

Agreement No. CE 13/2017 (CE)
Site Formation and Infrastructural Works for
Remaining Phases of Public Housing Developments at
Wang Chau, Yuen Long - Feasibility Study

**FINAL EXECUTIVE
SUMMARY (ISSUE 3)**

October 2019



土木工程拓展署
Civil Engineering and
Development Department



BLACK & VEATCH

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Works for Remaining Phases of
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Final Executive Summary

196587/B&V/051/Issue 3

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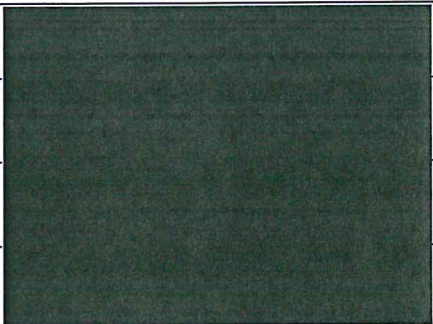
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	Name	Signature	Date
Prepared			October 2019
Checked			October 2019
Reviewed			October 2019
Authorised			October 2019

1 INTRODUCTION

1.1 Project Background

1.1.1 Black & Veatch Hong Kong Limited (B&V) was commissioned by Civil Engineering and Development Department (CEDD) to examine the technical feasibility of remaining phases of public housing developments at Wang Chau (the Assignment), which includes the study on drainage, sewerage, water supply, traffic, transport, and environmental impacts and requirements, and on the Development implementation programme. The Site is located at the western flank of Shan Pui Alluvial Valley, bounded by Fuk Hi Street to the east and Kai Shan to the west, the planned Yuen Long Industrial Estate Extension (YLIEE) to the north and a number of natural hillsides to the south.

1.1.2 The Assignment is to confirm the feasibility of public housing developments at Wang Chau (Development) by undertaking a series of technical assessments so as to support the proposed zoning amendment of land use. Both cost-effectiveness and technical feasibility of the Development would be considered in formulating any proposed works, mitigation measures and implementation programme for population intake. Subject to the findings of the Assignment, an investigation, design and construction consultancy may be commissioned to implement the recommended site formation and infrastructure works.

1.2 Objective of this Report

1.2.1 The purpose of this Executive Summary is to highlight all important findings, evaluation and recommendations for land resumption, site formation and the infrastructure works, the issues of concern to the community, the levels of environmental impacts, requirement for implementation of the Development and infrastructure works.

2 LATEST DEVELOPMENT PROPOSAL

2.1 Option Generation

2.1.1 In the Option Generation, Evaluation and Preliminary Assessments (OGEPA) under the Assignment, a set of guiding principles were formulated to address key constraints of the Site identified in the Baseline Review. Three development layout options have been formulated and compared against a set of evaluation criteria in different aspects including planning, land requirements, engineering and infrastructure, environment, economics and social aspects. An Optimal Scheme was chosen and carried forward for further analysis in the technical assessments. The optimal scheme is shown in **Figure 196587/B&V/OPT/103**.

2.2 Development Layout and Parameters

2.2.1 With reference to various development requirements and site constraints as stated in the OGEPA, the Site will be rezoned for residential use of public housing development with 13 residential blocks (10 blocks with 40 domestic storeys and 3 blocks with 42 domestic storeys) to provide 13,000 flats, which are subject to review in the detailed design stage. The public housing development will be supported by retail facilities, community facilities, car park, Public Transport Interchange (PTI), kindergarten and two primary schools.

2.2.2 The preliminary development parameters are summarized in **Table 2.1**.

Table 2.1 – Preliminary Development Parameters

	Development Parameters
Total Site Area	12.04 ha
Net Site Area for Public Housing	10.83 ha
Maximum Permitted Domestic Plot Ratio (PR)	6.0
Maximum Permitted Non-domestic Plot Ratio (PR)	0.5
Maximum Building Height	135 mPD
Total Flat Production	13,000 Flats
Average Flat Size	50 m ²
Design Population ⁽¹⁾	36,400
Retail	12,972 m ² GFA
Community Facilities	1,296 m ² GFA
Public Transport Interchange	5,290 m ² GFA
Carpark	30,000 m ² GFA
Kindergarten	26 Classrooms
School Provision	Two 24-Classroom Primary Schools (25.5 Students per class)
Target Population Intake	2033

Note:

(1) A person per flat ratio of 2.8 is adopted

- 2.2.3 Based on findings in the technical assessments as illustrated in Section 3, the preliminary engineering layout plan for supporting the Development is shown in **Figure 196587/B&V/ES/002**.

3 HIGHLIGHTS OF PRELIMINARY TECHNICAL ASSESSMENTS

3.1 Preliminary Traffic and Transport Impact Assessment

- 3.1.1 Traffic to be generated from the Development will cause an increase in junction flows and link flows. To cater for the additional trips, the operational performance of 15 critical junctions and 20 critical road links were assessed for Design Year 2036.
- 3.1.2 The assessment results indicate that all the critical junctions would be operated within their capacities except 5 junctions including Fuk Hi Street / Long Ping Road, Long Ping Road / Long Ping Estate Bus Terminus, Long Ping Road / Fung Chi Road, Fung Chi Road / Wang Tat Road and Fuk Hi Street / Wang Lok Street. They would be operated over their capacities and Pok Oi Interchange would be operated near its capacities in Design Year 2036. Junction improvements are proposed at these locations to mitigate the traffic impact.
- 3.1.3 Besides, all the road links will still operate within capacity (i.e. V/C ratios below 1.0.) in design year 2036 except Castle Peak Road – between Ping Shan and Yuen Long Highway (North of Pok Oi Interchange), and Yuen Long Highway (sections between Pok Oi Interchange and Shap Pat Heung Interchange, and West of Tong Yan San Tsuen Interchange) will operate with V/C ratio between 1.0 and 1.1. V/C ratio between 1.0 and 1.1 means that the road sections are slightly overloaded, but heavy congestions and long traffic queues would not be expected. The road sections will experience some delay with reduced traffic speed at peak periods, which is commonly seen at the strategic roads in some urban areas, but it will still be manageable.
- 3.1.4 It is anticipated that majority of pedestrian demands in peak hours are related to the public transport, which include rail and non-rail trips to/from the Development. The future pedestrian flows as well as the operational performance in Design Year 2036 indicated that all footpaths and crossings would operate with ample capacities in Design Year 2036 after population intake of the Development.
- 3.1.5 Based on the estimated public transport demand, an off-street bus terminus with sawtooth bus bay design is proposed to provide a minimum of 6 bus bays and 12 stacking spaces for franchised buses which will be subject to detailed planning at a later stage. Apart from the provided bus bays, provision of one GMB bay and one urban taxi bay and one New Territories taxi bay at the PTI are recommended to provide comprehensive coverage of the public transport services for the Development.
- 3.1.6 Based on the standard design of 6 ppl per sq.m for rail transport, it is estimated that an approximate 2,075 passengers per hour generated from the Development would induce only marginal increase of the maximum hourly passenger flow during the AM peak at the West Rail Line.

3.2 Preliminary Drainage Impact Assessment

- 3.2.1 Based on the results of the hydraulic model, it is noted that the entrance of the Site will be flooded due to inadequate discharge capacity of the existing drainage system within the Site, even with the implementation of Yuen Long Barrage Scheme (YLBS). Moreover, several segments of Fuk Hi Street and Long Ping Road are prone to flooding due to two major reasons: (i) road segments are low-lying together with relatively high downstream water level and (ii) inadequate capacity of some local drainage pipes.
- 3.2.2 The hydraulic assessment indicates that the Development would not induce adverse drainage impact upon commissioning of the following proposed drainage works:-
- (i) Construction of peripheral U-channels with size ranging from 600 to 750 mm;
 - (ii) Construction of a new 900 mm diameter pipe for replacement of part of the existing ditch adjacent to the Site;
 - (iii) Construction of a single-cell 3.5m (W) × 2.0m (H) box culvert within the Site and running underneath a segment of footpath along Fuk Hi Street for proper conveyance of runoff from Kai Shan Catchment;
 - (iv) Upgrading of existing stormwater pipes along the southbound of Fuk Hi Street from 300–450 mm to 1,500 mm diameter (under other project); and
 - (v) Construction of a stormwater storage tank within the Site for temporary storage of the additional runoff induced by the Development.
- 3.2.3 In view that the proposed drainage mitigation measures at this feasibility stage is schematic in nature, it is recommended that the modelling assumptions (including but not limited to the siltation condition of the existing network) and the proposed scheme (including but not limited to weir design, connection location of the discharge pipe, necessity of spare capacity of the flood storage facility) shall be reviewed and a detailed hydraulic assessment (including a flood extent map, if necessary) shall be provided in the investigation and detailed design stages of the Site when more detailed site formation scheme, building layout and the programme of interfacing projects (i.e. YLBS) become available. Furthermore, alternative schemes, such as construction of a separate drainage system to discharge runoff from Kai Shan and the Development directly to Yuen Long Nullah, can be considered to take advantage of the improved downstream drainage conditions from YLBS during the subsequent stages of the Development.

3.3 Preliminary Sewerage Impact assessment

- 3.3.1 Sewage generated from the Development is categorized into four sources: Residential, which consists of the sewage generated from the residents of the Development; students and teachers of the proposed schools; visitors and employees of the community facilities; and patrons of retail facilities. The total ADWF generated from the Development is estimated to be 7,642 m³/day.

- 3.3.2 Drainage Services Department (DSD) is currently implementing the proposed upgrading works of Yuen Long Effluent Polishing Plant (YLEPP) in order to upgrade the treatment level of Yuen Long Sewage Treatment Works (YLSTW) from secondary to tertiary level and upgrade the treatment capacity to 150,000 m³/day to cope with the future sewage flows in the sewage catchment.
- 3.3.3 A sewage scheme is proposed to collect the sewage by an internal sewerage system and discharge to a proposed terminal manhole, which is located near the entrance of the Site. Sewage collected at the proposed terminal manhole will be conveyed via the proposed 750 mm diameter sewer to the public sewerage system along Fuk Hi Street and eventually discharged to YLSTW for treatment and disposal.
- 3.3.4 To ensure that the public sewerage system has adequate level, capacity and performance, it is proposed to upgrade the existing gravity sewers from 300 - 900 mm diameter to 1,050 – 1,200 mm diameter with new gradients. The length of the proposed upgrading works is approximately 1,050 m.
- 3.3.5 According to the results of the hydraulic assessment, the upgraded sewerage system will have adequate capacity to cater for the accumulated sewage flow from the Site and the nearby development areas.

3.4 Preliminary Water Supply Impact assessment

- 3.4.1 Wang Chau Fresh Water Service Reservoir (WCFW S/R) is expected to have sufficient spare capacity to meet additional fresh water demand arisen from the Development. In addition, the planned capacity of Ngau Tam Mei Water Treatment Works (NTM WTW) would be sufficient to accommodate the additional demand from the Development.
- 3.4.2 It is proposed to serve the Development through an upgraded DN900 fresh water main along Fuk Shun Street, a planned DN600 fresh water main to be constructed under Wang Chau Phase 1 Development along Fuk Hi Street and a DN600 fresh water main along the new public road within the Site. It is anticipated that the proposed water supply system would be viable from the hydraulic and construction point of view.
- 3.4.3 Treated Sewage Effluent (TSE) is recommended as the flushing medium due to the lower unit life-cycle costs. However, since the programme for the supply of TSE has not been confirmed, the use of salt water is recommended as an interim measure for the Development at this stage. In view of the insufficient spare capacity of Lok On Pai Salt Water Pumping Station (LOPSW P/S) to provide additional flushing water demand for the Development, salt water supply via pump upgrade in LOPSW P/S and provision of a new DN300 salt water main from the existing DN400 salt water mains along Long Ping Road to the Site are required for supplying flushing water to the Development. While there is no committed programme for the supply of TSE to the Site from the planned YLEPP, close liaison with DSD on the availability of TSE for the Development is required. Should there be more updated information in provision of flushing water supply, adopting TSE as the flushing medium will be

further reviewed in the investigation phase of the project before proceeding into detailed design stage. In the unlikely event that both TSE and salt water will not be available for the Development, Temporary Mains Water for Flushing (TMF) will be considered as a last resort measure.

- 3.4.4 The provision of Smart Water Initiatives and Automatic Meter Readings will be investigated in the subsequent stages of the Development.

3.5 Preliminary Utilities Impact Study

- 3.5.1 The population increase arising from the Development may pose the need to upgrade existing utilities. Utilities required for the Development include power supply, highway lighting, gas supply and telecommunication services.
- 3.5.2 Given the availability of existing utilities adjacent to the Site, it is expected that the proposed utilities within the Site will be extended from the existing networks in the vicinity of the Site with proper connection and upgrading works.
- 3.5.3 The exact alignment and arrangement will be further discussed and determined with relevant government departments and service providers at a later stage.
- 3.5.4 According to information provided by service providers, some 11 kV transmission cables, telecommunication services are laid within the Site and adjacent to the Site. The cable diversion works and actual connection points would be further ascertained after liaison with relevant service providers at a later stage.

3.6 Preliminary Geotechnical Assessment

- 3.6.1 The solid geology of the Site consists of meta-siltstones and sandstones of the Mai Po Member of Lok Ma Chau Formation (Cmp). Fault bounded subcrops of marble from Yuen Long Formation are located to the southeast of the Site. The Site is generally underlain by terraced alluvium (clay and gravelly sand) and debris flow deposits (unsorted sand, gravel, cobbles and boulders; clay/silt matrix.).
- 3.6.2 A registered man-made feature (Feature No. 6NW-B/R 88) is identified located within the boundary of the Site. Regarding the registered man-made features in close proximity to the Site (Feature Nos. 6NW-B/C 103, 6NW-B/C 104, 6NW-B/C 105 and 6NW-B/C 122), with the assessment of the extreme travel distance of the potential landslide debris of the features, it is considered that failure of the concerned man-made features is unlikely to affect the Development.
- 3.6.3 To facilitate the Development, new man-made slopes / retaining walls will be constructed within the Site. These man-made features and retaining walls shall be designed in accordance with Geotechnical Manual for Slopes, Geoguide 1 – Guide to Retaining wall Design and other relevant circulars and standards as promulgated by the Hong Kong Government.

- 3.6.4 When more information on ground investigation are available, settlement analysis shall be carried out. Should the results indicate an unfavorable settlement time frame or degree of settlement, removal of the fill and alluvium layer is one of the options during site formation works so as to prevent settlement due to degradation of non-inert material and increase of surcharge. The quantities of fill removal will be determined when more site-specific Ground Investigation (GI) works are available. Apart from fill removal, in-situ ground improvement such as surcharging, stone columns, deep cement mixing and vertical drains could also be considered at a later stage.
- 3.6.5 The Site falls within Scheduled Area No.2 (Northwest New Territories) defined in the Fifth Schedule of the Buildings Ordinance. The geology of this area comprises superficial deposits overlying metamorphosed sedimentary strata (siltstone, sandstones and marble) as well as igneous rocks. The marble usually has a karstic upper surface with solution features. Large cavities occur within the marble in some locations. The planning, design and construction of works which involve ground investigations, excavations, foundations or groundwater pumping may encounter significant difficulties as a result of these ground conditions. Marble has been identified in the existing boreholes adjacent to the Site. The requirements set out in ETWB TC(W) No. 4/2004 for the geotechnical control for foundation works in Scheduled Area No.2 shall be strictly followed during foundation design and construction.
- 3.6.6 No adverse geological features are observed from existing GI records near the Site. It is considered that the Development is feasible from geotechnical point of view, with layout of the Development subject to further review when more comprehensive site-specific GI information can be obtained at a later stage of the Development.
- 3.6.7 Based on the geomorphological characteristics of the six identified catchments adjacent to the Site, the landslide history and the significance of the landslide hazards in each catchment, the Development is not subjected to a significant risk of natural terrain hazards. Further NTHS is not required for the proposed site.
- 3.7 Preliminary Site Formation Assessment**
- 3.7.1 In order to match the existing topography and to suit the housing layout as much as possible, it is proposed to form a 3-step platform to separate the western portion, the middle portion and the eastern portion of the Site.
- 3.7.2 L-shaped retaining walls with retaining height of 2.2 m to 7.2 m are proposed at the western boundary of the Site. Prior to major earth works to be carried out within the Site, the proposed retaining walls shall be installed. As the major cut works are expected at the western portion of the Site, it is recommended that the proposed earth works starts from the western portion to provide a source of materials for the proposed earth-filling works at remaining parts of the Site.
- 3.7.3 In addition to the proposed retaining wall mentioned above, slope systems (with gradient of 1:2) will be installed on all sides of the Site to accommodate various level

differences between the Site and the adjacent grounds. Permanent slopes are proposed along part of the western and southern boundaries where rooms for formation of permanent slopes are available. The proposed formation level at the eastern portion of the Site is constrained by drainage condition in the vicinity of the Site. With the YLBS, the drainage condition in the vicinity of the Site can be improved and proposed site level at the eastern portion can be further optimized. Moreover, the formation level of YLIEE to the immediate north of the Site is subject to review and adjustment. In view of the uncertainty of the implementation status of the YLIEE and YLBS, temporary slopes are proposed along the northern and eastern boundaries to avoid potential abortive works due to unnecessary retaining walls and allow flexibility to further optimize the site level / cut-fill balance.

3.8 Preliminary Environmental Review

Air Quality

- 3.8.1 During the site formation work of the Development, potential air quality impacts to nearby Air Sensitive Receivers (ASRs) are related to dust nuisance and emissions (sulphur dioxide (SO₂) and nitrogen dioxide (NO₂)) from vehicles and construction equipment on unpaved roads, material handling and wind erosion of exposed area respectively.
- 3.8.2 Dust control measures stipulated under the *Air Pollution Control (Construction Dust) Regulation*, together with proper site management/practice and good housekeeping are required to mitigate the potential dust impacts on the nearby ASRs. Requirements stipulated in the *Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation* will also be followed to control potential emissions from non-road mobile machineries during construction phase. “Recommended Pollution Control Clauses for Construction Contracts” available on Environmental Protection Department (EPD) website also contains recommended control measures to be implemented during construction. In consideration of the above, no unacceptable dust impact on nearby ASRs is anticipated.
- 3.8.3 The planned ASRs within the Site will be potentially affected by emissions from existing chimneys in the surrounding area. A total of 22 active chimneys are identified within the YLIE, of which 4 chimneys are located within 500 m of the Site. The closest chimney is at 190 m to the north of the Site.
- 3.8.4 The minimum requirement on the buffer distance from chimneys is 200 m regardless of the difference in height of the sensitive receivers and chimneys. With appropriate design of fresh air intake location for the community facilities to be at least 200 m away from the nearest chimney, all sensitive receivers within the Site would comply with the minimum buffer distance from chimneys recommended in the Hong Kong Planning Standards and Guidelines (HKPSG).

Noise

- 3.8.5 During construction, there would be noise exceedances predicted to all Noise Sensitive Receivers (NSRs) except the planned Wang Chau Phase 1 Development. Exceedances are anticipated at all other NSRs along Fuk Shun Street throughout late 2027 to early 2029. Noise mitigation measures including the use of quiet Powered Mechanical Equipments (PMEs), installation of temporary noise barriers and enclosure for the PMEs to screen noise from the affected NSRs are proposed. It is also recommended to implement good site practices as far as practicable so as to further reduce the noise impact at NSRs.
- 3.8.6 To minimize direct line-of-sight with NSRs, the ventilation fan of the PTI (if required in future detailed design) is proposed to be located at the north façade of the PTI, subject to detailed design at later stages. The future appointed contractor will be required through contract specifications to provide and implement a design sufficient to mitigate noise impact with reference to the recommendations in the Preliminary Environmental Review (PER) or the future detailed design such that no adverse noise impact arising from the planned ventilation fan of PTI (if required in future detailed design) is anticipated.
- 3.8.7 A combination of roadside barrier and application of low noise road surfacing material (LNRS) for the section of Fuk Hi Street proposed for improvement works is recommended at suitable locations. Two 4m high vertical barriers along the southbound of Fuk Hi Street is proposed to reduce the road traffic noise impact. Further mitigation measures have been considered ineffective as the exceedance is mainly due to the direct line of sight to Fuk Hi Street through the vehicular ingress/egress.
- 3.8.8 At-receiver mitigation measures, for example, in the form of architectural fins made of concrete and acoustic windows are proposed to alleviate the road traffic noise impacts for the NSRs at Block 11 and Block 13, subject to detailed design at later stages.
- 3.8.9 For the two primary schools within the Site, increasing the boundary wall of schools to 5 m is proposed as the only feasible direct mitigation measure at this stage. However, the adoption of the 5 m boundary wall shall be reviewed by Architectural Services Department or future project proponents of the schools following the Class Assessment Document when detailed layout of the schools is available during detailed design stage of the primary schools.

Water Quality

- 3.8.10 During construction, the runoff generated from watercourses upstream of the Site will be intercepted and diverted into peripheral U-channels, and eventually be discharged to the Yuen Long Nullah. The construction of these U-channels would be commenced together with the general site formation works. Mitigation measures are to be implemented during site formation. Also, site drainage would be well maintained and good construction practices would be observed to ensure that litter,

fuels and solvents are managed, stored and handled properly and do not enter the nearby streams and water bodies. Therefore, it is expected that no water quality impacts caused by accidental spillage would be generated. Furthermore, domestic sewage would be generated from the workforce during construction stage. However, this would be collected onsite using chemical toilets and be appropriately handled by licensed contractor. No direct discharge of sewage would be allowed. As such, no unacceptable water quality impacts would be expected.

- 3.8.11 During operational phase, all sewage will be properly collected by public sewer leading to the YLSTW for treatment before discharge, no adverse water quality impact is expected. Also, surface run-off to be generated from the Development is known as non-point source pollution. At the planning and design stages, the drainage systems should be properly planned to receive road runoff. Surface runoff from roads is expected to carry silt and grit and should be properly handled before discharge. Appropriate facilities, such as gullies and silt traps, shall be installed to intercept suspended solids before discharging into the nearby drainage system. With the implementation of the proposed mitigation measures, no adverse water quality from road runoff would be expected.
- 3.8.12 Furthermore, the level of contaminants in the runoff is generally limited for new development area and does not pose a significant threat to nearby watercourses. For locations that are prone to pollution, such as PTI and car park, separate drainage system should be considered at these locations and the runoff should be intercepted by gullies, silt traps or oil interceptors as necessary. With the implementation of the proposed mitigation measures, no adverse water quality would be expected.

Waste

- 3.8.13 The construction activities to be carried out for the Development would generate a variety of wastes that can be divided into distinct categories based on their composition and ultimate method of disposal. The identified waste types include:
- Site clearance waste;
 - Construction and demolition (C&D) materials;
 - General refuse;
 - Chemical waste; and
 - Asbestos containing materials (ACM).
- 3.8.14 The C&D materials generated from site formation should be sorted on-site into inert C&D materials (that is, public fill) and non-inert C&D materials. In order to minimise the impact resulting from collection and transportation of C&D materials for off-site disposal, the inert C&D materials should be reused on-site as backfilling material as far as practicable. Non-inert C&D materials, such as wood, plastic, steel and other metals should be reused or recycled and, as a last resort, disposed off to landfill.

- 3.8.15 With the implementation of mitigation measures, such as maximizing the reuse of C&D materials and with proper waste management practices for handling, transportations and disposal of identified waste arisings from the Development, no adverse impacts are expected during the construction phase of the Development.

Ecology

- 3.8.16 Ecological surveys were carried out from December 2012 to February 2014 under the previous “Planning and Engineering Study for the Public Housing Site and Yuen Long Industrial Estate Extension at Wang Chau” (P&E Study), which covers habitat and vegetation, mammal, avifauna, herpetofauna, butterfly and dragonfly, and freshwater fauna. To supplement the desktop study, site visits and verification surveys were conducted between September and December 2017 covering a 4 months period including both wet and dry seasons to update the current conditions.
- 3.8.17 The assessment area for ecological impact assessment contains developed area, agricultural lands, plantation, shrubland/grassland, woodland, fishponds and watercourses, while the Site mainly consists of developed area, agricultural land and some minor watercourses. The infrastructure works are located mainly along existing roads. The overall ecological value of the Site is fairly low due to its disturbed nature. Thus the overall direct impact due to loss of habitats of the Site is ranked minor.
- 3.8.18 Among the species of conservation importance recorded, only Japanese Pipistrelle, Common Rat Snake and Freshwater Crab were recorded within the Site. Japanese Pipistrelle was in low abundance within the Site and more suitable alternative habitats are available outside the Site. Common Rat Snake was recorded in this section of watercourse by previous studies and a Freshwater Crab species *Somanniathelphusa zanklon* was recorded during the verification study. Channelised watercourse is not the typical habitat for Common Rat Snake or the dependent habitat for the Freshwater Crab given that natural sections of watercourse with better conditions were present upstream. Both species were only recorded in small numbers. In view of the potential pollution, the severity of impact is considered to be minor.
- 3.8.19 The vegetation within the Site will be cleared for the Development, including a number of floral species which are the nectar/ larval food plants for butterfly species of conservation significance that have been recorded at Kai Shan. Nonetheless, these butterfly species were not identified within the Site, and the nectar/ larval food plants are common and mostly not present in large numbers in the Site, thus the loss of nectar/larval food plants of butterfly species is predicted to be of low significance. Yet, it is proposed to plant a number of floral species in the landscaped areas of the Development, if possible, in order to enhance the quality of habitats for the butterflies.
- 3.8.20 Several mitigation measures including avoidance of encroachment to Conservation Area (CA) zone, adjustment of the site boundary and alignment of infrastructure works to minimize any loss of habitats with ecological value, translocation of species

of conservation significance, as well as sensitive design of building façade and noise barrier to prevent bird strike are proposed. With these mitigation measures, any impact on ecology is expected to be insignificant.

Cultural Heritage

- 3.8.21 There are no Sites of Archaeological Interest (SAI), historical villages, declared monument or graded historic building, items of heritage interest, burial grounds and graves in-situ affected by the Development. After reviewing the Archaeological Desk-based Review and Proposal for Archaeological Field Survey in the P&E Study, three archaeological potential areas (Area A, Area B and Area C) were identified, of which Area A and Area C are partially within the southern part of the Site, which may have moderate archaeological potential to yield Ming to Early Qing dynasty archaeological deposits. Due to the issues on privacy and rights of land ownership, it is recommended that field investigation and field testing works shall be conducted to assess the archaeological potential in Area A and Area C falling within the Site after land resumption.
- 3.8.22 A well and shrine is identified within the Site. The well has a plaque with a date of 1912 written on it and it seems that the date refers to the notice for usage. Given its high fung shui and historical values to the local communities, it is recommended that the well and shrine could be retained in-situ as far as possible.

3.9 Preliminary Landscape and Visual Impact Assessment

- 3.9.1 Based on the broad brush tree survey, no registered OVT is identified within the Site, but 558 number of trees within the Site, Inset A, Inset B and Inset C would require felling. This requires a compensatory planting ratio of a minimum 1:1 by number as far as possible. During the later stage of the Development, an updated tree survey will be carried out and a tree felling application will be submitted. The exact number of trees to be retained/transplanted/felled will be reviewed. The final locations for transplantation shall be identified and the compensatory planting proposal will be prepared together with the application.
- 3.9.2 There are 26 Landscape Resources (LRs) and 20 Landscape Character Areas (LCAs) identified by the Development. Also, visual impact is anticipated from public viewpoint identified within the visual assessment area.
- 3.9.3 Several landscape and visual mitigation measures during the construction phase are proposed, which include minimising construction area and contractor's temporary works area, reduction of construction period, minimizing construction traffic, erection of decorative mesh screens or construction hoardings around works areas in visually unobtrusive colours, avoiding excessive height and bulk of temporary site buildings and structures, minimizing night-time lighting and night working periods, and carefully protecting existing trees.

3.9.4 Moreover, landscape and visual mitigation measures during the operational phase are proposed, including sensitive design of buildings, use of appropriate building materials and colours, directional road lighting units, provision of minimum 20%, but targeting 30% of greening, compensating trees at 1:1 ratio as far as possible, provision of landscape roof on multi-storey carpark, sensitively designed streetscape, provision of new tree planting within public housing site, and aesthetically designed noise barriers.

3.9.5 The overall residual landscape impact of the Development are considered to be moderately adverse following implementation of mitigation measures during the construction and operational phases (i.e. the Development will, with or without mitigation measures result in overall terms, negative landscape impacts to the identified LRAs and LCAs). The overall *residual visual impacts* of the Development are considered to be moderately adverse with mitigation during the operational phase.

3.10 Preliminary Land Contamination Assessment

3.10.1 The extent of the proposed Site Investigation (SI) area for the Land Contamination and Remediation Study (LCRS) has been determined based on findings from the site appraisal. The majority of potential contaminated sites in the proposed SI area for the LCRS are private lands, which were inaccessible. Therefore, it is recommended that once land resumption is completed, further site re-appraisal should be conducted for the Site in order to assess any potential land contamination issues and to ascertain the contaminative sources, hotspots of contamination. The sampling and testing plans should be updated based on the future site re-appraisal and submitted in the comprehensive Contamination Assessment Plan (CAP) for EPD's endorsement.

3.10.2 Contamination Assessment Report (CAR), Remediation Action Plan (RAP) and Remediation Report (RR) (if necessary) should also be prepared and submitted to EPD for agreement and remediation works (if necessary) should be finished prior to the commencement of site formation for the Development.

3.11 Preliminary Air Ventilation Assessment

3.11.1 According to the findings of the AVA-EE, the annual prevailing wind comes from NNE, NE, E, ENE and S directions while the summer prevailing wind comes from SSE, S, SW, SSW and WSW directions. The site layout has carefully taken account of design practices in air ventilation aspect, such as adjustment of building layout and building separation to minimize air ventilation impact to the surrounding areas. After taking into account the existing topography, the location of the existing built-up areas and provision of mitigation measures, it is considered that the Development would not have adverse air ventilation impacts to surrounding environment.

- 3.11.2 Moreover, the Development shall not be limited to the proposed design and shall include other features as far as possible at the detailed design stage. Mitigation measures for air ventilation will be reviewed again at next stage with detailed architectural layout design. For instance, the following recommendations shall be considered:
- Building Permeability equivalent to 20% to 33.3% of total frontal area with reference to PNAP APP-152;
 - Minimisation of podium bulk with ground coverage of no more than 65%;
 - Building setback with reference to PNAP APP-152;
 - Providing minimum 20% greening ratio but targeting for 30%, taking into account the site constraints of individual phases;
 - Avoidance of long continuous façades; and
 - Reference could also be made to recommendations of design measures in the HKPSG.
- 3.11.3 It is recommended that a quantitative AVA (in form of Initial Study) shall be conducted for the Development at the detailed design stage to review the mitigation measures to suit the detailed architectural layout. The current qualitative AVA is subject to change upon detailed layout development.

3.12 Preliminary Land Requirement Study

- 3.12.1 Based on the proposed extent of land required for the implementation of the Development, the number and extent of the land uses, facilities and properties potentially affected by the Development are identified and summarised in **Table 3.1**. The total area for works limit¹ of the Development is approximately 173,386 m².

Table 3.1 – Summary of Major Features Affected by the Development

Feature	Affected Number	Affected Area (m²)
Private Lot (OSL)	233	84,791
BL	2	91
MOT	26	2,490
LOA	2	84
GLA	1	2,220
Existing STT	14	9,032
Graves/Urns/Kam Taps	0	-
Shrines	1	-
Building/ Structures	161	17,209
Residents	142	-
Registered Slope	1	-

¹ Works Limit is the physical limit of which contractor has obligation to carry out relevant construction works under contract.

Feature	Affected Number	Affected Area (m ²)
Agricultural Lands	-	22,071
Businesses ⁽²⁾	38	75,375

Note: (2) According to the Preliminary Land Requirement Study Report of this study, the term “Businesses” include open storage areas, open carparks, vehicle repair/maintenance workshops, logistic companies, waste recycling workshops, etc.

- 3.12.2 It is recommended Clearance Application Forms (CAFs) with the final land requirement plans be prepared and submitted in the investigation and detailed design consultancies so as to kick start the process of land resumption / land clearance for the Development under the relevant ordinances. Further liaison with Lands Department should be carried out at a later stage so as to complete the process of land resumption / land clearance.

3.13 Preliminary Sustainability Assessment

- 3.13.1 The computer programme - CASET is adopted as evaluation framework to assess the sustainability implications of the Development. The CASET parameters have been assessed qualitatively and quantitatively where possible.
- 3.13.2 The sustainability assessment at this stage indicates that with the implementation of the Development, the main benefits would be improvement in housing and living conditions, economy, leisure and society and social infrastructure. These benefits come in the form of improved health and well-being of residents, positive economic return, and enhancement to social involvement. Also, the associated transport infrastructure such as the PTI would improve connectivity between the Development and other districts. On the other hand, negative impacts come mainly in the form of environmental degradation, with deterioration in natural resources.
- 3.13.3 Overall, the benefits produced by the Development outweigh the residual negative impacts especially in the long term. Therefore, with the implementation of the proposed mitigation measures to minimize the negative impacts, the Development is considered sustainable.

4 IMPLEMENTATION PROGRAMME

4.1 Project Programme of Major Works

4.1.1 It is given to understand that the proposed site formation works and the essential infrastructure works including roadworks (except the internal roads within the future housing sites), drainage, sewerage and water supply facilities, as well as the necessary environmental mitigation measures, will be carried out by CEDD; while the implementation of the proposed public housing developments will be carried out by Housing Department (HD).

4.1.2 The main activities are categorised according to the following project stages:

- Feasibility Study;
- Rezoning Exercise;
- Investigation Stage;
- Gazettal Procedure;
- Land Resumption/ Land Clearance;
- Detailed Design Stage;
- Public Works Programme Procedure;
- Tender Stage; and
- Construction Stage.

4.1.3 The milestone dates of the key activities are summarised in **Table 4.1** below.

Table 4.1 – Milestone Dates of the Key Activities

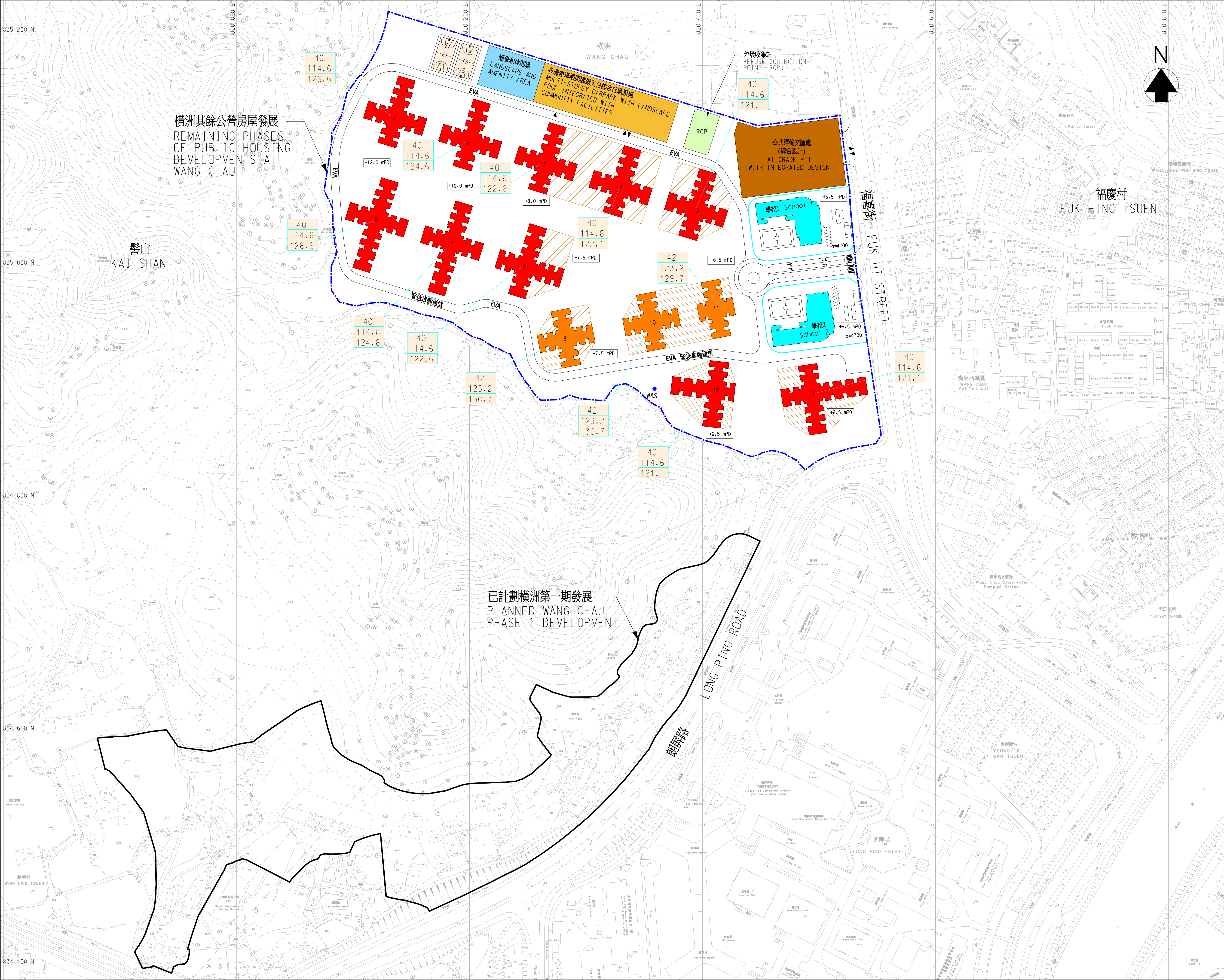
Key Activities	Milestone Dates
Completion of Rezoning Exercise	August 2021
Commencement of Investigation Phase	June 2020
Commencement of Detailed Design Phase	December 2021
Completion of Road Gazettal Process (including ExCo Approval)	June 2023
Completion of Land Resumption / Land Clearance	March 2025
Commencement of Construction Phase (Site formation and Infrastructure Works)	January 2027
Site Formation Works Completed for Site Handover to HD	July 2029
Completion of public housing construction of Remaining Phases of Wang Chau Development	July 2033

5 CONCLUSION

- 5.1.1 The public housing developments at Wang Chau Remaining Phases were proposed to relieve the housing demand in Hong Kong and to bring social benefits to the local community. Preliminary technical assessments had been completed and confirmed the feasibility and sustainability of the Development.

END OF TEXT

FIGURES



圖例：
LEGEND:

橫洲第一期公營房屋發展工地範圍
SITE BOUNDARY FOR PHASE 1
OF PUBLIC HOUSING
DEVELOPMENTS AT WANG CHAU

橫洲其餘公營房屋發展工地範圍 (有待審查)
SITE BOUNDARY FOR REMAINING PHASES
OF PUBLIC HOUSING DEVELOPMENTS
AT WANG CHAU (SUBJECT TO REVIEW)

住宅樓宇 (41層)
RESIDENTIAL BLOCKS (41 STOREYS)

住宅樓宇 (44層 (包括一層隔火層))
RESIDENTIAL BLOCKS
(44 STOREYS (WITH 1 REFUGE FLOOR))

零售設施
RETAIL

政府、機構或社區設施
GOVERNMENT, INSTITUTION AND
COMMUNITY (G/I/C) FACILITY

住宅層數 (不包括平台或大堂)
NO. OF DOMESTIC STOREYS
(EXCL. PODIUM/LOBBY)

樓宇高度 (米)
BUILDING HEIGHT (METERS)

樓宇高度 (米) (主水平基準以上)
mPD OF BUILDING (METERS)

水井和龕 (盡可能原址保留)
WELL AND SHRINE (TO BE RETAINED
IN SITU AS FAR AS POSSIBLE)

A	01/18			WT
版本 Revision	日期 Date	內容 Description		簡稱 Initial
		設計 Designed	覆查 Checked	繪畫 Drawn
簡稱 Initial	WT	KC	SZ	-
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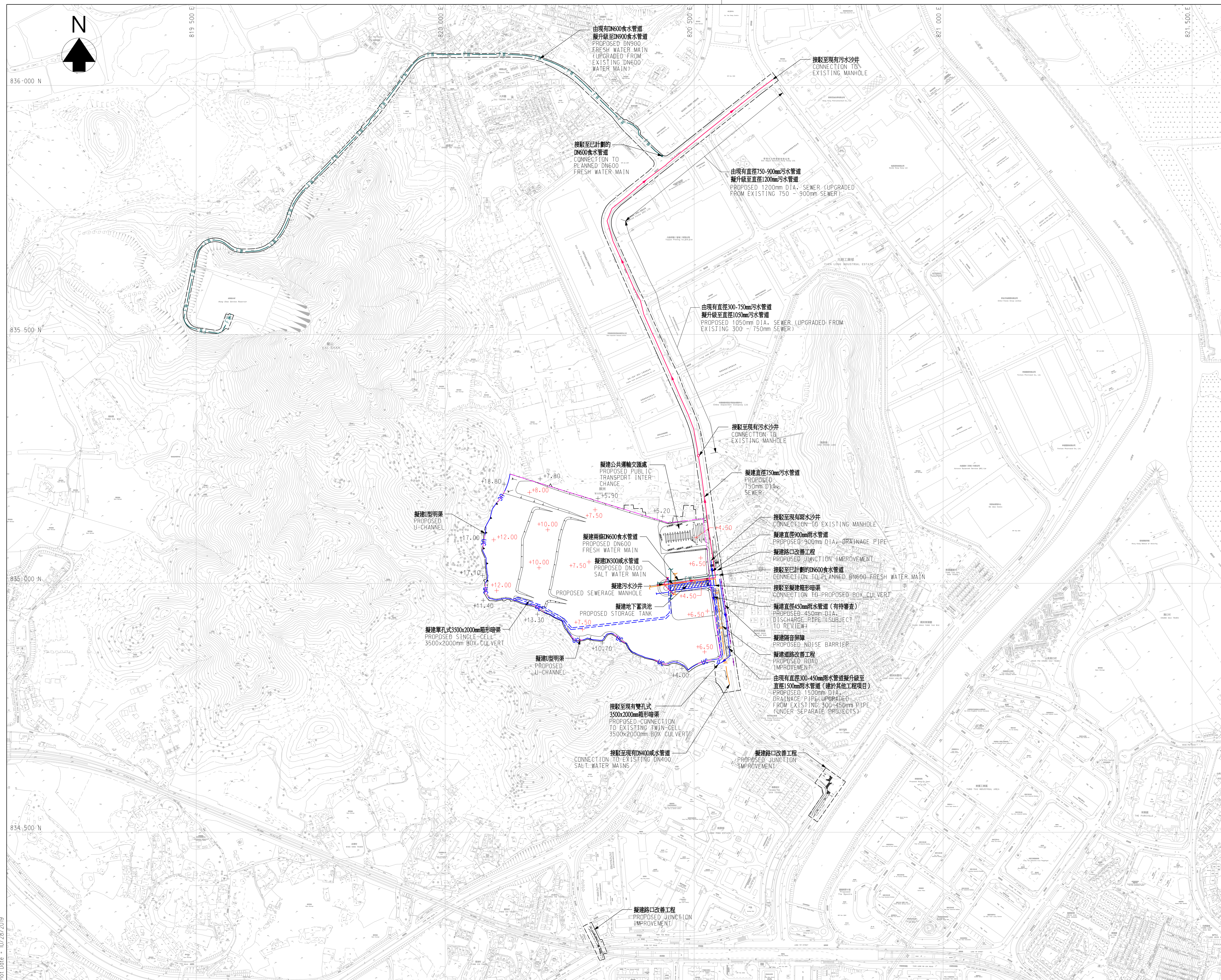
工程名稱
Project Title
元朗橫洲其餘
公營房屋發展的工地平整及基礎設施工程-可行性研究
SITE FORMATION AND INFRASTRUCTURAL
WORKS FOR REMAINING PHASES
OF PUBLIC HOUSING DEVELOPMENTS
AT WANG CHAU, YUEN LONG
- FEASIBILITY STUDY

圖則名稱
Drawing Title
初步擬定發展設計圖
方案三
(只供參考)
PRELIMINARY PROPOSED LAYOUT OF
INITIAL DEVELOPMENT OPTION 3
(FOR REFERENCE ONLY)

圖則編號 Drawing No.	比例 Scale
196587/B&V/OPT/103	1 : 1500 (A1) 1 : 3000 (A3)

土木工程拓展署
CEDD Civil Engineering and
Development Department

BLACK & VEATCH HONG KONG LIMITED
博威工程顧問有限公司



CAD Filename = Y:\Daily Work\20191024H\196587\196587-B&V-ES-002.dgn

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圖例：
LEGEND:

擬建污水管道
PROPOSED SEWERAGE PIPE
擬建污水沙井
PROPOSED SEWERAGE MANHOLE
擬建食水管道
PROPOSED FRESH WATERMAIN
擬建咸水管道
PROPOSED SALT WATER MAIN
擬建雨水管道
PROPOSED DRAINAGE PIPE
擬建U型明渠
PROPOSED U-CHANNEL
擬建箱型暗渠
PROPOSED BOX CULVERT
擬建地下蓄洪池
PROPOSED UNDERGROUND STOR
擬建隔音屏障
PROPOSED NOISE BARRIER
擬建擋土牆
PROPOSED RETAINING WALL
工地範圍
(有待審查)
BOUNDARY OF THE SITE
(SUBJECT TO REVIEW)

 擬建斜坡
PROPOSED SLOPE

 施工區界限
WORKS LIMIT

+7.80 現有路面水平
EXISTING GROUND LEVEL

+8.00 擬建工地平整路面水平
PROPOSED SITE FORMATION LEVEL

版本 Revision	日期 Date	內容 Description		簡稱 Initial
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工程名稱
Project Title

元朗橫洲其餘
公營房屋發展的工地平整及基礎設施工程- 可行性研究

SITE FORMATION AND INFRASTRUCTURAL
WORKS FOR REMAINING PHASES
OF PUBLIC HOUSING DEVELOPMENTS
AT WANG CHAU, YUEN LONG
- FEASIBILITY STUDY

圖則名稱
Drawing Title

概念設計圖
NOTIONAL LAYOUT PLAN

圖則編號 Drawing No.	比例 Scale
196587/B&V/ES/002	1 : 3500 (A1) 1 : 7000 (A3)



土木工程拓展署
Civil Engineering and
Development Department



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