

## ***Annex C***

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### **Replacement Pages of Drainage Impact Assessment**

condition and proposed conditions. The flood extent at the area is similar under both the existing and proposed conditions.

4.3.9 Under the extremely high sea level condition such as 1 in 50 years and 1 in 200 years design sea level, the design sea level of those extreme condition (i.e. 5.42mPD for 50 years and 6.74mPD for 200 years respectively) is higher than the existing ground levels for most of Tai Po area which are between 5mPD and 6mPD, for examples, the village areas, currently vegetation area, near Control Points 4 to 6 (i.e. ground levels from 4.4mPD to 4.6mPD). Sea water is anticipated to be flooded into those areas which have ground levels lower than the design sea level under 1 in 50 years and 1 in 200 years flood events in both existing and proposed conditions. Based on the hydraulic model results, the flooding for these areas is mainly arising from extreme high design sea level and low existing topography of the areas. In view of the flooding is causing by high design sea level, thus, it is considered that no significant adverse impacts will be arising from the proposed Development with the proposed drainage.

4.3.10 In view that the downstream portion of the existing stream course will be flooded under extreme event for both existing and proposed conditions, to ensure public safety, management measures including fencing off the Applicant-owned lands near the concerned section of stream course to prevent trespassing and access to the stream course, providing warning signages along the fencing of Applicant-owned lands and erecting warning signages and warning system with loudspeakers in the development of Area (A) Phase I and SWC to warn the public staying away from the watercourse during extreme events will be provided.

4.3.11 As the flood extent of the proposed condition are in generally reduced when compared to the existing condition. Thus, there will be no significant adverse impacts arising from the proposed Development upon the provision of proposed mitigation measures.

#### 4.4 Drainage Impact Assessment for only Development in Area (A) Phase I and Area (B)

4.4.1 In view of the development in Area (A) Phase II will be implemented later than other parts of the Development, a hydraulic sensitivity analysis for only the development in Area (A) Phase I and Area (B) in place has also been carried out. Under this scenario, all proposed drainage system as mentioned in **Section 4.1** will be provided under the development in Area (A) Phase I and Area (B) except the site condition for the Area (A) Phase II will be maintained as existing condition and its runoff will be discharged to the existing stream course.

4.4.2 Same as scenario of the entire Development in **Section 4.3**, control points, as given in **Appendix E**, have been placed to observe changes in predicted water level between existing and proposed conditions for concerned drainage system under this sensitivity analysis. The predicated water levels under the 10 years, 50 years and 200 years flood return period under the existing and proposed conditions for only the development in Area (A) Phase I and Area (B) are presented in **Table 4.2**.

4.4.3 The result of the hydraulic model also shows that the proposed 4m x 3m to 4m x 3.5m box culvert will have at least 300mm freeboard under 200-year flood event.

(i.e. ground levels from 4.4mPD to 4.6mPD) is anticipated to be flooded by sea water under 1 in 50 years and 1 in 200 years flood events under both existing and proposed conditions. Based on the hydraulic model results, the flooding for these areas is mainly arising from extreme high design sea level and low existing topography of the areas. In view of the flooding is causing by high design sea level, thus, it is considered that no significant adverse impacts will be arising from the proposed Development with the proposed drainage.

4.4.10 In view that the downstream portion of the existing stream course will be flooded under extreme event for both existing and proposed conditions, to ensure public safety, management measures including fencing off the Applicant-owned lands near the concerned section of stream course to prevent trespassing and access to the stream course, providing warning signages along the fencing of Applicant-owned lands, and erecting warning signages and warning system with loudspeakers in the development of Area (A) Phase I and SWC to warn the public staying away from the watercourse during extreme events will be provided.

4.4.11 As the flood extent of the proposed condition are in generally reduced when compared to the existing condition. Thus, there will be no significant adverse impacts arising from the proposed Development upon the provision of proposed mitigation measures.

## 4.5 Maintenance Responsibility

4.5.1 **Appendix I** shows the drainage features within and near the Development Site and **Table 4.4** summarises the proposed maintenance parties for the drainage features associated with the proposed development.

4.5.2 In light of that part of the existing stream course falling within the development in Area (A) Phase I and Area (A) Phase II, the owners of the development in Area (A) Phase I and Phase II will be responsible for the maintenance of that part of the existing stream course on government land and private land while HAD will be the maintenance party for the existing stream course located on unleased and unallocated government land. For other existing and proposed drainage features within the development in Area (A) Phase I, the owners of the development in Area (A) Phase I will be responsible for the maintenance of those proposed drainage features including proposed box culvert, 1650mm diameter pipe and 1050mm diameter on both government land and private lands.

4.5.3 The SWC will be managed by the future owner/ operator, the proposed flood wall with a crest level of 7.5 mPD for the SWC and drainage facilities, including flap valve for Pipe B1, will be maintained by the future owner/ operator.

4.5.4 The owners of the development in Area (A) Phase I will be responsible for the maintenance works of the proposed box culvert, the proposed boundary channels and associated pipes, the existing stream course on government land and private lands within the development in Area (A) Phase I and the existing stormwater drainage facilities at the northern part of the development in Area (A) Phase I near Fung Yuen Road, as well as structural maintenance of drainage within the development in Area (A) Phase I. The maintenance works will include routine inspection and desilting works for

the proposed box culvert, the proposed boundary channels and associated pipes and the works will be carried out before wet season, after wet season and after storms.

- 4.5.5 The owners of the development in Area (A) Phase II will be responsible for the maintenance works of the existing stream course on government land and private lands within the development in Area (A) Phase II . The maintenance works will include routine inspection and desilting works for the existing stream course and the works will be carried out before wet season, after wet season and after storms.

**Table 4.4: Maintenance matrix**

Drainage Features	Maintenance Party
Existing stream course within Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Existing stream course within Area (A) Phase II of the Development Site Boundary	Owners of the development in Area (A) Phase II
Existing stream course outside Area (A) Phase I and Area (A) Phase II of the Development Site Boundary on unleased and unallocated Government land	HAD
Existing box culvert with a size ranged from 3.6m x 2.5m along Fung Yuen Road on Government land	DSD
Existing box culvert with a size ranged from 3.6m x 2.5m within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Existing pipe with diameter of 600mm connecting from the lake in Butterfly Valley <sup>1</sup> to the existing stream course	The drainage works of the proposed development will not affect this existing pipe, maintenance responsibility will remain unchanged from the current arrangement.
Existing stormwater drainage facilities at the northern part of the Area (A) Phase I near Fung Yuen Road within the Development Site	Owners of the development in Area (A) Phase I
Proposed box culvert within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Proposed pipe with diameter of 1650mm within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Proposed pipe with diameter of 1050mm within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Proposed boundary channels with covers and associated pipes and the proposed flap valve for Pipes 3.1.3, 3.2.2 and 3.3.1 within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I
Proposed internal drainage within the Area (A) Phase I of the Development Site Boundary	Owners of the development in Area (A) Phase I

<sup>1</sup> Previously known as Le Jardin

Drainage Features	Maintenance Party
Proposed internal drainage within the Area (A) Phase II of the Development Site Boundary	Owners of the development in Area (A) Phase II
Proposed flood wall of the social welfare complex (SWC) and drainage facilities in Area (B) including the proposed flap valve for Pipe B1	Owner/ operator of the SWC
Proposed internal drainage, flap valve and emergency pump of SWC	Owner/ operator of the SWC
Proposed management measures including fencing and warning signages at Applicant-owned lands near downstream of existing stream course, warning signages and warning system in the Area (A) Phase I of the Development	Owners of the development in Area (A) Phase I
Proposed management measures including warning signages and warning system in SWC	Owner/ operator of the SWC

## 4.6 Conceptual Interim Drainage Arrangement for Construction Phases

- 4.6.1 To minimise flood risk in association with the construction phase of the proposed Development, conceptual interim drainage arrangement for construction stage including site formation stage and phasing of works for the proposed Development has been proposed in **Appendix M**. All the information in **Appendix M**, including but not limited to phasing of works and time of works, is tentative and subject to further update, if necessary, based on the future detailed design and Contractor actual construction arrangement for the final development layout.
- 4.6.2 Based on the construction sequence presented in **Appendix M**, the construction period for the proposed Development is a few years, to maintain the flow path of nearby areas mainly for villages and agriculture use near the Site, surface drainage channels as per permanent boundary channels for the development in Area (A) Phase I and interim drainage with discharge capacity for 10 years rainfall for the developments in Area (A) Phase II and Area (B) will be constructed at the beginning of construction stage and will be provided throughout the construction stage. The construction of permanent boundary drainage channels in Area (A) Phase I should be completed in construction stage before commencement of development works in the site. The site runoff will be properly collected and discharged into existing stream course via local temporary site drainage with desilting facilities. Also, the construction activities that will affect / in close vicinity of the existing stream course are all carefully scheduled and will be constructed in dry seasons. Thus, it is considered that there will be no insurmountable drainage impacts during construction stage and the flow path of neighbouring areas can be maintained.

divided into an upper section and a lower section. Under the proposed condition, the upper section of the existing stream course will be connected to the proposed box culvert via a proposed 1650mm diameter pipe whilst the lower section of the existing stream course will serve to receive part of flow from the existing culvert, flow from the existing 1800 drain and runoff from the Site so that the stream habitat can be maintained but the flooding condition at the Site can be improved.

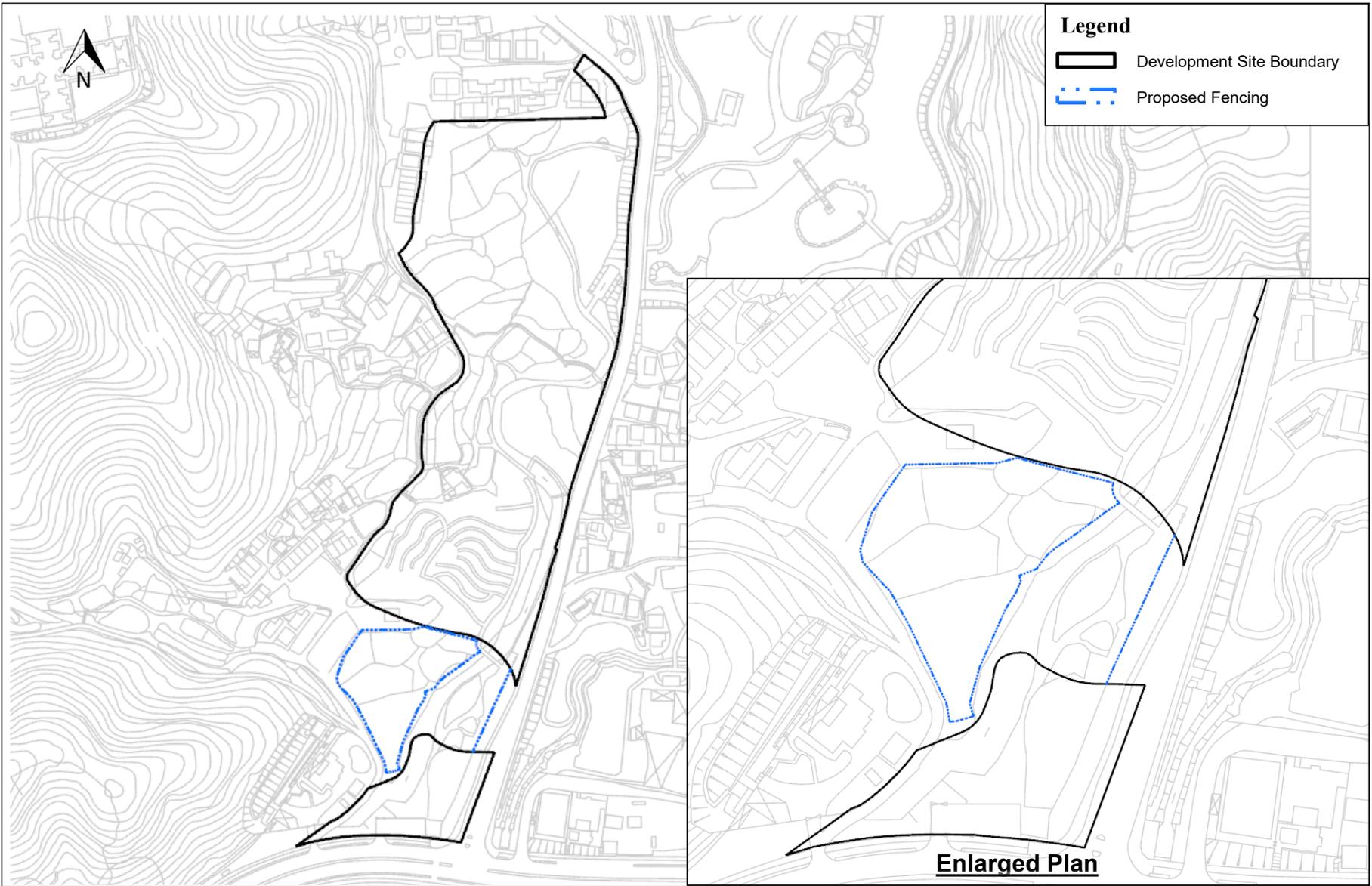
- 5.1.3 Based on the model results, the water levels at the upstream and mid-stream section of the existing stream course are significantly reduced under 1 in 10 years, 1 in 50 years and 1 in 200 years flood event compared with the existing condition. For the upstream section of the existing stream course (i.e. Control points 1 and 2), the water levels are reduced up to 2.6m, 1.5m and 1.4m under 1 in 10 years, 1 in 50 years and 1 in 200 years flood event compared with the existing condition. A significant drop of in water levels (up to -1.5m) is also anticipated at the mid-stream section of the existing stream course (i.e. Control points 3a, 3b and 3c) under 1 in 200 years flood event. With the provision of the proposed box culvert, the drainage condition at upstream and mid-stream of the stream course are greatly improved.
- 5.1.4 In view of that the removal of existing abandoned cross river facilities and provision of a proper drainage system i.e. the proposed box culvert, which collects stormwater including flooded water and part of stream course water under existing drainage condition back to the downstream section of the existing stream course at Control point 4a, under the proposed condition, there will be a slight decrease in the water levels at Control point 4a under 1 in 200 years storm event compared with the existing condition.
- 5.1.5 At the downstream section of the existing stream course (Control Points 5a, 5b and 6) which located at a village zone, the predicated water level is similar to existing condition and flooding only localised at area near to the banks of existing stream course. Since there is no major change in flooding extent under the 1 in 10 years flood event and flood wall with crest level of +7.5mPD (with 0.3m freeboard under the 200 years flood event) has been proposed at the proposed SWC to mitigate the potential flood risk. In view that the downstream portion of the existing stream course will be flooded under extreme event for both existing and proposed conditions, to ensure public safety, management measures including fencing off the Applicant-owned lands near the concerned section of stream course to prevent trespassing and access to the stream course, providing warning signage along the fencing of Applicant-owned lands and erecting warning signages and warning system with loudspeakers in the development in Area (A) Phase I and SWC to warn the public staying away from the watercourse during extreme events will be provided. It is considered that there is no significant drainage impacts to the existing drainage system due to the proposed Development with the provided drainage mitigation measures.
- 5.1.6 As the flood extent of the proposed condition are in generally reduced when compared to the existing condition. Besides, the result of the hydraulic model also shows that the proposed box culvert will have at least 300mm freeboard under the 200-year flood event. Thus, there will be no significant adverse impacts arising from the proposed Development upon the provision of proposed mitigation measures.
- 5.1.7 In view of the development in Area (A) Phase II will be implemented later than other parts of the Development, a hydraulic sensitivity analysis for only the development in Area (A) Phase I and Area (B) in place has also been carried out. Under this scenario, all proposed drainage system as mentioned in **Section 4.1** will be provided under the development in Area (A) Phase I and Area (B) except the site condition for the Area (A)

Phase II will be maintained as existing condition and its runoff will be discharged to the existing stream course.

- 5.1.8 The hydraulic results for the sensitivity analysis for condition only the development in Area (A) Phase I and Area (B) is very similar to the results of entire Development except that the section of existing stream course falling within the site of the development in Area (A) Phase II will marginally have a 300mm freeboard under the 200 years storm event upon the runoff from the development in Area (A) Phase I has been discharged to the proposed box culvert due the low ground levels in this local area. In view that the flood extent of the proposed condition under sensitivity analysis are in generally reduced when compared to the existing condition. Besides, the result of the hydraulic model also shows that the proposed box culvert will have at least 300mm freeboard under the 200-year flood event. Thus, there will also be no significant adverse impacts arising from the proposed Development under condition of only Area (A) Phase I and Area (B) in place upon the provision of proposed mitigation measures.
- 5.1.9 In light of that part of the existing stream course falling within the development in Area (A) Phase I and Area (A) Phase II, the owners of the development in Area (A) Phase I and Phase II will be responsible for the maintenance of that part of the existing stream course on government land and private lands within the development site while HAD will be the maintenance party for the existing stream course located on unleased and unallocated government land. For other existing and proposed drainage features within the development in Area (A) Phase I , the owners of the development in Area (A) Phase I will be responsible for the maintenance of those proposed drainage features including proposed box culvert, 1650mm diameter pipe and 1050mm diameter on both government land and private lands.

## 5.2 Conceptual Interim Drainage Arrangement for Construction Phases

- 5.2.1 To minimise flood risk in association with the construction phase of the proposed Development, conceptual interim drainage arrangement for construction stage including site formation stage and phasing of works for the proposed Development has been proposed. The conceptual interim drainage arrangement, including but not limit to phasing of works and time of works, is tentative and subject to further update, if necessary, based on the future detailed design and Contractor actual construction arrangement for the final development layout.
- 5.2.2 The construction of the proposed Development will take a few years, to maintain the flow path of nearby areas mainly for villages and agriculture use near the Site, surface drainage channels as per permanent boundary channels for the development in Area (A) Phase I and interim drainage with discharge capacity for 10 years rainfall for the developments in Area (A) Phase II and Area (B) will be constructed at the beginning of construction stage and will be provided throughout the construction stage. The site runoff will be properly collected and discharged into existing stream course via local temporary site drainage with desilting facilities. Also, the construction activities that will affect / in close vicinity of the existing stream course are all carefully scheduled and will be constructed in dry seasons. Thus, it is considered that there will be no insurmountable drainage impacts during construction stage and the flow path of neighbouring areas can be maintained.



**Project** Proposed Residential Development(s) with Retail, Public Vehicle Park and Social Welfare Facilities at Various Lots and Adjoining Government Land at Fung Yuen, Tai Po, New Territories

**Title** Extent of Proposed Fencing

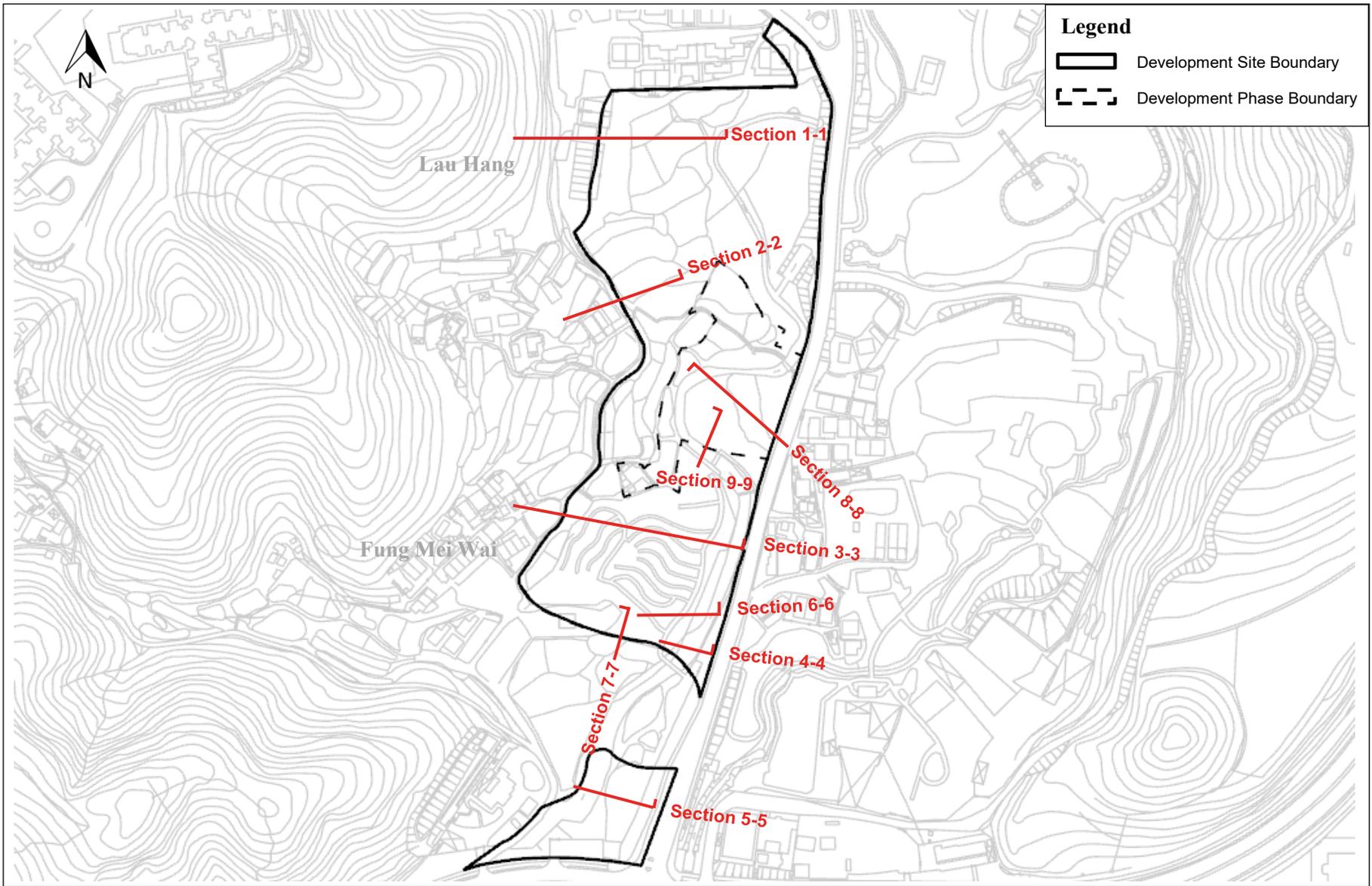
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**Appendix B2**



**Project** Proposed Residential Development(s) with Retail, Public Vehicle Park and Social Welfare Facilities at Various Lots and Adjoining Government Land at Fung Yuen, Tai Po, New Territories

**Title** Sectional Views of Proposed Mitigation Measures

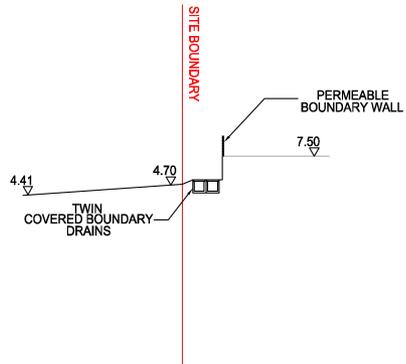
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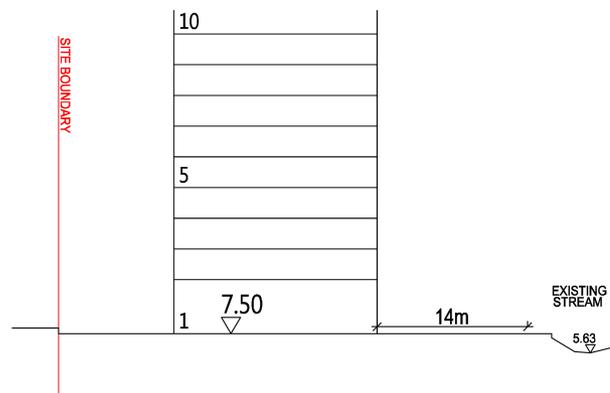
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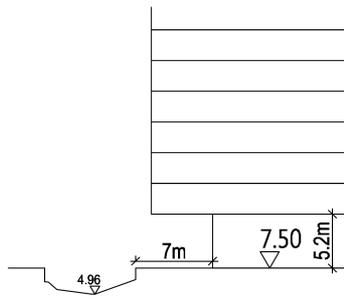
**Appendix K**



SECTION 7 - 7



SECTION 8 - 8



SECTION 9 - 9

**Project** Proposed Residential Development(s) with Retail, Public Vehicle Park And Social Welfare Facilities at Various Lots and Adjoining Government Land in DD 11, Fung Yuen, Tai Po, New Territories

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**Title** Sectional Views of Proposed Mitigation Measures

**Appendix K**

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