

**S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12**

**PROPOSED REZONING FROM “R(C)” TO “G/IC”
FOR A PROPOSED “SOCIAL WELFARE FACILITIES”
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)**

**AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.**

**FURTHER INFORMATION (5)
August 2023**

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CONTENT

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**S12A AMENDMENT OF PLAN APPLICATION
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RESPONSE-TO-COMMENT – EPD

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**AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.**

**Proposed Rezoning From “R(C)” To “G/IC” for
a Proposed “Social Welfare Facilities” (Residential Care Homes for The Elderly) (RCHE)
Lot 4823 in D.D.104, 81 San Tam Road, San Tin, N.T.
S12A Application for Planning Application No. Y/YL-NTM/9
Response-to-Comment – EPD
(Updated 27 July 2023)**

Comments	Response
<p>1. Comments of the Director of Environmental Protection (DEP) as follows:</p> <p><u>EPD’s Comments on the revised EA (FI-4)</u></p> <p><u>Comments on air quality assessment</u></p> <p>1. Sections 2.1.1 and 2.3.1: Please conduct an updated site survey since the site survey was conducted about a year ago.</p> <p>2. Section 2.1.1 2nd bullet point and Table 2: Please note that the air quality monitoring data In Year 2022 are available now and please update the text and table.</p> <p>3. Section 2.1.1: Please revise the 2nd bullet point as “No air-sensitive uses including openable window, fresh air intake and recreational use in the open space is allowed within the buffer zone”. Similar amendment shall be applied to the legend in Figure 2.1.1.</p> <p>4. Section 2.4.1: Please delete “short-term” in lines 4-5.</p> <p>5. Section 2.4.1, last bullet point: Please revise to “No concurrent project in the surrounding area and hence adverse cumulative air quality impact during the construction stage is not anticipated.”</p> <p>6. Section 2.5.1</p> <p>(a) Please delete the 2nd bullet point since it is not related to air quality impact during operation stage.</p> <p>(b) 3rd bullet point, please provide the sewage treatment capacity of the on-site STP or other justifications (e.g. no. of bed spaces provided in the proposed RCHE) to further</p>	<p>Recent site visit on 24th July 2023 has been conducted. The observation is the same as 22nd June 2022. Date of recent site visit has been added to Section 2.1.1 and 2.3.1.</p> <p>Noted Section 2.1.1 2nd bullet point has been updated and the monitoring data of Year 2022 has been added in Table 2.</p> <p>Figure 2.1.1. and Bullet point of Section 2.2.1 has been revised.</p> <p>Noted and deleted accordingly.</p> <p>Noted and amend accordingly.</p> <p>(a) Deleted accordingly.</p> <p>(b) The Proposed Development only have a total 142 bed spaces (far below than 2000 population). The justification is stated in 2nd bullet point of Section 2.5.1. In addition, according to the STP</p>

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<p>justify the scale of the on-site STP is small.</p> <p>(c) 4th bullet point, please revise “or” to “and”.</p> <p>(d) 5th bullet point, please delete “ , or else odour treatment or masking facilities may be required”.</p> <p>(e) 6th bullet point, the specification of the deodorization unit including odour removal efficiency and the life time of the deodorization system could not be found in Appendix 2.2. Please supplement. If such information is not available, the consultant may consider to remove Appendix 2.2 and revise this bullet point by specifying the targeted odour removal efficiency (i.e. 99.5%) and provide source of reference (e.g. make reference to other STP with similar scale and odour removal efficiency from approved EIA reports/ AQIA, etc.) to support the targeted odour removal efficiency is achievable. Please also address if replacement of the deodorizer will be taken place annually since it is claimed that its service life is only 12 months.</p> <p>(f) Instead of providing the serving population size, please provide the sewage handling capacity of the on-site STP.</p> <p><u>Comments on Noise Impact Assessment</u></p> <p>1. The applicant will be required for submission of a detailed Noise Impact Assessment (NIA) report for the latest master layout plans (to demonstrate 100% compliance with</p>	<p>design calculation in Appendix 4.3, the treatment capacity of the on-site STP is 77.5 cu.m/day and serving 250 head/day.</p> <p>(e) Revised</p> <p>(d) Revised</p> <p>(e) The spec of deodorization unit is attached in Appendix 2.2. It is supplemented that replacement Of the deodorizing filter will be taken place annually.</p> <p>(f) The handling capacity is 77.5 cu.m/day as per calculation in Appendix 4.3.</p> <p>Noted.</p>

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Comments	Response
<p>the noise criteria under HKPSG) and the implementation of mitigation measure identified therein, to the satisfaction of the DEP/ LandsD under land lease mechanism.</p> <p>2. Section 3.3.2: Please document TD’s agreement on the traffic forecast data in the report once available. In case TD has no comment on the methodology for traffic forecast only, the consultant should provide written confirmation from the respective competent party (e.g. traffic consultant) that TD’s endorsed methodology has been strictly adopted in preparing the traffic forecast data, and hence the validity of traffic data can be confirmed.</p> <p><u>Comments on water quality impact</u></p> <p>1. Sections 4.2: The construction works are in close proximity to the watercourse, relevant mitigation measure from the ETWB TC (Works) No. 5/2005 shall be incorporated.</p> <p>2. Section 4.3</p> <p>(a) Please provide a high-resolution figure with indicating the WSRs in Appendix.</p> <p>(b) Various fishponds and watercourses are sited within the 500m assessment area, please specify rather identifying them by general nature.</p> <p>3. Sections 4.4 and 4.5:</p> <p>(a) For better presentation, please indicate the potential source of water quality impact and respective mitigation measures during construction and operation phases in separate sections.</p>	<p>Noted. Please refer to Appendix 7.1</p> <p>Noted and supplemented.</p> <p>(a) Noted and provided in Appendix 4.2.</p> <p>(b) ID from the fishponds have been provided. Also, with reference to the Geoinfo map or basemap, drainage channel and nullah have been also identified. Others are considered as water course. Given that our project scale is small and the major WSRs have been identified, we considered the levels of details are sufficient for current planning stage.</p> <p>(a) The headline of potential source and mitigation measures have been added for better presentation. Section 4.4 and 4.5 have been revised accordingly.</p>

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<p>(b) Please elaborate on the mitigation measures to be implemented rather citing the ProPRECC notes only or selectively quote certain measures.</p> <p>4. RtC comment 5</p> <p>(a) Appendix 4.1 is missing.</p> <p>(b) Please indicate the estimated population and staff, and the unit load factor.</p> <p>5. Sections 4.5 (last bullet point on page 26): Please elaborate the mitigation measures.</p> <p>6. On-site Tertiary STP</p> <p>(a) Please indicate the discharge point of the treated effluent.</p> <p>(b) The treated effluent discharge from construction and operational stages should be sited away from natural water course.</p> <p><u>Comments on landfill gas hazard assessment</u></p> <p>1. Table 4.3 of Section 4.2.1.2 of the LGHA report stated that landfill gas monitoring data in Ngau Tam Mei Landfill is from “October 2013 to September 2015”, and the source analysis was conducted based on the subject data as stated in Section 4.2.1.3. It is contrary to “.....Recent gas monitoring data from July 2020 to June 2022 provided by</p>	<p>(b) Noted and elaborated in Section 4.4.</p> <p>(a) Appendix 4.1 has been attached.</p> <p>(b) The estimated population staff and the unit load factor has been shown in Appendix 4.1 and 4.3.</p> <p>The regular cleaning and sweeping open paved road reduce the suspended solid or other unwanted pollutants or waste fall into the stormwater drain.</p> <p>The relevant bullet point of Section 4.5 has been revised.</p> <p>(a) The proposed discharge point is shown in Appendix 4.3.</p> <p>(b) Noted. The proposed discharge point is the drainage channel.</p> <p>In addition, statement of “The treated effluent discharge from construction and operational stages should be sited away from natural water course” has been supplemented in Section 4.5.</p> <p>Relevant content has been revised to from “July 2020 to June 2022”.</p>

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S12A Application for Planning Application No. Y/YL-NTM/9
Response-to-Comment – EPD
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Comments	Response
<p>EPD are attached in Appendix B” as stated in Section 3.4.1.1. Please review and correct inconsistency.</p> <p>2. Landfill gas hazard assessment report was found in the F1-4 but not include in the revised EA report. Please consider if it is more appropriate to include the LFGH as a section in the EA report.</p>	<p>Noted. Landfill gas hazard assessment is included following Section 5 of the EA report.</p>

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SAN TIN, N.T.**

REVISED ENVIRONMENTAL ASSESSMENT REPORT



**S12A Amendment of Plan Application,
Approved Ngau Tam Mei Outline Zoning Plan No.
S/YL-NTM/12
Proposed Rezoning from "R(C)" to "GIC" for a
Proposed "Social Welfare Facilities"
At Lot 4823 in DD 104, 81 San Tam Road, San Tin
Environmental Assessment Report**

3 August 2023

Ref No.: C220410W-01

Submitted to:

R LEE Architects (HK) Ltd
Unit 1601, 16/F Stelux House,
698 Prince Edward Road East,
San Po Kong, Kowloon

Prepared By:

NOVOX Limited

Phone: (852) 2690-9881
Fax: (852) 2600-4286
Address: Rm L, 7/F, Block II, 14-24 Au Pui Wan St, Fo Tan, N.T.
Email: info@novox.com.hk

Project:	Proposed Residential Care Home for Elderly at 81 San Tam Road, Yuen Long, N.T.				
Document No.:	C220410W-01				
Revision	Issue Date	Description	Author	Checker	Approver
A	08/07/2022	First Issue	PL	EN	BW
B	12/07/2022	Revised according to comment	PL	EN	BW
C	6/12/2022	Revised according to comment	PL	EN	BW
D	6/02/2023	Updated road traffic data	PL	EN	BW
E	12/05/2023	Revised according to comment	PL	EN	BW
F	24/05/2023	Include TD's reply	PL	EN	BW
G	03/08/2023	Revised according to DEP comment	PL	EN	BW

Approved by:



Banting Wong
MSc, CEng, MIOA,
MHKIQEP, MHKIOA, AFCHKRI, MHKIEIA

Disclaimer:

- This report is prepared and submitted by Novox Limited with all reasonable skill to the best of our knowledge, incorporating our Terms and Conditions and taking account of the resources devoted to it by agreement with the client.
- We disclaim any responsibility to the client and others in respect of any matters outside the project scope.
- This report is confidential to the client and we accept no responsibility of whatsoever nature to third parties to whom this report, or any part thereof, is made known. Any such party relies upon the report at their own risk.

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1 INTRODUCTION

1.1 BACKGROUND

Wonder Pacific Development Limited (the Applicant) intends to develop an 10-storey Residential Care Home for the Elderly (RCHE) (the Development) at Lot 4823 in D.D. 140 in 81 San Tam Road, San Tin (the Site).

For a proposed amendment to the approved Ngau Tam Mei Outline Zoning Plan No. S/YL-NTM/12, a planning application to the Town Planning Board (TPB) under Section 12A of the Town Planning Ordinance (TPO) is required for rezoning from “R(C)” zone to “G/IC” zone.

To satisfy the Section 12A planning application, Novox Ltd is commissioned to conduct an environmental assessment to evaluate the potential environmental impact based on the latest master layout plan.

1.2 THE PROJECT AREA

The Site area is approximately 736.3m² and it is located at Lot 4823 in D.D. 140 in 81 San Tam Road, as shown in **Appendix 1.1**. It locates within the R(C) zone of the OZP. The site is currently an existing House. The Proposed Development is an 10-storey RCHE which comprises a total 142 bed spaces. The anticipated year of construction completion and occupation is 2027.

The floor layout plans, and section diagrams of the Proposed Development are provided in the Planning Statement of the Planning Application.

1.3 OBJECTIVE AND SCOPE OF ENVIRONMENTAL ASSESSMENT

The key objectives of this EA are to identify environmental key issues and constraints of the project, to identify possible environmental impacts, to propose mitigation measures against any unacceptable environmental impacts during the construction and operation phases of the project, including

- Identify all sensitive receivers of the Proposed Development.
- Assess the potential air quality impact at the Proposed Development due to vehicular and any industrial emissions.
- Carry out a Noise Impact Assessment (NIA) during construction and operation of the RCHE Proposed Development.
- Assess the potential impact of water quality and waste management impact due to the Proposed Development.
- Recommend the necessary mitigation measures to alleviate any unacceptable impacts.

2 AIR QUALITY IMPACT ASSESSMENT

2.1 AIR QUALITY STANDARDS

The Air Pollution Control Ordinance (APCO) provides the statutory authority for controlling air pollutants from a variety of sources. The Hong Kong Air Quality Objectives (AQOs), which stipulate the statutory limits of air pollutants and the maximum allowable numbers of exceedance over specific periods should be met. With passage of Hong Kong's Air Quality Objectives (AQOs) in the Air Pollution Control Ordinance (Cap. 311), the latest AQOs as listed in Table 1 have been in effect.

Table 1 Hong Kong Air Quality Objectives

Pollutant	Averaging time	Concentration limit ^[1] ($\mu\text{g}/\text{m}^3$)	Allowable number of exceedances
Sulphur Dioxide (SO_2)	10-minute	500	3
	24-hour	50	3
Respirable Suspended Particulates (PM_{10}) ^[2]	24-hour	100	9
	Annual	50	Not Applicable
Fine Suspended Particulates ($\text{PM}_{2.5}$) ^[3]	24-hour	50	35
	Annual	25	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 (Pb)	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.

2.1.1 The Site Environment

The existing environment of the proposed development is primarily affected by the local traffic such as San Tin Highway and San Tam Road. A site visit was carried out on 22nd June 2022 and 24th July 2023 within 500m study area of the project, and no chimneys were observed within 200m from the Site boundary during the site visit. The Site is used an existing House of GFA 294.258 m^2 and a plot ratio of 0.4. The uses adjoining to the Site is a small mountain full of greenery to the east, village houses namely Maple Garden and Casa Paradizo with 3 storeys to the north, and the south of the Site. Far away to the west of the Site are scattered building structures surrounding primarily for uses including warehouses,

workshops and with several village houses. As such, local traffic is considered to be the dominant emission source affecting the ambient air quality in these areas.

There is currently an air quality monitoring station operated by Environmental Protection Department (EPD) located outside the Project Site, namely Yuen Long Monitoring Station (situated at Yuen Long District Office, 269 Castle Peak Road). Despite this, in terms of geographical location, this monitoring station is considered the closest to the proposed Project Site. The annual average of air pollutants in $\mu\text{g}/\text{m}^3$ monitored at this station for the year 2018-2022 are summarized in Table 2 below. In 2022, all measured parameters complied with the AQO except Ozone recorded non-compliance with the 8-hour AQO ($160 \mu\text{g}/\text{m}^3$ with allowance of 9 exceedances of AQO limit per year).

Table 2 EPD Air Quality Monitoring Record at Yuen Long Monitoring Station in 2018-2022

Pollutant	Averaging Time	Conc. Limits ($\mu\text{g}/\text{m}^3$)	No. of Exceedances Allowed	Concentrations ($\mu\text{g}/\text{m}^3$) [1]					Remarks
				2018	2019	2020	2021	2022	
PM ₁₀	24-hour	100	9	75	83	77	73	56	10th highest conc.
	Annual	50	Not Applicable	37	37	30	30	25	/
PM _{2.5}	24-hour	50	35	34	34	28	31	30	36th highest conc.
	Annual	25	Not Applicable	20	20	16	17	16	/
NO ₂	1-hour	200	18	150	161	135	148	122	19th highest conc.
	Annual	40	Not Applicable	43	44	32	40	37	/
SO ₂	10-minute	500	3	52	42	26	24	21	4th highest conc.
	24-hour	50	3	17	11	10	14	7	4th highest conc.
CO	1-hour	30,000	0	1,720	2,150	1,530	2,090	1,700	1st highest conc.
	8-hour ^[2]	10,000	0	1,574	1,903	1,279	1,591	1,519	1st highest conc.

O ₃	8-hour ^[2]	160	9	162	200	154	178	194	10th highest conc.
Note: [1] Bolded concentrations indicate exceedance of the air quality objectives									

2.1.2 Representative Air Quality Sensitive Receivers (ASRs)

All the residential units within the proposed development are identified as sensitive receivers for air quality impact assessment. **Appendix 2.1** shows the locations of Representative ASRs of proposed RCHE development.

2.1.3 Hong Kong Planning Standards and Guidelines (HKPSG)

According to Chapter 9, Environment of the Hong Kong Planning Standard and Guidelines (HKPSG), adequate buffer distance or screening should be provided between sensitive receptors and potential air pollution emitters. For roads that are distinguished as local distributor and truck road for active and passive recreational uses, the buffer distance must be greater than 5m and 20m respectively as shown in Table 3 below.

Table 3 Guidelines on Usage of Open Space Site

Pollution Source	Parameter	Buffer Distance	Permitted Uses
Road and Highways	<i>Type of Road</i>		
	Trunk Road and Primary Distributor	>20m	Active and passive recreation 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	

2.2 OPERATIONAL VECHICULAR EMISSION SOURCES

2.2.1 Evaluation of Air Quality Impact

The development may be subject to vehicular emission impact from roads nearby during the operational phase of the project. According to the Annual Traffic Census 2021 published by

the Transport Department (TD), San Tam Road is classified as a rural road and San Tin Highway is classified as a trunk road. With a view to achieving a better air quality environment, the project proponent proposed to incorporate a separation distance of more than 20m and more than 5m between the sensitive uses of this Project and from the road kerb of the San Tin Highway and San Tam Road, respectively, which satisfies the buffer distance requirement for active and passive recreation uses according to Chapter 9, Environment of the Hong Kong Planning Standard and Guidelines (HKPSG) as shown in Section 2.1.3. No adverse vehicular emission impact is anticipated upon incorporation of the relevant buffer distance stipulated under the HKPSG into the layout design. The buffer distance between the said roads and the proposed RCHE development is shown in **Appendix 2.1**. In order to avoid adverse air quality impact from the traffic emission, a buffer zone is recommended for the Proposed Development with the following requirements:

- No air-sensitive uses including openable window, fresh air intake and recreational uses in open space is allowed within buffer zones.
- With the provision of the buffer zone, the buffer distances recommended in HKPSG will be satisfied. Therefore, no adverse air quality impact on the Site from traffic emission is anticipated.

2.3 OPERATIONAL INDUSTRIAL EMISSION SOURCES

2.3.1 Evaluation of Air Quality Impact

As discussed in Section 2.1.1, it has confirmed in a site visit carried out on 22 June 2022 and 24th July 2023 within 200m study area of the project, that no chimneys were observed within 200m from the Site boundary during the site visit. The uses adjoining to the Site is a small mountain full of greenery to the east, village houses namely Maple Garden and Casa Paradizo with 3 storeys to the north, and the south of the Site. To the west of the Site are scattered building structures surrounding primarily for uses including warehouses, workshops and with several village houses. It is confirmed that there is no air and odour emission sources in 200m study area by site survey. As such, local traffic is considered to be the dominant emission source affecting the ambient air quality in these areas. Thus, no adverse air quality impact to the proposed RCHE development due to industrial source emissions is anticipated.

2.4 CONSTRUCTION DUST EMISSION SOURCES

2.4.1 Evaluation of Air Quality Impact

The potential air quality impacts include the dust and exhaust emissions arising from the construction (e.g., demolition, site formation, foundation and formworks etc.). The nearest ASRs are Casa Paradizo Block C (i.e. 22m between the Site and ASR) and Maple Garden Block G3 (i.e. 51m between the Site and ASR). This may cause air quality (i.e., dust) impacts on the surrounding air sensitive receivers. (Figure 2.1.2 refers)

However, the Project Site Area is only about 736m² which is a very small footprint. Considering the size of site formation and excavation is in a small scale, the amount of excavated material and number of dump truck would be limited. No significant dust impact

from the construction works is anticipated.

In order to further minimize the potential dust emissions and for good site practice, relevant mitigation measures under the Air Pollution Control (Construction Dust) Regulation would be incorporated in the relevant works contracts.

- Good practice and mitigation measures to be implemented during the construction phase are as follows:
- Regular watering to reduce dust emissions from exposed site surfaces and unpaved roads, particularly during dry weather.
- Frequent watering for particularly dusty areas and areas close to ASRs.
- Open stockpiles shall be avoided or covered. Where possible, prevent placing dusty material storage piles near ASRs.
- Side enclosure and covering of any aggregate or dusty material storage piles to reduce emissions. Where this is not practicable owing to frequent usage, watering shall be applied to aggregate fines.
- Tarpaulin covering of all dusty vehicle loads transported to and from the Site.
- Establishment and use of vehicle wheel and body washing facilities at the exit points of the Site.
- Use of water sprinklers at the loading area where dust generation is likely during the loading process of loose material, particularly in dry weather.
- Provision of not less than 2.4m high hoarding from ground level along site boundary where adjoins a road, streets or other accessible to the public except for a site entrance or exit.
- Imposition of speed controls for vehicles within the Site.
- Where possible, routing of vehicles and positioning of construction plant should be at the maximum possible distance from off-site ASRs.
- Every stock of more than 20 bags of cement or dry Pulverised Fuel Ash (PFA) should be covered entirely by impervious sheeting or placed in an area sheltered on the top and the 3 sides.
- Electric power supply shall be provided for on-site machinery as far as practicable to minimize aerial emissions.

It is also suggested that the contractor should set up a communication channel (e.g. regular meeting) with the management office of Casa Paradizo to have a better dust control management, if necessary. With implementation of the recommended mitigation measures, no adverse air quality impacts during construction are anticipated.

No concurrent project in the surrounding area and hence adverse cumulative air quality impact during the construction stage is not anticipated.

2.5 OPERATION AIR QUALITY IMPACT

2.5.1 Evaluation of Air Quality Impact

Odour Impact from the proposed on-site STP

The proposed on-site Sewage Treatment Plant (STP) with sewage treatment capacity storage time greater than 60 days is a potential source of odour impact to residents and the public in the vicinity during operation phase. The Proposed Development only have a total 142 bed spaces (far below than 2000 population). In addition, according to the STP design calculation in Appendix 4.3, the treatment capacity of the on-site STP is 77.5cu.m/day and serving 250head/Day.

Hence, EPD's Guidelines for the Design of Small Sewage Treatment Plant shall be followed for the STP as follows:

The STP should be sited with good buffering distance from houses, and enclosed to minimize adverse impact.

Ventilation exhaust pipes should be taken to roof level.

In order to reduce the odour nuisance from STP, a deodorization adsorption system (as shown in **Appendix 2.2**) is proposed to install for removal of odour from generated sources, which included a FRP vessel with activated carbon media, pre-filter, post-filter and dehumidifier. The deodorization adsorption system will have minimum odour removal efficiency of 99.5% at 5ppm H₂S concentration. The deodorization adsorption system will have minimum service life for 12 months continuous operation for 5ppm H₂S loading. Replacement of the deodorizing filter will be taken place annually. Sufficient adsorption capacity of activated carbon will be installed. The odour removal air from the outlet of deodorization adsorption system will be exhausted through the air duct to high level. In addition, a wet sludge transfer pipe will be installed to draw wet sludge from the sludge holding tank at STP to the collection point adjacent to the entrance of development in fully close system for tanker collection of washing sludge to dispose to Government sewage treatment plant. It will be eliminated outdoor release during wet sludge disposal service.

The tentative location of the STP exhaust has been designed as far as possible all nearby ASRs. Considering that at source mitigation measures (e.g. deodorization adsorption system) would be applied, no adverse odour impact from the proposed on-site STP is anticipated.

Cooking Fume/odour from the proposed kitchen.

Kitchen will be provided at the Proposed Project. Oily fume and cooking odour emissions will potentially arising from the kitchen. In order to minimise the potential oily fume and odour emissions from the canteen/kitchen, the following considerations of positioning the exhaust outlets of the kitchen as recommended in the Control of Oil Fume and Cooling Odour from Restaurants and Food Business published by the Environmental Protection Department (EPD) shall be considered during the detailed design stage:

- locate the outlets at such a place where the ventilation is good and the emissions from them can be adequately dispersed without hindrance.
- provide sufficient separate distance from any sensitive receptor in the vicinity so that the emissions will not cause, or contribute to, an odour nuisance or other type of air pollution to the public.
- ensure the emission from the exhaust system will be directed vertically upwards, unless it can be demonstrated by an environmental professional that other direction is more advantageous in preventing the emission from causing air pollution problems.
- ensure the emission from the exhaust system will not be restricted or deflected by, for example, the use of plates or caps.

In order to minimise the impact of oily fume and cooking odour, the Applicant is committed to install a grease filter (as shown in **Appendix 2.3**) to control oily fume and cooking odour. Operation and maintenance of the exhaust system as well as the air pollution control equipment should be carried out by competent staff with sufficient training and relevant skills, and should be done in accordance with the manufacturer's specifications and specified procedures. To ensure proper performance, qualified professionals should be employed to undertake regular monitoring, inspection, cleaning and maintenance of components.

The tentative location of the Kitchen exhaust has been designed as far as possible all nearby ASRs. Considering that at source mitigation measure (e.g. grease filter) would be applied, no adverse odour impact from the proposed kitchen is anticipated.

3 NOISE IMPACT ASSESSMENT

3.1 NOISE ENVIRONMENT

3.1.1 The Site Environment

The Subject Site is surrounded by mainly low-rise residential development, including Maple Garden and Casa Paradizo. San Tin Highway is located near the western side of the development nearby which will generate road traffic noise impact. There exists operation for sales of building materials with open storage to the west as observed in onsite survey. No existing noise sources are operating at night time.

3.1.2 Representative Noise Sensitive Receivers (NSRs)

All the residential units within the proposed development are identified as sensitive receivers for noise impact assessment. Representative Noise Sensitive Receivers (NSRs) at each flat was selected for the quantitative traffic noise impact assessment, their locations and room sizes are shown in **Appendix 3.1**. The assessment points include all openable windows in habitable rooms such as living rooms and bedrooms. Windows in noise tolerance spaces such as toilets, bathroom and staircases are excluded.

There is no diagnostic rooms / wards in the proposed RCHE development. The Multi-Function Areas will not rely on operable window for ventilation.

The assessment points have been taken to be situated at 1.2 m above floor slabs and at 1 m away from the external facade of openable windows of habitable room of the flats.

3.2 ENVIRONMENTAL LEGISLATION AND STANDARDS

3.2.1 Road Traffic Noise Assessment Criteria

Noise standards are recommended in the *Hong Kong Planning Standards and Guidelines* (HKPSG) for planning against noise impact from road traffic. As stated in Table 4.1 of Chapter 9 of HKPSG, the criterion for road traffic noise impact on domestic premises (habitable rooms) is $L_{10}(1\text{-hour}) 70\text{dB(A)}$. This criterion applies to uses which rely on openable windows for ventilation.

3.2.2 Fixed Noise Sources Assessment Criteria

Impacts of fixed noise sources within the Proposed Development on nearby noise sensitive buildings is governed by the Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM) issued under the Noise Control Ordinance (“NCO”) and sections of Chapter 9 of HKPSG.

In setting the ANL, reference has to be made to the Area Sensitive Rating (“ASR”) in Table 1 of IND-TM reflecting the type of area where the noise sensitive receivers (“NSRs”) are situated. The proposed development and surrounding existing residential developments are considered low density residential area. Future noise sensitive uses of the proposed

development are expected to be directly affected by San Tin Highway with Annual Average Daily Traffic (“AADT”) in excess of 30,000 (i.e. influencing factor, IF). An ASR of “C” is considered representative of the noise sensitive uses. For NSRs without direct line of sight to San Tin Highway, An ASR of “B” is adopted. ANL and operation noise criteria for different Area Sensitivity Ratings (ASRs) are summarized in **Table 3-1** and **Table 3-2**.

According to the HKPSG, the level of the intruding noise at the façade of the nearest sensitive use should be at least 5 dB(A) below the appropriate ANL shown in the IND-TM or, in the case of the background being 5 dB(A) lower than the Acceptable Noise Level (ANL), the predicted noise level should not exceed the background.

Background noise level in terms of L₉₀(1-hr) will be measured onsite by future contractor so that it can be adopted for determining necessary noise mitigation measures to meet the requirement. Regarding the identified existing NSR discussed above, it is close to and directly affected by road traffic along San Tin Highway so that the background noise level is more likely to be higher than ANL-5.

Table 3-1 Area Sensitivity Rating (ASR)

Type of Area Containing NSR \ Degree to which NSR is affected by IF	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

Table 3-2 Acceptable Noise Levels (ANLs)

Time Period \ 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

Remarks:

- 1) Prevailing background noise level to be measured by future contractor. Prevailing background noise level or ANL-5 will be finally adopted.

3.2.3 Construction Noise Assessment Criteria

The main piece of legislation controlling environmental noise nuisance impact is the *Noise Control Ordinance (NCO)*. The NCO enables regulations and Technical Memoranda (TM) to be made, which introduce detailed control criteria, measurement procedures and other

technical matters.

Construction noise is governed under the following TMs:

- Technical Memorandum on Noise from Percussive Piling (PP-TM).
- Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM).
- Technical Memorandum on Noise from Construction Work in Designated Areas (DA-TM).

During “Restricted Hours”, defined as 7pm to 7am from Monday to Saturday and all day on public holidays, the construction contractor must apply for and receive a Construction Noise Permit (CNP) from EPD for percussive piling (at any time) or any other construction activities conducted. While there is no planned construction works to be carried out during the restricted hours, the relevant TMs should be followed in case there is any need to carry out works in such time period in future.

3.3 ROAD TRAFFIC NOISE ASSESSMENT

3.3.1 Assessment Model

The U.K. Department of Transport’s procedure “*Calculation of Road Traffic Noise*” (CRTN) is used to predict the hourly L_{10} (1-hour) noise levels generated from road traffic at selected representative NSRs using proprietary noise prediction software CadnaA. Road traffic noise impacts on various floor levels on the respective residential blocks/houses have been predicted. Practicable environmental mitigation measures will be recommended where necessary. The predicted noise levels are compared with the relevant HKPSG noise standards (i.e. L_{10} (1-hour) 70dB(A)).

The assessment methodology was implemented using noise prediction software CadnaA, which is a graphically based computer programs in full compliance with the noise prediction methodologies as set out in CRTN.

This proprietary modeling software is capable of simulating various road traffic conditions, road conditions and the form of noise mitigation measures. All the topographic effect, distance information, view angle information, shielding effects, ground absorption and façade reflection can be accurately illustrated and computed.

Topographic barrier including surrounding building structures, retaining walls, and natural terrains etc. all provide screening or reflection effect to the noise source. This information is retrieved from the latest digital map data provided by Lands Department and digitized in the road traffic noise model.

For the propagation of noise, a worst-case hard ground as defined in CRTN was assumed throughout the Study Area.

A +2.5dB(A) correction for façade reflection was applied at receptor locations in accordance with CRTN.

3.3.2 Traffic Flow Data

The road layout defines the road width, opposing traffic lane separation, road surface type, traffic mix, traffic flow and design speed. For the purpose of this road traffic noise impact assessment, traffic flows have been forecasted for all major roads within 300m of the proposed development. The road network was divided into discrete segments, each of which was assigned a segment number.

The proposed development is scheduled for construction completion and operation in year 2027. Traffic forecast for year 2042 representing the worst situation within 15 years from the operation of the residential care home is provided by project traffic consultant and included in **Table 3-3**. The traffic forecast was conducted by the Project's traffic consultant and agreed with Transport Department (TD) and Planning Department (PlanD) as shown in **Appendix 7.1**.

Table 3-3 Year 2042 Traffic Forecast for Noise Impact Assessment

Road ID.	Road Name	Direction	Road Surface	Road Speed [km/h]	AM Peak		PM Peak	
					Traffic Flows [veh/hr]	% of HV *1	Traffic Flows [veh/hr]	% of HV *1
A	Geranium Path	Two-way	Impervious	50	30	10%	30	10%
B	Royal Palms Boulevar	Two-way	Impervious	50	580	10%	564	10%
C1	Castle Peak Road - Mai Po	NB	Impervious	50	770	34%	690	30%
C2	Castle Peak Road - Mai Po	SB	Impervious	50	1185	34%	640	23%
D1	Castle Peak Road - Mai Po	NB	Impervious	50	940	25%	900	19%
D2	Castle Peak Road - Mai Po	SB	Impervious	50	1490	20%	790	18%
E1	Castle Peak Road - Mai Po	NB	Impervious	50	915	23%	870	17%
E2	Castle Peak Road - Mai Po	SB	Impervious	50	1515	21%	815	20%
F1	San Tin Highway	NB	Pervious	100	4700	26%	4030	25%
F2	San Tin Highway	SB	Pervious	100	4815	30%	5025	20%
G1	San Tam Road	NB	Impervious	50	740	17%	595	10%
G2	San Tam Road	SB	Impervious	50	950	22%	650	20%
H1	San Tam Road	NB	Impervious	50	700	15%	670	10%
H2	San Tam Road	SB	Impervious	50	1005	20%	585	20%
I1	San Tam Road	NB	Impervious	50	685	15%	665	10%
I2	San Tam Road	SB	Impervious	50	1005	20%	585	20%
J	Access Road	Two-way	Impervious	50	25	10%	30	10%
K	Maple Gardens 5th Street	Two-way	Impervious	50	30	10%	30	10%
L	Maple Gardens 4th Street	Two-way	Impervious	50	30	10%	30	10%
M	Maple Gardens 6th Street	Two-way	Impervious	50	30	10%	30	10%

N	Maple Gardens 6th Street	Two-way	Impervious	50	30	10%	30	10%
O	Maple Gardens 6th Street	Two-way	Impervious	50	30	10%	30	10%
P	Maple Gardens 5th Street	One-way	Impervious	8	30	10%	30	10%
Q	Access Road	Two-way	Impervious	50	55	10%	55	10%
R	Access Road	Two-way	Impervious	50	55	10%	55	10%

Remarks:

- 1) HV includes Light Van, Public Light Bus, Light Goods Vehicle, Medium Goods Vehicle, Heavy Goods Vehicle and Container/Tractor, Coach and Bus.

3.3.3 Road Surface Conditions

The CRTN modelling method uses emission level adjustments to take into account the influence of various road surfaces and gradients on noise emission level. A -1dB correction to the basic road source noise level is applied to impervious road surface with traffic speed below 75km/hr, and -3.5dB correction to the basic road source noise level for pervious road surface.

3.3.4 Road Traffic Noise Impact for Baseline Scenario

Quantitative road traffic noise impact assessment has been carried out and compared against the criterion. Noise levels were calculated for the baseline scenario without noise mitigation in place. Predicted maximum traffic noise levels for each assessment point are shown in table below. The detailed noise model and contour map are shown in **Appendix 3.1** for reference. The assessment is based on conservation assumption of hard reflecting ground surface over the entire Study Area.

In the baseline scenario the building layout and orientation has been duly considered with respect to traffic noise impact. Whereas practicable, the housing units are oriented away from major roads. Noise tolerant facades are used for self-screening. Notwithstanding the above, there is still slight noise exceedance. Noise mitigation measures are necessary.

Table 3-4 Predicted Road Traffic Noise Impact for Unmitigated Scenario

Window ID	Predicted Noise Level						Noise Criteria, dBA
	L _{10, 1 hour} , dBA						
	2/F	3/F	4/F	5/F	6/F	7/F	
W01	77.8	76.7	76.7	76.8	76.8	76.9	70
W02	76.7	76.9	77.0	77.0	77.1	77.1	70
W03	76.9	76.8	76.9	76.9	77.0	77.0	70
W04	76.9	76.6	76.6	76.7	76.8	76.9	70
W05	76.8	63.9	64.8	66.0	67.2	68.3	70
W06	76.6	54.5	54.8	55.2	56.1	57.7	70
W07	57.2	54.0	54.2	54.6	55.6	57.3	70
W08	53.9	57.9	58.5	58.7	59.2	60.1	70

W09	52.9	64.8	66.6	66.9	67.0	67.2	70
W10	53.3	69.3	71.8	72.1	72.2	72.2	70
W11	54.8	72.4	75.3	75.9	76.0	75.9	70
W12	59.2	69.6	73.4	74.2	74.3	74.3	70
W13	62.0	68.1	72.4	73.3	73.4	73.5	70
W14	63.9		71.4	72.4	72.5	72.6	70
W15	62.0		71.0	72.2	72.4	72.4	70
W16	60.8		71.2	71.5	71.6	71.6	70
W17	59.5		67.3	67.3	67.4	67.6	70
W18			68.7	68.8	68.9	69.0	70
W19			68.7	68.8	68.9	69.0	70
W20			68.7	68.7	68.8	69.0	70

Remarks:

	North Façade
	East Façade
	Void in South Façade

3.3.5 Road Traffic Noise Impact for Mitigated Scenario

Practicable noise mitigation noise measures have been incorporated in the building layout design, in accordance with Practice Note on Application of Innovative Noise Mitigation Designs in Planning Private Residential Developments against Road Traffic Noise Impact (PN_INMD), including:

At the northern façade, vertical architectural fin is provided. The fin extends 1.7m from the building façade.

At the eastern façade, a vertical architectural fin is provided at the southeast corners. The fin extends 1.5m from the building façade.

At the southern façade, NSRs are located within a building void with self noise screening. Yet there are still some NSRs having direct line of sight towards San Tin Highway, thus a vertical architectural fin is provided at entrance towards the building void to block the line of sight. The fin extends 0.9m from the building façade.

The maximum noise reductions by architectural fins are capped at 3dB for conservatism. For receivers with still having residual noise impact with the above architectural fins in place, acoustic window will be provided. An additional window layer is introduced to the conventional side-hung window in a staggering position. The outer window is a conventional push-pull type window whilst the inner one consists of a half-size sliding window. Making reference to PN_INMD, the proposed acoustic window configuration can offer an additional traffic noise reduction of 6dB(A). In detail design stage, mock-up test will be conducted to demonstrate that adequate noise reduction will be achieved.

Sound absorption material is proposed on the back side of architectural fin. Additional SAM are proposed at the entrance to the void area, as indicated in Figure 3.1.6 and 3.1.7. The proposed SAM would be in the form of 50mm thick rockwool covered in waterproof acoustic transparent member and perforated panel.

The location and details of mitigation measures are illustrated in **Appendix 3.1**.

With the above mitigation measures in place, predicted maximum traffic noise levels for each assessment point are shown below. Since all the noise assessment points comply with the HKPSG noise standard, the residual noise impact is considered to be satisfactory.

Table 3-5 Predicted Road Traffic Noise Impact for Mitigated Scenario

Window ID	Predicted Noise Level						Noise Criteria, dBA
	L _{10, 1 hour} , dBA						
	2/F	3/F	4/F	5/F	6/F	7/F	
W01	<u>68.8</u>	<u>67.8</u>	<u>67.8</u>	<u>67.8</u>	<u>67.9</u>	<u>68.0</u>	70
W02	<u>67.8</u>	<u>68.0</u>	<u>68.1</u>	<u>68.1</u>	<u>68.2</u>	<u>68.4</u>	70
W03	<u>68.3</u>	<u>69.6</u>	<u>69.7</u>	<u>69.8</u>	<u>69.9</u>	<u>70.0</u>	70
W04	<u>69.0</u>	<u>69.8</u>	<u>69.8</u>	<u>69.9</u>	<u>70.0</u>	<u>70.0</u>	70
W05	<u>69.7</u>	63.0	63.8	65.2	66.6	67.8	70
W06	<u>69.8</u>	52.7	52.7	53.0	54.3	56.5	70
W07	56.4	52.3	52.3	52.6	54.0	56.3	70
W08	53.2	55.4	56.0	56.2	56.6	57.4	70
W09	52.4	62.4	64.1	64.3	64.4	64.6	70
W10	52.2	66.6	69.0	69.3	69.4	69.5	70
W11	52.2	<u>64.8</u>	<u>68.5</u>	<u>69.2</u>	<u>69.3</u>	<u>69.3</u>	70
W12	56.7	69.1	<u>66.7</u>	<u>67.4</u>	<u>67.5</u>	<u>67.5</u>	70
W13	59.3	65.6	<u>65.7</u>	<u>66.5</u>	<u>66.6</u>	<u>66.7</u>	70
W14	63.2		<u>64.7</u>	<u>65.5</u>	<u>65.7</u>	<u>65.7</u>	70
W15	60.4		<u>64.3</u>	<u>65.3</u>	<u>65.5</u>	<u>65.5</u>	70
W16	58.2		69.9	<u>64.1</u>	<u>64.2</u>	<u>64.3</u>	70
W17	56.9		64.6	64.7	64.8	64.9	70
W18			66.2	66.3	66.4	66.7	70
W19			66.1	66.2	66.3	66.4	70
W20			66.0	66.1	66.2	66.3	70

Remarks:

- Noise reduction by acoustic fin is capped at 3dB(A) for conservatism.

North Façade

	<i>East Façade</i>
	<i>Void in South Façade</i>
<u>68.8</u>	<i>Underlined cells indicate façades with acoustic windows</i>

3.4 FIXED SOURCE NOISE ASSESSMENT

3.4.1 Assessment Model

Standard acoustical principles in accordance with “ISO 9613-2:1996 Acoustics — Attenuation of sound during propagation outdoors — Part 2: General method of calculation” will be adopted for prediction of fixed noise impact. The general equation used to calculate the equivalent continuous sound pressure level at a receiver location arising from each individual noise source is described below:

$$L_{eq} = L_w + D_c - A_{div} - A_{atm} - A_{gr} - A_{bar} - A_{misc}$$

Where

L_w is the sound power level of the noise source;

D_c is the directivity factor of the noise source;

A_{div} is the attenuation due to geometrical divergence;

A_{atm} is the attenuation due to atmospheric absorption;

A_{gr} is the attenuation due to ground effect;

A_{bar} is the attenuation due to barrier;

A_{misc} is the attenuation due to miscellaneous other effects.

The prediction methodology described in ISO 9631-2 is implemented via noise prediction software CadnaA. A 3D model was constructed taking into account the topology and site layout plan. CadnaA is proprietary software for noise mapping of road traffic, railway as well as fixed industrial plants, etc. It has been used for city-scale Strategic Noise Mapping in Europe according to the EC Directive 2002/49/EC, the reliability has been well verified and accepted.

Topographic barrier including surrounding buildings, retaining walls, and natural terrains etc. all provide screening effect to the noise source. This information is retrieved from the latest digital map data provided by Lands Department.

The noise barriers within the proposed development include self-screening by noise tolerant building blocks and architectural fins. These barriers are constructed in the 3D model based on latest master layout plan. For calculation of barrier screening effect, maximum insertion loss is capped at 20dB for single barrier, 25dB for double barrier, according to ISO 9613.

For the propagation of noise, a worst-case hard ground was assumed throughout the Study Area. No ground attenuation effect is applied.

A +3.0dB(A) correction for façade reflection was applied at receptor locations.

3.4.2 Identified Existing Fixed Noise Sources

Site survey has been conducted on 22 June 2022 to identify any presence of industrial/fixed noisy facilities/activities. There exists operation for sales of building materials with open storage to the west as observed in onsite survey.

According to the onsite survey, there is no noticeable noise observed from open storage. The noise environment is dominated by road traffic, apparently from San Tin Highway.

To summarise, potential fixed/industrial noise sources were identified to the west of the Subject Site. Particulars of the identified fixed noise sources are presented below. No existing noise sources are operating at night time. The location of the noise sources are taken at nearest workshop areas where forklift, cranes and saw cuts would normally operate.

Table 3-6 Identified Fixed Noise Sources for Noise Impact Assessment

ID	Source Description	Source Location		Assumed SWL, dB(A)	Operation?		Reference
		Easting	Northing		0700-2300	2300-0700	
S1	盈豐倉庫 (Storage)	22.48355	114.05799	92	Y	N	Transitional Housing Development at Lots 111 (Part), 116 to 119 in D.D. 108 and Adjoining Government Land, Fan Kam Road, Pat Heung, N.T. - Environmental Assessment
S2	松輝木業公司 (Industrial)	22.48313	114.05794	92	Y	N	Transitional Housing Development at Lots 111 (Part), 116 to 119 in D.D. 108 and Adjoining Government Land, Fan Kam Road, Pat Heung, N.T. - Environmental Assessment

3.4.3 Identified Fixed Noise Source Generated by the Project

Planned fixed noise sources within the Proposed RCHE Development are identified as shown in **Appendix 3.2**

Among the identified sources, the dominate sources are two nos. of cooling towers located on the open rooftop having direct line of sight to NSRs. The noise may potentially affect Casa Paradizo and Maple Garden in the close proximity.

Most of the Mechanical and Electrical (M&E) equipment, such as chiller, water pumps, lift machines, etc. will be installed in enclosed plant rooms of the Proposed RCHE Development. Transformers and Sewage Treatment Plant will be located in the basement level and placed inside enclosed structure. The guidance of “Good Practices on Ventilation System Noise Control” and “Good Practices on Pumping System Noise Control” issued from EPD shall be referred to. Appropriate mitigation measures, where necessary, shall be provided to comply with the noise criteria.

Small power rating split type air conditioning systems will be installed for individual room. However, the noise impact of those small power rating outdoor units shall be minimal, and the contribution is hence not considered in the noise impact assessment.

3.4.4 Allowable Sound Power Level

At this stage the cooling towers for the project had not been confirmed as which shall be designed in future by the design and build contractor. As such the maximum allowable sound power level will be determined by back calculation from the separation distance between the noise source and nearby representative nearest noise sensitive receivers are given in table below.

A catalogue of low noise type cooling towers as shown in **Appendix 3.2** for reference. The Sound Power Level (SWL) of this cooling tower model is 93dB which is adopted in the noise model. The sound power level and noise mitigation requirements will be stipulated in the project contractor specification governing the equipment selection by the design and build contractor.

Table 3-7 Proposed Fixed Source Noise Mitigation Treatment

Noise Sources	Allowable SWL	Noise Mitigation Description (refer to Appendix 3.2)
Cooling Tower (Intake)	73 dB(A)	- Low noise type cooling tower - Intake silencer with IL of 20dB(A), the silencer is typically 900 to 1200 long subject to supplier model selection
Cooling Tower (Discharge)	93 dB(A)	- Low noise type cooling tower - No silencer to be provided since fan noise is directed upward in the open rooftop and not affecting low rise residential premises

3.4.5 Fixed Plant Noise Assessment Results

Based on the allowable SWL and two cooling towers in full load operation, the noise impact at the worst affected façade at nearby representative NSRs are tabulated below.

Table 3-8 Predicted Fixed Source Noise Impact to Surroundings

ID	NSR	Predicted Noise Level at Worst Façade, dB(A)	Nighttime Noise Criteria, ANL-5 dB(A)
N01	Maple Garden G3	34.8	55
N02	Casa Paradizo A18	32.4	55
N03	Casa Paradizo C7	39.7	50

As such, provided the fixed plant noise generation at the cooling tower does not exceed the allowable SWL, fixed plant noise impact towards the affected NSRs will not exceed the noise criteria stipulated in the HKPSG.

3.4.6 Fixed Plant Noise Assessment Results

There are also existing industrial fixed noise sources operating during daytime. The cumulative fixed noise impact is included in the fixed noise impact assessment for compliance check. Fixed plant noise impact towards the affected NSRs will not exceed the ANL noise criteria.

Table 3-9 Predicted Cumulative Fixed Source Noise Impact

ID	NSR	Predicted Noise Level at Worst Façade dB(A)			Day & Evening Criteria, ANL dB(A)
		Planned Fixed Plant Noise	Existing Fixed Plant Noise	Cumulative Noise	
N01	Maple Garden G3	34.8	47.2	47.4	70
N02	Casa Paradizo A18	32.4	49.0	49.1	70
N03	Casa Paradizo C7	39.7	37.9	41.9	65

3.5 CONSTRUCTION NOISE IMPACT

Various construction activities will be the key noise sources generated during the construction phase. In particular, the use of PME and the vehicle movement within the Site are the major potential noise sources. Construction shall be carried out during non-restricted hours as far as practicable. The mitigation measures recommended in ProPECC PN2/93 should be implemented where applicable. In addition, the following measures and on-site practice are recommended in order to minimize the potential construction noise impacts during daytime:

- Quiet PME and construction method should be adopted if possible.
- The Contractor shall devise and execute working methods to minimise the noise impacts on the surrounding sensitive uses, and provide experienced personnel with suitable training to ensure that those methods are implemented.
- Switch off idling equipment.
- Regular maintenance of equipment.
- Fit muffler or silencer for equipment.
- Noisy equipment and noisy activities should be located as far away from the NSRs as is practical.
- Use quiet construction method, e.g. use saw-cut or hydraulic crusher instead of excavator mounted percussive breaker.
- PME should be kept to a minimum and the parallel use of noisy equipment / machineries should be avoided.
- Erect noise barriers or noise enclosure for the PME if appropriate.

- Implement good house-keeping and provide regular maintenance to the PME.
- Spot check resultant noise levels at nearby NSRs.

If construction work involving use of PME will be required during restricted hours, a CNP shall be applied for under the NCO. The noise criteria and assessment procedures for obtaining a CNP are specified in GW-TM.

With the implementation of the abovementioned mitigation measures, adverse construction noise impact is not anticipated.

4 WATER QUALITY IMPACT ASSESSMENT

4.1 INTRODUCTION

This section reviews the water quality impacts from the Project. The potential environmental impacts from construction effluent generated by the proposed works and operation of the proposed residential home for elderly are assessed. Standards, guidelines and legislation, recommended mitigation measures and the disposal strategy are reviewed.

4.2 LEGISLATIONS, STANDARDS AND GUIDELINES

The following relevant Hong Kong legislations/guidelines governing water pollution control have been referenced in carrying out the assessment:

- Environmental Impact Assessment Ordinance and EIAO-TM (Annex 6 and 14);
- Water Pollution Control Ordinance (WPCO) (Cap. 358) (as amended by the Water Pollution Control (Amendment) Ordinance 1990 and 1993);
- Water Pollution Control (General) Regulations (as amended by the Water Pollution Control (General) (Amendment) Regulations 1990 and 1994);
- Water Pollution Control (Sewerage) Regulation;
- Water Quality Objectives (WQOs) for relevant Water Control Zones (WCZs);
- Practice Note for Professional Persons ProPECC Note PN1/94, Construction Site Drainage; and
- Practice Note for Professional Persons ProPECC Note PN 5/93, Drainage Plans subject to Comment by the Environmental Protection Department.
- ETWB TC(W) No. 5/2005 “Protection of Natural Streams/Rivers from Adverse Impacts Arising from Construction Works

4.3 IDENTIFICATION OF WATER SENSITIVE RECEIVERS

The project site is located within the Northwest of New Territories and within the catchment of the Deep Bay Water Control Zone.

No communal foul sewer connection is available for the project area.

The quality of effluent during the construction and operation phase of the projects will be bounded by the discharge standard of Deep Bay Water Control Zone, subject to the estimated discharge quantity. Standards for effluents discharged into the coastal waters of Deep Bay Water Control Zone is annexed in Cap. 358AK Technical Memorandum on Effluent Standards.

For the marine environment, the nearest EPD Water Quality Monitoring Station (WQMS) to 81 San Tam Road is DM1. The latest summary of baseline condition of subject WQMS

in 2021 is extracted, reference from “Marine Water Quality in Hong Kong in 2021” by EPD.

In 2021, the overall WQO compliance rate for Deep Bay WCZ was 60%, as compared with a ten year average of 47% in 2009-2018. Overall, with the measures under the Deep Bay Water Pollution Control Joint Implementation Plan taken progressively by Hong Kong and Shenzhen, there have been significant water quality improvements in Deep Bay. In particular, there have been full compliance of NH₃-N WQOs in the past seven years. Although Deep Bay, as compared with other WCZs, shows higher nutrient levels with annual depth-averaged TIN levels exceeding the respective TIN WQOs, a noticeable long-term decrease in TIN levels since mid-2000s has been seen.

Summary of water quality statistics for the Deep Bay WCZ in 2021

Parameter	DM1 (Nearest to the Stie)
Temperature (°C)	26.4 (17.6 - 32.6)
Salinity	16.2 (9.4 - 22.2)
Dissolved Oxygen (mg/L)	5.5 (4.0 - 7.7)
Dissolved Oxy gen (% Saturation)	74 (56 - 101)
pH	7.3 (6.9 - 7.8)
Secchi Disc Depth (m)	1.0 (0.9 - 1.3)
Turbidity (NTU)	23.6 (9.8 - 38.0)
Suspended Solids (mg/L)	29.5 (13.0 - 57.0)
5-day Biochemical Ox y gen Demand (mg/L)	2.5 (1.1 - 12.0)
Ammonia Nitrogen (mg/L)	0.417 (0.150 - 0.950)
Unionised Ammonia (mg/L)	0.005 (0.002 - 0.009)
Nitrite Nitrogen (mg/L)	0.152 (0.060 - 0.260)
Nitrate Nitrogen (mg/L)	1.260 (0.490 - 2.700)

Total Inorganic Nitrogen (mg/L)	1.83 (0.82 - 3.41)
Total Kjeldahl Nitrogen (mg/L)	0.75 (0.51 - 0.86)
Total Nitrogen (mg/L)	1.95 (1.55 - 2.23)
Orthophosphate Phosphorus (mg/L)	0.159 (0.110 - 0.220)
Total Phosphorus (mg/L)	0.20 (0.14 - 0.26)
Silica (as SiO ₂) (mg/L)	6.18 (1.40 - 11.00)
Chlorophy II-a (µg/L)	8.3 (1.7 - 15.0)
E.coli (count/100mL)	160 (23 - 1600)
Faecal Coliforms (count/100mL)	400 (86 - 3000)

Water Sensitive Receivers (WSRs) are defined as those users of the aquatic/marine environment whose use of the environment could be impaired as a result of the proposed project. When WSRs that are potentially affected by the construction and operation of the Project are identified, further study will be conducted. The Water Sensitive Receivers (WSRs) identified within 500m of the Project boundary that may potentially be affected are shown in **Appendix 4.1** and the representative WSRs are listed below –

WSR1	Agricultural Land
WSR2	Fishpond (Pond 13 to Pond 28)
WSR3	Abandoned Fishpond (Pond 1 to Pond 11)
WSR4	Nullah
WSR5	Drainage Channel
WSR6	Water Course

4.4 WATER QUALITY IMPACTS AND MITIGATIONS DURING CONSTRUCTION PHASE

Potential Impact

Proposed construction works mainly involve excavation of soil, piling and building

construction works. Key water pollution sources include:

General Construction Activities

General construction activities, including wheel washing, dust suppression from excavation and pilling works, concrete casting and utility installation, may generate wastewater which would contain high concentration of SS. Various construction works may also generate debris and waste such as packaging, construction materials and general refuse. Uncontrolled discharge of site effluents and waste generated from the construction works would lead to deterioration in water quality. Adoption of the guidelines and good site practices for handling and disposal of construction discharges as specified in **below mitigation section** would minimize the potential impacts.

Surface Runoff from Rainfall and Wind Erosion

In particular, surface runoff into receiving water courses during and immediate after rainstorm events is of major concern. During rainstorms, site runoff would wash away the soil particles on unpaved lands and areas with exposed topsoil. Sediment laden runoff and wind-blown dust would result in deteriorating water quality with increase of SS levels and turbidity and may result in induced effects on aquatic ecological resources. It is important that proper site practice and good site management (as specified in the ProPECC PN 1/94 "Construction Site Drainage") to be followed to prevent site runoff with high level of SS from entering the surrounding waters. With the implementation of appropriate measures to control runoff and drainage from the construction site, disturbance of water bodies would be avoided and deterioration in water quality would be minimal.

Spillage of Chemicals

Accidental spillage and the storage of chemicals used on-site, such as petroleum products, surplus adhesives, spent lubrication oil, grease and mineral oil, spent acid and alkaline solutions/solvent and other chemicals, may contaminate the surface soils. The contaminated soil particles may be washed away by construction site runoff or stormwater drainage and eventually may affect nearby water bodies. The potential impacts could however be mitigated by practical mitigation measures and good site practices as given in **below mitigation section**.

Sewage from the Construction Workforce

Sewage effluents will arise from the sanitary facilities provided for the on-site construction workforce. The characteristics of sewage would include high levels of BOD5, Ammonia and E. coli counts. This temporary sewage can be handled by providing adequate portable chemical toilets. Provided that sewage is not discharged directly into storm drains or inland waters adjacent to the construction site, and temporary sanitary facilities are used and properly maintained, it is unlikely that sewage generated from the sites would have a significant water quality impact.

Construction Works in Close Proximity of Nearby Water Bodies

Construction activities within or in close vicinity to nearby water bodies may affect the water quality due to potential release of wastewater which is generally with high

concentration of SS and elevated pH. Mitigation measures shall be implemented to control the release of wastewater into the adjacent water environment. With proper implementation of appropriate construction runoff control practices as referred to ProPECC PN 1/94 “Construction Site Drainage” and the provision of mitigation measures as described in the ETWB TC (Works) No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works”, it is anticipated that no unacceptable water quality impacts would be arising from the construction works nearby the water bodies.

Mitigation Measures

Dust Suppression

Water used in dust suppression should as far as practicable be re-circulated after sedimentation. When there is a need for final disposal, the wastewater should be led to silt removal facilities before being discharged to the storm drain.

Wheel Washing Water

All vehicles and plant should be cleaned before they leave a construction site to minimize the deposition of earth, mud, debris on roads. A wheel washing facility should be provided at every site exit if practicable and wheel-wash overflow shall be directed to silt removal facilities before being discharged to the storm drain. The site boundary between the wheel washing facility and the public road should be placed with sand bunds to prevent wheel-wash overflow from entering public road drains.

Wastewater from Concrete Casting

Wastewater generated from the washing down of mixing trucks and drum mixers and similar equipment should whenever practicable be recycled. The discharge of wastewater should be kept to a minimum. To prevent pollution from wastewater overflow, the pump sump of any water recycling system should be provided with an on-line standby pump of adequate capacity and with automatic alternating devices. Under normal circumstances, surplus wastewater may be discharged into foul sewers after treatment in silt removal.

Rubbish and Litter

Good site practices should be adopted to remove rubbish and litter from construction sites so as to prevent the rubbish and litter from spreading from the works area. It is recommended to clean the construction sites on a regular basis. Adequate refuse collection points shall be provided on-site.

Construction Site Runoff

The site practices outlined in ProPECC PN 1/94 “Construction Site Drainage” should be followed as far as practicable to minimise surface runoff and the chance of erosion. It is expected that the following measures recommended will effectively control runoff from the works sites and avoid water pollution downstream and shall be implemented during construction phase.

Surface runoff from construction sites should be discharged into storm drains via sand/silt

removal facilities such as sedimentation basin/tank. The treated effluent discharge from construction stages should be sited away from natural water course. Earth bunds or waterfilled barriers with geotextile sheet should be provided on site boundaries to intercept surface runoff from outside the site so that it will not wash across the site and to prevent surface runoff flowing out of the site. Bunds or sandbags should also be used within the site to direct surface runoff into the silt removal facilities. Stagnant surface runoff should be pumped to the silt removal facilities before discharged into storm drains.

Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed so as to prevent silt, construction materials or debris from getting into the drainage system without having previously passed through sedimentation tank, and to prevent storm runoff from getting into foul sewers. Discharge of surface runoff into foul sewers must always be prevented in order not to unduly overload the foul sewerage system.

Silt removal facilities and manholes should be maintained and the deposited silt and grit should be removed regularly, at the onset of and after each rainstorm to prevent local flooding.

Surface excavation should be carefully programmed to avoid wet-season operation. If it is unavoidable, any exposed top soils should be covered with a tarpaulin or other means. For the purpose of preventing soil erosion, temporary exposed slope surfaces should be covered e.g. by tarpaulin, as excavation proceeds. 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.

Open stockpiles (e.g. aggregates, sand and fill material) should also be covered with a tarpaulin to avoid erosion during rainstorms. The washing of material from the stockpiles directly into the storm drains should be prevented by passing the runoff through sedimentation tank. Arrangements should always be in place in such a way that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.

Spillage of Chemicals

Chemical waste, as defined under the Waste Disposal (Chemical Waste) (General) Regulation, includes any substance being scrap material, or unwanted substances specified under Schedule 1 of the Regulation. Substances likely to be generated by construction activities arise from the maintenance of construction plant and equipment of the Project. These include, but not limited to the following:

- Lubricating oil and waste fuel (diesel) from construction plant with improper maintenance;
- Spent solvents from equipment cleaning activities.

Due to the scale of an active work front of the Project, it is anticipated that no maintenance shop for construction plant and equipment would be operated on-site and storage fuel on-site is minimal. Drainage traps such as grease traps and petrol interceptors will be installed at each of the drainage outlets to filter out chemical pollutants from surface runoff.

Mitigation such as providing drip tray/proper storage of chemical containers will be strictly

implemented during the construction works. In case of any leakage on bare ground, oil and grease decontamination kit will be available on-site for clean-up of oil leakage. Any fuels should be stored in bunded areas such that spillage can be easily collected. The contractor shall prepare an oil / chemical clean-up plan in the Waste Management Plan before the commencement of construction works. It should ensure that leakages or spillages are contained and cleaned up immediately. Once spillage is identified on-site, the clean-up procedures should be carried out as below:

- Contact the site agent and/or foreman immediately and report the spillage;
- Identify the source of spillage and determine nature of the material;
- Stop leakage immediately where possible;
- Identify all current and potential affected areas according to the flow of spillage and stop the spillage from flowing to other works areas;
- Contain the surface runoff of spillage by using bunds made from available materials;
- After the surface runoff of spillage is contained, remove the materials (including contaminated soil where necessary) using pumps and/or absorbent materials; and
- Dispose of the materials, including the contaminated soil, as chemical waste

Waste oil should be collected and stored for recycling or disposal, in accordance with the Waste Disposal Ordinance (Cap. 354). The contractor must register as a chemical waste producer if chemical wastes would be produced from the construction activities. The Waste Disposal Ordinance (Cap. 354) and its subsidiary regulations in particular the Waste Disposal (Chemical Waste) (General) Regulation, should be observed and complied with for disposal of chemical wastes. The Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes published under the Waste Disposal Ordinance (Cap. 354) details the requirements to deal with chemical wastes. General requirements are given as follows:

- Suitable containers should be used to hold the chemical wastes to avoid leakage or spillage during storage, handling and transport;
- Chemical waste containers should be suitably labelled, to notify and warn the personnel who are handling the wastes, to avoid accidents; and
- Storage area should be selected at a safe location on site and adequate space should be allocated to the storage area

Sewage Effluent from Construction Workforce

Portable chemical toilets would be provided for handling the sewage effluent generated by the workforce. The number of the chemical toilets required for the construction sites would be subject to later detailed design, the capacity of the chemical toilets, and contractor's site practices. A licensed contractor would be employed to provide appropriate and adequate portable toilets and be responsible for appropriate disposal and maintenance.

Domestic sewage generated by the construction workforce should be appropriately managed to avoid potential adverse impacts of uncontrolled sewage discharge into nearby water courses. Portable chemical toilets shall be appropriately located on-site in proximity to all major works areas where they shall remain and be maintained in good working order for the convenience of the workforce during the construction phase.

The provision of temporary toilet facilities within the water gathering ground, if any, is subject to approval of the Director of Water Supplies. As a minimum requirement, temporary toilet facilities must be located more than 30m from any watercourse.

Notices would be posted at conspicuous locations to remind the workers not to discharge any sewage or wastewater into the nearby environment during the construction phase of the Project. Regular environmental audit on the construction site would be conducted in order to provide an effective control of any malpractices and achieve continual improvement of environmental performance on site.

Construction Works in Close Proximity of Nearby Water Bodies

The practices outlined in ETWB TC (Works) No. 5/2005 “Protection of natural streams/rivers from adverse impacts arising from construction works” should also be adopted where applicable to minimize the water quality impacts upon any natural streams or surface water systems. Relevant mitigation measures from the ETWB TC (Works) No. 5/2005 should be followed. Examples are shown below -

- Construction works close to the inland waters should be carried out in dry season as far as practicable where the flow in the surface channel or stream is low.
- The use of less or smaller construction plants may be specified in areas close to the water courses to reduce the disturbance to the surface water.
- Temporary storage of materials (e.g. equipment, chemicals and fuel) and temporary stockpile of construction materials should be located well away from any water courses during carrying out of the construction works.
- Stockpiling of construction materials and dusty materials should be covered and located away from any water courses.
- Construction debris and spoil should be covered up and/or disposed of as soon as possible to avoid being washed into the nearby water receivers.
- Proper shoring may need to be erected in order to prevent soil or mud from slipping into the watercourses.
- Fencing should be erected on the sides facing the nearest stream course to trap all wind-blown litters such as paper, plastic bags, bottles and boxes within the site from entering the nearby water bodies.

4.5 WATER QUALITY IMPACTS AND MITIGATIONS DURING OPERATION PHASE

Potential Impact

The Project is to build a residential care home for elderly, accommodating at most 142 nos. of bedspaces. Sewage from the residents as well as workers and visitors will be generated from bathing and showers, toilet flushing, pantry, toilet basins, etc.

Mitigation Measures

All storm water/rainwater from both open paved and developed areas of the site will be conveyed to the storm water drain.

The *ProPECC Note PN 5/93* provides guidelines and practices for handling, treatment, and disposal of various effluent discharges to stormwater drains and foul sewers. The design of site drainage and disposal of site effluents generated within the proposed development area should follow the relevant guidelines and practices as given in the *ProPECC Note PN 5/93*.

Since there is no communal foul sewer connection, an onsite tertiary sewage treatment plant (STP) will be installed to handle all sewage generated from the proposed residential care home before discharging offsite. Preliminary design of the on-site tertiary STP according to Guidelines for the Design of Small Sewage Treatment Plants by EPD, including the amount of sewage flow generated per day (from residents, staff, facilities, etc.), the size of the STP, mitigation measures to prevent discharge/ overflow of untreated raw sewage, etc. are annexed in **Appendix 4.3**. The major parameter of the STP is listed in below -

Total Daily Flow	77.5m ³ /day
Average Hourly Flow (DWF)	3.23m ³ /hr
Peak Hourly Rate (6 x DWF)	19.38 m ³ /hr
Size of MBR Tank	34.97 m ³ /hr
Size of Equalization Tank	19.38 m ³ /hr

Proper operation and maintenance should be provided for the STP. Storm water/rainwater should be separated from the sewage collection network to avoid overload to the STP. The effluent standards are listed below

Parameter	Tertiary Effluent Standard (Upper Limit)*
BOD5	10mg/L
TSS	10mg/L
TN	20mg/L
TP	2mg/L
Ammonia N	5mg/L
E coli	100cfu/100ml

Note (*) – Depending on the water body receiving the discharge, the more stringent set of the effluent standards (those listed on the WPCO TM) should be adopted as appropriate.

Sewage will be treated by the onsite STP before discharge. The proposed discharge point is shown in Appendix 4.3. The detailed location of proposed discharge point would be finalized during the detailed design stage. The treated effluent discharge from operational stages should be sited away from natural water course.

The disposal of the treated effluent shall comply with relevant statutory requirements and guidelines such as Water Pollution Control Ordinance (Cap. 358), etc. All discharges during the operation phase of the proposed development are required to comply with the Technical Memorandum for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS) issued under Section 21 of the Water Pollution Control Ordinance (WPCO). The TM-DSS defines acceptable discharge limits to different types of receiving waters. Under the TM-DSS, effluents discharged into the drainage and sewerage systems, inland and coastal waters of the Water Control Zones (WCZs) are subject to pollutant concentration standards for specified discharge volumes. These are defined by the Environmental Protection Department (EPD) and are specified in licence conditions for any new discharge within a WCZ. Therefore, no adverse water quality impact on WQO is anticipated.

All storm water/rainwater from open paved and developed areas of the site will be conveyed to the storm water drain via properly designed surface drainage. Facilities such as standard gully grating, with spacing which is capable of screening off large substances such as fallen leaves and rubbish should be provided at the inlet of drainage system. Good management measures such as regular cleaning and sweeping open paved area of the site is suggested during operational phase to reduce the suspended solid or other unwanted pollutants or waste fall into the stormwater drain.

During operation phase, stormwater runoff from paved surfaces within the Project Sites will be directed to a managed stormwater drainage system. Runoff from the roofs of buildings and road surfaces within the Sites may carry suspended solids and other pollutants such as fuel, oils and heavy metals that could enter nearby surface water bodies or storm drains if uncontrolled. With implementation of stormwater best management practices including provision of trapped gullies and catch-pits, adverse impacts to the water quality is not anticipated.

Similar to that during the construction phase, a water discharge license should be obtained for the operation of the proposed residential care home for elderly. All the requirements and conditions as stipulated on the license shall be observed and complied with.

5 WASTE MANAGEMENT

5.1 INTRODUCTION

This section reveals and discusses types of wastes generated from the Project during construction and operation phases. Hence, proper waste management strategies are recommended to reduce, reuse, recycle and dispose of wastes.

5.2 LEGISLATIONS, STANDARDS AND GUIDELINES

The following relevant Hong Kong legislations and guidelines governing waste disposal and management have been referenced in carrying out the assessment:

- Waste Disposal Ordinance (Cap. 354);
- *A Guide to the Chemical Waste Control Scheme;*
- *A Guide to the Registration of Chemical Waste Producers;*
- Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes; and
 - *Code of Practice for the Management of Clinical Waste – Small Clinical Waste Producers.*

5.3 WASTE MANAGEMENT IMPLICATIONS OF THE CONSTRUCTION PHASE

Major construction activities for the Project include demolition of existing property, site clearance, piling, construction of substructure and superstructure. Considering the small scale of the Project, it is anticipated not much waste would be generated though the exact quantity will be subject to detailed construction methods.

Wastes generated from the Project during the construction phase generally consist of:

- Construction and demolition (C&D) waste;
- General refuse; and
- Chemical waste.
- Possible wastes generated from the Project are detailed in Table 5-1.
- Table 5-1 Possible Waste Generated During the Construction Phase

WASTE TYPE	POSSIBLE WASTE GENERATED FROM THE PROJECT
INERT C&D WASTE	<ul style="list-style-type: none"> • CONCRETE FROM DEMOLITION OF EXISTING PROPERTY • EXCAVATED MATERIALS (EXCLUDING TOPSOIL)

WASTE TYPE	POSSIBLE WASTE GENERATED FROM THE PROJECT
NON-INERT C&D WASTE	<ul style="list-style-type: none"> • FELLED TREES • REMOVED PLANT • TOPSOIL • DISCARDED FURNITURE • DAMAGED SCAFFOLDING BAMBOO • WOOD FORMWORK • USED PACKAGING MATERIALS
GENERAL REFUSE	<ul style="list-style-type: none"> • WASTEPAPER • FOOD DEBRIS • PACKAGING MATERIAL
CHEMICAL WASTE	<ul style="list-style-type: none"> • SPENT LUBRICATING OIL • PAINT

A Waste Management Plan (WMP) will be prepared to outline the estimated types and quantities of waste generated in the Project and formulate the approaches in dealing with them. Typical hierarchy of waste management, i.e., avoid, minimize, recycle and disposal as the last resort, will be adopted for the Project. The aims of the WMP are to:

- improve the resource efficiency.
- increase the waste and materials awareness of staff; and
- help to discharge duty of care obligations.

5.3.1 Waste Avoidance

To avoid generation of waste during the construction phase, good and detailed planning and smart procurement is crucial. The following approaches are suggested:

- avoid excess order;
- arrange delivery of goods according to construction progress;
- reject and return damaged goods;
- keep protective packaging on and ensure storage areas are secure and weatherproofs;
- minimize movement of goods to lower the chance of damage to goods; and
- eliminate over packaging and liaise with suppliers to return packaging materials to them.

5.3.2 Construction and Demolition Materials

Excavated materials, such as soil and rock, and demolition concrete should be reused for backfilling on site as far as practicable. Surplus materials of these inert types should be delivered to the Civil Engineering and Development Department (CEDD) managed public

fill reception points and/or sorting facilities. Prior licensing is required from the CEDD.

Non-inert C&D wastes, in particular steel bars and used cables from demolition works of this project, are recyclables and should be delivered to proper outlets for recycling. On the other hand, felled trees, removed plant and topsoil are normally not reusable and should be delivered to the landfill for disposal.

Considering that there are many types of wastes generated, proper sorting and segregation of various C&D wastes could minimize cross contamination and enhance waste recovery quantity.

A trip ticket system will be implemented for any wastes disposal to the public fill reception points, sorting facilities and landfills. All the disposal records should be properly maintained.

5.3.3 Chemical Waste

Chemicals, including lubricating oil, paint, thinner, etc. will be used in the Project. Should there be any chemical wastes generated in the Project, the Contractor is required to register as chemical waste producer pursuant to the Waste Disposal (Chemical Waste) (General) Regulation. Proper containers, labels and storage areas must be provided in accordance with the aforesaid regulation.

All the chemical waste should be collected by licensed chemical waste collector for disposal at the Chemical Waste Treatment Centre (CWTC) at Tsing Yi or other licensed chemical waste treatment/disposal facilities.

5.3.4 General Refuse

General refuse includes wastepaper, packaging materials and food debris generated by the workforce on site. No canteen will be provided on site during the construction phase. The quantity of general waste is anticipated minimal in view of the small scale of the construction works. Nonetheless, before offsite disposal, they should be segregated into recyclable and non-recyclable wastes and kept in different covered storage areas/bins, where all of them should be sufficiently maintained and cleaned, to avoid attracting vermin and pests. All the general refuse will be collected on-site, separately from C&D materials by an appropriate waste collector employed by the contractor to the landfill.

Training should be provided for all site workers about the concepts of site cleanliness and appropriate waste management procedure, including waste reduction, reuse and recycling. The training is expected to ensure their awareness of good waste management and the specific measures used at the site.

5.4 WASTE MANAGEMENT IMPLICATIONS OF THE OPERATIONAL PHASE

The project site will be converted into a residential care home for elderly. Wastes generated during operation phase includes:

- General refuse; and
- Clinical waste.

5.4.1 General Refuse

General refuse during the operation phase mainly comes from daily living of residents in the care home, e.g., food waste, packaging of goods, used plastic and glass bottles, bedding and blankets, etc., which are similar to those from general households. Considering the number of residents is low, the quantity of general waste should not be significant.

Solid waste should be properly kept in covered containers/storage areas to avoid attracting of vermin or pests. Recycling containers are recommended to be provided at suitable locations to encourage recycling in the care home.

5.4.2 Clinical Waste

Residential care home for elderly is considered as a small clinical waste producer. It is likely that some types of clinical wastes, particularly needles and sharps, would be generated from its operation. As such, the Operator of the care home should complete the “*Clinical Waste Producer Premises Code Request Form*” and manage the clinical waste in accordance with the *Code of Practice for the Management of Clinical Waste – Small Clinical Waste Producers*.

Clinical waste should be segregated from other wastes. Used needles and sharps are classified as Group 1 clinical waste and should be stored safely in sharps box, before transferring to a disposal site. Colour of the sharps box should be either in yellow or a combination of yellow and white and sealed with proprietary closure.

The care home operator shall engage the service of licensed collectors to collect and transport clinical waste to the CWTC for proper disposal. Alternatively, the clinical waste may also be delivered by a health professional under the clinical waste producer, if there is any, and subject to compliance of additional requirements as stipulated in the *Code of Practice for the Management of Clinical Waste – Small Clinical Waste Producers*.

The care home operator must also keep all the records of the clinical waste consigned to a licensed collector or delivered to a collection point or licensed disposal facility. To achieve it, it is suggested to retain the Waste Producer Copy of the Clinical Waste Trip Tickets of each delivery.

5.5 LAND CONTAMINATION

The subject lot is virgin land before existing development. Referring to the FSD’s reply dated 6 December 2022, neither records of dangerous license, nor incidents of spillage / leakage of dangerous goods were found. Also, EPD has no record of any reported chemical spillage / leakage incident at the captioned locations as shown in Appendix 5.1. There was no record of chemical waste producers’ registration found as per record inspection at EPD Territory Control Office dated 5 July 2022. Considering the historical land use of the site, it is confirmed that land contamination assessment was not required.

**S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12**

**PROPOSED REZONING FROM "R(C)" TO "G/IC"
FOR A PROPOSED "SOCIAL WELFARE FACILITIES"
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)**

**AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.**

6. LANDFILL GAS HAZARD ASSESSMENT REPORT

August 2023

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1 Introduction

1.1 Background

1.1.1.1 The project is a re-development of an existing Single Family House into a RCHE, Plans of which are attached as per Appendix A. (hereafter as "the proposed development") at Lot No. 4823 in D.D. 104, Yuen Long, near the Ngau Tam Mei Landfill (hereafter as "the Site").

1.1.1.2 The Site is located within the 250m consultation zone of the Ngau Tam Mei Landfill (refer to Figure 1.1). With reference to the "*Landfill Gas Hazard Assessment Guidance Note*" (Guidance Note) published by Environmental Protection Department (EPD), a Landfill Gas (LFG) Hazard Assessment should be conducted for both construction and operational stages.

1.1.1.3 A Landfill Gas Hazard Assessment Report for the existing house is submitted and approved by 04/2016. Although the Foot Print of the proposed development is different than before, the protective measure, both at construction and operation stages would be very similar. Those would be re-iterated in this Report.

1.2 Study Objectives

1.2.1.1 The objectives of this LFG Hazard Assessment are:

- To review background information of the Landfill, and particularly environmental monitoring records to identify potential sources of LFG;
- To identify the possible LFG pathways through ground or underground cavities, utilities or groundwater, and evaluate the conditions of these pathways through which the LFG must pass if it is to reach the works areas;
- To identify the elements of the proposed development (targets) that are sensitive to LFG exposure;
- To qualitatively assess the risks that LFG may pose to the target for each of Source-Pathway-Target combination; and
- To recommend suitable LFG protection measures for potential LFG migration and monitoring requirements, as necessary.

1.3

Report Structure

1.3.1.1

The remaining chapters of this report are shown below:

Chapter 2 – Site Context

Chapter 3 – Information of Ngau Tam Mei Landfill

Chapter 4 – Qualitative Source-Pathway-Target Analysis

Chapter 5 – Recommendations and Protection Measures

Chapter 6 – Conclusion

2 Site Context

2.1 Site Location and Its Environs

2.1.1.1 The proposed development located Along San Tam Road and surrounded by Maple Garden to the north, Ngau Tam Mei Landfill to the East, and Casa Paradizo to the south. Royal Palms is located further west to the Site crossing San Tam Road and San Tin Highway. The proposed development is situated in a "Residential Zone (Group C)" according to the Ngau Tam Mei Outline Zoning Plan (OZP S/YL-NTM/12) and proposed to re-zone to "G/IC" to facilitate a RCHE development. The Site area is approximately 730 m².

2.1.1.2 Figure 2.1 shows the Site location and its environs.

2.2 Proposed Development

2.2.1.1 The proposed development comprises a Ten-storeys building for a RCHE with various facilities including:

- LG/F Entrance & Carpark
- UG/F Multi-purpose Rooms
- 1/F Wellness Centre + Sky Garden
- 2/F RCHE
- 3/F RCHE
- 4/F-7/F RCHE
- 8/F Admin Office + Staff Quarter

2.2.1.2 The proposed layout plan is shown in Appendix A.

2.2.1.3 According to the latest programme, the occupancy date of the proposed development is expected to be in year 2027.

3 Information of Ngau Tam Mei Landfill

3.1 History of Ngau Tam Mei Landfill

3.1.1.1 The Ngau Tam Mei Landfill is located to the north-east of Yuen Long and to the east of the San Tin Highway. To the west of the landfill is the Maple Gardens residential development and immediately to the south west are the Casa Paradizo and Green Crest residential developments. Ngau Tam Mei Landfill situated in a small valley and prior to the formation of two platforms. It started to receive waste in Year 1973. Ngau Tam Mei Landfill has a total area of 2.0 hectares and an approximately 0.15 million tonnes of, mainly domestic and industrial wastes were deposited prior to its closure in Year 1975.

3.1.1.2 The restoration works generally included installation of a high integrity capping system on the two platforms, a leachate collection system, surface drainage systems, passive LFG management system. The restoration works were completed in Year 2000.

3.2 Landfill Gas Management System

3.2.1.1 At Ngau Tam Mei Landfill, the impermeable cap was installed on the platforms as part of the restoration work. The passive LFG management system constructed is driven by the differential between atmospheric pressure and LFG pressures within the waste. The system is a simple design, with no mechanically or electrically driven operations.

3.2.1.2 Following the completion of the restoration works, the landfill will be subject to a 30-year aftercare period during which a stringent monitoring programme has been implemented to ensure the integrity of the restoration works.

3.3 Leachate Management System

3.3.1.1 After the restoration works, leachate is collected and delivered to the Leachate Treatment Works at Gin Drinker Bay Landfill (GDB Landfill) for treatment and disposal. Prior to transferring of leachate to GDB Landfill, the collected leachate is stored in an underground leachate collection chamber with a capacity of approximately 50 m³. A leakage detection system has been equipped to provide an early warning to any leakages. No leachate is discharged into the nearby surface waters.

3.4 Landfill Gas Monitoring

- 3.4.1.1 A post-restoration monitoring programme had been conducted under the restoration contract for the Ngau Tam Mei landfill. LFG (including methane and carbon dioxide) is monitored at the monitoring wells which installed outside the boundary of the landfill. The location of monitoring wells adjacent to the Site is shown on Figure 3.1. Recent gas monitoring data from July 2020 to June 2022 provided by EPD are attached in Appendix B. The Figure show a continuous low level of Methane throughout the period and it could conclude that same extra low Methane level are to be observed after June 2022.
- 3.4.1.2 According to Figure 3.1, no monitoring wells fall within the site boundary. Project Proponent should avoid interfering with nearby landfill facilities and take care of the nearby area to avoid any damage or interruption to the landfill restoration and aftercare works by EPD.

4 Qualitative Source-Pathway-Target Analysis

4.1 Assessment Methodology

4.1.1.1 A practice note for professional persons "Landfill Gas Hazard Assessment for Developments adjacent to Landfills" (ProPECC PN3/96) published by EPD in 1996 to set out the conditions under which a LFG Hazard Assessment may be required. ProPECC PN3/96 also provides guidance to relevant professionals on how to conduct such assessments.

4.1.1.2 Further details of the approach and methodology of the required assessment for LFG hazards are presented in "Landfill Gas Hazard Assessment Guidance Note" (Guidance Note).

4.1.1.3 These two documents are referred throughout the LFG Hazard Assessment. The assessment methodology is based on the "Source – Pathway – Target" model. The meaning of these three components are as follows:

- **Source** – location, nature and likely quantities/ concentrations of LFG which has the potential to affect the development.
- **Pathway** – the ground and groundwater conditions, through which LFG must pass in order to reach the development.
- **Target** – elements of the development that are sensitive to the effects of LFG.

4.1.1.4 The LFG source, identified pathway(s), and identified target(s) are then categorised in order to facilitate the assessment process. Having determined into which categories of source, pathway and target, the combination of landfill and development fall a preliminary assessment of the overall risk may be made by reference to Table 4.1.

Table 4.1 Classification of Risk Category

Source	Pathway	Target Sensitivity	Risk Category
Major	Very short/direct	High	Very High
		Medium	High
		Low	Medium
	Moderately short/direct	High	High
		Medium	Medium
		Low	Low
	Long/indirect	High	High
		Medium	Medium
		Low	Low

Source	Pathway	Target Sensitivity	Risk Category
Medium	Very short/direct	High	High
		Medium	Medium
		Low	Low
	Moderately short/direct	High	High
		Medium	Medium
		Low	Low
	Long/indirect	High	Medium
		Medium	Low
		Low	Very low
Minor	Very short/direct	High	High
		Medium	Medium
		Low	Low
	Moderately short/direct	High	Medium
		Medium	Low
		Low	Very low
	Long/indirect	High	Medium
		Medium	Low
		Low	Very low

4.1.1.5

Table 4.2 summarises the implications of each risk category, with reference to Table 4.1 of the Guidance Note.

Table 4.2 Summary of General Categorization of Risk

Category	Level of Risk	Implication
A	Very high (Undesirable)	The type of development being proposed is very undesirable and a less sensitive form of development should be considered. At the very least, extensive engineering measures, alarm systems and emergency action plans are likely to be required.
B	High	Significant engineering measures will be required to protect the planned development.
C	Medium	Engineering measures will be required to protect the planned development.
D	Low	Some precautionary measures will be required to ensure that the planned development is safe.
E	Very low (Insignificant)	The risk is so low that no precautionary measures are required.

4.2

Source

4.2.1.1

The Ngau Tam Mei Landfill has been restored with a capping system together with a passive LFG management system. LFG monitoring was conducted at a number of monitoring wells to detect any sign of off-site LFG migration.

4.2.1.2

The LFG monitoring data in Ngau Tam Mei landfill are obtained from EPD. The location of the LFG monitoring wells and LFG monitoring data are shown in Figure 3.1 and Appendix B respectively. The LFG monitoring data from July 2020 to June 2022 are summarised in Table 4.3.

Table 4.3 Landfill Gas Monitoring Data in Ngau Tam Mei Landfill (July 2020 to June 2022)

Landfill Gas Monitoring Wells	Range of Concentration (%V/V)	
	Methane (CH ₄)	Carbon Dioxide (CO ₂)
A451	<0.1 - 0.1	<0.1 - 9.8
A452	<0.1	1.6 - 23.0
A453	<0.1	<0.1 - 9.8
A454	<0.1	3.3 - 18.8
A455	<0.1 - 0.1	0.1 - 3.4
A456	<0.1	0.2 - 6.6
A457A	<0.1	<0.1 - 0.3
A458	<0.1	0.3 - 9.0
A459	<0.1	1.8 - 15.1
A460	<0.1	2.7 - 11.6
A461	<0.1	2.8 - 7.7
DH403	<0.1 - 0.1	0.3 - 7.9
DH405	<0.1	0.6 - 10.9
DH407	<0.1 - 0.1	0.1 - 10.7
DH408	<0.1	<0.1 - 5.0

4.2.1.3

As the concentration of methane in most of the perimeter gas monitoring wells were below the limit of detection of 0.1%, this suggests that off-site migration of methane towards the Site should be insignificant. However, the concentration of carbon dioxide (i.e. <0.1% to 23.0%) were found much higher than the ambient level in many monitoring locations. Owing to the high concentration of carbon dioxide, this may cause the risk of asphyxiation to workers especially those working in excavations or semi-confined spaces. Therefore, the LFG source of the Ngau Tam Mei Landfill is considered as "Medium".

4.3

Pathways

4.3.1.1

LFG is generated under positive pressure as a result of microbial degradation of organic matter in the buried wastes. This will create a pressure gradient, causing migration of the gas to points of lower pressure. Migration pathways will therefore be determined by zones of lowest resistance to gas movement.

4.3.1.2 Based on the available underground services and utilities layout plan (including telephone lines, gas pipeline, water mains, electric cables, foul sewer and stormwater pipe), no existing services or utilities directly linking the Ngau Tam Mei Landfill and the proposed development was identified. The existing services or utilities are primarily associated with the utility entries from San Tam Road, hence can only form a secondary pathway for gas migration into the development via loose packed infill materials or possible open void conduits. The path length between Ngau Tam Mei Landfill and the existing underground services and utilities will be more than 100m. Therefore, the man-made pathways are categorised as **"Long / indirect"**.

4.3.1.3 For the natural pathways, the path length between Ngau Tam Mei Landfill and the proposed development will be more than 100m. Therefore, the natural pathways for the Ngau Tam Mei Landfill is categorised as **"Long / indirect"**.

4.4 Targets

4.4.1.1 In general, potential targets associated with proposed development include:

- Excavations for utilities installation, electric meter room and lower ground sewage treatment plant during construction stage;
- Manholes, inspection chambers or voids of services or utilities, electric meter room and lower ground sewage treatment plant during operational stage;
- Ground floor areas within the building blocks during operational stage.

4.4.1.2 It is anticipated that a shallow excavations for the utilities and garden establishment would be involved during the construction stage of the proposed development. Laying of some electric cables to the proposed development is anticipated, which may be sub-surface or on grade. According to Section 3.18 of the Guidance Note, the level of risk for shallow excavations is categorized as **"Low Sensitivity"**. However, deep excavations for the services including lower ground sewage treatment plant would be involved during the construction stage of the proposed development. According to Section 3.18 of the Guidance Note, the level of risk for deep excavations is categorised as **"Medium Sensitivity"**.

4.4.1.3 During operational stage, some manholes, inspection chambers or voids of services or utilities, electric meter room and lower ground sewage treatment plant will be present within the Site. There is a risk of asphyxiation to persons using poorly ventilated enclosed spaces, where gas is accumulated. However, these areas are restricted to only allow the authorised or well-trained personnel who have been briefed on the potential hazards relating to LFG and the specific safety procedures to be followed. Moreover, the residents and visitors shall not access to these areas during normal operation, and the sign indication and security system will be provided to prevent any unauthorised personnel access to the these

services. The risk level for these targets is also categorised as "**Medium Sensitivity**".

- 4.4.1.4 The use of Lower Ground Floor as Entrance Lobby & Car Park of the proposed development will be only accessed by the residents and visitor during operation stage. The risk level for the ground floor areas within the building block is therefore categorized as "**Medium Sensitivity**".

4.5 Summary of Qualitative Source-Pathway-Target Analysis

- 4.5.1.1 Based upon the sources, pathways and targets classified above, the qualitative LFG hazard assessment for the proposed development is summarised in Table 4.4.

Table 4.4 Source- Pathway-Target Analysis

Source	Pathway	Sensitivity Target	Risk
<p><u>Ngau Tam Mei Landfill</u></p> <p>The landfill started to receive waste in 1973. Recently obtained gas monitoring data in general show methane concentrations were below the limit of detection. However, the concentrations of carbon dioxide (range from <0.1% to 23.0%) were much higher than ambient level in many monitoring locations.</p> <p>(Medium Source)</p>	<p><u>Man-made Pathways</u></p> <p>There are no utilities or services directly linking between Ngau Tam Mei Landfill and the proposed development.</p>	<p><u>Shallow excavations during construction stage</u></p> <p>Shallow excavation for utilities installation and garden establishment.</p> <p>(Low Sensitivity Target)</p>	Very Low
		<p><u>Natural Pathways</u></p> <p>The Site is located more than 100m away from the edge of the Ngau Tam Mei Landfill.</p>	<p><u>Deep excavations during construction stage</u></p> <p>Deep excavations for services including lower ground sewage treatment plant.</p> <p>(Medium Sensitivity Target)</p>
	<p>(Long / Indirect Pathway)</p>	<p><u>Maintenance of services during operational stage</u></p> <p>Manholes or inspection chambers of utilities or services, electric meter room and lower ground sewage treatment plant.</p> <p>(Medium Sensitivity Target)</p>	Low
		<p><u>Ground floor areas within building blocks during operational stage</u></p> <p>Ground floor areas of the proposed development is only accessible to the residents and visitors.</p> <p>(Medium Sensitivity Target)</p>	Low

4.6 Site Categorisation

- 4.6.1.1 According to the Guidance Note, for the purpose of categorising a site, the category is based on the highest level of risk nominated for any of the potential impacts identified.
- 4.6.1.2 Referring to Table 4.4, the overall risk level for the proposed development associated with the Ngau Tam Mei Landfill is classified as "Low", which falls into **Risk Category D**. For Risk Category D, "Some precautionary measures will be required to ensure that the planned development is safe" as stated in the Guidance Note. According to Table 4.2 of the Guidance Note, the generic protection measures will include "passive control of gas". The recommended protective measures during the construction and operational stages are provided and presented in the following section.

5 Recommendations and Protection Measures

5.1 Construction Stage

5.1.1 Precautionary Measures

5.1.1.1 In general, the contractor should be informed of the following:

- Potential presence of methane and carbon dioxide in soil voids;
- Physical and chemical nature of LFG;
- Fire and explosion hazard, toxicity effects and health hazards associated with LFG; and
- Methodologies / requirements for LFG monitoring.

5.1.1.2 Precautions should be clearly laid down and rigidly adhered to with respect to:

- Trenching and excavation; and
- Creation of confined or semi-confined spaces at, near to or below ground level such that potential hazards to workers due to LFG.

5.1.1.3 During construction stage, the following precautionary measures and safety clauses should be implemented and specified in tender / contract documentation:

- A properly trained Safety Officer should be present on-site during the construction period to oversee the possible LFG risks and be responsible for first aid, emergency and evacuation;
- The Safety Officer or professional Environmental Consultant should use an intrinsically safe portable instrument(s), appropriately calibrated and capable of monitoring methane, carbon dioxide and oxygen;
- All relevant construction workers who work in, or have responsibility for, "at risk" areas should be briefed of the potential risks associated with LFG and the necessary responses and actions needed;
- There should be proper warning of the potential hazards in the vicinity of excavations and proposals of "method-of-working" statements for these works covering all normal and emergency procedures to minimize the potential risk of LFG for agreement by the Engineer representative and the professional Environmental Consultant;
- There should be proper control of welding, flame cutting and any other hot works within trenches, confined spaces and excavation areas;
- A 'no smoking' policy should be strictly enforced;
- Naked flames are to be prohibited within any excavation or ground-level confined space unless otherwise agreed by the Safety Officer or professional Environmental Consultant;

- At a minimum, no work should be undertaken in the absence of fire extinguishers. There should be adequate provision of fire extinguishing equipment and fire-resistant clothing. Gas detection equipment and appropriate breathing apparatus should be available and used when entering confined spaces or trenches deeper than 2 metres;
- The contractor to propose appropriate locations and designs for mobile offices, equipment stores, mess rooms, etc. in accordance with the followings:
 - Mobile offices, equipment stores, mess rooms etc. should be located on an area which has been proven to be gas free (by survey with portable gas detectors) and ongoing monitoring should be carried out to ensure that these areas remain gas free. The use of permanent gas detectors may be appropriate in some circumstances where there is a relatively high risk but for many developments it will be sufficient to have regular monitoring undertaken manually by the safety officer. The particular arrangements to be adopted at a specific site will need to be determined during the risk assessment/design of protection measures;
 - Alternatively, such buildings should be raised clear of the ground. If buildings are raised clear of the ground, a minimum, clear separation distance (as measured from the highest point on the ground surface to the underside of the lowest floor joist) should be 500mm;
 - Workers should be instructed to adopt good hygiene practices to prevent direct exposure to leachate or leachate-contaminated groundwater, if any. Workers should wash thoroughly after work, eat only in clean area after washing hands, and wear protective gear including gloves and appropriate clothing;
 - Utility companies should be advised of the proposed development and cable/pipe laying being in the vicinity of the Ngau Tam Mei Landfill for their attention to observe the relevant regulations and requirements in such regards when inspection or works are being undertaken at the nearby area; and
 - Relevant recommendations and requirements as stated in Section 8 of the Guidance Note (provided in Appendix C) should be incorporated in the tender / contract documents.

5.1.2

LFG Monitoring during Construction Stage

5.1.2.1

At a minimum, routine LFG monitoring should be undertaken twice per day at start of work during all excavation works below ground level deeper than 300 mm and/or after prolonged periods of enclosure/not ventilated. All measurements in excavations should be made with the extended monitoring tube located not more than 10 mm from the exposed ground surface. Monitoring should be performed properly to make sure that the area is free of LFG before enter into the area. The LFG monitoring should be undertaken by a trained Safety Officer or professional Environmental Consultant.

- 5.1.2.2 For excavations deeper than 1 m, measurements should be carried out:
- At the ground surface before excavation commences;
 - Immediately before any worker enters the excavation;
 - At the beginning of each working day for the entire period the excavation remains open; and
 - Periodically through the working day whilst workers are in the excavation.

- 5.1.2.3 For excavations between 300 mm and 1 m deep, measurements should be carried out:
- Directly after the excavation has been completed; and
 - Periodically whilst the excavation remains open.

- 5.1.2.4 For excavations less than 300 mm deep, monitoring may be omitted, at the discretion of the Safety Officer or Environmental Consultant.

- 5.1.2.5 Monitoring of methane, carbon dioxide and oxygen should be undertaken using appropriately calibrated portable gas detection equipment. Monitoring equipment should have, as a minimum, the indication ranges set out in Table 5.1:

Table 5.1 Detection Ranges of the Gas Monitoring Instrument

Gas	Range of Detection
Methane	0 - 100% Lower Explosive Limit (LEL) and 0 - 100% v/v
Carbon dioxide	0 - 100%
Oxygen	0 - 21%

- 5.1.2.6 All measurements should be recorded and kept on-site for ease of inspection. The routine monitoring reports should be endorsed and submitted to EPD by the Authorised Person (AP) or Project Architect for record at least once a month.

- 5.1.2.7 Depending on the results of the measurements, action required will vary and shall be set down by appropriately qualified person. At a minimum, these shall encompass those actions specified in Table 5.2.

Table 5.2 Action Plan in the Event of Gas being detected (Construction Stage)

Parameter	Measurement	Action
Methane (CH ₄)	>10% LEL (i.e. > 0.5 % by volume)	<ul style="list-style-type: none"> Prohibit hot works Ventilate to restore CH₄ to below 10% LEL
Methane (CH ₄)	>20% LEL (i.e. > 1 % by volume)	<ul style="list-style-type: none"> Stop works Evacuate personnel / prohibit entry Increase ventilation to restore CH₄ to below 10% LEL
Carbon Dioxide (CO ₂)	>0.5%	<ul style="list-style-type: none"> Ventilate to restore CO₂ to less than 0.5%
	>1.5%	<ul style="list-style-type: none"> Stop works Evacuate personnel / prohibit entry Increase ventilation to restore to less than 0.5%
Oxygen (O ₂)	<19%	<ul style="list-style-type: none"> Ventilate trench / void to restore O₂ level to more than 19%
	<18%	<ul style="list-style-type: none"> Stop works Evacuate personnel / prohibit entry Increase ventilation to restore O₂ to more than 19%

5.2 Operational Stage

5.2.1 Protection and Precautionary Measures

5.2.1.1 As per general categorization of risk, the proposed development are in Category D for "Low" level of risk during operational stage.

5.2.1.2 In order to reduce the likelihood of LFG infiltration and accumulation, protection measures have to be adopted. The recommended protection measures are discussed in below.

5.2.1.3 The following passive control measures for proposed development should be included:

- Providing good and effective ventilation for the proposed development including electric meter room and lower ground sewage treatment plant (STP) to prevent the accumulation of landfill gas;

- Providing gas-resistant polymeric membranes which can be incorporated into the floor or wall construction as a continuous sealed layer. The membranes should be able to demonstrate low gas permeability and resistant to possible chemical attack and may incorporate aluminium wafers to improve performance;
- High density concrete can be applied at the lowest ground slab to enhance the resistance of gas permeation; and
- Passive control measures may be used in low and medium risk situations where gas emissions are expected to be at relatively low rates and concentrations and venting to atmosphere is unlikely to cause a hazard or nuisance due to the low concentration or high dilution which will occur.

5.2.1.4 Subsequent excavations or below ground works may be carried out in future years during maintenance stage. Such activities should be carried out with an awareness of the potential presence of LFG in the ground and appropriate precautionary measure as mentioned in Section 5.1 should be followed to guard against any hazard arising.

5.2.1.5 Mechanical ventilation system shall be provided for plant rooms including electric meter room and lower ground sewage treatment plant (STP) to prevent the accumulation of landfill gas. The designed mechanical ventilation rate at the plant rooms are summarised in the Table 5.3.

Table 5.3 Mechanical Ventilation Rate

Plant Room	Air change per hour (ACH)
Electric Meter Room	10
Sewage Treatment Plant (STP)	12

5.2.1.6 The mechanical ventilation system should be sufficient to remove any potential landfill gas build-up in the plant rooms. Moreover, the mechanical ventilation system would be provided with backup / standby units and temporary power supply units to ensure continued operation during maintenance or malfunction of the system.

5.2.1.7 The details of the adopted protective measures such as, the gas-resistant polymeric membranes specifications, construction drawings showing locations of installation, physical sample and construction certification report showing the membranes are installed according to specifications along with photos taken during construction should be endorsed and submitted to EPD by the Authorised Person (AP) or Project Architect during construction stage.

5.2.1.8 The lowest ground floor slab is of high density concrete made of high proportion of cement with a density of 450 kg/m³ which can make the structure more resistant to gas permeation. Therefore, the potential of landfill gas infiltration through the underground soil into the building envelope should be minimal.

- 5.2.1.9 The concerned utility companies shall be informed of the proximity of the Site to the landfill and the associated hazards due to LFG. The Project Architect (R Lee Architects (HK) Limited) shall co-ordinate with the concerned contractor or utility companies in the design and maintenance of their facilities.
- 5.2.1.10 All ducts, chambers and manholes, if any, shall be sealed off from the ground to prevent ingress of LFG and facilitate venting to the atmosphere. Figure 5.1 and Figure 5.2 present typical designs for services passing through the consultation zone and above ground termination of the services within the consultation zone.
- 5.2.1.11 Vent pipes/ gridded manhole covers/ dense well-compacted concrete materials completed with gas-resistant membranes sealing may be incorporated in the underground utilities manholes or inspection chambers to avoid build-up of gas and provide resistance to gas permeation. Typical design of vented manhole are shown in Figure 5.3. Under all circumstances, care should be taken when accessing any manhole chambers especially those which are not fitted with vents and necessary safety procedures must be followed.
- 5.2.1.12 During the operational stage, any service voids, manholes, chambers or culvert within the Site, which is large enough to permit access to personnel should be subject to entry safety procedures. Works in confined spaces are controlled by the Factories and Industrial Undertakings (Confined Spaces) Regulation of the Factories and Industrial Undertakings Ordinance and the Safety Guide to Working in Confined Spaces should be followed to ensure compliance with the Regulation.
- 5.2.1.13 In general, when work is being undertaken in confined spaces, sufficient approved resuscitation equipment, breathing apparatus and safety torches should be made available. Persons involved in or supervising such work should be trained and practiced in the use of such equipment. A permit-to-work system for entry into confined spaces should be developed by an appropriately qualified person and the system should be consistently employed.
- 5.2.2 LFG Monitoring during Operational Stage**
- 5.2.2.1 To safeguard the users of the proposed development from the possible hazards of asphyxiation effects of LFG, a LFG monitoring program shall be instituted. The objectives of monitoring during the operational stage of the Project are:
- To obtain early warning of potential problematic areas and permit timely remedial actions taken by the restoration contractor of the Landfill;
 - To provide reassurance to the public; and
 - To include methane, carbon dioxide and oxygen as determinants.
- 5.2.2.2 The sensitive rooms at the ground floor of the buildings might need to be monitored by gas detection equipment. Besides, there are sewage treatment plant room and manholes at the below ground floor as part of drainage / sewerage systems. Since these locations would be potentially at risk to gas ingress and gas accumulation, it should also be monitored by gas detection equipment and the monitoring work would be under the guidance of qualified safety officer. The performance

requirement of the portable gas detection equipment shall be referred to Section 5.1.2.5 and Table 5.1 of this report. The proposed monitoring locations are shown in Figure 5.4.

5.2.2.3

Table 5.4 presents a recommended LFG monitoring programme for the initial operational stage.

Table 5.4 LFG Monitoring Frequency during the Operational Stage

Period	Monitoring Frequency
First year after completion of the construction stage	Monthly
Second year after completion of the construction stage	Quarterly if LFG is not detected in the first year. Otherwise, the monitoring frequency will be maintained in monthly basis.
Monitoring can be ceased if no LFG is detected in the past 2-years monitoring	

5.2.2.4

A LFG monitoring report which summarises the monitoring results should be endorsed and submitted to EPD by the Authorised Person (AP) or Project Architect within 1 month of completion of the LFG monitoring. The frequency of submission of the LFG monitoring reports should follow Table 5.4.

5.2.2.5

Table 5.5 presents an action plan to specify the actions to be taken in response to gas detection. The future operator shall conduct further investigations and gas monitoring if necessary. A professional Environmental Consultant in this specific field should be engaged to interpret the results. Expert advice from the professional Environmental Consultant should be sought where necessary.

Table 5.5 Action Plan in the Event of Gas being detected (Operational Stage)

Parameter	Actions
All detectable levels	Confirm / verify the reading with a second instrument, monitor the trend of readings and carry out additional monitoring & investigation, if necessary
0.5 % v/v (10% LEL) CH ₄ or 0.5% CO ₂ , whichever is exceeded	<p><u>Trigger level:</u></p> <ul style="list-style-type: none"> • Stop hot works; • Inform the property management; • Immediate mitigation measures such as mechanical ventilation shall be provided; • Report to EPD; • Further investigation to be undertaken within the Site; • Increase the gas monitoring frequency to weekly.
1 % v/v (20% LEL) CH ₄ or 1.5% CO ₂ , whichever is exceeded	<p><u>Action level:</u></p> <ul style="list-style-type: none"> • Stop all works; • Evacuate personnel / prohibit entry; • Inform the property management; • Immediate mitigation measures such as mechanical ventilation shall be provided; • Report to EPD; • Further investigation to be undertaken within the Site; • Increase the gas monitoring frequency to daily.

Note: Oxygen (O₂) should also be monitored for reference.

** - CO₂ may be above the trigger / action levels due to decomposition of organic matters. In that case, the monitoring results should be interpreted by the qualified environmental consultant.*

6

Conclusion

- 6.1.1.1 Since the proposed development will be located within the consultation zone of the Ngau Tam Mei Landfill, this Landfill Gas Hazard Assessment was undertaken to assess the likelihood of LFG migration.
- 6.1.1.2 The results of the landfill gas hazard assessment shows the overall level of landfill gas risk posed by the Ngau Tam Mei Landfill to the proposed development is "Low".
- 6.1.1.3 Appropriate protection and precautionary measures including regular landfill gas monitoring during both of the construction and operation of the project have been recommended. Provided that all the recommended protection measures with the monitoring are implemented properly, the safety of the site workers and all personnel presence at the proposed development would be safeguarded and there would be no adverse impact anticipated on the feasibility of the proposed development.

S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12

PROPOSED REZONING FROM "R(C)" TO "G/IC"
FOR A PROPOSED "SOCIAL WELFARE FACILITIES"
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)

AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.

FIGURES

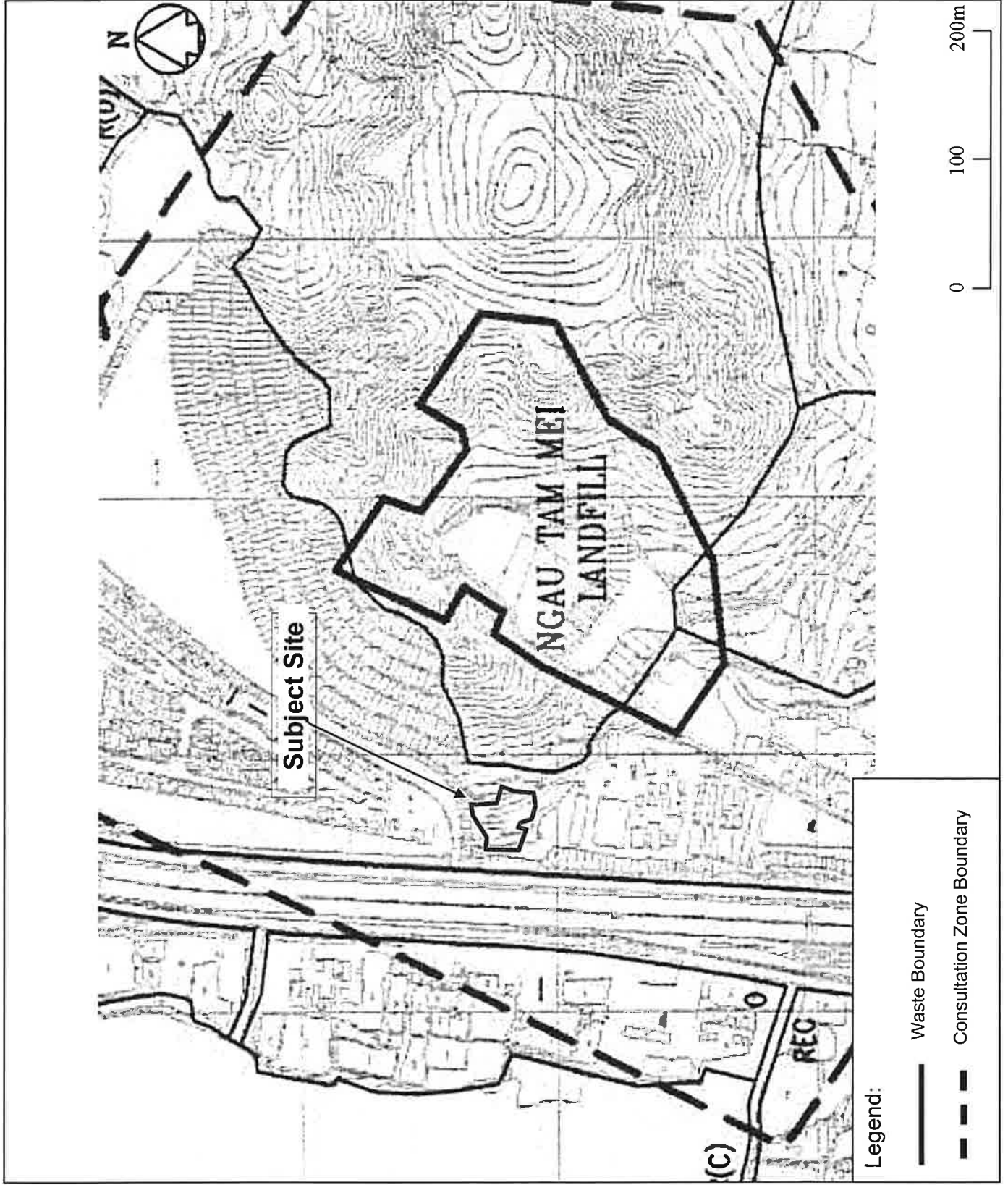
**Location of the
Proposed
Development
and Ngau Tam
Mei Landfill**

Figure 1.1

Scale: As Shown

Date: March 2016

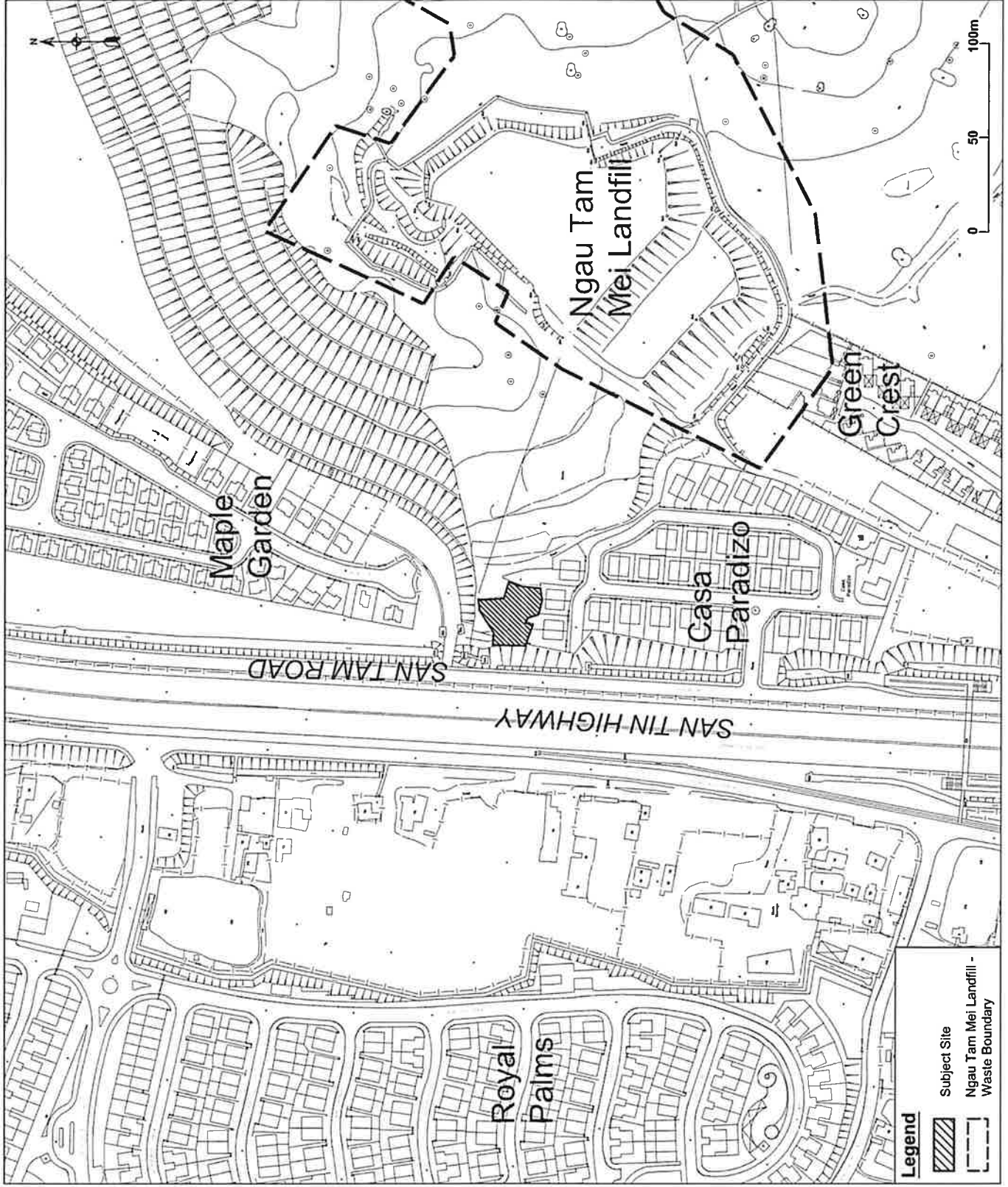
Rev.: 1



Site Location and Its Environs

Figure 2.1

Scale: As Shown
Date: December 2015
Rev.: 0



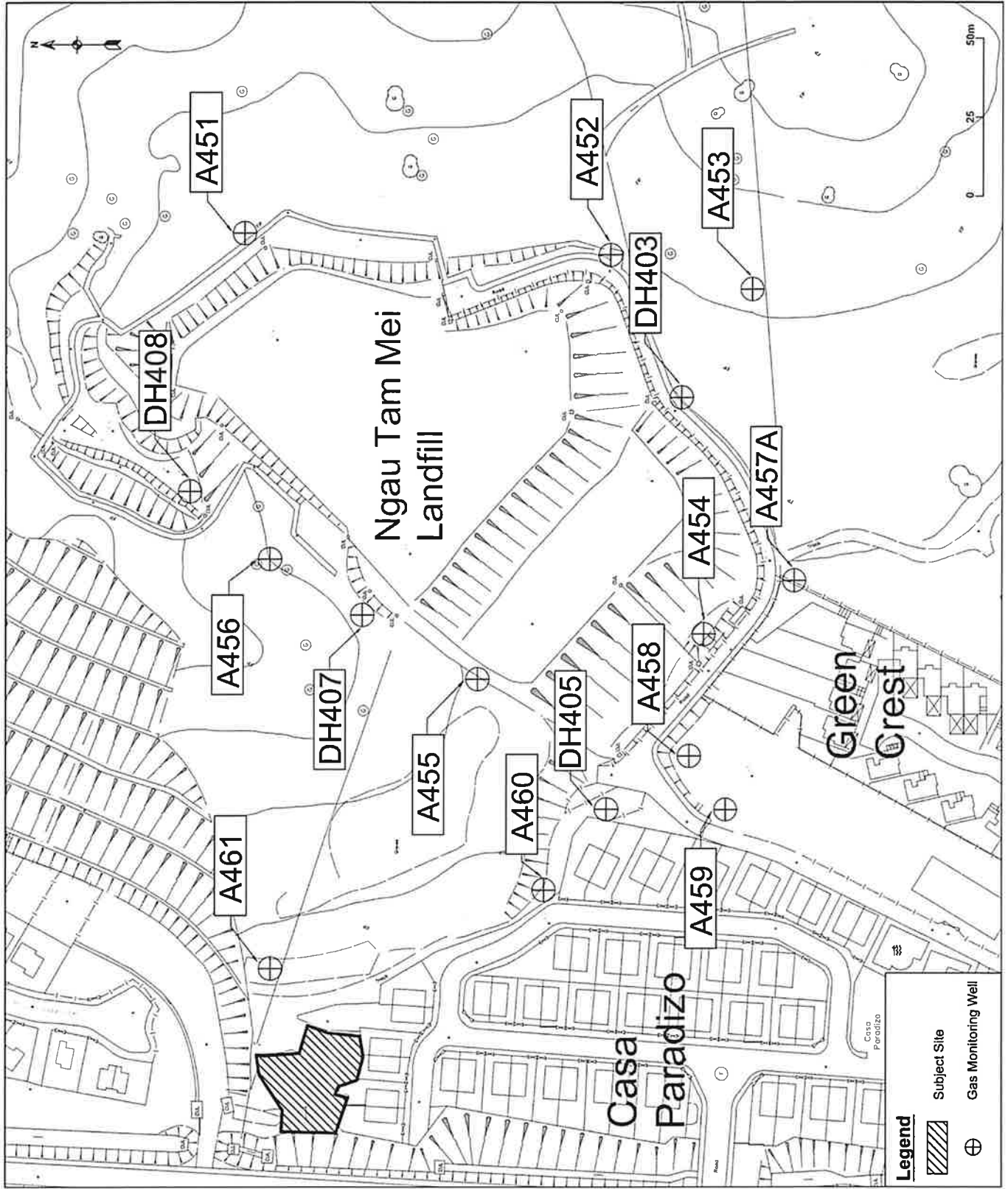
Locations of Relevant Gas Monitoring Wells at Ngau Tam Mei Landfill

Figure 3.1

Scale: As Shown

Date: December 2015

Rev.: 0



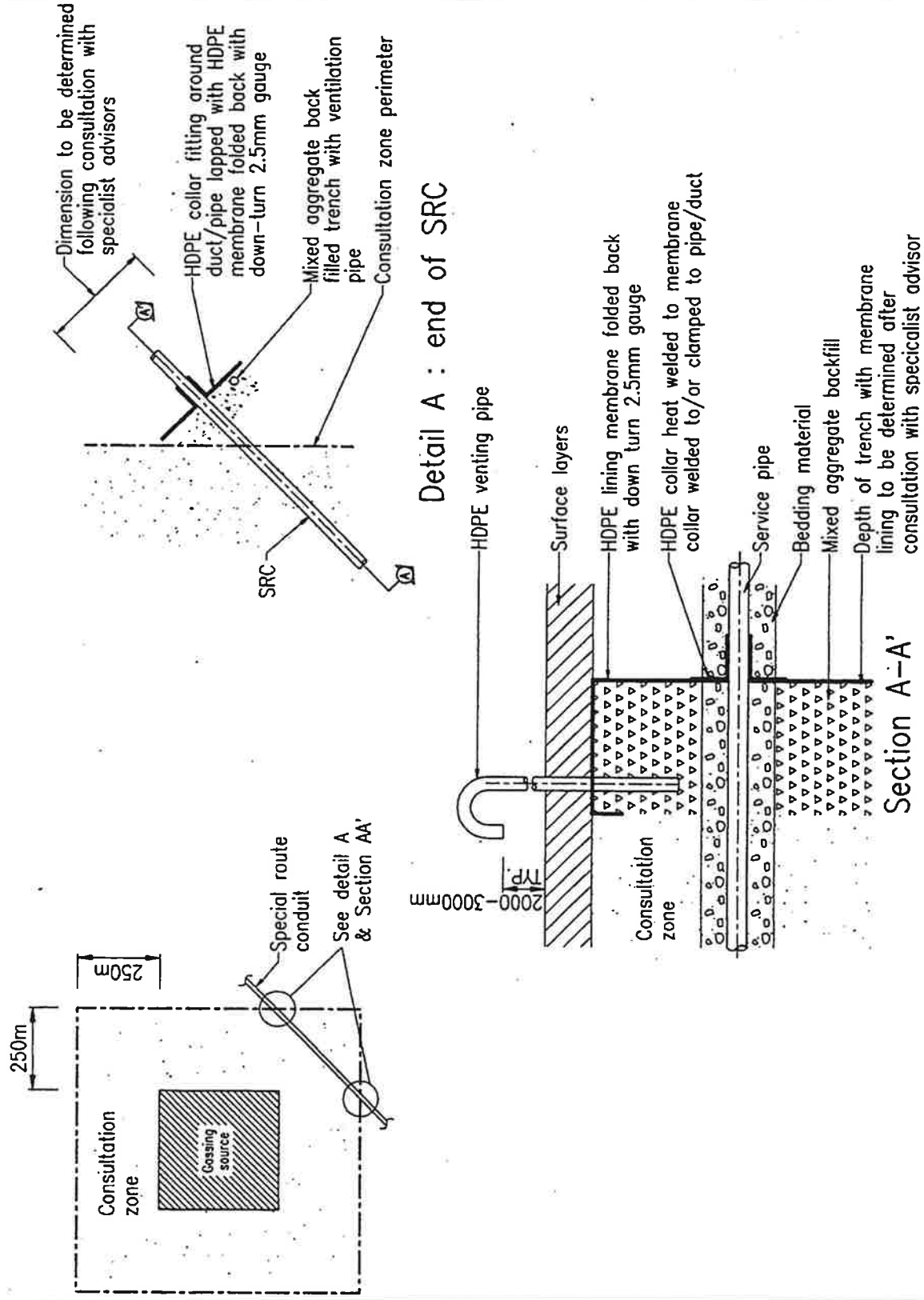
Typical Design for Services Passing Through the Consultation Zone – Special Route Conduit (SRC)

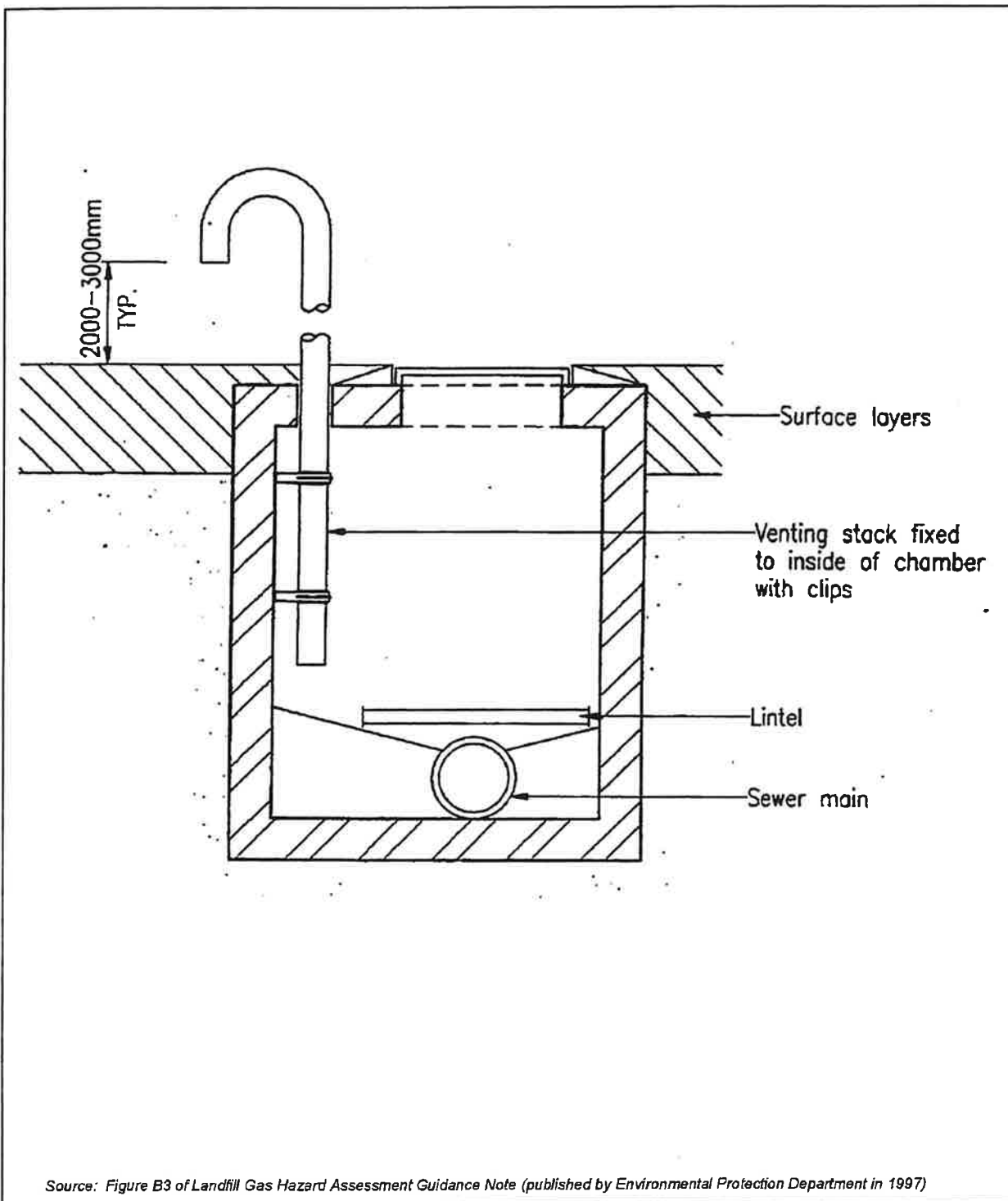
Figure 5.1

Scale: NTS

Date: December 2015

Rev.: 0





Landfill Gas Hazard Assessment
Report

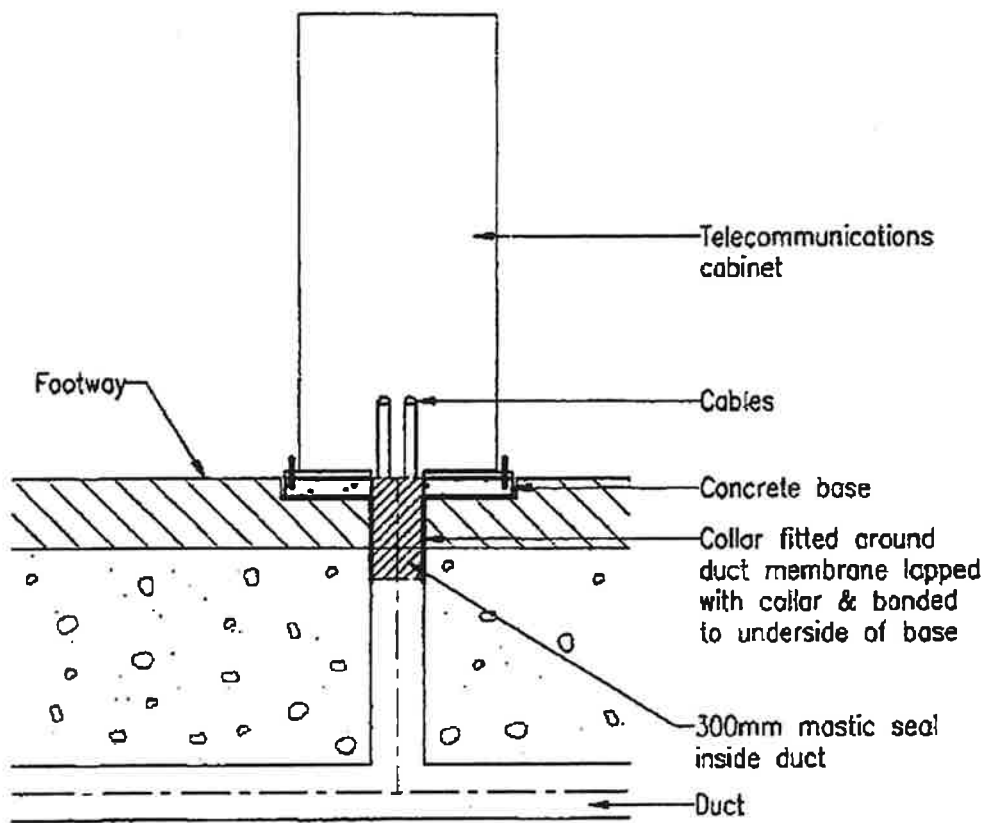
Typical Design of Vented Manhole within Consultation Zone

Figure 5.3

Scale: NTS

Date: December 2015

Rev.: 0



Source: Figure B7 of Landfill Gas Hazard Assessment Guidance Note (published by Environmental Protection Department in 1997)

Landfill Gas Hazard Assessment
Report

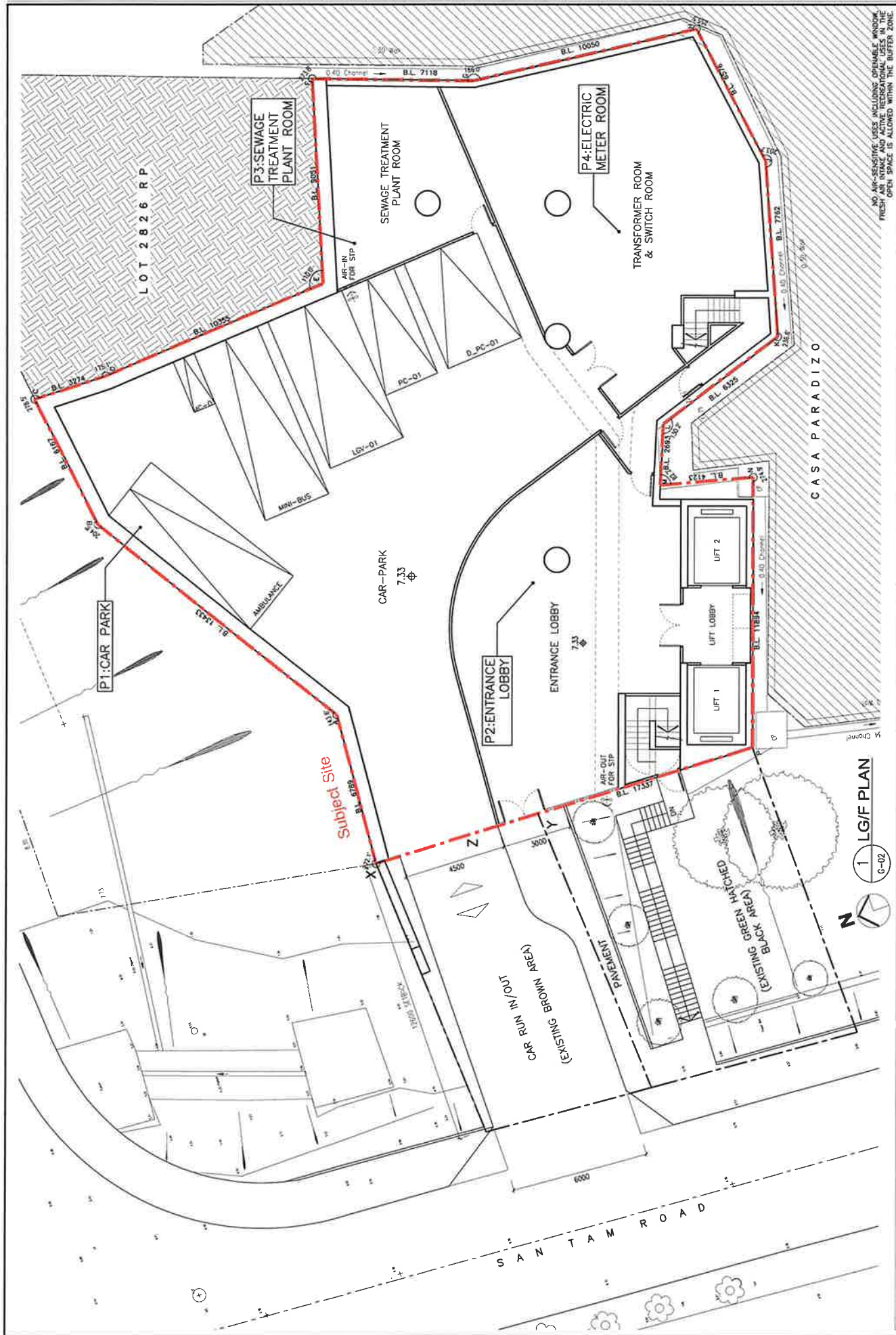
Typical Surface Detail for Above Ground Termination of Services within Consultation Zone

Figure 5.2

Scale: NTS

Date: December 2015

Rev.: 0



2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 at 81 SAN TAM ROAD,
 YUEN LONG, N.T.

PROPOSED LANDFILL GAS MONITORING LOCATION (LG/F)

1 LG/F PLAN
 G-02

FIGURE 5.4 1:225 (A4) A DEC 2022

NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOWS, FRESH AIR INTAKE AND ACTIVE RECREATIONAL USES IN THE OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

Do not scale drawings.
 This drawing shall be used for reference only.
 The drawing shall be used for reference only.
 All dimensions shall be in millimeters unless otherwise specified.
 This drawing is not for construction purposes unless expressly indicated.

RLEB

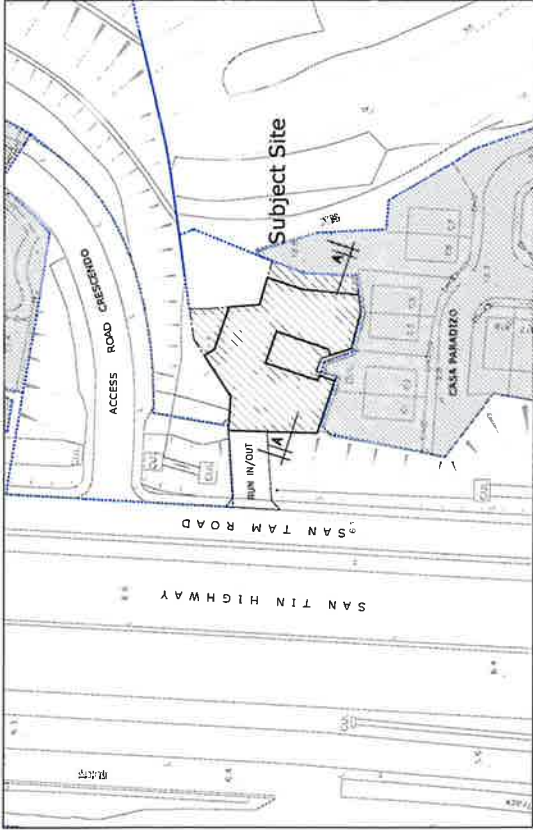
S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12

PROPOSED REZONING FROM "R(C)" TO "G/IC"
FOR A PROPOSED "SOCIAL WELFARE FACILITIES"
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)

AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.

APPENDIX A

DEVELOPMENT LAYOUT PLANS



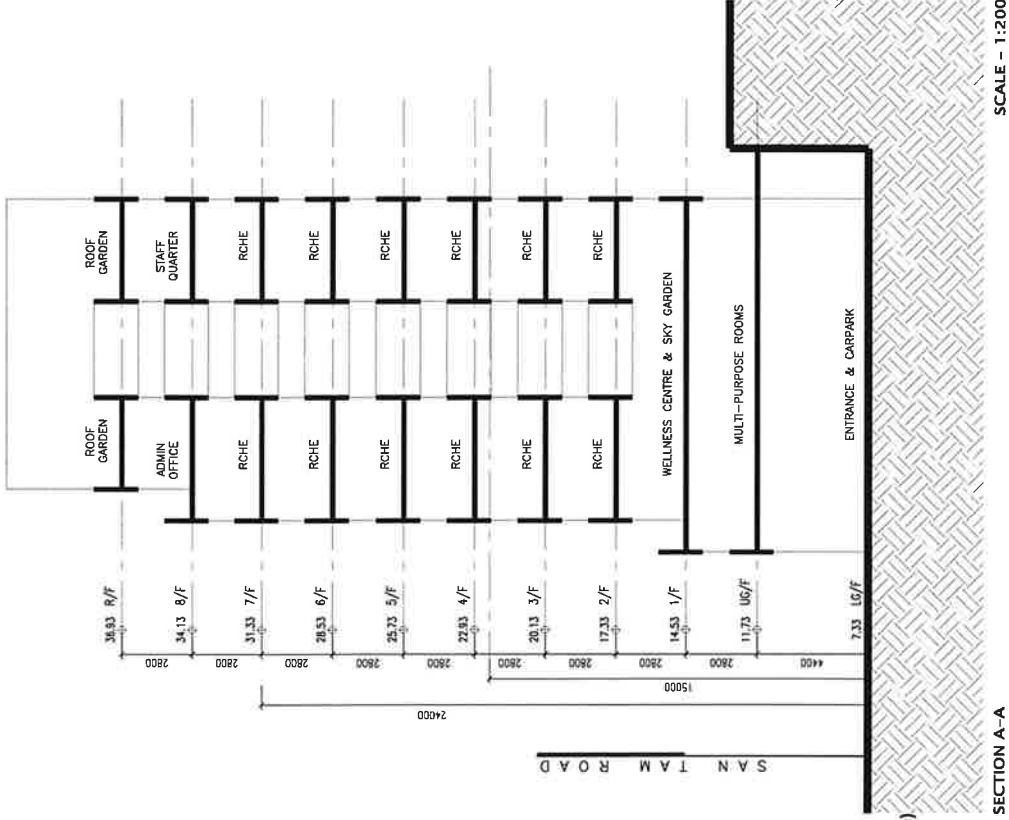
BLOCK PLAN
SCALE - 1:1000

DEVELOPMENT SCHEDULE:

Site Area	736.3 m ²	(7926 ft ²)
Class of Site	A	
Proposed Plot Ratio For Non-Domestic	7.33	
Proposed Site Coverage above For Non-Domestic (Above 15m)	75.558%	
Maximum Gross Floor Area	5400 m ²	(58125.6 ft ²)
Proposed Building Height	36.93 mPD	
Absolute Height	29.6 m	
Proposed No. Of Storey	10 STOREYS	
Proposed Gross Floor Area		
LG/F (ENTRANCE & CARPARK)	352.479 m ²	
UG/F (MULTI-PURPOSE ROOMS)	617.819 m ²	
1/F (WELLNESS CENTRE + SKY GARDEN)	626.160 m ²	
2/F (RCHE)	595.090 m ²	(45 nos. of bed)
3/F (RCHE)	556.330 m ²	(17 nos. of bed + 3 nos. of isolation room)
4/F - 7/F (RCHE)	556.330 m ² x 4 storeys	
	= 2225.32 m ²	(20 nos. of bed x 4 storeys)
8/F (ADMIN OFFIC + STAFF QUARTER)	426.802 m ²	
TOTAL	5400.000 m²	(142 nos. of bed + 3 nos. of isolation room)
Parking Spaces:		
No. of LGV (3.5m x 7m x 3.6m H.)		: 1 Nos.
No. of Minibus (3m x 8m x 3.6m H.)		: 1 Nos.
No. of Private Car Parking (2.5m x 5m x 2.4m H.)		: 1 Nos.
No. of Accessible Private Car Parking (3.5m x 5m x 2.4m H.)		: 1 Nos.
No. of Motorcycle Parking (1m x 2.4m x 2.4m H.)		: 1 Nos.

DEVELOPMENT SCHEDULE & SECTION

2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
at 81 SAN TAM ROAD,
YUEN LONG, N.T.



SECTION A-A
SCALE - 1:200

NO AIR-SENSITIVE USES INCLUDING OPERABLE WINDOW FRESH AIR INTAKE SHALL BE LOCATED WITHIN THE BUFFER ZONE. OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

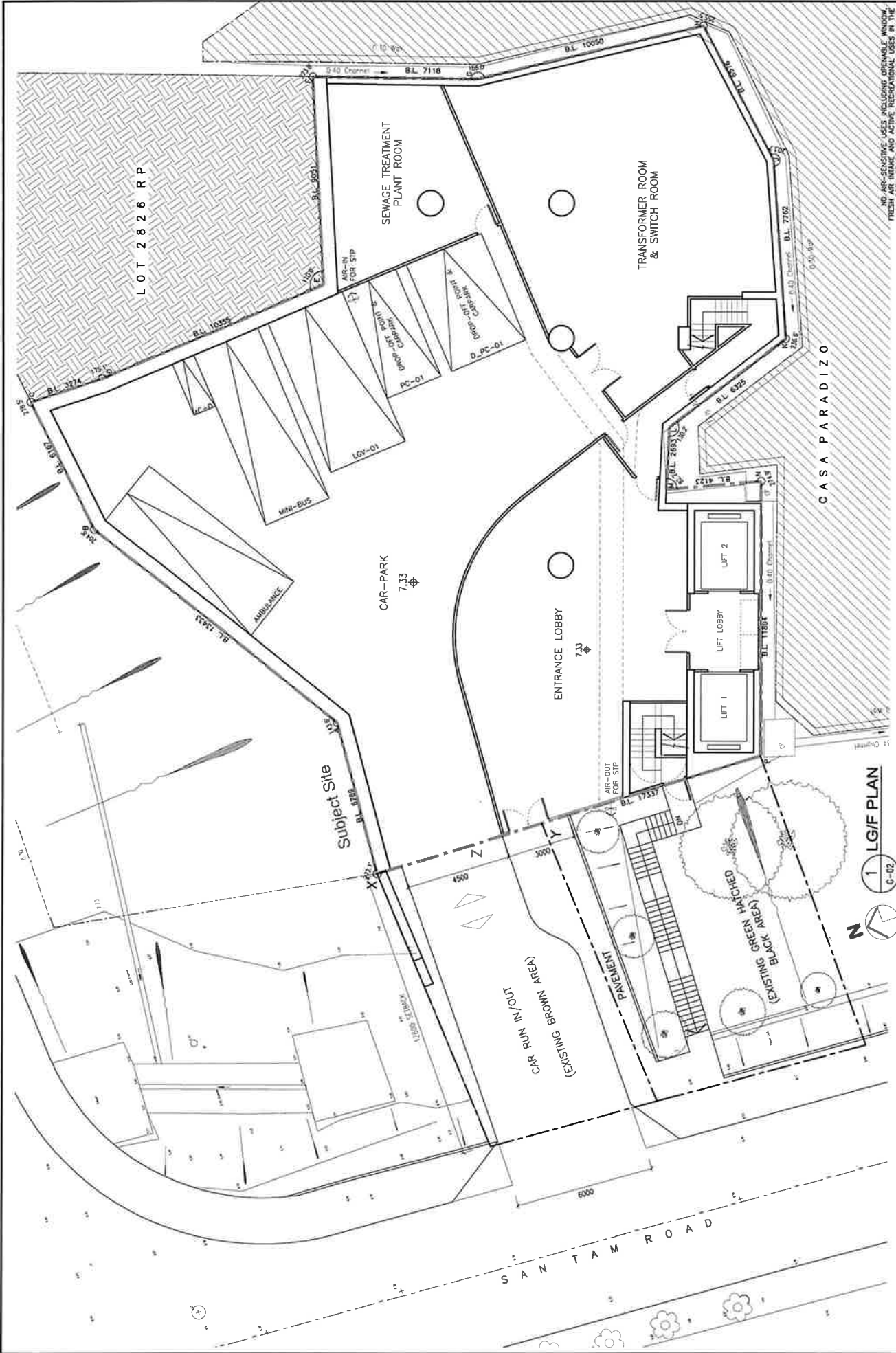
Drawings shall be used to verify exact dimensions on site. The drawings show the design intent of the architect only, contractors are required to obtain site-specific information where appropriate. This drawing is for the property of 'Rise Architects (HK) Ltd' unless otherwise specified. This drawing is not for construction purposes unless expressly certified.

OCT 2020
JULY 2022

B A
N.T.S. (A3)
N.T.S. (A4)

G-01





NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW, FRESH AIR INTAKE OR AIR CONDITIONING UNIT OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

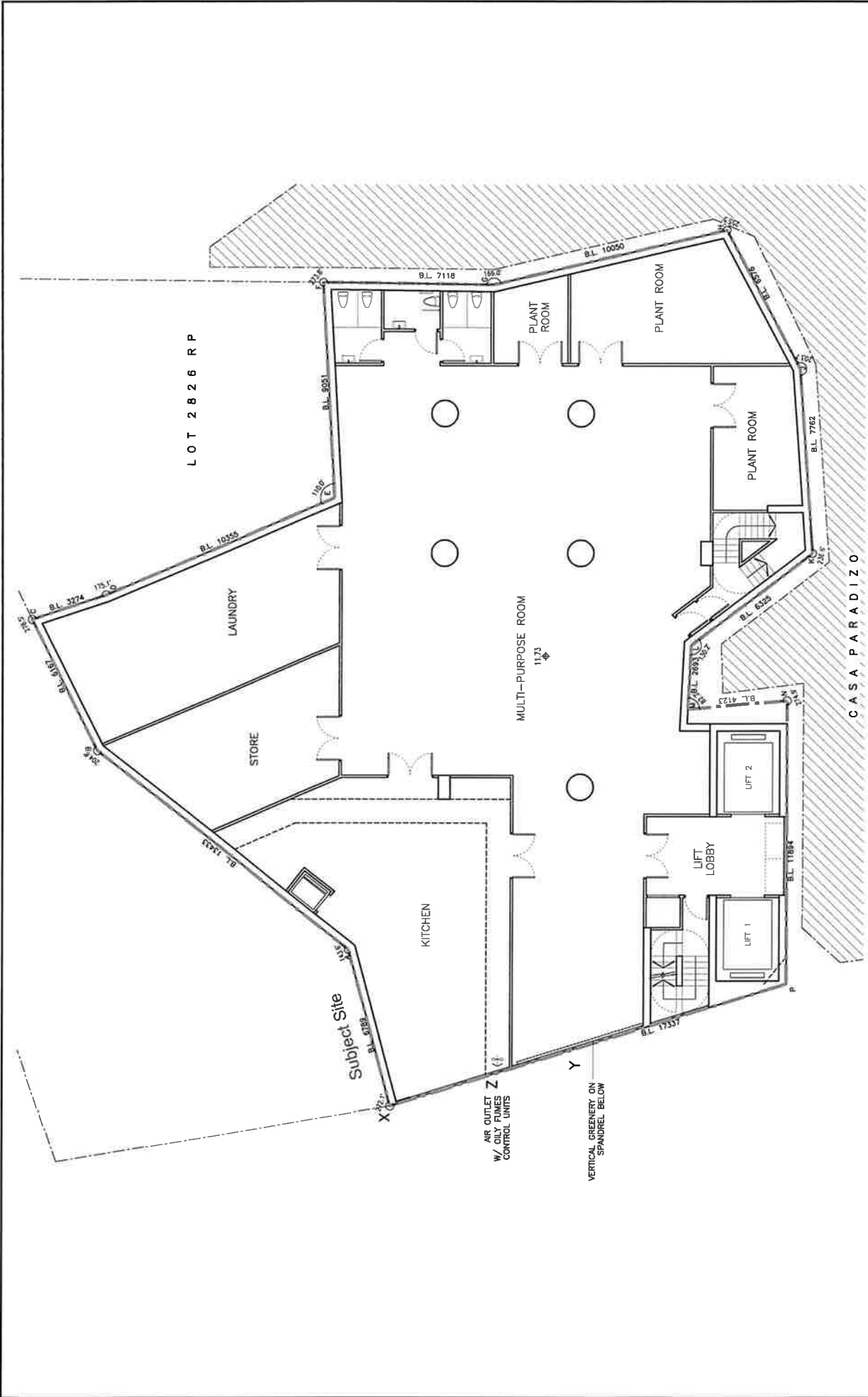
Drawn scale drawings
 DEC 2022
 OCT 2022
 JULY 2022
 This drawing shall be used to verify work dimensions on site.
 The drawings show the design intent of the architect only, contractors are required to
 alert step drawings where appropriate.
 It is the responsibility of the contractor to verify the dimensions of the work on site.
 This drawing is not for construction purposes unless expressly certified.

G-02	1:150 (A3) 1:225 (A4)	C B A	DEC 2022 OCT 2022 JULY 2022
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LG/F PLAN
ENTRANCE & CARPARK

2202
 PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 at 81 SAN TAM ROAD,
 YUEN LONG, N.T.





NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW, FRESH AIR INTAKE, OR AIR-SENSITIVE USES IN OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

Print scale drawings. Do not scale drawings. Check dimensions on site. The drawings show the dimensions of the building shell. Contractors are required to submit shop drawings where appropriate. The drawings are for the purpose of "Rise-Over-Admission (HOA) Lift" unless otherwise specified. This drawing is not for construction purposes unless expressly certified.

OCT 2022
JULY 2022

B A

1:150 (A3)
1:225 (A4)

G-03

1

UG/F PLAN

MULTI-PURPOSE ROOMS

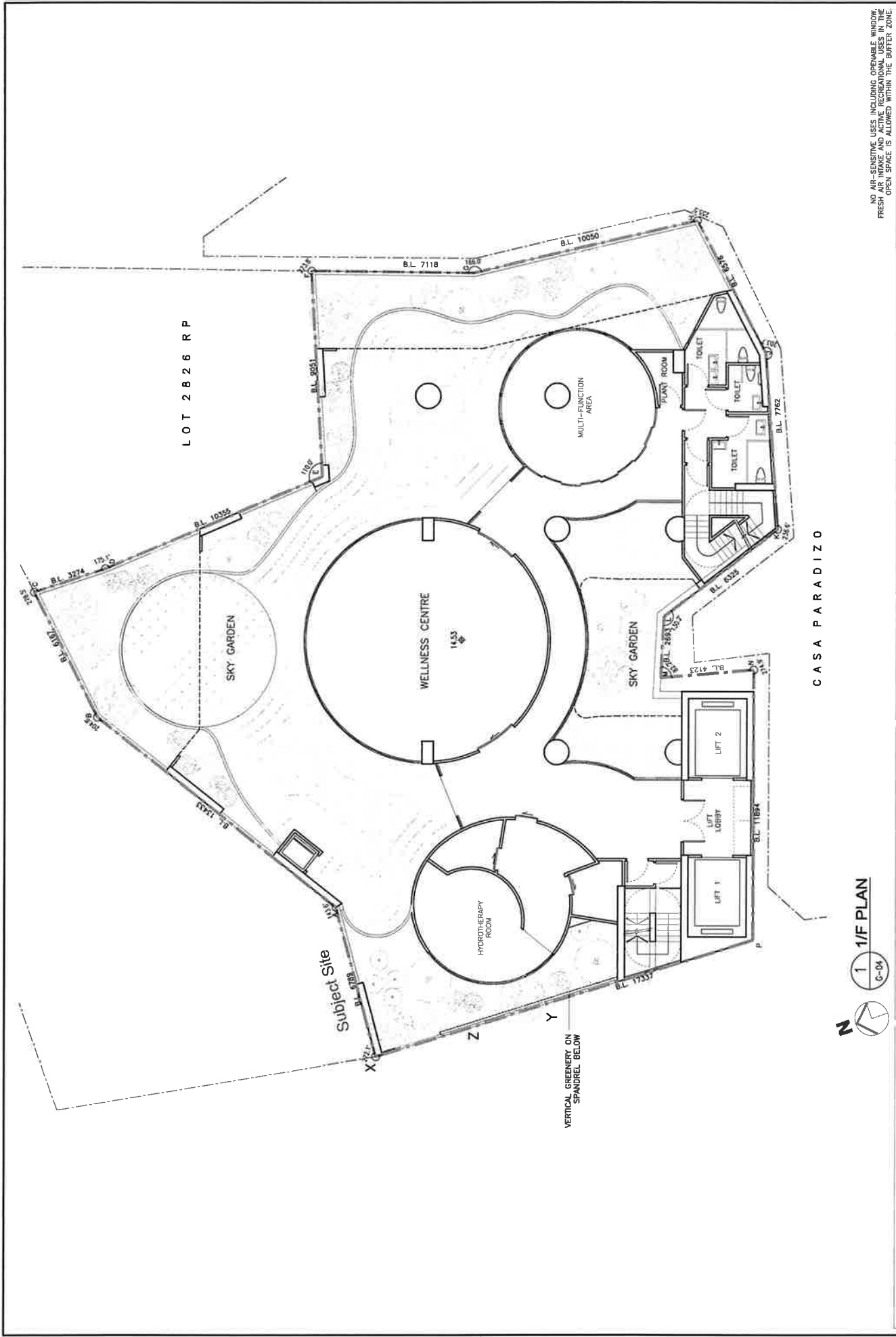
2202

PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY

at 81 SAN TAM ROAD,

YUEN LONG, N.T.

RIEBE



LOT 2826 RP

CASA PARADIZO

1
1/F PLAN
G-04

1/F PLAN
WELLNESS CENTRE & SKY GARDEN

2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
at 81 SAN TAM ROAD,
YUEN LONG, N.T.

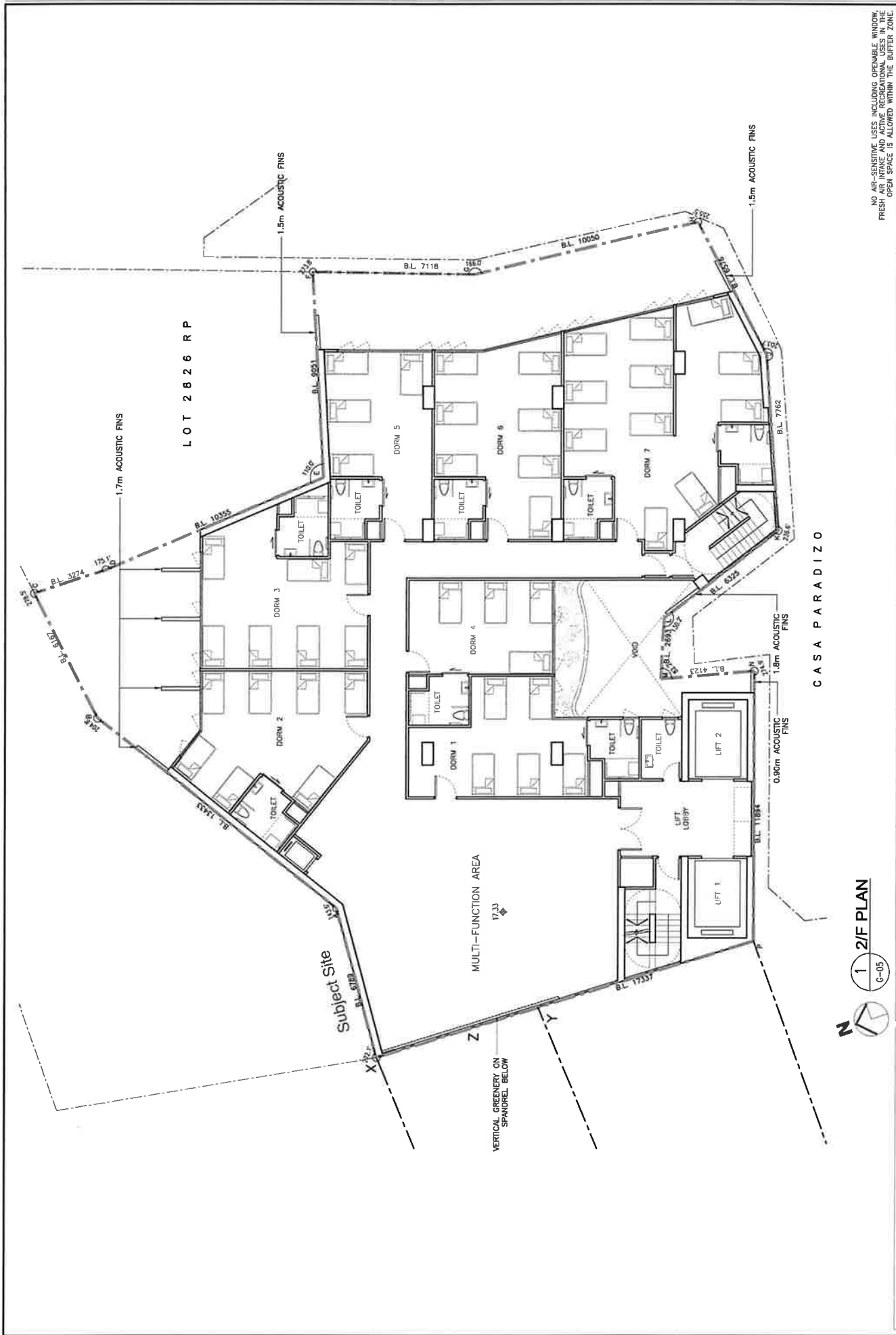
G-04
1:150 (A3)
1:125 (A4)

OCT 2022
JULY 2022

Do not scale drawings.
Contractors to verify exact dimensions on site.
The drawings show the dimensions of the architect only, contractors are required to adjust any drawings where appropriate.
This drawing is not for construction purposes unless expressly certified.

NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW, FRESH AIR INTAKE AND EXHAUST SYSTEMS. OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.





NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW, FRESH AIR INTAKE AND LOWER RECREATIONAL USES IN THE OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.



Do not scale drawings. Do not refer to any dimensions on the drawings unless specifically noted. The drawings show the design intent of the architect only, contractors are required to submit shop drawings where appropriate. The drawings are the property of RLEEB Architects (HK) Ltd. unless otherwise specified. This drawing is not for construction purposes unless expressly certified.

OCT. 2022
JULY 1, 2022

B A

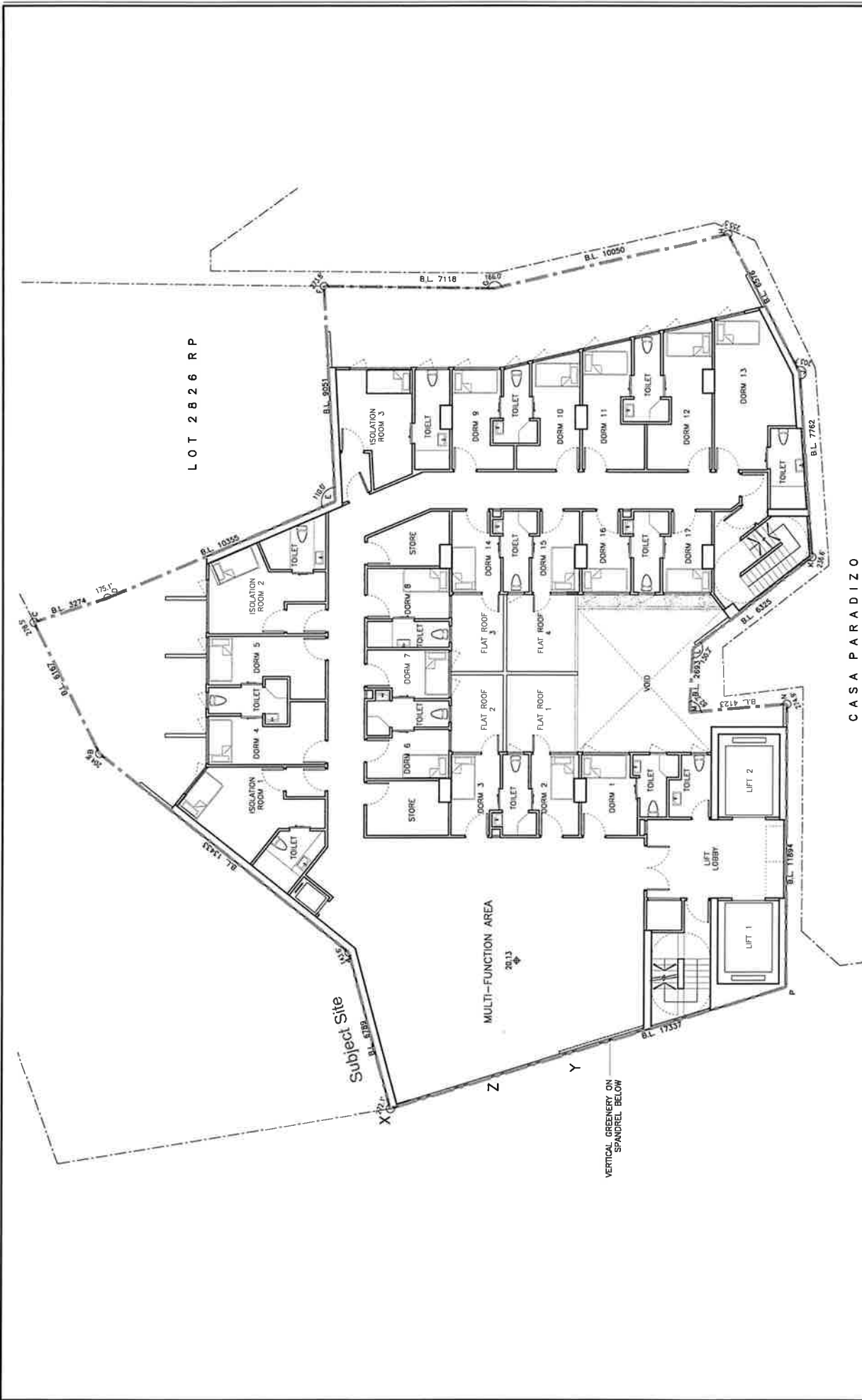
1:150 (A3)
1:225 (A4)

G-05

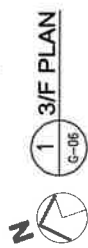
1 2/F PLAN

G-05
2/F PLAN
RCHE

2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
at 81 SAN TAM ROAD,
YUEN LONG, N.T.



CASA PARADIZO



2202
 PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 at 81 SAN TAM ROAD,
 YUEN LONG, N.T.

3/F PLAN
 RCHE

G-06

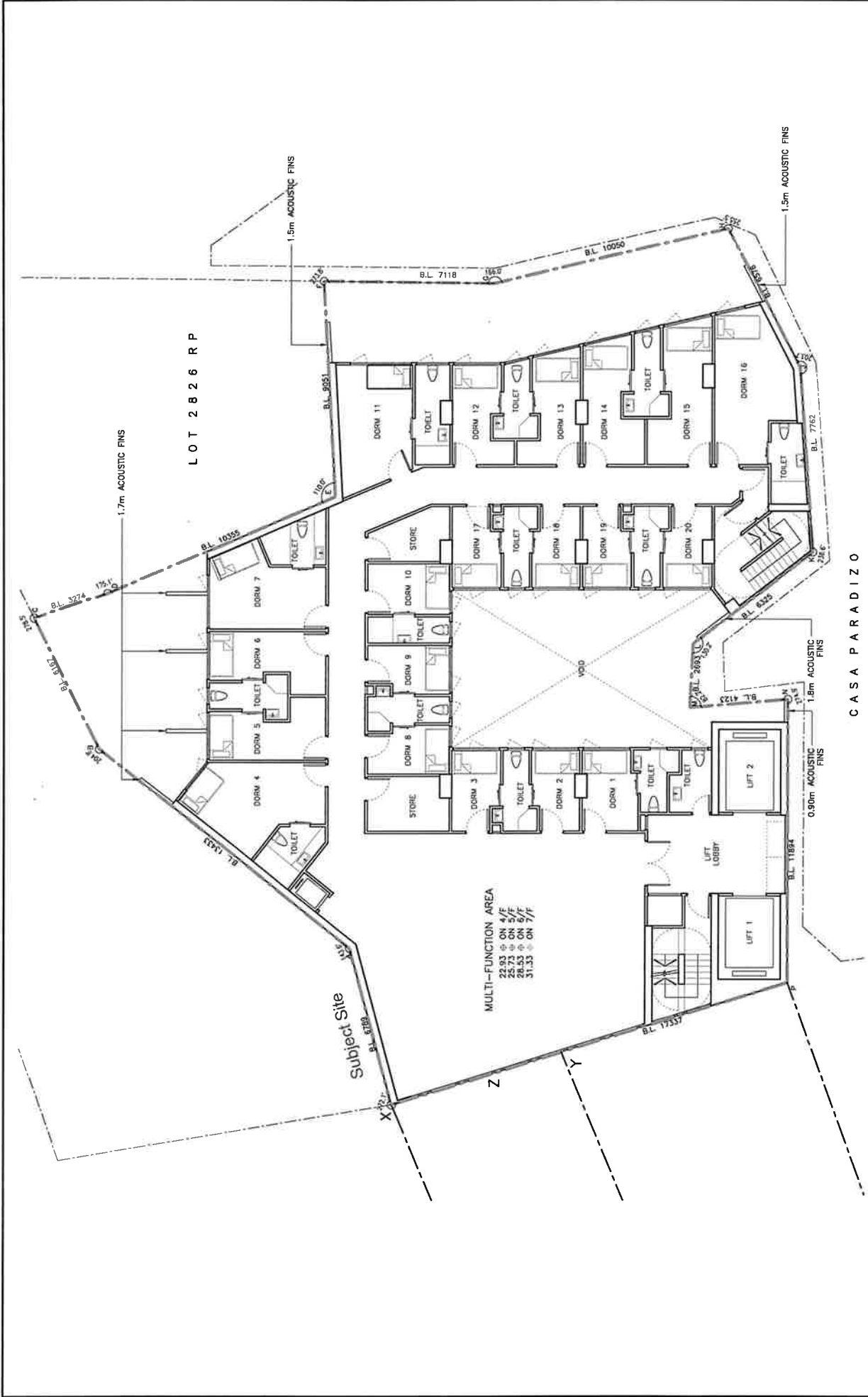
C
 G
 A

DEC 2022
 JULY 2022

Do not scale drawings.
 Construction of building shall be in accordance with the approved plans.
 The drawings show the latest extent of the architect's work, contractors are required to
 submit shop drawings where appropriate.
 It is the responsibility of the contractor to refer to the drawings for any discrepancies.
 The drawings are not for construction purposes unless expressly certified.

NO AIR-SENSITIVE USES INCLUDING OPERABLE WINDOW,
 FRESH AIR INTAKE AND ACTIVE RECREATIONAL USES IN THE
 OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.





MULTI-FUNCTION AREA
 22.93 ON 4/F
 22.73 ON 5/F
 28.53 ON 6/F
 31.33 ON 7/F

CASA PARADIZO



TYPICAL FLOOR PLAN PLAN

TYPICAL FLOOR PLAN PLAN
 RCHE

2202
 PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 at 81 SAN TAM ROAD,
 YUEN LONG, N.T.

G-07

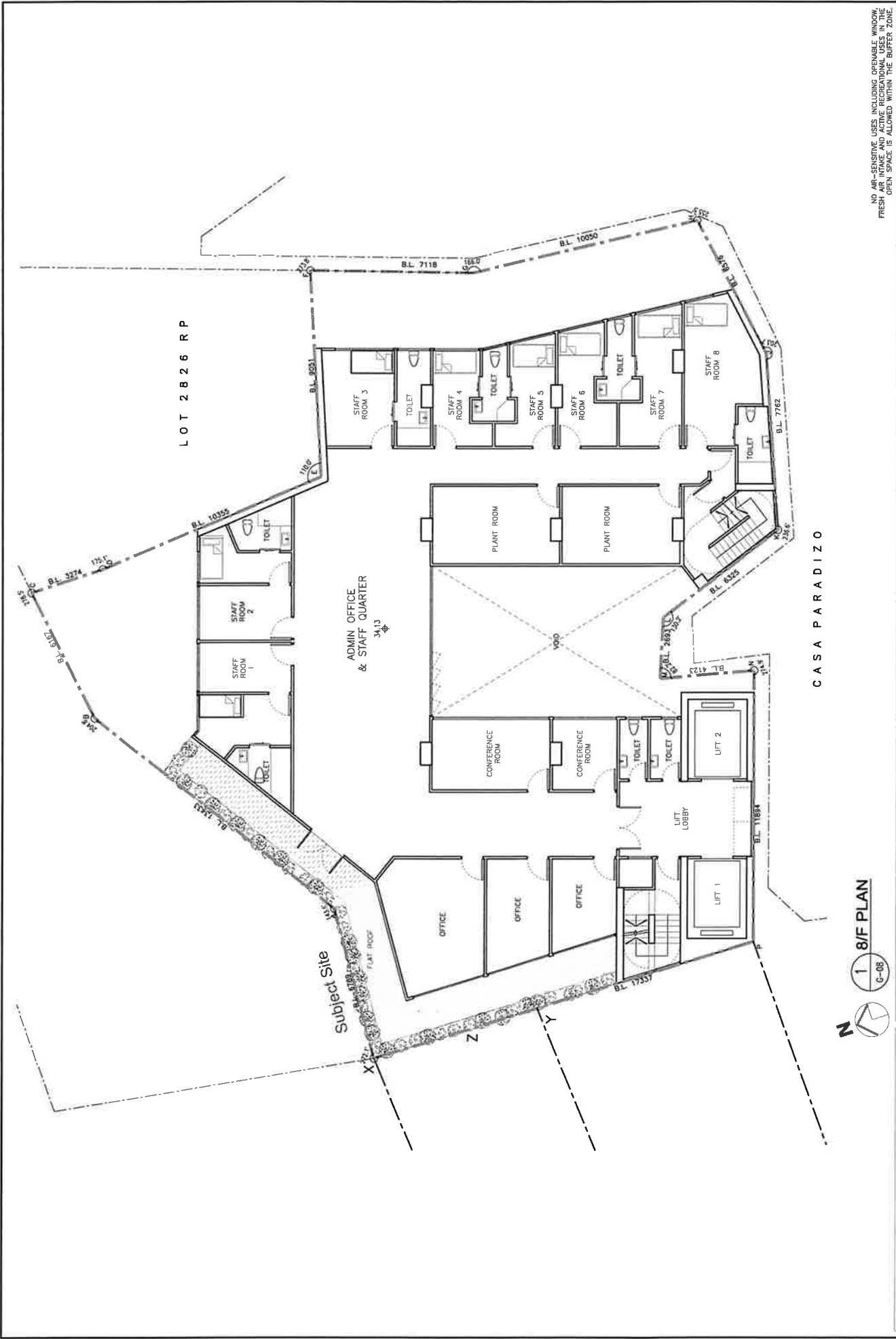
1:150 (A3)
 1:225 (A4)

OCT. 2022
 JULY. 2022

Drawings are prepared by staff members of the
 firm. The drawings are the design ideas of the architect only. Contractors are required to
 submit shop drawings where appropriate. The drawings are for the property of the client and
 are not to be used for any other purpose without the written consent of the architect.
 The drawings are for construction purposes unless expressly certified.

NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW
 AND DOOR INCLUDING BALCONY USES IN THE
 OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.





NO AIR-SENSITIVE USES INCLUDING OPERABLE WINDOW, FRESH AIR INTAKE, OR AIR CONDITIONING UNITS. OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

Drawings were prepared for the purpose of the project. The drawings show the design intent of the architect and are not to be used for construction purposes unless expressly certified. This drawing is not for construction purposes unless expressly certified.

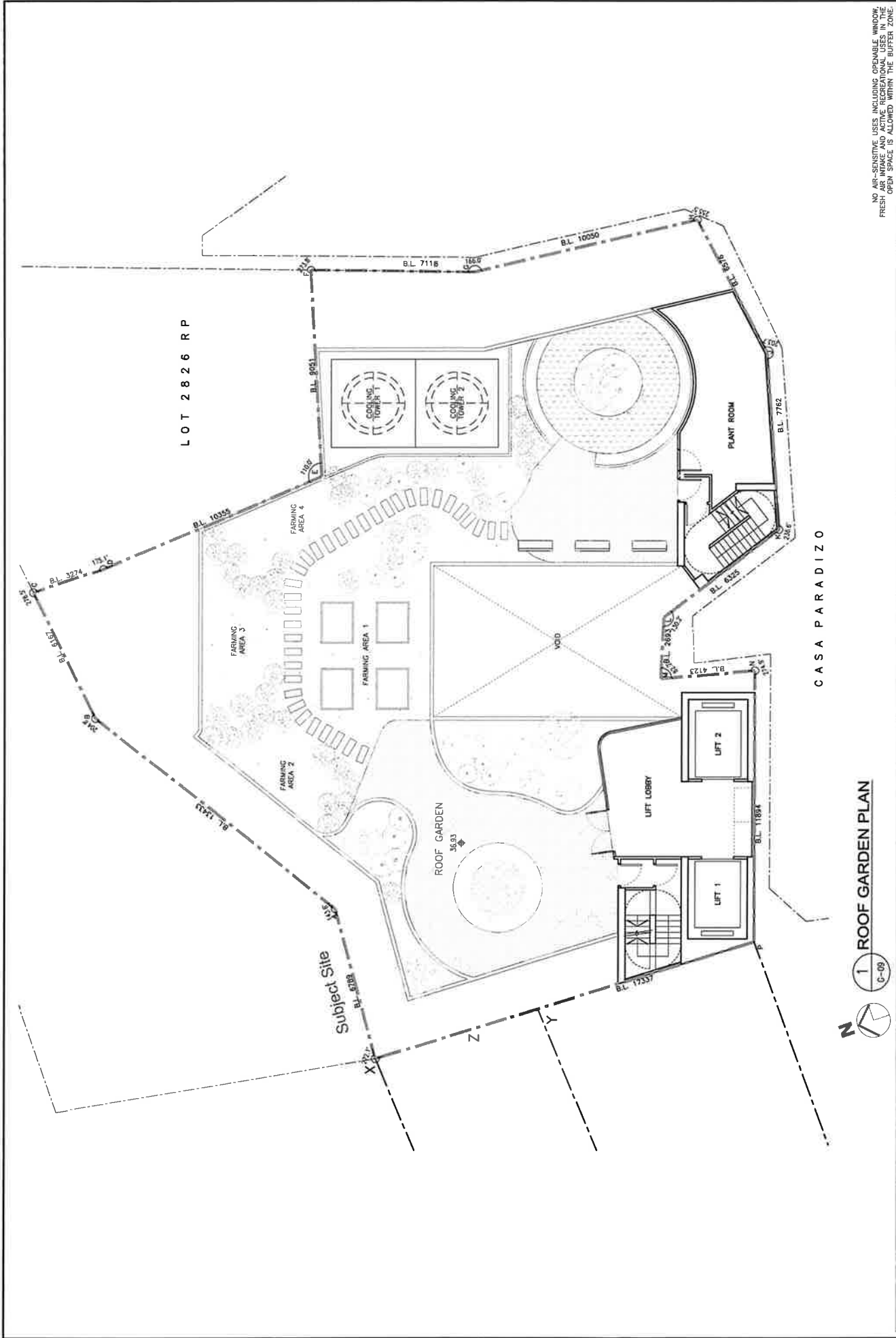
OCT. 2022
JULY, 2022

G-08 1:150 (A3) B
1:225 (A4) A

8/F PLAN
ADMIN OFFICE & STAFF QUARTER

2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
at 81 SAN TAM ROAD,
YUEN LONG, N.T.





LOT 2826 RP

CASA PARADIZO

ROOF GARDEN PLAN

1
G-09

ROOF GARDEN PLAN

2202
PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
at 81 SAN TAM ROAD,
YUEN LONG, N.T.

NO AIR-SENSITIVE USES INCLUDING OPERABLE WINDOW,
OR INTAKE AND ACTIVE RECREATIONAL USES IN THE
OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.

Does not include drawings
The drawings shall be used for the purpose of the project only. Contractors are required to
submit shop drawings where appropriate.
The drawings are for the property of "RLEEB Architects (HK) Ltd" unless
otherwise specified.
The drawings are not for construction purposes unless expressly certified.

OCT. 2022
JULY, 2022

G-09 1:150 (A3) B 1:225 (A4) A

RLEEB

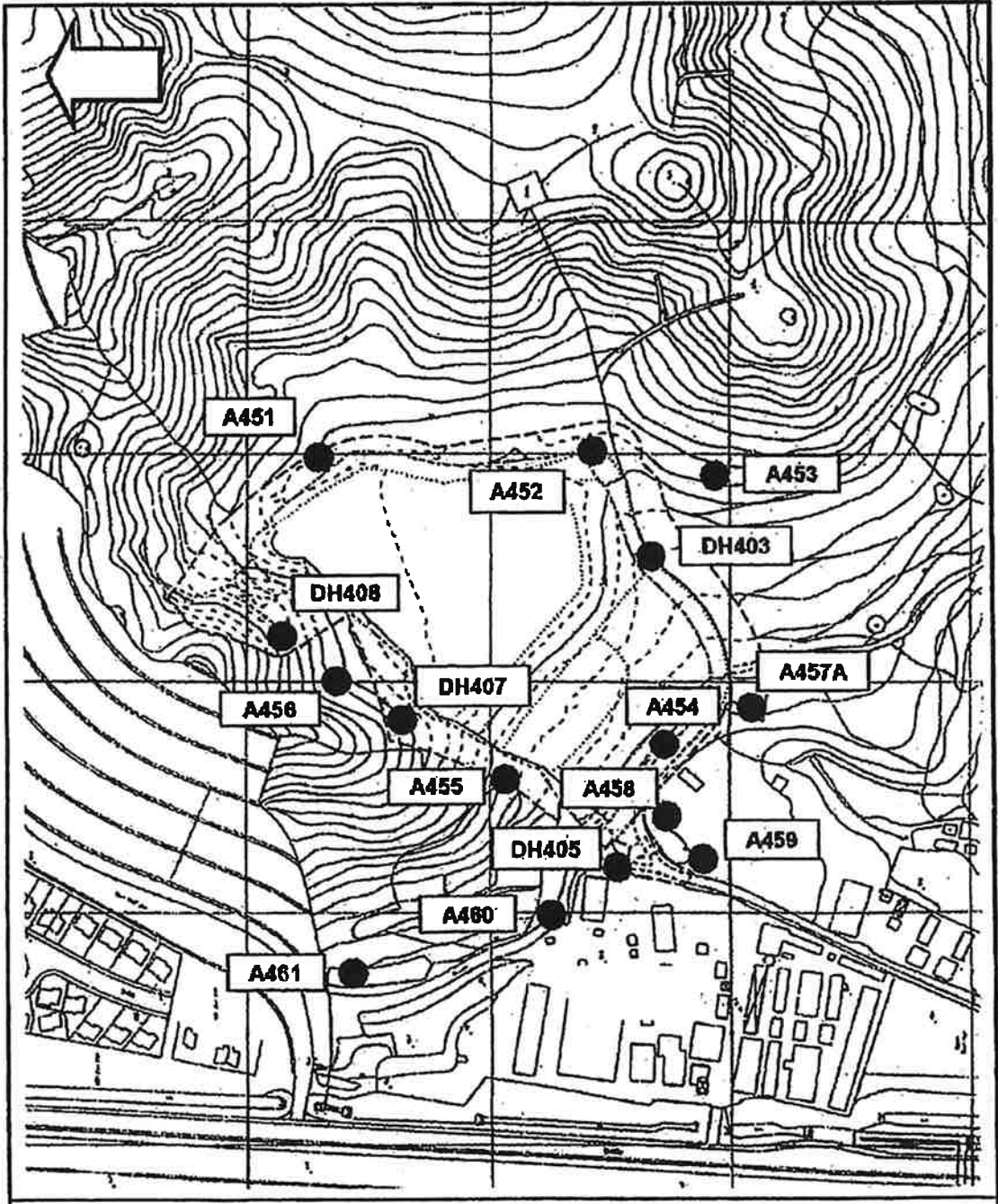
S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12

PROPOSED REZONING FROM "R(C)" TO "G/IC"
FOR A PROPOSED "SOCIAL WELFARE FACILITIES"
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)

AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.

APPENDIX B

RECENT GAS MONITORING DATA OF NGAU TAM
MEI LANDFILL
(FROM JULY 2020 TO JUNE 2022)



Locations of Landfill Gas Migration Monitoring Wells

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
Date of Monitoring: 17-Jul-2020
Weather Condition: Sunny
Equipment Used: Landfill gas monitor
GEM-2000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	10:43	<0.1	4.4	15.4	28.1	0	
A452	10:39	<0.1	2.4	17.5	30.9	0	
A453	10:34	<0.1	1.4	18.4	32.1	0	
A454	10:22	<0.1	13.6	0.6	33.2	0	
A455	11:00	<0.1	1.7	18.1	33.8	0	
A456	10:51	<0.1	0.5	19.3	30.0	0	
A457A	9:55	<0.1	<0.1	14.9	31.1	0	
A458	10:02	<0.1	6.7	13.9	30.8	0	
A459	10:08	<0.1	0.3	19.0	34.8	0	
A460	10:14	<0.1	0.4	18.9	32.5	0	
A461	10:17	<0.1	0.8	18.7	31.0	0	
DH403	10:26	<0.1	1.6	18.2	31.5	0	
DH405	10:12	<0.1	5.4	14.8	35.8	0	
DH407	10:48	<0.1	<0.1	19.9	30.4	0	
DH408	10:54	<0.1	0.8	19.0	33.4	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
Date of Monitoring: 14-Aug-2020
Weather Condition: Sunny
Equipment Used: Landfill gas monitor
GEM-2000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:54	<0.1	6.3	12.6	30.6	0	
A452	14:46	<0.1	0.3	19.0	34.7	0	
A453	14:42	<0.1	4.3	15.4	32.5	0	
A454	14:29	<0.1	11.8	0.3	35.0	0	
A455	15:06	0.1	8.1	9.2	32.8	0	
A456	15:00	<0.1	3.0	16.5	30.3	0	
A457A	14:02	<0.1	<0.1	13.8	34.0	0	
A458	14:09	<0.1	4.5	15.3	34.0	0	
A459	14:13	<0.1	0.9	18.3	35.0	0	
A460	14:21	<0.1	0.7	17.9	35.0	0	
A461	14:24	<0.1	4.5	9.9	32.8	0	
DH403	14:38	<0.1	7.1	10.9	31.3	0	
DH405	14:17	<0.1	9.8	10.4	34.4	0	
DH407	14:56	<0.1	5.9	13.1	28.8	0	
DH408	15:03	<0.1	3.5	15.5	35.0	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
Date of Monitoring: 25-Sep-2020
Weather Condition: Sunny
Equipment Used: Landfill gas monitor
GEM-2000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	11:31	<0.1	7.6	11.0	28.3	0	
A452	11:28	<0.1	1.5	17.8	29.5	0	
A453	11:23	<0.1	4.8	15.2	27.8	0	
A454	11:14	<0.1	8.1	6.5	33.7	0	
A455	11:43	<0.1	5.3	14.2	26.9	0	
A456	11:36	<0.1	3.4	16.1	25.9	0	
A457A	11:08	<0.1	<0.1	10.7	31.2	0	
A458	11:00	<0.1	2.8	17.4	28.3	0	
A459	11:03	<0.1	1.7	17.8	28.7	0	
A460	11:51	<0.1	2.5	16.0	30.3	0	
A461	11:58	<0.1	6.0	10.3	29.2	0	
DH403	11:20	<0.1	7.4	11.3	28.5	0	
DH405	11:48	<0.1	6.5	14.6	35.1	0	
DH407	11:34	<0.1	6.6	12.3	27.1	0	
DH408	11:39	<0.1	4.4	15.2	28.7	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
Date of Monitoring: 22-Oct-2020
Weather Condition: Sunny
Equipment Used: Landfill gas monitor
GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	10:39	<0.1	0.8	20.5	24.6	0	
A452	10:34	<0.1	5.5	15.8	22.5	0	
A453	10:29	<0.1	2.7	18.5	24.1	0	
A454	9:45	<0.1	16.7	0.4	29.8	0	
A455	11:06	<0.1	3.0	18.1	23.8	0	
A456	10:48	<0.1	0.5	21.1	23.2	0	
A457A	10:10	<0.1	<0.1	11.5	24.8	0	
A458	10:01	<0.1	4.2	17.0	26.0	0	
A459	10:05	<0.1	1.8	19.2	27.3	0	
A460	9:52	<0.1	8.0	6.5	24.5	0	
A461	9:56	<0.1	4.3	15.5	24.4	0	
DH403	10:23	<0.1	1.3	20.0	23.3	0	
DH405	9:50	<0.1	5.5	16.6	29.0	0	
DH407	10:45	<0.1	0.3	21.3	22.8	0	
DH408	10:52	<0.1	1.6	19.9	25.2	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei Landfill gas monitor
 Date of Monitoring: 18-Nov-2020 Equipment Used: GEM-5000
 Weather Condition: Cloudy

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:17	<0.1	6.2	13.2	27.0	0	
A452	13:53	<0.1	3.8	18.6	26.9	0	
A453	14:22	<0.1	3.4	18.4	27.7	0	
A454	14:31	<0.1	16.1	5.3	31.1	0	
A455	14:12	<0.1	3.9	17.1	27.5	0	
A456	14:05	<0.1	1.8	19.7	27.5	0	
A457A	14:47	<0.1	<0.1	10.1	31.0	0	
A458	15:00	<0.1	8.5	12.8	29.4	0	
A459	15:05	<0.1	1.2	20.3	29.7	0	
A460	14:38	<0.1	5.3	12.5	28.7	0	
A461	14:41	<0.1	4.1	17.0	27.3	0	
DH403	14:26	<0.1	2.7	18.1	27.0	0	
DH405	14:34	<0.1	4.7	18.0	31.5	0	
DH407	14:01	<0.1	6.4	14.6	26.8	0	
DH408	14:09	<0.1	1.9	19.2	27.6	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei Landfill gas monitor
 Date of Monitoring: 15-Jan-2021 Equipment Used: GEM-5000
 Weather Condition: Sunny

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	13:38	<0.1	5.6	17.8	21.7	0	
A452	13:56	<0.1	9.2	14.6	19.5	0	
A453	14:00	<0.1	1.4	19.9	19.1	0	
A454	14:06	<0.1	16.3	9.2	24.5	0	
A455	13:49	0.1	6.2	16.4	20.5	0	
A456	13:44	<0.1	0.9	19.9	22.5	0	
A457A	14:34	<0.1	<0.1	14.8	25.2	0	
A458	14:42	<0.1	5.8	16.2	24.3	0	
A459	14:45	<0.1	2.0	19.8	25.8	0	
A460	14:12	<0.1	5.8	15.6	21.6	0	
A461	14:24	<0.1	4.3	17.9	20.7	0	
DH403	14:03	<0.1	9.5	11.1	19.8	0	
DH405	14:09	<0.1	8.2	14.5	23.6	0	
DH407	13:46	<0.1	7.7	12.4	19.4	0	
DH408	13:42	<0.1	4.8	18.5	25.6	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei Landfill gas monitor
 Date of Monitoring: 18-Dec-2020 Equipment Used: GEM-5000
 Weather Condition: Sunny

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	11:16	<0.1	7.0	14.0	16.6	0	
A452	11:13	<0.1	6.9	14.4	15.7	0	
A453	11:10	<0.1	1.6	20.1	16.1	0	
A454	11:03	<0.1	16.4	7.9	21.2	0	
A455	11:28	<0.1	7.0	14.4	16.6	0	
A456	11:22	<0.1	1.2	20.3	16.0	0	
A457A	10:42	<0.1	<0.1	12.1	18.4	0	
A458	10:31	<0.1	2.1	19.3	19.4	0	
A459	10:35	<0.1	2.5	18.9	20.4	0	
A460	10:54	<0.1	7.7	12.7	17.4	0	
A461	10:59	<0.1	5.8	17.2	17.2	0	
DH403	11:06	<0.1	7.7	14.2	15.5	0	
DH405	10:51	<0.1	7.0	15.7	21.3	0	
DH407	11:20	<0.1	4.2	18.0	15.3	0	
DH408	11:24	<0.1	4.0	18.3	25.5	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei Landfill gas monitor
 Date of Monitoring: 05-Feb-2021 Equipment Used: GEM-5000
 Weather Condition: Sunny

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	13:46	<0.1	7.7	14.3	24.0	0	
A452	13:35	<0.1	14.7	6.5	23.5	0	
A453	14:15	<0.1	1.8	19.1	25.0	0	
A454	14:28	<0.1	15.6	8.7	29.7	0	
A455	14:05	<0.1	5.1	15.1	24.7	0	
A456	13:57	<0.1	1.3	19.3	26.4	0	
A457A	14:47	<0.1	<0.1	14.3	30.4	0	
A458	14:56	<0.1	4.8	16.3	28.3	0	
A459	15:02	<0.1	0.7	20.1	30.1	0	
A460	14:34	<0.1	5.6	15.9	25.1	0	
A461	14:37	<0.1	2.9	18.5	25.8	0	
DH403	14:19	0.1	3.8	17.2	23.5	0	
DH405	14:30	<0.1	4.9	16.6	27.3	0	
DH407	13:50	<0.1	6.2	12.6	25.2	0	
DH408	14:00	<0.1	1.3	19.3	30.8	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 11-Mar-2021
 Weather Condition: Sunny
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:00	<0.1	1.9	20.6	26.1	0	
A452	13:56	<0.1	5.7	15.2	25.4	0	
A453	13:53	<0.1	1.5	20.5	27.5	0	
A454	13:46	<0.1	15.3	6.0	28.9	0	
A455	14:10	<0.1	4.7	16.1	25.9	0	
A456	14:04	<0.1	2.5	20.2	26.9	0	
A457A	14:22	<0.1	<0.1	13.4	29.2	0	
A458	9:44	<0.1	10.2	9.8	25.5	0	
A459	14:32	<0.1	0.1	20.6	31.0	0	
A460	13:38	<0.1	5.3	17.4	25.3	0	
A461	13:41	<0.1	2.7	19.4	26.4	0	
DH403	13:49	0.1	4.7	17.0	28.0	0	
DH405	13:35	<0.1	4.6	17.3	27.4	0	
DH407	14:03	<0.1	5.3	16.1	26.2	0	
DH408	14:06	<0.1	2.7	20.1	28.4	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 16-Apr-2021
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	13:54	<0.1	5.4	16.2	26.0	0	
A452	11:54	<0.1	3.0	18.3	23.5	0	
A453	11:50	<0.1	2.9	18.9	24.7	0	
A454	11:42	<0.1	15.8	6.6	26.6	0	
A455	14:09	<0.1	2.9	18.0	26.6	0	
A456	14:02	<0.1	0.7	20.4	25.6	0	
A457A	13:29	<0.1	<0.1	13.1	27.1	0	
A458	13:40	<0.1	4.6	16.1	26.7	0	
A459	14:21	<0.1	0.3	20.9	26.4	0	
A460	11:34	<0.1	4.5	18.0	24.5	0	
A461	11:38	<0.1	2.7	19.5	24.7	0	
DH403	11:45	<0.1	1.6	20.0	24.0	0	
DH405	11:27	<0.1	4.3	18.3	25.2	0	
DH407	14:04	<0.1	5.4	15.0	24.9	0	
DH408	13:59	<0.1	0.7	20.3	26.0	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 18-May-2021
 Weather Condition: Sunny
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:07	<0.1	4.8	16.5	33.0	0	
A452	13:58	<0.1	6.1	13.7	35.4	0	
A453	13:55	<0.1	3.9	16.9	33.6	0	
A454	13:46	<0.1	10.9	8.1	34.0	0	
A455	14:20	<0.1	4.4	15.9	37.1	0	
A456	14:02	<0.1	1.3	19.5	33.2	0	
A457A	14:32	<0.1	<0.1	14.1	36.7	0	
A458	14:40	<0.1	9.1	11.6	34.2	0	
A459	14:44	<0.1	0.6	20.7	34.5	0	
A460	13:40	<0.1	3.8	17.7	34.1	0	
A461	13:42	<0.1	3.7	17.7	33.9	0	
DH403	13:51	<0.1	8.2	12.9	35.0	0	
DH405	13:36	<0.1	4.2	17.5	33.2	0	
DH407	14:15	<0.1	5.1	15.3	33.3	0	
DH408	14:11	<0.1	1.3	20.2	36.6	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 18-Jun-2021
 Weather Condition: Fine
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	13:49	<0.1	6.1	14.4	33.9	0	
A452	13:53	<0.1	6.4	12.8	35.2	0	
A453	13:57	<0.1	4.2	15.9	34.5	0	
A454	14:05	<0.1	13.9	2.2	35.6	0	
A455	13:44	<0.1	4.4	15.5	35.2	0	
A456	13:38	<0.1	3.5	17.3	30.9	0	
A457A	14:30	<0.1	<0.1	12.9	37.0	0	
A458	14:39	<0.1	2.5	17.7	35.5	0	
A459	14:41	<0.1	1.1	18.6	38.8	0	
A460	14:10	<0.1	3.5	16.2	35.3	0	
A461	14:12	<0.1	4.2	15.2	35.3	0	
DH403	14:00	<0.1	10.2	9.7	34.2	0	
DH405	14:07	<0.1	4.3	16.1	37.3	0	
DH407	13:36	<0.1	5.9	14.3	32.5	0	
DH408	13:40	<0.1	1.3	19.1	34.6	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 16-Jul-2021
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	10:51	<0.1	5.1	15.3	29.7	0	
A452	10:47	<0.1	2.9	17.3	29.3	0	
A453	10:41	<0.1	3.0	17.7	30.0	0	
A454	10:33	<0.1	13.5	0.3	30.7	0	
A455	11:03	<0.1	0.2	20.2	29.1	0	
A456	10:57	<0.1	1.5	19.1	28.0	0	
A457A	10:04	<0.1	<0.1	11.3	29.8	0	
A458	10:15	<0.1	9.1	12.2	30.6	0	
A459	10:19	<0.1	1.8	18.8	31.7	0	
A460	10:26	<0.1	3.6	15.6	29.3	0	
A461	10:29	<0.1	3.2	15.8	28.4	0	
DH403	10:36	<0.1	6.8	13.4	28.9	0	
DH405	10:23	<0.1	1.2	19.3	30.2	0	
DH407	10:59	<0.1	2.1	18.5	27.2	0	
DH408	10:55	<0.1	0.1	20.2	29.6	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 13-Aug-2021
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:51	<0.1	9.2	10.6	28.2	0	
A452	14:36	<0.1	6.6	11.7	27.6	0	
A453	14:30	<0.1	4.7	15.4	28.5	0	
A454	14:16	<0.1	6.1	8.3	29.9	0	
A455	15:08	<0.1	10.3	9.0	29.2	0	
A456	14:58	<0.1	5.5	13.9	28.3	0	
A457A	15:22	<0.1	<0.1	11.0	31.4	0	
A458	13:51	<0.1	9.8	12.1	31.9	0	
A459	13:56	<0.1	1.6	18.3	30.2	0	
A460	14:08	<0.1	2.4	16.4	30.0	0	
A461	14:11	<0.1	6.5	8.5	29.8	0	
DH403	14:22	<0.1	12.2	8.1	27.9	0	
DH405	14:05	<0.1	6.4	14.4	30.4	0	
DH407	14:54	<0.1	6.5	13.3	27.8	0	
DH408	15:01	<0.1	6.0	13.6	29.8	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 27-Sep-2021
 Weather Condition: Fine
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:20	<0.1	7.4	11.4	28.8	0	
A452	14:17	<0.1	4.1	16.1	30.6	0	
A453	14:11	<0.1	4.3	16.1	30.5	0	
A454	14:01	<0.1	12.7	0.7	34.8	0	
A455	14:33	<0.1	8.7	11.2	29.4	0	
A456	14:26	<0.1	5.5	14.8	29.7	0	
A457A	14:48	<0.1	<0.1	9.3	36.0	0	
A458	13:42	<0.1	5.7	15.1	34.4	0	
A459	13:44	<0.1	1.8	18.3	33.3	0	
A460	13:52	<0.1	5.0	10.8	30.1	0	
A461	13:56	<0.1	5.8	11.7	30.3	0	
DH403	14:05	<0.1	9.1	10.6	30.2	0	
DH405	13:50	<0.1	7.2	14.1	33.2	0	
DH407	14:28	<0.1	6.4	13.4	29.1	0	
DH408	14:24	<0.1	3.2	16.9	32.1	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 27-Oct-2021
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	13:59	<0.1	3.0	16.6	25.5	0	
A452	13:56	<0.1	4.2	16.1	25.2	0	
A453	13:52	<0.1	2.5	18.6	26.0	0	
A454	13:46	<0.1	8.0	11.8	29.0	0	
A455	14:13	<0.1	6.1	13.3	25.9	0	
A456	14:05	<0.1	2.4	18.6	25.2	0	
A457A	14:46	<0.1	<0.1	13.8	28.8	0	
A458	14:34	<0.1	1.4	19.1	29.4	0	
A459	14:37	<0.1	1.6	18.5	30.0	0	
A460	14:22	<0.1	3.5	13.9	26.9	0	
A461	14:25	<0.1	4.9	10.9	27.0	0	
DH403	13:49	<0.1	8.6	11.9	25.6	0	
DH405	14:20	<0.1	0.3	20.1	27.8	0	
DH407	14:02	<0.1	5.4	13.7	24.2	0	
DH408	14:07	<0.1	6.7	13.5	25.8	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 18-Nov-2021
 Weather Condition: Sunny

Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:38	<0.1	6.6	11.8	23.5	0	
A452	14:28	<0.1	10.8	9.8	23.9	0	
A453	14:21	<0.1	3.9	16.9	23.5	0	
A454	14:10	<0.1	16.8	0.6	27.6	0	
A455	14:54	0.2	10.2	9.3	24.5	0	
A456	14:46	<0.1	0.6	20.2	23.4	0	
A457A	14:03	<0.1	<0.1	10.6	29.9	0	
A458	13:49	<0.1	10.9	11.1	27.8	0	
A459	13:54	<0.1	2.1	18.1	30.4	0	
A460	13:37	<0.1	4.8	12.2	25.1	0	
A461	13:40	<0.1	7.3	12.1	24.2	0	
DH403	14:15	<0.1	3.5	17.3	24.1	0	
DH405	13:33	<0.1	3.1	18.1	26.3	0	
DH407	14:48	<0.1	7.5	9.7	22.4	0	
DH408	14:42	<0.1	6.9	13.9	27.5	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 20-Jan-2022
 Weather Condition: Sunny

Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:27	<0.1	1.1	19.6	19.2	0	
A452	14:23	<0.1	12.5	7.9	18.5	0	
A453	14:20	<0.1	2.1	18.9	20.5	0	
A454	14:12	<0.1	16.6	5.1	24.7	0	
A455	14:42	<0.1	2.8	17.9	20.1	0	
A456	14:34	<0.1	0.7	20.2	21.1	0	
A457A	14:05	<0.1	<0.1	12.4	27.3	0	
A458	13:52	<0.1	4.8	15.7	23.7	0	
A459	13:56	<0.1	1.9	19.0	26.7	0	
A460	13:39	<0.1	6.0	14.0	20.5	0	
A461	13:43	<0.1	5.5	16.3	20.7	0	
DH403	14:16	<0.1	9.3	12.0	21.1	0	
DH405	13:34	<0.1	4.7	16.7	23.2	0	
DH407	14:37	<0.1	7.3	10.3	19.4	0	
DH408	14:31	<0.1	3.7	17.5	24.1	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 16-Dec-2021
 Weather Condition: Sunny

Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:13	<0.1	1.4	18.8	25.0	0	
A452	14:09	<0.1	3.9	16.1	25.3	0	
A453	14:04	<0.1	2.5	18.1	24.9	0	
A454	13:55	<0.1	17.3	2.0	26.9	0	
A455	14:28	<0.1	0.1	20.4	24.6	0	
A456	14:20	<0.1	0.4	19.9	24.8	0	
A457A	14:47	<0.1	<0.1	11.7	29.4	0	
A458	14:35	<0.1	1.4	19.0	26.5	0	
A459	14:38	<0.1	0.8	19.7	29.6	0	
A460	13:48	<0.1	6.5	10.5	26.5	0	
A461	13:50	<0.1	4.9	16.2	26.4	0	
DH403	13:59	<0.1	0.2	20.2	25.7	0	
DH405	13:44	<0.1	2.4	18.8	27.1	0	
DH407	14:18	<0.1	7.2	10.3	24.2	0	
DH408	14:23	<0.1	5.9	15.1	29.1	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 18-Feb-2022
 Weather Condition: Fine

Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:07	<0.1	0.5	20.4	18.3	0	
A452	14:35	<0.1	5.4	15.2	19.0	0	
A453	14:42	<0.1	2.2	19.6	18.0	0	
A454	14:52	<0.1	16.0	7.5	21.7	0	
A455	14:23	<0.1	4.2	16.3	19.1	0	
A456	14:17	<0.1	0.7	20.2	19.2	0	
A457A	15:16	<0.1	<0.1	13.6	23.6	0	
A458	15:29	<0.1	7.1	13.4	20.1	0	
A459	15:24	<0.1	0.7	20.6	22.5	0	
A460	15:02	<0.1	4.6	16.8	18.6	0	
A461	15:06	<0.1	5.2	17.0	17.6	0	
DH403	14:44	<0.1	7.8	13.4	17.7	0	
DH405	14:57	<0.1	4.6	17.1	19.8	0	
DH407	14:19	<0.1	7.0	11.6	18.3	0	
DH408	14:11	<0.1	5.2	16.4	21.8	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 17-Mar-2022
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:09	<0.1	6.6	14.2	25.9	0	
A452	14:29	<0.1	8.0	11.2	26.1	0	
A453	14:33	<0.1	2.7	18.5	26.4	0	
A454	14:04	<0.1	11.0	4.3	27.4	0	
A455	14:22	<0.1	3.1	17.3	27.8	0	
A456	14:16	<0.1	4.2	16.5	27.5	0	
A457A	13:57	<0.1	<0.1	14.0	29.0	0	
A458	13:41	<0.1	5.8	14.7	29.4	0	
A459	13:45	<0.1	1.2	19.1	30.0	0	
A460	13:32	<0.1	4.4	16.0	26.6	0	
A461	13:35	<0.1	3.1	17.0	26.9	0	
DH403	14:36	<0.1	2.0	19.1	26.0	0	
DH405	13:30	<0.1	4.9	16.2	28.9	0	
DH407	14:18	<0.1	6.2	12.6	25.7	0	
DH408	14:13	<0.1	2.0	18.9	28.2	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 14-Apr-2022
 Weather Condition: Sunny
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	11:48	<0.1	1.8	18.7	26.9	0	
A452	11:46	<0.1	0.6	19.5	26.0	0	
A453	12:06	<0.1	2.5	18.3	28.6	0	
A454	12:13	<0.1	10.6	1.9	30.3	0	
A455	11:59	<0.1	2.3	18.2	27.2	0	
A456	11:54	<0.1	2.6	18.2	29.2	0	
A457A	11:38	<0.1	<0.1	13.1	31.3	0	
A458	11:26	<0.1	2.1	18.5	30.7	0	
A459	11:29	<0.1	1.5	18.7	30.6	0	
A460	12:21	<0.1	3.6	15.7	28.2	0	
A461	12:23	<0.1	3.3	16.0	28.3	0	
DH403	12:10	<0.1	2.0	18.6	28.7	0	
DH405	12:18	<0.1	4.1	16.8	30.5	0	
DH407	11:57	<0.1	0.8	19.6	26.4	0	
DH408	11:52	<0.1	3.3	17.2	30.2	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 20-May-2022
 Weather Condition: Sunny
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	14:31	<0.1	8.2	10.6	30.1	0	
A452	14:20	<0.1	4.0	13.2	30.7	0	
A453	14:14	<0.1	4.3	15.7	31.0	0	
A454	11:55	<0.1	5.2	9.2	29.7	0	
A455	14:46	<0.1	0.4	19.6	31.8	0	
A456	14:36	<0.1	4.8	14.7	29.4	0	
A457A	15:11	<0.1	<0.1	13.1	35.7	0	
A458	14:59	<0.1	0.9	19.1	35.3	0	
A459	14:55	<0.1	1.3	18.2	36.2	0	
A460	14:10	<0.1	2.7	16.2	31.1	0	
A461	11:51	<0.1	4.9	11.2	28.8	0	
DH403	11:59	<0.1	9.5	9.3	29.8	0	
DH405	11:46	<0.1	3.8	17.1	28.9	0	
DH407	14:38	<0.1	6.4	11.8	27.2	0	
DH408	14:33	<0.1	3.8	16.1	31.4	0	

LANDFILL GAS MONITORING - FIELD MEASUREMENT

Name of Site : Ngau Tam Mei
 Date of Monitoring: 10-Jun-2022
 Weather Condition: Cloudy
 Equipment Used: Landfill gas monitor
 GEM-5000

Well No.	Time	Methane (%)	Carbon Dioxide (%)	Oxygen (%)	Temperature (°C)	Relative Pressure (mbar)	Remark
A451	15:06	<0.1	6.0	13.4	26.1	0	
A452	15:03	<0.1	4.8	8.0	27.8	0	
A453	14:59	<0.1	4.9	14.6	28.3	0	
A454	14:48	<0.1	6.5	2.5	29.6	0	
A455	15:19	<0.1	4.7	13.7	28.3	0	
A456	15:12	<0.1	3.7	16.5	26.4	0	
A457A	14:32	<0.1	<0.1	12.9	29.2	0	
A458	14:39	<0.1	1.3	19.2	30.4	0	
A459	14:44	<0.1	0.7	19.7	30.9	0	
A460	15:33	<0.1	1.5	18.0	27.6	0	
A461	15:35	<0.1	4.6	9.2	27.3	0	
DH403	14:54	<0.1	12.4	6.6	29.8	0	
DH405	15:26	<0.1	8.0	12.8	29.2	0	
DH407	15:10	<0.1	5.9	12.9	26.3	0	
DH408	15:15	<0.1	5.8	13.4	27.0	0	

S12A AMENDMENT OF PLAN APPLICATION
APPROVED NGAU TAM MEI
OUTLINE ZONING PLAN NO. S/YL-NTM/12

PROPOSED REZONING FROM "R(C)" TO "G/IC"
FOR A PROPOSED "SOCIAL WELFARE FACILITIES"
(RESIDENTIAL CARE HOMES FOR THE ELDERLY)
(RCHE)

AT LOT 4823 IN D.D.104, 81 SAN TAM ROAD,
SAN TIN, N.T.

APPENDIX C

"HAZARDS ARISING DURING CONSTRUCTION"
EXTRACTED FROM EDP'S LANFILL GAS HAZARD
ASSESSMENT GUIDANCE NOTE

Introduction

8.1 During the construction phase, hazards may arise which are related either to the flammability of landfill gas or to its potentially asphyxiating properties. In particular cases, it is possible that toxicity effects may be significant. The following sub-sections of the Guidance Note may be used to form the basis of Specification Clauses for incorporation in Contract Documentation for developments within the Consultation Zone.

General Hazards Which May Be Encountered

8.2 The developer should be aware of, and should inform construction contractors accordingly, that methane and carbon dioxide are always likely to be present in the soil voids. In addition the developer should be aware of the potential hazards and other properties of landfill gas as described in Section 1.

Outline of Safety Requirements

8.3 In all construction work adjacent to landfill sites, safety procedures should be implemented to minimise the risks of:

- fires and explosions;
- asphyxiation of workers; and
- toxicity effects.

8.4 Precautions should be clearly laid down and rigidly adhered to with respect to:

- trenching and excavation; and

- creation of confined spaces at, near to or below ground level.

8.5 In addition to normal site safety procedures, gas detection equipment and appropriate breathing apparatus should be available and used when entering confined spaces or trenches deeper than 1 metre.

Additional General Requirements

8.6 During the construction phase, the following additional precautions should be followed.

Appointment of Safety Officer

8.7 For large developments, a Safety Officer, trained in the use of gas detection equipment and landfill gas-related hazards, should be present on site throughout the groundworks phase. The Safety Officer should be provided with an intrinsically safe portable instrument (or instruments), appropriately calibrated and capable of measuring the following gases in the ranges indicated:

methane	0-100% LEL and 0-100 % v/v
carbon dioxide	0-100%; and
oxygen	0-21%

8.8 For smaller developments, if a Safety Officer is not appointed, then expert opinion and advice should be sought on a regular basis.

Safety Measures

8.9 All personnel who work on site and all visitors to the site should be made aware of the possibility of ignition of gas in the vicinity of excavations. Safety notices should be posted warning of the potential hazards.

8.10 Those staff who work in, or have responsibility for 'at risk' areas, including all excavation workers, supervisors and engineers working within the Consultation Zone, should receive appropriate training on working in areas susceptible to landfill gas, fire and explosion hazards.

8.11 An excavation procedure or code of practice to minimise landfill gas related risk should be devised and carried out by the project proponent.

8.12 No worker should be allowed to work alone at any time in or near to any excavation. At least one other worker should be available to assist with a rescue if needed.

8.13 Smoking, naked flames and all other sources of ignition should be prohibited within 15m of any excavation or ground-level confined space. 'No smoking' and 'No naked flame' notices should be posted prominently on the construction site and, if necessary, special areas designated for smoking.

8.14 Welding, flame-cutting or other hot works should be confined to open areas at least 15m from any trench or excavation.

8.15 Welding, flame-cutting or other hot works may only be carried out in trenches or confined spaces when controlled by a 'permit to work' procedure, properly authorised by the Safety Officer (or, in the case of small developments, other appropriately qualified person).

8.16 The permit to work procedure should set down clearly the requirements for continuous monitoring for methane, carbon dioxide and oxygen throughout the period during which the hot works are in progress. The procedure should also require the presence of an appropriately qualified person, in attendance outside the 'confined area', who shall be responsible for reviewing the gas measurements as they are made, and who shall have executive responsibility for suspending the work in the event of unacceptable or hazardous conditions. Only those workers who are appropriately trained and fully aware of the potentially hazardous conditions which may arise should be permitted to carry out hot works in confined areas.

8.17 Ground level construction plant should be fitted with vertical exhausts at least 0.6m above ground level and with spark arrestors.

8.18 Any electrical equipment, such as motors and extension cords, should be intrinsically safe.

8.19 During piping assembly or conduiting construction, all valves/seals should be closed immediately after installation. As construction progresses, all valves/seals should be closed as installed to prevent the migration of gases through the pipeline/conduit. All

pipework/conduiting should be capped at the end of each working day.

8.20 Mobile offices, equipment stores, mess rooms etc. should be located on an area which has been proven to be gas free (by survey with portable gas detectors) and ongoing monitoring should be carried out to ensure that these areas remain gas free. The use of permanent gas detectors may be appropriate in some circumstances where there is a relatively high risk but for many developments it will be sufficient to have regular monitoring undertaken manually by the safety officer. The particular arrangements to be adopted at a specific site will need to be determined during the risk assessment/design of protection measures.

8.21 Alternatively, such buildings should be raised clear of the ground. If buildings are raised clear of the ground, a minimum, clear separation distance (as measured from the highest point on the ground surface to the underside of the lowest floor joist) should be 500mm.

8.22 During construction, adequate fire extinguishing equipment, fire-resistant clothing and breathing apparatus (BA) sets should be made available on site.

- At larger developments, fire drills should be organised at not less than six monthly intervals.
- The developer should formulate a health and safety policy, standards and instructions for site personnel to follow.

Monitoring

8.23 Periodically during ground-works construction, the works area should be monitored for methane, carbon dioxide and oxygen using appropriately calibrated portable gas detection equipment.

8.24 The monitoring frequency and areas to be monitored should be set down prior to commencement of ground-works either by the Safety Officer or by an appropriately qualified person.

8.25 Routine monitoring should be carried out in all excavations, manholes and chambers and any other confined spaces that may have been created by, for example, the temporary storage of building materials on the site surface.

8.26 All measurements in excavations should be made with the monitoring tube located not more than 10mm from the exposed ground surface.

8.27 Monitoring of excavations should be undertaken as follows:

For excavations deeper than 1m, measurements should be made:

- at the ground surface before excavation commences;
- immediately before any worker enters the excavation;
- at the beginning of each working day for the entire period the excavation remains open; and
- periodically through the working day whilst workers are in the excavation.

For excavations between 300mm and 1m deep, measurements should be made:

- directly after the excavation has been completed; and
- periodically whilst the excavation remains open.

For excavations less than 300mm deep, monitoring may be omitted, at the discretion of the Safety Officer or other appropriately qualified person.

Actions in the Event of Gas Being Detected

8.28 Depending on the results of the measurements, actions required will vary and should be set down by the Safety Officer or other appropriately qualified person. As a minimum these should encompass those actions specified in *Table 8.1*.

Table 8.1 Actions in the Event of Gas Being Detected in Excavations

Parameter	Measurement	Action
O ₂	< 19%	Ventilate trench/void to restore O ₂ to >19%

Parameter	Measurement	Action
	< 18%	Stop works evacuate personnel/prohibit entry increase ventilation to restore O ₂ to >19%
CH ₄	> 10% LEL	Post 'No Smoking' signs prohibit hot works ventilate to restore CH ₄ to <10% LEL
	>20% LEL	Stop works evacuate personnel/prohibit entry increase ventilation to restore CH ₄ to <10% LEL
CO ₂	>0.5%	ventilate to restore CO ₂ to <0.5%
	> 1.5%	Stop works evacuate personnel/prohibit entry increase ventilation to restore CO ₂ to <0.5%

Specific Advice Relating to the Drilling of Boreholes

8.29 As part of the site investigation and subsequent ground works for a development within a Consultation Zone, it will often be necessary to drill exploratory boreholes. Such work should be undertaken following the general advice given above. Specific recommendations relating to the drilling of boreholes within the Consultation Zone are presented below.

Supervision and Safety Management of Drilling Operations

8.30 Drilling should only proceed with adequate care and precautions against the potential hazards which may be encountered.

8.31 Before site works begin, the drilling contractor should devise a 'method-of-working' statement covering all normal and emergency procedures and the site supervisor and all operatives must be familiar with this statement.

8.32 The method-of-working statement should cover, *inter alia*:

- number of operatives;
- experience and special skills of operatives;

- normal method of operations;
- emergency procedures, including fire fighting;
- supervisors responsibilities;
- storage and use of safety equipment;
- safety procedures; and
- signs, barriers and guarding.

Safety Equipment and Clothing

8.33 An intrinsically safe, portable methane meter should be available at all times.

Other safety equipment should include:

- no smoking signs, to be placed prominently adjacent to the drilling area;
- portable fire extinguisher;
- high visibility clothing to be worn by all drilling operatives; and
- additional protective clothing should include stout industrial boots (with steel toe cap and insole), plastic hard hats, heavy duty waterproof industrial groves.

Working Procedures

8.34 On arrival at site the drilling rig should be set-up up-wind of the borehole location, 'No smoking' signs set out and the working area should be roped or coned-off.

8.35 When drilling on landfill sites, all spoil obtained from the borehole should be stockpiled alongside the borehole and disposed of (to an appropriately licensed disposal site) at the end of the working day. At the end of the working day all vehicles, the drilling rig and any hand tools should be hosed-down with clean water to remove deposits of excavated spoil. Suitable guards or barriers should be placed around the excavation or borehole to prevent access by unauthorised persons.

Safety Procedures

8.36 One person should be present at all times during drilling operations, with the sole responsibility of assuring the observance of all safety procedures. This person should be trained in the use of all recommended safety equipment.

8.37 Smoking should be prohibited anywhere on a landfill site and within 15 metres of a

boring or excavation at any locations within the Consultation Zone.

8.38 For large diameter boreholes, a working platform should be placed over the hole which will prevent accidental entry into the hole by operatives.

8.39 No worker should be allowed to work alone at any time near the edge of the well under construction. Another worker should always be present, beyond the area considered to be subject to the possible effects of landfill gas or cave-in.

8.40 Periodically during the well construction, the work areas should be monitored for levels of methane.

8.41 If the well construction is not completed by the end of the working day, the hole should be covered with a plate of sufficient overlap to prevent access to the hole and sufficient structural strength to support expected loads. The plate should be weighted down to discourage removal and, on landfill sites, the edges of the plate should be covered with sufficient depth of wet soil to prevent escape of gas.

8.42 All pipes or casings should be capped at the end of each working day.

8.43 Engine-driven rigs should have vertical exhaust stacks discharging not less than 1.5m above ground level and should have overspeed limits to prevent engine run away on ingested gas.

8.44 Diesel engine air-intakes should also be located not less than 1.5m above ground level.

8.45 Any electrical equipment should be intrinsically safe.

8.46 Additional safety advice and guidance may be found in 'Investigation into Establishing an Effective Practical Safe Working Practice When Drilling in Landfill Sites and Adjacent Areas and Contaminated Ground and Adjacent Areas' compiled by the British Drilling Association (1993).

Installation of Vertical Wells

8.47 To prevent uncontrolled gas release and to protect personnel from the risk of falling into the borehole, the open borehole should be covered with a sheet or plate strong enough to support personnel and having an overlap all round the borehole.

8.48 The drilling rig, boring machine or excavator should remain in place over the borehole and could be used as a support to assist placement of the casing.

8.49 The upper end of the well casing should be sealed, preferably with a fused or screwed end cap or alternatively with an inflatable bag type flow stopper, until the permanent headworks/monitoring tap is fitted. Landfill gas must not be allowed to vent freely at the site surface.

7 CONCLUSION

This Environmental Assessment presents the findings from assessing the potential impacts associated with the operation of the proposed RCHE development to confirm its environmental suitability. Key environmental concerns have been addressed and potential impacts assessed covering the following:

- Air Quality
- Noise
- Water Quality
- Waste Management
- Landfill Gas

Overall, it would be environmentally acceptable with no adverse impacts on the identified sensitive uses. Suitable noise mitigation measures are recommended to minimize noise impacts to meet the specified noise standard.

Air Quality

The development may be subject to vehicular emission impact from roads nearby during the operation of the project. However, no adverse vehicular emission impact is anticipated upon incorporation of the relevant buffer distance stipulated under the HKPSG into the layout design.

There is no chimney within 200m from site boundary, i.e., complying the buffer distance for chimney emissions under the HKPSG. Thus, no adverse air quality impact to the proposed residential development due to industrial chimney emissions is anticipated.

Noise

Road traffic would be the major source of noise nuisance during the Project operation. After implementation of recommended architectural fins, the predicted noise levels at all residential units comply with HKPSG $L_{10}(1 \text{ hour})$ 70dB(A) noise criterion.

A catalogue of low noise type cooling towers as shown in Appendix 3.2 for reference. The Intake Silencers will be provided for the cooling towers located on open rooftop. The sound power level and noise mitigation requirements will be stipulated in the project contractor specification governing the equipment selection by the design and build contractor. Provided the fixed plant noise generation at the cooling tower does not exceed the allowable SWL, fixed plant noise impact towards the affected NSRs will not exceed the noise criteria stipulated in the HKPSG.

Water Quality

With a properly designed sewerage and drainage system, no insurmountable water quality impacts would be generated from the construction and operation phases of the Project.

Waste Management

The quantity of waste to be generated from the Project is anticipated not significant, considering the small project scale. Through proper project planning and execution, waste could be further avoided while useful materials could be reused or recycled. With implementation of the statutory procedures and recommended mitigation measures for offsite disposal of surplus excavated material, non-inert wastes, general refuse, chemical and clinical wastes, there should not be any insurmountable waste impact.

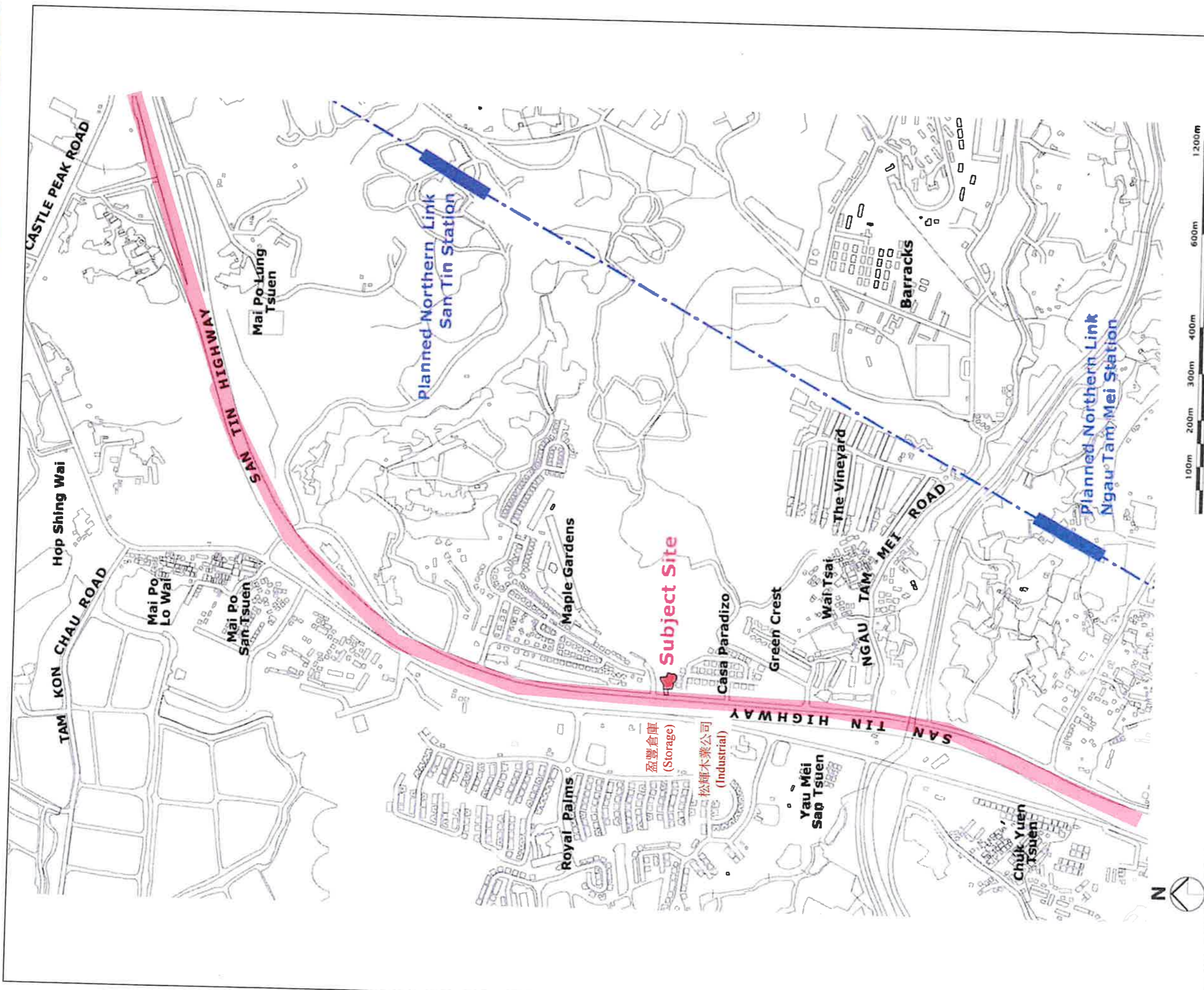
Landfill Gas

Since the proposed development will be located within the consultation zone of the Ngau Tam Mei Landfill, this Landfill Gas Hazard Assessment was undertaken to assess the likelihood of LFG migration.

The results of landfill gas hazard assessment shows the overall level of landfill gas risk posed by the Ngau Tam Mei Landfill to the proposed development is "Low".

Appropriate protection and precautionary measures including regular landfill gas monitoring during both the construction and operation of the project have been recommended. Provided that all the recommended protection measures with in monitoring are implemented properly, the safety of the site workers and all personnel presence in the proposed development would be safeguarded and there would be no adverse impact anticipated on the feasibility of the proposed development.

Appendix 1.1.
SITE LAYOUT PLAN & SURROUNDING
ENVIRONMENT

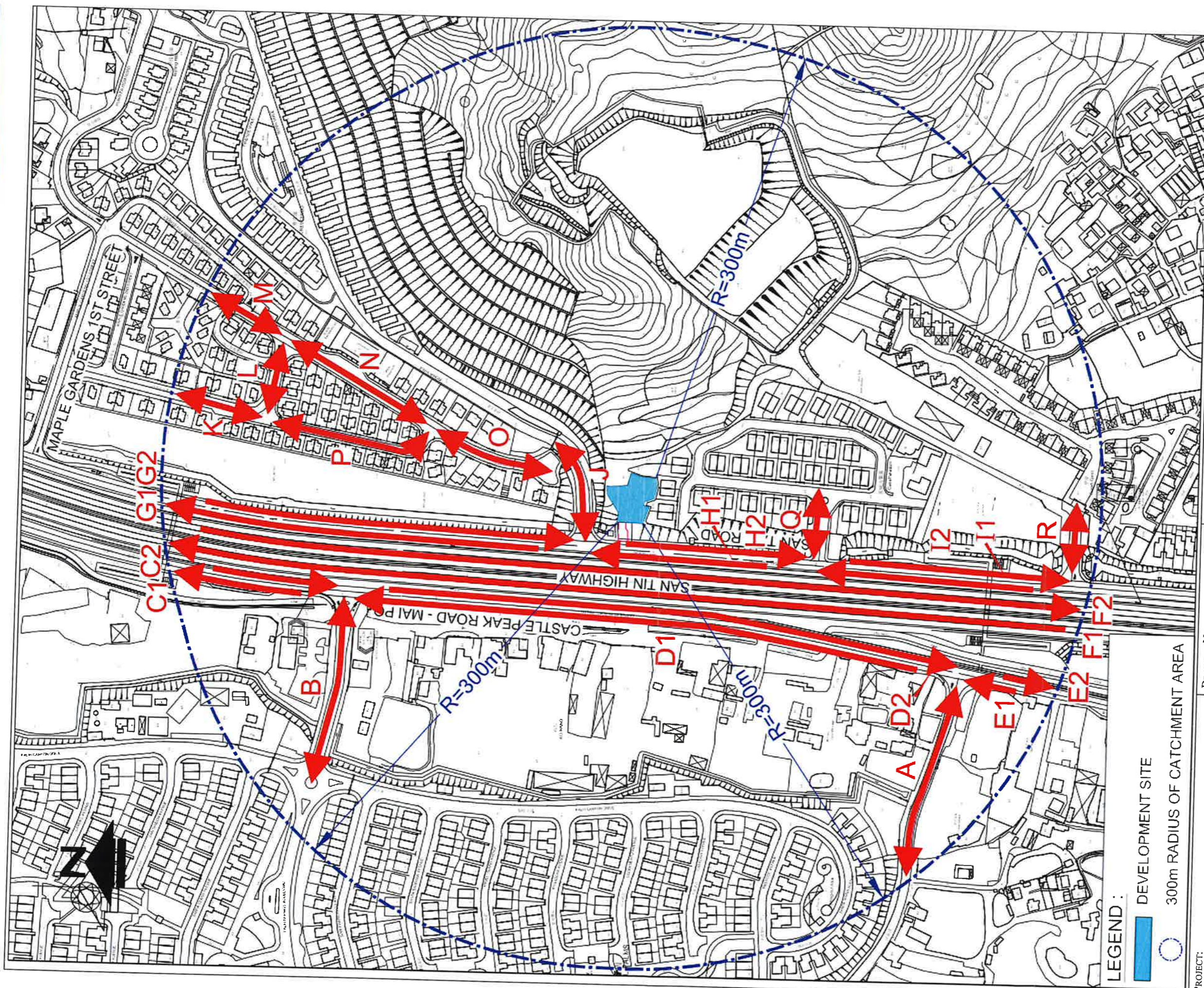


PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.		DRAWING No.: C220410W-01 1.1.1	Figure
DRAWING TITLE: SITE LAYOUT PLAN AND SURROUNDING ENVIRONMENT		SCALE: N.T.S.	REV: A

LEAD ARCHITECT:

ENVIRONMENTAL CONSULTANT:

PREPARED BY Phoenix Lee
CHECKED BY Eddy Ng
APPROVED BY Banting Wong



LEGEND :
 DEVELOPMENT SITE
 300m RADIUS OF CATCHMENT AREA

PROJECT:
 PROPOSED RESIDENTIAL CARE HOME FOR
 ELDERLY AT 81 SAN TAM ROAD, YUEN
 LONG, N.T.
 DRAWING TITLE:
 LOCATION OF ADJACENT ROADS

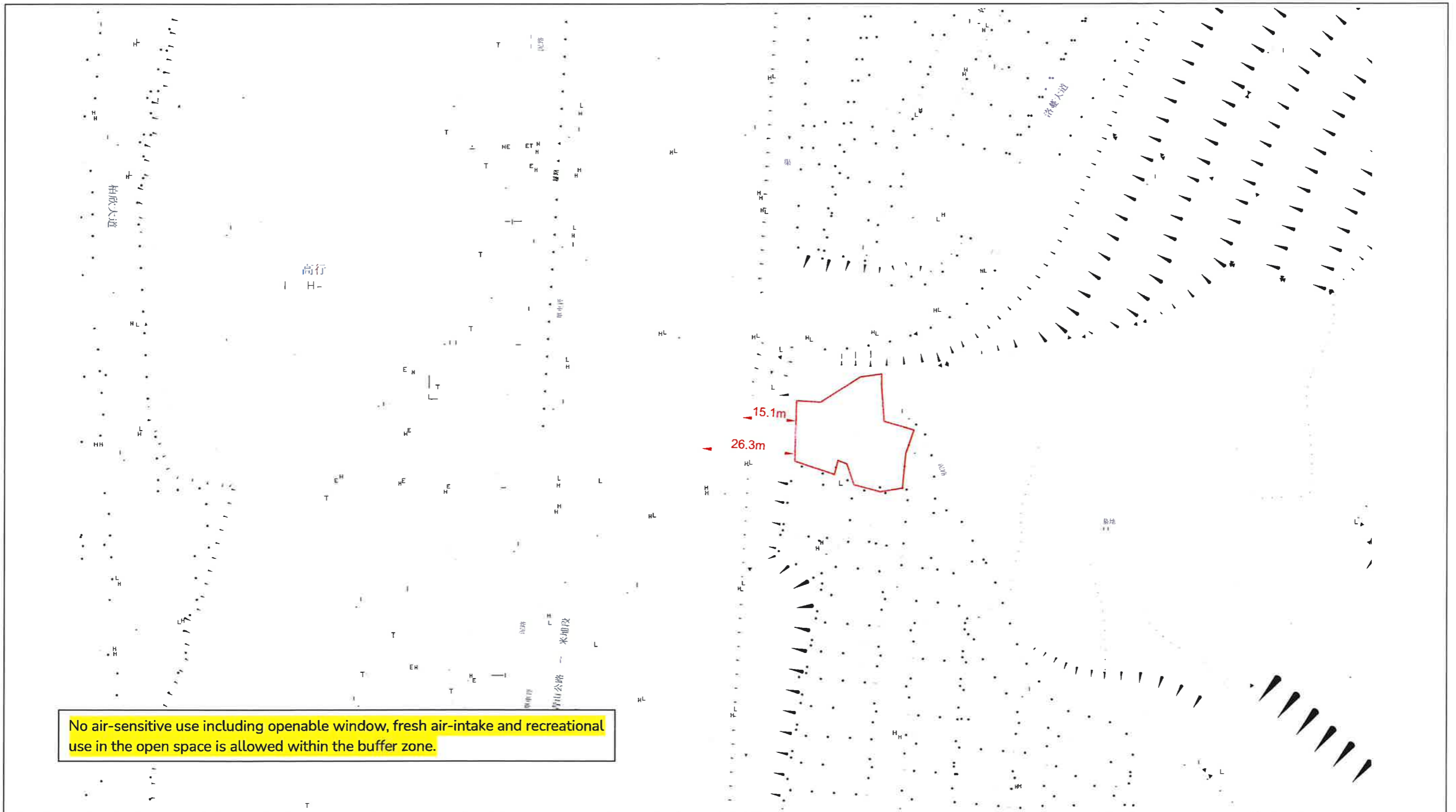
DRAWING NO.:
 C220410W-01
 1.1.2
 SCALE:
 N.T.S.
 REV:
 A

LEAD ARCHITECT:

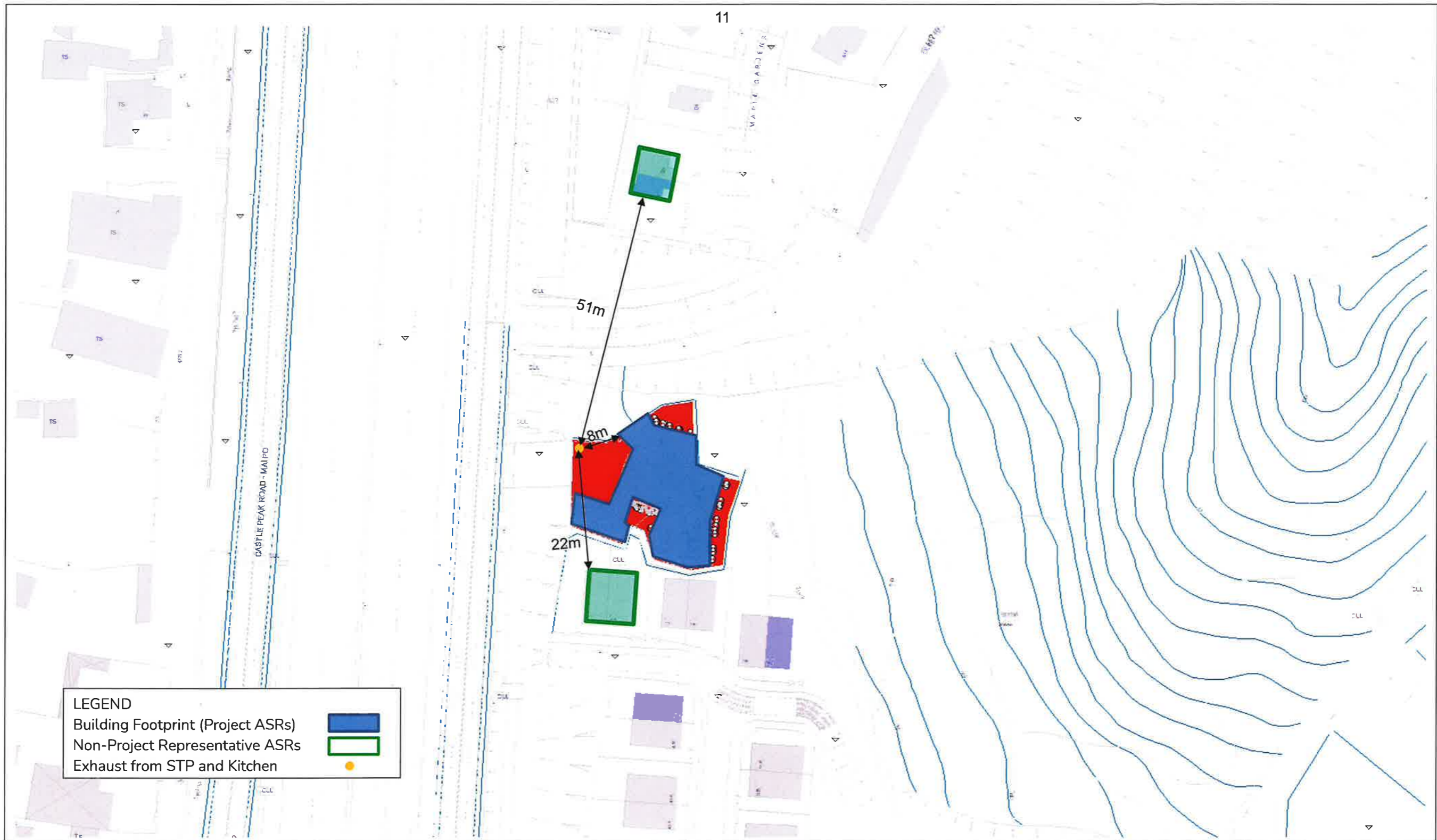
 ENVIRONMENTAL CONSULTANT:

PREPARED BY	PHOENIX LEE
CHECKED BY	EDDY NG
APPROVED BY	BANTING WONG

APPENDIX 2.1. AIR QUALITY SENSITIVE RECEIVERS & EMISSION SOURCES



<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01 Figure 2.1.1</p>		<p>LEAD ARCHITECT: <i>R Lee Architects (HK) Ltd</i></p> <p>ENVIRONMENTAL CONSULTANT: NOVOX</p>	<p>PREPARED BY Phoenix Lee</p>	
<p>DRAWING TITLE: REPRESENTATIVE ASRS & BUFFER DISTANCE FROM VEHICLE SOURCES</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>		<p>CHECKED BY Eddy Ng</p>	
				<p>APPROVED BY</p>	<p>Banting Wong</p>



LEGEND

- Building Footprint (Project ASRs)
- Non-Project Representative ASRs
- Exhaust from STP and Kitchen

<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01</p>	<p>Figure 2.1.2</p>	<p>LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i></p>	<p>ENVIRONMENTAL CONSULTANT: NOVOX</p>	<p>PREPARED BY Phoenix Lee</p>
<p>DRAWING TITLE: INDICATIVE LOCATION OF THE EXHAUST OF STP AND KITCHEN</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>			<p>CHECKED BY Eddy Ng</p>
					<p>APPROVED BY Banting Wong</p>

APPENDIX 2.2. BROCHURE OF THE DEODORIZATION SYSTEM

Project : Lot 4823, D.D. 104, 81 San Tam Road, San Tin, N. T.---

STP For RCHE

Schedule of Equipment

Activated Carbon Filter

Description	Activated Carbon Filter
Branch	Rage
Country of origin	China
Material	Filter - Activity Carbon Filter Housing – Fiberglass Piping – uPVC
Capacity	180 m3/hr
Flange Diameter	150 mm
Pipe Diameter	150 mm
Accessories	Dehumidifier Hydrogen Sulphide Transmitter and Detector Humidity Transmitter Pressure Indicator Local Control panel Extraction Fan w/ Motor

Project : Lot 4823, D.D. 104, 81 San Tam Road, San Tin, N. T.--

STP For RCHE

The design air flow is according to Technical Schedule of tender specification to specify air flow rate (min. 180m³/hr). The flow rate of provided air fan and accessories, please refer to Attachment – catalogue 12 in item of HF-121B (for Fan) and catalogue 6 in item of Process Air (for Dehumidifier).

a) Calculation for Air Volume.

$$\text{Tank area} : 3.5 \times 4.1\text{m} = 14.35 \text{ m}^2$$

$$\text{Tank Depth} : 3.05\text{m}$$

$$\text{Water Depth of Pump Stop} : 0.6\text{m}$$

$$\text{Times of Air change} : 5 \text{ times /hr}$$

$$\text{Tank max. air volume in sewage pump sump} : (3.05 - 0.6)\text{m} \times 14.35\text{m}^2 = 35.15\text{m}^3$$

$$\text{Total Air Flow} : 35.15 \times 5 = 175.8\text{m}^3/\text{hr} \text{ (take } 180\text{m}^3/\text{hr)}$$

b) Activated Carbon Filter contact time.

$$\text{Design contact time} : \geq 2 \text{ sec.}$$

$$\text{Provided volume of activated carbon} : 0.17 \text{ m}^3 \text{ (Refer to Attachment – Applicable Specification 1)}$$

$$\text{Air flow} : 180 \text{ m}^3/\text{hr} \text{ (} 0.05 \text{ m}^3/\text{sec)}$$

$$\text{Contact time} : \frac{0.17\text{m}^3}{0.05\text{m}^3/\text{sec}}$$

$$= 3.4 \text{ sec.} > 2 \text{ sec. (OK)}$$

c) Calculation for Vent Duct Size.

$$\text{Air duct area} : \text{Total air flow (m}^3/\text{s)} \div \text{Velocity(m/s)}$$

$$\text{Take Velocity} : 6\text{m/s}$$

$$\text{Min. requirement Area for Vent Duct} : 180\text{m}^3/\text{hr} \div 6\text{m/s} = 0.0081\text{m}^2$$

$$\text{Adopted } 0.15\text{m} \times 0.15\text{m} \text{ duct} = 0.0225\text{m}^2 > 0.0081\text{m}^2, \text{ OK}$$

$$\text{Check air velocity passing through vent duct} : \frac{180 \text{ m}^3/\text{hr} \div 3600\text{s/hr}}{0.0225\text{m}^2} = 2.22\text{m/s} > 2 \text{ sec. (OK)}$$

Therefore, the deodorizing adsorption system will have minimum odour removal efficiency of 99.5% at 5ppm H₂S concentration.

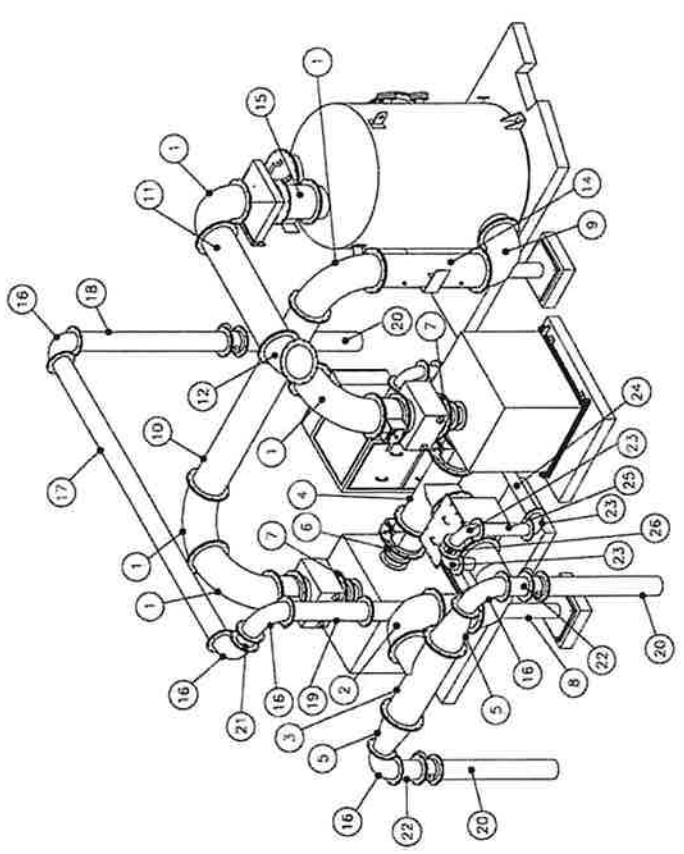
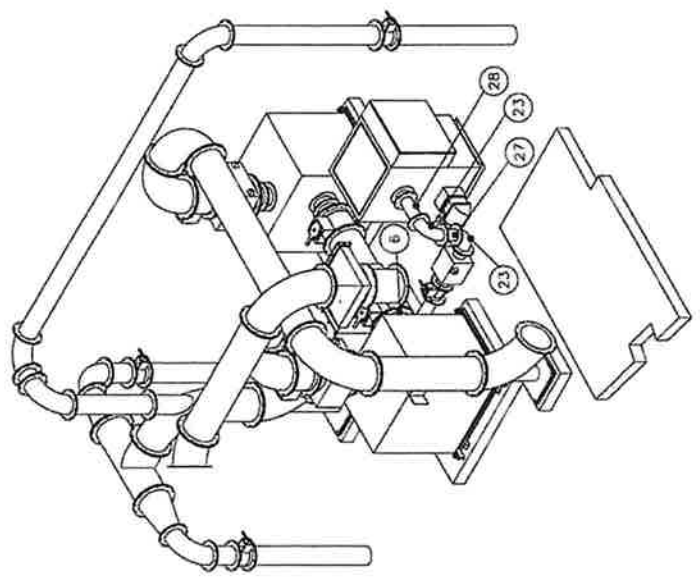
Above calculation is base on 1-year operation. A Storage of activated Carbon is standby to replace. The activated Carbon in the filter will be replaced if the gas detector find the odour release is beyond the calculation.

Equipment/ Material List of Deodorization Activated Carbon Adsorption Filter

Item	Description	Quantity
A	GRP air ductwork	
B	Flexible joint	
C	Flow switch for air duct	2 nos.
D	Diff pressure gage for pre-filter, after filter and carbon media	3 nos.
E	Electrochemical cell type H ₂ S detector in IP 65 enclosure	2 nos.
F	RH sensor	1 no
G	SS mist eliminator in SS house	1 no
H	Pre-filter in SS house	1 no
I	After filter in SS house	1 no
J	GRP Non-return damper	1 no
K	GRP Volume control damper	1 no
L	Extraction fan c/w acoustic enclosure	2 nos
M	Dehumidifier	1 no
N	Activated carbon filter Including GRP carbon vessel and activated carbon for initial fill up Local control panel with component	1 lot

建群:

1. 配件: 零件 数量 图示
2. 树脂: 4180 树脂
3. 表面: 4180 树脂 灰色RAL7032
4. 配件: 除锈剂 500ml, 并随零件厚度为 直径 100 至 500 = 4 毫米
5. 所有金属零件: 3.0 至 3.16
6. 除锈剂 500ml, 所有尺寸, 均为毫米
7. 请参见: MWPP2-PP-02
MWPP2-PP-03
MWPP2-PP-04 同时查看



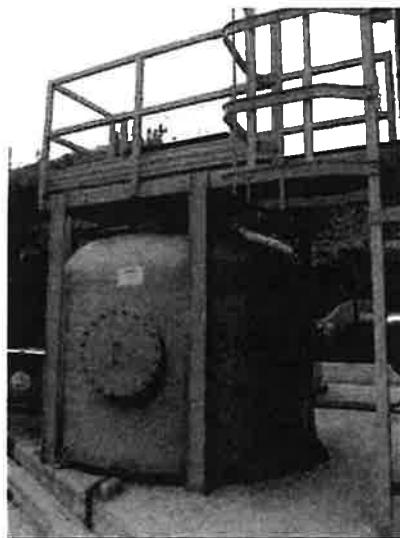
图号: MWPP2-PP-01



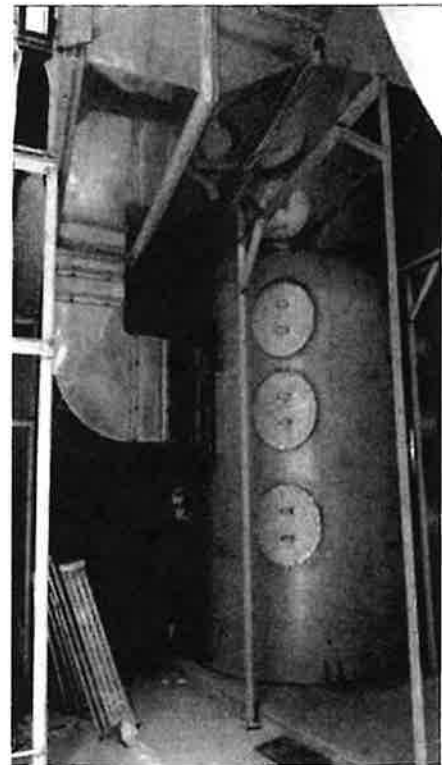
Rage Activated carbon adsorption tower is designed for industrial and municipal odour control. Activated carbon is the most widely used media for pollutant adsorption in gas phase. The carbon pellet has a very porous structure with a high surface-to-volume ratio, and enables the odorous compounds being captured when the foul gases passing through the carbon bed through the duty extraction fan.



The adsorption tower can be a single bed or dual bed design depends on the air volume and made from Fiberglass Reinforced Plastic (FRP), steel or stainless steel as per the specification.



A single bed construction activated carbon filter system with cat ladder and working platform



A dual bed construction system with air duct connection



Two dual bed construction filter houses on a 12m length trailer delivered to site

A wide range of activated carbon manufactured from both bituminous coal and coconut shell and impregnated specific chemicals available for various odorous compound removal. Sometimes, beds of carbon with different chemical impregnated are packed in the single house for capture and chemically destroy different type of odourous composition. Typically, KOH or KMNO₄ for breaking down Hydrogen Sulphide. The disadvantage of the addition of caustics lowers the ignition temperature and shall be considered as hazardous, and higher production cost.

Recently, regenerate type activated carbon is available, which is unimpregnated carbon that regain some absorption capacity after washing. However, cost will be higher.



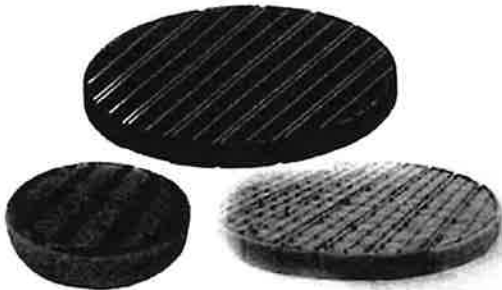
Benefits

- Simple in construction & maintenance
- Capable to handle a number of odourous gases.

Attachment - Catalogue 3



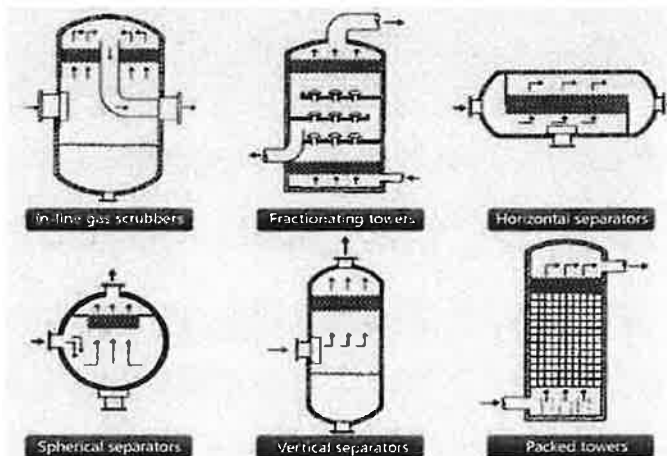
Wire Mesh Mist Eliminator or Demister is a kind of vapor liquid separating device. It is widely used in the chemical, petroleum, medical, light, metallurgy and environmental protection industries. It is most often used to separate liquid drop with diameter of more than $3-5\mu\text{m}$ in the separation tower.



Forms available : Disc, Cube

Size : made to fit the tower or vessel

Typical installation of demister



Choice of materials

Materials	Code	Materials	Code	Non-metallic Materials	Code
Brass	H65	321SS	SS21	PTFE	F6
Tin-copper	QSn	304SS	SS04	Nylon yarn	NY
Nickel	N4	316SS	SS16	PVC	PVC
Steel	NS-80	Titanium	TA		

ATF

AIRTECHGROUP

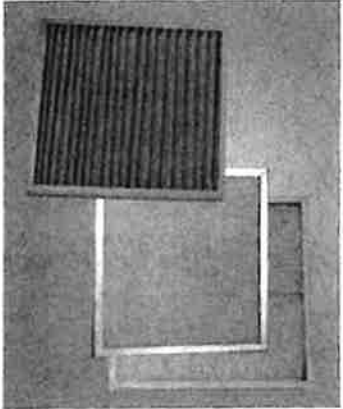
PRE FILTER

产品与服务

◆初效过滤器

GT 耐高温
粗效过滤器

- 风量大
- 阻力小
- 具不燃性
- 抗化学性佳、吸湿性低
- 耐高温，可在400°C环境下长期使用



- 一般初级过滤
- 热风式高温烤箱空气过滤
- 涂装厂高温烤箱空气过滤

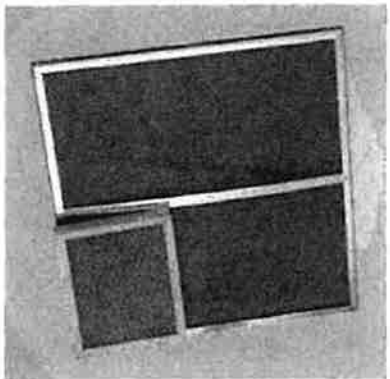
型号尺寸及其他参数

型号	外形尺寸 (mm)		外框	材料
	长	宽		
GT	595	595x50	铝合金 镀锌板	耐高温涤纶纤维
	500	500x50		
	495	495x15		
	480	480x15		

注：可按用户具体要求定做

Gh金属孔网

粗效过滤器



- 风量大
- 阻力小
- 可重复清洗使用
- 使用寿命长，性价比高

- 中央空调空调器初级过滤
- 特殊耐酸、碱或高温之通风过滤

PRE FILTER

型号尺寸及其他参数

型号	外形尺寸 (mm)		外框	材料
	长	宽		
GH	250	250x44	铝合金 镀锌板	耐高温涤纶纤维
	595	495x21		
	595	295x21		
	495	495x21		

注：可按用户具体要求定做

Specified size
250 x 250 x 44mm



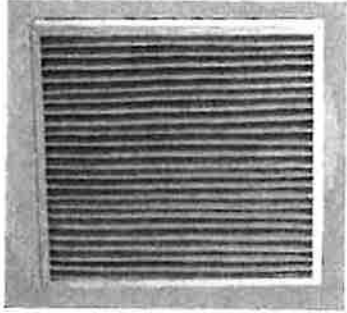
AFTER FILTER



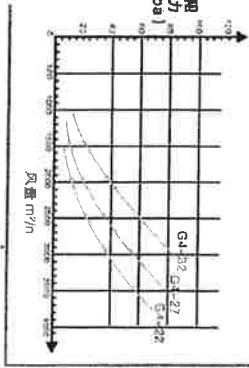
产品与服务

◆初效过滤器

G4级粗效过滤器



风量与阻力关系



型号尺寸及其他参数

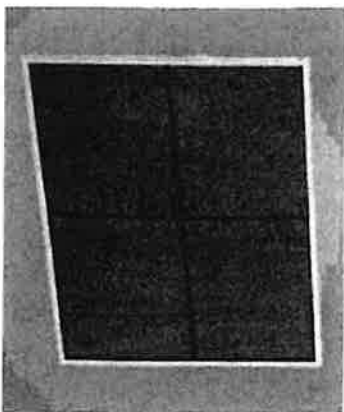
型号	外形尺寸 宽×高×深 mm	额定风量 m³/h	初阻力 Pa	效率 (级别) EN779 %	材料		
					外框	滤料	防护网
G4	595x595x46	3200	45	90 记重法	铝合金 镀锌板	G4级 无纺布	双面 喷塑 铁丝
	595x495x46	3000					
	595x295x46	2700					
	495x495x46	1600					
	250x250x44	1300					

注：可按用户具体要求定做。滤料实际颜色可能与图片颜色有差异，以实物为准。

specified size 250 x 250 x 44mm

GN尼龙网粗效过滤器

- 风量小
 - 阻力小
 - 可重复清洗使用
 - 使用寿命长，性价比高
- 中央空调、家用空调器
初级过滤
特殊耐酸、碱之通风过滤



型号尺寸及其他参数

型号	外形尺寸 宽×高×深 mm	材料	
		外框	滤料
GN	595x595x10	铝合金 镀锌板	尼龙网
	595x495x10		
	595x295x10		
	495x495x10		

注：可按用户具体要求定做



Main parameter

Main Parameters/Model		ZLMD-1
Process Air	Max.Rated Airflow (m ³ /h)	160~200
	Process ESP (Pa)	/
Reactivation Air	Rated Airflow (m ³ /h)	53~67
	Process ESP (Pa)	/
Reactivation Mode	Electric, Max Power (kW)	1.5
	Rating Power(kW)	1.3
Dehumidifying Capacity (20°C,70%) (kg/h)		1.5
Overall Dimensions (mm)	Length	525
	Width	372
	Height	382
Approx. Weight (kg)		45
Applied Temperature (°C)		-20°C~ +70°C
Supply power		1 ph, 220V,50HZ
	Package	Wooden cases



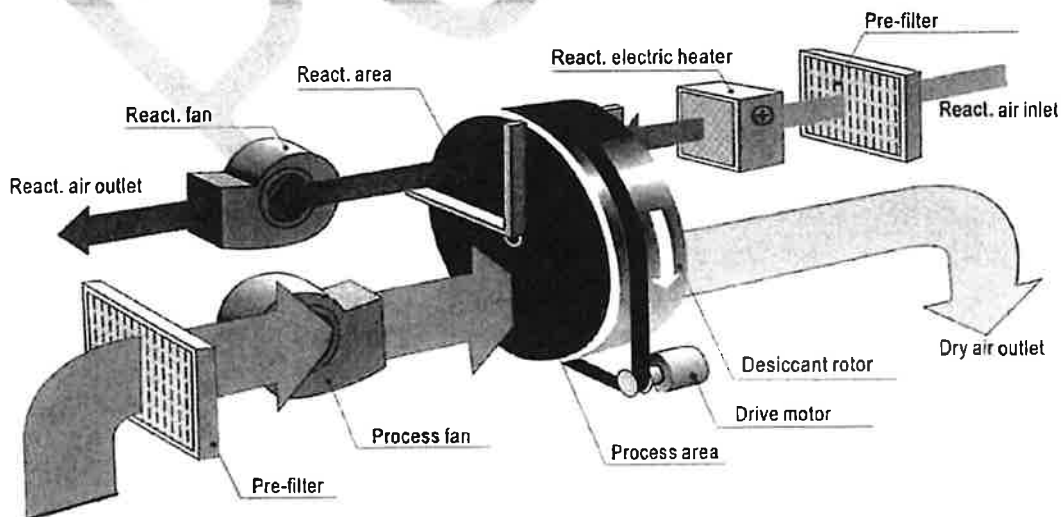
Structure and Work Principle

The core component of rotary dehumidifier is the 8-16 hour spin in turn densely cellular Conde desiccant wheel. The desiccant wheel on both sides by high-performance silicon fluorine rubber seals along the entire surface of the radial will be divided into 270 ° of the treatment area and 90 ° of the regeneration zone, when the moist air comes into the processing area, the air moisture in the desiccant wheel was adsorbed into dry air, dry air meet the need of dry place or gas production process.

With the increases of absorptive water in the absorption process, desiccant wheel gradually loss of moisture absorption capacity. In order to maintain constant moisture absorption capacity, rotary should be regenerated. So, tending to saturation the drive wheel driven by the motor slowly turns into the regeneration area, regeneration restored.

Heated to 100-140°C, the regeneration air and deal with the wind in the opposite direction enters into the regeneration zone, the moisture desorption in the wheel takes exhausted to outside by renewable wind. Desiccant wheel restore moisture absorption capacity and under the drive of low-level driver enters into the handling area to process and absorb the wind again.

When wheel rotate constantly, dehumidify and regeneration continues. Thus, exporting the constant humidity and dry air won't stop.





HZ PERITECH DEHUMIDIFYING EQUIPMENT CO., LTD

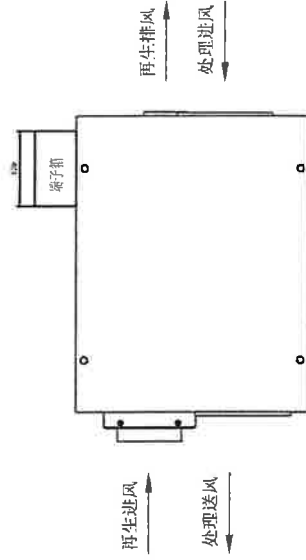
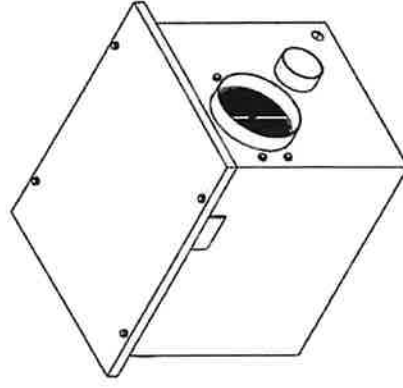
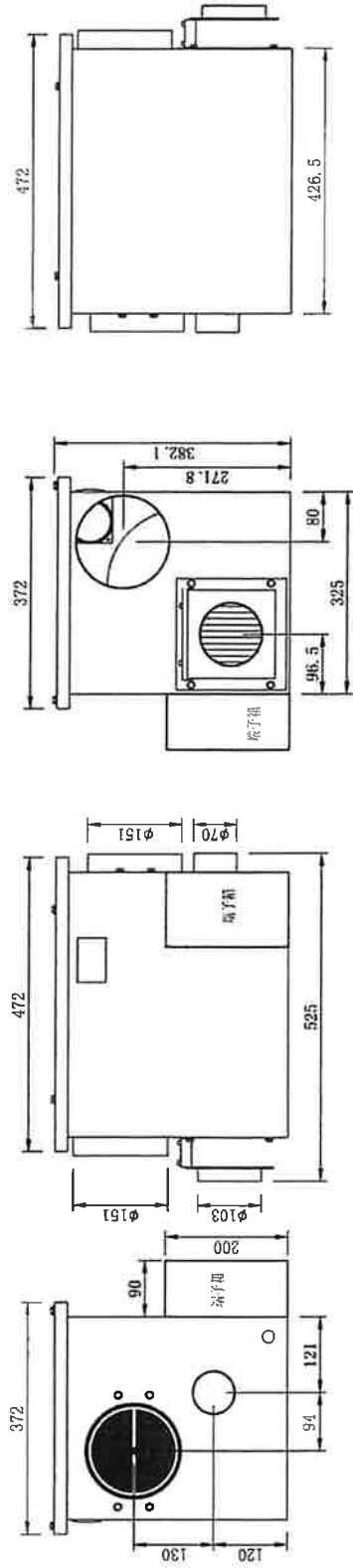
Main Components


Name	Manufacturer
Desiccant rotor	PROFLUTE, Sweden
Process fan	Hangzhou Dunli
Reactivation fan	Hangzhou Dunli
Reducer	JIAXUE GROUP
Cabinet	Stainless Steel 316

Pictures:



尺寸分段	0.5-6	>6-30	>30-120	>120-400	>400-1000	>1000-2000
公差范围	±0.1	±0.2	±0.3	±0.5	±0.6	±1.2



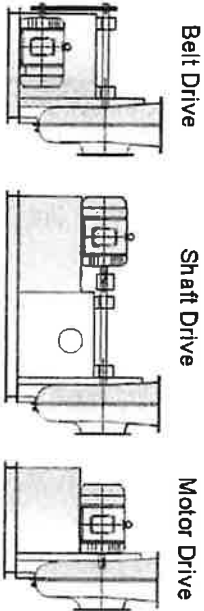
 普瑞泰® Peritek		杭州普瑞泰设备有限公司	
总机 4008111111		销售 057185111111	
网址 www.peritek.com.cn		地址 浙江省杭州市滨江区...	
图号 ZLJ01-0-10		比例 1:1	
日期 2011.11.11		设计 ...	
审核 ...		批准 ...	

外形图

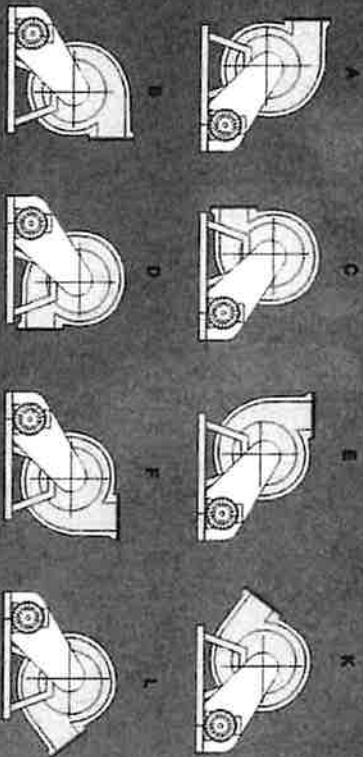
ZLJ01-0-10

TECHNICAL DATA

Drive Type:



Arrangements:



▶ for the tail side direction

Winfan Technology Corporation, Ltd.

Tel: 86-512-83296761

Fax: 86-512-83296760

<http://www.winfan.com.cn>

E-mail: winfan@winfan.com.cn

Add No. 12, 1201, Lane, Sec2, Chang-An Rd.

Lulu-sheng, Taoyuan, Taiwan.

WINFAN Suzhou

Tel: 86-512-83296761

Fax: 86-512-83296760

<http://www.winfan.com>

E-mail: winfan@suzhou.com.cn

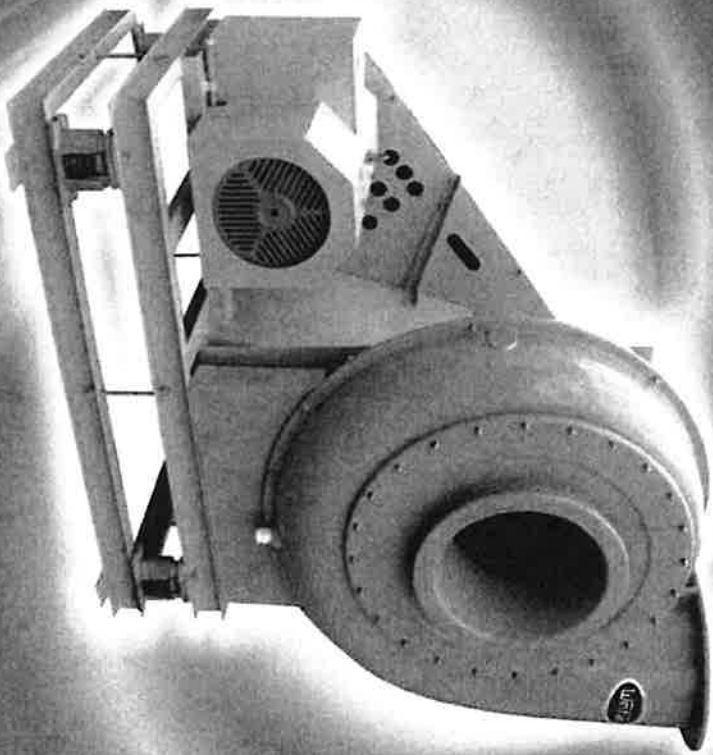
Add No. 651, Liannan Rd, Suzhou town,

Wujiang city, Suzhou.

WIN FAN

FRP High Pressure Fan

HIGH VOLUME • HIGH EFFICIENCY • LOW VIBRATION • LOW NOISE



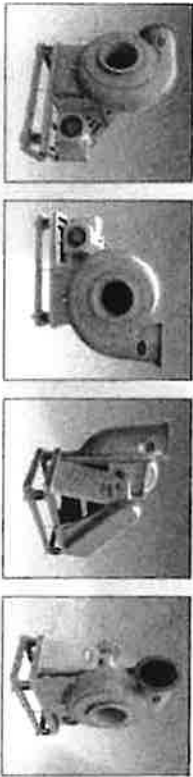
Winfan Technology Corporation, Ltd.



FRP HIGH PRESSURE FANS

Winfan can provide the professional fan with the high performance, standard design specification, advanced technic, human-based main taince and intimate service. The high pressure fan with high volume, high efficiency, lower vibration, lower noise leading the live of business and will be your best choice

Beautiful Appearance Excellent Performance



»» USE & CHARACTERISTIC

» USE: It can be used in the environment with high pressure and corrosion, for example: Fiberglass Fabricating, Rare earth refining, Chemical medicine, Wastewater deodorization, Paper making, Reclairating Acid

» CHARACTERISTIC:

- 1. The highest pressure is 6000Pa, used broadly,
- 2. High efficiency(save electricity),it can great profit and save cost for you

TO CHOOSE FAN



FOR EXAMPLE:

Static pressuse : 450mmAq

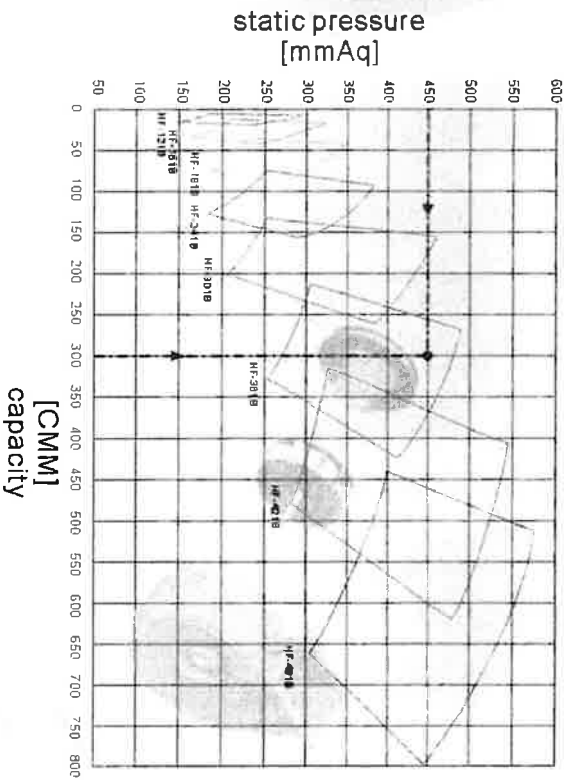
Q : 300cmm

According to the curve,

We can choose : HF-361B

Remarks : 1CMM=60CMH 1Pa=0.1mmAq

The Performance Curve

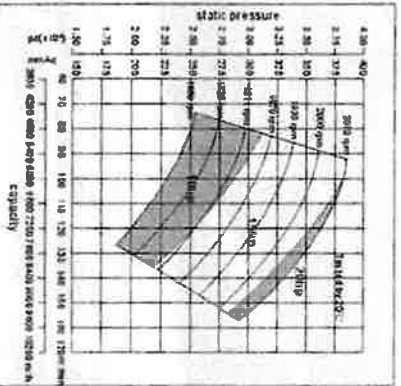
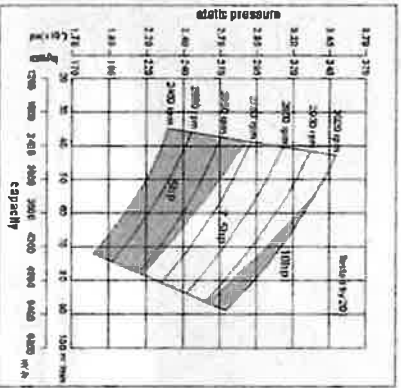
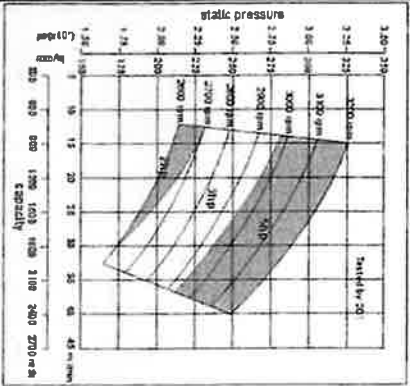
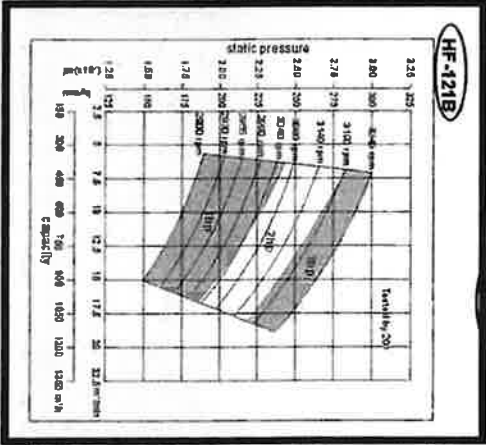


WINFAN Technology Co.,Ltd.

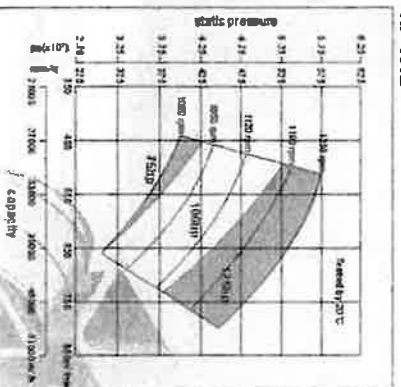
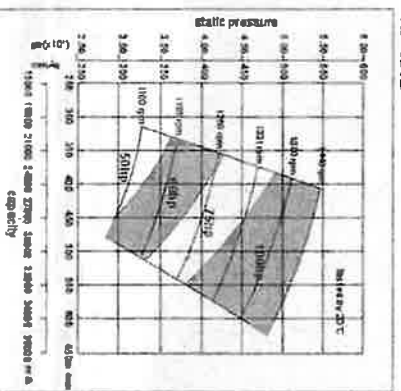
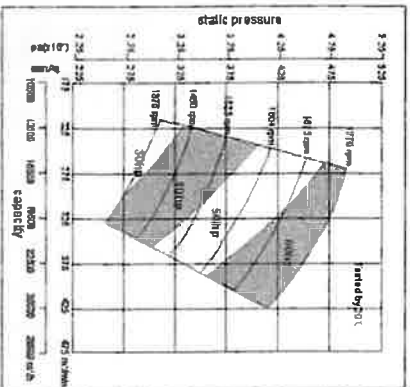
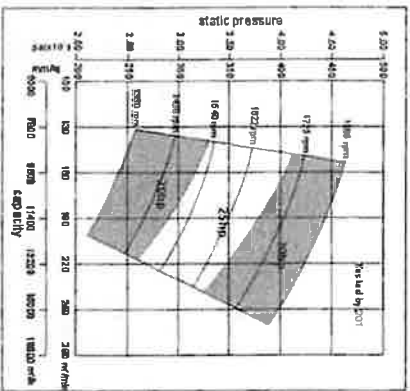
PERFORMANCE



HF-121B 151B 181B 241B



HF-301B 361B 421B 481B



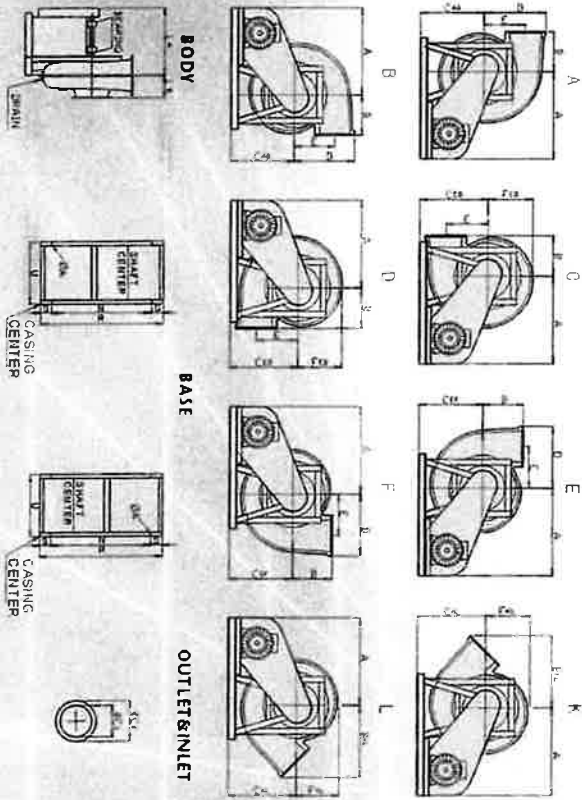
Power rating BHP is not including the belt drive loss
The air is in standard state

Power rating BHP is not including the belt drive loss
The air is in standard state

INFAN Technology Co., Ltd.

FAN DIMENSION

HF-121B 151B 181B 241B 301B

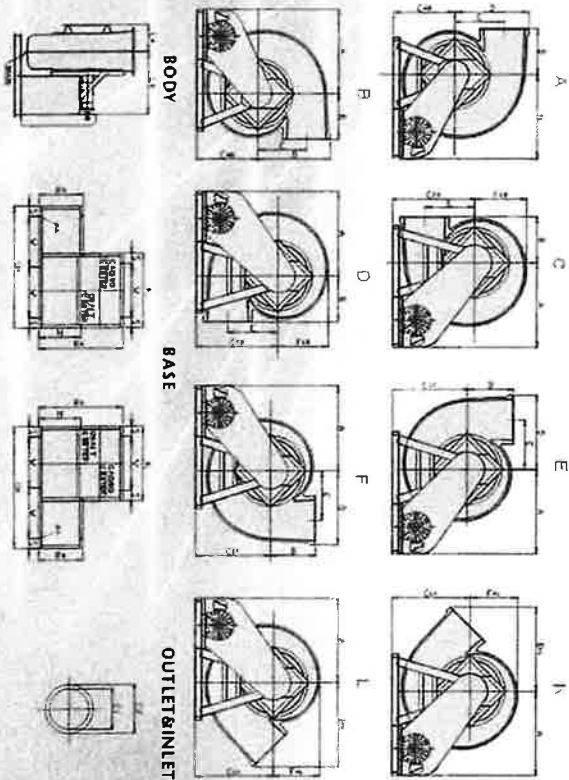


MODEL	BODY											INLET	
	A	B	Ba	Ca	Cb	Cc	Ca	D	E	Fa	Fb	U	Ua
HF-121B	285	260	420	360	400	360	360	335	210	260	250	120	460
HF-151B	355	325	420	500	500	600	500	418	263	325	313	150	550
HF-181B	821	360	658	500	600	600	600	570	250	366	345	265	705
HF-241B	970	447	801	700	700	700	750	685	466	498	485	249	751
HF-301B	1120	600	1056	800	1100	950	950	896	586	633	581	343	910

MODEL	BASE						INLET			
	R	U	N	S	W	VA	OC1	OC2	OC3	OC4
HF-121B	700	433	500	100	125	14	150	250	300	300
HF-151B	675	565	425	125	125	14	185	250	300	300
HF-181B	1147	646	697	125	125	14	400	400	500	500
HF-241B	1350	645	1100	125	125	14	350	450	450	450
HF-301B	1600	630	1350	125	125	14	500	600	600	600

★ For specific size, please do not hesitate to contact with us.
★ It is correspond to class III

HF-361B 421B 481B

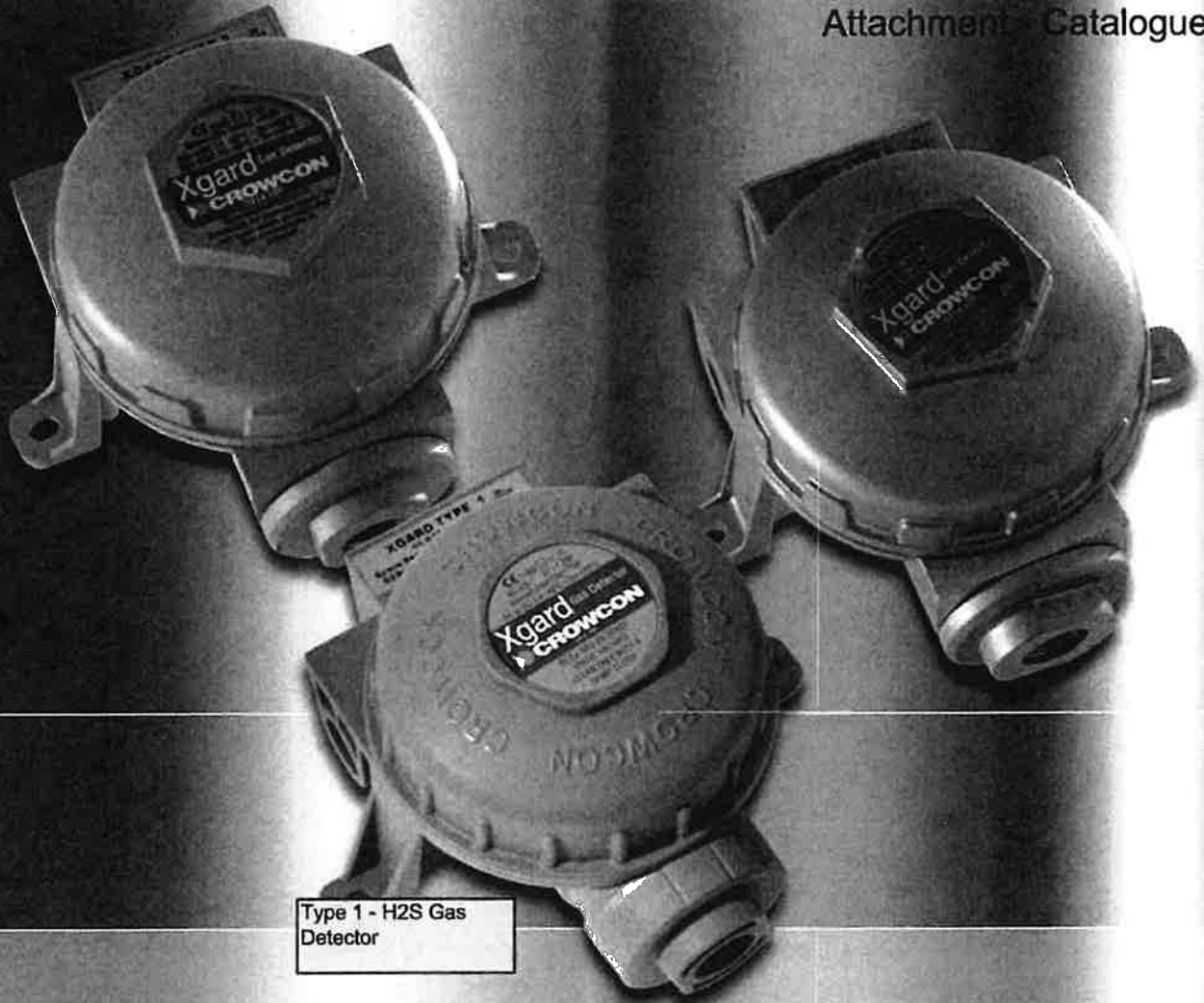


MODEL	BODY											INLET	
	A	B	Ba	Ca	Cb	Cc	Ca	D	E	Fa	Fb	U	Ua
HF-361B	1250	680	1252	900	1200	1100	1150	1090	730	774.2	695	400	930
HF-421B	1536	840	1165	1100	1300	1100	1100	1165	740	855	800	450	1135
HF-481B	1530	860	1145	1050	1300	1250	1200	1210	590	865	850	560	1360

MODEL	BASE						INLET				
	Ra	Rb	Ua	Ub	N	S	W	VA	OC1	OC2	
HF-361B	1170	662	1800	1100	585	150	750	800	16	800	720
HF-421B	1410	760	2350	1510	705	150	1025	1210	16	700	650
HF-481B	1674	836	2280	1445	837	150	990	1145	16	800	950

★ For specific size, please do not hesitate to contact with us.
★ It is correspond to class III





Type 1 - H2S Gas
Detector

Fixed detectors
For flammable, toxic or oxygen gases

Xgard

- | | |
|--------------|--|
| Xgard Type 1 | Intrinsically safe toxic and oxygen gas detector |
| Xgard Type 2 | Flameproof toxic and oxygen gas detector |
| Xgard Type 3 | Flameproof flammable gas detector |
| Xgard Type 4 | Flameproof high temperature flammable gas detector |
| Xgard Type 5 | Flameproof flammable gas detector with 4-20mA output |
| Xgard Type 6 | Flameproof thermal conductivity type gas detector |
| Xsafe | Safe area flammable gas detector |

Xgard

The Xgard range of gas detectors has been specifically designed to meet your requirements. The dangers presented by toxic and flammable gases as well as oxygen deficiency vary with each application. Xgard offers three different sensor concepts so you can choose exactly what you need for your site.

Xgard is available in flameproof, intrinsically safe or safe area formats for use in all environments, whatever the classification.

Xgard, gas detectors you can trust.

Low cost of ownership

Xgard detectors are designed for easy installation and maintenance to keep costs down.

The three junction box options are all designed to make replacement of sensors and filters extremely simple. Spare sensors simply plug in.

Xgard Types 1 and 2 utilise oxygen sensors with a 2 year life span, so sensor replacement costs are halved when compared to conventional oxygen detectors.

Many spare parts are common to all Xgard models, which keeps spares holding requirements to a minimum.

Flexible installation options

Xgard is designed for either wall or ceiling mounting without the need for additional brackets.

Xgard can accommodate 1/2", 3/4" NPT or 1" NPT cable glands to suit all site requirements.

High temperature models are available for hot environments (up to 150°C).

Accessories are available for air monitoring and sampling applications as well as remote gassing for simple sensor checking.

Wide range of sensors

Xgard offers an extremely wide range of sensors for all applications.

Poison resistant pell sticks for all flammable detection needs including hydrocarbons, hydrogen, ammonia, jet fuel, loaded petrol and vapours containing halogens. Electrochemical sensors are used to detect a vast range of toxic gases and oxygen.

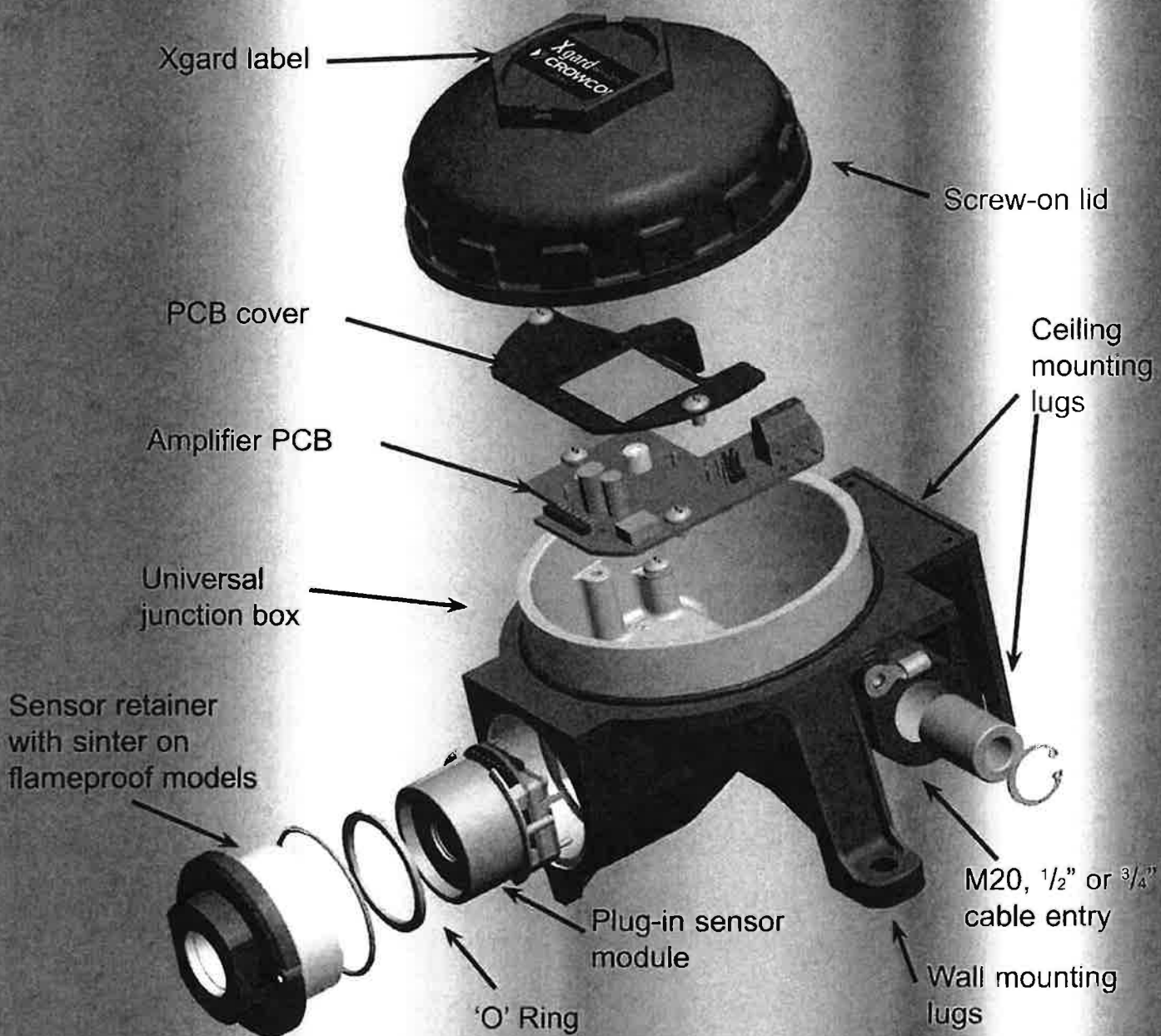
Thermal conducting sensors are available to monitor volume concentrations of gases.

Rugged and reliable

Xgard is manufactured using a choice of three materials: glass reinforced nylon, highly durable aluminium or a tough polyether coating for 316 stainless steel for ultimate corrosion resistance. All versions are designed to operate even in the harshest conditions.

Solar reflectors and weatherproof covers are available for use in areas subject to regular wash-downs, or offshore environments.

Xgard



(all accessories require an Accessory Adaptor to be fitted to the Xgard junction box)

Spray Deflector

For outdoor use and protection against wash-down operations.



Sun Shield

For use where a detector is installed in direct sunlight.



Weatherproof Cap

For use in very wet conditions, such as offshore installations and ships.



Collector Cone

For aiding detection of gases which are lighter than air, such as Hydrogen and Methane.



Flow Adaptor

For use in sampling applications.



Accessory Adaptor

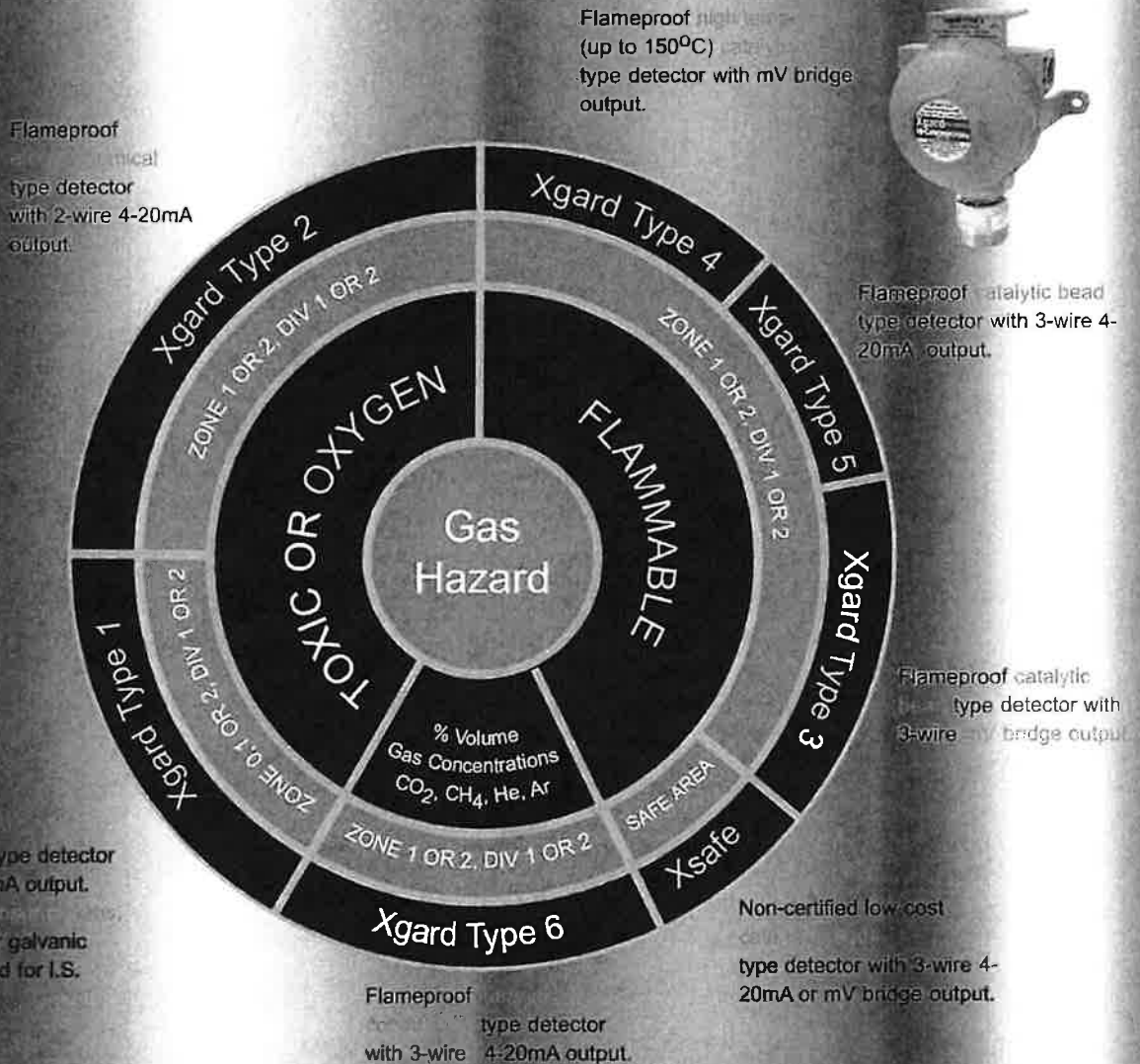
For fitting accessories to Xgard.



Detector Selection

The Xgard range offers a comprehensive selection of fixed point gas detectors that meet the diverse requirements for flammable and toxic gas detection and oxygen monitoring in industries throughout the world.

This diagram is designed to help you choose the correct Xgard detector to suit your needs.



Ordering Requirements

The following code is designed to help in the selection of the correct detector. The product reference number should be compiled by inserting the appropriate integer in each box.

Detector	Type No.	Code	Output	Junction Box	Code	Cable Entry	Code	Certification	Code	Gas Type	Range
XGARD	Type 1	1	1	Standard ¹	A	M20	M20	ATEX	AT	Abbreviated up to 8 characters	From selection shown on table
XSAFE	Type 2	2	2	Stainless Steel ²	S	1/2" NPT	1/2"	UL	UL		
	Type 3	3	3			1/2" NPT	1/4"				
	Type 4	4	4								
	Type 5	5	5								
	Type 6	6	6								
XSAFE	XS		mV or mA								

¹ Xgard Type 1 ATEX certified detectors will be supplied in a glass-reinforced nylon enclosure as standard, or in a 316 stainless steel enclosure as an option. Xgard Type 1 UL certified detectors and all other Xgard Types will be supplied in aluminium as standard, or in a 316 stainless steel enclosure as an option.

² The stainless steel option is not available for Xsafe.

Example product reference for an I.S. 0-25ppm H₂S detector with ATEX certification and M20 cable entry in a standard (nylon) junction box:

XGARD 1/A/M20/AT/H2S/25.

Attachment - Catalogue 18

Gas type	LTEL (ppm) LEL (%vol)	STEL (ppm) UEL (%vol)	Ranges Available: Type 1	Ranges Available: Type 2	Ranges Available: Type 3,4,5 & Xsafe	Ranges Available: Type 6
Acetylene (C ₂ H ₂)	2.3 (2.4)	100			0-100% l _{el} *	
Ammonia (NH ₃)	25 15 (15)	35 33.6 (28)	50, 100, 250, 500, 1000 ppm		0-25% l _{el} *	
Argon (Ar)	-	-				0-20% vv (in air) [†]
Arsine (AsH ₃)	0.05	-	1 ppm			
Bromine (Br ₂)	0.1	0.2	3, 5 ppm			
Butane (C ₄ H ₁₀)	1.4 (1.8)	9.3 (9)			0-100% l _{el} *	0-25% vv (in air) [†]
Carbon Dioxide (CO ₂)	5000 (0.5%vol)	15000 (1.5%vol)				0-50%, 100% vv (in air) [†]
Carbon Monoxide (CO)	30	200	50, 100, 150, 200, 250, 300, 500, 1000 ppm	50, 100, 250, 300, 500, 1000 ppm		
Chlorine (Cl ₂)	-	0.9	3, 5, 10, 20, 50, 100 ppm			
Chlorine Dioxide (ClO ₂)	0.1	0.3	1 ppm			
Diborane (B ₂ H ₆)	0.1	-	1 ppm			
Ethane (C ₂ H ₆)	2.5 (3)	15.5			0-100% l _{el} *	
Ethylene (C ₂ H ₄)	2.9 (2.7)	36			0-100% l _{el} *	
Ethylene Oxide (C ₂ H ₄ O)	5	-	10, 50, 100 ppm	10, 50, 100 ppm		
Fluorine (F ₂)	1	1	1 ppm			
Germane (GeH ₄)	0.2	0.6	2 ppm			
Helium (He)	-	-				0-5%, 10%, 20% 50%-100% vv (in air) [†]
Hydrogen (H ₂)	4	77 (80)	200, 2000 ppm 2%, 4% vv	200, 2000 ppm [‡] 2%, 4% w	0-100% l _{el} *	0-5%, 10%, 50% vv (in air) 0-20%, 25%, 30%, 50% vv (H ₂ in N ₂)
Hydrogen Chloride (HCL)	1	5	5, 10, 25 ppm			
Hydrogen Cyanide (HCN)	-	10	25, 30 ppm			
Hydrogen Fluoride (HF)	1.6	3	10 ppm			
Hydrogen Sulphide (H₂S)	5	10	5, 10 (20), 25, 50, 100, 200, 250, 300, 1000 ppm	5, 10, 20, 25, 50, 100, 200 ppm		
Hydrogen Sulfide (H ₂ S)	5	10			0-100% l _{el} *	
Methane (CH ₄)	4.4 (5)	17 (15)			0-100% l _{el}	0-10%, 25% 100% vv (in air) 0-100% vv (CH ₄ in CO ₂) [†]
Nitric Oxide (NO)	5*	15*	25, 50, 100 ppm			
Nitrogen Dioxide (NO ₂)	1	1	5, 10, 30, 50, 100 ppm			
Ozone (O ₃)	-	0.2	1 ppm			
Oxygen (O ₂)	-	-	25% Vol	25% Vol		
Pentane (C ₅ H ₁₂)	1.4 (1.5) 600ppm	7.8 (7.8) 1800ppm			0-100% l _{el} *	
Petrol	1.3	6			0-100% l _{el} *	
Phosgene (COCl ₂)	0.02	0.06	1 ppm			
Phosphine (PH ₃)	0.1	0.2	1 ppm			
Propane (C ₃ H ₈)	1.7 (2.2)	10.9 (10)			0-100% l _{el}	0-25% vv (in air) [†]
Silane (SiH ₄)	0.5	1	1 ppm			
Sulphur Dioxide (SO ₂)	1	1	10, 20, 50, 100, 250 ppm			
Vinyl Chloride (VCM) (CH ₂ =CHCl)	3.6 3	33			0-100% l _{el} *	
Volatile Organics (VO)**	-	-	0 - 100 ppm**			

Notes: Other sensors and ranges may be available, please contact Crowcon.

*Ranges not available for Xsafe or Xgard Type 4

†Contact Crowcon for availability

LTEL & STEL figures are derived from the UK HSE document: EH40 Oct 07. Alternative thresholds may apply in countries outside of the UK

LEL figures derived from EN61779-1: 2000

** Current limits advised in the UK

** Nominal 0-100ppm range with Carbon Monoxide (CO). Contact Crowcon for a full list of gases that can be detected using this sensor

Xgard Specifications



Type 1 - H2S Gas Detector

Xgard Model	Type 1	Type 2	Type 3	Type 4	Type 5	Type 6	Xsafe
Junction box material	ATEX Certified; Glass-reinforced nylon or 316 S/S UL Certified; Aluminium or 316 S/S	Aluminium or 316 Stainless Steel	Aluminium or 316 Stainless Steel	Aluminium or 316 Stainless Steel	Aluminium or 316 Stainless Steel	Aluminium or 316 Stainless Steel	Aluminium
Dimensions	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)	195 x 166 x 111mm (7.6 x 6.5 x 4.3 inches)	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)	156 x 166 x 111mm (6.1 x 6.5 x 4.3 inches)
Weight	Nylon 0.5Kg (1.1lbs) Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	Alloy 1Kg (2.2 lbs) 316 S/S: 3.1kg (6.8 lbs)	1Kg (2.2 lbs)
Ingress protection	IP65, IP66 with weatherproof cap	IP65, IP66 with weatherproof cap	IP65, IP66 with weatherproof cap	IP54	IP65, IP66 with weatherproof cap	IP65, IP66 with weatherproof cap	IP65, IP66 with weatherproof cap
Cable entries	1 x M20 or 1/2" NPT on right-side	1 x M20, 1/2" NPT or 3/4" NPT on right-side	1 x M20, 1/2" NPT or 3/4" NPT on right-side	1 x M20, 1/2" NPT or 3/4" NPT on right-side	1 x M20, 1/2" NPT or 3/4" NPT on right-side	1 x M20, 1/2" NPT or 3/4" NPT on right-side	1 x M20, or 1/2" NPT on right-side
Terminations	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)	0.5 to 2.5mm ² (20 to 13awg)
Sensor type	Electrochemical	Electrochemical	Catalytic bead	316 s/s sensor housing with catalytic beads	Catalytic bead	Thermal conductivity	Catalytic bead
Operating temperature	-20 to +50°C (-4 to 122°F) (typical) (to +55°C intermittent)	-20 to +50°C (-4 to 122°F) (typical) (to +55°C intermittent)	-40 to +80°C (-40 to 176°F)	-20 to +150°C (-4 to 302°F)	-40 to +55°C (-40 to 131°F)	+10 to +55°C (50 to 131°F)	-40 to +80°C (-40 to 176°F) (mV version) -40 to +55°C (-40 to 131°F) (mA version)
Humidity	0-90% RH non-condensing	0-90% RH non-condensing	0-99% RH non-condensing	0-99% RH non-condensing	0-99% RH non-condensing	0-90% RH non-condensing	0-99% RH non-condensing
Repeatability	<2% FSD (Typ.)	<2% FSD (Typ.)	<2% FSD (Typ.)	<2% FSD (Typ.)	<2% FSD (Typ.)	<2% FSD (Typ.)	<2% FSD (Typ.)
Zero drift	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)	<2% FSD / month (Typ.)
Response time	T90 <10s Oxygen T90 <30s to 120s Toxic (sensor dependent)	T90 <10s Oxygen T90 <30s to 120s Toxic (sensor dependent)	T90 <15s (Typ)	T90 <15s (Typ)	T90 <15s (Typ)	T90 <15s (Typ)	T90 <15s (Typ)
Operating voltage	8 - 30V dc	8 - 30V dc	2.0V dc +/- 0.1V (Typ)	2.0V dc +/- 0.1V (Typ)	10 - 30V dc	10 - 30V dc	10 - 30V dc (mA version) 2.0V dc (mV version)
Power requirements	24mA max.	24mA max.	300mA (Typical)	300mA (Typical)	50mA @ 24V dc 1.2W	50mA @ 24V dc 1.2W	mA version: 50mA @ 24V dc 1.2W mV version: 300mA (Typ.)
Electrical output	2-wire 4-20mA (current sink)	2-wire 4-20mA (current sink)	3-wire mV bridge Typical signal 12-15mV / %lcl CH4	3-wire mV bridge Typical signal >10mV / %lcl CH4	3-wire 4-20mA (current sink or source)	3-wire 4-20mA (current sink or source)	mA version: 3-wire 4-20mA (current sink or source) mV version: 3-wire mV bridge Typical signal 12-15mV / %lcl CH4
Approvals	ATEX: (Ex) II 1 G Exia IIC T4 (Tamb -40 to +55°C) UL/cUL Groups A,B,C,D IECEx MED Marine (96/98/EC) Oxygen Only	ATEX: (Ex) II 2 GD Exd IIC T6 (Tamb -40 to +55°C) UL: Class 1, Div. 1 Groups B,C,D IECEx MED Marine (96/98/EC) Oxygen Only	ATEX: (Ex) II 2 GD Exd IIC T4 (Tamb -40 to +80°C) Exd IIC T6 (Tamb -40 to +50°C) UL: Class 1, Div. 1 Groups B,C,D IECEx	ATEX: (Ex) II 2 G Exd IIC T3 (Tamb -20 to +150°C)	ATEX: (Ex) II 2 GD Exd IIC T6 (Tamb -40 to +50°C) Exd IIC T4 (Tamb -40 to +80°C) UL: Class 1, Div. 1 Groups B,C,D IECEx	ATEX: (Ex) II 2 GD Exd IIC T6 (Tamb -40 to +50°C) Exd IIC T4 (Tamb -40 to +80°C) UL: Class 1, Div. 1 Groups B,C,D IECEx	Not certified for use in a hazardous environment.
EMC compliance	EN 50270	EN 50270	EN 50270	EN 50270	EN 50270	EN 50270	EN 50270

* 3/4" cable entry only available on aluminium junction boxes



A HALMA COMPANY

P03018 Issue 5 April 08

UK Office
Crowcon Detection Instruments Ltd
2 Blacklands Way
Abingdon Business Park
Abingdon
Oxfordshire OX14 1DY
United Kingdom
Tel: +44 (0) 1235 557700
Fax: +44 (0) 1235 557749
Email: crowcon@crowcon.com
Web Site: www.crowcon.com

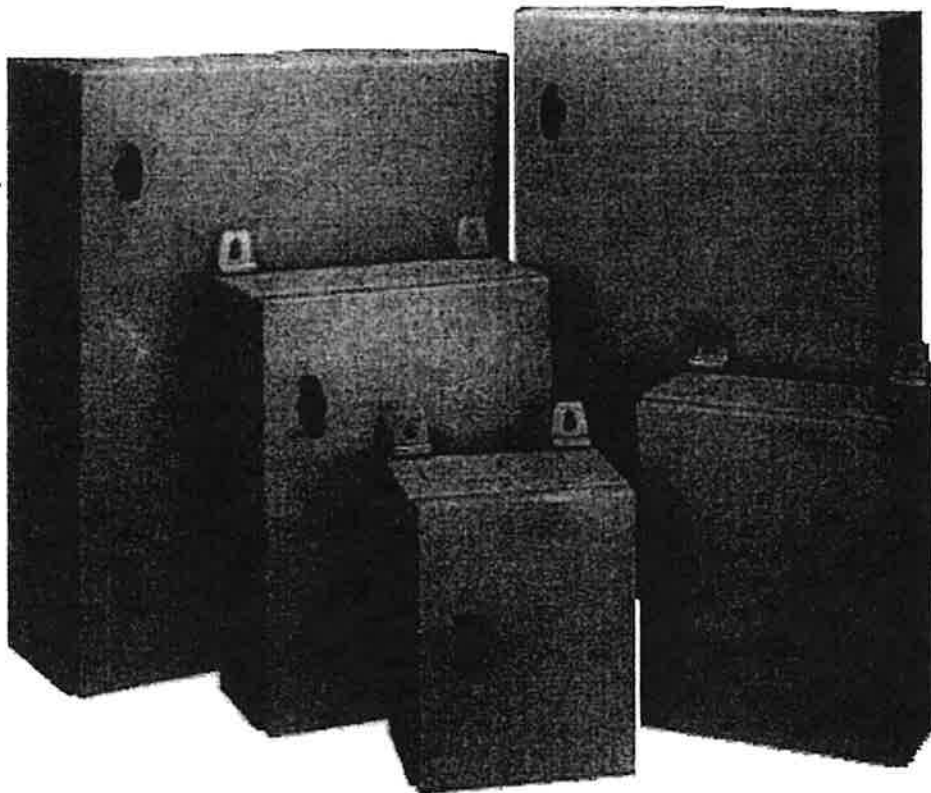
USA Office
Crowcon Detection Instruments Ltd
21 Kenton Lands Road
Erlanger
Kentucky 41018-1845
USA
Tel: +1 859 957 1039 or
1-800-5-CROWCON
Fax: +1 859 957 1044
Email: salesusa@crowcon.com
Web Site: www.crowcon.com

Rotterdam Office
Crowcon Detection Instruments Ltd
Vlamblaem 129
3068JG, Rotterdam
Netherlands
Tel: +31 10 421 1232
Fax: +31 10 421 0542
Email: eu@crowcon.com
Web Site: www.crowcon.com

Singapore Office
Crowcon Detection Instruments Ltd
Block 194 Pandan Loop
#06-20 Pantech Industrial Complex
Singapore 128383
Tel: +65 6745 2936
Fax: +65 6745 0467
Email: sales@crowcon.com.sg
Web Site: www.crowcon.com

Yau Luen Electric Copper Iron Engineering Co.

WATERPROOF SERIES

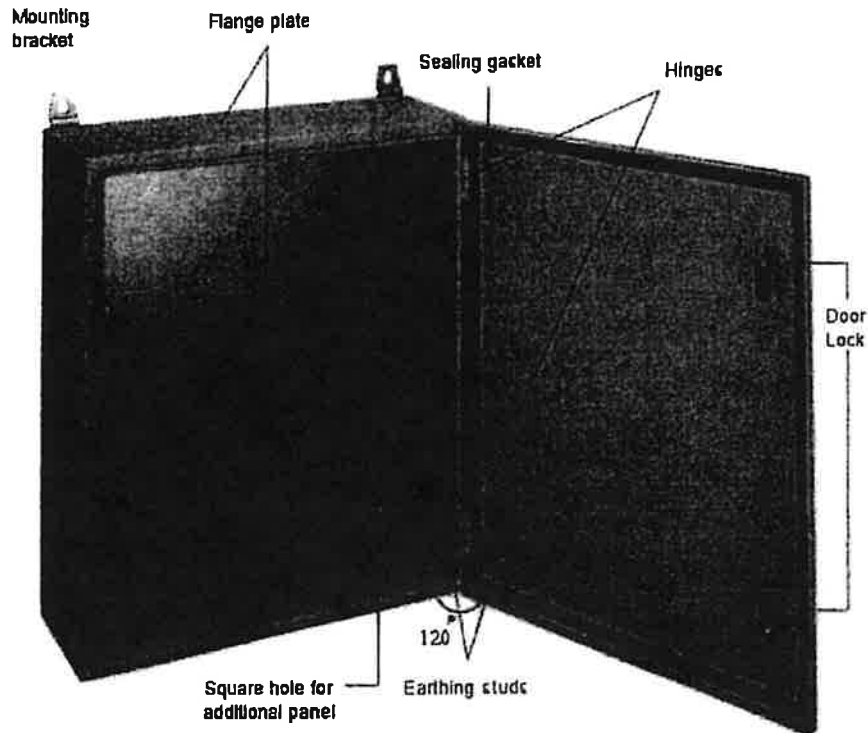


Yau Luen Electric Copper Iron Engineering Co.

Yau Luen Electric Copper Iron Engineering Co.

WATERPROOF SERIES ENCLOSURE IP-54

(BS EN60439-1, IEC 439-1 and IEC 529)



1. The enclosures are manufactured from electrolysis zinc-coated sheet.
2. External wall mounting bracket ease to place on the wall.
3. Flange plate with sealing gasket that increased cable entry capacity.
4. Sealing gaskets add on the door and flange.
5. Concealed and easily removable hinges allowing more than 120° door opening.
6. Standard bar lock with wing-shaped handle.
7. Earthing studs fitted on door and body.
8. Four wall mounting holes with plastic blanking plugs.
9. Fixing of additional panel by means of 4 square lock blot,
10. ASTA Certificate to BS EN60439-1, IEC439-1 and IEC 529.

Options are available upon request

Stainless steel enclosures
Higher degree of protection, i.e. IP-55 and IP-65
Other modular sizes
Other colours, electric orange or RAL 7032
Safety cylinder lock or castell locks

Yau Luen Electric Copper Iron Engineering Co.



STC Test Report

Date : 2011-12-02
No. : HE158412

Page 1 of 9

- Applicant (YAL003)** : Yau Luen Electric Copper Iron Engineering Co.
Flat 1-4 & 7-8, G/F., Kwai On Factory Estate,
103-113 Tai Lin Pai Road, Kwai Chung,
New Territories, Hong Kong.
- Description of Sample(s)** : Submitted sample(s) said to be
Product: IP65 Enclosures
Brand name: YL
Model no.: Not provided
Electrical rating: Not provided
Quantity submitted: 2 pc.
Country of origin: Hong Kong
Country of destination: Not provided
Manufacturer: Yau Luen Electric Copper Iron Engineering Co.
- Date Sample(s) Received** : 2011-09-01 and 2011-11-18
- Date Tested** : 2011-09-12 and 2011-11-23 to 2011-11-25
- Investigation Requested** : Test according to the Ingress protection requirements of clauses
13 and 14 of IEC 60529.
- Conclusion(s)** : The submitted sample(s) COMPLIED with the requirements
(IP65) of clauses 13 and 14 of

- IEC 60529:2001+C1:2003
[Degrees of protection provided by enclosures (IP code)]
- Remark(s)** : -



PPC
CHAN Ka Chun, Vincent
Authorized Signatory

Electrical Safety Department
For and on behalf of

The Hong Kong Standards and Testing Centre Ltd

The Hong Kong Standards and Testing Centre Ltd.

10 Dai Wang Street, Tai Po Industrial Estate, N. T., Hong Kong
Tel: (852) 2666 1888 Fax: (852) 2664 4353 E-mail: hkstc@hkstc.org Homepage: www.stcgroup.org

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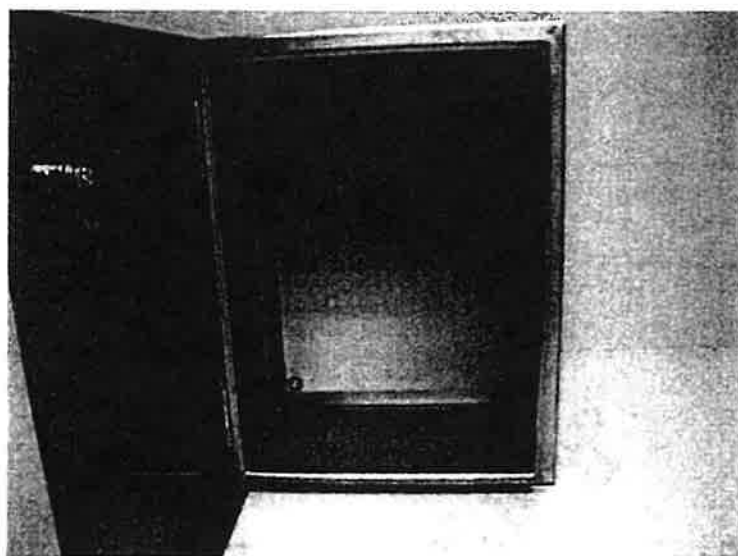
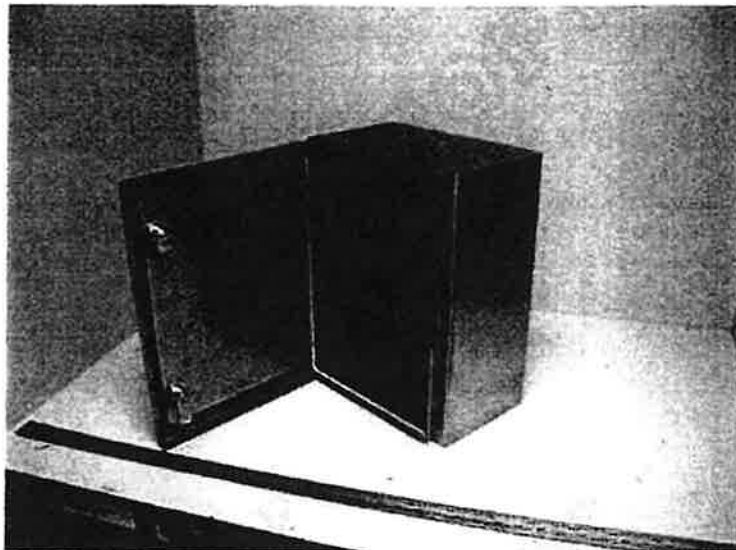


STC Test Report

Date : 2011-12-02
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Page 7 of 9

Product Photographs



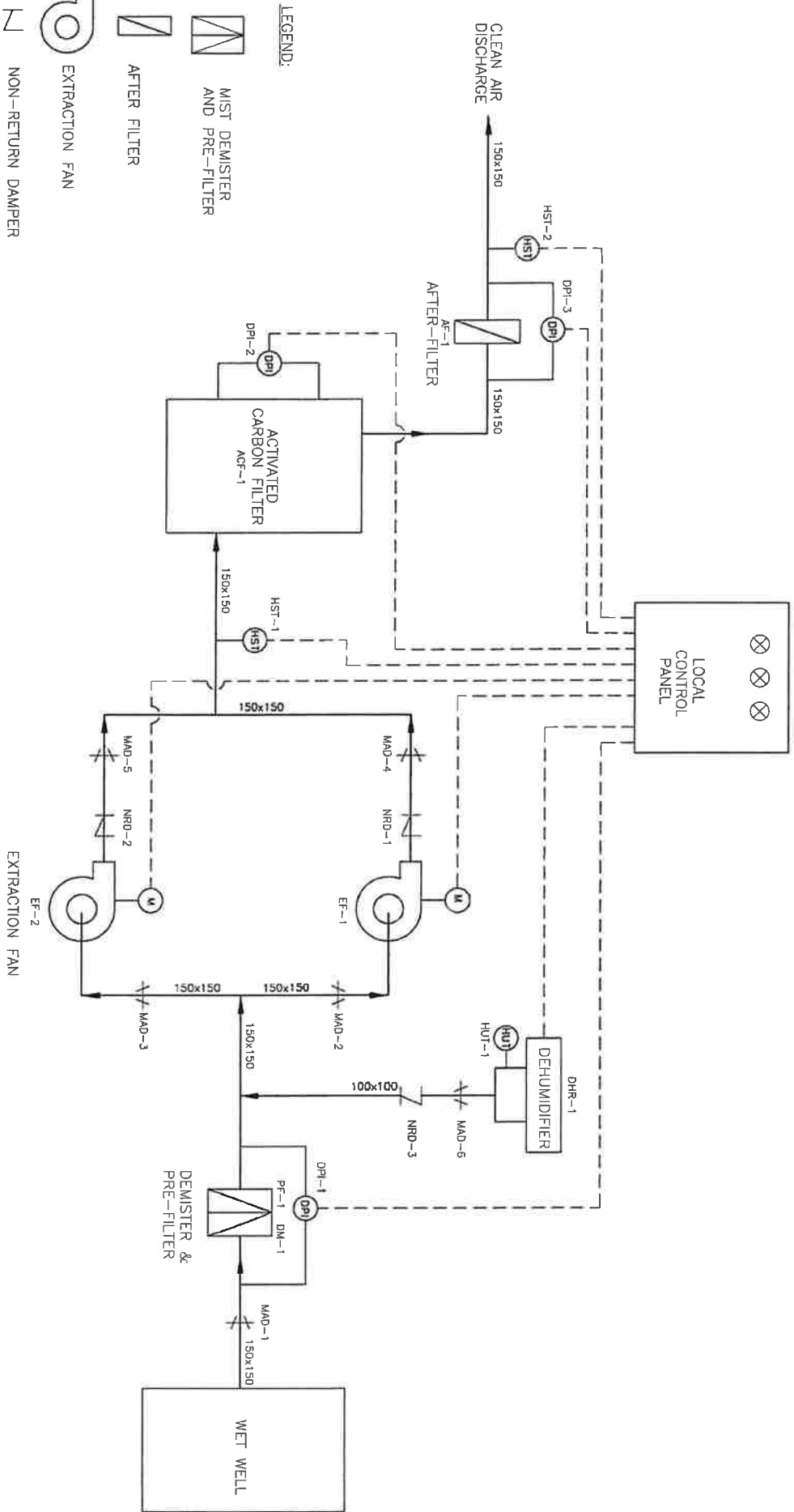
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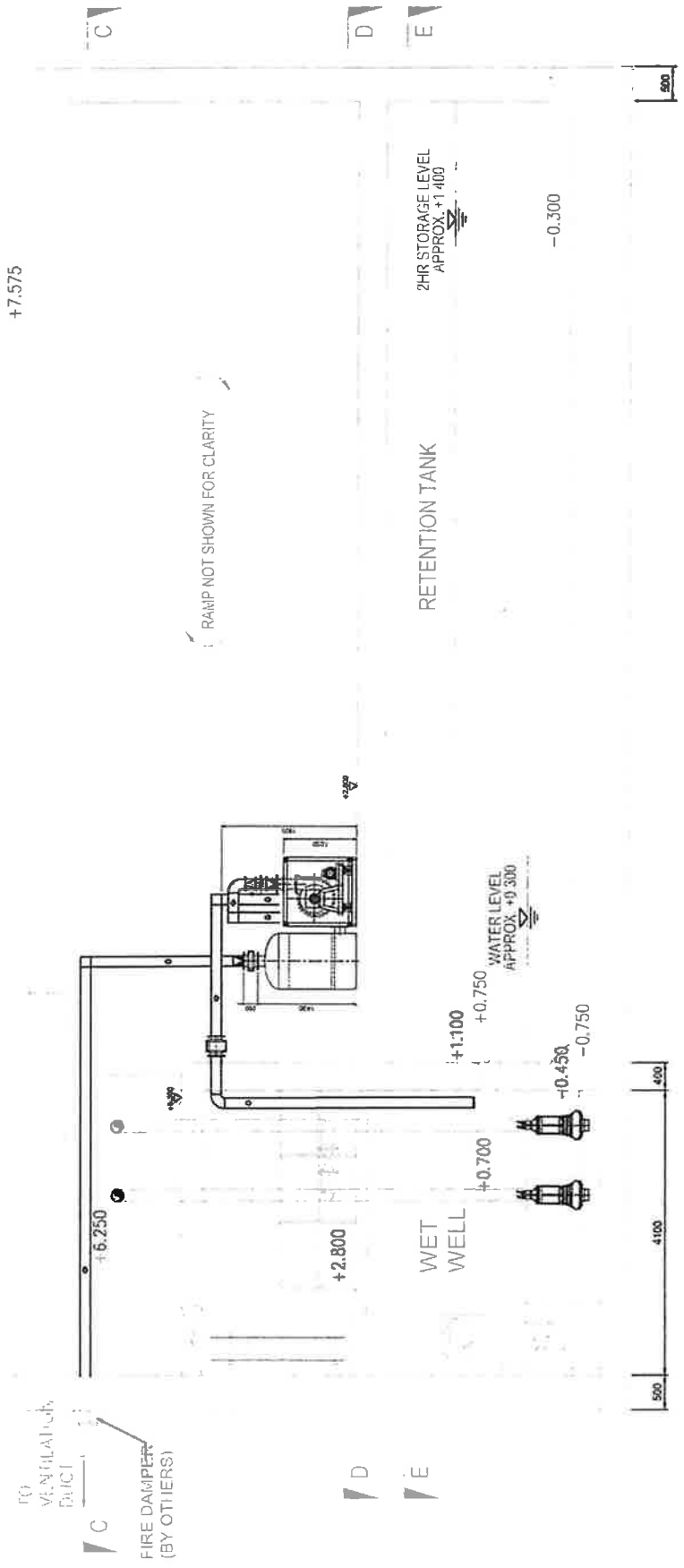
Attachment - Schematic Diagram

- EXTRACTION FAN
- MIST DEMISTER AND PRE-FILTER
- AFTER FILTER
- NON-RETURN DAMPER
- MANUAL AIR DAMPER
- HYDROGEN SULPHIDE TRANSMITTER
- DIFFERENTIAL PRESSURE INDICATOR
- HUMIDITY TRANSMITTER
- EXTRACTION FAN MOTOR

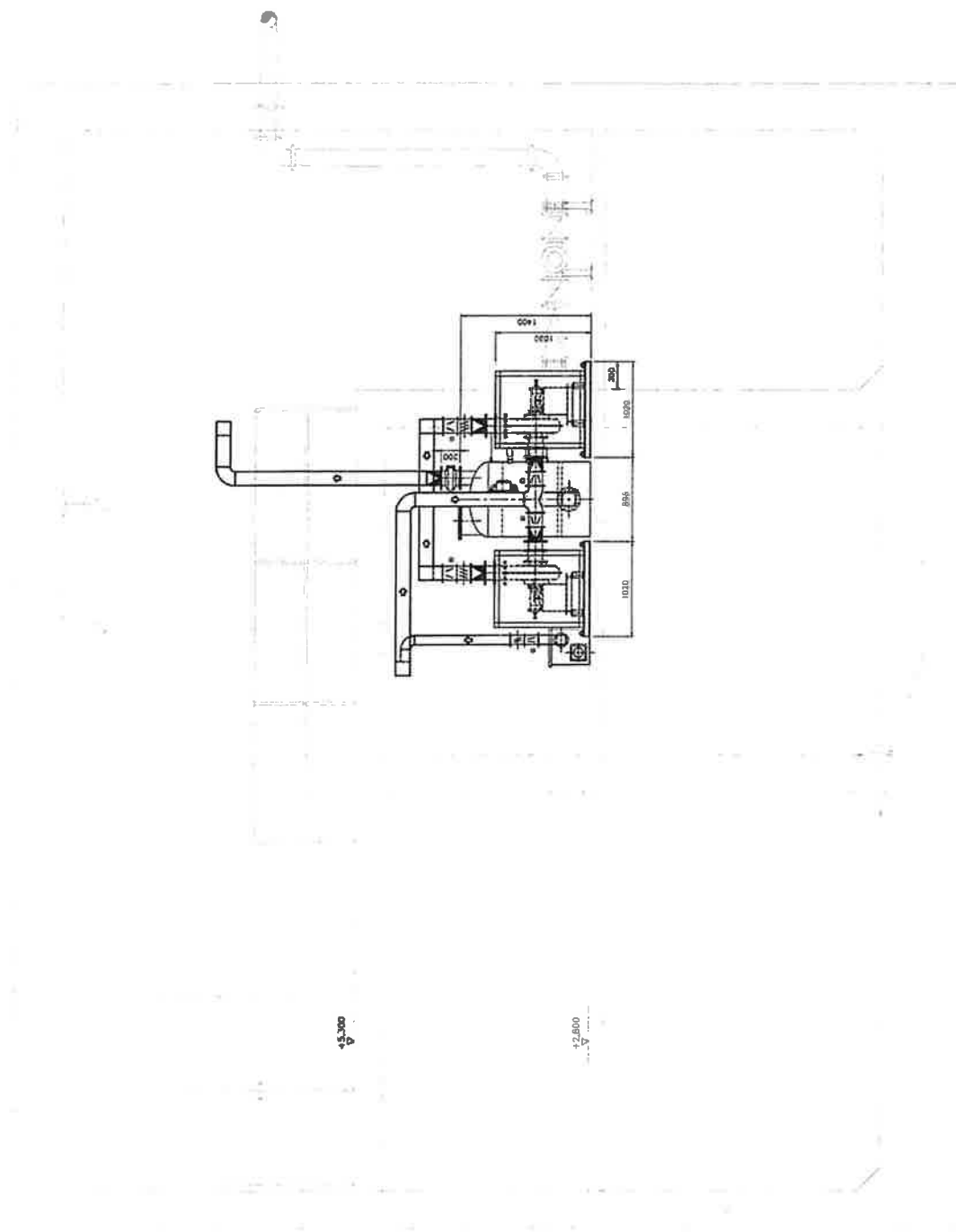


ECOLO ENVIRONMENTAL INDUSTRIES		CLIENT: ANRICH ENVIRONMENTAL TECHNOLOGY CO., LTD	
Drawn by	DATE	PROJECT /JOB:	
Checked by	DATE	FLUID OF ACTIVATED CARBON FILTER SYSTEM	
Approved by	DATE	FOR KWU TUNG SEWAGE PUMP ROOM	
<small>COMPANY RESERVE: THIS DRAWING IS THE PROPERTY OF ECOLO AND IS TO BE USED ONLY FOR THE PROJECT AND MANUFACTURE WITHOUT PRIOR PERMISSION</small>		<small>Drawing No</small> EHV6984-P0-001	
<small>REVISION</small> 0			

Attachment - Drawing 1



Attachment - Drawing 2





Hong Kong & Macau

	Job Description	Type	Quantity	Air volume	Completion
1	Odour absorption at City Polytechnic University	A/C filter	1 set	0.5m ³ /s	Before 1997
2	Chlorine absorption at Silvermine Bay T/W	Chemical	1 set	2.0m ³ /s	Before 1997
3	Chlorine absorption at Tai Lam Chung T/W	Chemical	1 set	2.0m ³ /s	Before 1997
4	Chlorine absorption at Sheung Shui T/W	Chemical	1 set	3.5m ³ /s	Before 1997
5	Chlorine absorption at Sham Tseung T/W	Chemical	1 set	3.5m ³ /s	Before 1997
6	Chlorine absorption at Tai Po Tau T/W	Chemical	1 set	5.0m ³ /s	Before 1997
7	Chlorine absorption at Yau Kam Tau T/W	Chemical	1 set	5.0m ³ /s	Before 1997
8	Odour absorption at North Point Sewage Treatment Works	Biofilter	1 set	1.5m ³ /s	Before 1997
9	Odour control system at Macau ETAR waste water treatment plant	A/C filter	10 sets	3.0 m ³ /s	Before 1997
10	Odour removal at various locations in Sheung Shui slaughterhouse	Chemical	12 sets	13 to 48m ³ /s	1999
11	Odour removal at RL P/S at Siu Ho Wan STW	Chemical	1 set	0.4 m ³ /s	2007
12	Odour removal at Digested Sludge Pump Pit at Shatin STW	Biofilter (semi-open type)	1 set	N/A	2007
13	Odour removal at Ngau Tam Mei waste composting plant	Biofiltration system	1 set	7.5 m ³ /s	2008
14	Odour removal at Sheung Shui Slaughterhouse	Biofiltration system	1 set	3.0 m ³ /s	2009
15	SO ₂ fume recovery system at Stonecutter Island STW	A/C filter	1 set	0.17 m ³ /s	2009
16	Odour removal at Shui Cheong Street Sewage Pumping Station	A/C filter	1 set	1.11m ³ /s	2010 /12
17	Odour removal at Siu Hong Sewage Pumping Station	Biofilter & A/C filter for polishing	1 each	0.14 m ³ /s	2011 /6

Attachment - Job Reference 2



	Job Description	Type	Quantity	Air volume	Completion
18	Deodourising system for Shatin Sewage Treatment Works	Biotrickling filter	2 sets	19,000m ³ /h 25,000m ³ /h	2012/2 2012/6
19	Deodourising system for Sewage Pumping Station and Desilting Compound at Jordan Valley Box Culvert	A/C filter	2 sets	3.5 m ³ /s 40.0m ³ /s	2013/6
20	Deodourising system for Siu Ho Wan Sewage Treatment Works	Biotrickling filter	1 set	8,800m ³ /h	2014/ 10
21	Upgrading of DOU system 2 at Pak Kok Sewage Pumping Station	Biofilter & A/C filter for polishing	1 each	850m ³ /h	2014/10
22	Deodourising system for Wanchai East PTW - screening plant	Biotrickling filter	1 set	15,000m ³ /h	2015
23	Deodourising system for Wanchai East PTW - pumping station	Biotrickling filter	1 set	15,000m ³ /h	2015
24	Deodourising system for Tin Liu Ha SPS	Biofilter	1 set	648m ³ /h	2015
25	Deodourising system for Ngau Tam Mei waste composting plant	A/C filter	1 set	38,000m ³ /h	2015
26	Deodourising system for Tong Min Tsuen SPS	Biofilter	1 set	720m ³ /h	2015

DEODORISING SYSTEM

- | | | |
|---|------|---|
| <i>Deodorising System</i> | 7.01 | <p>(1) The Sub-contractor shall design, supply, deliver to Site, install, test, commission and be liable to defects during Defects Liability Period of one (1) set of deodorising system. The set of deodorising system shall include the following components, but not limited to:</p> <ul style="list-style-type: none"> - One (1) no. deodoriser unit - One (1) no. desiccant type dehumidifier - One (1) no. extraction fan - Volume control dampers and intake grilles - Pre-filters and After Filters - Stainless steel grade 316 ductwork for odour extraction from the wet wells in Sewage Pump Room - One (1) set of hydrogen sulphide detection system <p>(2) The deodorising system shall be designed to extract foul air from wet wells (5 air change per hour) of the Sewage Pump Room, i.e. 180m³/h approximately, deodorises the foul air by passing through an activated carbon filter bed and directly discharge the deodorised air into atmosphere without connecting to the ventilation system.</p> <p>(3) The deodorising system shall be fixed horizontal bed type. The removal efficiency of the deodorising system for hydrogen sulphide shall not be less than 99.5% with hydrogen sulphide concentration of 5ppm (average). Removal efficiency test report shall be submitted to the Engineer.</p> <p>(4) The Sub-contractor shall be responsible for the design of deodorising system and submit the design calculations of the deodorisers and all air ducts to the Engineer for approval.</p> |
| <i>Deodoriser (Activated Carbon Filter)</i> | 7.02 | <p>(1) The deodoriser shall use potassium hydroxide (KOH) impregnated activated carbon as filter media to treat the extracted foul air. The Sub-contractor shall provide the initial filling of the filter media at installation stage and arrange a complete replacement of the used filter media at the end of Defects Liability Period.</p> <p>(2) The Sub-contractor shall provide test certificate to verify the capacity of the activated carbon for initial filling. The replacement filter media shall only be delivered to Site towards the end of Defects Liability Period.</p> <p>(3) The filter media shall be totally inorganic, non-toxic, and self-incombustible at operating temperature range as specified in the General Specification and shall not support any microbial growth. The air velocity through the filter media shall not be greater than 0.4m/s with a contact time of not less than 2s. The filter media shall have a breakthrough hydrogen sulphide concentration of not greater than 0.025ppm at a constant inlet hydrogen sulphide concentration of 5ppm at maximum air flow as specified, and shall provide an overall efficiency of not less than 99.5%.</p> |

Attachment - Applicable Specification 2

Kwu Tung Sewage Pump Room	Particular Specification Electrical and Mechanical Requirements
	<ul style="list-style-type: none">(4) The corresponding breakthrough time of the activated carbon filter beds shall not be less than one (1) calendar year with the system operating continuously at the conditions specified.(5) The housing of the deodoriser shall be fabricated from flame retardant glass fibre reinforced plastic resins (GRP) or approved equivalent. The supporting framework and all metallic fittings for the deodoriser shall be made of stainless steel.(6) The deodoriser shall be provided with access hatches at level not higher than 1 m above the finished floor for replacement of filter media. All hinges, hold-down lever and accessories shall be made of stainless steel. In addition to the access hatches, media test ports shall be provided.(7) Maintenance platform complete with handrailings, toe board, step ladder and etc. shall be provided for the deodorizer by the Sub-contractor. The maintenance platform shall be made of GRP or approved equivalent.(8) Differential pressure gauges shall be installed to measure the pressure drop across all filters, including activated carbon filter, prefilter and after filter. Alarm indication at the control panel shall be provided in the case of a preset level of high pressure drop is detected.
<i>Prefilter and After-Filter Unit</i> 7.03	<ul style="list-style-type: none">(1) A prefilter and after-filter unit shall be installed at the inlet and outlet of the deodoriser respectively for the removal of particulate. It shall be in a readily accessible and removable frame and have an average efficiency of not less than 40% when tested in accordance with ASHRAE 52-76. The framework shall be made of stainless steel. The prefilter shall be made of stainless steel. The prefilter shall be designed so as to facilitate side removal of the filter elements. A differential pressure-sensing device shall be installed at the suction and discharge side of the filter assembly and it will initiate an alarm to alert the operation staff on the conditions of the filter units. After filter shall have at least 90% particulate removal efficiency and shall be of disposable type.
<i>Mist Eliminator</i> 7.04	<ul style="list-style-type: none">(1) The mist eliminator shall be made of stainless steel housed in stainless steel frame. The mist removal efficiency shall not be less than 98% on 20 micron moisture droplets.
<i>Dehumidifier</i> 7.05	<ul style="list-style-type: none">(1) Fresh air shall be drawn into the dehumidifier, dried and then discharged into the foul air stream. The mixed air is then conveyed to the deodorizer. No foul air shall be in contact with the dehumidifier.(2) Dehumidifier shall be provided to reduce the relative humidity of the foul air to 85%RH (max) under any conditions.

Attachment - Applicable Specification 3

Kwu Tung Sewage Pump Room	Particular Specification Electrical and Mechanical Requirements
<i>Extraction Fan and Air Duct</i> 7.06	<p>(3) The dehumidifier shall be adsorption type. The dehumidifier shall complete with high efficiency, incombustible, non-toxic silica gel impregnated rotor, process air fan, reactivation air fan, electrical heater, air filters, control panel and duct type remote humidistat. The rotor shall be washable.</p> <p>(1) The motor of the extraction fan shall have class F insulation and enclosure protection to IP 55. The driving motor shall be dual speed with speed ratio at 2:1.</p> <p>(2) The centrifugal fan shall be capable of providing the maximum airflow as specified against the respective system loss. Design calculation for the odorous air extraction shall be submitted to the Engineer for approval before manufacturing. The fan impeller and casing in contact with the air extracted shall be made of GRP.</p> <p>(3) The noise level of the fan shall not exceed 10 dBA above the background noise level measured at 1m from the extraction fan and discharge hood. Should this not be met by the deodorising system, the Sub-contractor shall supply and install noise abatement equipment to attain the required noise level without any extra cost incurred. All metalwork of the noise abatement equipment shall be made of stainless steel. Acoustic enclosures for the fans shall be provided, if necessary.</p> <p>(4) Air duct shall be fabricated from stainless steel sheet with 1mm minimum thickness. All other metal parts of the ductwork shall also be made of stainless steel grade 316. The ducts and fittings shall be designed and constructed with all necessary accessories to minimize waste of energy and pressure losses due to eddies, vortices, etc. Adequate supports and other necessary absorbers and fittings for reducing noise/vibration shall be provided.</p> <p>(5) The delivery volume shall be manually adjustable and locked within a range of 0% to 100% of the maximum airflow rate of the fan. All necessary accessories for this control shall be provided.</p> <p>(6) A damper shall be installed at the upstream of the prefilter, which enables the isolation of the deodoriser for maintenance purpose.</p> <p>(7) Noise and vibration shall not be transmitted to the structure or any other element through hangers and brackets. Flexible connection for joining the ductwork with the extraction fan shall be provided.</p> <p>(8) All intake openings shall be fitted with stainless steel mesh guards.</p> <p>(9) Stainless steel discharge hood complete with stainless steel rain hood and insect guard shall be provided.</p> <p>(10) Ductwork as shown in the Drawings is for indication purposes only. The Sub-contractor shall be responsible for the sizing and detailing of the complete ductwork arrangement, inclusive of fittings, dampers, grilles,</p>

Attachment - Applicable Specification 4

Kwu Tung Sewage Pump Room Particular Specification
Electrical and Mechanical Requirements

etc., and shall submit detailed calculations on the extraction system for the Engineer's approval.

- (11) The Sub-contractor shall provide all the accessories and equipment necessary to comply with FSD's requirements at no extra cost to the Employer. The Sub-contractor shall carry out all necessary submission to FSD for approval, if required.
- (12) All ductwork shall be constructed to the recommendation of the U.K. Heating and Ventilation Sub-contractors Association (HVAC); ductwork group as summarised in their publication DW/142: "Sheet Metal Ductwork Specification for Low, Medium and High pressure/Velocity Air Systems". The recommendations for low velocity systems shall be applicable for this Contract.
- (13) The Sub-contractor shall test and demonstrate the air tightness of the ductwork by measuring and comparing the total air flows at the inlet and discharge points. Discrepancy between the total inlet and discharge volume shall not be greater than 5%.

Hydrogen Sulphide Detection System

7.07

- (1) The hydrogen sulphide concentration of the foul air and the deodorised air shall be continuously monitored by the hydrogen sulphide detection system. The system shall be able to determine the hydrogen sulphide concentration in the range from 0ppm to 20ppm for foul air and from 0ppm to 5ppm for deodorised air. System shall provide a visual indication of the concentration continuously. The hydrogen sulphide detector shall be of electronic type fixed to the deodoriser.

Control and Alarm

7.08

- (1) **General Operation**
 - The deodorising system shall be running continuously at low speed which the deodorising system capable of handling 90m³/h in normal operation and able to manually select to high-speed mode, which the deodorising system capable of handling 180m³/h, if required.
 - On pressing the Emergency Stop button at field equipment, the drive motor shall stop immediately regardless of its mode of operation. Upon the release of the emergency stop switch, the stopped equipment shall not automatically resume its operation. It can only be resumed its operation manually upon the release of the emergency stop, acknowledgement and reset of the alarm at the control panel.
- (2) **Automatic Control**
 - Under "Automatic" mode, the deodorising system shall be running continuously at low speed.
 - The deodorising system shall be running at high speed under the per-set timer, which shall be a 24-hour timer with adjustable steps of not more than one hour.
- (3) **Manual Control**

Attachment - Applicable Specification 5

Kwu Tung Sewage Pump Room

Particular Specification
Electrical and Mechanical Requirements

- Under "Manual" control mode, the deodorising system shall be controlled by the "Start/Stop" push buttons on the control panel.
- A selector shall be provided on the control panel for low/high speed selections.

(4) **Indications on Deodorising System Local Control Panel**

The local control panel shall provide, but not be limited to the following:-

- Suitably rated TP&N fuse switches for the motor starter type
- Motor starter contactor designed and constructed to BS EN 60947-4-1;
- Power on/off indicators
- Phase or supply mains failure indicators
- Fans fault indicators
- Dehumidifier fault indicator
- H₂S breakthrough alarm indicator
- Prefilter clog indicator
- Carbon media clog indicator
- Afterfilter clog indicator
- Inlet H₂S concentration
- Outlet H₂S concentration
- Fan start/stop push button
- Fan "Auto/off/Manual" selectors
- Fan "Running and Stop" indicators
- Alarm/fault reset button
- Hour-run meter
- Ammeters and voltmeters for reading of motor current and voltage respectively;
- "FAULT ACKNOWLEDGED" and "FAULT RESET" push button;

- (5) Deodorising System Local Control Panel shall be housed inside an IP 56 stainless steel grade 316 enclosure. Electric heater shall be provided to eliminate humidity inside the panel. Control Panel shall be installed on a suitable rigid steel framework solidly anchored to the concrete foundation, or at locations as approved by the Engineer.

*Testing of the
Deodorising
System*

7.09

(1)

The Sub-contractor shall carry out two tests with no less than two samples for the deodorising system. First test shall be carried out before completion of Works to verify the hydrogen sulphide removal efficiency. The remaining test shall be conducted a month before completion of Defect Liability Period. The test shall be conducted by an independent HOKLAS accredited laboratory and approved by the Engineer. The test procedures shall be recommended by the manufacturer and submit to the Engineer for approval. The Sub-contractor shall provide artificial hydrogen sulphide gas to verify the removal efficiency as specified in the relevant Clause of this Particular Specification under specified/simulated airflow conditions if the concentration of hydrogen sulphide of the inlet ductwork is below 5ppm.

Attachment - Applicable Specification 1

Plumbing and Drainage Installation Sub-Contract for
Proposed Residential Development at
Lot. 2640, DD92,
Castle Peak Road, Kwu Tung, N.T.

TECHNICAL SCHEDULE (Cont'd)

DEODORISING SYSTEM (To be supplied by a single manufacturer as a complete package)

Item	Description	Specified	Offered
	<u>Deodoriser</u>	Supply and install	
1.	Manufacturer		RAGE
2.	Country of Origin		USA / PRC
3.	Model No.		ACP-FRP-180-C-SB-1
4.	Type		ACTIVATED CARBON FILTER
5.	Residence Time		> 2
6.	Design Air Flow Rate	Min 180m ³ /hr	180 m ³ /hr
7.	Pressure Drop		≈ 500 Pa
8.	Media Volume and Weight		0.17 m ³ , 90 kg
9.	Overall Dimension		
	Width		600 mm
	Length		≈ 1500 mm
	Height		
10.	Weight		≈ 300 kg
11.	Material of Construction		
	Housing	GRP	GRP
	Structure	Stainless Steel	GRP
12.	Impregnated Chemical	Potassium hydroxide	KOH
13.	Breakthrough Time of Activated Carbon	1 year	> 1 YEAR
	<u>Mist Eliminator</u>	Supply and install	
14.	Manufacturer		RAGE
15.	Country of Origin		PRC
16.	Model No.		RAGE-MIST-SS
17.	Capacity		180 m ³ /hr

Attachment - Applicable Specification 2

Plumbing and Drainage Installation Sub-Contract for
Proposed Residential Development at
Lot. 2640, DD92,
Castle Peak Road, Kwu Tung, N.T.

TECHNICAL SCHEDULE (Cont'd)

DEODORISING SYSTEM (Cont'd)

Item	Description	Specified	Offered
	<u>Pre-filter & After-filter</u>		
		Supply and install	
18.	Manufacturer		ATF
19.	Country of Origin		PRC
20.	Model No.		G3
21.	Type		Panel type
22.	Design air flow		180 m ³ /h
23.	Pressure drop		0.25 kPa
24.	Removal efficiency	Not less than 90%	> 90 %
	<u>Dehumidifier</u>		
		Supply and install	
25.	Manufacturer		PERITEK
26.	Country of Origin		PRC
27.	Model No.		ZLKD-120F
28.	Type		DESCICCANT WHEEL
29.	Rotor Material (Media)	Silica gel	SILICA GEL
30.	Dimensions		
	Length		620 mm
	Width		310 mm
	Height		1000 mm
31.	Process Air Flow		≈ 18 m ³ /hr
32.	External static available at design flowrate		≈ 150 Pa
33.	Reactivated air flow		≈ 6 m ³ /hr
34.	Outlet Air Condition	85% RH (Maximum)	56 °C, 20 %RH
35.	Mixed Air Condition	85% RH (Maximum)	36 °C, 75 %RH
36.	Sound Level at 1 m		< 10 dBA ABOVE BACKGROUND

Attachment - Applicable Specification 3

Plumbing and Drainage Installation Sub-Contract for
Proposed Residential Development at
Lot. 2640, DD92,
Castle Peak Road, Kwu Tung, N.T.

TECHNICAL SCHEDULE (Cont'd)

DEODORISING SYSTEM (Cont'd)

Item	Description	Specified	Offered
37.	Total Operating Weight		50 kg
	<u>Centrifugal Fan</u>	Supply and install	
38.	Manufacturer		WINFAN
39.	Country of Origin		PRC
40.	Model No.		HP121
41.	Type		CENTRIFUGAL
42.	Capacity	Min 180m ³ /h (High Speed) Min 90m ³ /h (Low Speed)	180 m ³ /h 90 m ³ /h
43.	Static Pressure		1.5 kPa
44.	Diameter		TBA mm
45.	Speed		TBA rpm
46.	Sound Level at 1m	<10dBA	< 10 dBA
	<u>Centrifugal Fan Motor</u>	Supply and install	ABOVE BACKGROUND
47.	Manufacturer		SIEMENS
48.	Country of Origin		PRC
49.	Speed		1450 rpm
50.	Degree of Protection (IP)		55
51.	Voltage		380 V
52.	Rated Current		TBA A
53.	Phase & Frequency		3Φ 50Hz
54.	Class of Insulation		F

Attachment - Applicable Specification 4

Plumbing and Drainage Installation Sub-Contract for
Proposed Residential Development at
Lot. 2640, DD92,
Castle Peak Road, Kwu Tung, N.T.

TECHNICAL SCHEDULE (Cont'd)

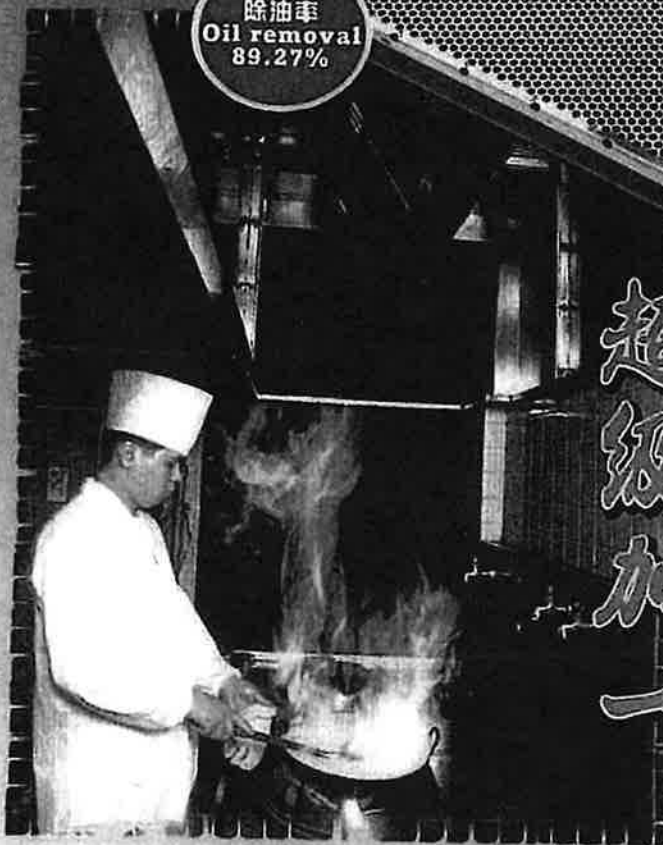
DEODORISING SYSTEM (Cont'd)

Item	Description	Specified	Offered
	<u>Hydrogen Sulphide Detection System</u>	Supply and install	
55.	Manufacturer		CROWCON
56.	Country of Origin		UK
57.	Model No.		XGARD
58.	Type		1
59.	Measuring Range		0-25 0-5 ppm
	<u>Stainless Steel Odour Ductwork</u>	Supply and install	
60.	Manufacturer		} BY OTHERS
61.	Country of Origin		

APPENDIX 2.3. BROCHURE OF THE GREASE FILTER

ALL STAINLESS GREASE FILTER
PLUS ONE & PLUS ONE SUPER

除油率
 Oil removal
 89.27%



使用不銹鋼製的廚房油煙網
 使廚房更安全、更舒適

加一
 超級加一

- Good Ventilation 通風性良好
- Powerful Retention of Fumes 除垢力強煙異味
- Light-Weight Filter 耐用全不銹鋼製
- Not Easily Clogged 過濾網不易阻塞
- Save Maintenance Fee 少維修怪錢省時

KAWASHO

日本廚房工業會
 的認定品。
 適合想節省消防
 經費有關除去油
 煙的準則。日本
 廚房工業會認可
 兩種，請以安心
 使用。

JAPAN KITCHEN INDUSTRY ASSOCIATION

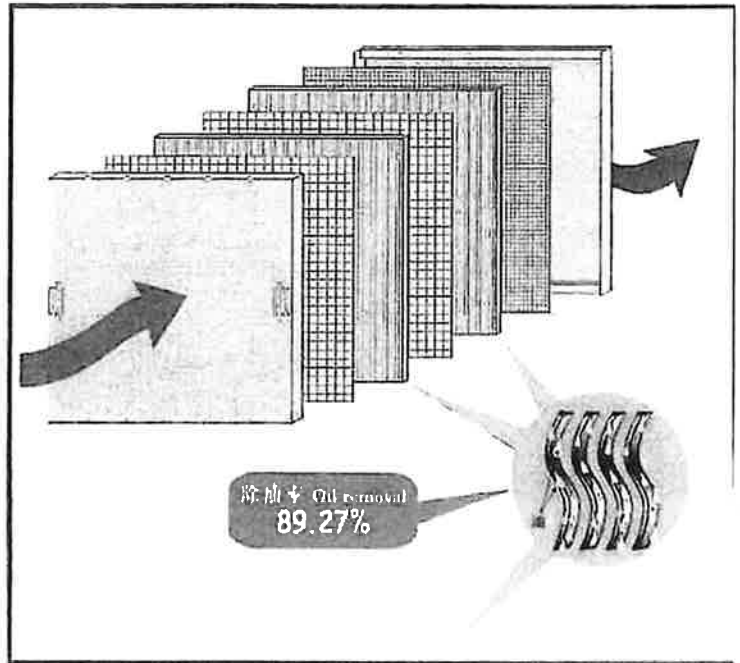


「超級加一」及「加一」的油濾光片

- 「超級加一」及「加一」的優點是通氣性，確實有效地除去油塵的 Long Life 油濾光片。
- 具有通風性和除去油塵的2種性能均能做到兩方平衡的優質 Grease Filter。

由於油濾光片上下方面均是特殊耐熱，加上使用不銹鋼纖維組成，故此在排氣中同時可將油塵捉住及除去。所以當油濾光片累積的油塵減少，相對性便可維持長時間性能效用。

(特許取得 第3141063號)



「超級加一」及「加一」的6個特性優秀點

- 1) **優質的通風性**
由於擁有優質的良好的換氣能力，故此能夠控制廚房內的溫度上升及可以將廚房的舒適環境得以維持。
- 2) **卓越的除油性能**
因為長方形斷面上已佈滿特殊耐熱性及不銹鋼纖維，故能夠容易將油塵捉住。
- 3) **維持更長的高性能**
由於利用編設方法而成的特殊耐熱性及不銹鋼纖維的油濾光片，不但可減少油塵的成份滯留，同時也可以使通風的效能更暢順，更甚者是能夠將除去油塵的性能得以長期性的維持。
- 4) **全是不銹鋼製的產品，長期使用更加經濟**
因為擁有優良的耐蝕性、耐熱性、耐衝擊性、以及藥品性的抵擋。由於以不銹鋼製成的油濾光片非常堅硬，因此外貌美觀得以更長持久。
- 5) **節省經費**
擁有優良的通風性和除去性能的不銹鋼纖維，能減輕換風氣用的摩打負擔及減少機器裏污物的積聚，當然亦可省下更多不必要的電費和減少清掃的費用。
- 6) **優良的洗淨法**
油塵分子的滯留相繼減少，故可將裏面的油塵更容易洗淨。

WE GUARANTEE HYGIENIC KITCHENS 'NO GREASE, AND NO SMELLY ODOR'

This Specially-Designed Cooked Hood Serves the Kitchen Requirements of Business Establishments.

Specification :-

1. Good Ventilation - maintains a pleasant environment and does not strain the suction-fan.
2. Powerful Retention of Fumes - more efficient than other cooker hoods.
3. Light-Weight Filter - unique stainless steel which is very light.
4. Not Easily Clogged - fast, powerful and efficient suction and retention of fumes.
5. Annual maintenance fees are kept to the minimum.

KITCHEN HAZARDS : HOW TO OVERCOME THEM

Present-day kitchen environment and conditions which are greasy smoky and sticky may lead to fire hazards. In addition, the fumes which are trapped due to poor ventilation and improper kitchen maintenance may also cause fires.

GUIDELINES ON FIRE PREVENTION

The Japanese Fire Department makes it mandatory for all Japanese kitchens to install grease filters and to clean the ducts once a month. This maintenance work is very costly. In spite of these measures, fire still occurs in kitchens.

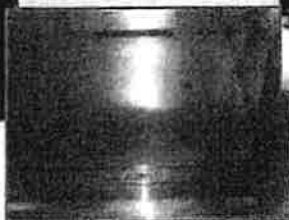
INEFFICIENT SUCTION AND RETENTION OF OIL IN THE FUMES

There is a slow build-up of grease and oil in the filter owing to non-optimum performance of the filter system. This leads to a hazardous situation likely to cause fires in the kitchen! The buffalo-shaped filter does not efficiently retain the oil in the fumes and the sub-standard and unhygienic ventilation system. The factors are the main causes of the high incidence of kitchen fires.

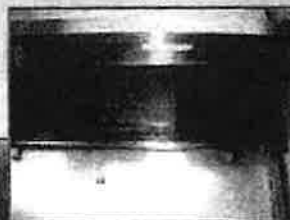
Due to the poor retention of oil by the filter, the filter clogs easily, causing oxidation. To overcome all the above problems, our company, the Totaru Plan (M) Sdn. Bhd, has invented the latest state-of-the-art cooker hood. It is super efficient in oil retention and provides the highest standard in ventilation. It is hardy, durable and a boon to all consumers!



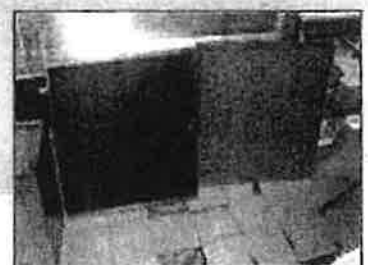
• Before Installation
未安裝 Kawasho 隔油煙網前



• Cleaned air duct and hood with
Kawasho grease filter installed
清潔煙罩風槽後及安裝 Kawasho 隔油煙網

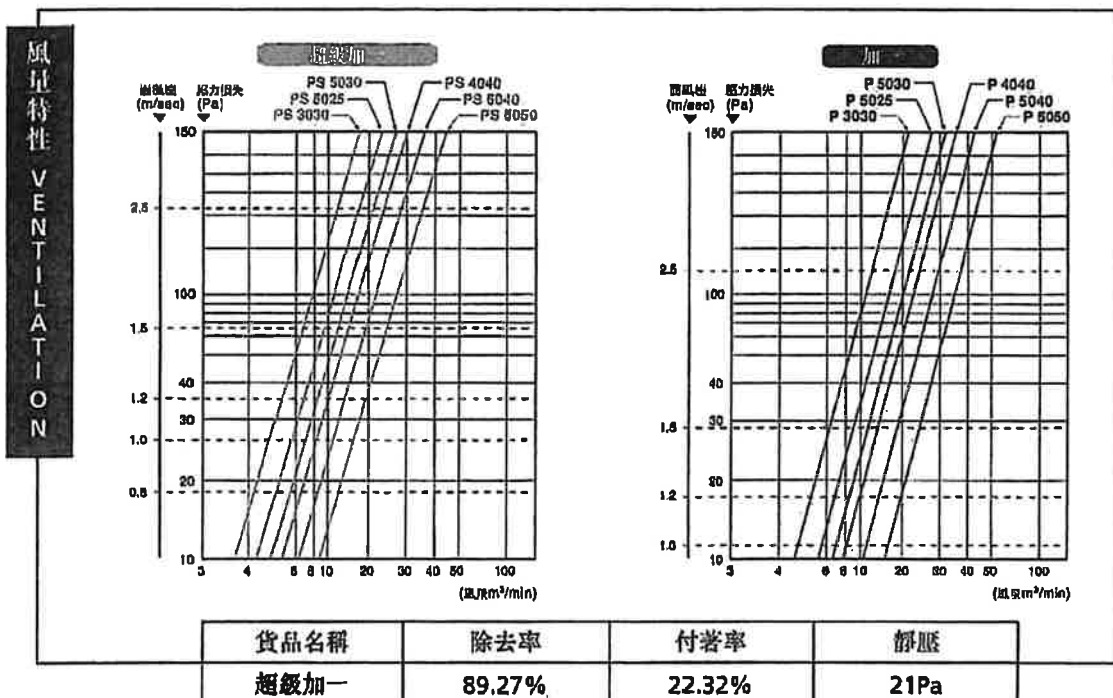


• Air duct and hood are still in
clean condition
風槽及煙罩內能仍然保持清潔



• Front and rear of Filter
隔油網的前後面

型號尺寸 SIZE CHART	超級加	加一	幅 (W)	高 (H)	厚 (t)
	PS 5050	PS 5050	500	500	25
	PS 5050S	PS 5050S	495	500	25
	PS 5040	PS 5040	500	400	25
	PS 5040S	PS 5040S	495	400	25
	PS 5030	PS 5030	500	300	25
	PS 5030S	PS 5030S	495	300	25
	PS 5025	PS 5025	500	250	25
	PS 5025S	PS 5025S	495	250	25
	PS 4040	PS 4040	400	400	25
PS 3030	PS 3030	300	300	25	



規格 SPECIFICATIONS	
桶子型號 Bucket Type	G. F. 5
桶子尺碼 Bucket Size	600(高)Hx540(長)Lx220(闊)W
裝置水容量 Capacity	70 (公升)Litres
隔油網容量 Filter Holding Capacity	5 (塊)Pieces
不銹鋼架尺寸 Dimension of Stainless Steel Rack	(Grease Filter) 560(高)H x 520(長)L x 120(闊)W 3(裝用)Pieces 560(高)H x 520(長)L x 80(闊)W 2(換用)Pieces

生產商
川鐵商事株式会社
Tel : 03-5203-5141

總部
株式会社
Tel : 045-471-8800

海外營業部
多德來(香港)有限公司
Tel : 852-2191-7686

TOTARU PLAN (JAPAN)
Web-site : www.totaru.com

TOTARU PLAN (H.K.) LTD.
Web-site : www.totaru.com.hk



GREASE COOL & FILTER CLEANER

SUPER GREASE FILTER POWDER CLEANER

STAINLESS GREASE FILTER CLEANER

超力油煙網清潔粉劑

不銹鋼油煙網清潔劑



業務用ステンレ製グリスフィルター

Yokohama, Japan

DIRECTIONS FOR USE 使用方法

Input 750g of Grease Removal Power with water (hot or cool) into TOTARU STAINLESS BUCKET, and then input 1000ml of Grease Removal Cleaner into bucket, after wipe off with dirty filter 8hrs to 48hrs, rinse with clean of water

首先將750克除油粉放入多德來不銹鋼桶內，然後再加入清水(冷熱皆可)，再將1000毫升除油劑放入桶內及攪和後便可將污垢的隔油煙網放至水中，待浸8至48小時後再用清水徹底洗淨便可

TOTARU PLAN (HK) LTD.

TOTARU G.F. BOX

Stainless Steel Grease Filter Cleaning Box

不銹鋼隔油網清潔箱



業務用ステンレ製箱

Yokohama, Japan



STAINLESS STEEL BOX

規格

SPECIFICATIONS

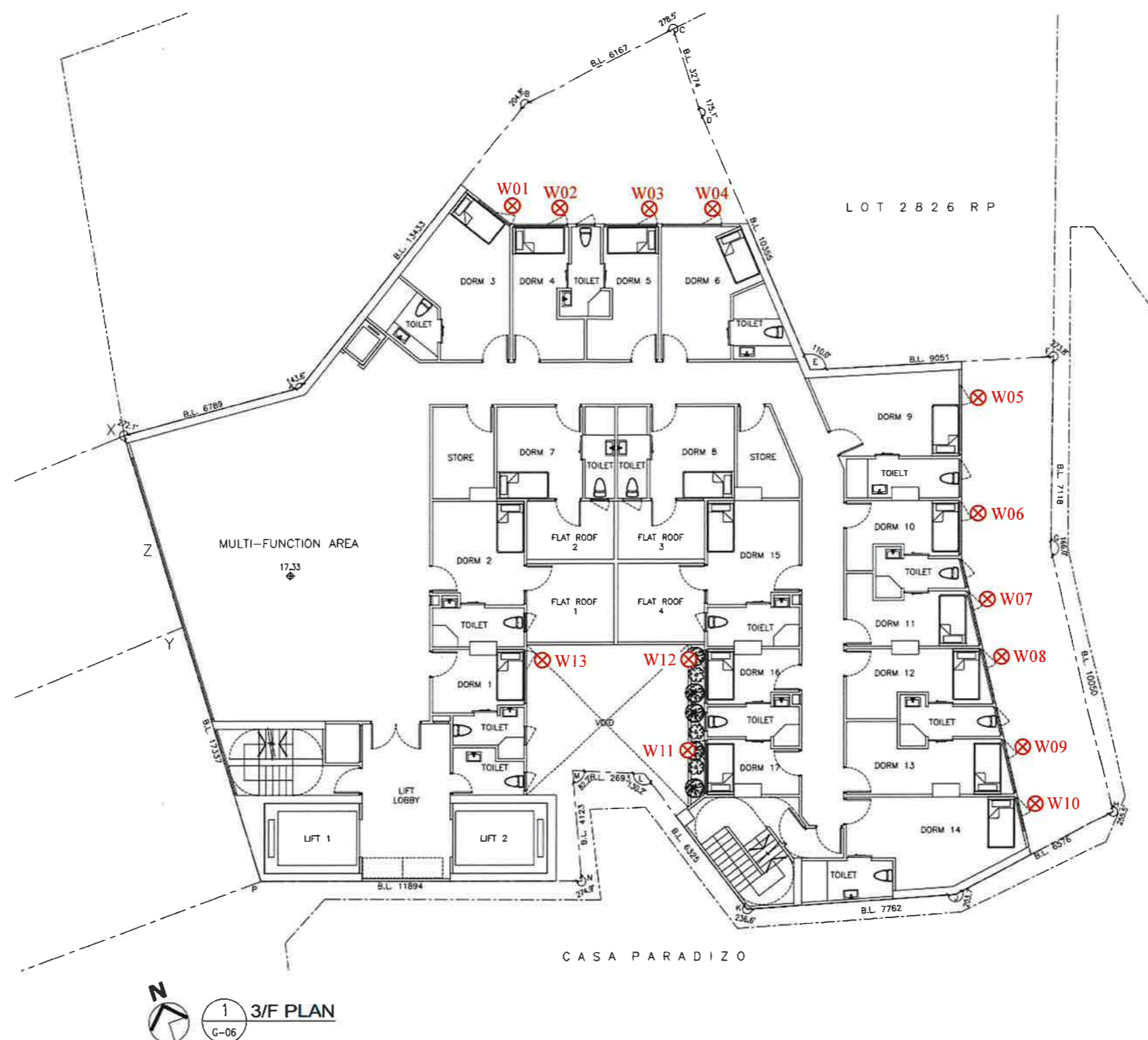
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裝置水容量 Capacity	70 (公升) Litres
隔油網容量 Filter Holding Capacity	5 (塊) Pieces
不銹鋼架 Stainless Steel Rack	(Grease Filter) 560 (高)H x 520 (長)L x 120 (闊)W 3(塊用)Pieces
	560 (高)H x 520 (長)L x 80 (闊)W 2(塊用)Pieces

TOTARU PLAN (HK) LTD.

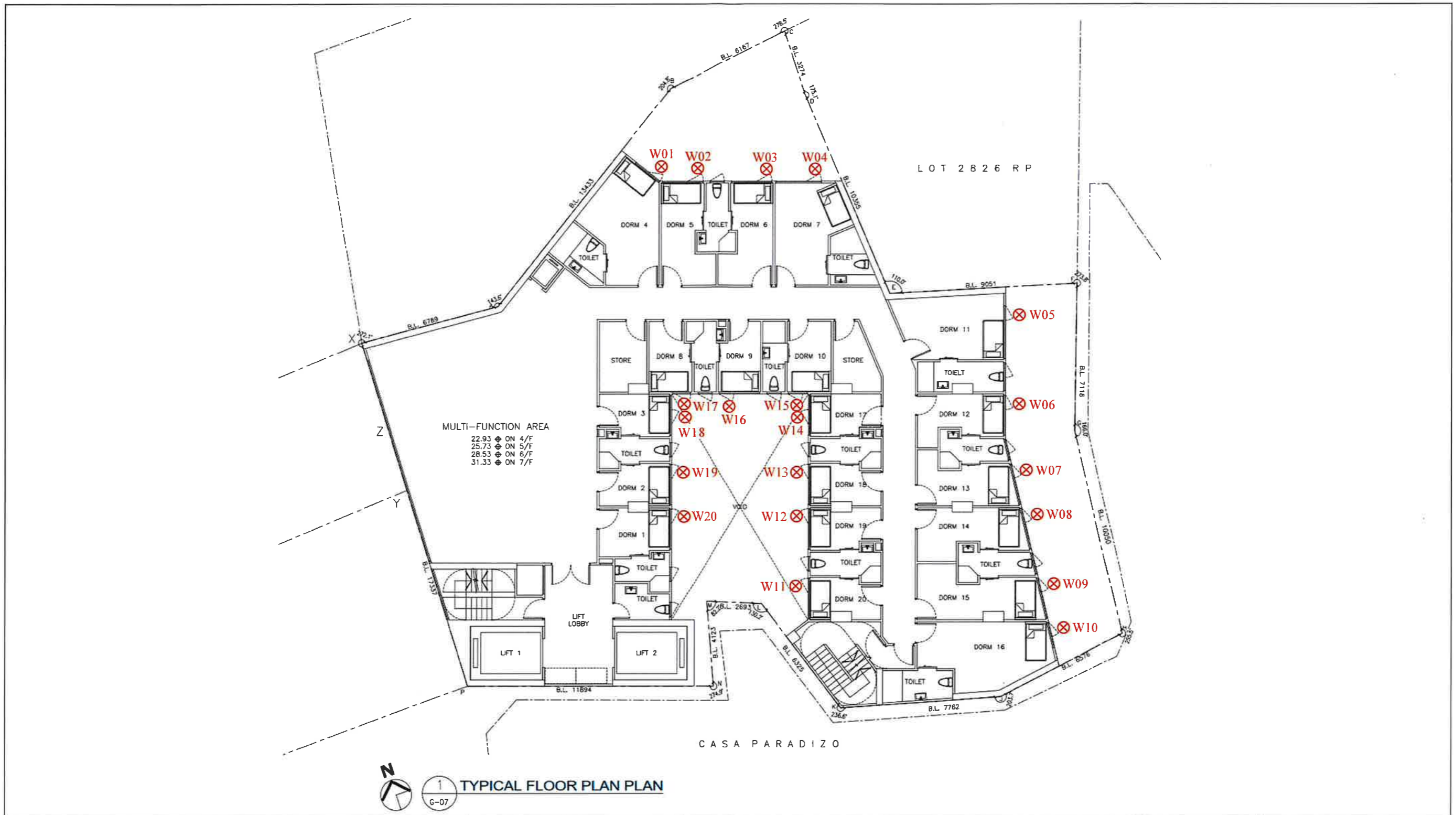
APPENDIX 3.1. TRAFFIC NOISE IMPACT ASSESSMENT



<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01 Figure 3.1.1</p>	<p>LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i></p> <p>ENVIRONMENTAL CONSULTANT: NOVOX</p>	<p>PREPARED BY Phoenix Lee</p>	
<p>DRAWING TITLE: REPRESENTATIVE NOISE SENSITIVE RECEIVERS FOR TRAFFIC NOISE IMPACT ASSESSMENT (2/F)</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>	<p>CHECKED BY Eddy Ng</p>	
			<p>APPROVED BY</p>	<p>Banting Wong</p>



PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.		DRAWING No.: C220410W-01 Figure 3.1.2		LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i>		ENVIRONMENTAL CONSULTANT: NOVOX		PREPARED BY Phoenix Lee
DRAWING TITLE: REPRESENTATIVE NOISE SENSITIVE RECEIVERS FOR TRAFFIC NOISE IMPACT ASSESSMENT (3/F)		SCALE: N.T.S.	REV: A					CHECKED BY Eddy Ng
								APPROVED BY Banting Wong



PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING No.: C220410W-01 Figure 3.1.3		LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee	
	DRAWING TITLE: REPRESENTATIVE NOISE SENSITIVE RECEIVERS FOR TRAFFIC NOISE IMPACT ASSESSMENT (4/F TO 7/F TYPICAL)	SCALE: N.T.S.			REV: A	CHECKED BY Eddy Ng
						APPROVED BY Banting Wong

Floor	Dorm	Size(sq.m.)	traffic noise	fixed noise
2F	Dorm 1	33.724		
	Dorm 2	39.464		
	Dorm 3	41.985		
	Dorm 4	26.091		
	Dorm 5	30.522		
	Dorm 6	40.59		
	Dorm 7	68.644		
3F	Dorm 1	7.497		
	Dorm 2	6.403		
	Dorm 3	6.498		
	Dorm 4	10.788		
	Dorm 5	10.594		
	Dorm 6	6.603		
	Dorm 7	6.498		
	Dorm 8	7.225		
	Dorm 9	8.624		
	Dorm 10	9.698		
	Dorm 11	11.018		
	Dorm 12	12.735		
	Dorm 13	18.114		
	Dorm 14	6.498		
	Dorm 15	6.403		
	Dorm 16	6.298		
	Dorm 17	6.203		
	Isolation RM 1	14.435		
	Isolation RM 2	12.359		
	Isolation RM 3	12.711		
4F	Dorm 1	7.497		
	Dorm 2	6.403		
	Dorm 3	6.498		
	Dorm 4	16.798		
	Dorm 5	10.788		
	Dorm 6	10.594		
	Dorm 7	14.713		
	Dorm 8	6.603		
	Dorm 9	6.498		
	Dorm 10	7.225		
	Dorm 11	15.339		
	Dorm 12	8.624		
	Dorm 13	9.698		
	Dorm 14	11.018		
	Dorm 15	12.735		
	Dorm 16	18.114		
	Dorm 17	6.498		
	Dorm 18	6.403		
	Dorm 19	6.298		
	Dorm 20	6.203		
5F	Staff Rm. 1	18.277		
	Staff Rm. 2	16.564		
	Staff Rm. 3	12.94		
	Staff Rm. 4	8.624		
	Staff Rm. 5	9.698		
	Staff Rm. 6	11.018		
	Staff Rm. 7	12.735		
	Staff Rm. 8	18.114		

PROJECT:
**PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 AT 81 SAN TAM ROAD, YUEN LONG, N.T.**

DRAWING NO.:
C220410W-01 Figure 3.1.4

DRAWING TITLE:
**REPRESENTATIVE NOISE SENSITIVE RECEIVERS FOR TRAFFIC NOISE
 IMPACT ASSESSMENT (4/F TO 7/F TYPICAL)**

SCALE:
 N.T.S.

REV:
 A

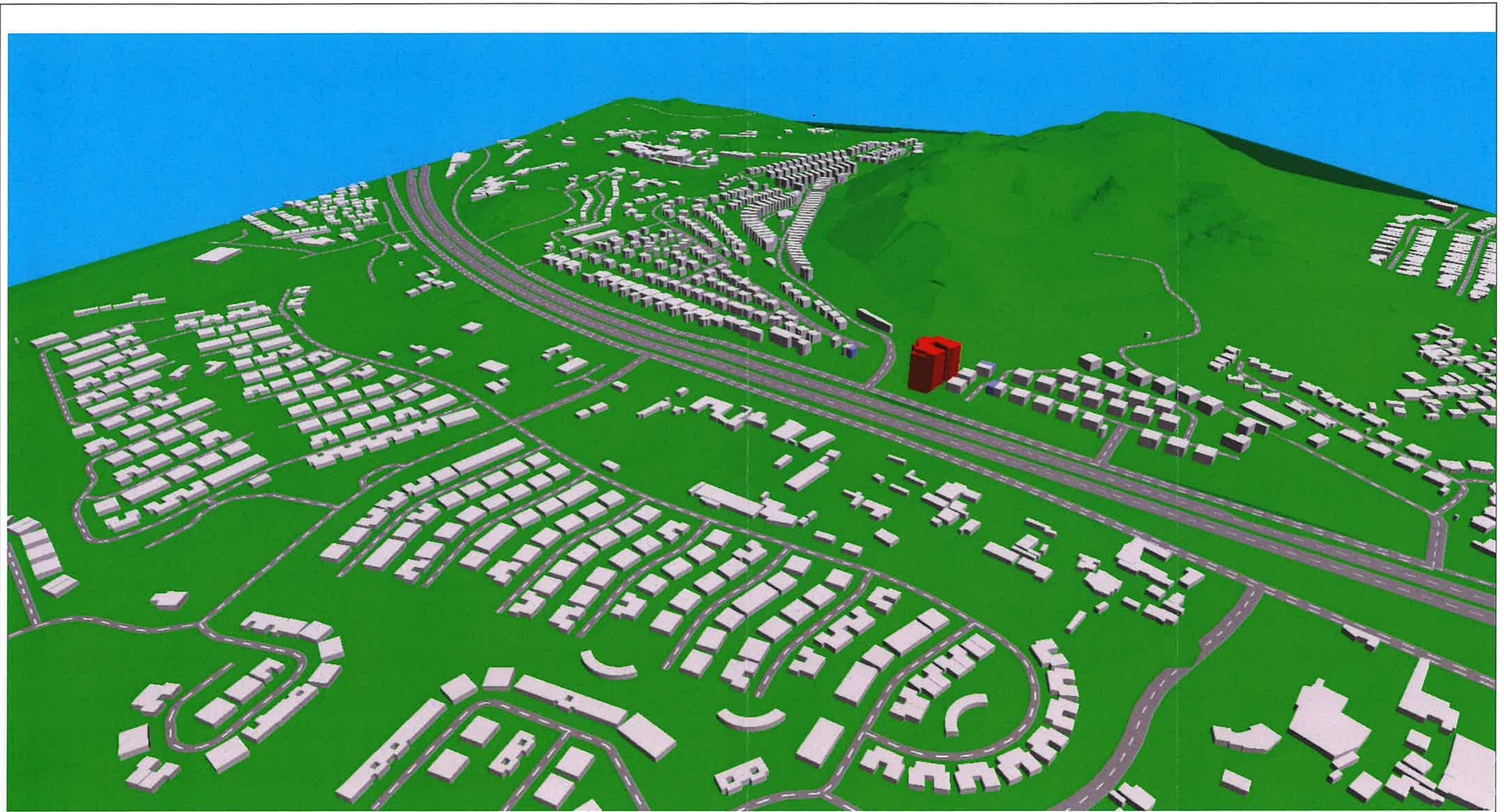
LEAD ARCHITECT:




ENVIRONMENTAL CONSULTANT:

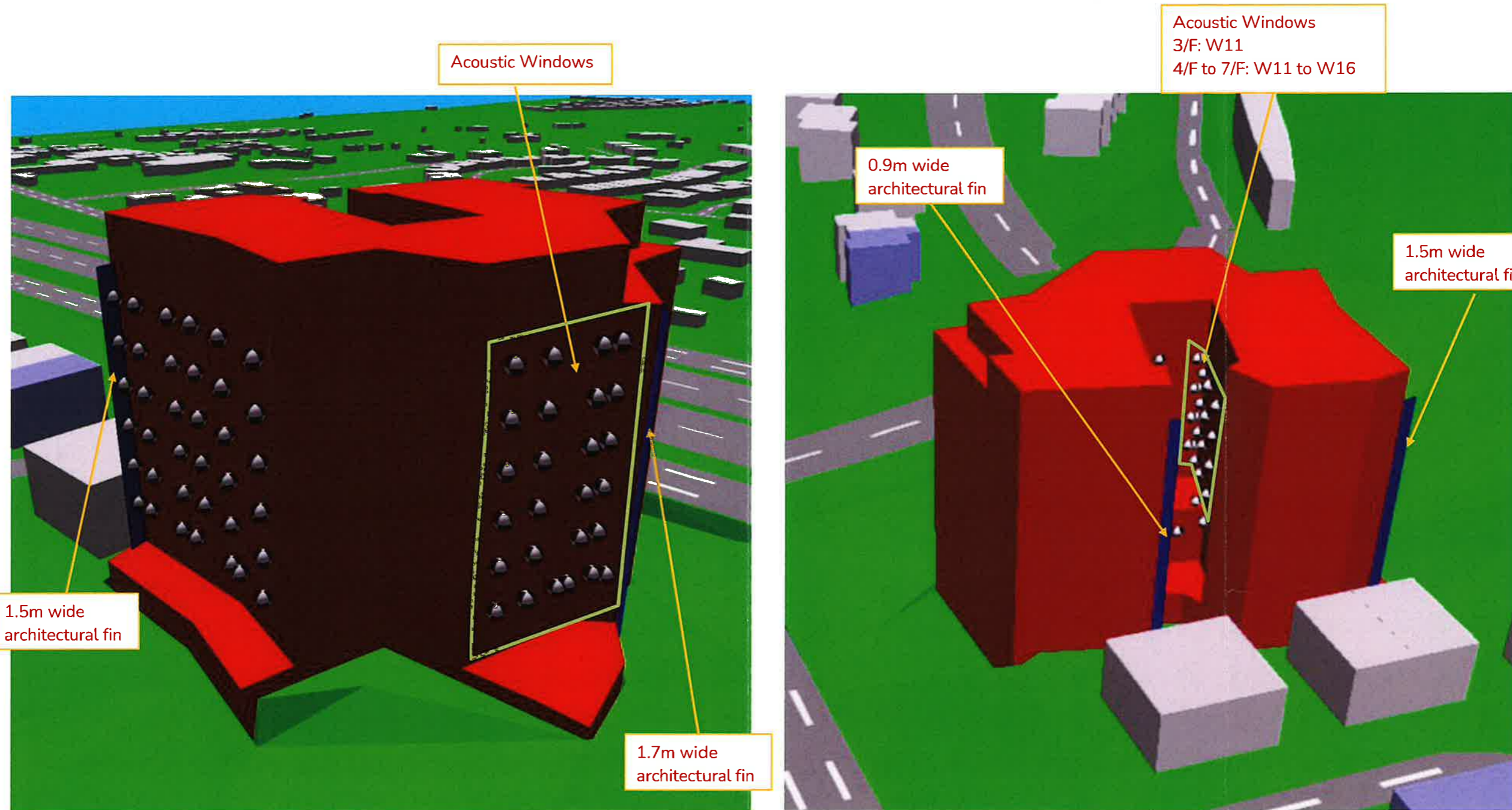

PREPARED BY
 Phoenix Lee

CHECKED BY
 Eddy Ng

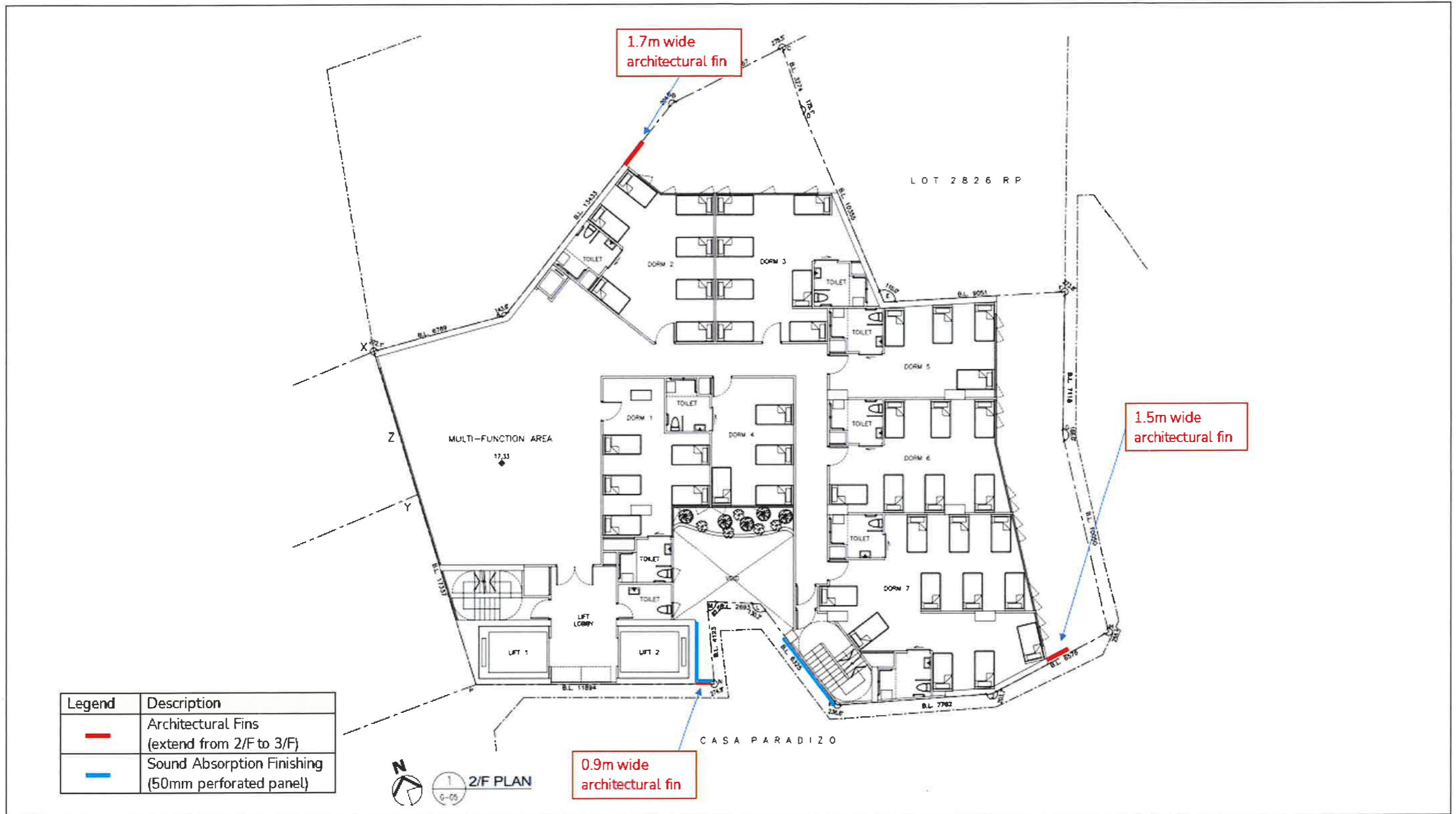
APPROVED BY
 Banting Wong





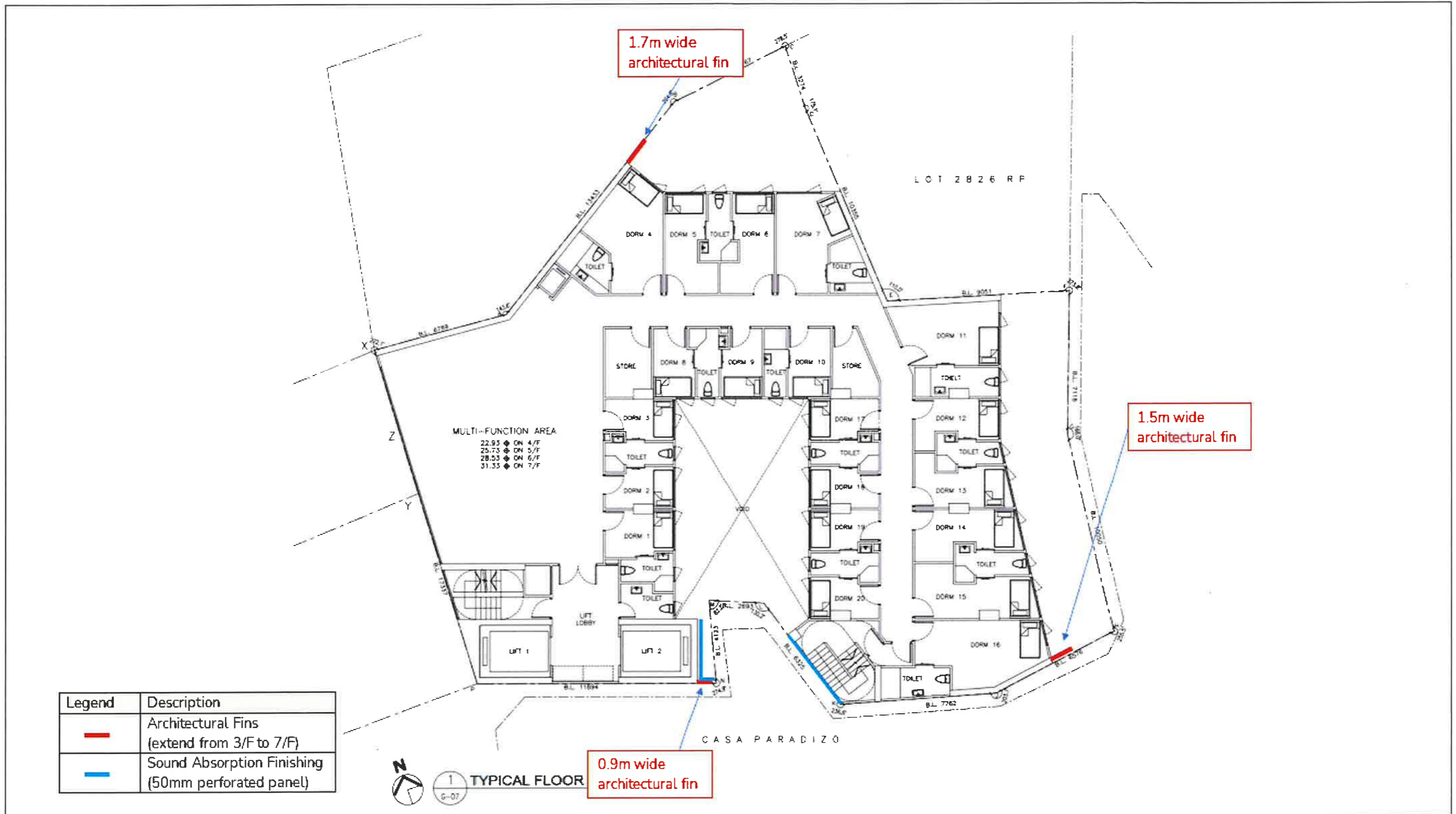
<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01 Figure 3.1.4</p>		<p>LEAD ARCHITECT: </p>	<p>PREPARED BY Phoenix Lee</p>
<p>DRAWING TITLE: 3D VIEW OF NOISE MODEL, NOISE SOURCES AND REPRESENTATIVE NSRS</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>	<p>ENVIRONMENTAL CONSULTANT: </p>	<p>CHECKED BY Eddy Ng</p>
			<p>APPROVED BY</p>	<p>Banting Wong</p>



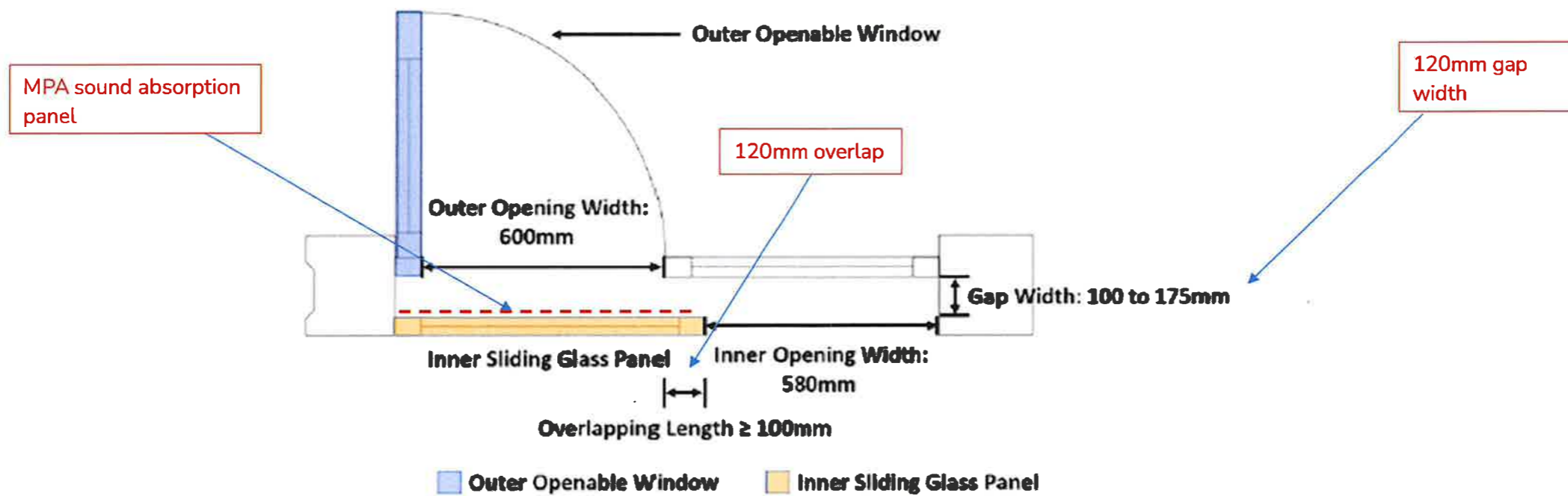
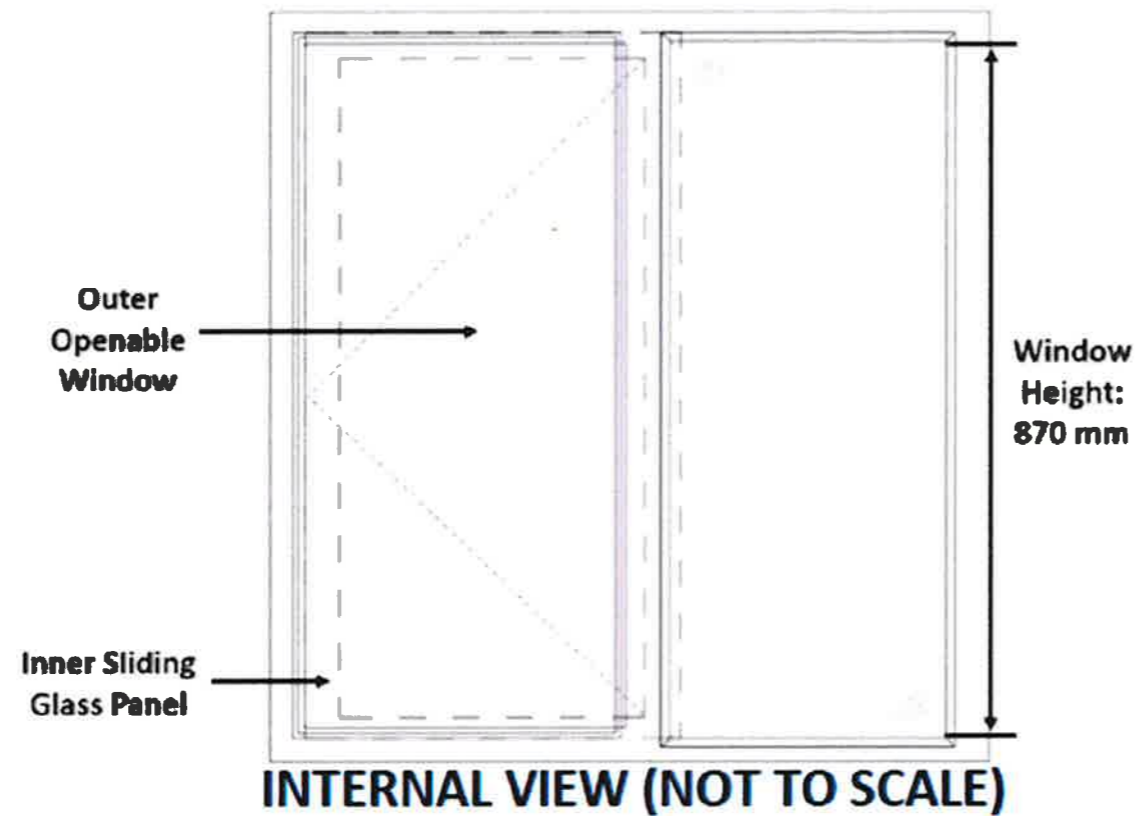
PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING NO.: C220410W-01 Figure 3.1.5		LEAD ARCHITECT:	ENVIRONMENTAL CONSULTANT:	PREPARED BY	Phoenix Lee
	DRAWING TITLE: 3D VIEW OF NOISE MITIGATION MEASURES	SCALE: N.T.S.	REV: A	<i>R. Lee Architects (P/R) Ltd</i>	NOVOX	CHECKED BY
					APPROVED BY	Banting Wong



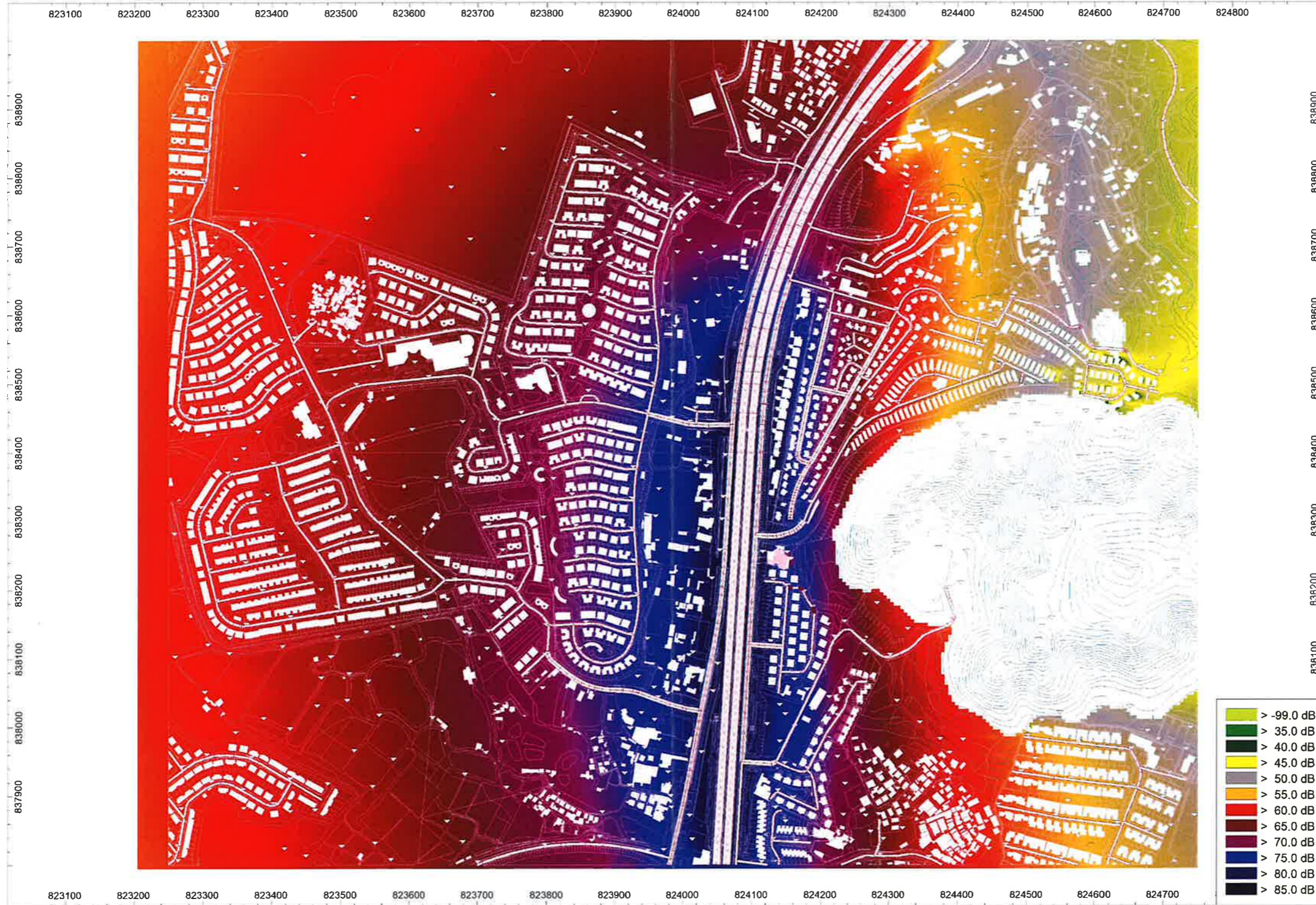
PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING No.: C220410W-01 Figure 3.1.6	LEAD ARCHITECT:  ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
DRAWING TITLE: ACOUSTIC MITIGATION MEASURES FOR ROAD TRAFFIC NOISE (2/F)	SCALE: N.T.S.	REV: A	CHECKED BY Eddy Ng
			APPROVED BY Banting Wong



PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING No.: C220410W-01 Figure 3.1.7		LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
	DRAWING TITLE: ACOUSTIC MITIGATION MEASURES FOR ROAD TRAFFIC NOISE (3/F to 7/F)	SCALE: N.T.S.			REV: A
APPROVED BY Banting Wong					

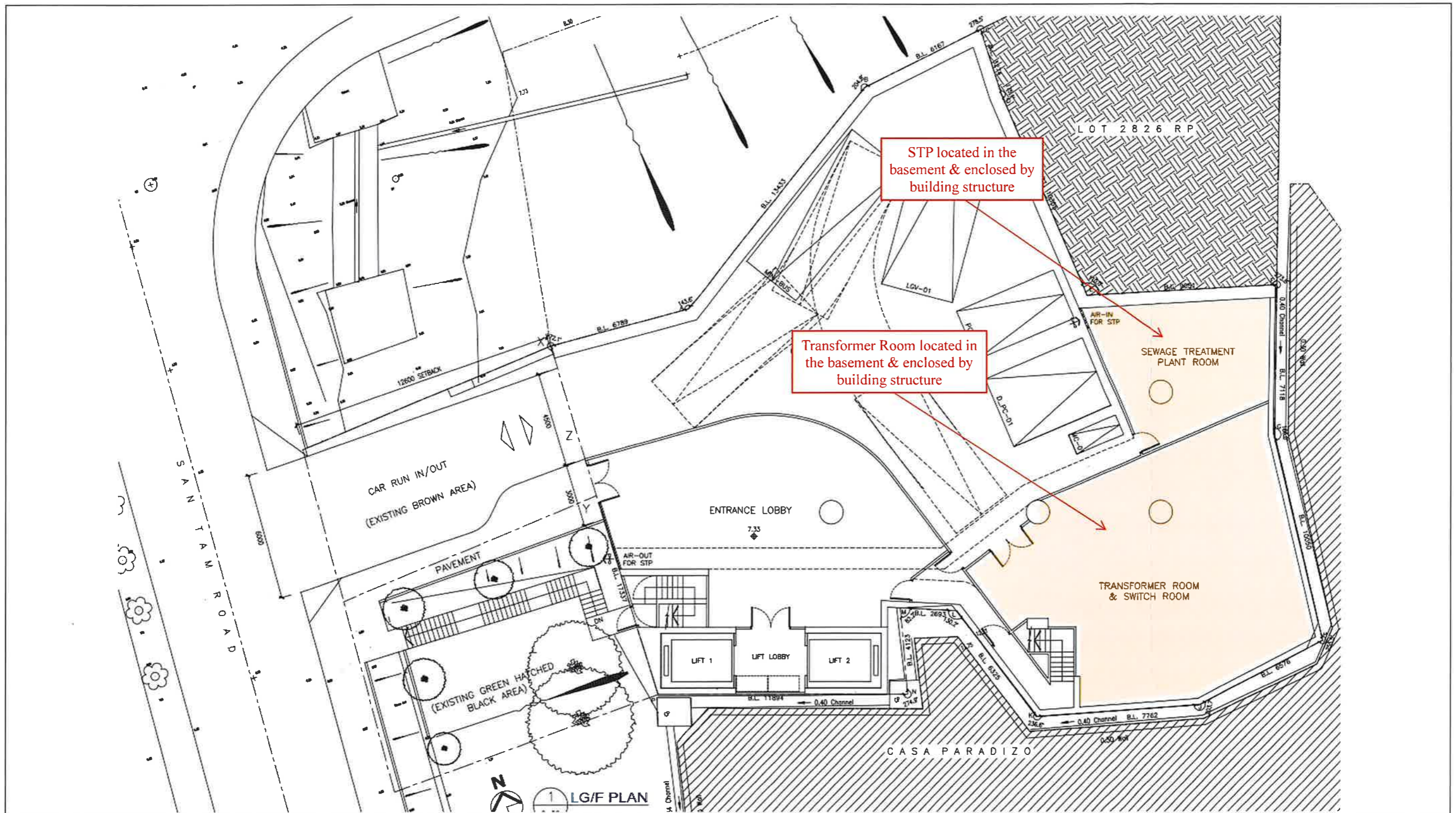


PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING NO.: C220410W-01 Figure 3.1.8		LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee	
	DRAWING TITLE: ACOUSTIC MITIGATION MEASURES FOR ROAD TRAFFIC NOISE – ACOUSTIC WINDOW	SCALE: N.T.S.			REV: A	CHECKED BY Eddy Ng
						APPROVED BY Banting Wong

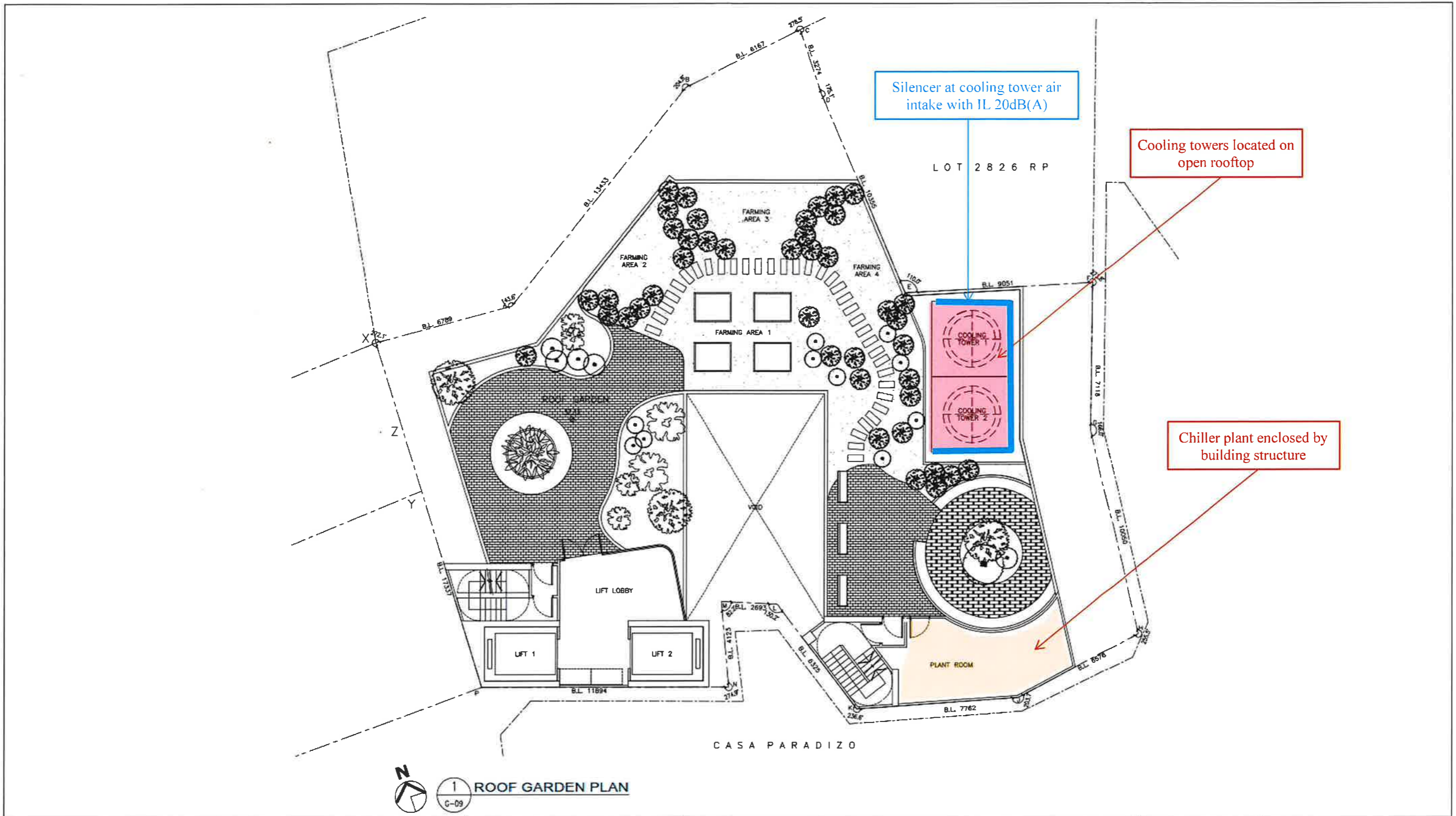


<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01 Figure 3.1.9</p>	<p>LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i></p>	<p>ENVIRONMENTAL CONSULTANT: OVOX</p>	<p>PREPARED BY Phoenix Lee</p>
<p>DRAWING TITLE: NOISE CONTOUR OF ROAD TRAFFIC NOISE IMPACT (MITIGATED)</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>	<p>CHECKED BY Eddy Ng</p>	<p>APPROVED BY Banting Wong</p>

Appendix 3.2. FIXED SOURCE NOISE ASSESSMENT



<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING No.: C220410W-01 Figure 3.2.1</p>	<p>LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i></p> <p>ENVIRONMENTAL CONSULTANT: NOVOX</p>	<p>PREPARED BY Phoenix Lee</p>
<p>DRAWING TITLE: FIXED NOISE SOURCES LOCATIONS & MITIGATION TREATMENT (LG/F)</p>	<p>SCALE: N.T.S.</p> <p>REV: A</p>		<p>CHECKED BY Eddy Ng</p>
			<p>APPROVED BY Banting Wong</p>



PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.		DRAWING No.: C220410W-01 Figure 3.2.2		LEAD ARCHITECT: <i>R. Lee Architects (HK) Ltd</i>		ENVIRONMENTAL CONSULTANT: OVOX		PREPARED BY Phoenix Lee
DRAWING TITLE: FIXED NOISE SOURCES LOCATIONS & MITIGATION TREATMENT (R/F)		SCALE: N.T.S.	REV: A					CHECKED BY Eddy Ng
								APPROVED BY Banting Wong

1



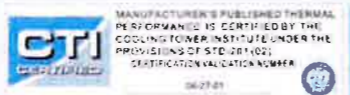
The **ryowo** Group is the pioneer and manufacturer of fiberglass-reinforced polyester (FRP) cooling towers in Hong Kong.

We offer a full range of product lines in FRP, stainless steel and galvanized steel water-cooling towers. With our vital production station, Shenzhen RYOWO Cooling Tower Company Limited, we manufacture, market and service a full range of water-cooling towers. Over 90% of the cooling tower parts are from our own factory and, as a result, control of cost and quality are ensured.

RYOWO has been a member of the Cooling Technology Institute since 1982. With our own R&D Department and testing facilities, we have five lines of product which are CTI-201 certified.

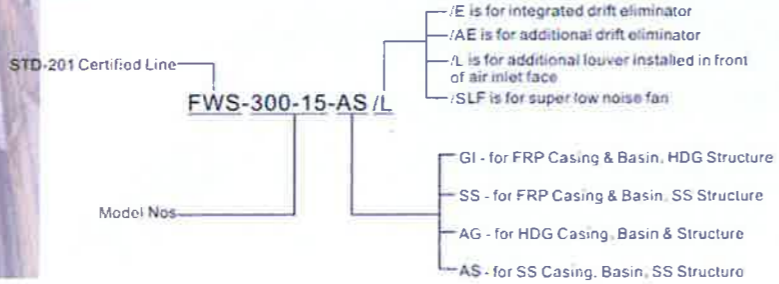
In 2004, our R & D department successfully developed a CTI STD-201 rated product line, the FWS series, the highest standard of water-cooling towers with guaranteed cooling capacity. In order to expand the application of our cooling towers, we developed the integrated drift eliminator, and used the super low noise fan as an option in this series.

FWS
Low Noise Cross Flow Type



THE COOLING TOWER YOU CAN RELY ON

MODEL DESIGNATION



3 SPECIFICATION

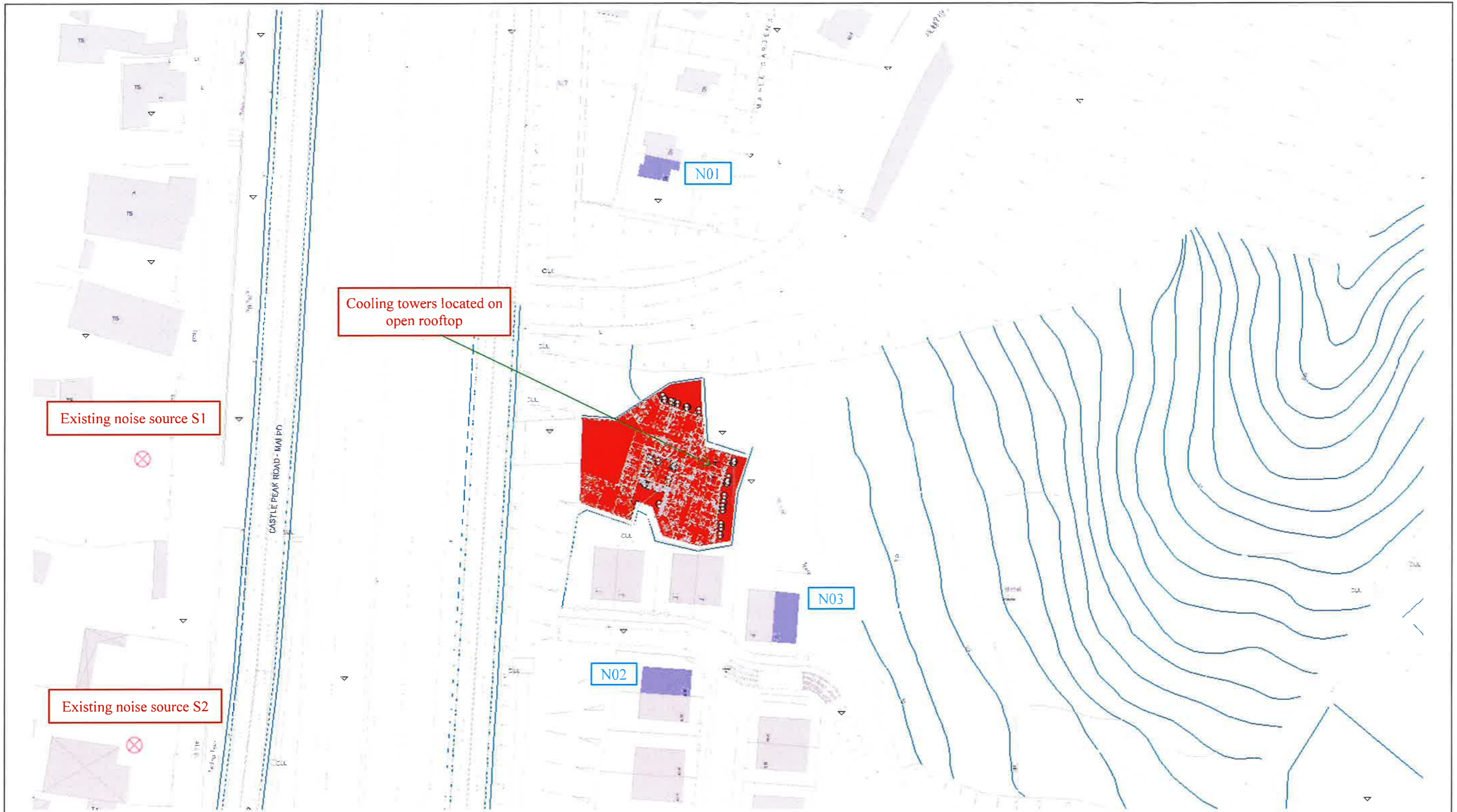
Cooling Tower selected for 81 San Tam Road Yuen Long Model FWS-94-7.5 by Ryowo, two units are required to be installed.



Model	Nominal Water Flow (M ³ /hr)	Dimension				Fan Motor (kW)	Fan Dia (mm)	Piping				Sound Power Level	Weight	
		L (mm)	W (mm)	H (mm)	H (mm)			In (mm)	Out (mm)	Pa (mm)	Dr (mm)		Net (kg)	Gross (kg)
FWS-94-4	94			2628	3.2							88	1335	2500
FWS-94-5	107			4705	5.5	1600	1004	150	25	50	50	91	1385	2850
FWS-94-7.5	116	4000	2000	4745	7.5							93	1400	2865
FWS-127-5.5	127			4705	5.5							90	1320	3000
FWS-127-7.5	141	4400	2300	4745	7.5	1800	1004	150	25	50	50	92	1445	3015
FWS-127-11	160			4825	11							94	1650	3050
FWS-169-7.5	169			4745	7.5							92	1690	3700
FWS-169-11	192	4400	2500	4825	11	2000	1254	200	25	50	50	94	1750	3720
FWS-169-15	213			4825	15							95	1770	3780
FWS-200-7.5	190			4745	7.5							91	1745	3800
FWS-200-11	215	4600	2600	4825	11	2400	1254	200	40	80	50	93	1750	4055
FWS-200-15	235			4910	15							95	1755	4080
FWS-240-7.5	210			4945	7.5							90	1690	5000
FWS-240-11	240	4800	3200	5065	11	2400	1254	200	40	80	50	93	1695	5055
FWS-240-15	268			5110	15							94	1690	5060
FWS-275-7.5	275			4745	7.5							89	1650	5160
FWS-275-11	284	5200	3200	4845	11	2600	1504	200	40	80	50	92	1705	5215
FWS-275-15	284			4910	15							94	1710	5220
FWS-300-7.5	235			4895	7.5							89	1310	6500
FWS-300-11	270			4965	11							91	1365	6555
FWS-300-15	300	6000	3200	5110	15	2400	1504	200	40	80	50	93	1370	6560
FWS-300-18.5	330			5125	18.5							94	1410	6600
FWS-300-22	340			5215	22							95	1420	6660
FWS-300-25	360			5285	25							88	1405	6595
FWS-300-30	360			5345	30							91	1460	6650
FWS-300-35	330	6100	3200	5415	35	2900	1504	250	50	80	50	93	1465	6655
FWS-300-35.5	340			5475	35.5							94	1465	6665
FWS-300-37	375			5515	37							95	1565	6755
FWS-350-7.5	275			4965	7.5							89	1550	6720
FWS-350-11	315			5145	11							92	1625	6825
FWS-350-15	350	5400	3600	5180	15	3000	1504	250	50	80	50	93	1640	6830
FWS-350-18.5	375			5295	18.5							94	1680	6870
FWS-350-22	400			5395	22							95	1740	6920
FWS-350-25	375			5485	25							87	1640	7000
FWS-400-11	375			5065	11							89	1685	7055
FWS-400-15	360			5110	15							91	1660	7065
FWS-400-18.5	385	6600	3600	5175	18.5	3000	1254	250	50	80	50	92	1730	7100
FWS-400-22	410			5245	22							93	1790	7160
FWS-400-25	430			5345	25							94	1820	7155
FWS-500-7.5	405			5060	7.5							87	1230	8080
FWS-500-11	445			5070	11							90	1285	8055
FWS-500-15	385	6900	4200	5115	15	3400	1254	250	50	80	50	91	1290	8060
FWS-500-18.5	410			5180	18.5							93	1335	8100
FWS-500-22	435			5220	22							94	1390	8120
FWS-500-30	485			5250	30							95	1415	8145
FWS-540-7.5	374			4990	7.5							87	1240	8060
FWS-540-11	390			5070	11							89	1405	8135
FWS-540-15	400	6900	3600	5114	15	3000	1254	250	50	80	50	91	1410	8120
FWS-540-18.5	430			5180	18.5							92	1450	8140
FWS-540-22	455			5220	22							94	1510	8210
FWS-540-30	500			5340	30							95	1525	8225
FWS-600-11	435			5255	11							89	1505	9000
FWS-600-15	485			5300	15							91	1500	9015
FWS-600-18.5	470	7000	4200	5365	18.5	3700	1504	300	50	80	50	92	1560	9045
FWS-600-22	550			5405	22							94	1520	9085
FWS-600-30	610			5465	30							95	1540	9110
FWS-600-37	650			5485	37							96	1530	9100
FWS-700-11	474			5744	11							89	1660	12000
FWS-700-15	470			5810	15							91	1665	12005
FWS-700-18.5	610			5865	18.5							92	1660	12035
FWS-700-22	648	7000	5000	5904	22	3700	1504	300	50	80	50	93	1745	12120
FWS-700-30	720			5965	30							95	1780	12145
FWS-700-37	765			5985	37							96	1970	12155
FWS-800-11	555			7155	11							88	1995	14800
FWS-800-15	615			7200	15							90	1910	14885
FWS-800-18.5	655			7265	18.5	4200	1504	300	50	80	50	91	1945	14920
FWS-800-22	695			7305	22							93	2010	14985
FWS-800-30	780	7500	5000	7365	30							95	2035	15010
FWS-800-37	820			7385	37							96	2225	15200
FWS-800-45	880			7405	45	4200	1504	350	50	80	50	99	2255	15250
FWS-800-55	940			7495	55							100	2365	15340

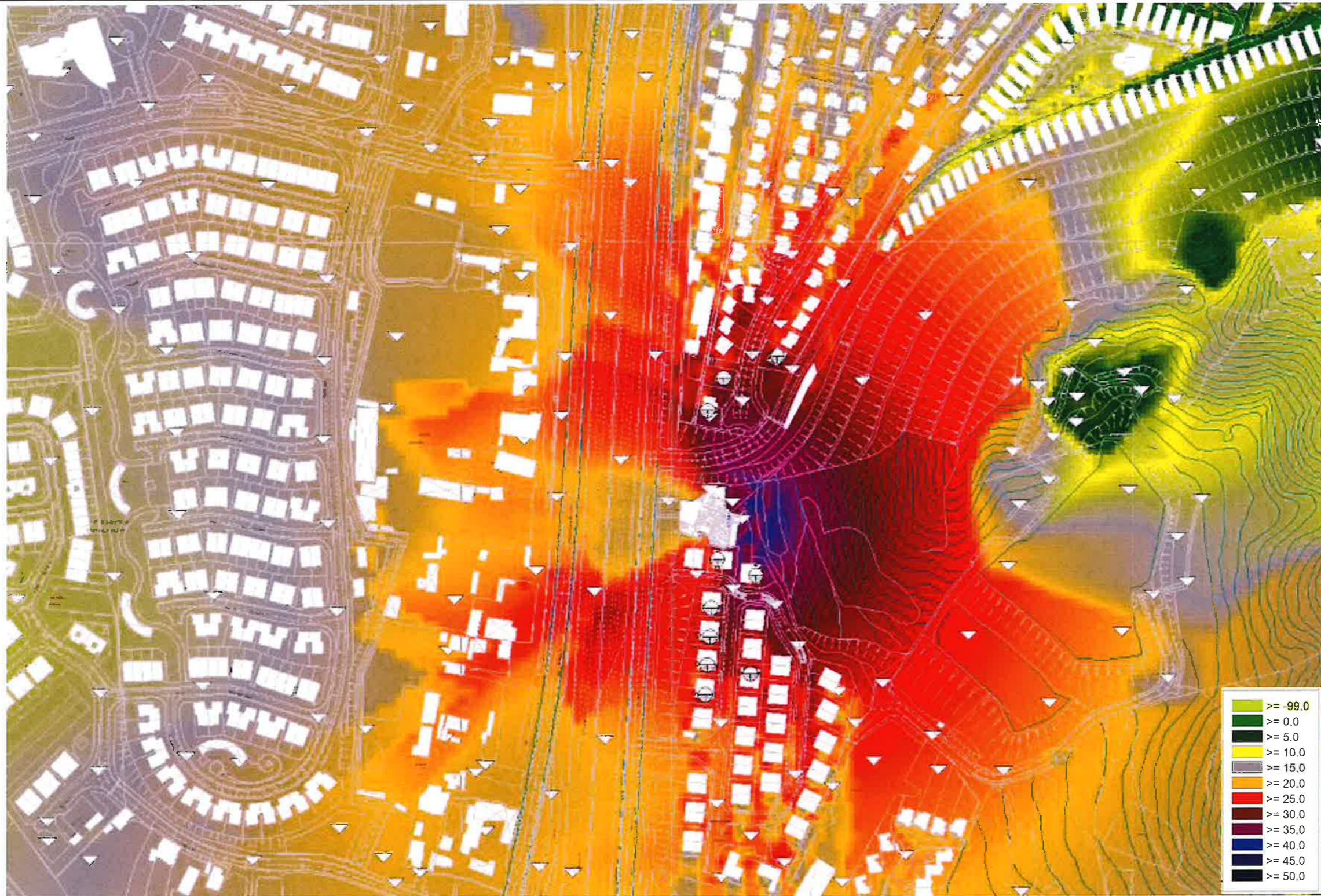
Notes:
 1/CTI Certification applies to the operation with the Wet Bulb Temp. between 12.8°C and 32.2°C, Max. Entering Water Temp. 51.7°C, Min. Range of 2.2°C and Min. Approach of 2.8°C
 2/The nominal water flows are based upon 37°C HWT, 32°C CWT, 28°C WBT, 32°C DBT and 101.3 kPa Barometric pressure.
 3/Sound Power Level is in dBA re 10⁻¹² Watt
 4/Data and specifications are subjected to change without prior notice





PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING No.: C220410W-01 Figure 3.2.3	LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
DRAWING TITLE: ACOUSTIC DATA FOR PROPOSED COOLING TOWERS	SCALE: N.T.S.	REV: A		CHECKED BY Eddy Ng
				APPROVED BY Banting Wong





PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING No.: C220410W-01 Figure 3.2.4		LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
	DRAWING TITLE: LOCATION OF FIXED NOISE SOURCES & REPRESENTATIVE NSRS	SCALE: N.T.S.			REV: A
APPROVED BY Banting Wong					



<p>PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.</p>	<p>DRAWING NO.: C220410W-01 Figure 3.2.5</p>		<p>LEAD ARCHITECT: </p>	<p>PREPARED BY Phoenix Lee</p>	
<p>DRAWING TITLE: NOISE CONTOUR OF FIXED SOURCE NOISE IMPACT (MITIGATED)</p>	<p>SCALE: N.T.S.</p>	<p>REV: A</p>	<p>ENVIRONMENTAL CONSULTANT: </p>	<p>CHECKED BY Eddy Ng</p>	<p>APPROVED BY Banting Wong</p>

Appendix 4.1. WATER QUALITY STANDARD

Determinand	Flow rate	≅ 10	> 10 and ≅ 200	> 200 and ≅ 400	> 400 and ≅ 600	> 600 and ≅ 800	> 800 and ≅ 1000	> 1000 and ≅ 1500	> 1500 and ≅ 2000	> 2000 and ≅ 3000	> 3000 and ≅ 4000	> 4000 and ≅ 5000	> 5000 and ≅ 6000
	(m ³ /day)	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
pH (pH units)		6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9	6-9
Temperature (°C)	45	45	45	45	45	45	45	45	45	45	45	45	45
Colour (lovibond units) (25mm cell length)	1	1	1	1	1	1	1	1	1	1	1	1	1
Suspended solids	50	50	50	50	50	50	25	25	25	25	25	25	25
BOD	20	20	20	20	20	20	10	10	10	10	10	10	10
COD	80	80	80	80	80	80	50	50	50	50	50	50	50
Oil & Grease	20	20	20	20	20	20	10	10	10	10	10	10	10
Iron	10	10	10	7	5	4	3	2	1	1	1	1	1
Boron	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2	0.2
Barium	5	4	3	2.5	2	1.6	1.1	0.8	0.5	0.4	0.3	0.2	0.2
Mercury	0.1		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Cadmium	0.1		0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001	0.001
Other toxic metals individually	1	0.5	0.5	0.5	0.4	0.4	0.25	0.2	0.15	0.1	0.1	0.1	0.1
Total toxic metals	2	1	1	1	0.8	0.8	0.5	0.4	0.3	0.2	0.14	0.1	0.1
Cyanide	0.1	0.1	0.1	0.1	0.1	0.08	0.06	0.04	0.03	0.02	0.01	0.01	0.01
Phenols	0.5	0.5	0.4	0.3	0.25	0.2	0.1	0.1	0.1	0.1	0.1	0.1	0.1
Sulphide	5	5	5	5	5	5	2.5	2.5	1.5	1	1	1	0.5
Total residual chlorine	1	1	1	1	1	1	1	1	1	1	1	1	1
Total nitrogen	100	100	100	100	100	100	80	80	50	50	50	50	50
Total phosphorus	10	10	10	10	10	10	8	8	5	5	5	5	5
Surfactants (total)	15	15	15	15	15	15	10	10	10	10	10	10	7
E. coli (count/100ml)	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000	1000

PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING NO.: C220410W-01 Figure 4.1.1		LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee	
	DRAWING TITLE: STANDARDS FOR EFFLUENTS DISCHARGED INTO THE COASTAL WATERS OF DEEP BAY WATER CONTROL ZONE	SCALE: N.T.S.			REV: A	CHECKED BY Eddy Ng
						APPROVED BY Banting Wong

Appendix 4.2. WATER SENSITIVE RECEIVERS

LEGEND

500m STUDY AREA

SITE BOUNDARY

AGRICULTURAL LAND

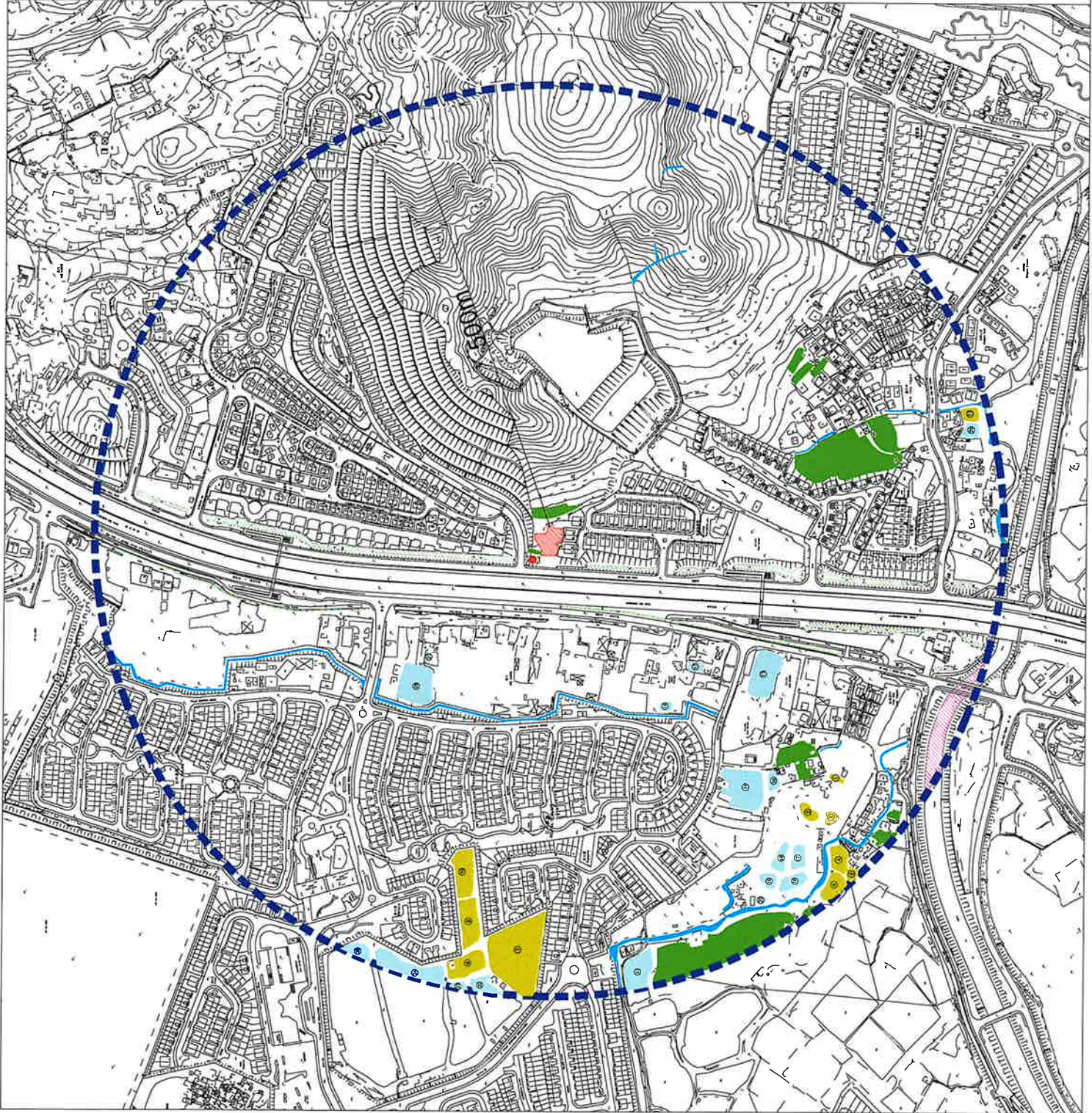
FISHPOND

ABANDONED FISHPOND

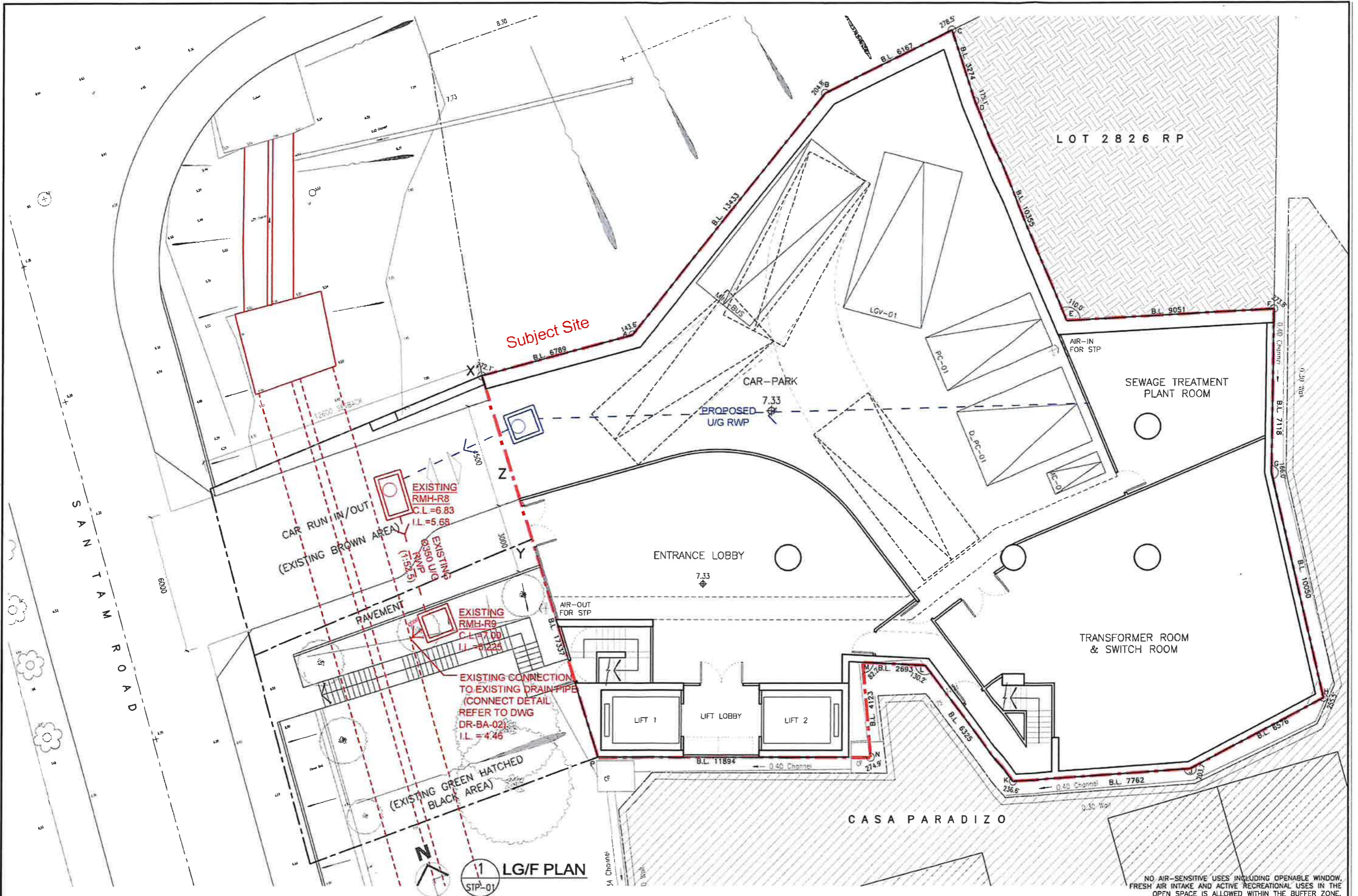
NULLAH

DRAINAGE CHANNEL

WATER COURSES



Appendix 4.3. PRELIMINARY DISCHARGE ROUTE AND DESIGN CALCULATION OF STP



2202
 PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY
 at 81 SAN TAM ROAD,
 YUEN LONG, N.T.

LG/F PLAN
 DISCHARGE ROUTE OF THE STP

STP-01 1:150 (A3)

OCT. 2022

Do not scale drawing.
 Contractors are required to verify exact dimensions on site.
 The drawings show the design intent of the architect only, contractors are required to submit shop drawings where appropriate.
 The design remains to be the property of "R.Lee Architects (HK) Ltd" unless otherwise specified.
 This drawing is not for construction purposes unless expressly certified.

NO AIR-SENSITIVE USES INCLUDING OPENABLE WINDOW,
 FRESH AIR INTAKE AND ACTIVE RECREATIONAL USES IN THE
 OPEN SPACE IS ALLOWED WITHIN THE BUFFER ZONE.



Design Calculation

Revision 1

for

Sewage Treatment Plant (MBR)

For Ngau Tam Mei Lot no. 4823 in DD104 for

Residential Care Home Services

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BASIS OF DESIGN

I. BASIC OF DESIGN

Hydraulic Loading and Organic Loading

A) From Residents

No. of Residents	:	200 head/Day
Unit Flow	:	0.37m ³ /head/day
BOD ₅ Loading for Residents	:	0.055 kg/head/day
SS Loading for Residents	:	0.055 kg/head/day

Daily Flow from Residents
= 200 head x 0.37 m³/head/day
= 74 m³/day

BOD₅ Loading from Residents
= 200 head x 0.055 kg/head/day
= 11 kg/day

SS Loading from Residents
= 200 head x 0.055 kg/head/day
= 11 kg/day

B) From Staff

No. of Staff	:	50 head/Day
Unit Flow	:	0.07m ³ /head/day
BOD ₅ Loading for User	:	0.023 kg/head/day
SS Loading for User	:	0.023 kg/head/day

Daily Flow from Staff
= 50 head x 0.07 m³/head/day
= 3.5 m³/day

BOD₅ Loading from Staff
= 50 head x 0.023 kg/head/day
= 1.15 kg/day

SS Loading from Staff
= 50 head x 0.023 kg/head/day
= 1.15 kg/day

Influent Condition

Total Daily Flow
= $(74+3.5) \text{ m}^3/\text{day}$
= $77.5 \text{ m}^3/\text{day}$

Average Hourly Flow (DWF)
= $\frac{77.5 \text{ m}^3/\text{day}}{24\text{hr}/\text{day}}$
= $3.23 \text{ m}^3/\text{hr}$

Peak Hourly (6 DWF)
= $3.23 \text{ m}^3/\text{hr} \times 6$
= $19.38 \text{ m}^3/\text{hr}$

Design Flow (3DWF)
= $3.23 \text{ m}^3/\text{hr} \times 3$
= $9.69 \text{ m}^3/\text{hr}$

Total BOD₅ Loading
= $(11+1.15) \text{ kg/day}$
= 12.15 kg/day (156.774 mg/l)

Total SS Loading
= $(11+1.15) \text{ kg/day}$
= 12.15 kg/day (156.774 mg/l)

Required Standard of Treated Water

BOD ₅	: ≤ 10 mg/L
SS	: ≤ 10 mg/L
E. coli	: ≤ 100 count/100ml
TN	: ≤ 20mg/l
Amonia Nitrogen	: ≤ 5mg/l
TP	: ≤ 2mg/l

PROCESS DESCRIPTION

II. PROCESS DESCRIPTION

Sewage arising from development will be collected by the sewerage collection network to the Equalization Tank for the treatment process via the automatic coarse bar screen of bar spacing 20mm (one auto duty and one manual standby).

a) Equalization Tank

Primary screened sewage then flows by gravity into the Equalization Tank. The Equalization Tank acts to equalize the flow in terms of both hydraulic and organic loading. Aeration and mixing in the Equalization Tank is provided by two submersible air ejector (one duty) to prevent sewage from becoming septic and to prevent solids from settling. Two sewage transfer pumps (one duty and one standby) are provided to transfer equalized sewage from the Equalization Tank to automatic fine bar screen of bar spacing 2mm (one auto duty and one manual standby) to flows by gravity into the MBR Tank.

b) MBR Tank

Equalized and screened sewage transfers to the Membrane Bioreactor (MBR) Tank and then mixed & aerated together with the Mixed Liquor Suspended Solids (MLSS) for the removal of organic pollutants such as BOD. The MBR system is a suspended growth activated sludge system followed by micro-filtration for sludge-liquid separation by the membrane modules. Submerged, outside-in, flat sheet type membrane module (four duty) will be installed in the MBR Tank.

This membrane will separate treated effluent from MLSS (pore size smaller than 0.08 μm) and no further secondary sedimentation is required. The effective retention of MLSS provided the long Sludge Retention Time (SRT) and short Hydraulic Retention Time (HRT) for the treatment process. In-built bubble diffusers of MBR module and diffusers in MBR tank will provide aeration in the MBR System. Scrubbing of the membrane will effectively be achieved by the continuous aeration. Compressed air will be supplied by positive displacement blowers (one duty and one standby).

Pressure Transmitter (one duty) across the membrane and pump will be provided indicate the running pressure of permeate pumps (two duty and one standby). The dissolved oxygen monitor is provided to monitor the dissolved oxygen content in MBR tank which indicate the aeration condition inside the tank.

Two submersible de-sludge pumps (one duty and one standby) will be provided in MBR Tank. Duty de-sludge pump transfers surplus activated sludge to the Sludge Holding Tank for further treatment. The operation of de-sludge depends on the real situation of MBR tank such as the thickness of active sludge bed or the concentration of MLSS. At the early stage, the operation of de-sludge pump shall be manual and would switch to timer control once the system is deemed as mature.

c) Disinfection and Effluent Discharge

MBR treatment system can provide highly efficient suspended solids removal by physical separation. Three permeate pumps (two duty and one standby) will operate by level controller to draw the effluent through the membrane filter to UV disinfection system (one duty and one standby) for elimination of growth of E.Coli.

This UV sterilizer equipped with advanced automatic wiping system. The unfiltered solid may coat on the UV quartz sleeve and reduce transmittance strength. The wipe ring which surrounded the UV quartz sleeve will automatically wipe out the solid coated on the sleeve surface under the factory pre-set timer.

Electromagnetic flowmeter (one duty) is provided at the discharge pipe after UV sterilizer for effluent monitoring purpose.

d) Sludge Holding Tank

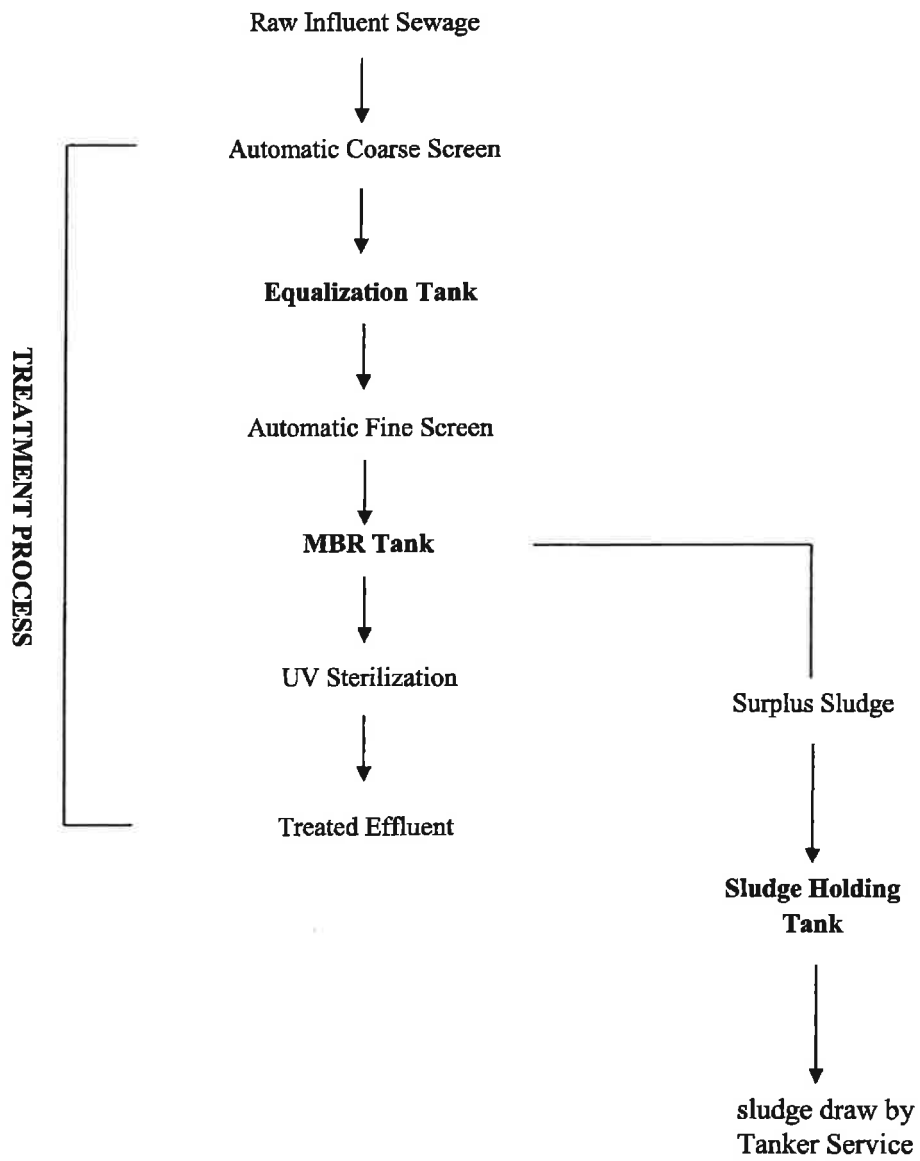
Waste sludge is an end product of all aerobic processes. It may be allowed to build up in the MBR Tank to a certain extent as an increase in mixed-liquor solids, or in the Sludge Holding Tank.

Surplus activated sludge of approximately 1% solids content is wasted from the MBR Tank to the Sludge Holding Tank by the de-sludge pump. This sludge wasting is regulated on a time basis according to sludge growth rate as measured by the rate of increase in mixed liquor suspended solids (MLSS). The sludge in the Sludge Holding Tank will be further digested aerobically by aeration through the submersible air ejector (one duty).

Aeration in sludge holding tank will be stopped regularly for gravity thickening of the sludge. The Sludge Holding Tank is designed to hold wasted sludge for a minimum of twenty (20) days. Digested sludge will be disposed by sludge dewatering system frequently.

TREATMENT PROCESS SCHEMATIC

III. TREATMENT PROCESS FLOW DIAGRAM



DESIGN CALCULATION

IV. DESIGN CALCULATION

A. Automatic Coarse Bar Screen

An automatic coarse bar screen is installed before Equalization Tank to removal debris from entering raw sewage.

Bar Spacing: 20mm

Flow capability = $70 \text{ m}^3/\text{hr} > \text{Peak hourly flow } 19.38 \text{ m}^3/\text{hr}$

B. Equalization Tank

The minimum retention time of Equalization Tank should be 2 hours of peak hourly Flow.

(i) *Size of Tank*

The minimum effective value = 2 hr x (Peak hourly flow – Design hourly flow)

$$= 2 \text{ hr} \times (19.38 - 9.69) \text{ m}^3/\text{hr} \\ = 19.38 \text{ m}^3$$

Tank size = 3.5 m (L) x 3 m (W)

Tank Height = 3 m

Top water level (TWL) = +2.7

Bottom water level (BWL) = +0.0

Water depth (WD) = 2.7 m

Effective water level = 2.1 m

Effective volume = 3.5 m(L) x 3 m(W) x 2.1 m (H) \\ = 22.05 m^3

$$(ii) \text{ Retention time} = \frac{22.05 \text{ m}^3}{(19.38 - 9.69) \text{ m}^3/\text{hr}} = 2.28 \text{ hrs} > 2 \text{ hrs, OK}$$

(iii) *Check pump Start/stop frequency*

Pump stop level = +0.6

Pump start level = +0.8

Pump start/stop volume = 3.5 m (L) x 3 m (W) x 0.2 m \\ = 2.1 m^3

$$\text{Pump start/stop frequency} = \frac{15 \times 9.69 \text{ m}^3/\text{hr} \div 60 \text{ min/hr}}{2.1} \\ = 1.15 \text{ time/hr} < 10 \text{ times/hr, OK}$$

$$\begin{aligned}
 \text{(iv) Air requirement for mixing} &= 20\text{m}^3/\text{min per } 1000\text{m}^3 \text{ of tank volume} \\
 &= 20 \text{ m}^3/\text{min} \times \frac{3.5 \text{ m} \times 3 \text{ m} \times 2.7 \text{ m}}{1000\text{m}^3} \\
 &= 0.567 \text{ m}^3/\text{min} \\
 &= 34.02 \text{ m}^3/\text{hr}
 \end{aligned}$$

Provide two submersible pumps, (one duty and one standby) in the Equalization Tank to transfer sewage with equalized flow of 19.5 m³/hr at 5 m head to MBR Tank.

Provide one sets of submersible ejector at air capacity 45 m³/hr in 3mAq.

C. Automatic Fine Bar Screen

An automatic fine bar screen is installed before Equalization Tank to removal fine debris from entering raw sewage.

Bar Spacing: 2mm

Flow capability = 26 m³/hr > Peak hourly flow 9.69 m³/hr

D. Membrane Bioreactor Tank (MBR Tank)

Pre-treated sewage will be pumped at a constant rate, from Equalization Tank to MBR Tank. Air is provided for biological treatment.

(i) *Size of Tank*

Tank Size = 3.5 m (L) x 3.7 m (W)

Tank Height = 3 m

Top water level = +2.7

Bottom water level = +0.0

Water Depth = 2.7 m

Tank capacity

= 3.5 m (L) x 3.7 m (W) x 2.7 m (WD)

= 34.97 m³

$$\text{(ii) Retention time} = \frac{34.97 \text{ m}^3}{9.69 \text{ m}^3/\text{hr}}$$

$$= 3.4 \text{ hrs} > 3\text{hrs, OK}$$

(iii) *Calculation of F/M ratio of MBR Tank*

After passing through the Bar Screen, the BOD loading before entering the MBR tank will be removed by 7.5%

Influent BOD loading = 12.15 Kg/day

BOD loading before entering the MBR Tank

$$= 12.15 \text{ kg/day} \times 0.925$$

$$= 11.24 \text{ kg/day (145.02 mg/l)}$$

Assume MLSS = 5000 mg/l,

F/M ratio

$$= 11.24 \text{ kg/day} / (5000 \text{ mg/l} \times 10^{-6} \text{ kg/mg} \times 10^3 \text{ l/m}^3 \times 47.25 \text{ m}^3)$$

$$= 0.064 \text{ Kg BOD/ Kg MLSS -day}$$

(iv) *Nos. of Membrane module required*

Design flux rate of membrane sheet = 35 litre/m²-hr

Minimum filtration area required:

$$= (9.69 \text{ m}^3/\text{hr} \times 1000 \text{ l/m}^3) / 35 \text{ litre/m}^2\text{-hr}$$

$$= 277 \text{ m}^2$$

Three sets of “Toray” NHP210-150S membrane module is adopted , each of membrane filtration area of 105 m² to provide total filtration area of 315m² for this tank.

(v) *Calculation of Volumetric BOD Loading*

After passing through the Bar Screen, the BOD loading before entering the MBR tank will be removed by 7.5%

After passing through the Bar Screen BOD loading = 11.24 kg/day (145.02 mg/l)

$$\frac{Q \text{ m}^3/\text{day} \times 10^3 \times S \text{ mg/l}}{V \text{ m}^3 \times 10^3}$$

$$= (77.5 \text{ m}^3/\text{day} \times 145.02 \text{ mg/l}) / 34.97 \text{ m}^3$$

$$= 321.43 \text{ mg/l-day}$$

$$= 0.321 \text{ Kg BOD/ m}^3\text{-day}$$

(vi) *Ammonia Nitrogen removal*

Assume Ammonia Nitrogen = 20mg/l

Ammonia Nitrogen of influent sewage : Total flow x 20mg/l
 = 77.5m³/day x 20mg/l
 = 1550 g/day
 = 1.55 kg/day

(vii) Calculation of oxygen requirement

(a) Air requirement for BOD removal:
 Recommended by manufacturer is 110 m³ air /kg - BOD removed.

Minimum air requirement for BOD removal
 = (145 - 20) mg/l x 77.5 m³/day x 110 m³/kg x 10⁻⁶ kg/mg x 10³ l/m³
 = 1065.76 m³/day
 = 44.4 m³/hr (0.74 m³/min)

(b) Air requirement for air scour of membrane module
 From manufacturer design, 1 m³/min air is required for air scour of one membrane module.

Total air required for air scour of membrane modules
 = 1 m³/min x 60 min x 3 modules
 = 180 m³/hr (3 m³/min)

(c) Air requirement for Ammonia Nitrogen removal:
 Recommended by manufacturer is 380 m³ air /kg - BOD removed.

Minimum air requirement for Ammonia Nitrogen removal
 = (20 - 2) mg/l x 77.5 m³/day x 380 m³/kg x 10⁻⁶ kg/mg x 10³ l/m³
 = 530.1 m³/day
 = 22.1 m³/hr (0.368 m³/min)

Total minimum air required for air blower
 = (44.4 + 180 + 22.1) m³/hr
 = 246.5 m³/hr(4.1 m³/min)

Provide two air blowers (one duty and one standby) with airflow of 4.74m³/min (284.4m³/hr) at 3.0mAq.

(viii) Check pump Start/stop frequency

Pump stop level = +1.5

Pump start level = +1.7

Pump start/stop volume = 3.5 m (L) x 3.7 m (W) x 0.2m
= 2.59 m³

Pump start/stop frequency = $\frac{15 \times 9.69 \text{ m}^3/\text{hr} \div 60 \text{ min/hr}}{2.59}$
= 0.94 time/hr < 10 times/hr, OK

E. UV Sterilization

UV Sterilizer is selected with nominal flow capacity of 24 m³/hr to disinfect filtered effluent of design flow capacity (9.69 m³/hr).

Dose requirement = 30000 $\mu\text{W}/\text{cm}^2$ for achieve 99.99% E. Coli removal

UV Chamber inner diameter = 150mm (15cm)

Quartz sleeve outer diameter = 28mm (2.8cm)

Total watt of UV lamp = 200W (200 x 10⁶ μW)

UV lamp arch length = 1000mm (100cm)

Liquid transmission over 1cm = 1.0

Quartz sleeve transmission loss = 10% (assume)

UV output loss = 20% (assume)

UV chamber effective volume

= Water flow through UV chamber area x Lamp arch length

= $[(15/2)^2 - (2.8/2)^2] \times \pi \times 100 \text{ cm}$

= 17055 cm³

= 17.055 L

Retention Time

= Volume / flow rate

= 17.055 L / (9.69m³/hr x 1000L / 3600sec)L/s

= 6.34 sec.

UV intensity at Chamber wall

= [Watt of UV lamp / (π x Chamber inner diameter x Lamp arch length)] x Liquid transmission x Quartz sleeve transmission loss x UV output loss

= $[200 \times 10^6 \mu\text{W} / (\pi \times 15\text{cm} \times 100\text{cm})] \times 1 \times 0.9 \times 0.8$

= 42441 x 1 x 0.9 x 0.8

= 30558 $\mu\text{W}/\text{cm}^2$

UV Dose at Chamber wall
 = Retention time x UV intensity at Chamber wall
 = 6.34 sec. x 30558 $\mu\text{W}/\text{cm}^2$
 = 193737 $\mu\text{Ws}/\text{cm}^2$ (>30000 $\mu\text{Ws}/\text{cm}^2$, **OK**)

F. Sludge Holding Tank

A Sludge Holding Tank for holding primary sludge and secondary sludge for 60 days. Wet sludge will be disposed by tankers regular. Submersible ejector is installed in the tank to prevent stagnant condition and remove odor of the wastewater. The submersible ejector will be controlled by timer and only operated at certain time interval which does not affect the settling efficiency.

(i) Size of Tank (Holding time)

A Sludge Holding Tank for holding the secondary sludge for 60 days. The sludge holding time is calculated as follows:

$$\text{Tank Size} = 2.9 \text{ m (L)} \times 3.7 \text{ m (W)}$$

$$\text{Tank Height} = 3 \text{ m}$$

$$\text{Top water level} = +2.7$$

$$\text{Bottom water level} = +0.0$$

$$\text{Water Depth} = 2.7 \text{ m}$$

$$\begin{aligned} \text{Tank capacity} &= 2.9 \text{ m (L)} \times 3.7 \text{ m (W)} \times 2.7 \text{ m (WD)} \\ &= 28.97 \text{ m}^3 \end{aligned}$$

With 7.5% BOD removed after fine bar screen

BOD loading for biological treatment

$$= 11.24 \text{ kg/day}$$

BOD removal rate

$$= 77.5 \text{ m}^3/\text{day} \times 1000 \text{ litre/m}^3 \times (145 - 20) \text{ mg/litre} \times 10^{-6} \text{ kg/day}$$

$$= 9.69 \text{ kg/day}$$

Sludge yield from biological processes is taken as 1 kg solid/1 kg BOD removed. Therefore sludge production rate is calculated as follows:

$$\begin{aligned} \text{Sludge production rate} &= 9.69 \text{ kg/day} \times 1.0 \text{ kg/kg BOD removal} \\ &= 9.69 \text{ kg/day} \end{aligned}$$

Assuming that the wet sludge solid content is 2% and specific gravity of 1.01

$$\begin{aligned}\text{Volume of wet sludge produced} &= \frac{9.69 \text{ kg/day}}{0.02 \times 1.01 \times 1000 \text{ kg/m}^3} \\ &= 0.48 \text{ m}^3/\text{day}\end{aligned}$$

$$\begin{aligned}\text{Storage time} &= \left(\frac{28.97 \text{ m}^3}{0.48 \text{ m}^3/\text{day}} \right) \\ &= 60.4 \text{ days} > 60 \text{ days, OK}\end{aligned}$$

(ii) Air requirement for aeration and mixing

$$\begin{aligned}&= 30 \text{ m}^3/\text{min per } 1000 \text{ m}^3 \text{ x tank volume} \\ &= (30 \text{ m}^3/\text{min} \times 28.975 \text{ m}^3) / 1000 \text{ m}^3 \\ &= 0.87 \text{ m}^3/\text{min} \\ &= 52.15 \text{ m}^3/\text{hr}\end{aligned}$$

Provide a submersible ejector with air flow of 80 m³/hr at 3 mAq.

MAJOR EQUIPMENT LIST

V. MAJOR EQUIPMENT LIST

1. Automatic Coarse Bar Screen

1set – ‘Tsurumi’ model KS-200S-20mm with bar opening of 20mm and flow capacity of 70 m³/hr

1set – Manual Bar Screen with bar opening of 20mm

2. Equalization Tank

2sets – ‘Tsurumi’ model TOS-50B2.75 submersible pump, one duty and one standby, each of flow capacity of 19.4m³/hr vs 5m c/w 0.75 kw motor (3ph/50Hz/380V), w/SS316 lifting chain

1set – ‘Tsurumi’ model TOS-22BER5 submersible ejector, in 45m³/hr vs 3mAq c/w 2.2 kw motor (3ph/50Hz/380V), w/ SS316 lifting chain

1set – Level switches for the above pumps

3. Automatic Fine Bar Screen

1set – ‘Tsurumi’ model KE-200S-2mm with bar opening of 2mm and flow capacity of 26 m³/hr

1set – Manual Bar Screen with bar opening of 2mm

4. MBR Tank

4sets – ‘Toray’ model NHP210-150S flat-sheet type membrane module provided individually 315 m² area of membrane plat at pore size of 0.08 micron with flux rate of 35 litre/m²/hr.

3sets – ‘Liverani’ model EP 40”-M TF non-submersible permeate pump, two duty and one standby, in flow capacity of 4.8 m³/hr(21.1gpm) vs 12.5m head c/w 1.1 kw motor (3ph/50Hz/380V)

2sets – ‘Tsurumi’ model TOK-50UT2.4 submersible pump, one duty and one standby, each of flow capacity of 12m³/hr vs 5m c/w 0.4 kw motor (3ph/50Hz/380V), w/SS316 lifting chain

2sets – ‘Tsurumi’ model RSR-80 air blowers, one duty and one standby, in 284.4m³/hr vs 3mAq c/w 5.5 kw motor (3ph/50Hz/380V)

1set – Level switches for the above pumps

5. Sludge Holding Tank

1set – ‘Tsurumi’ model 50UT2.4 submersible pump, one duty of flow capacity of 12m³/hr vs 5m c/w 0.4 kw motor (3ph/50Hz/380V), w/SS316 lifting chain

1set – ‘Tsurumi’ model TOS-37BER5 submersible ejector, in 80m³/hr vs 3mAq c/w 3.7 kw motor (3ph/50Hz/380V), w/ SS316 lifting chain

6. UV Sterilizer

2sets – ‘Triogen’ model SLP150-50-1 UV Sterilizer, one duty and one standby, each of flow capacity of 24m³/hr c/w 0.2 kw motor (3ph/50Hz/380V)

7. One set of pressure transmitter, dissolved oxygen monitor, MLSS monitor and electromagnetic flow meter indicating the suction pressure dissolved oxygen sensor and MLSS sensor in MBR tank and the final discharge flow.
8. Centralized PLC Control panel for above sewage treatment system
9. Interconnecting pipe, valves and fittings for above sewage treatment system
10. Interconnecting cable, conduit and fitting for above sewage treatment system

APPENDIX 5.1 FSD AND EPD'S REPLY ON LAND CONTAMINATION

消防處
香港九龍尖沙咀東彌敦道1號
消防處總部大廈



FIRE SERVICES DEPARTMENT
FIRE SERVICES HEADQUARTERS BUILDING,
No.1 Hong Chong Road,
Trim Sha Tsui East, Kowloon,
Hong Kong.

本處編號 OUR REF. : (120) in FSD GR 6-5/4 R Pl. 44
來函編號 YOUR REF. :
電子郵件 E-mail : hkfisdcsq@hkfisd.gov.hk
圖文傳真 FAX NO. : 2739 5879
電話 TEL NO. : 2733 7741

6 December 2022

NOVOX Limited
Room L, 7/F, Block 2,
Kinho Industrial Building,
14-24 Au Pui Wan Street, Fota, Shatin
(Attn: Mr. Eddy NG, Project Manager)

Dear Mr. NG,

**Proposed Residential Care Home for Elderly at Lot 4823 in DD 104,
81 San Tam Road, Yuen Long
Request for Information of Dangerous Goods & Incident Records**

I refer to your letter of 14.10.2022 regarding the captioned request and reply below in response to your questions:-

Please be advised that neither records of dangerous goods license, nor incidents of spillage / leakage of dangerous goods were found in connection with the given conditions of your request at the subject location.

If you have further questions, please feel free to contact the undersigned.

Yours sincerely,

(NG Wing-chit)
for Director of Fire Services

Ref. number and date should be quoted in reference to this letter
凡提及本處通訊引或編號及日期

Eddy NG (Novox)

From: leclau@epd.gov.hk
Sent: Wednesday, June 29, 2022 4:02 PM
To: eddyng@novox.com.hk
Cc: arthurlau@epd.gov.hk; leclau@epd.gov.hk
Subject: Fw: Proposed RCHE at 81 San Tam Road - Request for information about Spillage/Leakage of Chemical Waste or Chemicals
Attachments: Proposed RCHE at 81 San Tam Road_RFI Chemical Leakage.pdf

Dear Sir/Madam,

Re. your letter and email of 28.6.2022 below.

This Office has no record of any reported chemical spillage / leakage incident at the captioned locations. Nonetheless, you are advised to check with other relevant parties / departments for such information as appropriate.

For record of Chemical Waste Producers Registration, a registry is available at our Territory Control Office in Wan Chai. Please contact our Mr. Eric FUNG at 2835 1027 or our Mr. MA at 6308 0705 for details during the office hours.

Yours faithfully,

(Leo K.Y. LAU)
for Director of Environmental Protection

Tel. - 2158 5833

— Forwarded by Leo KY LALUEPDHKBARG on 29/06/2022 15:57 —

From: "Eddy NG (Novox)" <eddy.ng@novox.com.hk>
To: <leclau@epd.gov.hk>
Cc: <banting.wong@novox.com.hk>
Date: 29/06/2022 15:03
Subject: Proposed RCHE at 81 San Tam Road - Request for information about Spillage/Leakage of Chemical Waste or Chemicals

Dear Sir,

A construction project is under planning at the captioned site. As part of the environmental assessment, we are required to undertake a land contamination assessment in order to identify any potential contaminated issues within the Project Area, shown in below Figure as per attached. For this, we would like to request for the following information of the Project Area:

- * Any records of spillage/ leakage of chemical waste or chemicals at the Project Area.

PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING NO.: C220410W-01 Figure 5.1.1	LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
DRAWING TITLE: FSD AND EPD'S REPLY ON LAND CONTAMINATION	SCALE: N.T.S.	REV: A		CHECKED BY Eddy Ng
				APPROVED BY Banting Wong

APPENDIX 7.1 TD'S REPLY ON TRAFFIC FORECAST



CTA Consultants Limited

Transportation, Planning, Engineering, Research and Development

We commit We deliver

用心
以誠

Our Ref: 22069HK/hor/ykl/04

By E-mail only
(Email: eddy.ng@novox.com.hk)

24 May 2023

Novox Limited
Room L, 7/F, Block 2, Kinho Industrial Building
14-24 Au Pui Wan Street
Fotan, Shatin
Hong Kong

Attn: Mr. Eddy Ng

Dear Sir,

**S12A Amendment of Plan Application,
Approved Ngau Tam Mei Outline Zoning Plan No. S/YL-NTM/12
Proposed Rezoning from "R(C)" to "G/IC" for a Proposed "Social Welfare Facilities"
(Residential Care Homes for the Elderly) (RCHE)
At Lot 4823 in DD 104, 81 San Tam Road, San Tin, N.T.
Year 2042 Traffic Forecasts for Traffic Noise Impact Assessment (TNIA)**

We refer to our submission of traffic forecasts via our letter [Ref.: 22069HK/hor/ykl/03] dated 8 February 2023 and e-mail dated 23 May 2023, and the e-mail reply from Transport Department dated 22 and 23 May 2023 regarding the captioned subject.

We write to confirm that Transport Department's endorsed methodology prepared by us has been strictly adopted in preparing the traffic forecast for the Noise Impact Assessment Report prepared by Novox Limited.

Should you have any queries or require further information, please do not hesitate to contact the undersigned at 2214 0849.

Thank you very much for your kind attention.

Yours Faithfully,
For and on behalf of
CTA Consultants Ltd.


Horace Mak
Director

CTA Consultants Limited 志達顧問有限公司
Unit 2108, 21/F, Westlands Centre, 20 Westlands Road, Quarry Bay, Hong Kong
香港銅鑼灣華蘭路20號華蘭中心21樓2108室
Tel: (852) 2214 0849 / Fax: (852) 2214 0817
Email: cta@ctaconsultants.com / website: www.ctaconsultants.com

1 of 1

Subject: RE: S12A amendment of OZP no. S/YL-NTM/12 - Proposed RCHE at 81 San Tam Road, San Tin, NT

Chi Kong LEUNG <chikongleung@td.gov.hk>
to Agnes Lee, Evonne Li, Horace Mak, Ming Yip TSE

Tue 23 May 20 41:12 days ago

You are viewing an attached message. R Lee Architects (HK) Ltd Mail can't verify the authenticity of attached messages.

Dear Agnes,

I have no further comment on the captioned submission from traffic engineering point of view.

Thank you.

Regards,
Donald Leung
E/IP, TE/NTW
Transport Department
Tel. 2399 2778

From: "Agnes Lee" <agneslee@ctaconsultants.com>
To: "Chi Kong LEUNG" <chikongleung@td.gov.hk>
Cc: "Evonne Li" <evonneli@ctaconsultants.com>, "Horace Mak" <horacemak@ctaconsultants.com>, "Ming Yip TSE" <mingyiptse@td.gov.hk>
Date: 23/05/2023 03:48 PM
Subject: RE: S12A amendment of OZP no. S/YL-NTM/12 - Proposed RCHE at 81 San Tam Road, San Tin, NT



Dear Donald,

Please be advised that the value of trip generation 'attraction' of Application no. Y YL-NSW 9 in Table 3.10 was due to typos. Please find attached the replacement page for Table 3.10 for your review and reference.

Thanks.

Agnes Lee
CTA Consultants Limited
Unit 2108, 21/F, Westlands Centre, 20 Westlands Road, Quarry Bay, H. K.
Tel: (852) 2214 0849 Fax: (852) 2214 0817
Email: cta@ctaconsultants.com

From: Chi Kong LEUNG <chikongleung@td.gov.hk>
Sent: Monday, May 22, 2023 5:18 PM
To: Agnes Lee <agneslee@ctaconsultants.com>
Cc: "Evonne Li" <evonneli@ctaconsultants.com>, "Horace Mak" <horacemak@ctaconsultants.com>, "Ming Yip TSE" <mingyiptse@td.gov.hk>
Subject: RE: S12A amendment of OZP no. S/YL-NTM/12 - Proposed RCHE at 81 San Tam Road, San Tin, NT

PROJECT: PROPOSED RESIDENTIAL CARE HOME FOR ELDERLY AT 81 SAN TAM ROAD, YUEN LONG, N.T.	DRAWING NO.: C220410W-01 Figure 6.1.1	LEAD ARCHITECT: 	ENVIRONMENTAL CONSULTANT: 	PREPARED BY Phoenix Lee
DRAWING TITLE: TD'S REPLY ON TRAFFIC FORECAST	SCALE: N.T.S.	REV: A		CHECKED BY Eddy Ng
				APPROVED BY Banting Wong