

Legislative Council Panel on Transport
Subcommittee on Matters Relating to Railways
Settlement Issues of the Construction of the Shatin to Central Link

(Translation)

Introduction

This paper reports to Members on the settlement issues of the construction of the Shatin to Central Link (“SCL”).

Background

2. The SCL, with a total length of 17 kilometres, consists of Tai Wai to Hung Hom Section and Hung Hom to Admiralty Section. There are ten stations in SCL. Apart from bringing improvements to the existing Tai Wai Station, the SCL project involves construction of new stations or extension of existing stations at Hin Keng, Diamond Hill, Kai Tak, Sung Wong Toi, To Kwa Wan, Ho Man Tin, Hung Hom, Exhibition Centre, and Admiralty Station, which eventually form a territory-wide strategic railway project (alignment layout at **Annex**).

3. The SCL project involves the construction of various underground stations and tunnel sections. During construction stage, it is inevitable that works would cause impacts to the surroundings. These impacts may include causing settlements to buildings, bridges, underground utilities and roads in the vicinity of the works sites. As such, at the design stage of the project, the MTR Corporation Limited (“MTRCL”) needs to carry out assessment and consult relevant Government departments (including Buildings Department (“BD”) and Geotechnical Engineering Office) to establish a stringent monitoring system. Prior to and during construction, the MTRCL would install monitoring points at suitable locations and conduct regular monitoring. With the continuous monitoring of the areas in the vicinity of the

construction works, the MTRCL could understand the impacts brought by the works to the ambient environment and take appropriate actions to contain the impacts within a controllable and safe range.

Monitoring Mechanism of Building Works by the Government

4. In the SCL Project, depending on the applicability of the Buildings Ordinance (Cap. 123), building works under railway projects may fall under the purview of the Building Authority or the Highways Department (“HyD”). Pursuant to the Mass Transit Railway Ordinance (Cap. 556), the Building Authority may issue the Instrument of Exemption to exempt the MTRCL from part of the requirements under the Buildings Ordinance¹. For those building works of SCL project not covered by the Buildings Ordinance, the Director of Highways, in accordance with the entrustment agreement signed between the Government and the MTRCL, may issue the Instrument of Compliance requiring the MTRCL to follow the administrative procedures and requirements as stipulated in the Instrument² for carrying out building works. The objective is for the quality of building works to be not

¹ The expansion of Hung Hom Station and the construction of Sung Wong Toi Station of the SCL project are within the land leased to the Kowloon-Canton Railway Corporation and the Government land given to the MTRCL as short term tenancy respectively. The construction works at these locations are controlled under the Buildings Ordinance (Cap. 123). With the consideration of the specific nature of building works related to railway construction, the Building Authority (i.e. Director of Buildings), in accordance with Clause 54(2) of the Mass Transit Railway Ordinance (Cap. 556), issued the Instrument of Exemption in December 2012 to exempt the MTRCL from several requirements under the Buildings Ordinance. The exemption is only limited to those procedures involving the appointment of Authorized Person and Registered Structural Engineers, approval of drawings, issuing works permits and occupation permits. The Instrument of Exemption also stipulates that the MTRCL has to appoint persons possessing the appropriate experience and qualifications to be responsible for works in different aspects, and to establish project management plan for relevant works. The project management plan implements a set of assurance and management system with the objective to ensure the management of the building works can attain the requirements not inferior to the standards as required by that of the Buildings Ordinance. Also, the Buildings Department has to be consulted regarding specified types of building works.

² Pursuant to the provision in section 41 of the Buildings Ordinance, construction works of the SCL project which is located at Government land and unleased land are exempted from the control of the Ordinance. In accordance with the entrustment agreement signed between the Government and the MTRCL, the Director of Highways issued the Instrument of Compliance requiring the MTRCL to follow the administrative procedures and requirements as stipulated in the Instrument for carrying out building works. The objective is to ensure that the quality of building works to be not inferior to the standards as required by the Buildings Ordinance and its subsidiary legislations.

inferior to the standards as required by the Buildings Ordinance and its subsidiary legislations.

5. In accordance with the requirements set out in the Instrument of Exemption or Instrument of Compliance, the Competent Persons (“CP”) or the Registered Geotechnical Engineers (“RGE”) of the MTRCL have to consult the BD or the HyD for SCL works, and submit the relevant documents (including drawings, design reports, calculation information) and impact assessment to the nearby buildings or structures (including construction drawings, method statements of temporary works, comprehensive structural condition surveys of affected buildings, structures, slopes or retaining walls, risk assessment reports, monitoring plans and contingency plans) for the proposed works under SCL, for the BD or the HyD to offer views. The MTRCL shall propose protective measures, modifications or re-provisioning of existing government structures, buildings, slopes, public utilities and other facilities which may be affected by the SCL project, and consult relevant government departments and utility undertakers in order to ensure the safety of the nearby buildings, structures, and utilities.

6. Based on our understanding, the MTRCL, by making reference to the “Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers” (“the Practice Notes”) published by the BD and in consultation with the relevant departments, had established a monitoring mechanism with a three-tier activation mechanism, with the third tier set as the highest trigger level.

7. According to the three-tier activation mechanism, the MTRCL has to take the prescribed actions when the settlement reading reaches the pre-set levels of each tier. In general, when the settlement reading reaches the first trigger level, the Contractor would submit detailed action plans to the MTRCL to formulate the pre-defined mitigation measures. The MTRCL would also consider adding more monitoring points or increasing the frequency of monitoring. The MTRCL would consult relevant government departments (including the HyD or the BD) on the detailed action plans. When the settlement reading reaches the second trigger level, the MTRCL would implement the mitigation measures as

stipulated under the detailed action plan. The mitigation measures can include strengthening works, installation of recharging wells, provision of additional temporary supports, conducting condition surveys to buildings by professional engineers, closer monitoring of the trend of settlement or tilting, or undertaking building assessments. The purpose is to ensure that the impacts due to the construction works fall within the expected level. When the settlement reading reaches or exceeds the highest trigger level, the MTRCL has to carry out a holistic review on the structural integrity of the neighbouring facilities and structures immediately, to consider revising the pre-set trigger levels (see ensuing paragraphs), or to temporarily suspend the works.

8. Building works carried out under common private development projects mostly involve foundation works and shallow excavation confined to sites of relatively small size. The relevant registered building professionals normally make reference to the prescribed trigger levels³ in the Practice Notes. As for railway works, the nature is different from common private building works, which normally involve large scale deep underground excavation and tunneling works. The extent covers stations along the railway, rail tunnels and ventilation buildings, etc. The MTRCL has to conduct more detailed assessment on the potential settlements that might be caused to the surroundings of the sites by the relevant construction works. Reference is usually made to the prescribed three-tier trigger levels in the Practice Notes at the initial stage of the works. Upon commencement of construction when more information can be gathered, such as soil parameters, underground water levels, excavation sequences and condition of structures, etc., the MTRCL could estimate the acceptable potential settlement levels of the affected structures and facilities according to actual situation and consult the relevant departments. The established trigger levels are normally set at a more conservative level so that progressive and continuous monitoring works can be done and the pre-determined mitigation measures can be adopted.

³ The relevant registered building professionals may make reference to the prescribed three-tier trigger levels as provided in the Practice Notes. Alternatively, they may choose to conduct engineering analysis and assessment for individual structures, buildings, public utilities and other facilities that might be affected by the works to establish the more appropriate three-tier trigger levels. Both approaches mentioned above are in compliance with the requirements of the Practice Notes.

9. Prior to and during construction, the MTRCL would install settlement monitoring points for assessing the impacts of excavation works to the surrounding roads, pavements, underground utilities and structures. This monitoring measure can ensure that the works are carried out in compliance with the design and relevant statutory requirements in order to safeguard public safety. The MTRCL would also provide monthly report to the BD or HyD with the monitoring results including the settlement data. When settlements reach or exceed the pre-set trigger levels, the MTRCL would implement the appropriate follow up actions according to the mechanism as mentioned in paragraph 7 above. If necessary, amending the pre-set trigger levels may be considered according to the circumstances. As mentioned in paragraph 8, if the MTRCL establishes a more conservative pre-set trigger levels at the beginning, there are room for raising the pre-set trigger levels. However, the MTRCL has to consult the relevant departments and stakeholders regarding the revision, and on the premise that safety of the construction can be assured.

10. Apart from the settlement readings, the BD and HyD are also concerned about whether differential settlements would occur in buildings or underground utilities, which could induce extra stress to the foundations, building structures and connections of pipelines, that in turn cause abnormalities to these facilities. In this regard, the Practice Notes of the BD have stipulated the allowable tilting of buildings and angular distortion of underground pipelines. According to the Practice Notes, the maximum allowable tilting of buildings and angular distortion of underground pipelines are set at 1 in 500 and 1 in 300 respectively.

11. Under the three-tier activation mechanism, the highest pre-set trigger level is definitely not a watershed. Even if the settlement of some structures exceed the highest pre-set trigger level (irrespective of whether it has been revised or not) due the railway works nearby, it does not mean that structural safety problem will appear. It is important that the MTRCL shall monitor the settlement of the relevant structures and facilities in a frequent and continuous manner during its implementation works. Upon consulting relevant departments, the MTRCL would carry

out mitigation measures to ensure the structural safety of the facilities. The MTRCL consolidates the settlement data of affected buildings and facilities for reporting to the BD and HyD in a regular manner. Through analyzing the settlement data to understand the impact of the construction works to the surrounding environment, the MTRCL can take appropriate actions to bring the impacts to within controllable and safe range. As safety is always the top priority, works on site shall be suspended if any imminent danger is identified to safeguard safety of the public, construction personnel on site and facilities nearby.

12. The settlement data as well as the follow up actions taken by the MTRCL are provided in separate paper of the MTRCL. The ensuing paragraphs focus on the settlement situation in the vicinity of To Kwa Wan Station and Exhibition Centre Station sites.

Situation of Settlement Monitoring Points Near To Kwa Wan Station

13. The To Kwa Wan Station of the SCL is located below ground at Ma Tau Wai Road, with buildings alongside. In view of the depth of the station and constrained by limited space, the MTRCL had to construct diaphragm walls and lateral supporting walls to ensure the safety of station construction works. After the completion of the diaphragm walls in March 2015, the contractor commenced the excavation work for the station which was completed in November 2016.

14. According to the MTRCL's records, the settlement readings at some monitoring points had exceeded the pre-set trigger levels during the construction period. To ensure the safety of the public, the MTRCL had taken relevant measures in accordance with the mechanism, which included increasing the monitoring points, inspecting the condition of buildings by registered structural engineer and grouting to reinforce the underground stratum, etc. Based on the information obtained during the course of excavation work, the MTRCL proposed to revise the settlement trigger levels and had consulted the HyD. After scrutinizing the proposal and seeking professional advice of the relevant departments such as the Geotechnical Engineering Office of the Civil Engineering and

Development Department, the HyD agreed to revise the trigger levels of the three-tier activation mechanism.

15. Although the accumulated settlement of certain buildings settlement monitoring points are higher than the highest trigger level at present, the construction of the station structure had substantially been completed. The remaining works are mainly electrical and mechanical works as well as building services works. The impact on the settlements of the concerned buildings is relatively small. The monitoring data submitted by the MTRCL in December 2017 and July 2018 indicate that the settlement at the said locations have been steady. The MTRCL would continue to monitor the situation of these monitoring points.

16. According to the MTRCL's assessment, tilting of the buildings in the vicinity of the To Kwa Wan Station is still within the range of the tilting limit stipulated in the Practice Notes of the BD. In other words, all buildings with settlement readings reaching the highest trigger level near To Kwa Wan Station have a tilting less than the limit specified in the Practice Notes. The MTRCL also confirmed the structural safety and stability of the buildings in the performance review after the completion of the station structure.

17. On 9 August 2018, the BD deployed its officers to inspect the 23 buildings affected by the settlement near the site of To Kwa Wan Station as reported by the media. No obvious structural safety problem has been identified. The HyD, together with its Monitoring and Verification Consultant, and the BD inspected the 23 buildings and area in vicinity again on 10 August 2018 and it has been further confirmed that no obvious structural safety problem and abnormalities near the underground facilities were observed. The BD would keep monitoring the condition of the concerned buildings and making sure they are structurally safe. To alleviate public concerns, the MTRCL would arrange registered structural engineer to inspect the above 23 buildings mentioned above.

18. Regarding roads, readings of certain ground settlement monitoring points located at the footpath of Ma Tau Wai Road and Lok

Shan Road, reached the highest trigger level in 2015. After learning about the situation, the MTRCL has reinstated the relevant pavement which had subsequently been opened for public use. As for the underground utilities, the MTRCL has also contacted the Towngas for a review on the underground gas pipes.

Situation of Settlement Monitoring Points Near Wan Chai North

19. The Exhibition Centre Station and tunneling works of the SCL works project in Wan Chai North are located underground, the construction of which involves large scale excavation works. The MTRCL had installed settlement monitoring points in the vicinity of the works sites to monitor the nearby settlement. According to the latest monitoring data of the MTRCL, the settlement of some monitoring points has exceeded the highest trigger level. To ease public concerns, the MTRCL suspended the excavation works of Exhibition Centre Station on 10 August 2018. The HyD together with the Monitoring and Verification consultant carried out site inspection on the following day, covering the buildings and structures near those monitoring points under its purview with readings exceeding the highest trigger level. Neither obvious structural safety problem nor abnormal conditions for the underground utilities concerned were observed. The BD also inspected relevant buildings nearby and no obvious structural problem was found. The BD would keep monitoring the structural conditions of relevant buildings to ensure their structural safety.

20. The suspension of excavation works does not imply that there is any imminent danger. The HyD has requested the MTRCL to analyze the settlement monitoring data in details. If there is a need to revise the pre-set levels of the three-tier activation mechanism, the MTRCL shall provide concrete justifications and consult the HyD, relevant departments and stakeholders on their proposed trigger levels. The HyD would only agree the proposed revision on the three-tier activation mechanism and allow the resumption of excavation works at the Exhibition Centre Station if the HyD is satisfied with MTRCL's proposal. The proposed revision on the three-tier activation mechanism

is currently nearly completed.

21. For the roads and footpaths near the Exhibition Centre Station site, such as Convention Avenue, Fleming Road and Expo Drive, while the settlement readings of some of the monitoring points have reached the highest trigger level, the roads and footpaths concerned had resumed normal use after taking such measures including road resurfacing or repaving of paving blocks.

22. There are water pipes, cooling mains, gas pipes, stormwater drains etc. laid at Wan Chai North. Although some settlements of these utility pipelines are observed, their angular distortion is kept within 1 in 300 stipulated in the Practice Notes. The services of these public utilities have not been affected.

23. As regard building structures, no accumulated settlement of buildings in the vicinity of the Exhibition Centre Station (except for Fleet Arcade) have reached the highest trigger level. Also, no tilting caused by uneven settlement had reached the highest allowable level. That is, their tilting had not exceeded the prescribed trigger level of 1 in 500 stipulated in the BD's Practice Notes.

24. Before the tunnel boring machine passed underneath Fleet Arcade in April and October 2017, the MTRCL, in considering the potential impacts to the Fleet Arcade by the up track and low track tunnels from Fenwick Pier Street to Admiralty Station, had conducted assessment for the Fleet Arcade and installed steel frames and carried out other specific preventive measures. During the tunneling works, the MTRCL had closely monitored change in the settlement of Fleet Arcade to ensure construction safety. The works for the up track and low track were completed in May and November 2017 respectively. Upon its completion, the MTRCL reassessed the conditions of the Fleet Arcade and the impact assessment report concluded that its structural condition was acceptable. HyD is currently reviewing the report.

Situation of Settlement at Other Stations or Tunnels and Settlement Data Dissemination Mechanism

25. Regarding the settlement data for other stations and tunnel sections of the SCL, the MTRCL had addressed in its separate paper. When the monitoring stations readings reach their respective highest trigger level, the MTRCL would arrange suspension of works, notify the relevant stakeholders of the settlement readings and, subject to analysis results, consider adjusting the trigger levels of the three-tier activation mechanism. To improve transparency of the settlement data and let the public understand its latest settlement situation, the Government is liaising with the MTRCL on a settlement data dissemination mechanism. Details will be announced the soonest.

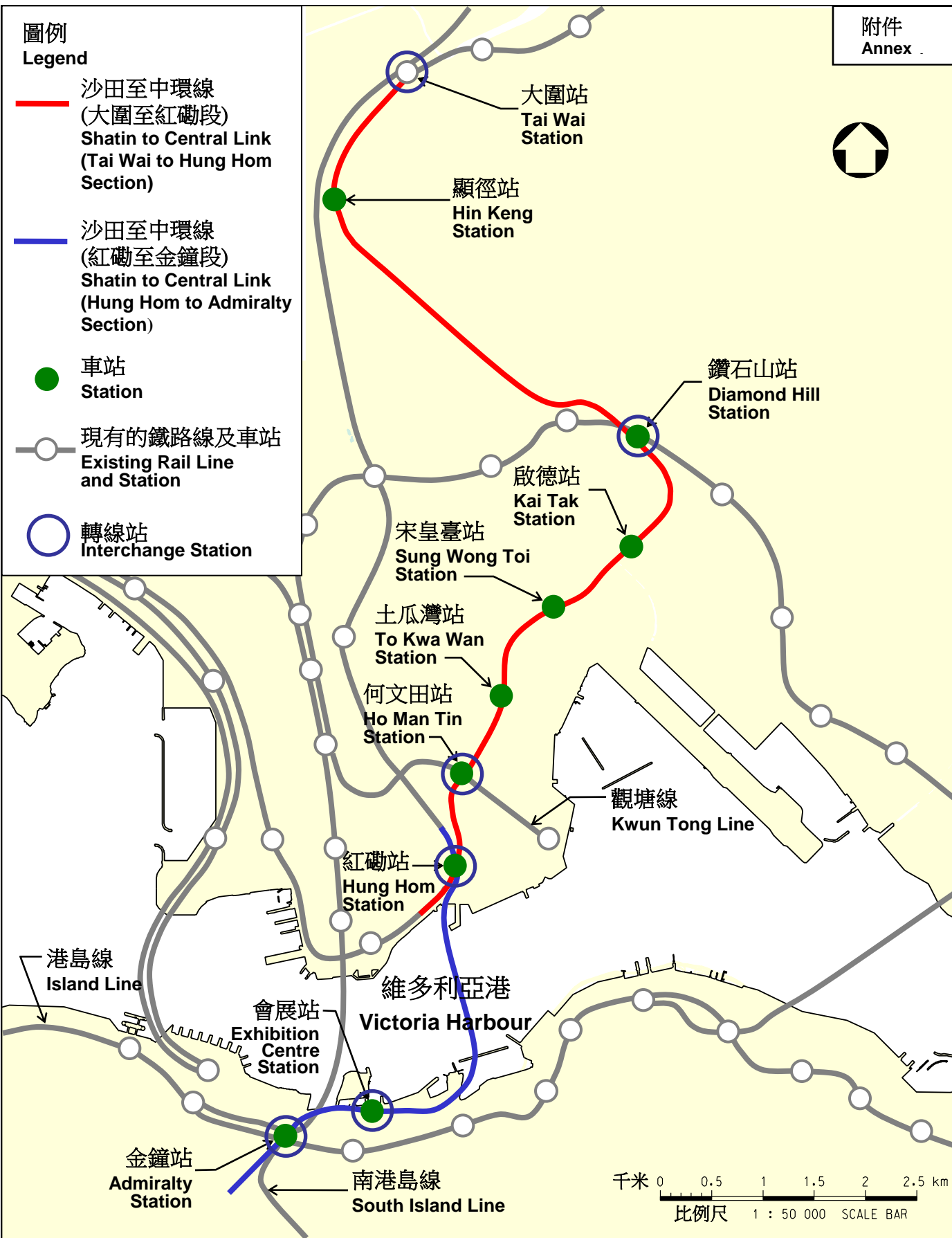
Conclusion

26. The safety and quality of railway projects are always the prime consideration of the Government. Under any circumstances, we shall take safeguarding the safety of the public, construction personnel on sites and facilities nearby as our top priority. The HyD and BD shall closely monitor the conditions of structures and underground utilities in the vicinity of construction to ensure the works are carried out in a safe manner.

**Transport and Housing Bureau
Highways Department
August 2018**

圖例
Legend

- 沙田至中環線
(大圍至紅磡段)
Shatin to Central Link
(Tai Wai to Hung Hom Section)
- 沙田至中環線
(紅磡至金鐘段)
Shatin to Central Link
(Hung Hom to Admiralty Section)
- 車站
Station
- 現有的鐵路線及車站
Existing Rail Line
and Station
- 轉線站
Interchange Station



圖則名稱 drawing title

沙田至中環線的走線

Alignment of the Shatin to Central Link

圖號 drawing no.

HRWSCLO03-SK0465

版權所有 copyright reserved

鐵路拓展處 Railways Development Centre



路政署

Highways Department