Annex A

HERITAGE IMPACT ASSESSMENT IN RESPECT OF THE REPROVISIOING OF HARCOURT ROAD FRESH WATER PUMPING STATION TO COTTON TREE DRIVE

SUPPLEMENTARY PAPER ON THE PROPOSED MITIGATION MEASURE FOR THE OLD STONE WALL

Introduction

The purpose of this supplementary paper is to address the concerns raised by Members of the Antiquities Advisory Board (AAB) at the AAB meeting held on 4 March 2014 on the preservation of the existing 35 m long old stone wall within the site during the construction of the proposed pumping station and evaluate the different mitigation measures. Other than temporary removal of the old stone wall piece by piece, the following 2 mitigation measures will be evaluated:

(a) In-situ preservation of the old stone wall within the site with temporary support; and

(b) Temporary removal of the old stone wall by sections and subsequent reinstatement of the old stone wall at its original location after completion of the construction work for the pumping station.

Affected Old Stone Wall

2. The total length of the old stone wall is 155 m of which 35 m lies within the site as shown in Figure 1. Therefore, only about 23% of the total length of the old stone wall will be affected by the proposed construction work of the pumping station.

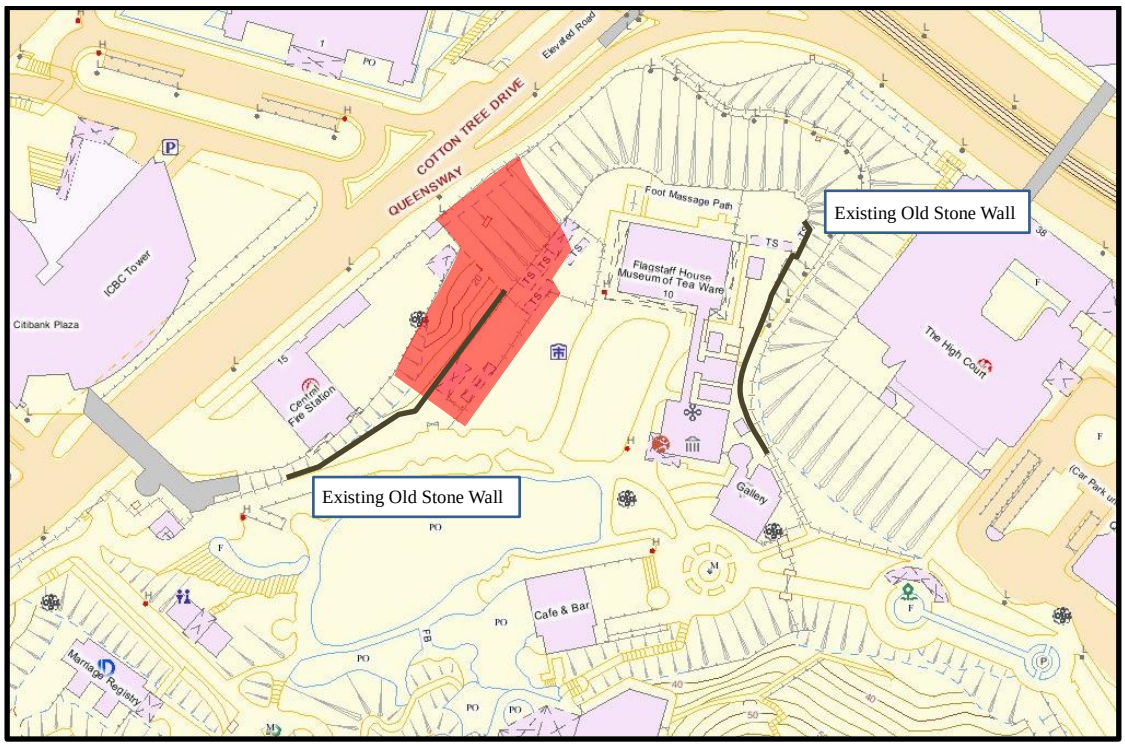

Figure 1: Extent of the Existing Old Stone Wall

3. The old stone wall was formed by the stacking of layers of rectangular pieces of granite stones of approximately 5 inches (127 mm) in height and approximately 22 inches (550 mm) in depth with varying widths (see Figure 2). Due to the varying widths of the granite stones, there is no regular pattern except that the stones are arranged in uniform horizontal layers, each layer with a height of approximately 5 inches (127 mm). It is noted that about 80% of the 35 m long old stone wall does not have any mortar joint (i.e. the stones are placed without any mortar between the joints) as shown in Figure 2 while the remaining stone wall has mortar joints as shown in Figure 3 possibly to avoid the weeding problem. Based on a granite density of about 2700 kg/m^3, it is estimated that the mass of individual stones may vary from 10 kg to 50 kg.

Figure 2: Existing Old Stone Wall without Mortar Joints

Figure 3: Existing Old Stone Wall with Mortar Joints

In-situ preservation of the existing old stone wall

4. The feasibility of preserving the old stone wall in-situ has been studied. In order to preserve the old stone wall in-situ and to allow for the construction of the pumping station structure, it is necessary to provide temporary support to the old stone wall within the site prior to the commencement of the site formation works. The only possible way to provide temporary support to the old stone wall within the site is to install temporary piles with brackets at the existing slope down to the formation level of the pumping station as shown in Figures 4 to 6. However, the installation of

these temporary piles is extremely difficult, if not impossible, because there is a need to rest the piling equipment on a deep slope and therefore a working platform supported by mini-piles has to be built at the slope first to facilitate the piling works. In view of the limited site area, the provision of a proper access for moving the piling equipment onto the working platform without damaging the old stone wall is an extremely challenging task on site.

5. During the site formation works, excavation works will be carried out underneath the old stone wall and between the temporary piles. The piles will be subject to a high risk of being hit by the construction plants which will lead to damages of the wall. After the site formation works, a tower crane has to be built to facilitate the transportation of construction materials on the site. However, as the old stone wall will be the only object standing alone at the center of the site at a height of over 15m above the ground, there is a high risk that the old stone wall will be hit by the moving crane as it transports construction materials. Moreover, as the subsequent construction works for the pumping station will be carried out underneath and near the old stone wall, there is a high risk that the stone wall will be hit by various construction plants. In addition, as the temporary support system will hinder the construction of the roof slab of the pumping station, construction joints will inevitably be required at the roof slab which will greatly increase the risk of water leakage in the pumping station structure. The waterproofing of the pumping station structure is important to ensure the normal operation of the motors of water pumps and the electrical equipment within the station.

6. In-situ preservation of the old stone wall will affect the critical path of the project because additional time is required for the installation of the temporary support system to the old stone wall. Moreover, the increase in difficulties in site formation works and the subsequent construction of the building structure due to the existence of the old stone wall and its temporary support system on site will increase the construction period by about 1 year. As a result, the construction period for the pumping station will be extended from 4 years to 5 years, during which the old stone wall preserved in-situ will continuously be subject to a high risk of being damaged accidentally by various construction plants. In light of the risks and difficulties mentioned above, it is considered infeasible to preserve the old stone wall in-situ.

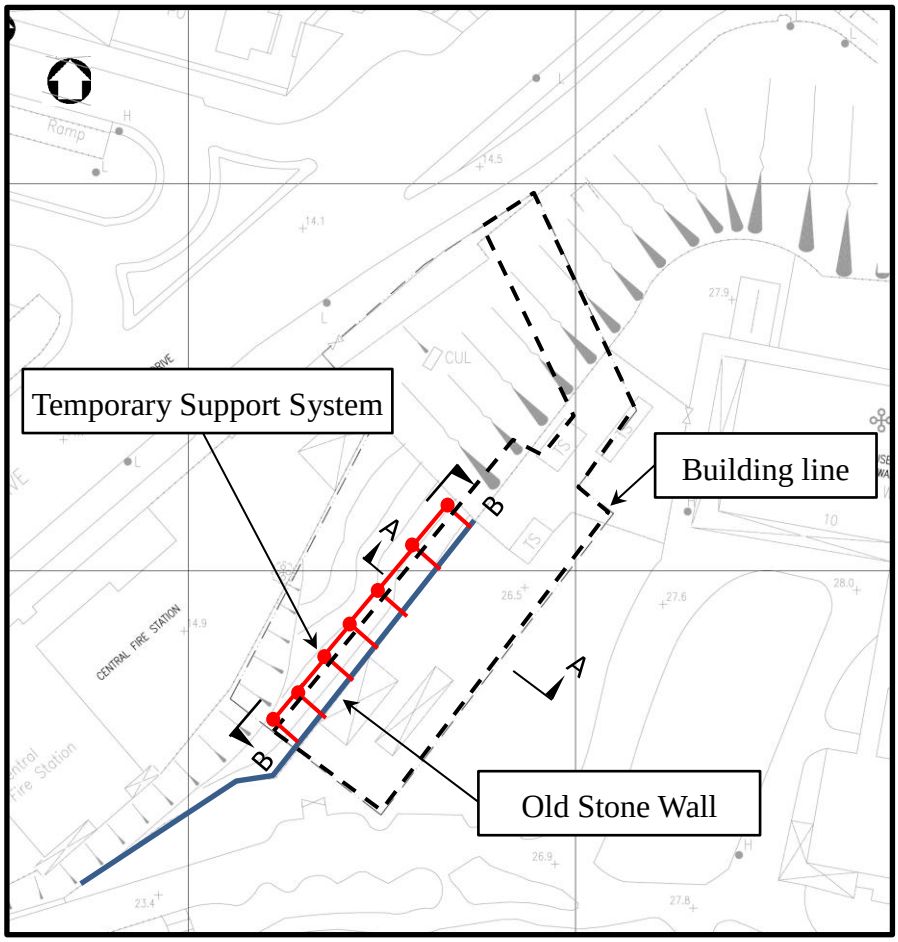

Figure 4: Temporary Support to the Old Stone Wall

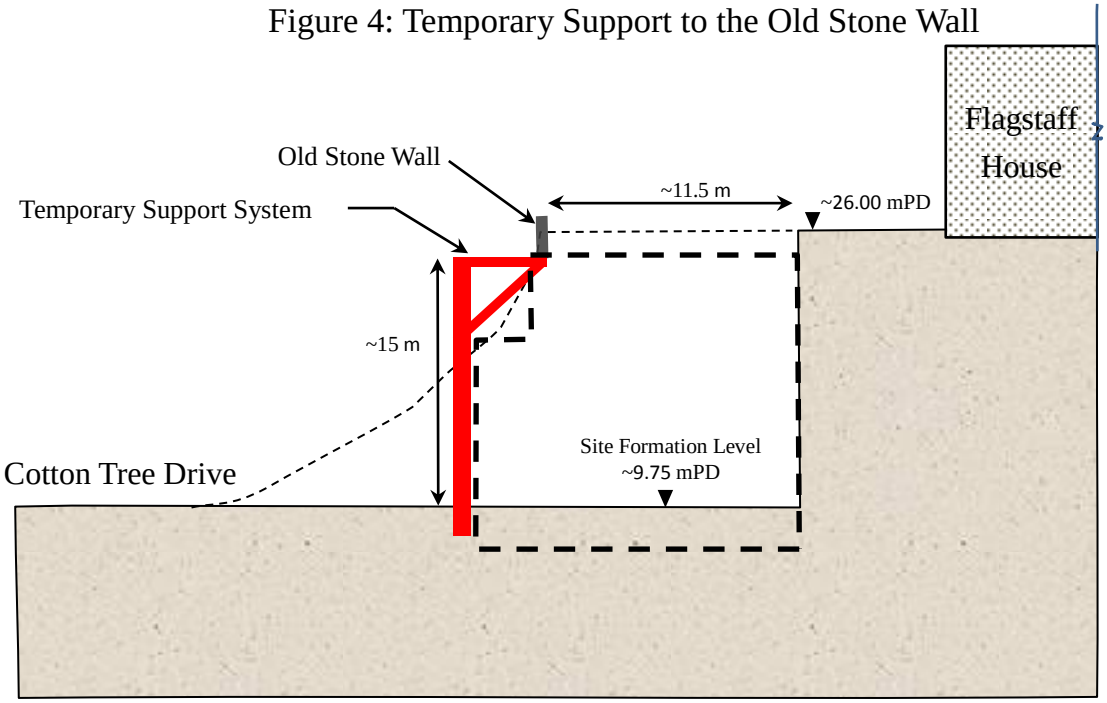

Figure 5: Section A - A

Figure 6: Section B – B

Temporary removal of the stone wall in sections and subsequent reinstatement

7. The feasibility of removing the old stone wall by sections instead of removing individual granite stones has also been studied. This method can better preserve the original appearance and structure of the old stone wall. However, due to the heavy weight of the granite stones, the length of each section will be limited to about 5 m (about 20 tonnes per section including the temporary protection system). Due to the staggered and irregular pattern of the granite stones, in order to divide the stone wall into sections, some granite stones have to be removed. The granite stones located between sections of the old stone wall will be removed with care to avoid damage.

8. To ensure that the existing old stone wall is suitable for removal, condition survey and necessary remedial works to the old stone wall should be carried out before the commencement of works. Before removing a section of the old stone wall, the old stone wall will be well-protected and the bottom of that section of the old stone wall will be undermined and provided with support (such as steel plates). In addition, it is necessary to protect both sides and ends of the section of the old stone wall in order to ensure its integrity and to protect it from damage during removal and transportation. The Heritage Consultant, with inputs from a structural engineer, will conduct study and inspection to determine the exact length for each section and the portion of the affected old stone wall suitable for removal in sections. As it is neither possible nor safe to store the removed sections of the stone wall within the limited

area of the construction site, these sections of the old stone wall will be stored off-site in a safe and controlled place to the satisfaction of the Antiquities and Monuments Office (AMO). For reinstatement of the old stone wall, all sections of the old stone wall will be positioned accurately in order to enable the installation of the granite stones between sections of the stone wall. A detailed cartographic and photographic survey of the affected part of the old stone wall will be carried out by a heritage consultant prior to the temporary removal of the wall and commencement of the construction works. In addition, the temporary removal and reinstatement of the old stone wall will be carried out by an approved Specialist under the Category of "Repair and Restoration of Historic Buildings". Method statement for removal and reinstatement of the old stone wall will be submitted to the AMO for comment and agreement prior to the commencement of the works.

Conclusion

9. As the construction of the new pumping station involves massive excavation at the existing slope and nursery, in-situ preservation of the existing old stone wall will require extensive temporary support which would create undue hardship for the construction of the pumping station. If in-situ preservation of the existing old stone wall is a prerequisite criterion, it will involve additional time and cost to the whole construction project. In addition, the old stone wall will be subject to a high risk of damage for a prolonged period of 5 years. It is therefore not recommended to preserve the stone wall in-situ.

10. The alternative option mentioned in paragraphs 7 to 8 above (i.e. to temporarily remove the old stone wall in sections and reinstate it at its original location after the construction of the pumping station) can better preserve the original appearance and integrity of the old stone wall and is considered as an acceptable mitigation measure. It is therefore recommended that the affected part of the old stone wall be temporarily removed by sections as far as possible with due care and then be reinstated at its original location after the completion of the construction works for the pumping station. Removal of the old stone wall piece by piece will only be considered where it is not possible to remove the stone wall by sections without damaging to the old stone wall.

Design Division
Water Supplies Department
March 2014