

Appendix H: Revised PER Report

Prepared for

Pine Garden Foundation Limited

Prepared by

Ramboll Hong Kong Limited

**SECTION 16 PLANNING APPLICATION FOR PROPOSED TAI
PO KAU NATURE ACADEMY**

PRELIMINARY ENVIRONMENTAL REVIEW REPORT

Date **12 October 2022**

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Project Reference **SPMTPKEREI00**

Document No. **R8589_v2.0**

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1. INTRODUCTION

1.1 Background

- 1.1.1 The Application Site is located at Tai Po Kau, Tai Po, which is currently occupied mainly by vegetation with a few vacant single storey building structures within the site area. The Applicant has proposed to construct a Tai Po Kau Nature Academy within the Application Site, where three single storey building blocks including one visitor centre, one activity centre and a plant nursery, together with other ancillary facilities such as car parks, sewage treatment plant and grass area/camping ground, will be provided (the Proposed Development).
- 1.1.2 Ramboll Hong Kong Ltd. (the Consultant) has been commissioned by the Applicant to conduct this Preliminary Environmental Review (PER) in order to demonstrate that the Proposed Development will be environmentally acceptable.

1.2 Purpose of this Report

- 1.2.1 This PER addresses the potential environmental impacts associated with the construction and operation of the Proposed Development and recommends suitable mitigation measures as necessary to demonstrate environmental acceptability. This PER also serves to confirm the feasibility and acceptability of the Proposed Development design and construction planning to pre-empt/minimise environmental impacts/nuisances, where practicable.

1.3 Project Description

- 1.3.1 The Application Site has an area of about 9,054m² and is within an area currently zoned Green Belt ("GB") under the Draft Tai Po Outline Zoning Plan (OZP) (No. S/TP/29). The Application Site is located outside the Tai Po Kau Nature Reserve.
- 1.3.2 The Application Site is rural in nature, which is bounded by a restricted road, Tai Po Kau Forest Track – Kau Lead Section to the south and southeast. To the immediate north of the Applicant Site, there is a stream, Tai Po Kau Stream, running downstream to Tolo Harbour. Tai Po Kau Special Area Tai Po Kau Management Centre is located to the northwest of the Application Site. The rest of the surrounding areas are mainly hillside forest.
- 1.3.3 **Figure 1.1** shows the location of the Application Site and its environs, and the proposed layout of the site is shown in **Figure 1.2**. Based on the current design scheme, there will be three single storey building blocks comprising of a visitor centre, an activity centre and a plant nursery, green areas with designated native species, green field for outdoor activity, tree nurse, pond with aquatic species, camping area and a sewage treatment system for the Proposed Development. The layout plans and conceptual design of the Proposed Development are presented in **Appendix 1.1**.
- 1.3.4 Based on the current estimate, the Application Site will accommodate about 400 visitors daily with about 10 site staff upon project occupation. Overnight programme will be arranged during March to April and September to November, with maximum of 18 people including tutors and participants and a maximum of 4 times a month.

1.4 Scoping of Environmental Issues

- 1.4.1 The environmental implications associated with the Project have been reviewed based on the best available information at this preliminary design stage. The main environmental concerns are summarised below:
- Potential noise impact arising from the Proposed Development;

- Potential air quality impact arising from the Proposed Development;
- Potential water quality issue associated with the Proposed Development;
- Generation of waste from the Proposed Development; and
- Potential environmental impacts arising from construction of the Proposed Development.

1.4.2 As mentioned, the Application Site is currently occupied mainly by vegetation and is rural in nature, thus land contamination due to current land use at the site is not anticipated. Photos showing the existing site conditions are shown in **Appendix 1.2**. Also, based on the aerial photos from Lands Department, the Application Site appeared to be occupied by farmlands since 1960's. Building structures associated with the farmlands in the Application Site were found. It is reasonably believed that these were used for accommodation of farmers and for storage uses. Currently, the Application Site is occupied mainly by vegetation with a few vacant single storey building structures which were also found in the historical aerial photos. No farming operation or other activities are being undertaken. The selected aerial photos showing the historical conditions of the Application Site are shown in **Appendix 1.3**. Given that no potential land contaminating activities have been identified within the Application Site, land contamination issues at the Application Site are not anticipated. Thus, land contamination has been scoped out from this PER Report.

1.4.3 Based on the current design, the Proposed Development is relatively small in scale with the deployment of limited number of plant and equipment. Construction works mainly including demolish two abandoned single storey vacant building structures, modification of the existing building structures to visitor centre and activity centre and plant nursery. The construction methods include casting in-situ reinforced concrete for spread footing foundations and parts of superstructure, installing pre-fabricated / precast structural and non-structural components, installing building service systems and equipment, carrying out fitting-out works, forming access paths, and carrying out landscaping works and slope upgrading works if found necessary. Lean construction and cut-and-fill balance will be proposed. No extensive site formation and foundation works is required. Only minor excavation will be needed for enhancement of the pond. The overall construction period is anticipated to be about 12 months. Considering the small scale of construction works, potential dust, noise and water quality impacts arising from construction activities will be minimal. As mainly modification of the existing building structures and only minor excavation works will be required, the volume of construction and demolition materials to be generated will be small. As lean construction and cut-and-fill balance will be adopted, the transportation for construction mainly includes material delivery and equipment transportation. There will be modification works for three single-storey small buildings only. No frequent traffic trips will be anticipated during construction phase.

1.4.4 With the implementation of proper good site practices and standard pollution control measures, including those recommended in the Air Pollution Control (Construction Dust) Regulation, ProPECC PN2/93¹ and ProPECC PN1/94², no adverse environmental impact during the construction of the Proposed Development is anticipated. Thus, construction phase air quality, noise and water quality impacts have been scoped out from this PER Report.

¹ Source location: https://www.epd.gov.hk/epd/sites/default/files/epd/english/resources_pub/publications/files/pn93_2.pdf

² Source location: https://www.epd.gov.hk/epd/sites/default/files/epd/english/resources_pub/publications/files/pn94_1.pdf

1.5 Structure of the Report

1.5.1 The structure of this report is as follows:

- Section 1 introduces the project background and description, and the main tasks and purpose of this report;
- Section 2 presents the **construction and** operational air quality impact assessment;
- Section 3 presents the operational noise impact assessment;
- Section 4 presents the **construction and** operational water quality impact assessment;
- Section 5 presents the waste management implications; and
- Section 6 presents the conclusion of this report.

2. AIR QUALITY

2.1 Introduction

2.1.1 The aim of this section is to identify potential air quality impact relating to the Proposed Development within assessment area; and, if required, to recommend likely practical pollution control and mitigation measures required with respect to the Hong Kong Planning Standards and Guidelines (HKPSG) and other relevant legislations.

2.2 Relevant Legislation, Standards and Guidelines

2.2.1 Air quality is affected by such factors as the emission rate of air pollutants, the separation distance between emission sources and receptors, height and width of buildings as well as meteorology. The Hong Kong Planning Standard and Guidelines (HKPSG) provides guidance on environmental considerations in the planning of both public and private developments. In this section, the principal framework for planning against air pollution according to the HKPSG is considered. Please refer to the Recommended Minimum Buffer Distance from Roads and Industrial Chimneys as shown in **Table 2.1** below.

Table 2.1 HKPSG - Recommended Minimum Buffer Distance from Roads and Industrial Chimneys

Pollution Source	Parameter	Buffer Distance	Permitted Uses
Road and Highways	Type of Road		
	Trunk Road and Primary Distributor	> 20m	Active and passive recreational uses
		3 - 20m	Passive recreational uses
		< 3m	Amenity areas
	District Distributor	> 10m	Active and passive recreational uses
		< 10m	Passive recreational uses
	Local Distributor	> 5m	Active and passive recreational uses
		< 5m	Passive recreational uses
Under Flyovers	-	Passive recreational uses	
Industrial Areas	Difference in Height between Industrial Chimney Exit and the Site		
	<20m	>200m	Active and passive recreational uses
		5 - 200m	Passive recreational uses
	20 - 30m	>100m	Active and passive recreational uses
		5-100m	Passive recreational uses
	30m - 40m	>50m	Active and passive recreational uses
		5 - 50m	Passive recreational uses
	>40m	>10m	Active and passive recreational uses

Remarks:

- (a) In situations where the height of chimneys is not known, use the set of guidelines marked with an asterisk for preliminary planning purpose and refine as and when more information is available.
- (b) The buffer distance is the horizontal, shortest distance from the boundary of the industrial lot, the position of existing chimneys or the edge of road kerb, to the boundary of open space sites.
- (c) The guidelines are generally applicable to major industrial areas but NOT individual large industrial establishments which are likely to be significant air pollution sources. Consult EPD when planning open space sites close to such establishments.

(d) Amenity areas are permitted in any situation.

2.2.2 Assessment criteria for aerial emission is based on the Hong Kong Air Quality Objectives (AQOs), and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM) for controlling air pollutants. The AQOs, effective on 1 January 2022, are shown in **Table 2.2** below.

Table 2.2 Hong Kong Air Quality Objectives (AQOs)

Pollutant	Averaging time	Concentration limit ^[i] ($\mu\text{g}/\text{m}^3$)	Number of exceedances allowed per year
Sulphur dioxide, SO ₂	10-minute	500	3
	24-hour	125	3
Respirable suspended particulates, RSP (PM ₁₀) ^[ii]	24-hour	100	9
	Annual	50	Not applicable
Fine suspended Particulates, FSP (PM _{2.5}) ^[iii]	24-hour	75	9
	Annual	35	Not applicable
Nitrogen dioxide, NO ₂	1-hour	200	18
	Annual	40	Not applicable
Ozone, O ₃	8-hour	160	9
Carbon monoxide, CO	1-hour	30,000	0
	8-hour	10,000	0
Lead	Annual	0.5	Not applicable

Note:

[i] All measurements of the concentration of gaseous air pollutants, i.e., sulphur dioxide, nitrogen dioxide, ozone and carbon monoxide, are to be adjusted to a reference temperature of 293 Kelvin and a reference pressure of 101.325 kilopascal.

[ii] Respirable suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 10 μm or less.

[iii] Fine suspended particulates means suspended particles in air with a nominal aerodynamic diameter of 2.5 μm or less.

2.3 Baseline Conditions

Description of the Environment

2.3.1 As shown in **Figure 1.1**, the Application Site is located at a rural area in Tai Po Kau, Tai Po. The Application Site is bounded by a restricted road, Tai Po Kau Forest Track – Kau Lead Section to the south and southeast. To the immediate north of the Applicant Site, there is a stream, Tai Po Kau Stream, running downstream to Tolo Harbour. Tai Po Kau Special Area Tai Po Kau Management Centre is located to the northwest of the Application Site. The rest of the surrounding areas are mainly hillside forest. A number of village houses are located from about 165m to 300m to the north and northeast of the Application Site. There is only a small section of Tai Po Road (Tai Po Kau) located about 400m to the northeast of the Application Site.

2.3.2 Site surveys were carried out in August 2021 and March 2022, no chimneys and other industrial emission sources were identified in the vicinity of the Application Site during the survey. As the Application Site is rural in nature, there are no particular sources affecting the prevailing air climate of the area.

Existing Air Quality in Tai Po District

2.3.3 The tentative years of completion of the Proposed Development are 2025. Therefore, the year of 2025 hourly background concentration of NO₂, RSP and FSP from the PATH (Pollutants in the Atmosphere and the Transport over Hong Kong) v2.1 model has been adopted for the purpose of this assessment. The Application Site is within PATH Grid

41,45 and the background data for Year 2025 was extracted from the corresponding grid.

2.3.4 Tai Po Air Quality Monitoring Station (AQMS) of the Environmental Protection Department (EPD) is the closest station to the Application Site and should be representative of the prevailing air climate of the Application Site. Thus, the historical air quality monitoring data of the past five years, i.e. 2017 to 2021, obtained from Tai Po AQMS and PATH data for Year 2025 are summarised in Table 2.3 to depict the trend in air quality.

Table 2.3 EPD Air Quality Monitoring Data at Tai Po AQMS (Year 2017 to 2021) and PATH v2.1 (Grid 41,45) (Year 2025)

Year	Concentration of Pollutants (µg/m ³)								
	19 th highest 1-hour NO ₂	Annual NO ₂	4 th highest 24-hour SO ₂	4 th highest 10-min SO ₂	10 th highest 24-hour RSP	Annual RSP	36 th highest 24-hour FSP	Annual FSP	10 th highest 8-hour O ₃
2017	127	39	9	39	82	32	39	22	181
2018	125	36	8	24	69	31	33	19	167
2019	142	36	10	20	65	31	35	20	197
2020	106	30	7	19	58	24	28	15	165
2021	115	32	8	15	60	26	27	16	168
Prevailing AQOs	200	40	50	500	100	50	50	25	160
PATH in 2025 (41,45)	61	11	10	63	62	21	22	7	196

Note: Bolded numbers indicate exceedances of the respective prevailing AQOs.

2.3.5 The monitoring results are indicative of the prevailing baseline air quality in the assessment area. Exceedances of 8-hour average O₃ concentration were recorded at Tai Po AQMS from Year 2017 to Year 2021, and Year 2025. Apart from that, all other past 5-year average pollution levels in the relevant averaging periods comply with the current Air Quality Objectives (AQOs).

2.4 Air Sensitive Receivers (ASRs)

2.4.1 The assessment area for the air quality impact assessment is defined as the area within 500m from the boundary of the Application Site, as shown in Figure 2.1. Air Sensitive Receivers (ASRs) have been identified in accordance with the HKPSG and Annex 12 of the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The existing ASRs are identified with reference to the latest information provided on the survey maps, Draft Outline Zoning Plan, topographic maps, aerial photos and land status, and also the site survey. No planned ASR has been identified in the vicinity of the Application Site. The first layer of existing ASRs located closest to the Application Site have been identified as the representative ASRs. Details of the representative ASRs are summarised in Table 2.4 and indicated in Figure 2.1.

Table 2.4 Summary of Representative ASRs

ASR ID	Descriptions	Use	No. of Storeys	Approximate Minimum Horizontal Distance to Application Site (m)
ASR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	Office	1	73
ASR 2	Village House 1	Residential	2	276
ASR 3	Village House 2	Residential	1	291

ASR ID	Descriptions	Use	No. of Storeys	Approximate Minimum Horizontal Distance to Application Site (m)
ASR 4	Village House 5	Residential	2	306
ASR 5	Village House 3	Residential	2	300
ASR 6	Village House 6	Residential	2	335
ASR 7	Village House 7	Residential	1	346
ASR 8	Village House 4	Residential	2	165
ASR 9	Village House 8	Residential	1	488

2.5 Identification and Evaluation of Potential Air Quality Impact

Construction Phase

2.5.1 With the small scale of the proposed development, the amount of excavation material would be very limited. As mainly modification of the existing building structures and only minor excavation works will be required, the volume of construction and demolition materials to be generated will be small. As lean construction and cut-and-fill balance will be adopted, the transportation for construction mainly includes material delivery and equipment transportation. There will be modification works for three single-storey small buildings only. No frequent traffic trips will be anticipated during construction phase. With adoption of good practices, it is expected that no adverse air quality impact is anticipated during construction phase.

Operation Phase

Air Quality Impact on the Existing ASRs

2.5.2 Odour issue might arise from the proposed sewage treatment plant which will be located within a separate structure near the plant nursery to cater for the sewage generation from the Proposed Development. The design daily treatment capacity is approximately 20m³, tentatively. The proposed on-site sewage treatment plant is no different to similar existing facilities within numerous residential and other developments around unsewered parts of Hong Kong.

2.5.3 With a view to minimizing the potential odour impact arising from the proposed sewage treatment plant, the plant has been planned at a location furthest away from the ASRs as far as practical. Moreover, the following odour control measures will be considered during the detailed design stage of Proposed Development:

- Odourous facilities will be fully enclosed;
- A deodorizing system with an odour removal efficiency of at least 99.5% will be provided at exhaust vent of the proposed sewage treatment plant;
- Exhaust vent of the proposed plant will be located away from the closest ASRs;
- Screening waste will be stored in enclosed containers;
- Negative pressure will be maintained to prevent foul air from flowing out to the environment; and
- Good housekeeping will be maintained in the sewerage collection systems to prevent the development of anaerobic conditions.

-
- 2.5.4 With the aforementioned odour control measures in place, odour issue as a result of the Proposed Development is not anticipated.
- 2.5.5 As the Proposed Development will be for educational purpose and will not involve any industrial emission activities, unacceptable air quality impact on the ASRs in the vicinity of the Application Site due to operation of the Proposed Development is not anticipated.

Air Quality Impact on the Proposed Development

- 2.5.6 Site surveys were conducted in August 2021 and March 2022, no existing chimneys and other industrial emission sources were identified within 200m from the site boundary of the Application Site. Besides, no existing sewage treatment plants have been identified within 500m from the Application Site. There is only a restricted road, Tai Po Kau Forest Track – Kau Lead Section nearby the Application Site and only a small section of Tai Po Road (Tai Po Kau) located about 400m to the northeast of the Application Site. Thus, adverse air quality impact on the Proposed Development due to vehicular emission or other air polluting sources is not expected and therefore is not further assessed. As mentioned, the sewage treatment plant will be fully enclosed and provided with a deodorizing system, odour issue on the Proposed Development is also not anticipated.

3. NOISE

3.1 Introduction

3.1.1 The aim of this section is to identify potential noise impact relating to the Proposed Development within the assessment area; and, if required, to recommend likely practical pollution control and mitigation measures required with respect to the Hong Kong Planning Standards and Guidelines (HKPSG) and other relevant legislations.

3.2 Relevant Legislation, Standards and Guidelines

3.2.1 Fixed noise sources are controlled under the Noise Control Ordinance (NCO). Fixed noise impact assessment has been carried out in accordance with the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM). For the planned fixed noise sources within the Application Site, they should follow the noise criteria set out in the HKPSG.

Fixed Noise Source Impact Assessment

3.2.2 The NCO requires that fixed noise source impacts shall comply with the Acceptable Noise Levels (ANL) laid down in Table 2 of IND-TM. In adopting the appropriate ANL, reference has been made to the Area Sensitivity Rating (ASR) in Table 1 of the IND-TM (reproduced in **Table 3.1**) corresponding to the nature of the area where the noise sensitive receivers (NSRs) are situated and the presence of Influencing Factor (such as industrial area, major roads, or area within the boundary of Hong Kong International Airport).

Table 3.1 Area Sensitivity Ratings (ASRs)

Type of Area Containing NSR	Degree to which NSR is affected by Influencing Factor		
	Not Affected	Indirectly Affected	Directly Affected
(i) Rural area, including country parks or village type developments	A	B	B
(ii) Low density residential area consisting of low-rise or isolated high-rise developments	A	B	C
(iii) Urban area	B	C	C
(iv) Area other than those above	B	B	C

Source: Table 1 of Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites

3.2.3 **Table 3.2** shows the appropriate ANLs for impacts by fixed noise sources.

Table 3.2 Acceptable Noise Levels (ANLs), dB(A)

Area Sensitivity Ratings in relevant Time Periods	ASR		
	A	B	C
Day (0700 to 1900 hours)	60	65	70
Evening (1900 to 2300 hours)			
Night (2300 to 0700 hours)	50	55	60

Source: Table 2 of Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites

- 3.2.4 The HKPSG requires that the planned fixed noise sources shall comply with 5 dB(A) below the ANLs shown in **Table 3.2**, or the prevailing background noise level which will be discussed in **Section 3.3**, whichever is lower.

3.3 Description of the Environment

- 3.3.1 As shown in **Figure 1.1**, the Application Site is located at a rural area in Tai Po Kau, Tai Po. The Application Site is bounded by a restricted road, Tai Po Kau Forest Track – Kau Lead Section to the south and southeast. Tai Po Kau Special Area Tai Po Kau Management Centre is located to the northwest of the Application Site. To the immediate north of the Applicant Site, there is a stream, Tai Po Kau Stream, running downstream to Tolo Harbour. The rest of the surrounding areas are mainly hillside forest. A number of village houses are located from about 165m to 300m to the north and northeast of the Application Site. There is only a small section of Tai Po Road (Tai Po Kau) located about 400m to the northeast of the Application Site.
- 3.3.2 The Application Site is rural in nature, where the existing noise climate is quiet. Site surveys were carried out in August 2021 and March 2022, and no potential noise sources, such as vehicular roads and industrial plants, that might affect the existing noise climate were identified in the vicinity of the Application Site.
- 3.3.3 A 24-hour background noise measurement covering both daytime and night-time periods was carried out within the Application Site in April 2022. As the noise environment within the Application Site is similar to those at the village houses within the assessment area, the background noise data collected are considered representative to the noise climate of the surrounding NSRs. The background noise measurement location is shown in **Figure 3.1**. As a conservative approach, the lowest 30-minute L_{90} levels recorded during daytime and night-time periods respectively are used to represent the prevailing noise levels. The recorded lowest daytime and night-time background noise levels ($L_{90,30\text{-min}}$) in free-field are 43.1dB(A) and 45.2dB(A) respectively. A summary of the measured background noise levels with façade correction is shown in **Table 3.3**.

Table 3.3 Background Noise Measurement Results, dB(A)

Measurement Location ID	Description	Prevailing Noise Level, $L_{90,30\text{-min}}$ dB(A)	
		Day & Evening Time Period ⁽¹⁾	Night-time Period ⁽²⁾
NM1	Within the Application Site	46.1	48.2

Notes:

- (1) Background noise measurement was carried out during Day & Evening Time Period, i.e. between 0700 to 2300 hours
- (2) Background noise measurement was carried out during Night-time Period, i.e. between 2300 to 0700 hours
- (3) As free-field noise measurement was carried out, a +3 dB(A) façade correction is applied in the measurement results.

- 3.3.4 Photos of noise measurement setup are shown in **Appendix 3.1**. During the noise measurement, the sound level meter was checked using an acoustic calibrator generating a sound pressure level of 94.0 dB(A) at 1kHz immediately before and after the noise measurement. The measurement was accepted as valid only if the calibration levels before and after the noise measurements were agreed to within 1.0 dB(A). Moreover, the sound level meter and acoustic calibrator were calibrated in accredited laboratories annually to ensure reliable performance. Information of the sound level meter and calibrator used for the noise measurement, and the relevant calibration certificates are shown in **Appendix 3.2**.

Table 3.4 Noise Monitoring Equipment

Equipment	Brand & Model Number	Serial Number
Sound Level Meter	Nosonic NOR139	1392835
Acoustic Calibrator	Norsonic NOR1256	125626667

3.3.5 Given that the Application Site and its surrounding are rural in nature with no potential noise sources nearby, the measured background noise levels are representative of the prevailing noise levels at all representative NSRs.

3.4 Noise Sensitive Receivers (NSRs)

3.4.1 The assessment area for the noise impact assessment is defined as the area within 300m from the boundary of the Application Site and is shown in **Figure 3.2**. Noise sensitive receivers (NSRs) within the noise impact assessment area have been identified in accordance with the HKPSG. Existing NSRs have been identified with reference to the latest information provided on the survey maps, topographic maps, aerial photos and land status plans, and also the site survey. No planned development has been identified in the vicinity of the Application Site.

3.4.2 The first layer of existing NSRs located closest to the Application Site have been identified as the representative NSRs. Details of the representative NSRs are summarised in **Table 3.5** and indicated in **Figure 3.2**.

Table 3.5 Summary of Representation Noise Sensitive Receivers

NSR ID	Descriptions	Use	No. of Storeys	Approximate Minimum Horizontal Distance to Application Site (m)
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	Office	1	73
NSR 2	Village House 1	Residential	2	276
NSR 3	Village House 2	Residential	1	291
NSR 4	Village House 3	Residential	2	300
NSR 5	Village House 4	Residential	2	165

3.5 Identification and Evaluation of Potential Noise Impact

Noise Impact on the Existing NSRs

3.5.1 The design of the activity centre and visitor centre rely on natural ventilation and thus, no air-conditioning equipment will be provided on site. The only potential noise impact on the existing NSRs due to the Proposed Development will be the proposed **Modular Integrated Construction (MIC)** sewage treatment plant which will be located within the plant nursery. Assessment of maximum allowable sound power levels (SWLs) of the sewage treatment plant, which might affect the existing NSRs, has been carried out. The sewage treatment plant will be enclosed within the room nearby the plant nursery.

3.5.2 In view of the nature and scale of the Proposed Development, there will be only electricity meter and water meter house within the E&M Room. There will be no other mechanical plant and thus noise impact from the E&M Room is not anticipated.

3.5.3 The lawn and stage area will be used for outdoor recreational activities. Except under emergency situation, no loudspeaker system will be used for the outdoor activities. Thus, adverse noise impact from the outdoor activities is not anticipated.

3.5.4 Fixed plant noise assessment has been carried out by back-calculation of the maximum allowable SWLs of the ventilation fan/louvre of the sewage treatment plant, should they be installed, in compliance with the noise criteria for all representative existing NSRs presented in **Table 3.8** Table 3.9.

3.5.5 Indicative locations of the planned fixed noise source are shown in **Figure 3.3** and summarized in **Table 3.6**.

Table 3.6 Tentative Summary of Planned Fixed Noise Source

Noise Source ID	Description	Location of Noise Source	Quantity of Noise Source
PFS-01	Ventilation Fan / Louvre	Enclosed Sewage Treatment Plant	1

3.5.6 The maximum allowable SWL for the planned fixed noise sources is predicted based on the following procedures:

- Identify the closest representative NSRs to the planned fixed noise source;
- Determine the daytime/evening time and night-time noise criteria at the chosen NSRs;
- Use standard acoustic principle for attenuation and directivity; and
- Adopt correction of tonality, impulsiveness and intermittency as stipulated in the IND-TM. A correction for tonality of 6 dB(A) is applied in the calculation as conservation approach. Correction for impulsiveness and intermittency is not applicable as the operation of the proposed Sewage Treatment Plan would be continuous in nature.

3.5.7 With reference to the Draft Tai Po OZP No. S/TP/29, no industrial zones have been identified within 300m from the Application Site. With reference to INDM-TM, there were no industrial development, or major development, such as residential and commercial development within 500m from the Application Site. The Application Site is located in rural area no influencing factors are identified in the vicinity. Thus, an ASR of "A" has been assumed and adopted for all NSRs in determining the ANLs. A summary of the ANLs for the representative existing NSRs is presented in **Table 3.7**.

Table 3.7 Acceptable Noise Levels at the Representative NSRs

NSR ID	Description	Type of NSR	Area Sensitivity Rating ⁽¹⁾⁽³⁾	IND-TM ANL, dB(A) ⁽²⁾⁽³⁾	IND-TM ANL - 5, dB(A) ⁽²⁾
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	Office	A	60/50	55/45
NSR 2	Village House 1	Residential	A	60/50	55/45
NSR 3	Village House 2	Residential	A	60/50	55/45
NSR 4	Village House 3	Residential	A	60/50	55/45
NSR 5	Village House 4	Residential	A	60/50	55/45

Notes:

- (1) Type of area containing the NSRs is "Rural Area" with an ASR "A" as the NSRs are located in a rural area zoned as "GB" in the absence of influencing factor.
- (2) Day and evening time criteria / night-time criteria.
- (3) In any event, the ASRs and the ANLs adopted in this report are only indicative and they are used for assessment only. It should be noted that noise from fixed noise sources is controlled under section 13 of the Noise Control Ordinance. Therefore, the ASRs and ANLs determined in this report shall not prejudice the Noise Control Authority's discretion to determine noise impact

due to fixed noise sources on the basis of prevailing legislation and practices being in force, and taking account of contemporary conditions/ situations of adjoining land uses. The assessment of noise impacts due to fixed noise sources in this report shall not bind the Noise Control Authority in the context of law enforcement against any of the noise from fixed noise sources being assessed.

- 3.5.8 It should be noted that the daytime prevailing background noise levels measured on site is more than 5 dB(A) below the ANL shown in **Table 3.7**. Thus, the measured daytime background noise levels shown in **Table 3.3** have been used as the daytime noise criteria for the representative existing NSRs for estimation of maximum allowable SWL of planned fixed noise source. The adopted noise criteria for assessing the fixed plant noise impact on the existing NSRs are summarized in **Table 3.8**.

Table 3.8 Planned Fixed Noise Criteria at the Chosen Representative NSRs

NSR ID	Description	Representative Background Noise Monitoring Location	Time Period	Representative Background Noise Level, dB(A)	IND-TM ANL - 5, dB(A)	Adopted Fixed Plant Noise Criteria, dB(A)
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	NM1	Day & Evening	46.1	55	46.1
			Night	48.2	45	45
NSR 2	Village House 1	NM1	Day & Evening	46.1	55	46.1
			Night	48.2	45	45
NSR 3	Village House 2	NM1	Day & Evening	46.1	55	46.1
			Night	48.2	45	45
NSR 4	Village House 3	NM1	Day & Evening	46.1	55	46.1
			Night	48.2	45	45
NSR 5	Village House 4	NM1	Day & Evening	46.1	55	46.1
			Night	48.2	45	45

- 3.5.9 Back-calculation of maximum allowable SWLs of the planned fixed noise sources has been carried out against the noise criteria shown in **Table 3.9**. Locations of the assessment points are shown in **Figure 3.2**. The maximum allowable SWL for the planned fixed noise source assuming 24 hours continuous operation are summarized in **Table 3.9**, with the detailed calculations given in **Appendix 3.3**.

Table 3.9 Summary of Maximum Allowable SWL of the Planned Fixed Noise Source (Day and Evening Time & Night Time)

Fixed Noise Source ID	No. of Noise Source	Maximum Allowable SWL to Comply with Day Time Fixed Plant Noise Criteria, dB(A) / plant	Maximum Allowable SWL to Comply with Night Time Fixed Plant Noise Criteria, dB(A) / plant
PFS-01	1	90	90

- 3.5.10 The results of fixed plant noise assessment indicate that the SWL of ventilation fan/ louvre to be installed at the enclosed MIC sewage treatment plant should not exceed 90 dB(A) during both day-time hours and night-time hours in order to comply with the relevant noise criteria. With the adoption of maximum allowable SWLs, the respective Sound Pressure Levels (SPLs) at each of the NSRs are presented in **Table 3.10**.

Table 3.10 Summary of SPLs at the Representative NSRs (With night-time maximum allowable SWL)

NSR ID	NSR Description	SPL at NSRs, dB(A)	Night-time Noise Criterion, dB(A)
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	43	45
NSR 2	Village House 1	29	45
NSR 3	Village House 2	30	45
NSR 4	Village House 3	30	45
NSR 5	Village House 4	44	45

- 3.5.11 Noise control measures, such as silencer at the ventilation duct or acoustic louvres, should be installed to minimize the fixed noise impact where necessary.
- 3.5.12 With the adoption of maximum allowable SWL for the planned fixed noise source, as presented in **Table 3.9**, it is anticipated that the planned fixed noise sources will not cause adverse noise impact on the existing NSRs nearby. The maximum allowable SWL shall be reviewed during the detailed design of the Project should further noise screening can be provided.

Noise Impact on the Proposed Development

- 3.5.13 As mentioned, the Application Site is located in rural area and bounded by a restricted road, Tai Po Kau Forest Track – Kau Lead Section to the south and southeast, no industrial noise source nearby the Application Site was found. There is only a small section of Tai Po Road (Tai Po Kau) located about 400m to the northeast of the Application Site. Therefore, adverse noise impact on the Proposed Development during operation phase is not anticipated.

3.6 Mitigated Measures

- 3.6.1 The design of the ventilation fan/louvre of the sewage treatment plant to be provided in the Proposed Development should achieve the maximum allowable SWL as shown in **Table 3.9**. The maximum allowable SWL shall be reviewed during the detailed design of the Proposed Development should further noise screening can be provided. Provided that the ventilation fan/louvre are designed in compliance with the requirement of the IND-TM and the HKPSG, no adverse fixed noise impact is anticipated.

4. WATER QUALITY

4.1 Introduction

4.1.1 This section identifies potential water quality impact relating to the Proposed Development within the assessment area; and, if required, to recommend likely practical pollution control and mitigation measures required.

4.2 Environmental Legislation, Standards and Guideline

Water Pollution Control Ordinance (Cap. 358)

4.2.1 The Water Pollution Control Ordinance (Cap. 358), in existence since 1980, is the major legislation relating to the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZ). Corresponding statements of Water Quality Objectives (WQO) are stipulated for different water regimes (marine waters, inland waters, bathing beaches subzones, secondary contact recreation subzones and fish culture subzones) in each of the WCZ based on their beneficial uses.

4.2.2 The Application Site is located within the Tolo Harbour and Channel WCZ and the corresponding WQOs should be met.

Guidelines for the Design of Small Sewage Treatment Plants

4.2.3 These guidelines have been prepared with a view to providing Authorized Persons and designers with general advice on the design of small sewage treatment plants (STP) for private development up to 2,000 population equivalent.

Technical Memorandum on Effluent Discharge Standard (TM-DSS)

4.2.4 Besides setting the WQOs, the WPCO controls effluent discharging into the WCZs through a licensing system. The Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) issued under Section 21 of the WPCO gives guidance on the permissible effluent discharges based on the type of receiving waters (foul sewers, storm water drains, inland and coastal waters). The limits given in the TM-DSS control the physical, chemical and microbial quality of effluents. Under the TM-DSS, effluents discharged into the sewerage system and the inshore and marine waters of the WCZ are subject to standards for particular quantities of discharge. These standards are defined by the EPD and specified in licence conditions for any discharge within a WCZ. Any effluent discharge from the Project would be required to obtain discharge licence from the authority and comply with the required discharge standards and conditions stipulated in the discharge licence.

Professional Persons Environmental Consultative Committee Practice Notes 5/93 ("ProPECC PN 5/93")

4.2.5 The Practice Note for Professional Persons PN 5/93 – "Drainage Plans Subject to Comment by the EPD" provides guidelines and practices for the handling, treatment and disposal of different effluent discharges to stormwater drains and foul sewers. The design of site drainage and disposal of various site effluents generated within the new development area should base on the relevant guidelines and practices as given in the ProPECC PN 5/93.

Professional Persons Environmental Consultative Committee Practice Notes 1/94 ("ProPECC PN 1/94")

- 4.2.6 The Practice Note for Professional Persons PN 1/94 – "Construction Site Drainage" ("ProPECC PN 1/94") provides guidelines for the handling and disposal of construction discharges. This Note is generally applicable for control of site runoff and wastewater generated during the construction phase of the proposed development.

Environment, Transport and Works Bureau Technical Circular (Works) No. 5/2005 ("ETWB TCW No.5/2005")

- 4.2.7 The Environment, Transport and Works Bureau Technical Circular (Works) No. 5/2005 "Protection of natural streams/ rivers from adverse impacts arising from construction works" ("ETWB TCW No. 5/2005") provides an administrative framework to better protect all natural streams/ rivers from the impacts of construction works. It aims to clarify and strengthen existing measures for protection of natural streams/ rivers from the impacts of construction works.

4.3 Baseline Water Quality Conditions

Description of the Environment

- 4.3.1 As shown in **Figure 1.1**, the Application Site is located in rural area at Tai Po Kau, Tai Po. The Application Site is rural in nature, which is bounded by a restricted road, Tai Po Kau Forest Track – Kau Lead Section to the south and southeast. Tai Po Kau Special Area Tai Po Kau Management Centre is located to the northwest of the Application Site. To the immediate north of the Applicant Site, there is a stream, Tai Po Kau Stream, running downstream to Tolo Harbour. The rest of the surrounding areas are mainly hillside forest. There are currently no public drainage and sewerage systems serving the Application Site. Runoff generated by the surrounding is discharged to the existing Tai Po Kau Stream running downstream to Tolo Harbour which is within the Tolo Harbour and Channel WCZ.

River Water Quality

- 4.3.2 With reference to the River Water Quality in Hong Kong in 2020 issued by EPD, Tai Po Kau Stream fully achieved the WQOs in 2020. **Table 4.1** shows a summary of EPD's water quality statistics of the river water quality monitoring station (TR14) which are closest to the Application Site. Location of the river water quality monitoring station is indicated in **Figure 4.1**.

Table 4.1 Summary of EPD River Quality Data of Tai Po Kau Stream (TR14) at Selected Station in 2020

Parameters	Tai Po Kau Stream
	TR14
Dissolved Oxygen (mg/L)	7.9 (5.2 – 9.2)
pH	7.2 (6.9 – 7.8)
Suspended Solids (SS) (mg/L)	2.4 (<0.5 – 19.0)
5-day Biochemical Oxygen Demand (BOD ₅) (mg/L)	0.5 (0.3 – 4.1)
Chemical Oxygen Demand (mg/L)	4 (3 – 9)
Oil & Grease (mg/L)	<0.5 (<0.5 - <0.5)
<i>E. coli</i> (count/100 mL)	1,100 (180 – 6,500)

Parameters	Tai Po Kau Stream
	TR14
Faecal Coliforms (count/100 mL)	3,400 (510 – 27,000)
Ammonia-Nitrogen (mg/L)	0.07 (0.042 – 0.27)
Nitrate-Nitrogen (mg/L)	0.19 (0.13 – 0.52)
Total Kjeldahl Nitrogen (mg/L)	0.24 (0.12 – 0.34)
Orthophosphate Phosphorus (mg/L)	0.017 (<0.002 – 0.022)
Total Phosphorus (mg/L)	0.05 (<0.02 – 0.09)
Sulphide (mg/L)	<0.02 (<0.02 – <0.02)
Aluminium (µg/L)	<50 (<50 – 141)
Cadmium (µg/L)	<0.1 (<0.1 – 0.2)
Chromium (µg/L)	<1 (<1 – 1)
Copper (µg/L)	1 (<1 – 3)
Lead (µg/L)	<1 (<1 – <1)
Zinc (µg/L)	<10 (<10 – 25)
Flow (m ³ /s)	0.124 (0.043 – 0.514)

Source: Adopted from EPD River Water Quality in Hong Kong in 2020

Notes:

- (1) Data presented are in annual medians of monthly samples; except those for faecal coliforms and E. coli which are in annual geometric means.
- (2) Figures in brackets are annual ranges.
- (3) NM indicates no measurement taken.
- (4) Values at or below laboratory reporting limits are presented as laboratory reporting limits (see Appendix B).
- (5) Equal values for annual medians (or geometric means) and ranges indicate that all data are the same as or below laboratory reporting limits.

Assessment Area and Water Sensitive Receivers

- 4.3.3 The assessment area is defined as all areas within 500 m from the boundary of the Application Site.
- 4.3.4 Water sensitive receivers (WSRs) are defined as those users/occupants of the aquatic/marine environment whose use of the environment could be impaired as a result of the Project. The identified WSRs within the 500m assessment area include Tai Po Kau Stream and branches of natural streams flowing toward Tai Po Kau Stream. The locations of the identified WSRs are shown in **Figure 4.2**. No works are proposed at the identified WSRs, and thus these WSRs will not be directly affected by the Proposed Development.

4.4 Potential Water Quality Impacts

Construction Phase

- 4.4.1 Sediment laden runoff from the site would be the main source of water quality impacts during the construction phase. Activities that are likely to cause water pollution include:
- General construction activities;
 - Construction site runoff;

- Demolition works;
- Sewage effluent from the workforce; and
- Accidental spillage of chemicals.

4.4.2 The scale of the proposed development is small and only single-storey buildings are proposed. Hence, the potential impact on water quality from the construction works would not be significant. Nonetheless, mitigation measures shall be implemented as control the potential impacts to the minimal.

Operation Phase

Sewage Discharge

4.4.3 There is currently no public sewerage network serving the Application Site. A Modular Integrated Construction (MIC) sewage treatment plant located within the plant nursery facility is therefore proposed to cater the sewage generation from the Proposed Development. During operation phase of the Proposed Development, sewage generated from the Proposed Development and visitors will be properly collected and then will be treated in the proposed sewage treatment plant before being discharged to the stream leading to the Tolo Harbour and Channel WCZ.

4.4.4 The proposed sewage treatment plant should be designed generally in accordance with EPD's "Guidelines for the Design of Small Sewage Treatment Plants" to avoid pollution as far as practicable. Design specifications and detailed maintenance programmes etc. should be prepared during detailed design stage of the Project. The type of the proposed sewage treatment plant (Membrane Bio-Reactor, MBR) is fairly commonly used around Hong Kong, including Government facilities and the general principles of design, operation and maintenance would be broadly similar to those already operating in Hong Kong. To add, similar on-site treatment facilities have been provided for the Lady MacLehose Holiday Village, which is located within the Sai Kung Country Park.

4.4.5 A holding tank will be installed at the inlet to the sewage treatment plant, as well as an emergency (back-up) power supply. Furthermore, the type of package sewage treatment plant proposed for this project can be provided as parallel treatment streams, enabling one stream to continue sewage treatment if other treatment stream is not properly functioned. In the very unlikely event of total failure of the sewage treatment plant, the toilet facilities at the Site would simply be temporarily closed, with any untreated sewage removed by tanker. As such, there would be no emergency discharge from the sewage treatment plant.

4.4.6 The plant will be designed with the quality of the treated effluent comply with the standards stipulated in the discharge license issued under the Water Pollution Control Ordinance. And maintained by a specialist contractor with remote monitoring and alarm system as well as emergency maintenance teams. As such, no adverse water quality impact on the nearby WSRs is anticipated.

Fertilizer & Pesticides

4.4.7 The Proposed Development emphasize on the interactions with the surrounding rural context and minimize the disruption to the nature. Sustainable design concept including "Zero Carbon" and "Zero Waste Water" will be adopted. The use of fertilizer and pesticides will be very limited and only applied on as needed basis. Only environmental friendly fertilizer (e.g., organic compost) and pesticide (e.g., biokill) will be used. Preliminary, the estimated amount of fertilizer and pesticide required will be 18 grams / month and 0.5L/ month respectively. As the estimated monthly usage of fertilizers and pesticides are very small and limited, and would be applied by professionals who would not be utilized if rainfall and runoff are likely to occur. The

water impact due to surface runoff is insignificant and does not pose a significant threat to the nearby watercourses

4.5 Mitigation Measures

Construction Phase

4.5.1 The good practices given in the Professional Persons Environmental Consultative Committee Practice Note on "Construction Site Drainage" (ProPECC PN 1/94) in controlling water pollution at construction site shall be implemented during the construction phase of the Project. Surface runoff from the sites can be minimized through good on-site management practices by implementing viable erosion control measures which should be incorporated in contract clauses. The main practices provided in the aforementioned document (i.e. ProPECC PN 1/94) also summarized in the following paragraphs, which should be enforced to prevent unacceptable construction stage impacts and for compliance with the statutory criteria.

General Construction Activities and Site Runoff

- Exposed soil surfaces should be protected from rainfall through, for example, by covering temporarily exposed slope surfaces with impervious tarpaulin and protect temporary access roads by crushed stone or gravel;
- Open stockpiles of construction materials (e.g. aggregates, sand and fill material) on site should be covered with tarpaulin or similar fabric during rainstorms so as to prevent the washing away of construction materials, soil, silt or debris into any drainage system.
- Exposed soil areas should be minimized to reduce the potential for increased siltation and contamination of runoff;
- Minimise the time that soil surfaces are exposed;
- Slow down water run-off flowing across exposed soil surfaces;
- Channels, earth bunds or sand bag barriers should be provided on-site to properly direct surface runoff through drainage systems via adequately designed sand/silt removal facilities such as sand traps, silt traps and sediment basins. The construction runoff will be controlled in such a way that there will be no spillage of site runoff into adjacent areas or into the nearby bay;
- Oil interceptors are also recommended to be provided for stormwater drains near plant maintenance/repair areas, where necessary;
- Manholes (including newly constructed ones) should be adequately covered or temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system;
- Construction works should be programmed to minimise soil excavation works where practical during rainy conditions;
- Drainage facilities must be adequate for the controlled release of storm flows;

- Earthworks final surfaces should be well compacted, and the subsequent permanent work or surface protection should be carried out immediately after the final surfaces are formed to prevent erosion caused by rainstorms;
- Excavation of trenches in wet seasons should be dug and backfilled in short section and to minimize the ingress of rainwater into trenches; and
- Rainwater pumped out from trenches and foundation excavations should be discharged into storm drains via silt removal facilities.

Construction work at and near waterbodies

- 4.5.2 To minimise the potential water quality impacts from construction works located near any waterbodies, the practices outlined in the ETWB TC (Works) No. 5/2005 "Protection of natural streams/rivers from adverse impacts arising from construction works" should be adopted as applicable.

Operation Phase

- 4.5.3 The Water Pollution Control Ordinance controls the discharge of wastewater, including treated effluent into waters within areas designated as Water Control Zones. All sewage generated as a result of the Proposed Development will be properly collected and treated on-site before discharges. A discharge license issued by EPD shall be obtained for discharging effluent from the Application Site. The effluent quality shall be in accordance with the discharge licence imposed by the Authority. No adverse water quality impact on the nearby WSRs is anticipated.
- 4.5.4 If rainwater retention and harvesting is proposed, the Water Quality Standards for Rainwater Effluent Reuse as stated in the WSD's Technical Specifications on Grey Water Reuse and Rainwater Harvesting shall be observed. .

5. Waste Management

5.1 Introduction

- 5.1.1 This section reviews the waste management implications that will arise during construction and operation of the Proposed Development; and, if required, to recommend likely practical pollution control and mitigation measures required.

5.2 Environmental Legislation, Policies, Standards and Criteria and other Relevant Guidelines

- 5.2.1 The various types of waste may require a different approach for management according to their specific characteristics. The regulations and requirements regarding waste management (collection, storage, transfer and disposal) of the various waste streams are summarised below.

Waste Disposal Ordinance (Cap. 354)

- 5.2.2 The principal legislation regulating waste is the Waste Disposal Ordinance (WDO). The WDO prohibits the unauthorised disposal of wastes, and waste should be disposed of at locations licensed by EPD.

Waste Disposal (Chemical Waste) (General) Regulation

- 5.2.3 Chemical waste producers must register with EPD and either treat chemical waste produced through the use of an on-site plant licensed by EPD, or via a licensed contractor to collect and transfer the waste to a licensed facility. The Regulation also prescribes necessary storage facilities to be provided on site, and all requirements for waste labelling and the posting of warning signs.

Construction and Demolition (C&D) Materials

- 5.2.4 The current policy related to the dumping of C&D material is documented in the Works Branch Technical Circular No. 2/93, 'Public Dumps'. C&D materials that are wholly inert, namely public fill, should not be disposed of to landfill, but taken to public filling areas, which usually form part of reclamation schemes. The Land (Miscellaneous Provisions) Ordinance requires that dumping licences be obtained by 'individuals or companies who deliver public fill to public filling areas. The Civil Engineering & Development Department (CEDD) issues the licences under delegated powers from the Director of Lands.
- 5.2.5 Under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation, enacted in January 2006, construction waste delivered to a landfill for disposal must not contain more than 50% by weight of inert material. Construction waste delivered to a sorting facility for disposal must contain more than 50% by weight of inert material, and construction waste delivered to a public fill reception facility for disposal must consist entirely of inert material.
- 5.2.6 Measures have been introduced in the ETWB TCW No. 19/2005 Environmental Management on Construction Sites to enhance the management of C&D materials and to minimise its generation at source. The enhancement measures include the identification of opportunities to prevent waste during both the project planning and design stage as well as construction stage, and preparation of a Waste Management Plan (WMP) to ensure that measures are implemented during the construction stage for reduction of C&D materials.

Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes

- 5.2.7 The purpose of this Code is to provide guidance for complying with the requirements of the Waste Disposal (Chemical Waste)(General) Regulation on the packaging, labelling and storage of chemical waste.

5.3 Identification and Evaluation of Potential Impacts

Construction Phase

- 5.3.1 The construction activities to be carried out for the Proposed Development would generate construction and demolition (C&D) materials, general refuse and chemical waste.
- 5.3.2 Based on the current preliminary design, only two vacant small single storey building structures will be demolished. An activity centre, a visitor centre and a plant nursery will be constructed by modifying the existing vacant building structures on site. Most of the existing walls of the existing building structures will be retained.
- 5.3.3 On-site sorting of C&D materials and wastes will be carried out. Construction of gabion walls for retaining soil, forming access path and landscaping will be proposed to make use of construction debris salvaged from demolition. Cut-and-fill balance will be adopted for construction of foundation and landscaping works. Hence, the anticipated C&D materials and wastes will be minimal, except for yard waste due to site clearance. All recyclable materials, including metals, paper / cardboard packing, plastics (i.e. plastic sheets / foam from packaging materials), etc. will be collected by registered collectors for recycling.
- 5.3.4 All inert C&D materials generated awaiting for sub-sequent on-site re-use or export to disposal facilities, will need to be carefully stockpiled to avoid dust impact and other nuisances. Approximately 414 m³ inert C&D materials to be delivered to public filling reception facilities shall be materials consisting of soil, concrete, etc. And approximately 495 m³ Non-inert C&D wastes would be disposed of at designated landfills after sorting out recyclable materials. The Contractor should separate non-inert C&D wastes from inert C&D materials on-site. All segregated recyclable wastes (e.g. metal) should be collected regularly by recycling companies. Only the remaining non-inert C&D waste should be disposed of at designated landfill. The estimated quantity of C&D materials generated from the construction of the Project is presented in Table 5.1.

Table 5.1 Estimated Quantity of C&D Materials

Material	Estimated Quantity (m ³)		
	Total	Reuse on site	Deliver off-site
Inert C&D materials	414	0	414
Non-inert C&D wastes	579	84	495
Total Volume	993	84	909

- 5.3.5 Throughout the construction stage, the workforce would generate general refuse comprising food scraps, waste paper, empty containers, etc. There would be a maximum of 30 workers working on-site. Based on the generation rate of 0.65 kg per worker per day, the estimated amount of general refuse to be produced during the construction phase is 19.5 kg/day. Release of general refuse into the nearby watercourse should be prohibited as introduction of these wastes is likely to have detrimental effects on water quality in the area. Effective collection of site wastes would be required to prevent waste materials being blown around by wind, flushed or leached into the surrounding environment, and odour nuisance. Recyclable materials (i.e. paper, plastic bottles and aluminium cans) will be separated for recycling. The

non-recyclable refuse will be placed in bags and stored in enclosed containers, and disposed of on a daily basis to designated landfill.

- 5.3.6 The maintenance and servicing of construction plant and equipment may generate chemical wastes such as cleaning fluids, solvents, lubrication oil and fuel. Given the small number of plant and equipment, the amount of chemical waste generated will be small, in the order of a few cubic litre per month. For the disposal of chemical wastes, the Contractor would be required to register with EPD as a Chemical Waste Producer and to follow the requirements stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.

Operation Phase

- 5.3.7 It is anticipated that general refuse, such as food waste, packaging materials, etc., will be generated by visitors and staff during the operation of the Proposed Development.
- 5.3.8 Based on the current design scheme, the site will cater for a maximum of 400 visitors with about 10 site staff each day (in various sessions). With reference to the latest data from "Monitoring of Solid Waste in Hong Kong 2020" by EPD, the domestic waste disposal rate was 0.91 kg/person/day in Year 2020. Applying the same per capita disposal rate, the estimated maximum quantity of general refuse is about 373 kg/day. General refuse will be properly stored in the refuse collection point and will be collected on a daily basis. The general refuse will be managed by suitable waste collectors so that intentional or accidental release of wastes to the surrounding environment will not occur. Storage of general refuse would generate odour nuisance and visual impact if they are not managed in a proper manner. Vermin and pests may also be attracted if the waste containers are not cleaned or maintained properly and frequently. Therefore, general refuse should be temporarily stored in proper containers with covers to avoid adverse impact on the surroundings. To reduce waste generation and enhance waste recycling, sufficient properly labelled recycling bins for paper, plastic and aluminium should be provided at appropriate locations of the site for collection of recyclables for off-site recycling. Regular waste removal and collection of recyclables should be arranged to avoid odour nuisance or pest/vermin problem.
- 5.3.9 Chemical wastes such as lubricants might be generated from plant maintenance during the operation of the Proposed Development. The exact amounts of chemical wastes to be generated during operational phase will be subject to future operation practices. Given the nature of the Proposed Development, the quantity of chemical wastes to be generated during the operational phase is expected to be insignificant, in the order of a few litres per month. Thus, the associated environmental impact is expected to be minimal. Should any chemical waste be generated during the operation of the Proposed Development, the waste producers shall register with EPD and ensure proper packaging, labelling and storage of the chemical waste in accordance with Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes before disposal. The waste producers will either treat chemical waste produced through the use of an on-site plant licensed by EPD, or via waste collectors licensed by EPD for the collection of chemical waste.
- 5.3.10 A **Modular Integrated Construction (MIC)** sewage treatment plant will be provided on-site to cater for the sewage generation from the Proposed Development. The major solid waste types produced from the sewage treatment plant would be grit and screenings and the sludge associated with the sewage treatment process. As the scale of the proposed sewage treatment plant is small, the amount of grit and screenings and sewage sludge to be generated will be limited. Sewage sludge generated from the plant is suggested to be delivered to appropriate sludge treatment facilities for treatment or to existing landfills for disposal subject to detail design. The sewage

sludge should be contained in watertight containers or skips to avoid odour emission during transportation to sludge treatment facilities or landfill.

5.4 Mitigation Measures

Construction Phase

- 5.4.1 Good management and control can prevent the generation of excessive amounts of waste. Waste reduction is best achieved at the planning and design stage, as well as by ensuring the implementation of good site practices. Appropriate waste handling, transportation and disposal methods for all waste arising generated during the construction works should be implemented to ensure that construction wastes do not enter the nearby water bodies.
- 5.4.2 It is expected that adverse impacts from waste management would not arise, provided that good site practices are strictly followed. In order to monitor the disposal of C&D material at landfills and public fill reception facilities³ and landfills respectively, as appropriate, and to control fly tipping, Waste Management Plan (WMP) becomes part of Environmental Management Plan (EMP) to be submitted to Architect/ Engineer for approval before construction. A recording system for the amount of wastes generated, recycled and disposed of (including the disposal sites) should be updated on monthly basis and submitted to the Engineer for approval and record. and landfills respectively, through a trip-ticket system. It will require the Contractor(s) to separate public fill from C&D materials for disposal at appropriate facilities. One may follow the requirements stipulated in the Practice Note for Authorized Persons and Registered Structural Engineers ADV-19, and also make reference to ETWB TCW No. 19/2005 and DEVB TCW No. 6/2010.
- 5.4.3 General refuse should be stored in enclosed bins or compaction units separated from C&D material. A reputable waste collector should be employed by the contractor to remove general refuse from the site, separately from C&D material. An enclosed and covered area is preferred to reduce the occurrence of windblown light material.
- 5.4.4 The C&D material generated from the construction activities should be sorted on-site into inert C&D material (that is, public fill) and C&D waste. A suitable area should be designated within the site for temporary stockpiling of C&D material and to facilitate the sorting process.
- 5.4.5 All waste or materials stockpiled on site or during transportation shall be covered with impermeable sheet, especially during inclement weather, to minimise waste or material being washed away and entered into the nearby water course, Tai Po Kau Stream.
- 5.4.6 For chemical wastes produced at the construction site, the Contractor would be required to register with the EPD as a Chemical Waste Producer and to follow the guidelines stated in the Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes. Good quality containers compatible with the chemical wastes should be used. Appropriate labels should be securely attached on each chemical waste container indicating the corresponding chemical characteristics of the chemical waste, such as explosives, flammable, oxidizing, irritant, toxic, harmful, corrosive, etc. The Contractor shall use a licensed collector to transport and dispose of the chemical wastes generated at the Chemical Waste Treatment Centre at Tsing Yi, or other licenced facility, in accordance with the Waste Disposal (Chemical Waste) (General) Regulation.

³ Sorting facilities and public fill reception facilities are specified in Schedule 3 and Schedule 4 respectively of the Waste Disposal (Charges for Disposal of Construction Waste) Regulation. Disposal of public fill in public fill reception facilities requires a licence issued by the Director of Civil Engineering and Development.

-
- 5.4.7 With the implementation of good site practices, the environmental impact associated with waste handling and disposal should be surmountable.

Operation Phase

- 5.4.8 General refuse generated from the Proposed Development should be collected on a regular basis and delivered to the refuse collection point accordingly. A reputable waste collector should be employed to remove general refuse on a regular basis to avoid odour nuisance or pest/vermin problem. Provision of adequate recycling containers at suitable locations of the Proposed Development is recommended with a view to facilitating recycling of wastes such as aluminium cans, plastics and wastepaper.
- 5.4.9 The handling, storage, transportation and disposal of chemical wastes shall be conducted in accordance with the Code of Practice on the Packaging, Labelling and Storage of Chemical Waste and A Guide to the Chemical Waste Control Scheme both published by the EPD.
- 5.4.10 With proper implementation of waste management practices, adverse environmental impacts from handling and disposal of general refuse and chemical waste are not anticipated.

6. CONCLUSION

- 6.1.1 The potential environmental impacts arisen from the Project have been assessed in this PER report. Practical pollution control measures and mitigation measures have been recommended to alleviate the potential impacts.
- 6.1.2 Environmental sensitive uses and sources of environmental impacts have been identified. Potential environmental impacts on the sensitive uses have been assessed with mitigation measures proposed as appropriate to minimize the respective environmental impacts.
- 6.1.3 As the Application Site is located at rural area with no vehicular or industrial emissions and noise sources nearby, it is considered that the Proposed Development would not be subject to unacceptable air quality and noise impact.
- 6.1.4 With the implementation of the recommended maximum allowable sound power level for potential ventilation fan/louvre of the proposed **Modular Integrated Construction (MIC)** sewage treatment plant, adverse noise impact on the NSRs in the vicinity is not anticipated. Sewage generated will be properly treated with the proposed MIC sewage treatment plant to the standard imposed by the authority, adverse water quality impacts as a result of the Proposed Development is not anticipated. Proper odour control measures for the MIC sewage treatment plant will be designed and implemented to ensure no adverse odour impact would be imposed.
- 6.1.5 With the recommended control and mitigation measures in place, no adverse environmental impacts are anticipated from the construction and operation of the Proposed Development.

Figures

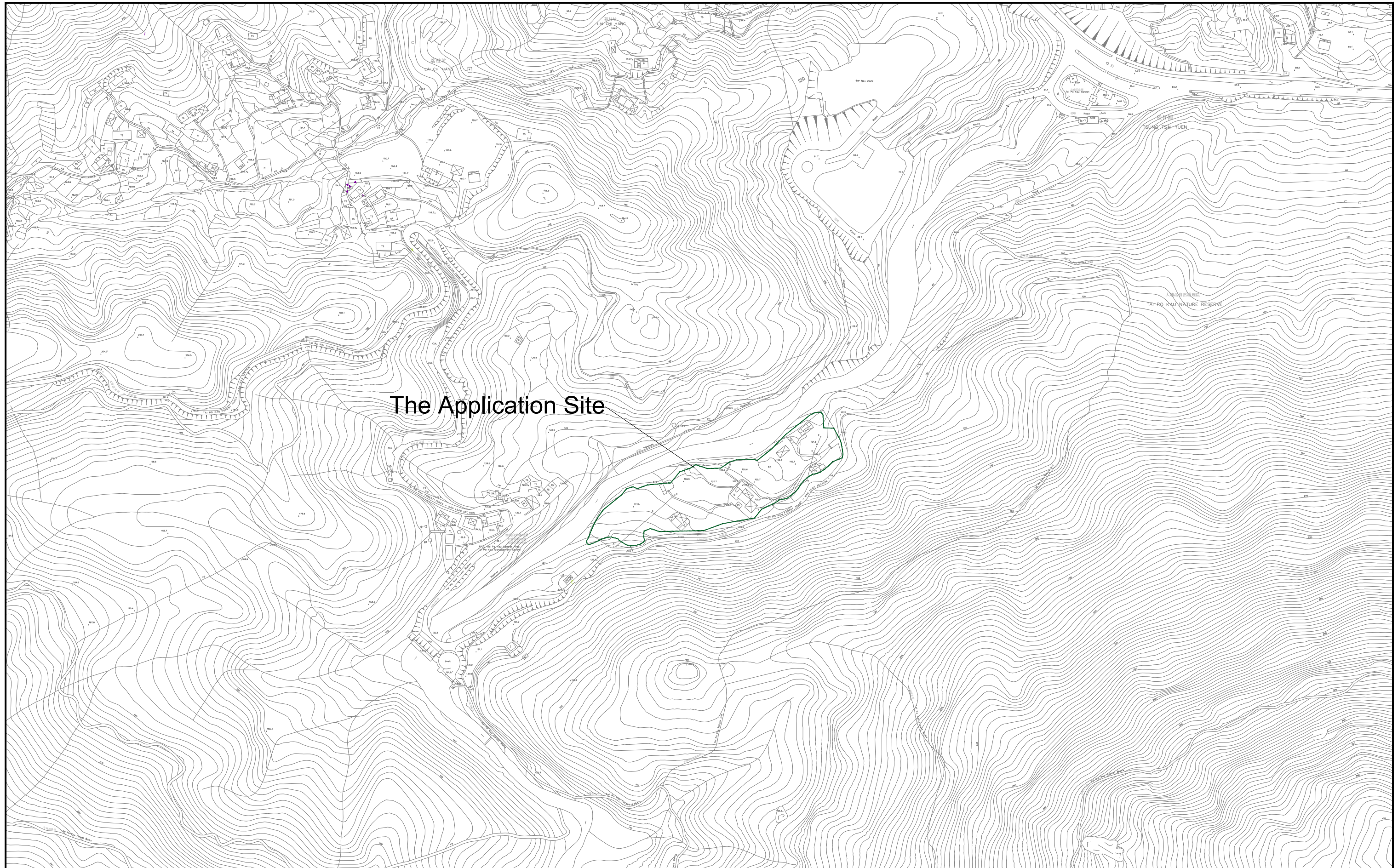


Figure: 1.1
Title: Location of the Application Site and Its Environ

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy



Drawn by: JC
 Checked by: YH
 Rev.: 2.0
 Date: Oct 2022

Legend

- Proposed Boundary
- Modular Integrated Construction (MIC) Sewage Treatment Plant

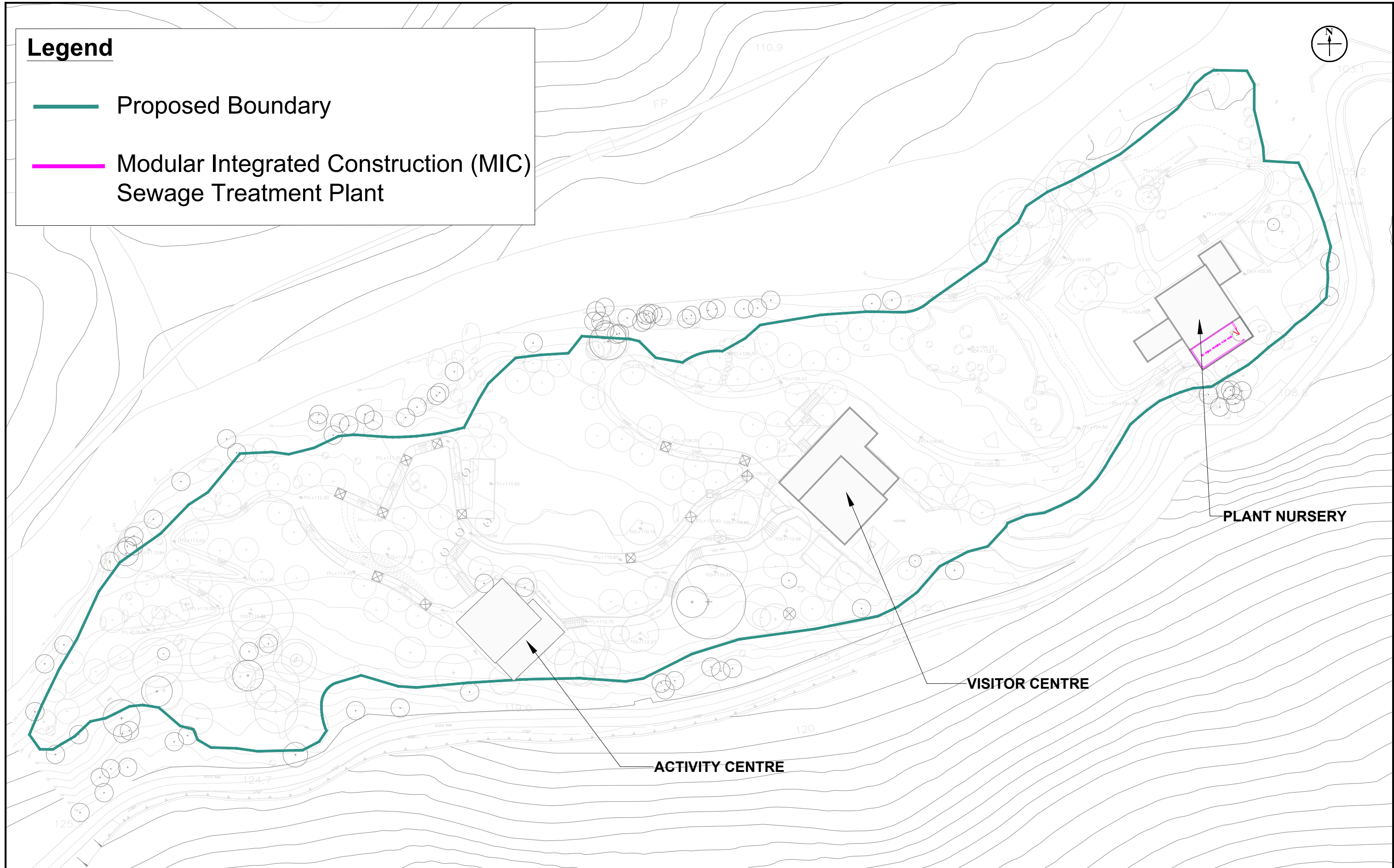


Figure: 1.2

Title: Tentative Site Layout Plan

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy

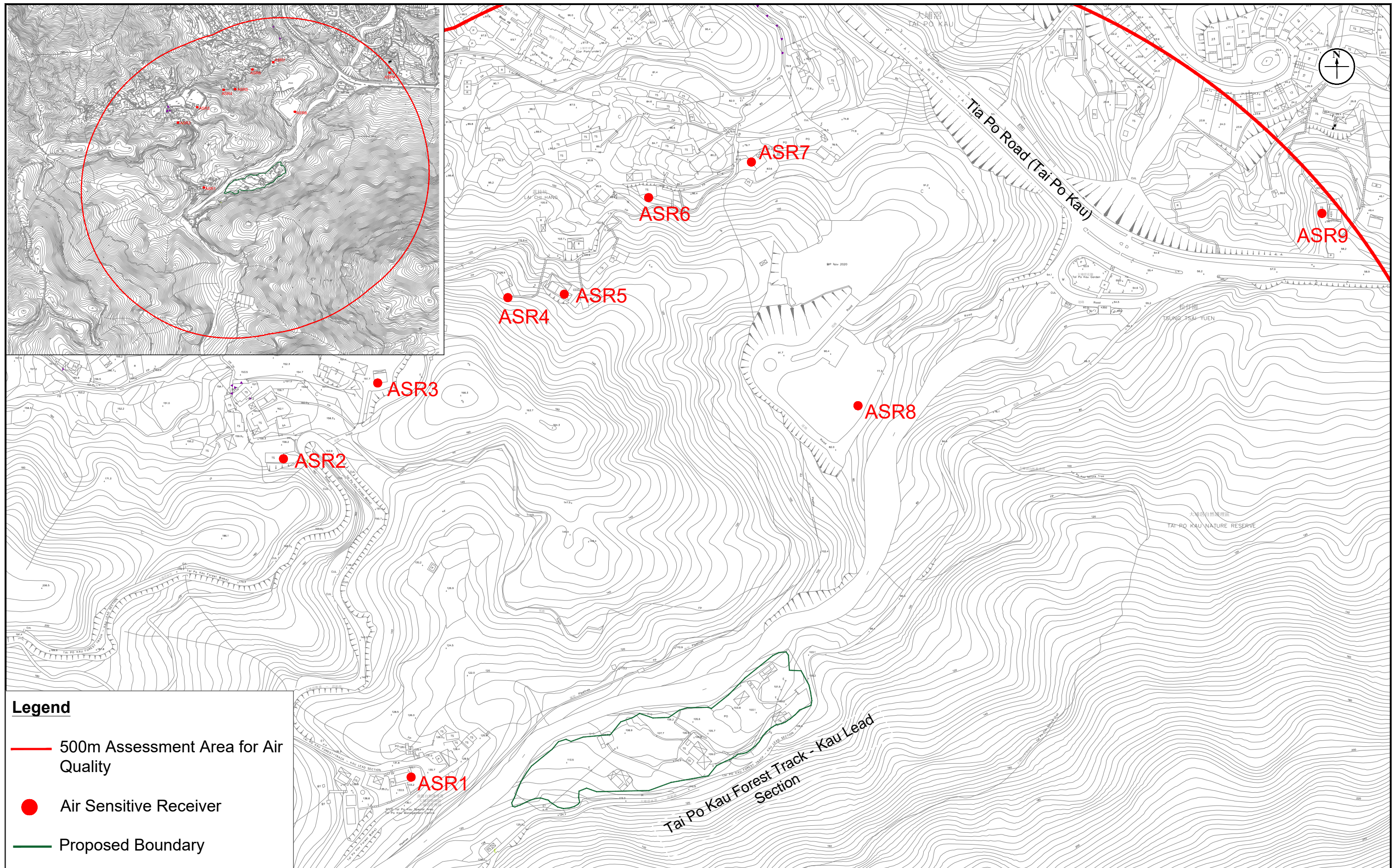


Drawn by: JC

Checked by: YH

Rev.: 2.0

Date: Oct 2022



Legend

- 500m Assessment Area for Air Quality
- Air Sensitive Receiver
- Proposed Boundary

Figure: 2.1

Title: Locations of Representative Air Sensitive Receivers

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy

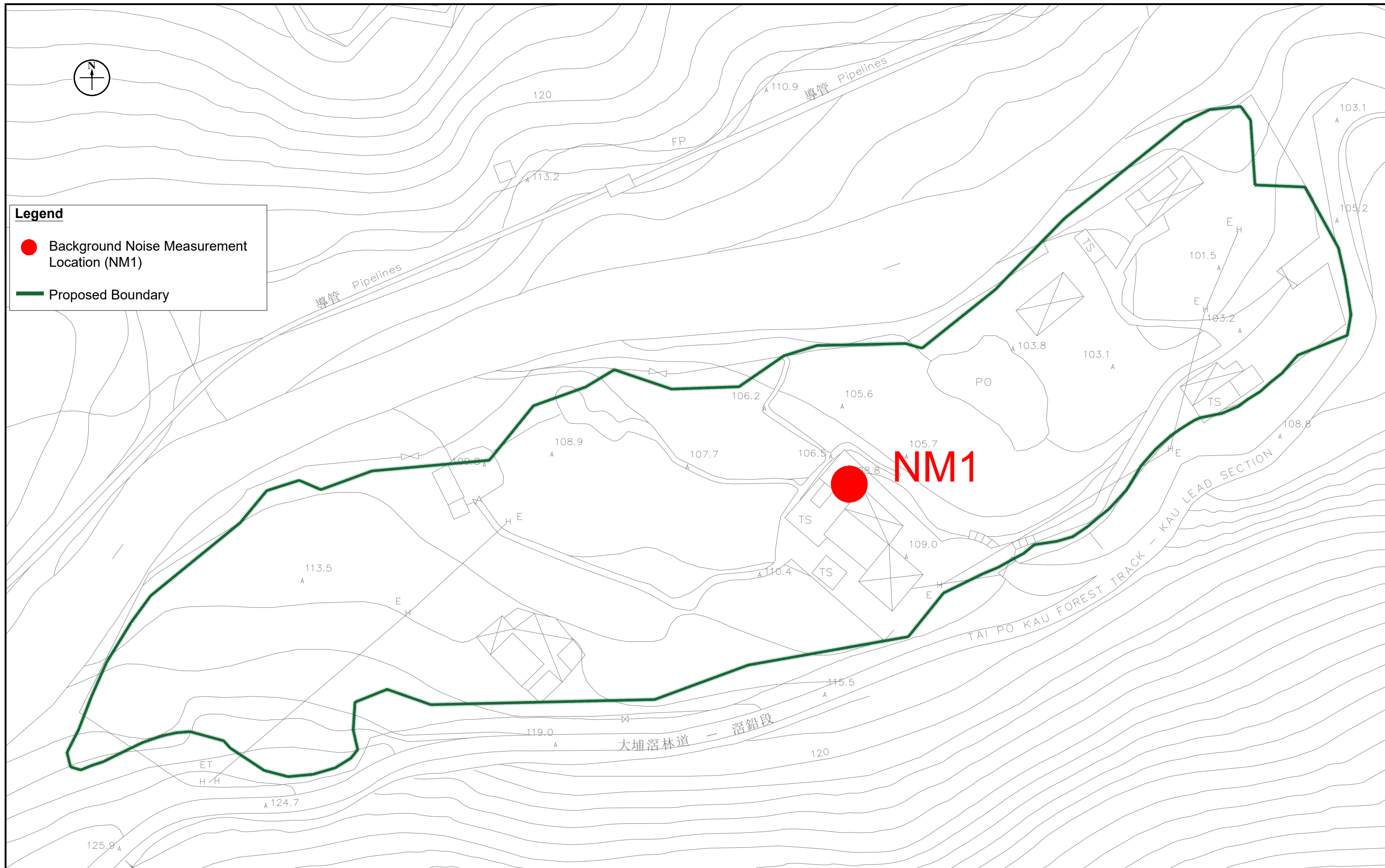
RAMBOLL

Drawn by: JC

Checked by: YH

Rev.: 2.0

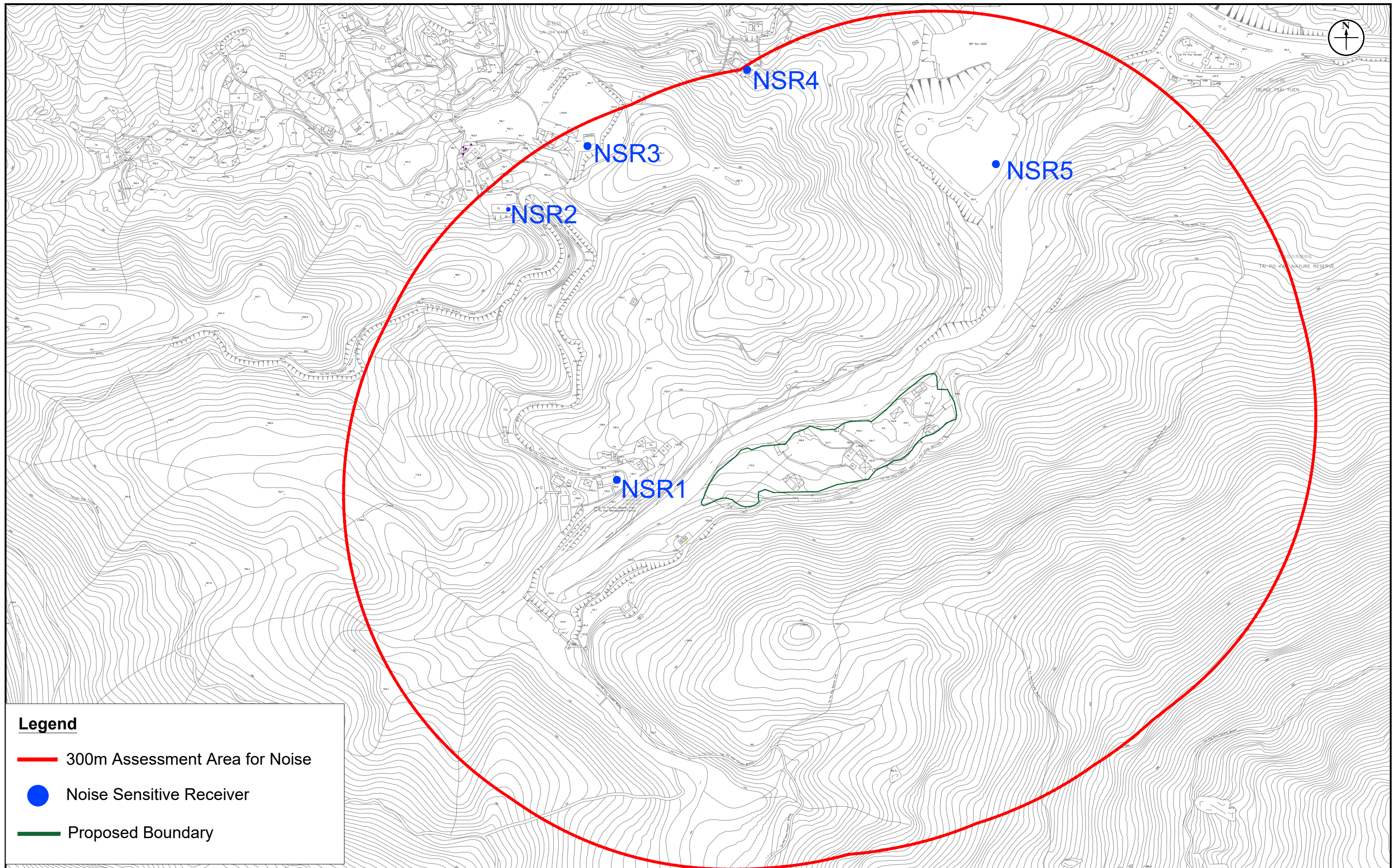
Date: Oct 2022



Legend

- Background Noise Measurement Location (NM1)
- Proposed Boundary

Figure: 3.1 Title: Background Noise Measurement Location Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy	RAMBOLL
	Drawn by: JC
	Checked by: YH
	Date: Oct 2022



Legend

- 300m Assessment Area for Noise
- Noise Sensitive Receiver
- Proposed Boundary

Figure: 3.2 Title: Locations of Representative Noise Sensitive Receivers Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy	RAMBOLL
	Drawn by: JC
	Checked by: YH
	Rev.: 2.0
	Date: Oct 2022

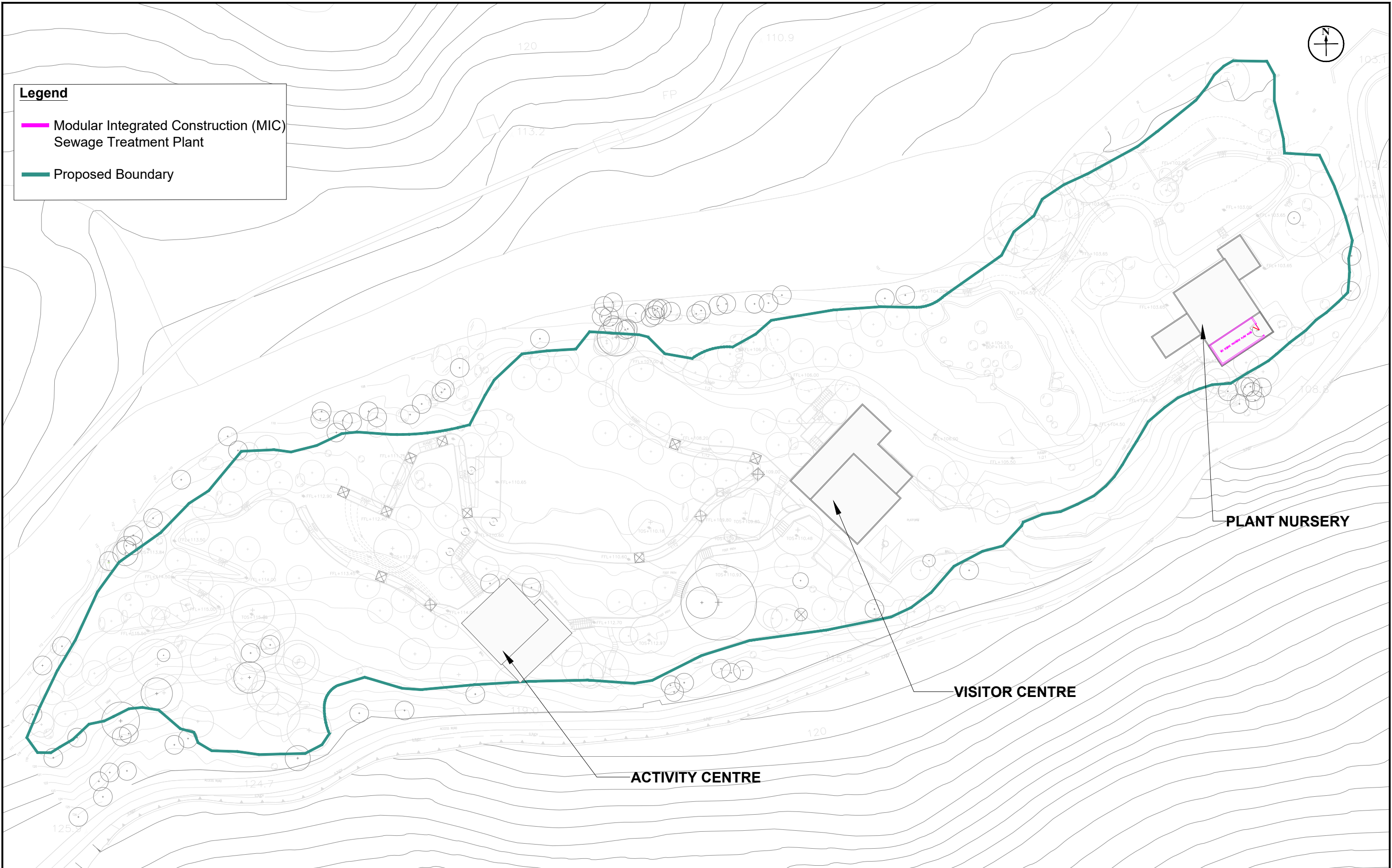


Figure: 3.3

Title: Locations of Planned Fixed Noise Sources

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy

RAMBOLL

Drawn by: JC

Checked by: YH

Rev.: 2.0

Date: Oct 2022

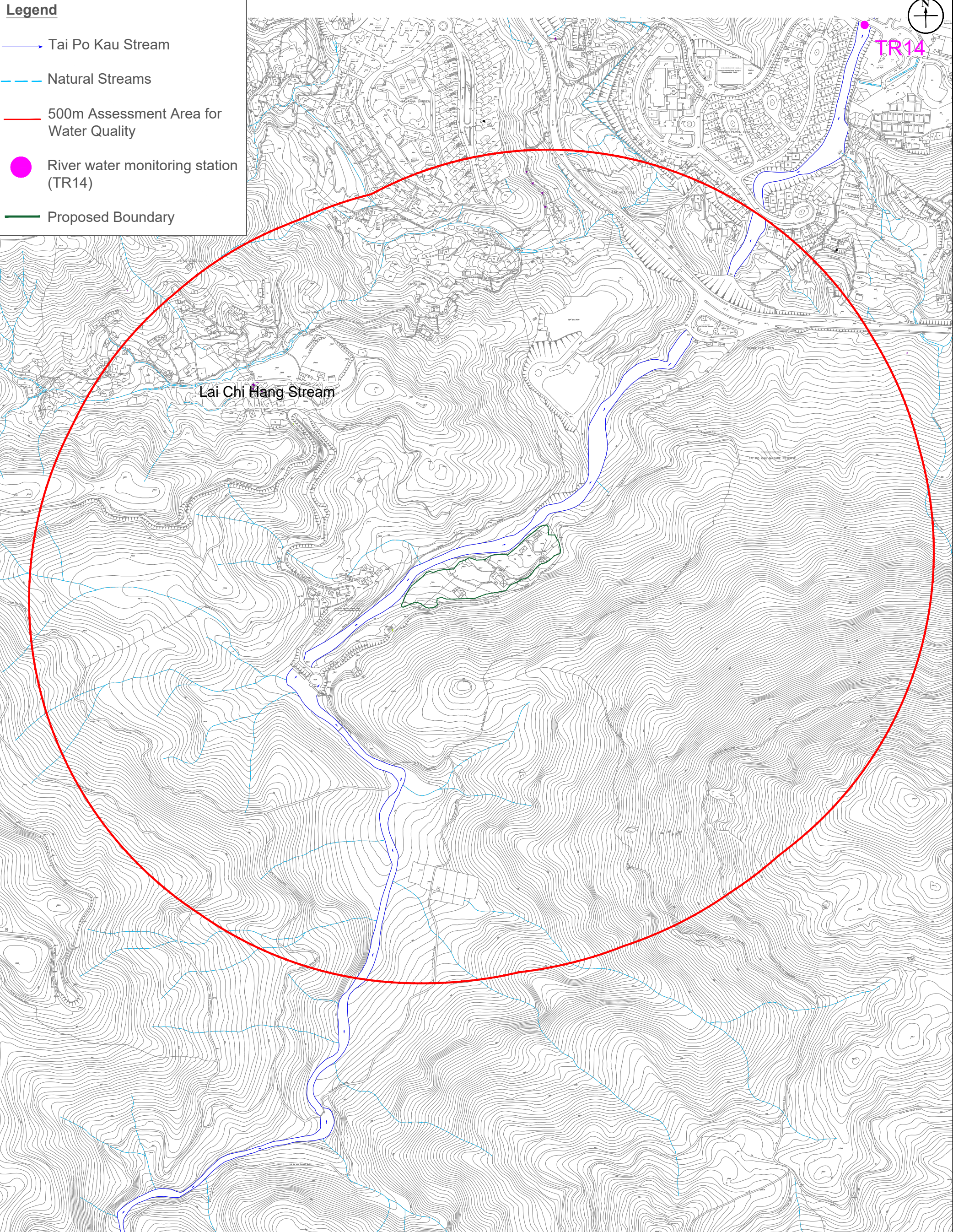


Figure: 4.1

Title: Locations of EPD's River Water Quality Monitoring Station (TR14)

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy



Drawn by: JC

Checked by: YH

Rev.: 2.0

Date: Oct 2022

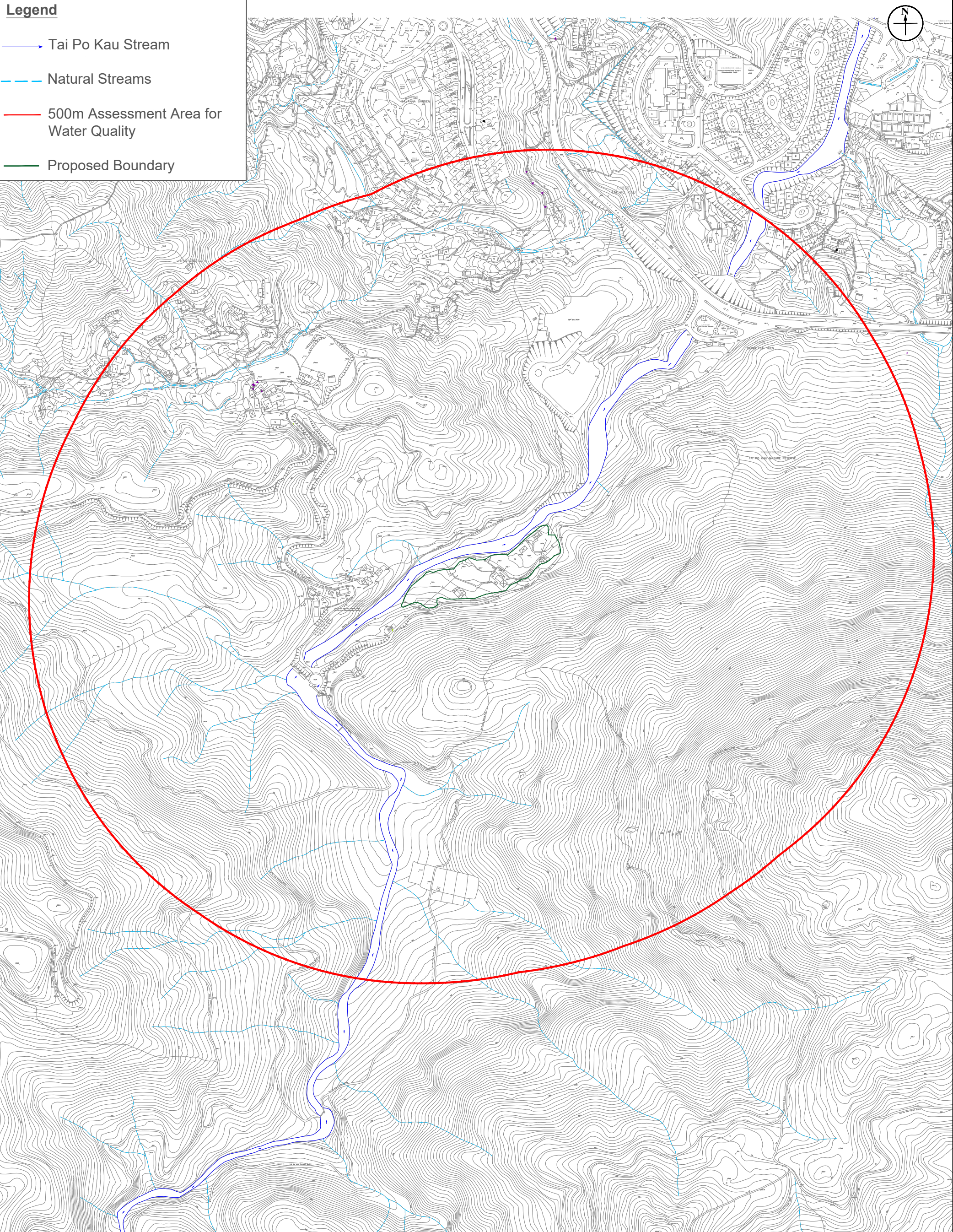


Figure: 4.2

Title: Locations of Water Sensitive Receivers

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy



Drawn by: JC

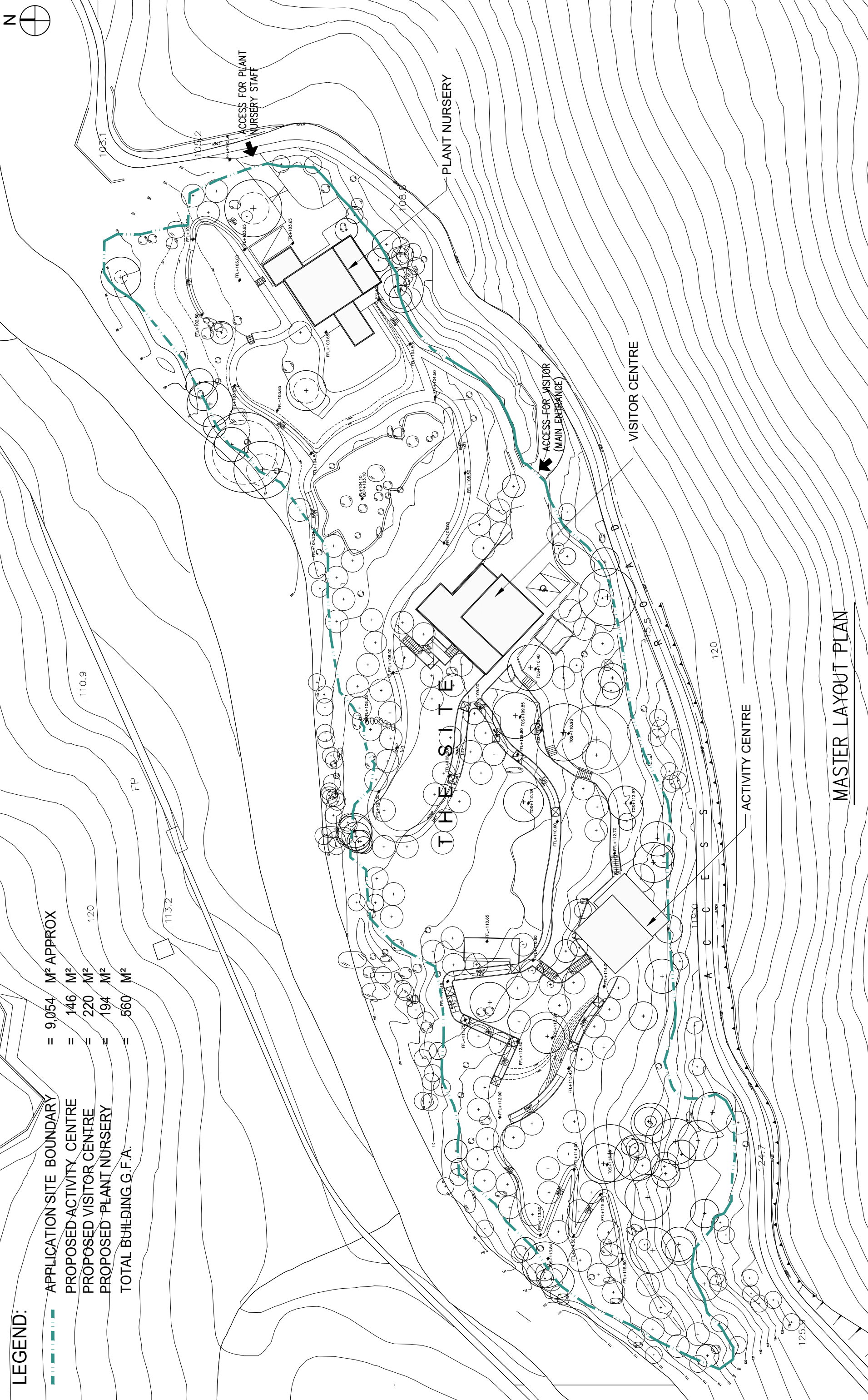
Checked by: YH

Rev.: 2.0

Date: Oct 2022

Appendices

Appendix 1.1
Building Layout Plans and Conceptual Design of the Proposed
Development


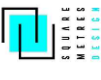


LEGEND:

- APPLICATION SITE BOUNDARY = 9,054 M² APPROX
- PROPOSED ACTIVITY CENTRE = 146 M²
- PROPOSED VISITOR CENTRE = 220 M²
- PROPOSED PLANT NURSERY = 194 M²
- TOTAL BUILDING G.F.A. = 560 M²

MASTER LAYOUT PLAN

TIP
TONY IP GREEN ARCHITECTS LTD.
 葉頌文環保建築師事務所
 Unit 328, Mega Cube, 8 Wang Kwong Road,
 Kowloon Bay, Hong Kong
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PROJECT MANAGER

LANDSCAPE ARCHITECT


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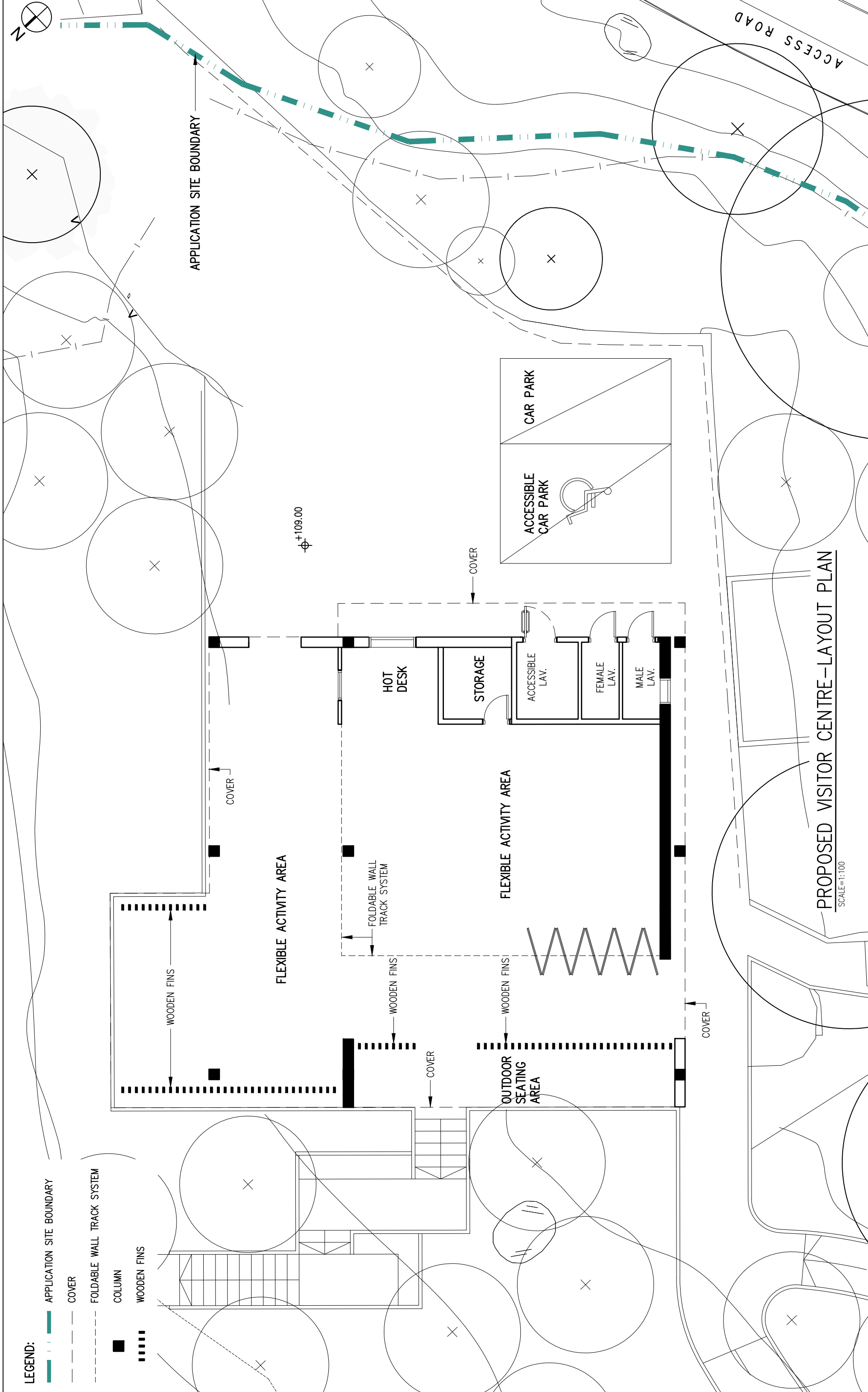
REV.	DESCRIPTION	DATE

PROJECT TITLE
 TAI PO KAU
 NATURE ACADEMY

DRAWING TITLE
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SCALE 1: 600 @ A3	CHECKED BY AK
DATE 16/05/2022	APPROVED BY TI
DRAWING NO. PLN001	REV. NO.

DRAWING PURPOSE
 Indicative Only



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- COVER
- FOLDABLE WALL TRACK SYSTEM
- COLUMN
- WOODEN FINES

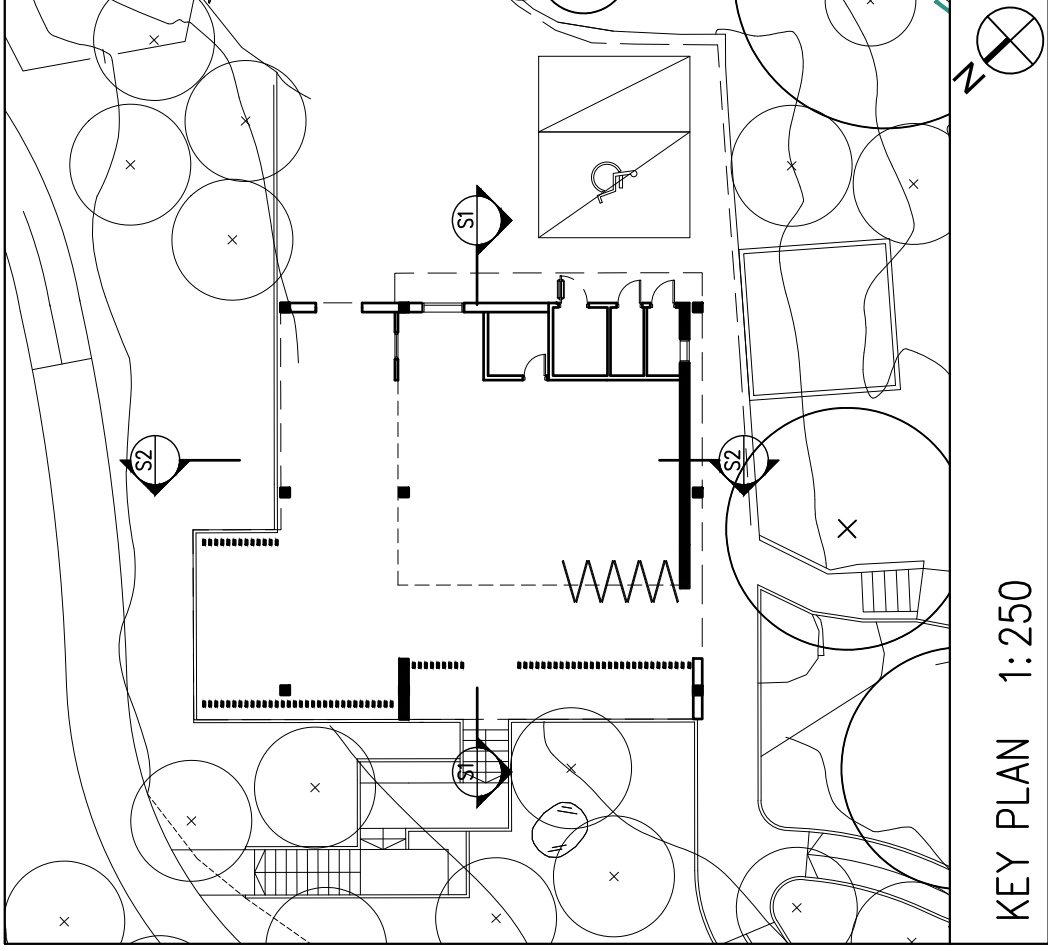
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DATE 16/05/2022	APPROVED BY TI	PROJECT TITLE TAI PO KAU NATURE ACADEMY	
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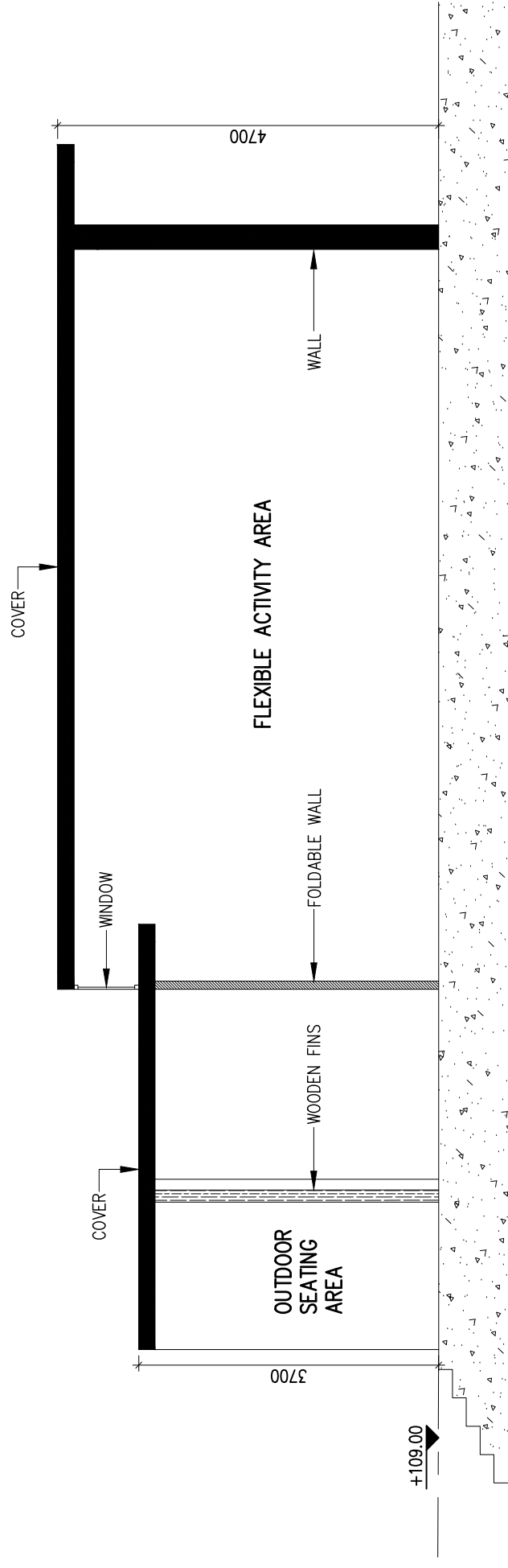
REV.	DESCRIPTION	DATE

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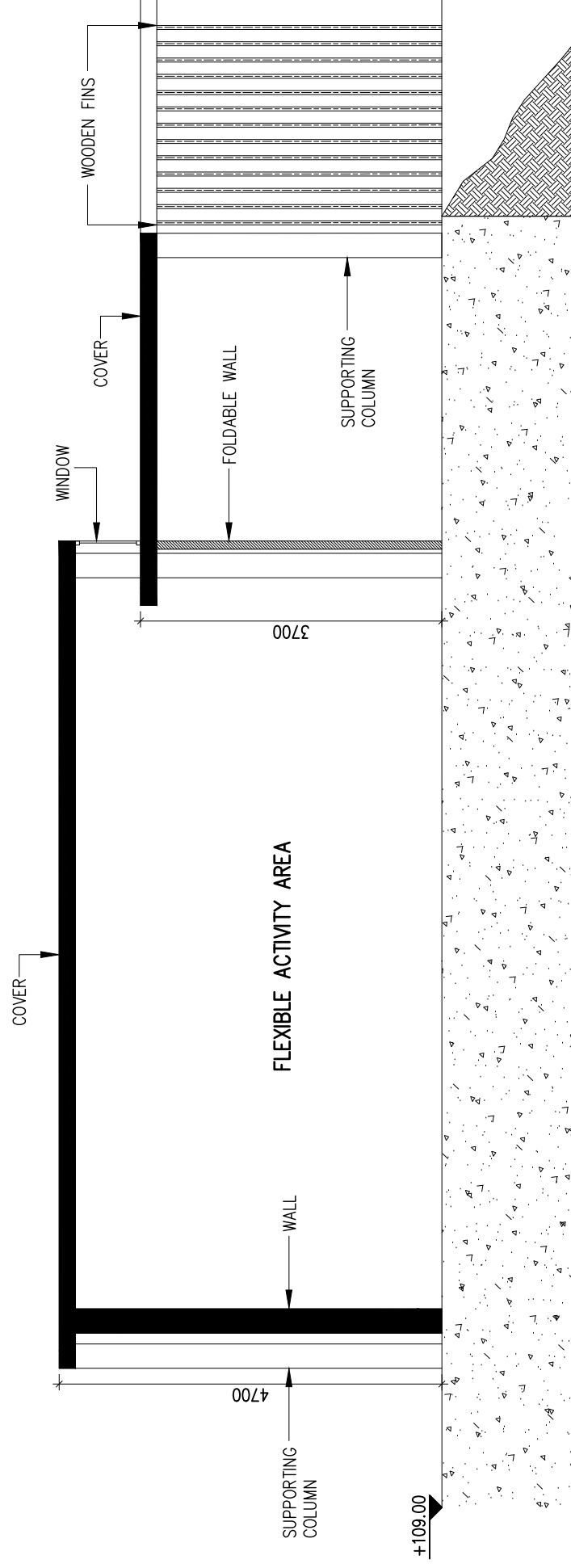
<p>TIP TONY IP GREEN ARCHITECTS LTD. 葉頌文環保建築師事務所 Unit 328, Mega Cube, 8 Wang Kwong Road, Kowloon Bay, Hong Kong T (852) 3596 7800 F (852) 3612 4916 E green@tonyip.green Copyright of this drawing reserved by TIP</p>	<p>Copyright of this drawing reserved by TIP</p>
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KEY PLAN 1:250



S1 SECTION
SCALE=1:75
PLN102



S2 SECTION
SCALE=1:75
PLN102

REV.	DESCRIPTION	DATE

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**TAI PO KAU
 NATURE ACADEMY**

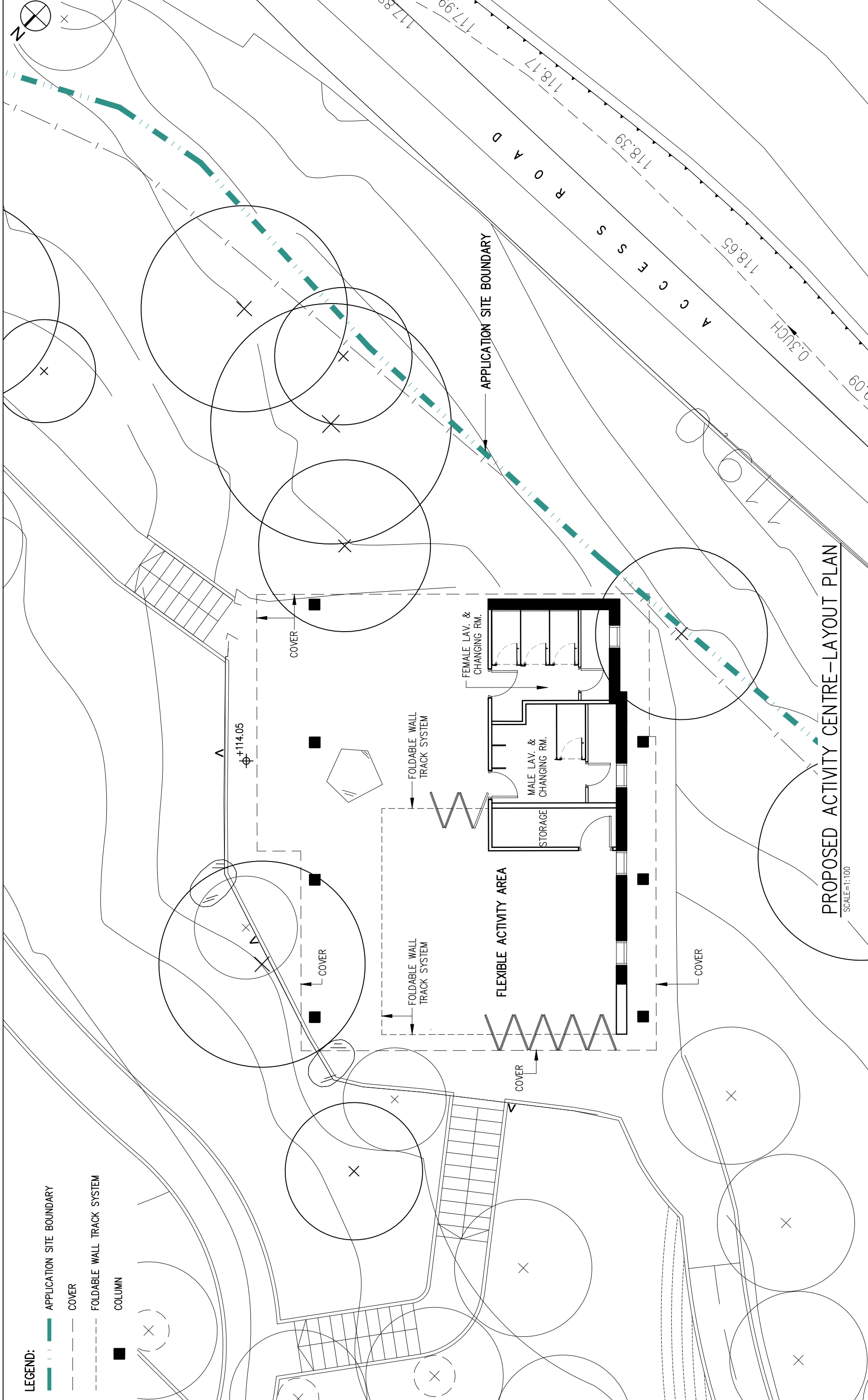
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**PROPOSED VISITOR
 CENTRE -
 SECTIONS**

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DATE 16/05/2022	APPROVED BY TI	
DRAWING NO. PLN102	REV. NO.	

Indicative Only


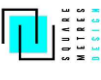
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-  COVER
-  FOLDABLE WALL TRACK SYSTEM
-  COLUMN



PROPOSED ACTIVITY CENTRE - LAYOUT PLAN
SCALE=1:100

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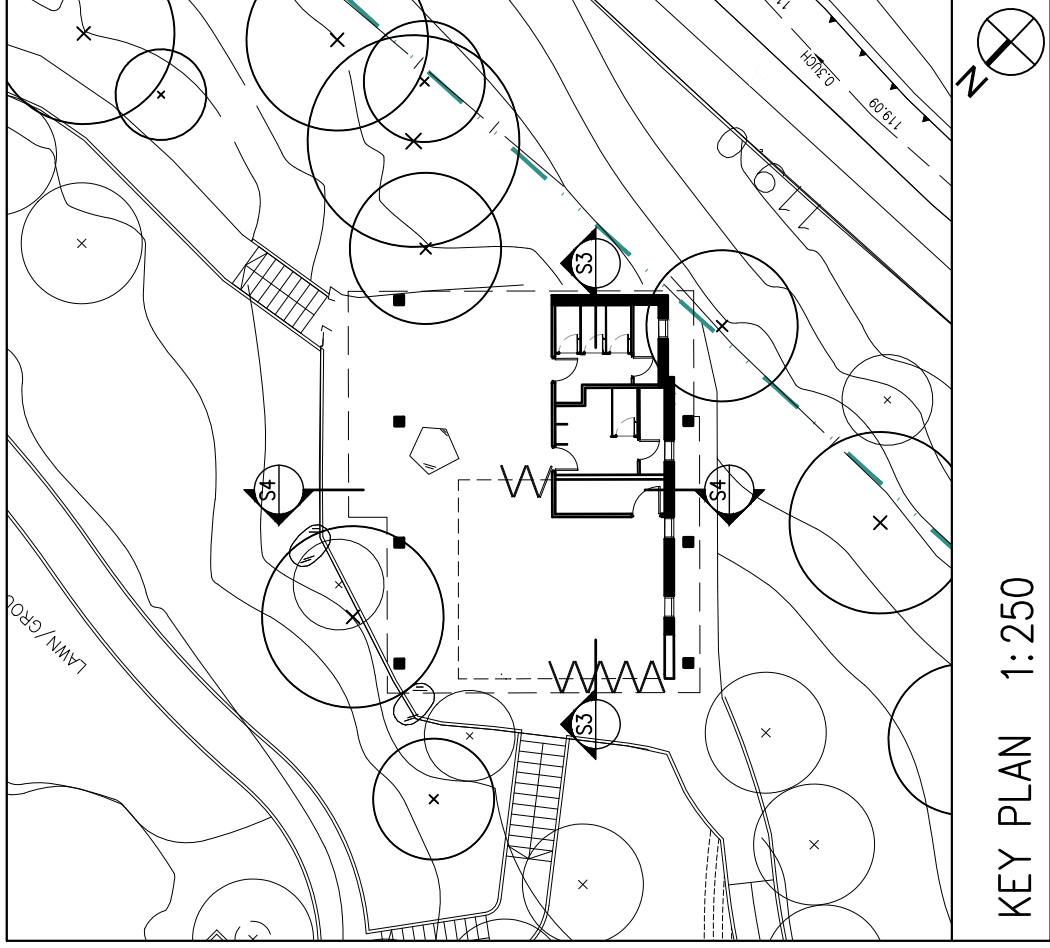
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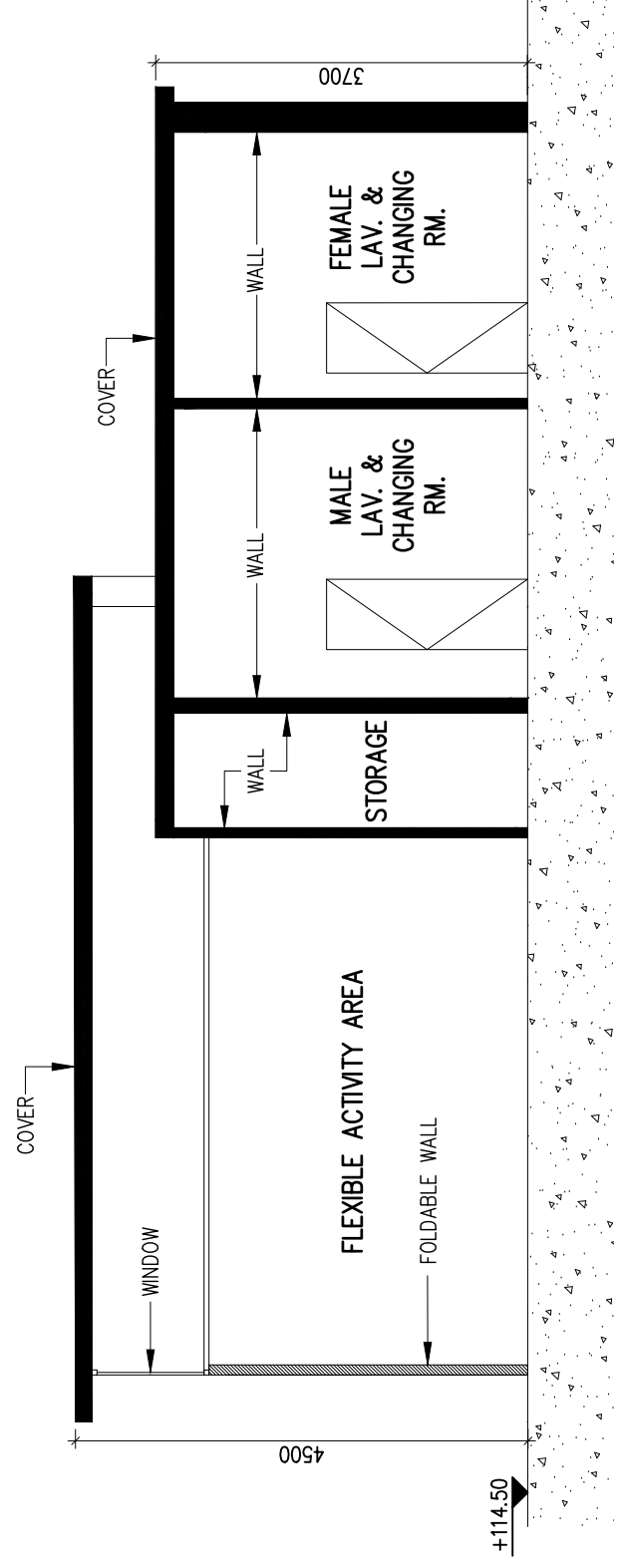
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DATE 16/05/2022	APPROVED BY TI
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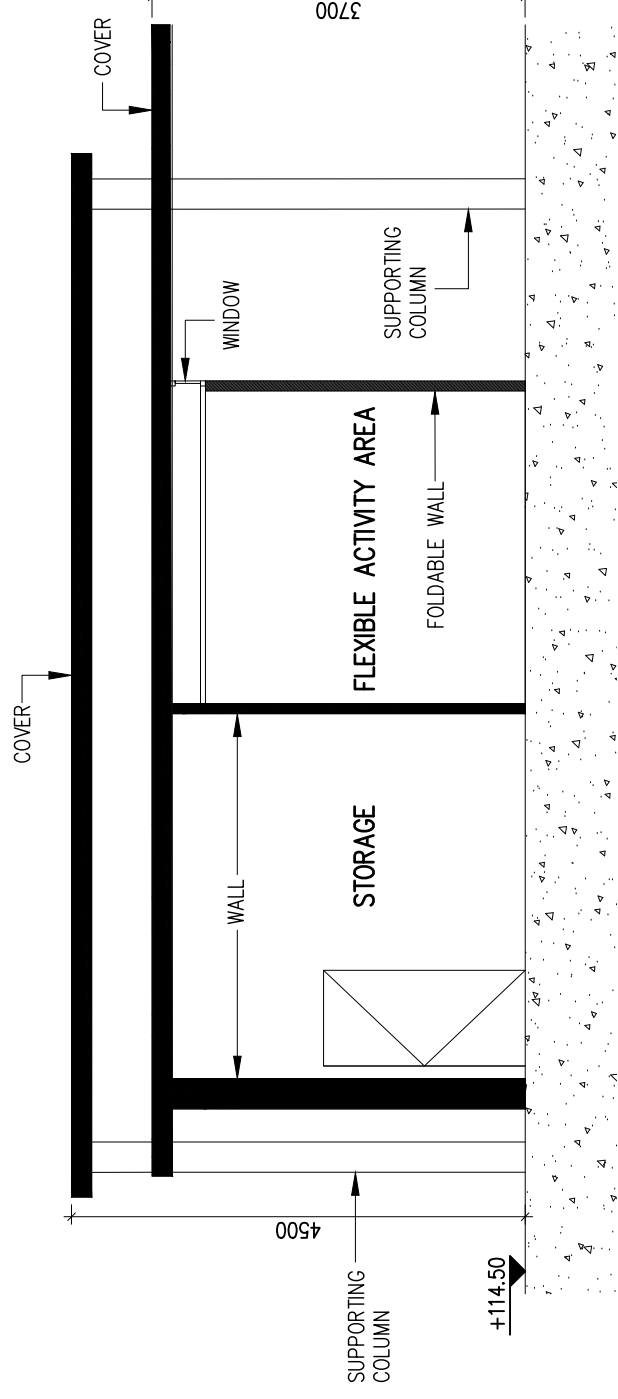
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KEY PLAN 1:250



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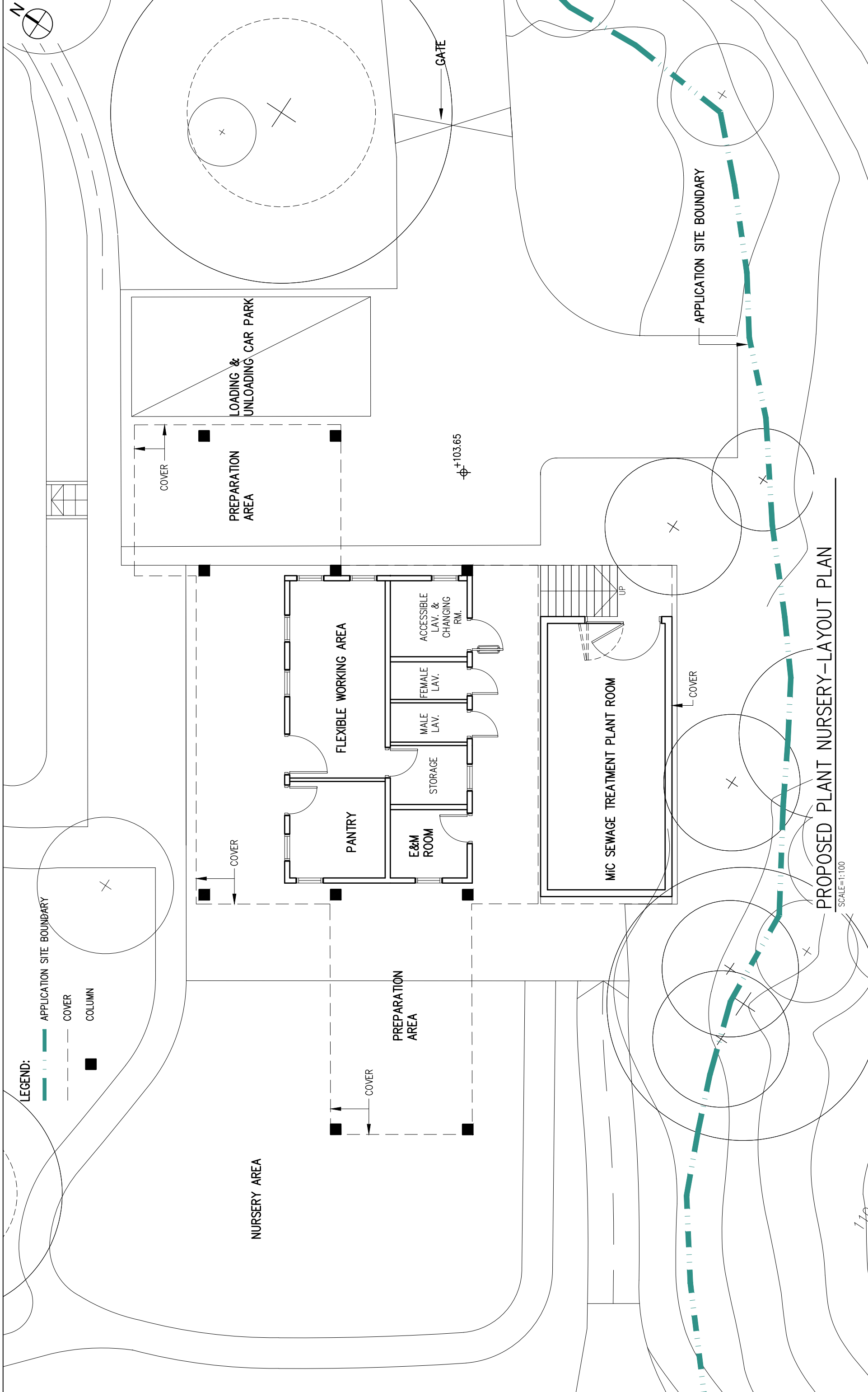


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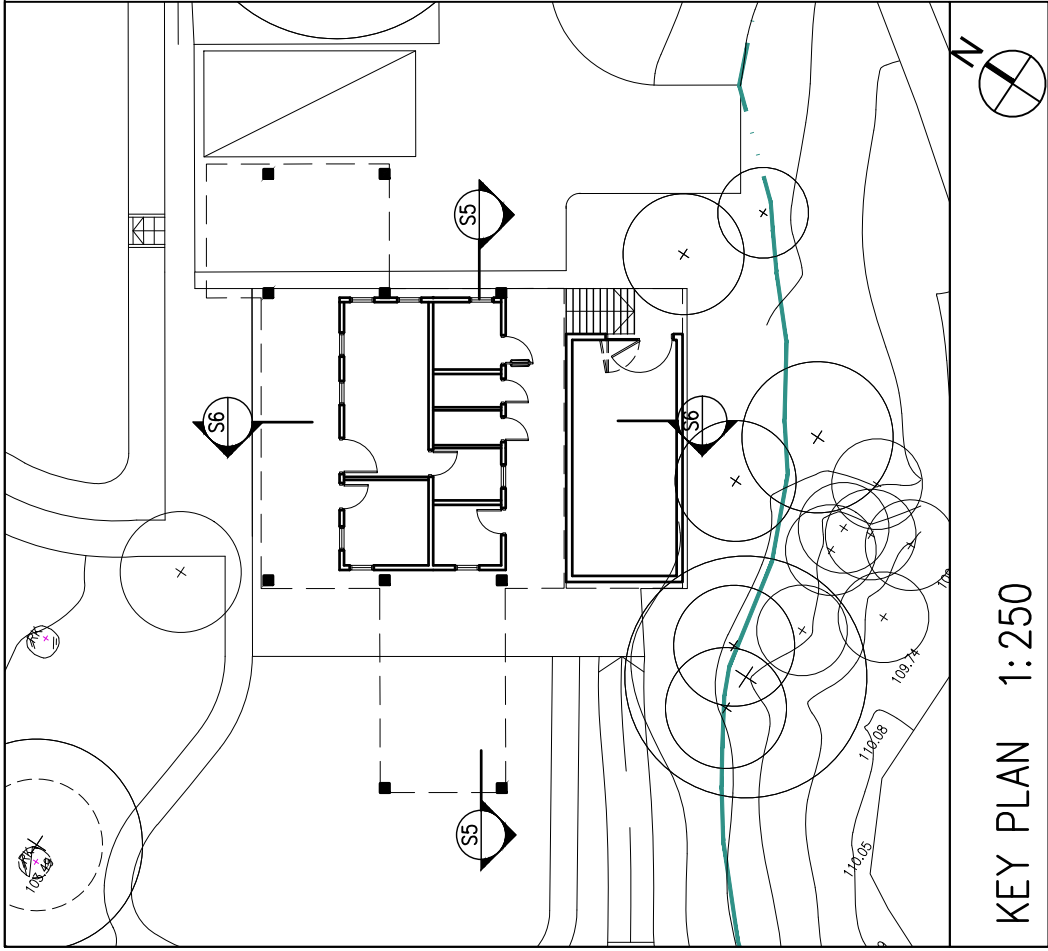
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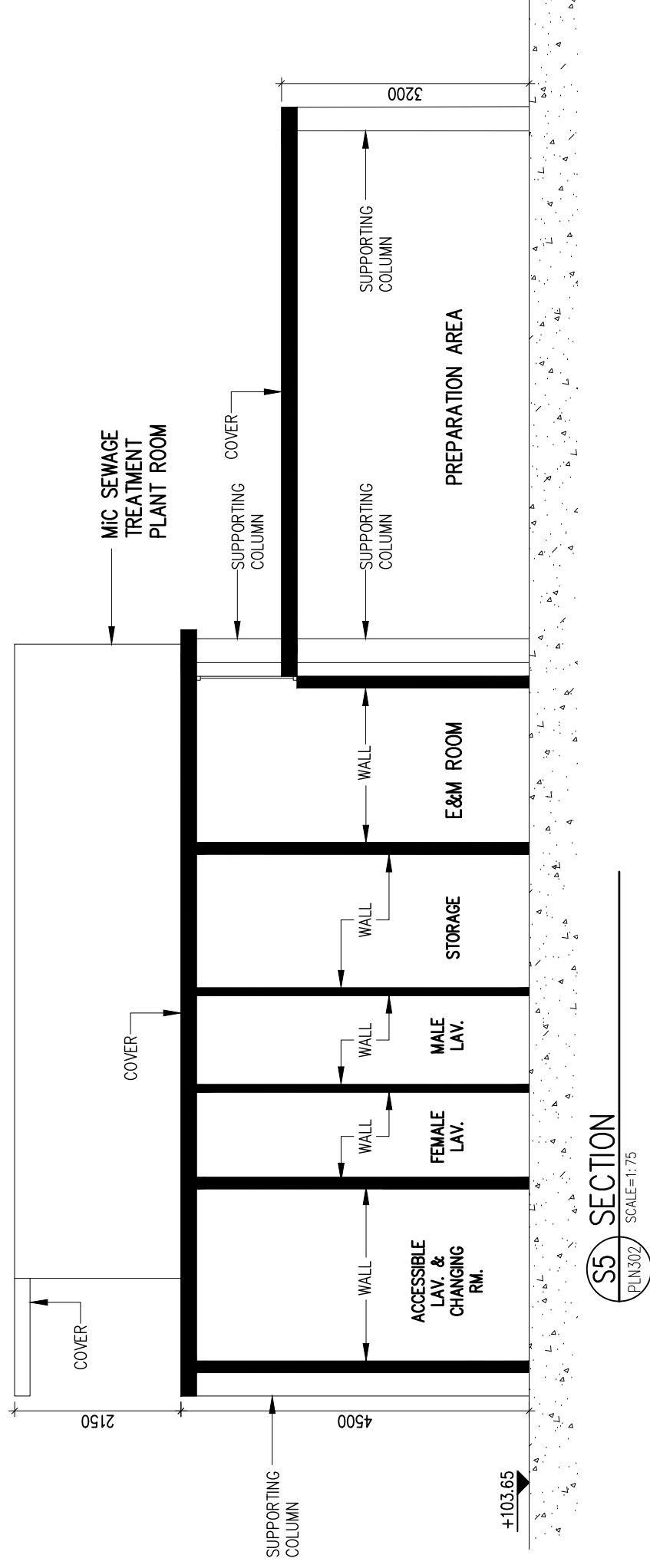
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 - - - COVER
 ■ COLUMN

PROPOSED PLANT NURSERY-LAYOUT PLAN
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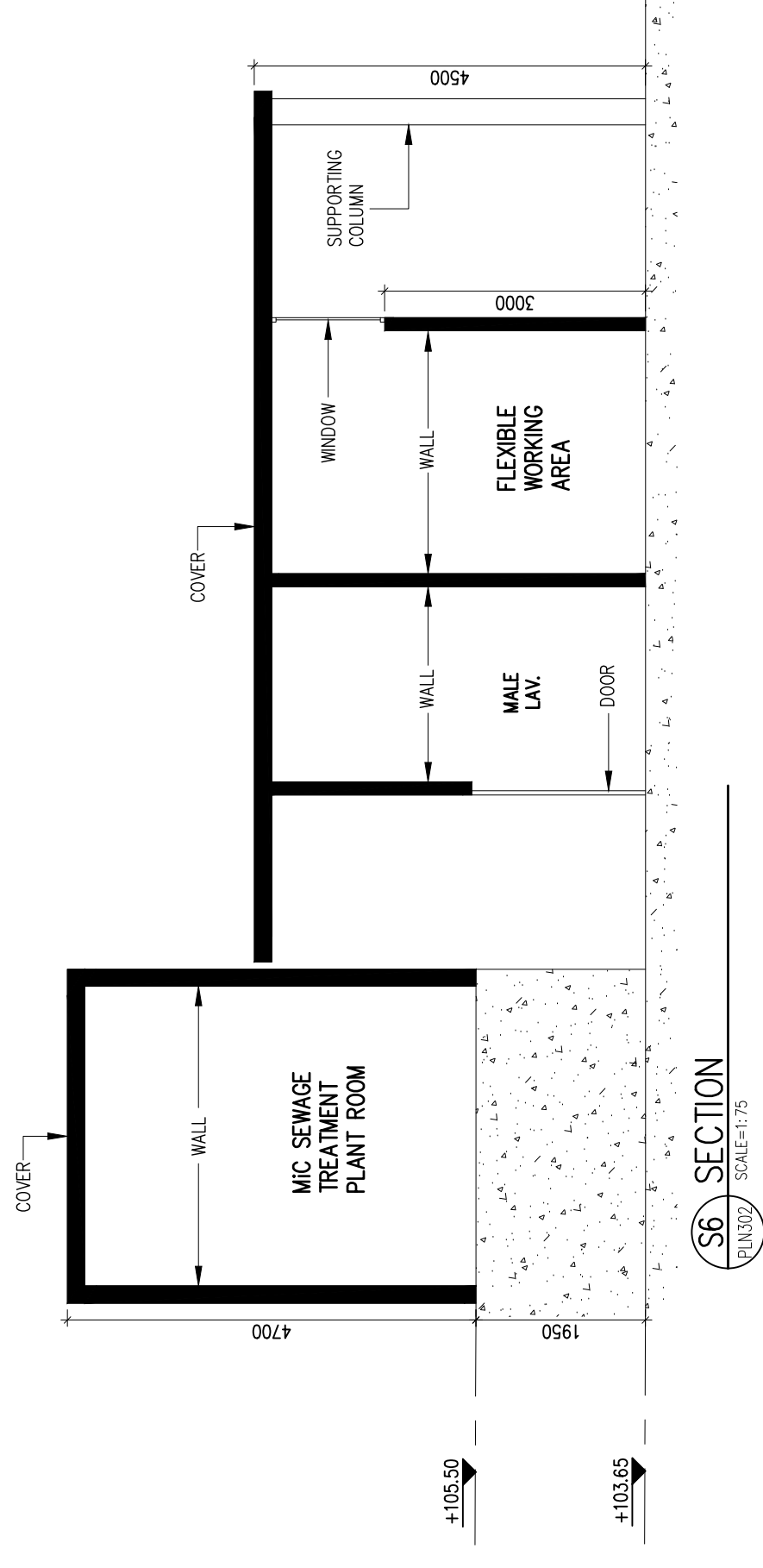
TIP TONY IP GREEN ARCHITECTS LTD. 葉頌文環保建築師事務所 Unit 328, Mega Cube, 8 Wang Kwong Road, Kowloon Bay, Hong Kong T (852) 3596 7800 F (852) 3612 4916 E green@tonyip.green Copyright of this drawing reserved by TIP	PROJECT MANAGER SMILEY PLANET LANDSCAPE ARCHITECT	Check all measurements on site. Do not scale off drawings. This drawing is to be read in conjunction with the specification and any discrepancies are to be immediately reported to the Architect. This drawing remains the copyright property of the Architect and is not to be reproduced in whole or in part without permission of the Architect.	REV. DESCRIPTION DATE	PROJECT TITLE TAI PO KAU NATURE ACADEMY	DRAWING TITLE PROPOSED PLANT NURSERY - LAYOUT PLAN	PROJECT NO. 21004SD SCALE 1: 100 @ A3 DATE 16/05/2022 DRAWING NO. PLN301	DRAWN BY WH CHECKED BY AK APPROVED BY TI REV. NO.	DRAWING PURPOSE <div style="border: 2px solid red; padding: 5px; color: red; text-align: center; font-weight: bold;"> Indicative Only </div>																							
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KEY PLAN 1:250



S5 SECTION
SCALE=1:75
PLN302



S6 SECTION
SCALE=1:75
PLN302

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REV.	DESCRIPTION	DATE

PROJECT TITLE
TAI PO KAU NATURE ACADEMY

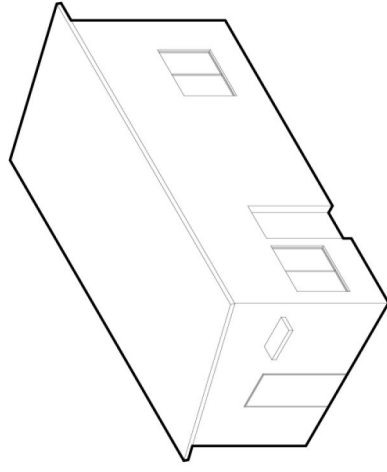
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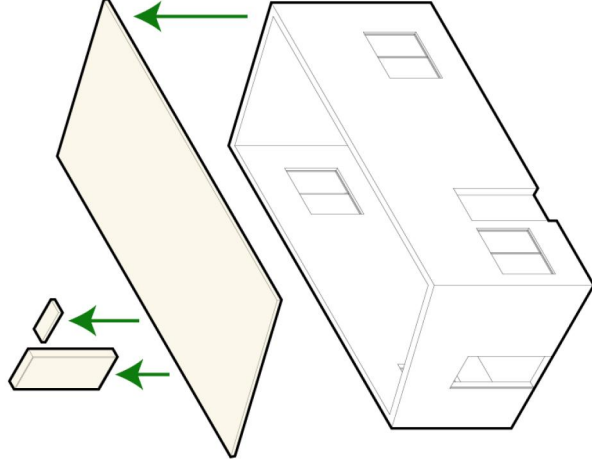
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CONCEPTUAL DIAGRAMS

TIP

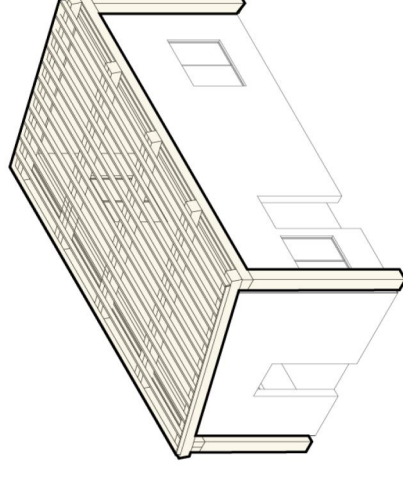


1. Existing Structure



2. Removal

Remove unusable structures and roof, keeping the existing walls.

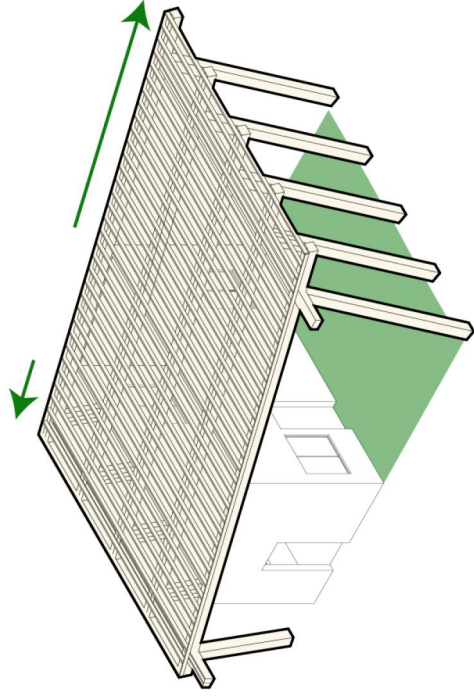


3. Roof Structure

Creating a new roof structure, Potentially usually Hong Kong's **local wood** or **CLT**.

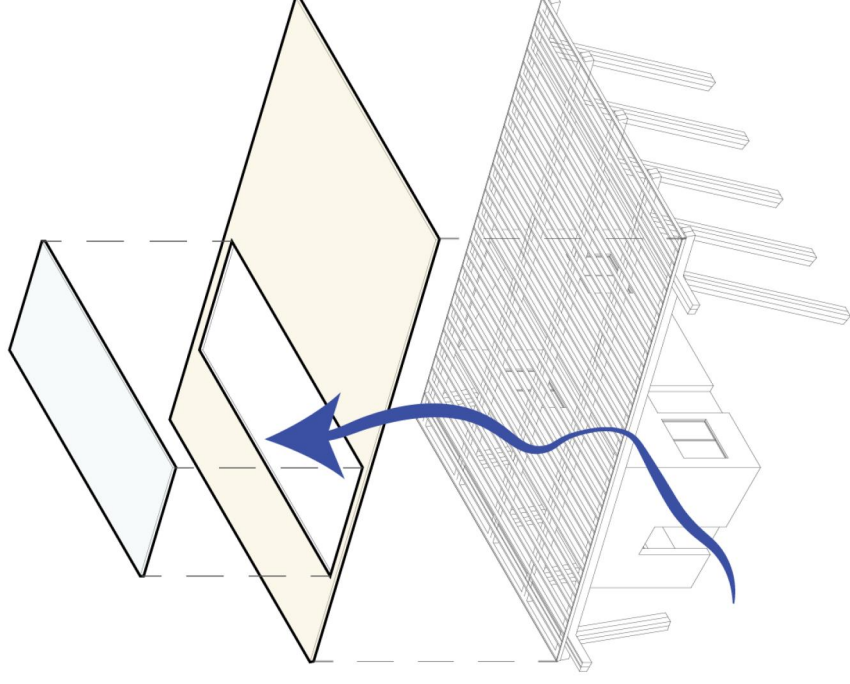
CONCEPTUAL DIAGRAMS

TIP^g



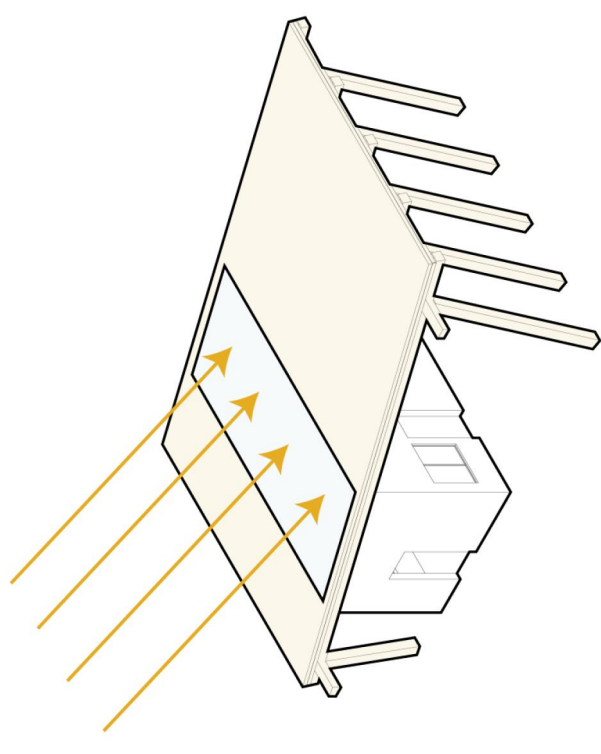
4. Extend

Create shaded outdoor **gathering space** by extending roof accordingly to the old slope.



5. Roof

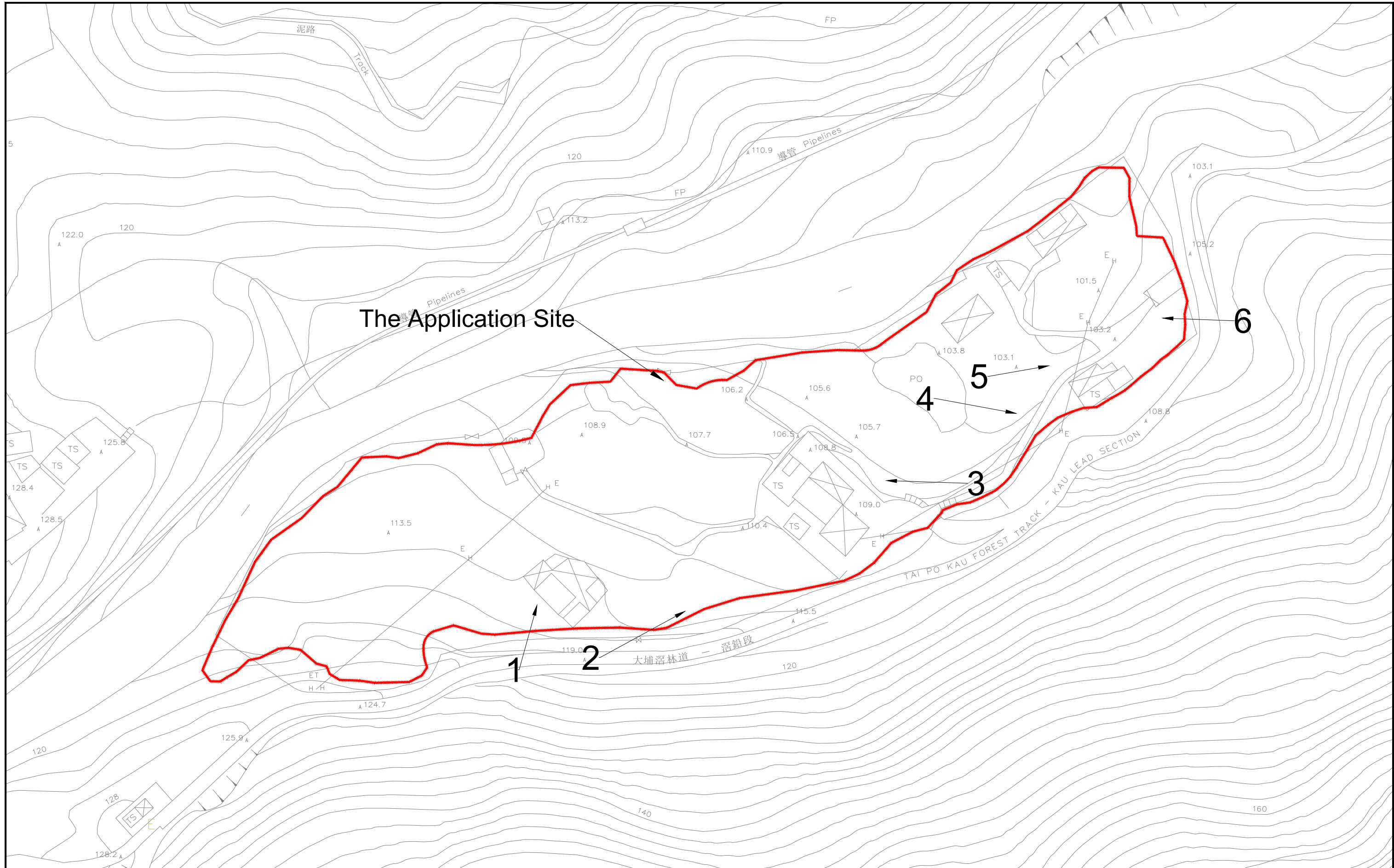
Light weight, low carbon roof lays on top of roof structure. Openable windows allow **natural ventilation**.



6. Skylight

Skylight on top of rooms to provide **natural daylighting**. While Canopy provides outdoor shade area.

**Appendix 1.2
Current Site Photos**



Appendix 1.2

Title: Current Site Photos

Project: Section 16 Planning Application for Proposed Tai Po Kau Nature Academy



Drawn by: JC

Checked by: AL

Rev.: 1.1

Date: Jul 2022

Photos Showing the Existing Conditions of the Application Site



Photo 1: General View of the Application Site



Photo 2: General View of the Application Site



Photo 3: General View of the Application Site



Photo 4: General View of the Application Site



Photo 5: General View of the Application Site



Photo 6: General View of the Application Site

Appendix 1.3 Historical Aerial Photos

Year 1963



Year 1973



Year 1980



Year 1990



Year 1998



Year 2005



Year 2015



Appendix 3.1
Photos of Background Noise Measurement Setup

Photos of Background Noise Measurement Undertaken in April 2022



Measurement within the Application Site (NM1)



Measurement within the Application Site (NM1)

**Appendix 3.2
Calibration Certificates**

Test object : Class 1 Sound Calibrator
Producer : Norsonic
Type : Nor1256
Serial No.: 125626667

Customer: Ramboll Environ Hong Kong

Address: Hong Kong

Order No: SO2120033

Calibration and verification performed:

The performed tests refer to the sections 5.2, 5.3 and 5.5 in IEC 60942 (2003): Electroacoustics - Sound Calibrators. The calibrator has been tested as described in Annex B of the same standard. A detailed description of the calibration procedure is separately available. L244-002: Procedure for Calibration of Acoustic Calibrators.

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity before the verification. During the measurements, the calibrator was placed on top of a reference microphone, only held in place by gravity. The submitted adapter ring (Nor4583) was used to obtain half inch configuration. The instruction manual Im1256_Ed2R2Eng was available during the verification test.

This sound calibrator is type approved by PTB, Germany (report ZDS-DE-16-M-PTB-0069), and fulfills the requirements of IEC 60942 (2003) for all the available combinations of frequencies and levels.

Date of calibration: 2021-05-27
Date of issue: 2021-05-27

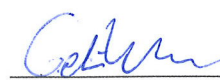
Environmental conditions :	Pressure:	Temperature:	Relative humidity:
Reference conditions:	101,325kPa	23,0°C	50 %RH
Measurement conditions:	98,27 ± 0,20 kPa	23,3 ± 0,5 °C	37,6 ± 3,0 %RH

Operator:



Nils Jørgen Andersen

Supervisor:



Geir Emil Westrum

Certificate No.: Cal 022-2021-13938

The stated levels are relative to 20 μ Pa. The stated levels are valid at measurement conditions. The distortion measure is a “signal to total distortion and noise” (SINAD) ratio covering the frequency range from 20 Hz to 20 kHz.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor $k=2$, which for a normal distribution corresponds to a coverage probability a approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02.

Results

Nominal freq. 250 Hz	Exact	Measured	Uncertainty
Frequency	251,2 Hz	251,2 Hz	0,1 Hz
Frequency stability		< 0,01 %	0,02%
Level (94 dB)	94,0 dB	94,00 dB	0,14 dB
Level (114 dB)	114,0 dB	113,99 dB	0,14 dB
Level stability (114 dB)		0,03 dB	0,02 dB
Distortion (94 dB)		0,3 %	0,3 %
Distortion (114 dB)		0,2 %	0,3 %

Nominal freq. 1000 Hz	Exact	Measured	Uncertainty
Frequency	1000,0 Hz	1000,0 Hz	0,1 Hz
Frequency stability		< 0,01 %	0,02%
Level (94 dB)	94,0 dB	94,00 dB	0,14 dB
Level (114 dB)	114,0 dB	114,00 dB	0,14 dB
Level stability (114 dB)		0,02 dB	0,02 dB
Distortion (94 dB)		0,5 %	0,3 %
Distortion (114 dB)		0,4 %	0,3 %

As public evidence was available, from a testing organization responsible for approving the results of pattern evaluation tests, to demonstrate that the model of sound calibrator fully conformed to the requirements for pattern evaluation described in Annex A of IEC 60942:2003, the sound calibrator tested is considered to conform to all the class 1 requirements of IEC 60942:2003.

Instrumentation

WSM6	Reference microphone	Nor1236 - 08647
G5	Signal Generator	Stanford Research DS 360 / 33568
MM3	Multimeter	Agilent 34401A / 3146A16811
U3	Calibration unit	Nor483B / 25757
BAR3	Environment (P, T and H)	Vaisala PTU300 / F1230002
L3	Sound level meter	Nor140 / 1403603

Traceability

PTB, Germany
IKM, Norway
IKM, Norway
IKM, Norway
JV, Norway
NCL, Norway

Measurements performed by



Certificate of Calibration

Certificate No.: A210028

Test object:	Manufacturer :	Type :	Serial No.:
Sound level meter :	Norsonic	139	1392835
Microphone :	Norsonic	1228	03447
Preamplifier :	Norsonic	1207	20874
Sound calibrator :	none		

Date of Receipt: 2021-06-21

Customer: Ramboll Hong Kong Limited
Address: 21/F, BEA Harbour View Centre, 56 Gloucester Road, Wan Chai, Hong Kong

Acoustical levels are stated relative to 20 μ Pa. Other dB levels are relative values.

The reported expanded uncertainty of measurement is stated as the standard uncertainty of measurement multiplied by the coverage factor k, which with the reported effective degree of freedom corresponds to coverage probability of approximately 95%. The standard uncertainty of measurement has been determined in accordance with EA publication EA-4/02

Statement of Conformity:

The Sound Level Meter has been shown to conform to class 1 requirements for all relevant electrical tests, described in IEC 61672-3, for the environmental conditions under which the tests were performed. However, as public evidence was not available, from a testing organization responsible for pattern approval, to demonstrate that the model of sound level meter conform to the requirements for pattern evaluation described in IEC 61672-1, no general statement or conclusion can be made about conformance of the Sound Level Meter to the requirements of IEC 61672-3.

Environmental conditions:	Pressure :	Temperature :	Humidity :
Reference conditions:	101,325 kPa	23,0 °C	50 %RH
Measurement conditions :	99,74 \pm 0,20 kPa	23,1 \pm 0,5 °C	56,1 \pm 1,5 %RH

Date of calibration: 2021-06-30

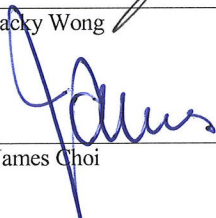
Date of issue: 2021-06-30

Prepared by:



Jacky Wong

Checked by:



James Choi

Comment: The values given in this Certificate of Calibration only relate to values measured at the time of the test and any measurement uncertainties quoted will not include allowances for the equipment long term drift, variations with environmental changes, vibration and shock during transportation, or the capability of any other laboratory to repeat the measurement. The results apply to the item as received.

The test equipment used for calibration are traceable to International Standards as specified in this certificate. This certificate may not be reproduced other than in full, without the prior written approval of this laboratory.



Certificate No.: A210028

Preconditioning :

The equipment was preconditioned for more than 12 hours at the specified calibration temperature and humidity.

Test Specification:

The Sound Level Meter has been calibrated in accordance with the requirements as specified the electrical tests in IEC 61672-3.

Reference equipment used in the calibration

Description:	Model:	Serial No.	Calibration Date:	Traceable to:
Multi-function sound calibrator	SME Calibration Unit 483B	31065	24-Jun-2021	PTB, Braunschweig, Germany
Signal generator	DS 360	123901	06-Oct-2020	The Government of HKSAR Standards and Calibration Laboratory
Multimeter	Agilent 34401A	MY41030277	06-Oct-2020	The Government of HKSAR Standards and Calibration Laboratory
Meteo Station HM30	HM30	1004085	22-Sep-2020	Sun Creation Engineering Limited Calibration & Testing Laboratory

Summary of Measurement Results

Self-generated noise - IEC 61672-3 Ed.2.0 Clause 11	Passed
Frequency weightings: A Network - IEC 61672-3 Ed.2.0 Clause 13.3	Passed
Frequency weightings: C Network - IEC 61672-3 Ed.2.0 Clause 13.3	Passed
Frequency weightings: Z Network - IEC 61672-3 Ed.2.0 Clause 13.3	Passed
Frequency and time weightings at 1 kHz IEC 61672-3 Ed.2.0 Clause 14	Passed
Level linearity on the reference level range - IEC 61672-3 Ed.2.0 Clause 16	Passed
Toneburst response - IEC 61672-3 Ed.2.0 Clause 18	Passed
Peak C sound level - IEC 61672-3 Ed.2.0 Clause 19	Passed
Overload indication - IEC 61672-3 Ed.2.0 Clause 20	Passed
High level stability test - IEC 61672-3 Ed.2.0 Clause 21	Passed
Long term stability test - IEC 61672-3 Ed.2.0 Clause 15	Passed

Records:

D:\calibration\slmcal\Nor139_1392835_M3.nmf

Verification:

The verification measurements have been performed using the calibration system Nor1504A with software type Nor1019.

The sound level meter instrument submitted for testing has successfully completed all relevant electrical tests of IEC61672-3, for the environmental conditions under which the tests were performed. Test signals are fed to the sound measuring device through an adapter that resembles the microphone signal. A special adapter with a suitable electrical characteristic is used.

Detailed measurement results are printed on the following pages.

Each of the verification test points has a Result indication (P or N) that tells the obtained result of the actual test.

P = the result is Passed

N = the result is Not passed

All verification tests must have a Passed indication in order to fulfill the requirements in the corresponding standard.

The test equipment used for calibration are traceable to International Standards as specified in this certificate. This certificate may not be reproduced other than in full, without the prior written approval of this laboratory.



Certificate No.: A210028

Measurement results

Self-generated noise - IEC 61672-3 Ed.2.0 #11

Network	Level (dB)	Comment
A	15,5	Equivalent capacity
C	18,3	Equivalent capacity
Z	21,9	Equivalent capacity

Test Passed

Frequency weightings: A Network - IEC 61672-3 Ed.2.0 #13.3

Frequency (Hz)	Ref. (dB)	Meas. (dB)	Uncert. (dB)	Dev. (dB)
63,1	92,0	91,9	0,3	-0,1
125,9	92,0	92,0	0,3	0,0
251,2	92,0	91,9	0,3	-0,1
501,2	92,0	91,9	0,3	-0,1
1000,0	92,0	92,0	0,3	0,0
1995,3	92,0	91,9	0,3	-0,1
3981,1	92,0	91,9	0,3	-0,1
7943,3	92,0	91,9	0,3	-0,1
15848,9	92,0	91,9	0,3	-0,1

Test Passed

Frequency weightings: C Network - IEC 61672-3 Ed.2.0 #13.3

Frequency (Hz)	Ref. (dB)	Meas. (dB)	Uncert. (dB)	Dev. (dB)
63,1	92,0	92,0	0,3	0,0
125,9	92,0	92,0	0,3	0,0
251,2	92,0	91,9	0,3	-0,1
501,2	92,0	92,0	0,3	0,0
1000,0	92,0	92,0	0,3	0,0
1995,3	92,0	91,9	0,3	-0,1
3981,1	92,0	91,9	0,3	-0,1
7943,3	92,0	91,9	0,3	-0,1
15848,9	92,0	91,9	0,3	-0,1

Test Passed

Frequency weightings: Z Network - IEC 61672-3 Ed.2.0 #13.3

Frequency (Hz)	Ref. (dB)	Meas. (dB)	Uncert. (dB)	Dev. (dB)
63,1	92,0	91,9	0,3	-0,1
125,9	92,0	91,9	0,3	-0,1
251,2	92,0	91,9	0,3	-0,1
501,2	92,0	92,0	0,3	0,0
1000,0	92,0	92,0	0,3	0,0
1995,3	92,0	91,9	0,3	-0,1
3981,1	92,0	91,9	0,3	-0,1
7943,3	92,0	91,9	0,3	-0,1
15848,9	92,0	91,9	0,3	-0,1

Test Passed

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Frequency and time weightings at 1 kHz IEC 61672-3 Ed.2.0 #14

Weightings	Ref.	Measured	Lim.	Uncert.	Dev.	Result
Time Netw	(dB)	(dB)	(dB) (dB)	(dB)	(dB)	
Fast A	114,0	114,0	0,2 -0,2	0,1	0,0	P
Fast C	114,0	114,0	0,2 -0,2	0,1	0,0	P
Fast Z	114,0	114,0	0,2 -0,2	0,1	0,0	P
Slow A	114,0	113,9	0,1 -0,1	0,1	-0,1	P
Leq A	114,0	114,0	0,1 -0,1	0,1	0,0	P
SEL A	124,0	124,0	0,1 -0,1	0,1	0,0	P

Test Passed

Level linearity on the reference level range - IEC 61672-3 Ed.2.0 #16

Ref.	Measured	Lim.	Uncert.	Dev.	Result
(dB)	(dB)	(dB) (dB)	(dB)	(dB)	
Measured at 31.5 Hz					
94,0	93,7	0,8 -0,8	0,1	-0,3	P
95,0	94,6	0,8 -0,8	0,1	-0,4	P
96,0	95,6	0,8 -0,8	0,1	-0,4	P
97,0	96,6	0,8 -0,8	0,1	-0,4	P
94,0	93,6	0,8 -0,8	0,1	-0,4	P
89,0	88,7	0,8 -0,8	0,1	-0,3	P
84,0	83,7	0,8 -0,8	0,1	-0,3	P
79,0	78,6	0,8 -0,8	0,1	-0,4	P
74,0	73,7	0,8 -0,8	0,1	-0,3	P
69,0	68,7	0,8 -0,8	0,1	-0,3	P
64,0	63,7	0,8 -0,8	0,1	-0,3	P
59,0	58,7	0,8 -0,8	0,1	-0,3	P
54,0	53,7	0,8 -0,8	0,1	-0,3	P
49,0	48,7	0,8 -0,8	0,1	-0,3	P
44,0	43,7	0,8 -0,8	0,1	-0,3	P
39,0	38,6	0,8 -0,8	0,1	-0,4	P
34,0	33,7	0,8 -0,8	0,1	-0,3	P
29,0	28,8	0,8 -0,8	0,1	-0,2	P
28,0	27,9	0,8 -0,8	0,1	-0,1	P
27,0	26,9	0,8 -0,8	0,1	-0,1	P
26,0	26,0	0,8 -0,8	0,1	0,0	P
25,0	25,1	0,8 -0,8	0,1	0,1	P
24,0	24,2	0,8 -0,8	0,1	0,2	P
Measured at 1 kHz					
114,0	114,0	0,8 -0,8	0,1	0,0	P
119,0	119,0	0,8 -0,8	0,1	0,0	P
124,0	124,0	0,8 -0,8	0,1	0,0	P
129,0	129,0	0,8 -0,8	0,1	0,0	P
132,0	132,0	0,8 -0,8	0,1	0,0	P
133,0	133,0	0,8 -0,8	0,1	0,0	P
134,0	134,0	0,8 -0,8	0,1	0,0	P
135,0	135,0	0,8 -0,8	0,1	0,0	P
136,0	136,0	0,8 -0,8	0,1	0,0	P
114,0	114,0	0,8 -0,8	0,1	0,0	P
109,0	109,0	0,8 -0,8	0,1	0,0	P
104,0	104,0	0,8 -0,8	0,1	0,0	P
99,0	99,0	0,8 -0,8	0,1	0,0	P
94,0	94,0	0,8 -0,8	0,1	0,0	P
89,0	89,0	0,8 -0,8	0,1	0,0	P
84,0	84,0	0,8 -0,8	0,1	0,0	P
79,0	78,9	0,8 -0,8	0,1	-0,1	P

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74,0	73,9	0,8	-0,8	0,1	-0,1	P
69,0	68,9	0,8	-0,8	0,1	-0,1	P
64,0	63,9	0,8	-0,8	0,1	-0,1	P
59,0	58,9	0,8	-0,8	0,1	-0,1	P
54,0	53,9	0,8	-0,8	0,1	-0,1	P
49,0	48,9	0,8	-0,8	0,1	-0,1	P
44,0	43,9	0,8	-0,8	0,1	-0,1	P
39,0	39,0	0,8	-0,8	0,1	0,0	P
34,0	34,0	0,8	-0,8	0,1	0,0	P
29,0	29,1	0,8	-0,8	0,1	0,1	P
28,0	28,1	0,8	-0,8	0,1	0,1	P
27,0	27,3	0,8	-0,8	0,1	0,3	P
26,0	26,3	0,8	-0,8	0,1	0,3	P
25,0	25,3	0,8	-0,8	0,1	0,3	P
24,0	24,4	0,8	-0,8	0,1	0,4	P
Measured at 8 kHz						
114,0	113,9	0,8	-0,8	0,1	-0,1	P
119,0	118,9	0,8	-0,8	0,1	-0,1	P
124,0	123,9	0,8	-0,8	0,1	-0,1	P
129,0	128,9	0,8	-0,8	0,1	-0,1	P
132,0	131,9	0,8	-0,8	0,1	-0,1	P
133,0	132,9	0,8	-0,8	0,1	-0,1	P
134,0	133,9	0,8	-0,8	0,1	-0,1	P
135,0	134,9	0,8	-0,8	0,1	-0,1	P
136,0	136,0	0,8	-0,8	0,1	0,0	P
114,0	113,9	0,8	-0,8	0,1	-0,1	P
109,0	108,9	0,8	-0,8	0,1	-0,1	P
104,0	103,9	0,8	-0,8	0,1	-0,1	P
99,0	98,9	0,8	-0,8	0,1	-0,1	P
94,0	93,9	0,8	-0,8	0,1	-0,1	P
89,0	88,9	0,8	-0,8	0,1	-0,1	P
84,0	83,9	0,8	-0,8	0,1	-0,1	P
79,0	78,9	0,8	-0,8	0,1	-0,1	P
74,0	73,9	0,8	-0,8	0,1	-0,1	P
69,0	68,9	0,8	-0,8	0,1	-0,1	P
64,0	63,9	0,8	-0,8	0,1	-0,1	P
59,0	58,9	0,8	-0,8	0,1	-0,1	P
54,0	53,9	0,8	-0,8	0,1	-0,1	P
49,0	48,9	0,8	-0,8	0,1	-0,1	P
44,0	43,9	0,8	-0,8	0,1	-0,1	P
39,0	38,9	0,8	-0,8	0,1	-0,1	P
34,0	34,0	0,8	-0,8	0,1	0,0	P
29,0	29,1	0,8	-0,8	0,1	0,1	P
28,0	28,1	0,8	-0,8	0,1	0,1	P
27,0	27,2	0,8	-0,8	0,1	0,2	P
26,0	26,2	0,8	-0,8	0,1	0,2	P
25,0	25,3	0,8	-0,8	0,1	0,3	P
24,0	24,5	0,8	-0,8	0,1	0,5	P

Test Passed

Toneburst response - IEC 61672-3 Ed.2.0 #18

Burst type	Ref. (dB)	Measured (dB)	Lim. (dB)	Uncert. (dB)	Dev. (dB)	Result
Fast 200 mSec	134,0	133,9	0,5	-0,5	0,1	-0,1 P
Fast 2.0 mSec	117,0	116,7	1,0	-1,5	0,1	-0,3 P
Fast 0.25 mSec	108,0	107,2	1,0	-3,0	0,1	-0,8 P

The test equipment used for calibration are traceable to International Standards as specified in this certificate. This certificate may not be reproduced other than in full, without the prior written approval of this laboratory.



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Slow	200 mSec	127,6	127,5	0,5	-0,5	0,1	-0,1	P
Slow	2.0 mSec	108,0	107,9	1,0	-3,0	0,1	-0,1	P
SEL	200 mSec	128,0	128,0	0,5	-0,5	0,1	0,0	P
SEL	2.0 mSec	108,0	107,9	1,0	-1,5	0,1	-0,1	P
SEL	0.25 mSec	99,0	98,4	1,0	-3,0	0,1	-0,6	P

Test Passed

Peak C sound level - IEC 61672-3 Ed.2.0 #19

Pulse Type	Pulse Freq. (Hz)	Ref. RMS (dB)	Ref. Peak (dB)	Measured Value (dB)	Lim. (+/-dB)	Uncert. (dB)	Dev. (dB)	Result
1 cycle	8k	126,0	129,4	129,1	2,0	0,1	-0,3	P
Pos 1/2 cycle	500	129,0	131,4	131,3	1,0	0,1	-0,1	P
Neg 1/2 cycle	500	129,0	131,4	131,3	1,0	0,1	-0,1	P

Test Passed

Overload indication - IEC 61672-3 Ed.2.0 #20

	Measured (dB)	Lim. (+/-dB)	Uncert. (dB)	Result
Level difference of positive and negative pulses:	0,2	1,5	0,1	P
Positive 1/2 cycle 4 kHz. Overload occurred at:	141,3			
Negative 1/2 cycle 4 kHz. Overload occurred at:	141,5			

Test Passed

High level stability test - IEC 61672-3 Ed.2.0 #21

Initial level (dB)	Final level (dB)	Diff. (dB)	Lim. value (dB)	Uncert. (dB)	Result
136,0	136,0	0,0	0,1	0,1	P

Test Passed

Long term stability test - IEC 61672-3 Ed.2.0 #15

Time interval (mm:SS)	StartLevel (dB)	StopLevel (dB)	Difference (dB)	Tolerance (dB)	Result
25:16	114,0	114,0	0,0	0,1	P

Test Passed

- END -

The test equipment used for calibration are traceable to International Standards as specified in this certificate. This certificate may not be reproduced other than in full, without the prior written approval of this laboratory.

Appendix 3.3
Calculation of Maximum Allowable Sound Power Level of the
Planned Fixed Noise Sources

Table 1. Information of Representative Noise Sensitive Receivers for Fixed Plant Noise Impact Assessment

NSR ID	Descriptions	Nature of Use	Location		Area Type	Area Sensitivity Rating (ASR)
			x	y		
			Easting	Northing		
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	Office use	836683	832233	Rural	A
NSR 2	Village House 1	Residential	836593	832459		A
NSR 3	Village House 2	Residential	836659	832511		A
NSR 4	Village House 3	Residential	836792	832575		A
NSR 5	Village House 4	Residential	837001	832489		A

Table 2. Inventory of Fixed Noise Sources for Fixed Noise Impact Assessment

Noise Source ID	Description of Noise Source	Model	Location		No. of Plant	In Operation? (Y/N)	
			X	Y		Daytime & Evening (0700-2300)	Night-time (2300-0700)
PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	--	836945	832277	1	Y	Y

Table 3. Calculation of Fixed Noise Impact on Existing NSRs (Day and Evening Time Period)

NSR				Fixed Plant Noise Source						Correction, dB(A)						SPL at NSR, dB(A) [3]	Overall SPL, dB(A) [3]	Fixed Plant Noise Criteria, dB(A)	
ID	Descriptions	Location		ID	Descriptions	Location		SWL LAeq, dB(A)	No. of Plants	Distance to NSR, m [1]	Distance	Screening [2]	Tonality	Intermittency	Impulsiveness				Facade
		X	Y			X	Y												
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	836683	832233	PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	836945	832277	90	1	265	-56	0	6	0	0	3	43	43	46
NSR 2	Village House 1	836593	832459	PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	836945	832277	90	1	396	-60	-10	6	0	0	3	29	29	46
NSR 3	Village House 2	836659	832511	PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	836945	832277	90	1	370	-59	-10	6	0	0	3	30	30	46
NSR 4	Village House 3	836792	832575	PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	836945	832277	90	1	335	-59	-10	6	0	0	3	30	30	46
NSR 5	Village House 4	837001	832489	PFS-01	Ventilation Fan / Louve of the Enclosed Sewage Treatment	836945	832277	90	1	219	-55	0	6	0	0	3	44	44	46

Notes

- [1] Horizontal distance instead of slant distance has been adopted as the worst-case scenario.
- [2] A screening correction of -10dB(A) is applied for plants which their line of sight to the NSR is completely screened by buildings/structures;
- [3] Noise levels are rounded to the nearest dB(A).
- [4] The prevailing background noise level measured on-site is used as the fixed plant noise criterion for NSRs.
- [5] A correction for tonality for 6 dB(A) is applied in the calculation as conservation approach.

Table 4. Calculation of Fixed Noise Impact on Existing NSRs (Night Time Period)

NSR				Fixed Plant Noise Source							Correction, dB(A)						SPL at NSR, dB(A) ^[3]	Overall SPL, dB(A) ^[3]	Fixed Plant Noise Criteria, dB(A)
ID	Descriptions	Location		ID	Descriptions	Location		SWL LAeq, dB(A)	No. of Plants	Distance to NSR, m ^[1]	Distance	Screening ^[2]	Tonality	Intermittency	Impulsiveness	Facade			
		X	Y			X	Y												
NSR 1	Tai Po Kau Special Area Tai Po Kau Management Centre	836683	832233	PFS-01	Ventilation Fan / Lourve of the Enclosed Sewage Treatment	836945	832277	90	1	265	-56	0	6	0	0	3	43	43	45
NSR 2	Village House 1	836593	832459	PFS-01	Ventilation Fan / Lourve of the Enclosed Sewage Treatment	836945	832277	90	1	396	-60	-10	6	0	0	3	29	29	45
NSR 3	Village House 2	836659	832511	PFS-01	Ventilation Fan / Lourve of the Enclosed Sewage Treatment	836945	832277	90	1	370	-59	-10	6	0	0	3	30	30	45
NSR 4	Village House 3	836792	832575	PFS-01	Ventilation Fan / Lourve of the Enclosed Sewage Treatment	836945	832277	90	1	335	-59	-10	6	0	0	3	30	30	45
NSR 5	Village House 4	837001	832489	PFS-01	Ventilation Fan / Lourve of the Enclosed Sewage Treatment	836945	832277	90	1	219	-55	0	6	0	0	3	44	44	45

Notes

- [1] Horizontal distance instead of slant distance has been adopted as the worst-case scenario.
- [2] A screening correction of -10dB(A) is applied for plants which their line of sight to the NSR is completely screened by buildings/structures;
- [3] Noise levels are rounded to the nearest dB(A).
- [4] A correction for tonality for 6 dB(A) is applied in the calculation as conservation approach.