the tunneling machines.

Delay mitigation and recovery measures

1.6 Since the award of Contract 826, the Corporation has taken active steps in an effort to mitigate and recover delays to the Mainland works, within the constraints and particularly, the absence of a defined contractual relationship and the circumstances that were encountered at the cross boundary location. For the Hong Kong section of the works the Corporation has reviewed the construction planning and methodologies in an effort to shorten activity durations. These steps have included instructing:

- (a) concurrent construction of the cross passages with tunnels;
- (b) completing ground treatment works as an alternative to installation of a steel bulkhead at the Mai Po reception shaft;
- (c) concurrent tunnel invert and walkway construction.
- 1.7 In the Mainland, the Corporation has worked closely with the Mainland contractor to facilitate the progress of the works and has been successful in achieving a number of improvements including:
- (a) acquisition of additional land at the Huanggang Park site to alleviate pressures on work areas by the competing contractors from the Hong Kong bound tunnels and the Futian bound Mainland tunnel;
- (b) reducing the length of the launch cavern to bring forward the commencement of the tunnel boring machine operations,
- (c) modifying the structural form of the cavern from tapered lining to stepped lining, reducing the time spent in re-configuring the formwork and shutters;
- (d) negotiating access to the northern section of the cavern (reserved for the Mainland north tunnel drive Tunnel Boring Machine) to facilitate earlier assembly of the first tunnel boring machine;
- (e) establishing the Tunnel Advisory Panel to facilitate close coordination between GSG and its contractor working on the cross border tunnel section, and;
- (f) establishing a cross border working group and a Coordination Group to facilitate communication between respective statutory authorities on either side of the Boundary.

2 MAIN CAUSES OF DELAY

Huanggang shaft excavation

- 2.1 The Huanggang shaft was delayed by four months. The shaft was eventually completed at the end of March 2011. This delay was caused by a combination of the following:
- (a) lack of experienced manpower resources;
- (b) the lifting capacity of the gantry crane installed at the main access shaft; and
- (c) limitation on supplies of explosives for blasting works during PRC National Meetings and during the Lunar New Year period.

Huanggang cavern excavation

2.2 On 1 December 2011, during drilling and blasting of the Huanggang cavern there was a reinforcement collapse causing two fatalities and fourteen injuries to workers. As a result, the works were suspended for 40 days. However, works fully resumed on 10 January 2012.

Slow tunneling progress

- 2.4 Delays have occurred to the progress of tunneling works on the Hong Kong sections of the tunnels. These delays were incurred by a combination of the following:
 - (a) Tunnel Boring Machines stopped and not excavating due to insufficient operating manpower resources, causing intermittent delays;
 - (b) Slow progress due to compressed air leakage from the tunnels causing bubbles to appear in a fish pond in the

RAMSAR Conservation Area and giving rise to tunnel face stability concerns;

- (c) Delays due to the Contractor providing insufficient plant and labour resources; compared with planned resources;
- (d) slow progress while a booster pump was installed in the UP Track tunnel; and
- (e) delays due to uncharted marble zones in the Mai Po area, requiring remedial ground treatment.

3 DELAY MITIGATION AND RECOVERY MEASURES

3.1 The Corporation has taken a number of measures to mitigate and recover the impacts to the Contract 826 arising from the works being carried out in the Mainland section, to the extent possible, including as set out below.

Ensuring efficient Tunnel Boring Machine operation

3.2 Two slurry TBMs were provided by the Contactor for use by the Mainland contractor for construction of the Mainland section of the cross border tunnels between Huanggang shaft in Shenzhen to the Boundary. To ensure close cooperation and coordination between both sides of the Boundary, the Corporation established a Tunnel Advisory Panel meeting weekly to monitor Tunnel Boring Machine operations and maintenance works. The panel's primary objective was to monitor and facilitate, to the extent possible, that the Tunnel Boring Machines remained in a serviceable condition to enable continual progress during construction of (initially) the Mainland tunnels.

Management of Boundary Crossing Issues

3.3 A unique challenge affecting Contract 826 related to the movement of plant, materials and workers across the Boundary. The

Corporation, with the help of Hong Kong Highways Department's Railway Development Office and their counterpart in Shenzhen established a cross border working group and a coordination group. These groups established cross border construction working arrangements covering cross border permit control, customs arrangements, spoil disposal and quarantine, emergency rescue, public order and buffer zone arrangements.

Huanggang Shaft Constraints

3.4 One of the biggest challenges has been the limited space of Huanggang shaft, which is required to accommodate both the Contractor's Tunnel Boring Machine (which is 13.2 metres in diameter), and the pair of Tunnel Boring Machines provided by the Corporation (both 9.9 metres in diameter). To overcome the problem with limited space, three additional gantry cranes and a high speed gantry crane have been installed over the shaft opening to facilitate and expedite segment and material delivery. In addition, a custom made portal crane at the base of the shaft and interlinked service tracks has helped to resolve some of the logistical issues within the cavern.

Restricted working space at Huanggang Park

3.5 Working space at Huanggang Park shaft site was a major constraint to progress of the Works. The Corporation's construction management team spent months assisting the Contractor to acquire additional works areas from the Huanggang Park. This has proved extremely helpful and has greatly eased competing interests for use of the limited available space at site, in particular, during the period when the 13.2 metre diameter Tunnel Boring Machine and associated slurry treatment plant were being assembled.

<u>Spoil disposal</u>

3.6 With the only tunnel access at the Huanggang shaft, spoil disposal to a Shenzhen authorised reception facility was constrained by a single exit point. Quarantine rules limiting spoil importation, in addition to quotas for Tunnel Boring Machine spoil disposal in Shenzhen, makes spoil disposal critical to the progress of tunneling works. In response to this constraint, the Corporation convened high level meetings with the Shenzhen Municipal Government following which it was agreed that disposal sites at Bujiwo (步九 窩) and Fuyong (福永) could be assigned to receive the tunnel spoil arising from the Hong Kong section of the cross border tunnel. The two reception sites have sufficient capacity for all of Contract 826's spoil.

Tunnel Boring Machine equipped with probe drills

- 3.7 Uncertainties and risks associated with boring though the known marble zones remain. However, due to access constraints only a limited number of ground investigation boreholes have been carried out. In addition, some boreholes have not been able to be bored directly along the tunnel alignment due to the presence of a (environmentally protected) fish pond bund at ground level. Grouting has also not been permitted in this area.
- 3.8 In response to those difficulties, the Contract 826 Tunnel Boring Machines have been equipped with 3600 probe drills which are able to probe ahead of the Tunnel Boring Machine by up to 40 metres. This enables the ground to be investigated ahead of tunneling works and any ground treatment measures carried out before ground problems are encountered.
- 3.9 However, tunneling in the marble zone continues to be of concern and when these zones are encountered they have the potential to significantly delay tunneling works. This is because these zones typically require the halting of the tunnel boring machine in order

for extensive grouting works to be carried out before the tunnel boring machine can restart excavation activity.

4 **PROGRAMME STATUS**

- 4.1 Prior to the first Tunnel Boring Machine arriving at the Boundary, the progress of the Mainland section of tunnel works was monitored against the agreed arrival dates of Tunnel Boring Machines to the Boundary and reported to the RDO during the Corporation's Monthly Progress Briefing.
- 4.2 The first tunnel boring machine finally arrived (the Down-track TBM) arrived at the Boundary on 27 November 2013. Progress of tunnelling in the Hong Kong section by the 826 Contractor at the end of March 2014 saw 232 metres out of a total of 1478 metres completed, equivalent to 15.7%. The Up Track tunnel boring machine finally arrived at the Boundary on 12 March 2014, some 14.5 months later than originally agreed at the commencement of works on the Mainland side.
- 4.3 Both tunnel drives are now progressing towards the Mai Po shaft on the Hong Kong side of the Boundary. Progress has been monitored closely, now that control is under the provisions of Contract 826.

附件十五

高鐵香港段項目文件檔案室的文件目錄

公開文件

- 1. 港鐵公司就高鐵香港段項目發出的新聞稿及新聞通告
- 2. 立法會交通事務委員會鐵路事宜小組委員會(鐵路事宜小 組委員會)電腦投影片簡介/文件
- 3. 鐵路事宜小組委員會會議紀錄

<u>政府有關文件</u>

- 工程進度報告(向路政署鐵路拓展署(鐵路拓展署)提交 的報告)
- 2. 高鐵設計/建造成本報告(向鐵路拓展署提交的報告)
- 3. 項目監管委員會文件/電腦投影片/會議紀錄
- 4. 高鐵項目監控小組文件/電腦投影片/會議紀錄
- 5. 港鐵公司向鐵路拓展署提交的工程進展電腦投影片

其他港鐵公司文件

- 向港鐵公司執行總監會提交的項目進展及成本報告/電腦 投影片,及相關會議紀錄
- 2. 高鐵項目成本情景規劃
- 3. 個別合約地質基準報告

承建商有關的文件

- 1. 合約及補充協議
- 2. 工程師的指示(修改)
- 3. 承建商進展報告/進展會議的紀錄

備註:視乎有關合約保密性的安排。此外,一些商業敏感資料可能被刪除。