

For discussion on
25 November 2019

Legislative Council
Panel on Development and Panel on Home Affairs
Joint Subcommittee to Monitor the Implementation of the
West Kowloon Cultural District Project

Update on the Construction of L1 and L2 Works Contracts for
the Lyric Theatre Complex and the Extended Basement

PURPOSE

This paper updates Members on the current progress of the Lyric Theatre Complex (LTC) development within the West Kowloon Cultural District (WKCD) Zone 3B.

BACKGROUND

2. At the meeting of the Joint Subcommittee to Monitor the Implementation of the WKCD Project (Joint Subcommittee) on 29 April 2019, the West Kowloon Cultural District Authority (WKCDA) briefed Members on the progress of the LTC with respect to the architectural design development and procurement of the main works packages. This paper seeks to provide a further update of the LTC construction development.

UPDATE ON HARDWARE DEVELOPMENT & CONSTRUCTION

3. The first construction works contract (F2) covers piling foundation for the LTC and the Integrated Basement (IB) in Zone 3B, including installation of peripheral elements of the excavation and lateral support (ELS) of the temporary cofferdam wall system around the whole site. It was awarded on 11 January 2016, with works commencing on 13 January 2016. The Practical Completion Certificate for the majority of these works was issued in January 2018 while that for the remaining works (the area to the north-west of the Airport Express Line (AEL) and Tung Chung Line (TCL)

tunnels) was issued in February 2018.

4. The LTC and the IB in Zone 3B consists of two further construction works contracts, namely L1 and L2. The second works contract (referred to as L1) contains the remaining ELS and most significant excavation works, pile-caps, adjacent public infrastructure works in Austin Road West and the essential basement structure to receive the LTC. The third works contract (referred to as L2) contains the LTC superstructure building itself and includes the structure, building services and architectural finishes installation for the entire LTC and IB in Zone 3B. Notably the LTC building is supported by a structural isolation spring damper system provided as part of L2 to ensure the necessary acoustic isolation from the vibration emanating from the AEL and TCL tunnels, and is installed by L2 above the piles and base slab constructed by L1.

5. The L1 Works Contract (L1-WC) was officially awarded on 8 January 2018 and current progress anticipates a delayed completion in the third quarter of 2020. The L2 Works Contract (L2-WC) commenced on 23 November 2018 and has a contractual date for Practical Completion (PC) in 2023. The L1-WC and L2-WC were separately tendered (approximately one year apart) and Gammon Construction Limited (Gammon) won both contracts.

6. On the L1-WC, as of the end of September 2019, Gammon has completed over 95% of the bulk excavation. However, the progress of the L1-WC has been affected by a combination of factors since the commencement, including groundwater drawdown outside the main cofferdam and water leakage into the cofferdam. On 25 July 2019, water leakage was observed at the south-east of the main cofferdam and a sinkhole then appeared in this area outside the cofferdam. Further details of this incident are provided in the **Annex**. The L1-WC Gammon has claimed that the incident has caused a delay of 114 days to the completion of the L1-WC, however the Contract Administrator (CA) has advised that Gammon have not demonstrated any entitlement in this regard.

7. Since the L1-WC incident in July 2019, considerable progress has been made in recent months with concrete blinding and reinforced concreting works. This has included the construction of basement pile caps which enabled the first L2 works,

as scheduled and approved in L2-WC Contractor's Main Work Programme (CMWP), to commence three weeks ahead of schedule. As of mid-November 2019, 53% of the L2 Vibration Isolation Spring (VIS) plinths and anchor bolts were cast and the first VIS was installed on 17 September 2019. The approved programme aims to install another 281 springs (out of a total of 630) at the South basement by mid-December 2019. The VIS is an important and unique feature which will protect the structure of the future theatre from any surrounding ground noise and vibration. As regards the critical proximity of the AEL Tunnel, the engineering settlement as result of the L1 works is well within the Registered Structural Engineer's estimate. The L2-WC aims to obtain BD consent to start construction of the slab above the VIS around mid-January 2020.

8. The L1-WC has a contractual programme obligation to handover the site to L2-WC in the period between 30 September 2019 to 30 November 2019. Despite the recent L1-WC incident, a large part of the southern section of the site (where the LTC facility is located above) was made available for the L2-WC's access in mid-September 2019 to commence the first activity of installing the VIS on their plinths. The remainder of the southern area of the site and subsequently the northern area will be progressively handed over from the L1-WC to the L2-WC in the months ahead. As at the time of submitting this paper, the L2-WC CMWP remains on schedule to achieve the Practical Completion in 2023.

9. With access to part of the site allowed, the L2-WC will integrate their programme with the L1-WC programme in order to address the current L1-WC delays; this programme remains under review by the CA. In addition to progressing the VIS works, the L2-WC is focusing on design development and procurement, and currently has 140 staff on site. Progress is being made with the coordination for L1 and L2 interfacing design information (i.e. cast-ins and openings for building services and architectural builders' works and finishes), the design of façade visual mock-ups and façade shop drawings production. The L2-WC Contractor is also working closely with the Consultant designer in pursuing further value engineering solutions during the construction stage that may achieve further construction cost savings.

ADVICE SOUGHT

10. Members are invited to note the development progress of the LTC.

**West Kowloon Cultural District Authority
November 2019**

**Report of the Flooding Incident on 25 July 2019 at the
Construction Site of the Lyric Theatre Complex and
Extended Basement L1 Works Contract under the
West Kowloon Cultural District Authority Development**

A. Executive Summary

1. This report contains a detailed assessment of the site flooding incident that occurred at the Construction Site of the Lyric Theatre Complex (LTC) and Extended Basement L1 Works Contract (entrusted by the Government to the West Kowloon Cultural District Authority (the Authority or WKCDA)) under the West Kowloon Cultural District Development on Thursday 25 July 2019. The report sets out a chronology of key events and activities (**see Appendix A**) that have occurred since the incident date until end of October 2019, and an assessment of the potential consequences for the project. Some activities relating to the incident remain ongoing, however the Authority is committed to be transparent and has decided to release this report in order to provide an overview of the events that occurred.
2. On 25 July 2019, water leakage was observed by Gammon Construction Limited's (Gammon) night shift supervisor at 00:12am at the south-eastern side of the main cofferdam. Immediate action was taken by the Gammon emergency team to stem the leak, which was brought under control and stopped at about 7:30am. The Authority was notified of the incident at about 6:30am and the Civil Engineering and Development Department (CEDD), the Authorised Person (AP), Registered Structural Engineer (RSE) and Registered Geotechnical Engineer (RGE) were also all notified by 7:45am.
3. The Authority issued a press statement about the incident on Thursday 25 July, followed by a media briefing the following day on Friday 26 July. Key messages were communicated via the media to a wider public and stakeholders as follows:
 - i) The MTRCL Airport Express Line, Kowloon Station, Elements and the surrounding residential and commercial developments are all unaffected by this incident;
 - ii) As there are no permanent utilities e.g. fresh water, telecom, etc running across the site, no utilities of any kind were affected;

- iii) A brief timeline of the incident was given and the work on site was on hold as a precautionary measure;
 - iv) There were no safety issues or injuries resulting from the incident and the Authority was and remains satisfied that there is no ongoing safety risk on site.
4. As regards the incident itself, the leakage was stopped by the Authority's works contractor, Gammon and to date there has been no further leakage of the cofferdam. The water that flowed into the excavated hole was filtered and pumped out soon after the incident and the sinkhole was filled within days of the start of the incident.
 5. Immediately following the stoppage of the leak, our AP, RSE and RGE examined the condition of the excavation and lateral support (ELS) system and ground conditions. Necessary measures to enhance the integrity (and water cut-off performance) of the ELS were identified and carried out by Gammon on site such as ongoing grouting around the incident area and strengthening of the soil berm at the base of the excavation. On 23 August, enhancement proposals for partial works resumption outside the incident area was approved by the Buildings Department (BD). Incident investigation and remedial proposals were submitted by AP, RSE and RGE to BD on 29 August 2019.
 6. Gammon reported the incident to the Authority's insurers, and they accompanied the loss adjusters to carry out a site investigation on 25 July 2019. Details of the insurance claim process are ongoing and commercially confidential between the parties involved.

B. Background

7. The construction of the LTC and Integrated Basement Project (Project) is split into two construction works contracts, named L1 and L2 and both have been awarded to Gammon. The L1 Works Contract, which is for the installation of ELS system for bulk excavation and construction of essential basement structures under and surrounding the LTC, commenced in January 2018. The L2 Works Contract is mainly for the construction of the LTC superstructure, physical works for which commenced on site on 17 September 2019. Prior to the L1 Works Contract, foundation works had been done by Gammon under another works contract (F2). The F2 Works Contract was completed in February 2018. The scope of the F2 Works Contract included the installation of the temporary cofferdam wall system around the whole site.

8. The main scope of the L1 Works Contract includes the ELS system of the Project which is subject to the Buildings Ordinance and BD regulations. As Government entrusted work, it is also subject to CEDD's scrutiny. The Project has strictly followed all statutory procedures in terms of design, statutory approvals and construction supervision of the works. The Authority employs a team of registered professionals, which include an AP, RSE, RGE and Registered General Building Contractor (RGBC), to carry out their statutory duties as required under the Buildings Ordinance.

Temporary Cofferdam Wall System

9. A temporary cofferdam wall is a system that surrounds or encloses the site to exclude the excessive inflow of water to create a dry environment to enable the excavation of the spoil inside. The total perimeter length of the temporary cofferdam wall for the L1 Works Contract is approximately 640m. Pipe Pile walls are commonly used for cofferdams in Hong Kong when constructing and excavating deep basements. They are designed to be as water-tight as possible but not fully water-tight, to create a dry area for the excavation. The purpose of them is to control inflow of water and protect adjacent structures/utilities.
10. Completed at the end of 2017, the temporary cofferdam wall system of the main site is comprised of an 813mm diameter steel pipe pile wall (or tubes), installed to a depth of approximately -30 Metres below the Principle Datum (mPD) to -40mPD (founded on alluvium or Completely Decomposed Granite). At the southern (Victoria Harbour) side of the cofferdam, a clutch pipe pile wall system (with physical interlock) was proposed, approved and installed by the previous F2 foundation contractor – this system entails the pre-installation of a vertical steel barrier between the pipe piles. The foundation contractor adopted the Engineer's reference design of a typical pipe pile wall and grout curtain as its design for the rest of the cofferdam i.e. the East, West and North perimeters of the site. A surrounding grout curtain (outside, but adjacent to the cofferdam) was installed down to a depth of 1 000mm below the rock head level under the foundations contract to provide an effective water cut-off for the subsequent ELS works under the L1 Works Contract. After installation of the pipe pile wall, pumping tests for assessment of water cut-off performance were successfully conducted by the F2 works contractor to the satisfaction and approval of BD. Under the L1 Works Contract, the contractor is responsible for taking over the F2 foundation contractor's completed ELS works, and maintaining those works, including the addition of any further grout curtain material that may be needed to prevent any leakage.

Statutory Requirement for Site Supervision of the ELS Works

11. The ELS works were approved by BD. Site Supervision of the excavation and lateral support works by a team of supervisors shall be provided each by the AP, RSE, RGE and RGBC in accordance with the Technical Memorandum for Supervision Plans 2009 and the Code of Practice for Site Supervision 2009 to ensure that the works are carried out in accordance with the approved plans and in such a manner as not to render inadequate the margin of safety of, or impair the stability of, or cause danger to any building, structure, land, street or services. The Technically Competent Persons (TCPs) of the AP, RSE, RGE and Registered Contractor's stream shall monitor the ELS works regularly in accordance with the submitted site supervision plan.
12. In August 2018, there was an incident to the cofferdam and is summarised in **Appendix B**.

C. Possible Causes of the Incident, Remedial and Preventive Measures

13. The investigation report, including possible causes of the incident and remedial and preventive measures, was submitted to BD on 29 August 2019. A revised report was submitted on 21 October 2019 and is currently under review by BD and Geotechnical Engineering Office (GEO).
14. The possible causes of the incident stated in the investigation report are summarised as follows:

- i) Water seepage at weak point in the grout curtain:

Minor seepage through the grout curtain is expected.

- ii) Presence of localised clay-like material behind the pipe pile wall at the incident location:

Grout curtain is designed to provide an adequate water cut-off performance for ground. It appears that the presence of localised clay at the incident location has resulted in imperfections in the grout curtain and therefore reduced the water cut-off performance, subject to further investigation.

- iii) Water leakage happened at nighttime:

Water leakage occurred at midnight and was not immediately controlled by re-grouting. Seepage in the past which happened during working

hours has been well controlled by re-grouting. The water leakage progressively washed away part of the soil berm at the base of the cofferdam, leading to localised damage to the grout curtain and subsequently water and soil ingress into the cofferdam.

15. A comprehensive review of the ELS system and monitoring system has been carried out by Gammon, AP, RSE and RGE, including but not limited to the following:
 - Checking the structural integrity of ELS works, such as setting out of struts and walings, welding of lagging plates and other abnormalities;
 - Conducting Ground Investigation works to review any change in ground condition;
 - Probing around the site to identify the presence of voids and corresponding remedial actions;
 - Reviewing the design of ELS works;
 - Review of the flow rate/volume of dewatering before and after the incident.

16. To address the possible causes of the incident as stated above, the following remedial and preventive measures, as stated in the investigation report, have been considered and implemented:
 - i) Installing an additional clutch-pipe-pile vertical steel barrier system along the eastern boundary of the site at the incident area to strengthen the water cut-off performance;
 - ii) Injecting additional grout into the ground to further enhance grout curtain water cut-off ability and to improve the ground condition;
 - iii) Deploying 2 grouting teams 24/7 full time on site to immediately deal with any water leakage that may take place at both day and nighttime;
 - iv) Installing extra monitoring points and increasing monitoring frequency for early detection of any sign of distress;
 - v) Enforcing a more stringent site inspection requirement for higher grade supervisor;
 - vi) Revising ELS procedures to enhance the preventive measures.

D. Potential Impacts

L1

17. BD issued approval letters on 23 August 2019, 20 September 2019 and

30 October 2019 allowing the site to carry out enhancement works including 1) pile cap basement works at the unaffected southern and northern areas (outside the incident area), 2) installation of additional vertical clutch pipe piles to strengthen the water cut-off ability of the cofferdam at the affected incident area (on the eastern boundary) and 3) revising the construction sequence to facilitate the basement construction works at the northern part of the site and enhancing the preventive measures at the southern part of the site, such that the dewatering inside the cofferdam can continue as before, and investigation and remedial works are being carried out concurrently. The installation of the additional vertical clutch pipe piles is estimated to be completed by end November 2019.

18. As regards the resumption of the remaining works at the affected incident area, close liaison with BD is ongoing to work out the sequence and location of work fronts and the respective timelines. It is anticipated that works in all areas can resume in early December 2019 provided that the investigation report is accepted by GEO and BD. Gammon has advised that this would result in a 114 days delay to the L1 Works Contract, however, the Contract Administrator has advised that Gammon has not demonstrated any entitlement in this regard.

L2

19. The first site work for the L2 Works Contract, which is installation of the Vibration Isolation Springs (VIS), commenced with the installation of the first VIS on 17 September 2019, which was three weeks ahead of the scheduled date, and the installation of VIS on B2 level will continue as planned against the L2 approved Contractors Main Works Programme.
20. At the time of writing, the Occupation Permit (OP) delivery date (12 December 2022) for the Lyric Theatre Complex Project remains unchanged. However, it will be necessary for Gammon to reschedule or re-sequence some of the future works within the L2 scope in order to meet the OP date, which they are obliged to do as a single contractor (L1 & L2) under the terms of contract. Otherwise, there has been no impact on the schedule of the project as a result of this incident.

Conclusion

21. There are still contractual and other issues that will have to be addressed going forward. We should emphasise that any further necessary remedial actions will be taken in a timely manner to ensure the completion of the LTC project can be achieved on time. The statutory authorities, as well as the WKCDA Board, the LegCo Joint Subcommittee (JSC) and the District Council have been, and also will be kept informed of the developments. The Authority will be fully

transparent as regards the incident as we always are. We wish to reiterate our serious and determined effort to communicate what has happened and what we have done and will be doing to address the issues.

22. We are confident that all key issues have now been addressed, however should further issues emerge going forward the Authority will keep the statutory authorities, our Board, the LegCo JSC and the District Council, fully informed. WKCDA has offered to arrange a site visit for all LegCo JSC Members and others to keep them abreast of the latest development of the West Kowloon Cultural District.

Chronology of Key Events of the Incident

25 July 2019 (Thursday)

1. On 25 July 2019, water leakage was observed by Gammon's night shift supervisor at 00:12am at the south-eastern side of the main cofferdam.
2. At 3:00am, Gammon's standby emergency team commenced grouting to try to stop water ingress but without success. The soil berm within the excavation area at the base of the cofferdam started washing away, leading to localised flooding into part of the excavated site. At 3:15am, a sinkhole at the southeast corner of the site (outside of the cofferdam) first appeared and the ground at the incident area collapsed as the leaks continued. At 5:00am, water ingress slowed down. Water leakage was then gradually controlled by grouting works.
3. At around 6:30am, Gammon implemented emergency communication procedures and informed the Resident Site Staff (RSS) and the Authority. Gammon informed RSE and RGE around 7:30am. CEDD was informed at around 7:45am by the Authority.
4. The leakage stopped at around 7:30am, following which the AP, RSE and RGE visually examined the condition of the excavation lateral support system and ground conditions. The following emergency measures were identified and carried out by Gammon, the works contractor:
 - i) Fence off affected area near the sinkhole location;
 - ii) Reinstate the damaged soil berm within the excavated area;
 - iii) Review and monitor all instrument readings under BD approved plans, such as tunnel settlement point, ground settlement marker, standpipe and piezometer, etc. and other instrument readings additional to the BD approved plans, such as strain gauge on the ELS steel members and Automatic Deformation Monitoring System inside the MTRC airport railway tunnel;
 - iv) Reduce surcharge loads at the sinkhole location by removing containers, lorry, equipment and material from the sinkhole location. Breakout affected thin concrete slab at ground level surface and backfill the voids below the slab;
 - v) Identify any presence of additional voids near the site office (AISO) by radar scanning/drilling. Fill up all voids with grout, e.g. vehicle access road, carpark and AISO raft footing.

5. The resulting sinkhole was approximately 10 metres (m) x 5m x 2m depth and extended to an area about 40m x 50m outside of the cofferdam but within the project area. Localised flooding to a depth of 1.5 – 2.0m was observed within the cofferdam. The flooded area is around 20% of the excavated site.
6. Formal notification to BD was made by AP, RSE and RGE at 11:30am, as it happens BD site monitoring team also turned up at 10:00am to conduct a regular site inspection.
7. Summary of government departments site visits on 25 July 2019:

Government Department	CEDD/GEO	BD	HK Police *	Fire Services Department (FSD)*	Environmental Protection Department
Approximate Arrival & Departure Times	11:00am 2:30pm	10:00am 5:15pm	1:15pm	1:15pm	5:15pm

* HK Police received an anonymous call about workers trapped inside a container office at sinkhole area. Police and FSD visited the site but no person was found.

8. At around 4:30pm, the Authority issued a press release to provide an update of the incident.

26 July 2019 (Friday)

9. The Authority hosted a media briefing at 3:00pm to provide an update of the incident with presence of major local and mainstream news media.
10. BD and GEO convened a meeting at 4:30pm with AP, RSE, RGE, CEDD, WKCDA and RSS representatives. Preliminary observations of the leakage and subsequent sinkhole incident were briefly reported to BD/GEO. RSE/RGE reported there was no deformation of the ELS system (visual inspection) after the incident. Apart from those damaged instruments near the sinkhole, only one ground settlement marker near the AISO site office exceeded the Action Level (this monitoring point is additional to BD requirements). There was no further abnormal reading before or after the incident. All works were stopped after the incident except for the emergency remedial works. BD raised concerns that the dewatering activities inside the cofferdam may cause detrimental effect to the ELS system and surrounding grounds and hence they requested

further investigation. AP, RSE and RGE proposed to submit a “road map” to list out all items to be included as part of the investigation and remedial report, to be submitted to BD by 29 July 2019 (Done).

11. Following upon the BD’s site inspection on 25 July 2019, BD issued a letter to the AP, copied to WKCD, RSE, RGE and the Contractor’s Authorised Signatory requesting submission of an investigation report about the incident by 02 August 2019.
12. AP and RSE submitted Form BA7 (Notice of Urgent Work Required as a Result of Accident or Emergency) by email at 10:40pm to give notice to BD about commencing urgent works as a result of an emergency.
13. A joint site visit was conducted with MTRCL (the Elements Developer) to demonstrate that there were no safety or technical concerns to the surrounding development.

27 July 2019 (Saturday)

14. Gammon continued with emergency works as follows:
 - i) Reinstate and strengthen the damaged perimeter soil berm at the base of the excavation with an additional row of concrete blocks at the toe of the berm;
 - ii) Breakout the affected concrete slab at the sinkhole area and backfill with additional soils;
 - iii) Fill all voids with grout at the vehicle access road, carpark and AISO raft footing.

29 July 2019 (Monday)

15. In the morning, the BD site monitoring team revisited the site and inspected the location of the leak and site conditions. BD also carried out checks on the ELS system as regards the following:

- i) Measure the width of the soil berm at the eastern and western sides of the cofferdam;

No major abnormalities were identified. The soil berm was fully reinstated as per BD approved drawings by 30 July 2019;

16. The “road map” checklist was formulated and sent to BD by RSE and RGE in the evening;

30 July 2019 (Tuesday)

17. In morning, the Authority, CEDD, AP and RGE accompanied the BD case officer in charge of L1 Works Contract, to inspect the condition of the site including visual examination of the ELS system, whether there were any further leakage points or seepage observed, review of the TCP records and discussed BD's preliminary comments on the road map submitted by RSE and RGE on 29 July 2019.
18. In the afternoon, the GEO conducted a general inspection of the conditions of the site. RSE and RGE updated GEO on the planned actions and emergency measures being carried out on site.
19. BD and GEO requested additional information to further supplement the "road map" checklist. RSE and RGE followed up with Gammon to address BD's and GEO's request.

31 July 2019 (Wednesday)

20. All efforts on site were re-focused on implementing the standard procedures for the preparation of a Typhoon. The Typhoon signal No.8 was hoisted at around 1:30pm. No damage was caused to the site as a result of the Typhoon, however on Thursday 1 August, accumulated heavy rainfall did cause flooding into the site (not from leakage), and it is expected this water will be pumped out over the next few days.

05 August 2019 (Monday)

21. Investigation report of the sinkhole incident was issued to BD.

07 - 19 August 2019

22. AP, RSE, RGE and Gammon held several meetings with both BD and GEO. Gammon, the AP and RSE advised that dewatering within the site is required for the emergency and enhancement works. In addition, Gammon submitted their report "Proposal for Enhanced Works Following the Subsidence Incident" to BD on 9 August 2019. A press release was issued on 13 August 2019 to update progress of the incident.

22 August 2019 (Thursday)

23. WKCDA and BD attended a meeting of the District Council (Yau Tsim Mong) to update members on the details of the incident.

23 August 2019 (Friday)

24. Works outside the incident area resumed as BD issued an approval

letter to the report “Proposal for Enhanced Works Following the Subsidence Incident”. The site was allowed to carry out further pile cap works at the unaffected southern and northern area, and further needle grouting at East, West and North sides of the site.

25. Gammon made a BD submission to propose the installation of an additional row of clutch-pile system behind the existing pipe pile wall along the eastern boundary of the site to enhance water cut-off performance of the cofferdam. The BD approval was received on 20 September 2019.

26 August 2019 (Monday)

26. WKCDA issued a press release to update media and the public about work resumption progress on the L1 works site outside the incident area.

03 – 18 September 2019

27. Meetings between Gammon, the AP, RSE, RGE, BD and GEO were conducted on the investigation report. Following the meetings, further supporting information is being collated and ground investigation works are being carried out to address BD/GEO’s comments. A press release was issued on 17 September 2019 to update latest progress of L1 construction work.

30 September 2019 (Monday)

28. RSE submitted an amendment plan to BD proposing to revise the construction sequence to facilitate the basement construction works at the northern part of the site and enhance the preventive measures at the southern part of the site. This submission was approved by BD on 30 October 2019.

09 – 31 October 2019

29. Meeting with GEO was conducted on 9 October 2019 for Gammon and RGE to present the preliminary ground investigation results of the site following the sinkhole incident. Gammon will prepare a layout plan to indicate the extent of grouting works to be done as a remedial measure for treatment to the ground. The proposed extent and details of the grouting was presented to BD and GEO on 23 October 2019.
30. The extent and details of the grouting works were included in a further update of the investigation report of the sinkhole incident, which was submitted to BD and GEO on 21 October 2019.

31. It is expected that the works at the incident area will resume in early December 2019 once the additional row of clutch-pile system is installed and grouting works for treatment to the ground is completed.

Summary of Incident in August 2018

1. Several monitoring checkpoints showed that the groundwater levels had triggered the “Action” level of the monitoring system. The ELS works were ceased on 03 August 2018 in accordance with the approved plans. RSE conducted an investigation on the same date and observed that no substantial ground settlement was found in the vicinity of the site and no substantial ground water seepage into the site due to the sudden water drawdown in the concerned standpipe/piezometer. The investigation report and mitigation measure proposal were submitted to BD on 14 August 2018.
2. BD had no objection (issued on 25 October 2018) to the RSE’s investigation report upon completion of the following remedial measures and satisfaction of the pumping tests:
 - a) Installation of new standpipes/piezometers.
 - b) Installation of additional recharge wells behind the cofferdam wall.
 - c) Additional grouting works along the affected area of the cofferdam wall.
3. The works resumed on 26 October 2018.