

Section 16 Application for Lot 215 RP (Part) in D.D. 78, Ta Kwu Ling North, New Territories

Environmental Assessment Report

Vannex International Limited

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1 Introduction

1.1 Background

- 1.1.1 The site is located at Lot 215 RP (Part) in D.D. 78, Ta Kwu Ling North, New Territories, where it is zoned as "AGR" and "OU (landfill)" in accordance with the approved Ta Kwu Ling North Outline Zoning Plan No. S/NE-TKLN/2 and the approved Wo Keng Shan Outline Zoning Plan No. S/NE-WKS/10, respectively. The client intends to redevelop the site into a proposed temporary battery recycling plant and associated land filling for a period of three years. Due to the proposed change in permitted uses, a Section 16 Planning Application will therefore be required.
- 1.1.2 Aurecon Hong Kong Limited has been commissioned to conduct an Environmental Assessment Report for assessing the air quality, noise, water quality and waste management upon the construction and operation of proposed temporary battery recycling plant to demonstrate the environmental acceptability for fulfilling the planning application requirement.

1.2 Objectives of the Environmental Assessment

- 1.2.1 The objective of this Report aims to identify key environmental issues associated with the proposed facility for any potential impacts identified. The Environmental Assessment Report will be prepared to address the environmental aspects arising from construction and operation of the proposed facility.

1.3 Report Structure

- 1.3.1 The remaining chapters of this report are shown below:
- Chapter 2 – Site Context
 - Chapter 3 – Air Quality Impact
 - Chapter 4 – Noise Impact
 - Chapter 5 – Water Quality Impact
 - Chapter 6 – Waste Management
 - Chapter 7 - Conclusion

2 Site Context

2.1 Site Location and Its Environments

- 2.1.1 The proposed facility is located at Lot 215 RP (Part) in D.D. 78, Ta Kwu Ling North, New Territories (**Figure 2.1**). The site is situated on land primarily designated for agricultural use (93%) under the Block Government Lease, while the remaining 7% falls within the “Other Specified Uses” zoning, adjacent to the leachate storage area of the existing North East New Territories (NENT) Landfill. The total site area is approximately 2,268m², and its south is connected by a path of about 720 m in length linking to Lin Chuk Road.

2.2 Proposed Development Scheme

- 2.2.1 The project site is currently vacant with no existing structures. It will comprise a 12-meter, two-storey building, with the ground floor accommodating material storage areas and plant facility such as the crushing and screening zone, carbonisation furnace areas, office area, and logistics areas including a loading platform and vehicle parking spaces. The first floor will be designated as storage region and staff rest areas. The building height (including the chimney) is approximately 49.0 mPD. The accommodation schedule of the proposed facility is provided in **Table 2.1**, while the master layout plan is shown in **Figure 2.2a and b**. According to the programme, construction works are tentatively scheduled for completion in mid-2027, with trial operations slated for mid- to late 2027.

Table 2.1 Accommodation Schedule of the Proposed Facility

Floor	Uses	Size (m ²)
G/F	Crushing and screening zone	365
G/F	Computer, printer dispose/ storage region area	240
G/F	Covered parking area	152
G/F	Carbonisation furnace area	96
G/F	Temporary storage area	90
G/F	Office area	55
G/F	Discharge region	50
G/F	Preliminary disassembly region area	36
G/F	Fine disassembly region area	35
G/F	Classification region	35
G/F	Electroless battery region	21
G/F	Air filter area	20
G/F	Storage room area	20
G/F	Landing platform	18
G/F	Milling machine region	15
G/F	Guard room area	15
G/F	Pump room area	15
G/F	Electric meter room	12
G/F	Weighbridge area	8
G/F	Toilet area	6
1/F	Storage region area	600

Floor	Uses	Size (m ²)
1/F	Site office region area	300
1/F	Staff rest area	270
1/F	Dining hall area	90
1/F	Locker room area	75
1/F	Toilet area	6

2.3 Description of Operation Process

- 2.3.1 The proposed facility is designed for the processing of waste batteries, including lead-acid batteries, general rechargeable batteries, lithium batteries, and industrial batteries, as well as regulated electrical appliances (i.e., computers, printers, scanners, and monitors).

Treatment Process for Waste Batteries

- 2.3.2 The operation involves two primary processes: (i) pyrolysis and (ii) crushing and separation following the pyrolysis stage.

Pyrolysis

- 2.3.3 The waste batteries will be loaded into the primary chamber (carbonisation furnace), where steam from the boiler will be used to remove oxygen and heat the batteries for approximately 15 minutes. Once the organic substances are vaporised, they will be directed to the secondary combustion chamber. A diesel burner will provide heating for this initial 2-hour period and will cease to operate once the vaporised organic substances are generated to provide fuel for continual combustion.
- 2.3.4 The exhaust gas will be burned in a secondary combustion chamber at 1100 °C, then processed through a filtration and purification device to remove air pollutants. The remaining gases will be discharged alongside excess air from the carbonisation furnace. After leaving the furnace, the gases will be further filtered, rapidly cooled by mixing with fresh air, and purified before being released into the atmosphere through a chimney. Solid products obtained after pyrolysis will be cooled and sent to the crushing area for further processing. The sequence of the pyrolysis process is illustrated in **Figure 2.3**.

Post-pyrolysis Crushing and Separation

- 2.3.5 After the pyrolysis process, the organic matter and electrolyte in the waste batteries are eliminated. The main components of the waste batteries at this stage are metallic materials such as lithium, nickel, cobalt, copper, iron, and aluminium. These metals are sorted and recycled through a three-stage crushing and sorting process (coarse, medium, and fine) to separate them based on their differing densities and sizes. The specific process flow is as follows:

- (1) The carbonised materials are fed into the first-level shredder via a vibrating feeder. The shredder performs coarse crushing, resulting in a particle size of $\leq 4\text{--}6$ cm. The crushed particles are then lifted and screened to separate the black powder, which is collected via negative pressure suction.
- (2) The remaining material enters the medium crusher, reducing the particle size to $\leq 8\text{--}10$ mm. These particles are screened again using a vibrating screen (secondary screening) to further separate the black powder.
- (3) The remaining materials fall into a wind sifter, where heavy materials (shells and tabs) are separated. Iron shells and lightweight materials (electrode sheets and black powder) are then isolated through magnetic separation. The lightweight materials are sucked via negative pressure into the fine crusher; the resulting particles fall into a suction pipe and are transported to a vibrating screen to extract the remaining black powder. Finally, the materials are fed into a gravity separator, where copper and aluminium particles are sorted and bagged.

2.3.6 The sequence of the post-pyrolysis crushing and separation is illustrated in **Figure 2.4**.

Treatment Process for Regulated Electrical Appliances

2.3.7 Regulated electrical appliances, including monitors, televisions, notebooks, tablet computers, printers, and scanners, will be recycled and treated at the proposed facility. They will first undergo registration, followed by weighing and recording of quantities. The main process involves dismantling the appliances into various materials, such as batteries, plastics, Printed Circuit Boards (PCBs), Liquid Crystal Display (LCD) / Light Emitting Diode (LED) panels, glass, and metals (including iron and non-ferrous metals). These materials will be segregated and sent to the corresponding recyclers or manufacturers for reuse, transferred to the designated Waste PCB / LCD / LED Disposal Section of the Vannex International Limited factory, or disposed of in a landfill if they are non-recyclable and non-hazardous. The treatment process for these regulated appliances are illustrated in **Figures 2.5 to 2.9**.

3 Air Quality Impact

3.1 Introduction

- 3.1.1 This section addresses the potential air quality impacts arising from the proposed facility during construction and operational phases. Appropriate mitigation measures are proposed to alleviate the potential air quality impact, if necessary.

3.2 Environmental Legislation, Standards and Guidelines

- 3.2.1 The relevant legislation, standards and guidelines are referenced to the present preliminary environmental review of air quality impacts include:

- Air Pollution Control Ordinance (APCO) (Cap. 311);
- Air Pollution Control (Construction Dust) Regulation (Cap.311R);
- Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation (Cap.311Z);
- Air Pollution Control (Fuel Restriction) Regulation (Cap.311I);
- Air Pollution Control (Specified Processes) Regulations (Cap. 311F); and
- Hong Kong Planning Standards and Guidelines (HKPSG)

Air Pollution Control Ordinance (Cap.311)

- 3.2.2 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 maximum allowable concentrations over specific periods for typical pollutants, should be met. The updated AQOs were put in force on 11 April 2025 and the relevant assessment criteria are presented in **Table 3.1**.

Table 3.1 Hong Kong Air Quality Objectives

Air Pollutant	Pollutant Concentration at Averaging Time, $\mu\text{g}/\text{m}^3$					
	10min	1-hour	8-hour	24-hour	1 year	Peak Season [#]
Carbon Monoxide	--	30,000 ⁽ⁱ⁾	10,000 ⁽ⁱ⁾	4,000 ⁽ⁱ⁾	--	--
Nitrogen Dioxide	--	200 ⁽ⁱⁱ⁾	--	120 ^(iv)	40	--
Sulphur Dioxide	500 ⁽ⁱⁱⁱ⁾	--	--	40 ⁽ⁱⁱⁱ⁾	--	--
Respirable Suspended Particulates (PM ₁₀)	--	--	--	75 ^(iv)	30	--
Fine Suspended Particulates (PM _{2.5})	--	--	--	37.5 ⁽ⁱⁱ⁾	15	--
Ozone	--	--	160 ^(iv)	--	--	100

Air Pollutant	Pollutant Concentration at Averaging Time, µg/m ³					
	10min	1-hour	8-hour	24-hour	1 year	Peak Season [#]
Lead	--	--	--	--	0.5	

Note:

(i) No exceedance allowed

(ii) Not to be exceeded more than 18 times

(iii) Not to be exceeded more than 3 times

(iv) Not to be exceeded more than 9 times

Parameters added in the Amendment Bill. The calculation of the new parameter peak season ozone should refer to the Air Pollution Control (Amendment) Bill 2024.

Air Pollution Control (Construction Dust) Regulation (Cap.311R)

- 3.2.3 Made under Section 43 of the APCO, the Air Pollution Control (Construction Dust) Regulation defines notifiable and regulatory works for achieving the purpose of dust control for a number of activities. The Regulation requires that any notifiable work shall give advance notice to the Environmental Protection Department (EPD), and the Contractors shall ensure that the notifiable and regulatory works are carried out in accordance with the Schedule of the Regulation. Dust control and suppression measures are also provided in the Schedule.
- 3.2.4 The proposed construction works for the facility are both notifiable works and regulatory works due to activities including foundation and superstructure of a building, material stockpiling and dusty material handling as potential sources of fugitive dust emissions as detailed under Parts I to IV of the Schedule on Dust Control Requirements.

Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation (Cap.311Z)

- 3.2.5 The Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation came into operation on 1 June 2015. Under the Regulation, non-road mobile machinery (NRMMS), except those exempted, are required to comply with the prescribed emission standards. From 1 September 2015, all regulated machines sold or leased for use in Hong Kong must be approved or exempted with a proper label in a prescribed format issued by EPD. Starting from 1 December 2015, only approved or exempted NRMMS with a proper label are allowed to be used in specified activities and locations including construction sites. Starting from 1 January 2019, the Air Pollution Control (Non-road Mobile Machinery) (Emission) (Amendment) Regulation 2018 came into effect, tightening in phases the statutory emission standards for newly approved non-road vehicles in line with the latest emission standards for road vehicles. The Contractor is required to ensure the adopted machines or nonroad vehicle under the Project could meet the prescribed emission standards and requirement.

Air Pollution Control (Fuel Restriction) Regulation (Cap.311I)

- 3.2.6 Under the Air Pollution Control (Fuel Restriction) Regulation, types of fuel allowed for use and the sulphur contents in commercial and industrial processes are controlled to reduce sulphur dioxide (SO₂) emissions. The contractors are required to use only fuels which are complied with the respective requirements such as gaseous fuel, conventional solid fuel with a sulphur content not exceeding 1% by weight, and liquid fuel with a sulphur content not exceeding 0.005% by weight and a viscosity not more than 6 centistokes at 40°C such as Ultra Low Sulphur Diesel (ULSD).

Air Pollution Control (Specified Processes) Regulation (Cap.311R)

- 3.2.7 Under the Air Pollution Control (Specified Processes) Regulation, major stationary air polluters, such as power plants, incinerators, concrete batching plants, which are classified as Specified Processes in the APCO and are subject to more stringent emission control. The operation of the proposed facility involves pyrolysis, which is classified as the specified process (SP) of “Gas Works” under Schedule 1 of the APCO. A SP license is therefore required for operation.
- 3.2.8 The EPD Best Practicable Means (BPM) for “Carbonisation and Gasification of Prescribed Materials Other than Plant Biomass” stipulates concentrations limits of SO₂, PM₁₀, PM_{2.5}, NO₂ and CO, as well as other non-AQO air pollutants, such as HCl and HF. **Table 3.2** summarises the emission limits for these pollutants. Air pollutant concentrations are expressed at reference conditions of 0°C temperature, 101.325 kPa pressure, dry and 11% oxygen content condition.

Table 3.2 Concentration Limits for Emission from Carbonisation and Gasification Plant

Air Pollutant	Concentration Limit		
	Half-hour Average	Daily Average	Average Concentration
Particulates	30 ⁽ⁱ⁾	10 ⁽ⁱ⁾	-
Gaseous and vaporous organic substances, expressed as total organic carbon	20 ⁽ⁱ⁾	10 ⁽ⁱ⁾	-
Nitrogen oxides, expressed as nitrogen dioxide (NO ₂)	400 ⁽ⁱ⁾	200 ⁽ⁱ⁾	-
Carbon monoxide (CO)	100 ⁽ⁱ⁾	50 ⁽ⁱ⁾	-
Hydrogen chloride (HCl)	60 ⁽ⁱ⁾	10 ⁽ⁱ⁾	-
Hydrogen chloride (HF)	4 ⁽ⁱ⁾	1 ⁽ⁱ⁾	-
Sulphur dioxide (SO ₂)	200 ⁽ⁱ⁾	50 ⁽ⁱ⁾	-
Cadmium and its compounds, expressed as cadmium (Cd) Thallium and its compounds, expressed as thallium (Tl)	-	-	Total 0.05 ^{(i) (iii)}
Mercury and its compounds, expressed as mercury (Hg)	-	-	0.05 ^{(i) (iii)}

Air Pollutant	Concentration Limit		
	Half-hour Average	Daily Average	Average Concentration
Antimony and its compounds, expressed as antimony (Sb)	-	-	Total 0.5 ^{(i) (iii)}
Arsenic and its compounds, expressed as arsenic (As)			
Lead and its compounds, expressed as lead (Pb)			
Chromium and its compounds, expressed as chromium (Cr)			
Cobalt and its compounds, expressed as cobalt (Co)			
Copper and its compounds, expressed as copper (Cu)			
Manganese and its compounds, expressed as manganese (Mn)			
Nickel and its compounds, expressed as nickel (Ni)			
Vanadium and its compounds, expressed as vanadium (V)			
Zinc and its compounds, expressed as zinc (Zn)			
Polychlorinated dibenzodioxins and polychlorinated dibenzofurans	-	-	0.1 ^{(ii) (iv)}

Note:

- (i) Air pollutant concentration limits are expressed in mg/m³, except for polychlorinated dibenzodioxins and polychlorinated dibenzofurans.
- (ii) The concentration limit of Polychlorinated dibenzodioxins and polychlorinated dibenzofurans is expressed in ng I-TEQ/m³
- (iii) The concentration limits for the above heavy metals and their compounds are the average values over a sampling period of a minimum of 30 minutes and a maximum of 8 hours
- (iv) The concentration limit for dioxins is the average value over the sampling period of a minimum of 6 hours and a maximum of 8 hours. Total concentrations shall be calculated based on the toxic equivalence factors stipulated in Annex II – *Calculations of Equivalent Concentration for Dioxins* in the “BPM for Carbonisation and Gasification of Prescribed Materials Other than Plant Biomass”

Hong Kong Planning Standards and Guidelines (HKPSG)

- 3.2.9 The Hong Kong Planning Standards and Guidelines (HKPSG) is a Government manual outlining criteria for the scale, location and site requirements of various land uses and facilities. It provides general guidelines to ensure that, during the planning process, the Government will reserve adequate land for social and economic development while providing public facilities that meet the community needs.
- 3.2.10 Table 3.1 of the HKPSG provides the broad guidelines for locating active open spaces close to potentially polluting uses, viz., industrial chimneys emissions. The recommended buffer distances are reproduced in **Table 3.3**.

Table 3.3 HKPSG's Recommended Minimum Buffer Distance from Industrial Chimneys

Difference in Height between Industrial Chimney Exit and the Site	Buffer Distance	Permitted Uses
< 20m	> 200m	Active and passive recreational uses
	5 - 200m	Passive recreational uses
20m - 30m (*)	> 100m	Active and passive recreational uses
	5 - 100m	Passive recreational uses
30m - 40m	> 50m	Active and passive recreational uses
	5 - 50m	Passive recreational uses
> 40m	> 10m	Active & passive recreational uses

Source: HKPSG Table 3.1: Guidelines on Usage of Open Space Site

Remarks:

(a) In situations where the height of chimneys is not known, use the set of guidelines marked with an asterisk for preliminary planning purpose and refine as and when more information is available.

(b) The buffer distance is the horizontal, shortest distance from the boundary of the industrial lot, the position of existing chimneys or the edge of road kerb, to the boundary of open space sites.

(c) The guidelines are generally applicable to major industrial areas but NOT individual large industrial establishments which are likely to be significant air pollution sources. Consult EPD when planning open space sites close to such establishments.

(d) Amenity areas are permitted in any situation.

3.3 Description of the Environment

Existing Air Quality in the North Area

3.3.1 The EPD air quality monitoring station (AQMS) located closest to the Project Site is the North Monitoring Station, which is located at 19 Pak Wo Road, Sheung Shui, approximately 6.6km from the Project Site. The air quality data of the latest five years i.e. 2020 to 2024, obtained from North Monitoring Station are summarised in **Table 3.4** to depict the trend in air quality. The air quality monitoring data from EPD's AQMS are indicative of the prevailing baseline air quality in the assessment area.

Table 3.4 EPD Air Quality Monitoring Data at North Monitoring Station (Year 2020 to 2024)

Pollutant	Parameter	Concentration (µg/m ³) ^[2]					Prevailing AQO (µg/m ³) ^[1]
		2020	2021	2022	2023	2024	
Respirable Suspended Particulates (RSP)	10 th highest 24-hour	55	62	50	57	56	75 (9)
	Annual	- ^[3]	25	23	27	25	30
Fine Suspended Particulates (FSP)	19 th highest 24- hour	- ^[4]	- ^[4]	- ^[4]	28	29	37.5 (18)
	Annual	- ^[3]	15	14	15	16	15

Pollutant	Parameter	Concentration ($\mu\text{g}/\text{m}^3$) ^[2]					Prevailing AQO ($\mu\text{g}/\text{m}^3$) ^[1]
		2020	2021	2022	2023	2024	
Nitrogen Dioxide (NO ₂)	19 th highest 1-hour	112	135	115	116	114	200 (18)
	Annual	- ^[3]	36	31	30	29	40
Sulphur Dioxide (SO ₂)	4 th highest 10-minute	19	18	27	27	18	500 (3)
	4 th highest 24-hour	8	7	7	7	7	40 (3)
Ozone (O ₃)	10 th highest 8-hour	<u>166</u>	<u>187</u>	<u>197</u>	<u>164</u>	<u>169</u>	160 (9)
CO	Maximum 1-hour	1830	2150	1710	2390	1710	30000
	Maximum 8-hour	1238	1550	1304	1231	1311	10000

Notes:

[1] Numbers in brackets is the number of exceedances allowed per year.

[2] Bolded and underlined values exceed the relevant AQO.

[3] North General Air Quality Monitoring Stations commissioned on 10 July 2020. Annual averages calculated from less than eight representative months were not published by EPD.

[4] Data for the 19th highest 24-hour FSP have been published by the EPD since 2023.

Future Background Air Quality

3.3.2

Future background air quality has been predicted based on hourly concentration data extracted from the “Pollutants in the Atmosphere and their Transport over Hong Kong” (PATH v3.0) model with Year 2027 emission inventory with within the assessment area grids (38,58); (38,59); (39,58); and (393.159) have been extracted and presented in **Table 3.5**. The coverage of the grids is illustrated in **Appendix 3.1** for reference.

Table 3.5 Background Air Pollutant in Year 2027 extracted from PATH v3.0

Pollutant	Parameter	Concentration ($\mu\text{g}/\text{m}^3$) ^[2]				Prevailing AQO ($\mu\text{g}/\text{m}^3$) ^[1]
		(38,58)	(38,59)	(39,58)	(39,59)	
Respirable Suspended Particulates (RSP)	10 th highest 24-hour	64	65	64	62	75 (9)
	Annual	24	24	24	23	30
Fine Suspended Particulates (FSP)	19 th highest 24-hour	<u>39</u>	<u>39</u>	<u>38</u>	37	37.5 (18)
	Annual	15	15	15	15	15
Nitrogen Dioxide (NO ₂)	19 th highest 1-hour	58	66	51	54	200 (18)
	Annual	12	15	11	14	40

Pollutant	Parameter	Concentration ($\mu\text{g}/\text{m}^3$) ^[2]				Prevailing AQO ($\mu\text{g}/\text{m}^3$) ^[1]
		(38,58)	(38,59)	(39,58)	(39,59)	
Sulphur Dioxide (SO_2)	4 th highest 10-minute	28	27	32	30	500 (3)
	4 th highest 24-hour	8	8	8	8	40 (3)
Ozone (O_3)	10 th highest 8-hour	<u>179</u>	<u>179</u>	<u>181</u>	<u>178</u>	160 (9)
CO	Maximum 1-hour	623	623	622	625	30000
	Maximum 8-hour	589	590	590	592	10000

Notes:

[1] Numbers in brackets is the number of exceedances allowed per year.

[2] Bolded and underlined values exceed the relevant AQO.

3.4 Study Area and Air Sensitive Receivers (ASRs)

3.4.1 The Study Area for air quality impact is identified as 500m from the boundary of the Project Site, as shown in **Figure 3.1**. Air sensitive receivers (ASRs) within the study area for air quality impact assessment have been identified in accordance with the HKPSG. ASRs for the construction and operation phases of the Project have been identified with reference to the latest information provided on the survey maps, topographic maps, aerial photos and land status plans.

3.4.2 The first layer of ASRs located closest to the Project boundary have been identified as the representative ASRs. The details of the representative ASRs are summarised in **Table 3.6** and indicated in **Figure 3.1**.

Table 3.6 Summary of Representative Air Sensitive Receiver

ASD ID	Description	Type of ASR	Approximate minimum horizontal distance to Project Site (m)	ASR for Construction Phase	ASR for Operation Phase
A1	No. 102 Ha Heung Yuen	Domestic premises	296	Yes	Yes
A2	Temporary structure near the south of the project boundary	Domestic premises	22	Yes	Yes

3.5 Impact Review – Construction Phase

- 3.5.1 Based on the proposed layout plan, the proposed facility will involve building construction works. The potential major air quality impact during construction is fugitive dust generated from excavation, foundation, and superstructure works; material storage and handling; loading and unloading of excavated materials; as well as dust and gaseous emissions from the operation of on-site vehicles and diesel-powered plants. The Contractor shall implement dust control measures in accordance with the requirements of the Air Pollution Control (Construction Dust) Regulation and the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation. The requirements of these regulations are summarised below.

Mitigation Measures

- 3.5.2 Typical relevant dust control measures include:

- Water spraying on any dusty materials before loading and unloading; stockpile of dusty materials; area where demolition work is carried out; area where excavation or earth moving activities are carried out; and any unpaved haul road;
- Provide hoarding of not less than 2.4 m high from ground level along the site boundary;
- Provide effective dust screens, sheeting or netting to enclose any scaffolding built around the perimeter of a building;
- Cover or shelter any stockpile of dusty materials;
- Provide vehicle washing facilities at all site exits to wash away any dusty materials from vehicle body and wheels before they leave the site and the vehicle washing facilities shall be paved; and
- Cover any dusty load on vehicles before they leave the site.

- 3.5.3 In addition to the dust reduction measures stipulated in the regulation, good site practices shall be incorporated and undertaken by the contractor to further minimise the fugitive dust generation, including the following:

- Avoid storage of dusty materials, including stockpiles and bags of cement, within the project site as far as possible;
- Minimise the drop height during loading and unloading; and
- Avoid the handling of dusty materials at open area.

- 3.5.4 Only a two-storey building will be constructed for the proposed facility. It is envisaged that only a small-scale excavation will be carried out. It is expected that no more than two dump trucks will operate on-site for unloading materials at any one time. Therefore, the transportation of dusty materials will be minimised.
- 3.5.5 With strict implementation of control measures stipulated in the Air Pollution Control (Construction Dust) Regulation and good site practice listed in the above, no adverse construction dust impact is anticipated.
- 3.5.6 The number of on-site machinery will be subject to future construction work arrangements. The requirements stipulated in the Air Pollution Control (Non-road Mobile Machinery) (Emission) Regulation will be complied with to control potential emissions from non-road mobile machinery during the construction phase. Therefore, the air quality impact arising from gaseous emissions of construction plants is considered minimal.

3.6 Impact Review – Operational Phase

- 3.6.1 The operation of the proposed facility involves carbonisation (i.e. pyrolysis), physical crushing and sieving, as well as the physical dismantling and de-soldering of electronic components and appliances. These processes result in the emission of particulates (i.e. PM_{2.5} and PM₁₀), nitrogen dioxide (NO₂), carbon monoxide (CO) and sulphur dioxide (SO₂), as well as other gaseous emissions such as hydrogen chloride (HCl) and hydrogen fluoride (HF).

Chimney Emission

- 3.6.2 During the pyrolysis, the process is programmed and controlled by setting the working pressure and temperature within the oxygen-free chamber. Although the manufacturer has not provided information regarding the detection of intermediate products from the lithium batteries, research on lithium battery electrolytes indicated that the resulting gases will be mainly fluorinated hydrocarbons, carbon monoxide (CO), carbon dioxide (CO₂) and hydrogen fluoride (HF)^{1 2 3 4}. High-temperature conditions (e.g., 900 °C or above) further favour decomposition, resulting in a high yield of HF. The gas products will pass through a gas filtration system before exiting via the chimney. The chimney is located at the northeast corner of the facility at a height of 25m above ground level. The chimney outlet is situated more than 100m from the nearest ASR (i.e. A2, the temporary structure near the southern project boundary) with a vertical height difference >22.5m from the nearest window or door opening. **Figure 3.2a** illustrates the distance between the chimney outlet and the nearest ASR (A2), while **Figure 3.2b** and **Figure 3.2c** show the vertical position of the chimney outlet and the approximate height of the nearest ASR (i.e. A2) respectively. These figures demonstrate compliance with the minimum buffer distance requirement for the chimney, as recommended in Table 3.3 of the HKPSG.

Post-pyrolysis Crushing

- 3.6.3 Following pyrolysis, carbonised materials, including the metals such as lithium, nickel, cobalt, copper, iron, and aluminium, are recovered as solid-form products. These materials are stored and then processed for crushing and sorting within the facility's dedicated crushing line. While fugitive dust emissions are expected during this stage, crushing and sorting will occur within a central dust removal system (see **Figure 2.4**), maintained under negative pressure with mechanical ventilation. The exhaust point for the crushing line's filtration system is illustrated in **Figure 3.2**.

Dismantling and De-soldering of Electronic Appliances

- 3.6.4 Fugitive dust emissions are anticipated during the dismantling of regulated electrical appliances (e.g., monitors, televisions, and computers) and the de-soldering of PCBs. Dismantling and de-soldering will be performed in a fume cupboard equipped with a negative pressure and filtration system.

¹ Liu, H., Han, J., Feng, Y., Nong, C., Liu, Y., Cheng, L., Gu, J., & Yuan, H. (2025). Thermal decomposition characteristics, products, and thermal transformation mechanisms of fluorine-containing organic components in lithium-ion batteries. *Journal of Environmental Chemical Engineering*, 13(6), Article 120248. <https://doi.org/10.1016/j.jece.2025.120248>

² Lombardo, G., Ebin, B., Steenari, B.-M., & Pétrau, J. (2021). Comparison of the effects of incineration, vacuum pyrolysis and dynamic pyrolysis on the composition of NMC-lithium battery cathode-material production scraps and separation of the current collector. *Resources, Conservation and Recycling*, 164, Article 105142. doi.org

³ Rensmo, A., Savvidou, E. K., Cousins, I. T., Hu, X., Schellenberger, S., & Benskin, J. P. (2023). Lithium-ion battery recycling: A source of per- and polyfluoroalkyl substances (PFAS) to the environment? *Environmental Science: Processes & Impacts*, 25(6), 1015–1025. doi.org

⁴ Wang, M., Liu, K., Yu, J., Zhang, Q., Zhang, Y., Valix, M., & Tsang, D. C. W. (2023). Challenges in recycling spent lithium-ion batteries: Spotlight on polyvinylidene fluoride removal. *Global Challenges*, 7(3), Article 2200237. doi.org

Vehicular Emission

- 3.6.5 It is expected that medium goods vehicles will be utilised for the transport of waste batteries and electronic appliances during the operational phase. While specific traffic data from the Transport Department is currently unavailable, operational traffic flow is projected to be minimal. Given an estimated generation rate of approximately 0.3 Passenger Car Unit (PCU) per hour, vehicular emissions are not anticipated to result in any adverse air quality impacts.

Mitigation Measures

- 3.6.6 Exhaust gas filtration systems should be equipped for the exhaust points. Emission control measure shall include, but not limited to the followings:
- A cyclone dust collector shall be provided during the pyrolysis process to remove large particles and adsorbed heavy metals, preventing them from blocking the lime adsorption box to ensure sufficient gas flow and adsorption efficiency.
 - A lime absorption box shall be provided during the pyrolysis process to remove acidic gases (such as sulphur dioxide, hydrogen chloride, hydrogen fluoride and nitrogen dioxide) by allowing the granular lime balls to contact the acidic gases and then undergo chemical reaction with the gas stream.
 - A bag filter with neatly arranged filter bags shall be installed to remove particles within the 0.05 µm - 20 µm range, achieving a dust removal efficiency of at least 99% prior to the exhaust points of the pyrolysis, crushing, dismantling and de-soldering processes.
 - A mechanical ventilation system shall be provided for the entire facility building to ensure sufficient fresh air intake from the roof. A separate exhaust system shall be installed to extract air outdoors through the lower portion of the ground floor.
 - The Air Pollution Control (Fuel Restriction) Regulation (Cap.311I) shall be followed. Fuel for the furnaces shall not have a sulphur content exceeding 0.005% by weight and a viscosity of no more than 6 centistokes at 40°C.
 - The Air Pollution Control (Specified Processes) Regulation (Cap.311R) shall be followed. A valid Specified Process (SP) license shall be obtained, and regular monitoring shall be conducted in accordance with the licensing requirements to ensure compliance with emission limits.
- 3.6.7 Given that the minimum buffer distance for the chimney meets the requirements of Table 3.3 of the HKPSG, and that the operator will obtain an SP licence in accordance with the Air Pollution Control Ordinance (APCO) (Cap. 311) and its subsidiary regulations, no residual air quality impacts are expected during the Project's operation, provided the mitigation measures described in **Section 3.6.6** are implemented.

4 Noise Impact

4.1 Introduction

- 4.1.1 This section identifies and evaluates the potential noise impact likely to arise during the construction and operations phases of the proposed facility. Practical mitigation measures are proposed to reduce environmental impacts to acceptable levels, if necessary.

4.2 Environmental Legislation, Standards and Guidelines

- 4.2.1 The Noise Control Ordinance (NCO) provides the statutory framework for noise control. Assessment procedures and standards relevant to the Project are set out in the Technical Memoranda (TM) and guidelines listed below:

- Chapter 9 "Environment" of the Hong Kong Planning Standards and Guidelines (HKSPG);
- Practice Note for Professional Persons No. ProPECC PN No.1/24 "Noise from Construction Activities - Non-Statutory Controls";
- Practice Note for Professional Persons No. ProPECC PN No.4/23 "Planning and Designing Noise Sensitive Developments";
- Noise Control Ordinance (NCO) (Cap.400);
- Technical Memorandum on Noise from Construction Work other than Percussive Piling (GW-TM); and
- Technical Memorandum for the Assessment of Noise from Places other than Domestic Premises, Public Places or Construction Sites (IND-TM).

Construction Phase

Construction Noise during Non-restricted Hours

- 4.2.2 The Noise Control Ordinance (NCO) provides the statutory framework for the control of noise from construction works, other than percussive piling, using powered mechanical equipment (PME) between 1900 and 0700 hours or at any time on Sundays and general holidays (i.e. restricted hours).
- 4.2.3 For control of non-restricted-hours construction noise, the contractor should implement noise abatement measures as recommended in the ProPECC PN 1/24 to minimise the construction noise during the daytime. The recommended daytime construction noise level at the façade of sensitive receivers during the period between 0700 and 1900 hours (except Sundays and general holidays) shall be met as far as practicable and are provided in **Table 4.1**.

Table 4.1 Noise Standards for Daytime Construction Activities

Noise Sensitive Uses	Noise Standard, Leq (30 mins), dB(A)
Domestic Dwellings	75
Nurseries and School	70 (65 during examinations)

Operation Phase***Fixed Plant Noise***

4.2.4

The NCO requires that noise impacts from existing fixed noise sources shall comply with the Acceptable Noise Levels (ANL) laid down in Table 2 of the Technical Memorandum for the Assessment of Noise from Places Other Than Domestic Premises, Public Places or Construction Sites (IND-TM). In setting the ANL, reference has been made to the Area Sensitivity Rating in Table 1 of the IND-TM (reproduced in **Table 4.2**) corresponding to the nature of the area where the NSRs are situated and the presence of Influencing Factor (such as industrial areas, major roads, or areas within the boundary of Hong Kong International Airport).

Table 4.2 Area Sensitivity Rating

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

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

Table 4.3 Acceptable Noise Level (ANL), dB(A)

Time Period	Acceptable Noise Level, Leq 30 mins, dB(A)		
	Area Sensitivity Rating "A"	Area Sensitivity Rating "B"	Area Sensitivity Rating "C"
Day-time (0700 – 1900 hours)	60	65	70
Evening (1900 -2300 hours)			
Night-time (2300-0700 hours)	50	55	60

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

- 4.2.5 The HKPSG requires that the planned fixed noise sources shall comply with a limit of 5 dB(A) below the ANLs shown in **Table 4.3**, or the prevailing background noise levels.

4.3 Assessment Locations

- 4.3.1 The Study Area for noise impact assessment includes all areas within 300m from the Project boundary. Representative Noise Sensitive Receivers (NSRs) located in the closest proximity to the Site Boundary of the proposed redevelopment are identified and detailed in **Table 4.4**. The locations of the NSRs are provided in **Figure 4.1**.

Table 4.4 Representative Noise Sensitive Receivers

NSRs	Uses	Description	No. of Storey	Distance to the Site (m)
N1	Residential	No. 102 Ha Heung Yuen	2	296
N2	Residential	Temporary structure near the south of the project boundary	1	22

- 4.3.2 The selection of noise assessment locations for N1 and N2 would be based on openable window at the ground floor which is considered at the closest distance to the site.

4.4 Background Environment

- 4.4.1 Background noise measurements were carried out to obtain the prevailing noise condition at the vicinity of the Site. The noise measurement was conducted at a representative location within the Site. The measurement result is shown in **Table 4.5**. The location of the background noise measurement is shown in **Figure 4.2** and **Appendix 4.3**.

Table 4.5 Background Noise Levels

Measurement Date	Measurement Time	Measured Noise Level, Leq (30min)	Observed Noise Source(s)
30-Apr-2026	13:30-14:00	55.1	Noise from daily domestic and agricultural activities in the vicinity
	19:30-20:00	57.2	Noise from daily domestic activities in the vicinity
	23:00-23:30	53.1	Noise from daily domestic activities in the vicinity

Note: Free-field noise measurement was conducted. Façade correction of +3dB(A) has been added to the measurement results.

4.5 Impact Review – Construction Phase

General Construction Noise Impact

- 4.5.1 The proposed development is planned to have trial operation in mid or late 2027. It is anticipated that the construction period will be less than 12 months. The construction of the project will involve site formation, ground investigation, excavation, non-percussive piling (using mini-piling), raft footing, and superstructure construction. The major potential noise sources associated with these activities include the use of Powered Mechanical Equipment (PMEs). No percussive piling will be adopted for this project.
- 4.5.2 Typical PMEs to be used for construction include drilling rigs, grout mixer, concrete truck, bar bending machine, vibrator, mobile crane, cutter, generator, air compressor, water pump, dump truck, concrete lorry mixer, and excavator. These PME types are for reference only and will be confirmed by the contractors based on actual construction conditions and programmes. The Contractor is responsible for selecting quiet PMEs to achieve noise reductions through the adopted working methodologies.
- 4.5.3 It is anticipated that the construction works will be conducted during daytime only (i.e. the non-restricted hours between 0700 and 1900 hours on any day except Sundays and general holidays). However, should any construction works involving PMEs be required during restricted hours (i.e. 1900 – 0700 hours of the next day on any day or anytime during Sundays or general holidays), a Construction Noise Permit (CNP) shall be obtained under the NCO.
- 4.5.4 For the control of construction noise during non-restricted hours, the Contractor should implement noise abatement measures as recommended in the ProPECC PN 1/24 to minimise the construction noise during the daytime. The recommended daytime construction noise levels at the façade of sensitive receivers between 0700 and 1900 hours (except Sundays and general holidays) shall be met as far as practicable and are provided in **Table 4.6**.

Table 4.6 Noise Standards for Daytime Construction Activities

Noise Sensitive Uses	Leq (30 mins), dB(A)
Dwelling	75

- 4.5.5 Given the small scale and nature of the project, as well as the anticipated construction period of less than 12 months, construction noise impacts on surrounding NSRs are anticipated to be minimal, provided that the appropriate noise control measures recommended below are implemented.

Mitigation Measures

- 4.5.6 The mitigation measures as per the requirements stated in PN1/24 “Noise from Construction Activities – Non-statutory Controls” should be adopted to minimise the potential noise impacts. These include:
- Scheduling of work - This includes avoiding simultaneous operation of noisy equipment.
 - Siting of facilities - Noisy equipment, such as emergency generators and water pumps, should always be sited as far as possible from noise sensitive receivers. Consideration should also be given to using structures such as temporary stockpiles and site buildings as noise barriers.
 - Selection of quiet equipment - This is one of the most effective measures and is increasingly practicable because of the availability of quiet equipment. For example, the use of a vibro ripper in breaking work, instead of excavator-mounted breakers, can achieve a noise reduction of 15-20 dB(A) and totally remove the annoying impulsive nature of the latter. Similarly, the use of a hydraulic rock drill with a sound power level not exceeding 110 dB(A) can reduce noise by 18 dB(A) when compared with a conventional crawler-mounted pneumatic rock drill. The contractors are allowed to use other types of quiet PME, which can reduce the total sound power levels to meet their needs.
 - Use of temporary acoustic barriers and enclosures – Providing acoustic barriers around construction site boundaries can effectively protect nearby residential uses. In addition, acoustic enclosures can be provided for static PME, such as air compressors and generators.

Good Site Practice

- 4.5.7 Good site practices, arrangements, or techniques on construction sites can provide considerable noise reductions. Examples of these include:
- Using well-maintained and regularly serviced plant during the works;
 - Turning off or throttling down plant that operates on an intermittent basis when not in active use; and
 - Using silencers or mufflers where possible and maintaining them adequately throughout the works;
- 4.5.8 With the implementation of the mitigation measures discussed above, the construction noise impact will be minimised.

4.6 Impact Review – Operational Phase

Fixed Plant Noise Impact Assessment

- 4.6.1 During the operational stage of the proposed facility, potential fixed noise sources include the furnaces, air compressor, and steam boiler, as well as the machinery for post-pyrolysis crushing and electronic appliances processing (e.g., forklifts, bucket elevators, vibratory feeders, twin shaft shredders, hammer mills, swing sifters, rotary airlocks, conveyor belts, magnetic/ gravity separators, cyclones, crushers). These fixed noise sources would be located indoors and fully enclosed by building structures. Fixed noise impacts are anticipated from the exhaust fans louvers and the outdoor air conditioning units; however, as these are located on the north façade of the proposed facility building, there is no direct line of sight to the nearest NSR (N2). These fixed noise impacts should be assessed to ensure compliance with the HKPSG and Noise Control Ordinance (“NCO”). **Figure 4.2** indicates the tentative locations of the louvers and the layout of the facility.

Assessment Criteria

- 4.6.2 The site is only connected to the road extending from Lin Chuk Road, with Wo Keng Shan Road within the 500m assessment area. Based on the 'Annual Traffic Census' issued by the Transport Department (TD) in 2024, there was no traffic flow data for Lin Chuk Road, Wo Keng Shan Road, or their extensions; thus, they are not considered Influencing Factors (IF) in accordance with the IND-TM. The site is also not located within 100m of “Industrial” or “Industrial Estate” zones.
- 4.6.3 The site is classified as a 'Rural area, including country parks or village type developments' and is not affected by an IF, the Area Sensitivity Rating is defined as 'A' according to **Table 4.2**.

4.6.4 The corresponding ANLs for NSRs in the vicinity have been determined, as shaded in **Table 4.7**.

Table 4.7 Acceptable Noise Levels (ANLs)

Time Period	Acceptable Noise Level, Leq 30 mins, dB(A)		
	Area Sensitivity Rating "A"	Area Sensitivity Rating "B"	Area Sensitivity Rating "C"
Day-time (0700 – 1900 hours)	60	65	70
Evening (1900 - 2300 hours)			
Night-time (2300- 0700 hours)	50	55	60

Note: The corresponding ANL for nearby NSRs is shaded in the table above and is 60 dB(A) for daytime and evening. No operations will occur on Sundays, public holidays, or during nighttime (2300–0700 hours).

4.6.5 According to HKPSG, for noise criteria involving planned fixed noise sources, the level of the intruding noise at the façade of the nearest existing sensitive use should be at least 5 dB(A) below the appropriate ANL shown in as shown in **Table 4.7**. In the case where the background is 5 dB(A) lower than the ANL, the intruding noise level should not exceed the background level.

4.6.6 Noise measurement was conducted to measure the background noise level in the vicinity of existing NSRs. According to the results shown in **Table 4.5**, the measured background noise levels are below ANL-5 (55dB(A) during daytime and evening, and 45dB(A) during night-time period). Hence, the measured background noise levels have been adopted as the noise criteria. The summary of noise criteria for the proposed facility is presented in **Table 4.8**. The proposed plant inventory for fixed plant noise assessment and the fixed plant noise calculation is provided in **Appendix 4.1** and **Appendix 4.2** respectively. The background noise measurement results for the fixed plant noise assessment are provided in **Appendix 4.3**.

Table 4.8 Noise Criteria adopted for fixed plant noise impact assessment

Time Period	Noise criteria (Background free field noise level, Leq 30 mins, dB(A))
Day-time (0700 – 1900 hours)	55
Evening (1900 - 2300 hours)	55
Night-time (2300- 0700 hours)	45

4.6.7 The fixed plant noise assessment has been conducted, and the detailed calculation is provided in **Appendix 4.3**. According to the predicted results, the noise impacts to the nearest NSRs are well within the established criteria for daytime and evening periods. Given that the facility will operate from 09:00 to 18:00 (Monday to Saturday) and no equipment or plants will operate on Sundays, public holidays or at night, it is anticipated that no fixed noise plant noise impacts will arise. **Table 4.9** summarises the noise impacts at the NSRs; as these comply with the noise criteria, no noise mitigation measures are necessary.

Table 4.9 Summary of Unmitigated Impacts on Existing NSRs

NSRs	Description	Daytime/ Evening Period, Leq (30min), dB(A) Noise criteria = 55 dB(A)
N1	No. 102 Ha Heung Yuen	46
N2	Temporary structure near the south of the project boundary	54

Note: No operations will occur on Sundays, public holidays, or during nighttime (2300–0700 hours).

5 Water Quality Impact

5.1 Introduction

- 5.1.1 This section discusses the potentials water impacts likely to arise during the construction and operation phases of the proposed facility. Practical mitigation measures are proposed to reduce environmental impacts to an acceptable level, if necessary.

5.2 Environmental Legislation, Standards and Guidelines

- 5.2.1 The relevant legislation and associated guidance applicable to this report for the assessment of water quality impacts include:
- Water Pollution Control Ordinance (WPCO) (Cap. 358) and its subsidiary legislation
 - Technical Memorandum on Standards for Effluents Discharged into Drainage and Sewerage Systems, Inland and Coastal Waters (TM-DSS)
 - Professional Persons Environmental Consultative Committee Practice Note 2/24 Construction Site Drainage (ProPECC PN 2/24)
 - Professional Persons Environmental Consultative Committee Practice Note 1/23 Drainage Plans subject to Comment by the Environmental Protection Department (ProPECC PN 1/23)
 - Chapter 9 “Environment” of the Hong Kong Planning Standards and Guidelines (HKSPG)

Water Pollution Control Ordinance (Cap.358)

- 5.2.2 The Water Pollution Control Ordinance (Cap.358), in existence since 1980, is the major legislation relating to the protection and control of water quality in Hong Kong. According to the Ordinance and its subsidiary legislation, Hong Kong waters are divided into ten water control zones (WCZs). The corresponding statements of Water Quality Objectives (WQOs) are stipulated for different water regimes (marine waters, inland waters, bathing beach, secondary contact recreation, and fish culture subzones) in each of the WCZs based on their beneficial uses.
- 5.2.3 The assessment area is located within the Deep Bay WCZ.

Technical Memorandum

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

ProPECC PN 2/24 Construction Site Drainage

- 5.2.5 The Professional Persons Environmental Consultative Committee Practice Note (ProPECC PN) PN 2/24 – Construction Site Drainage provides guidelines for the handling and disposal of construction discharges. This ProPECC PN is generally applicable for the control of site runoff and wastewater generated during the construction phase of the Project.

ProPECC PN 1/23 Drainage Plan subject to Comment by the Environmental Protection Department

- 5.2.6 ProPECC PN 1/23 – Drainage Plan subject to Comment by the Environmental Protection Department provides guidelines and practices for the handling, treatment and disposal of various effluent discharges to stormwater drains and foul sewers. The design of site drainage and the disposal of various site effluents generated within the works area should follow the relevant guidelines and practices as given in the practice note.

Hong Kong Planning Standards and Guidelines (HKSPG)

- 5.2.7 Chapter 9 of the HKPSG outlines environmental requirements that need to be considered in land use planning. The recommended guidelines and standards present a framework for planning against water pollution and provide guidelines for potentially polluting uses. It also lists out environmental factors that influence land use planning and recommends buffer distances for land uses. It provides additional guidelines against water pollution for sensitive uses such as aquaculture and fisheries zones, water gathering grounds, water intakes, bathing beaches and other contact recreational waters, and sites of ecological sensitivity, including marine parks and marine reserves.

5.3 Baseline Water Quality Conditions

5.3.1 There are no EPD marine or river water quality monitoring stations in the vicinity of the Project site. The nearest EPD marine water quality monitoring station are MM1 in Mirs Bay and DM1 in the Inner Deep Bay, which are located more than 7 km and 15 km from the Project site boundary, respectively. The nearest river water quality monitoring station (GR3) in the River Ganges (Ping Yue River) is located at approximately 1.1 km south of the Project site boundary. The EPD monitoring data collected at GM3 in 2024 is summarised in **Table 5.1**.

Table 5.1 Summary of River Water Quality Monitoring Data at River Ganges (GM3) in 2024

Parameter	River WQOs	Monitoring Station
		GR3
Dissolved Oxygen (mg/L)	≥ 4	7.5 (7.0 – 8.8)
pH	6.5 – 8.5	7.4 (7.0 – 8.2)
Suspended solids (mg/L)	≤ 20	16.5 (0.5 – 170.0)
5-day Biochemical Oxygen Demand (mg/L)	≤ 3	3.7 (0.7 – 12.0)
Chemical Oxygen Demand (mg/L)	≤ 15	8 (4 – 40)
Oil & grease (mg/L)	NA	<0.5 (<0.5 – 0.6)
<i>E. coli</i> (cfu/100mL)	NA	1495 (110 – 15000)
Faecal coliforms (cfu/100mL)	NA	9416 (260 – 170000)
Ammonia-nitrogen (mg/L)	NA	0.150 (0.056 – 0.860)
Nitrate-nitrogen (mg/L)	NA	0.340 (0.170 – 1.400)
Total Kjeldahl nitrogen (mg/L)	NA	0.36 (0.17 – 1.60)
Ortho-phosphate phosphorus (mg/L)	NA	0.015 (<0.008 – 0.027)
Total phosphorus (mg/L)	NA	0.04 (<0.02 – 0.19)
Sulphide (mg/L)	NA	<0.02 (<0.02 – <0.08)
Aluminium (µg/L)	NA	<50 (<50 – 70)
Cadmium (µg/L)	NA	<0.1 (<0.1 – <0.1)
Chromium (µg/L)	NA	<1 (<1 – 2)
Copper (µg/L)	NA	1 (<1 – 3)
Lead (µg/L)	NA	<1 (<1 – <1)

Parameter	River WQOs	Monitoring Station
		GR3
Zinc (µg/L)	NA	<10 (<10 – 150)
Flow (m ³ /s)	NA	0.048 (0.005 – 0.936)

Source: EPD River Water Quality in Hong Kong in 2024

Notes:

1. Data presented are in annual medians of monthly samples; except those for faecal coliforms and E. coli which are in annual geometric means.
2. Figures in brackets are annual ranges.
3. NA indicates not applicable.
4. “cfu” represents colony forming unit.
5. Values at or below laboratory reporting limits are presented as laboratory reporting limits.
6. Equal values for annual medians (or geometric means) and ranges indicate that all data are the same as or below laboratory reporting limit.

5.3.2 According to the River Water Quality in Hong Kong in 2024, which is the latest available information from the EPD, the WQO compliance rate of the River Ganges was 77%. The upstream station of the River Ganges (GR3) was rated as “Excellent” in the Water Quality Index (WQI), while the midstream station (GR2) and downstream station (GR1) were rated as “Fair” and “Good” respectively.

5.4 Impact Review – Construction Phase

- 5.4.1 The proposed facility will involve foundation works and building construction. As land-based construction activities with a limited extent of excavation work are expected to be undertaken, potential water quality impacts during construction phase will mainly related to the surface runoff from the handling of construction materials, foundation works, excavation and superstructure works, accidental chemical spills and sewerage from the workforce.
- 5.4.2 The key water quality issues associated with construction activities include surface runoff generated from general cleaning, wheel washing and water spraying for dust suppression. These types of wastewater would contain high concentrations of suspended solids (SS). The release of uncontrolled construction site runoff would increase SS levels and turbidity in the nearby water environment. Proper control of the stormwater runoff is necessary to prevent uncontrolled construction site runoff from being washed into the surrounding water sensitive receivers.
- 5.4.3 The effects on water quality from general construction activities are likely to be minimal, provided that site drainage is well maintained and good construction practices are implemented in accordance with ProPECC PN No. 2/24. A discharge license will be obtained in accordance with WPCO requirements before any wastewater is discharged from the site to storm drains or foul sewers. All site discharges will be pre-treated as necessary, in accordance with the WPCO, the discharge license conditions, and the relevant standards listed in the TM-DSS.
- 5.4.4 Accidental spillage of chemicals and sewerage from the workforce in the works areas may also contaminate surface soils. These contaminated soil particles may then be washed away by construction site runoff. This wastewaters should not be directly discharged into nearby drainage systems; otherwise, it could cause significant impacts on water quality.

Mitigation Measures

- 5.4.5 Good site practices are essential to control construction site runoff and accidental chemical spills. Recommended good site practices, according to Professional Persons Environmental Consultative Committee Practice Note 2/24 Construction Site Drainage (ProPECC PN 2/24), are listed below. With the implementation of these mitigation measures, adverse water quality impacts are not expected to arise from the construction works of the Project.
- At the start of site establishment, perimeter cut-off drains should be constructed to direct off-site water around the site, along with internal drainage works and erosion and sedimentation control facilities implemented. Channels (both temporary and permanent drainage pipes and culverts), earth bunds, or sand bag barriers should be provided on site to direct stormwater to silt removal facilities. The design of the temporary on-site drainage system will be undertaken by the Contractor prior to the commencement of construction.
 - The dikes or embankments for flood protection should be provided around the boundaries of earthwork areas. Temporary ditches should be provided to facilitate runoff discharge into storm drains via silt or sediment traps. These traps should be incorporated into the permanent drainage channels to enhance deposition rates.
 - The design of efficient silt removal facilities should be based on the guidelines in Appendix A1 of ProPECC PN 2/24. The detailed design of the sand/silt traps should be undertaken by the Contractor prior to the commencement of construction.

- Construction works should be programmed to minimise surface excavation works during the rainy season (April to September). All exposed earth areas should be stabilised and vegetated as soon as possible after earthworks are completed. If soil excavation cannot be avoided during the rainy season, or at any time of year when rainstorms are likely, exposed slope surfaces should be covered by tarpaulin or other means. Temporary access roads should be protected by crushed stone or gravel as excavation proceeds. Intercepting channels should be provided (e.g., along the crest/edge of excavation) to prevent storm runoff from washing across exposed soil surfaces. Arrangements should be in place to ensure that adequate surface protection measures can be safely carried out well before the arrival of a rainstorm.
- All drainage facilities and erosion and sediment control structures should be regularly inspected and maintained to ensure proper and efficient operation at all times, particularly following rainstorms. Deposited silt and grit should be removed regularly and disposed of by spreading them evenly over stable, vegetated areas.
- Measures should be taken to minimise the ingress of site runoff into excavations. If excavation in wet periods is necessary, it should be conducted and backfilled in short sections wherever practicable. Water pumped out from trenches or foundation excavations should be discharged into storm drains via silt removal facilities.
- All open stockpiles of construction materials (e.g., aggregates, sand and fill material) should be covered with tarpaulin or similar fabric during rainstorms. Measures should be taken to prevent construction materials, soil, silt or debris from washing into any drainage system.
- Manholes (including newly constructed ones) should always be adequately covered and temporarily sealed to prevent silt, construction materials or debris from being washed into the drainage system and to prevent storm runoff from being directed into foul sewers.
- Precautions to be taken at any time of year when rainstorms are likely, as well as actions required when a rainstorm is imminent or forecasted, and during or after rainstorms, are summarized in Appendix A2 of ProPECC PN 2/24. Particular attention should be paid to the control of silty surface runoff during storm events.
- All vehicles and plant should be cleaned before leaving a construction site to ensure no earth, mud, debris or the like is deposited on roads. Adequately designed and sited wheel washing facilities should be provided at every construction site exit where practicable. Wash-water should have sand and silt settled out and removed at least on a weekly basis to ensure the continued efficiency of the process. The section of access road leading to, and exiting from, the wheel-wash bay to the public road should be paved with sufficient backfall toward the wheel-wash bay to prevent vehicle tracking of soil and silty water onto public roads and drains.
- Oil interceptors should be provided in the drainage system downstream of any oil or fuel pollution sources. The oil interceptors should be emptied and cleaned regularly to prevent the release of oil and grease into the stormwater drainage system, particularly after an accidental spillage. A bypass should be provided for the oil interceptors to prevent the flushing of collected pollutants during heavy rain.
- Construction solid waste, debris and rubbish on site should be collected, handled and disposed of properly to avoid water quality impacts.
- Water used in ground boring and drilling for site investigation or rock/soil anchoring should, as far as practicable, be recirculated after sedimentation. When there is a need for final disposal, the wastewater should be discharged into storm drains via silt removal facilities.

5.4.6 The closest public toilet to the proposed facility is located the Chuk Yuen Village Public Toilet. Nevertheless, mobile chemical toilets shall be provided for the workers during the construction stage as a backup. Regular desludging shall be carried out to maintain proper hygiene.

5.5 Impact Review – Operational Phase

- 5.5.1 The “ProPECC PN 1/23, Drainage Plans subject to Comments by Environmental Protection Department”, provides guidelines and practices for the handling, treatment and disposal of various effluent discharges to stormwater drains and foul sewers. The design of site drainage and the disposal of site effluents generated within the proposed facility should follow the relevant guidelines and practices as given in the ProPECC PN 1/23.
- 5.5.2 According to the Sewerage Impact Assessment (SIA) provided separately in this Section 16 Planning Application, the possible impacts on the local sewerage network due to the operation of the proposed facility have been evaluated. The major sources of sewage at the facility mainly come from the staff toilets and the manufacturing activities. Residual condensation water from the steam boiler and the carbonisation furnace is collected by the floor drainage system and discharged as sewage. No kitchen or shower services are provided at the proposed facility. The wastewater generated from the operation of the proposed facility will be conveyed to the Flow Chamber “FCH1005171” through underground plastic piping, subject to EPD and Drainage Services Department (DSD) approval. With reference to the SIA, sewage generated from the proposed facility, which consists of condensed vapour from the boilers and sewage from employee toilets would amount to an Average Dry Weather Flow (ADWF) of 38.10m³/ day, and a peak flow of about 7L/s, based on 9 hours of daily operation.
- 5.5.3 There is no public sewerage system in the vicinity of the site. The existing DSD NENT Leachate Pumping Station nearby the site currently receives leachate collected from the nearby landfill and conveys this to Shek Wu Hui Sewage Treatment Works via a twin 150mm diameter rising main system. An E&M upgrade to the pumping station is scheduled for completion by mid-2027. Following this upgrade, sewage from the proposed facility is proposed to be discharged to the wetwell of the pumping station (i.e. M/H FCH100517) after the upgrading of the pumping station via a 100mm diameter rising main to be constructed by the proponent for sewage discharge to the existing wetwell of the NENT Leachate Pumping Station.
- 5.5.4 The assessment findings in the SIA demonstrated and confirmed that the quantity of the discharge generated by the operation of the project is expected to be insignificant compared to the capacity of the existing NENT Leachate Pumping Station. Therefore, adverse impacts on water quality during the operation phase of the Project are not anticipated.
- 5.5.5 Prior to the commencement of construction, the proponent shall submit the particulars of the connection details to DSD for agreement before the commencement of work.

6 Waste Management

6.1 Introduction

- 6.1.1 This section identifies the types of waste that are likely to be generated during the construction of the proposed facility and evaluates the associated waste management implications that may result from these waste types.

6.2 Environmental Legislation, Standards and Guidelines

- 6.2.1 The relevant legislation and associated guidance applicable to this PER for the review of waste management implications include:

- Waste Disposal Ordinance (WDO) (Cap. 354)
- Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C)
- Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)
- Public Health and Municipal Services Ordinance (Cap. 132) – Public Cleansing and Prevention of Nuisances Regulation
- Land (Miscellaneous Provisions) Ordinance (Cap. 28)
- Development Bureau Technical Circular (Works) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials (“DEVB TC(W) No. 6/2010”)
- Project Administration Handbook for Civil Engineering Works (PAH), Paragraph 4.1.3 of Chapter 4 “Construction and Demolition Materials” (subsumed from WBTC Nos. 25/99, 25/99A, 25/99C “Incorporation of Information on Construction and Demolition Material Management in Public Works Subcommittee Papers” and ETWB TCW No. 33/2002 “Management of Construction & Demolition Materials Including Rock”)
- Building Department Practice Note for Registered Contractors (“PNRC 17”), Control of Environmental Nuisance from Construction Sites
- Building Department’s Practice Notes for Authorized Persons (PNAP), Registered Structural Engineers and Registered Geotechnical Engineers No. ADV-19 Construction and Demolition Waste
- Environmental, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness
- Environmental, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 22/2003A, Additional Measures to improve Site Cleanliness and Control Mosquito Breeding on Construction Sites
- Code of Practice of the Packaging, Labelling and Storage of Chemical Waste, EPD (2022)
- A Guide to the Chemical Waste Control Scheme, EPD (2022)

Waste Disposal Ordinance (Cap. 354)

- 6.2.2 The Waste Disposal Ordinance (WDO) was enacted to provide the statutory framework for the management of all wastes, from where their point of final disposal, including control over the collection, treatment and disposal of waste. The WDO prohibits any person from using any land or premises for the disposal of wastes unless they have been authorised by, or have obtained a license from the waste disposal authority.

Waste Disposal (Chemical Waste) (General) Regulation (Cap.354C)

- 6.2.3 Under the WDO, the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C) regulates the chemical waste control and governs the possession, storage, collection, transport and disposal of chemical wastes. The EPD has also issued three statutory guidelines:
- A Guide to the Chemical Waste Control Scheme, which introduces and explains the legislative controls over the management of chemical waste in Hong Kong;
 - A Guide to the Registration of Chemical Waste Producers, which introduces the registration provisions of the Waste Disposal (Chemical Waste) (General) Regulation and the procedure for identifying chemical waste generation; and
 - Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes, which details how the chemical waste producers should comply with the regulations on chemical waste.

Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap. 354N)

- 6.2.4 Construction waste, as defined under the Waste Disposal (Charges for Disposal of Construction Waste) Regulation (Cap.354N), includes any substance, matter or thing generated from construction work and abandoned, whether or not it was processed or stockpiled before abandonment. It does not, however, include sludge, screenings or matter removed or generated from desludging, desilting or dredging works. This regulation stipulates that construction waste delivered to a landfill must not contain more than 50% inert material by weight; construction waste delivered to a sorting facility for disposal must contain more than 50% inert material by weight; and construction waste delivered to a public fill reception facility (PFRF) must consist entirely of inert material.

Public Health and Municipal Services Ordinance (Cap. 132)

- 6.2.5 The Public Cleansing and Prevention of Nuisances Regulation under the Public Health and Municipal Services Ordinance (Cap. 132) regulates the dumping of litter in public places. PNAP ADV-19 (Construction and Demolition Waste) provides guidelines for Authorized Persons (AP), Registered Structural Engineers (RSE), and Registered Geotechnical Engineers (RGE) to minimise construction and demolition (C&D) waste, encourage on-site sorting, and promote the reuse of inert materials.

Land (Miscellaneous Provisions) Ordinance (Cap. 28)

- 6.2.6 The inert portion of construction and demolition (C&D) materials (including rocks, soil, broken concrete, building debris, etc.) may be taken to PFRFs. PFRFs usually form part of land reclamation schemes and are operated by the Civil Engineering & Development Department (CEDD).
- 6.2.7 The Land (Miscellaneous Provisions) Ordinance (Cap. 28) requires that individuals or companies delivering public fill to the public filling facilities to obtain Dumping Licences. The licences are issued by CEDD under delegated authority from the Director of Lands.

Development Bureau Technical Circular (Works) No. 6/2010, Trip Ticket System for Disposal of Construction & Demolition Materials

- 6.2.8 Under DEVB TC(W) No. 6/2010 - Trip Ticket System for Disposal of Construction and Demolition Materials, for all contracts expected to generate inert C&D materials requiring disposal from the site, the project office should write to the Public Fill Committee (PFC) through the Secretary of the PFC to request a designated disposal ground for incorporation into the tender documents.
- 6.2.9 For contracts where the estimated amount of non-inert C&D materials requiring disposal at landfill facilities equals or exceeds 50 m³, the project office should seek confirmation from the Director of Environmental Protection (DEP) regarding the availability of landfill facilities; the DEP will then designate facilities, if available. For contracts where the estimated amount of non-inert C&D materials is less than 50 m³, the project office is not required to apply to the DEP for designated facilities but should still specify the appropriate landfill facilities for disposal in the tender documents.

Project Administration Handbook for Civil Engineering Works (PAH), Chapter 4

- 6.2.10 According to Paragraph 4.1.3, Chapter 4 of the Project Administration Handbook for Civil Engineering Works (PAH), CEDD requires the enhancement of C&D material management and the minimisation of waste at the source. This includes the preparation of a Construction and Demolition Material Management Plan (C&DMMP) during the early design stage.

Building Department Practice Note for Registered Contractors (PNRC 17)

- 6.2.11 *Building Department Practice Note for Registered Contractors (“PNRC 17”) - Control of Environmental Nuisance from Construction Sites*, outlines mandatory requirements for registered contractors to minimise construction site nuisances in Hong Kong. It addresses environmental nuisance including waste disposal, dust suppression, noise control, and wastewater treatment, aiming to protect the surrounding environment and public health. Contractors must adopt best practices to mitigate pollution and comply with environmental regulations.

PNAP ADV-19 (Construction and Demolition Waste)

- 6.2.12 *Building Department’s Practice Notes for Authorized Persons (PNAP), Registered Structural Engineers and Registered Geotechnical Engineers No. ADV-19 Construction and Demolition Waste* provides guidelines for Authorized Persons (AP), Registered Structural Engineers (RSE), and Registered Geotechnical Engineers (RGE) to minimise construction and demolition (C&D) waste, encourage on-site sorting, and promote the reuse of inert materials.

ETWB (W) No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness

- 6.2.13 *Environmental, Transport and Works Bureau (ETWB) Technical Circular (Works) No. 6/2002A, Enhanced Specification for Site Cleanliness and Tidiness* mandates an Enhanced Specification for Site Cleanliness and Tidiness for public works contracts, introducing specific operational and administrative duties for contractors to maintain high hygiene standards.

ETWB (W) No. 22/2003A, Additional Measures to improve Site Cleanliness and Control Mosquito Breeding on Construction Sites

- 6.2.14 The ETWB Technical Circular (Works) No. 22/2003A outlines mandatory measures for public works contractors in Hong Kong, including improved site housekeeping and waste management to maintain cleanliness and prevent mosquito breeding.

EPD’s Code of Practice of the Packaging, Labelling and Storage of Chemical Waste (2022)

- 6.2.15 The EPD’s Code of Practice on the Packaging, Labelling and Storage of Chemical Waste provides statutory guidance under the Waste Disposal (Chemical Waste) (General) Regulation in Hong Kong. It aims to ensure chemical waste is handled safely, minimising danger to health and environmental pollution before disposal.

A Guide to the Chemical Waste Control Scheme, EPD (2022)

- 6.2.16 *A Guide to the Chemical Waste Control Scheme* outlines Hong Kong's statutory controls on chemical waste management, focusing on proper handling from generation to disposal. It requires waste producers to register with the EPD, ensures safe on-site storage, packaging, and labelling, and mandates the use of licensed collectors.

6.3 Impact Review – Construction Phase

- 6.3.1 The proposed facility are located on a vacant land without existing structures. Small-scale site formation, foundation, and building construction will be conducted onsite. These activities are expected to generate a variety of wastes, which can be divided into categories based on their composition and ultimate method of disposal. The identified waste types include:
- Construction and demolition (C&D) materials;
 - Chemical wastes
 - General refuse.
- 6.3.2 Descriptions of each waste type and their potential impacts are detailed below.

Construction and Demolition (C&D) Materials

- 6.3.3 The majority of C&D materials generated during the construction stage would be from site formation and foundation works. All excavated materials shall be sorted into inert and non-inert C&D materials. The inert portion will mainly comprise concretes, asphalt, rocks, soils, and other soft organic materials, while the non-inert portion will comprise vegetation and wooden materials, and may also consist of small amounts of metals and general refuse.
- 6.3.4 Where practicable, the Contractor shall be encouraged to minimise C&D material volumes requiring off-site transport or disposal. Disposal outlets, such as public fill reception facilities, shall be identified for inert materials if no on-site reuse opportunities exist. Non-inert C&D materials should be reused or recycled as far as possible; any recyclable materials (e.g., metal or paper packaging) will be segregated and collected by a recycling contractor. The remaining non-inert C&D material will be disposed of at a landfill site. Landfill disposal should be considered a last resort for waste handling. The estimated quantity of C&D material generated from the construction of the Project is presented in **Table 6.1**.
- 6.3.5 The estimated quantities of inert and non-inert C&D materials to be generated during the construction phase are summarized in **Table 6.1**. The estimation of inert C&D material is based on building record plans, while the estimation for non-inert C&D material is based on site observations (e.g., vegetation).

Table 6.1 Estimated Quantity of C&D Materials Generated during Construction Phase

Inert C&D Materials (m ³)	Non-Inert C&D Materials (m ³)
3300	30

Chemical Waste

- 6.3.6 Chemicals are expected to be used during construction. These may include surplus adhesives, spent paints, petroleum products, lubrication oil, grease, mineral oil, spent acid/alkaline solutions, and other solvents. Accidental spillage in work areas may contaminate surface and sub-surface soils.
- 6.3.7 The volume of chemical waste generated will depend on the number of plants and vehicles and the frequency of on-site maintenance. It is anticipated that the total quantity will be limited to a few cubic meters per month.
- 6.3.8 Under the Waste Disposal (Chemical Waste) (General) Regulation, the Contractor must register with the EPD as a chemical waste producer and follow the “Code of Practice on the Packaging, Labelling and Storage of Chemical Wastes.” Quality containers compatible with the waste must be used, with incompatible chemicals stored separately. Labels must be securely attached to each container indicating characteristics such as explosive, flammable, oxidizing, irritant, toxic, harmful, or corrosive. The Contractor will use a licensed collector to transport and dispose of wastes at the approved Chemical Waste Treatment Centre or licensed recycling facilities.

General Refuse

- 6.3.9 The workforce will generate refuse comprising food scraps, paper waste, empty containers, and other materials. Such refuse will be properly stored in a designated area prior to collection and disposal. Disposal of refuse at sites other than approved waste transfer or disposal facilities is prohibited. Effective collection of the on-site wastes will prevent waste materials from being blown around by wind or creating odour nuisances, pests or vermin problems. Waste storage areas will be well maintained and cleaned regularly. The waste will be disposed of at designated landfill site (i.e., North East New Territories Landfill (NENT)).
- 6.3.10 To minimise the disposal quantities of general refuse, recycle bins for different types of recyclables should be provided alongside general refuse bins. Arrangements should be made with recycling contractors to collect the recycled material regularly. The Contractor shall provide briefing for workers regarding the avoidance, reduction, reuse and recycling of general refuse during induction training.
- 6.3.11 It is assumed that a maximum of 20 workers will work simultaneously at the Project site during construction phase. The quantity of general refuse generated per day is estimated to be 29.2 kg (assuming a waste generation rate of 1.46 kg per person per day). With the implementation of good waste management practices, adverse environmental impacts are not expected to arise from the storage, handling and transportation of workforce wastes.

Mitigation Measures

- 6.3.12 In line with the Hong Kong Government's position on waste minimisation, the practice of avoiding and minimising waste generation, as well as waste recycling, should be adopted as far as practicable throughout the construction phase. With implementation of the mitigation measures recommended below, no adverse waste management impact are anticipated.
- Waste management shall be controlled through contractual requirements as well as through statutory requirements.
 - The Contractor should reuse as much inert C&D materials as possible on-site. Inert and non-inert C&D waste should be segregated and stored in separate containers or skips to enhance reuse or recycling and ensure proper disposal.
 - As part of the Environmental Management Plan (EMP), a Waste Management Plan (WMP) should be developed by the Contractor and submitted to Architect/Engineer for approval before the commencement of any construction works. This should be based on the requirements of *Building Department's Practice Notes for Authorized Persons, Registered Structural Engineers and Registered Geotechnical Engineers No. ADV-19 Construction and Demolition Waste*. The objectives of the WMP are to identify potential environmental impacts, recommend appropriate waste handling, collection, sorting, disposal and recycling measures in accordance with current regulations, and permit the segregation of C&D materials where practicable (i.e. inert C&D materials/non-inert C&D materials) for reuse, recycling, or disposal at recycling facilities , public fills or landfills.
 - The Contractor should adopt good housekeeping practices with reference to the WMP. In addition to providing stockpiling and segregating areas on-site, effective collection of wastes is required to prevent materials from being blown by wind, flushed into nearby waters, or creating odour nuisance or pest and vermin problems. Waste storage areas should be well-maintained and cleaned regularly.
 - Mitigation measures listed in *Practice Note for Registered Contractors No. 17 Control of Environmental Nuisance from Construction Sites* shall be adopted. C&D materials shall be delivered to the designated outlets by dump trucks fitted with covered box type dump bed to minimise potential nuisance during transportation of waste. Refuse pending removal should be stored in receptacles with close-fitting covers to prevent leaching under inclement weather conditions such as heavy rainfall.
 - A trip-ticket system should be established in accordance with the Waste Disposal (Charges for Disposal of Construction Waste) Regulation to monitor disposal at public filling facilities and landfills, and to control fly-tipping. A trip-ticket system should be included as one of the contractual requirements for the contractor to strictly implement.
 - Whenever there are excess recyclable construction materials (e.g., bricks, plastics and metals), reuse and recycling should be carried out as far as practicable to minimise the amount of waste disposal. Other inert non-recyclable materials such as concrete, asphalt, should be treated as public fill. Surplus non-inert C&D materials and non-recyclable wastes should be disposed at designated landfill site.
 - For general refuse, recycle bins for different types of recyclable waste should be provided alongside general refuse bin to ensure proper separation from C&D materials. Arrangements should be made with the recycling companies to collect the recycle waste regularly. A reputable waste collector should be employed to remove general refuse from the site. Preferably an

enclosed and covered area should be provided to reduce the occurrence of “wind-blown” materials.

- Contractors should register as Chemical Waste Producer if any chemical waste is generated. A licensed collector shall be employed for handling and disposal of the chemical wastes, if any. In addition, any chemical waste generated should be handled in accordance with EPD’s Code of Practice on the Packaging, Labelling and Storage Chemical Waste.

6.4 Impact Review – Operational Phase

- 6.4.1 During operational phase, black powders will be generated from pyrolysis. The black powders mainly consist of two forms: lithium iron phosphate black powder and ternary lithium black powder. The main components of the black powders include lithium iron phosphate (LiFePO_4), layered nickel–cobalt–manganese ternary materials (NCM materials) ($\text{LiNi}_x\text{Co}_y\text{Mn}_z\text{O}_2$), graphite/ carbon materials, other metals such as aluminium, copper and iron. The recovered metals will be delivered to recycling companies, while the remaining black powders will be exported to Mainland China or Japan. The estimated amount of the solid products or waste materials generated from the battery recycling process is shown in **Table 6.2**.
- 6.4.2 Plastics, metals (including iron, aluminium, steel, and copper), PCBs, glass, and LCD/LED panels, as well as lithium batteries, will be generated and separated during the dismantling process of recycling electrical appliances. The recovered metals and plastics will be delivered to downstream recycling companies. The PCBs and LCD/LED panels will be sent to the designated Waste PCB and Waste LCD/LED Disposal Section of the Vannex International Limited factory. The waste batteries will be transferred to the Waste Batteries Disposal Section of the Vannex International Limited factory for further treatment. . Meanwhile, non-recyclable and non-hazardous solid waste will be disposed of at a landfill. Details of the material generation are shown in **Figures 2.5 to 2.9**, and the estimated amount of recovered materials or waste generated is shown in **Table 6.2**.

Table 6.2 Estimated Quantity of C&D Materials Generated during Operation Process

Material Generated	Estimated Quantity Generated during the Recycling Process (Tonne per day)						Approximate Amount in Total (Tonne per day)
	Battery	TV monitor	Computer Notebook	Tablet Computer	Printer	Scanner	
Metals	3.8	1	0.2	0.1	0.4	<0.1	5.5
Black powders	3.2	-	-	-	-	-	3.2
Plastics	-	0.4	0.1	0.1	0.3	0.1	1.0
Printed Circuit Boards (PCBs)	-	0.2	<0.1	0.1	<0.1	<0.1	0.3
LCD Glass	-	0.2	-	0.1	-	-	0.3
Cold Cathode Fluorescent Lamp (CCFL) Tubes	-	<0.1	-	-	-	-	<0.1
LCD/ LED Panels	-	-	<0.1	0.1	-	-	0.1

Material Generated	Estimated Quantity Generated during the Recycling Process (Tonne per day)						Approximate Amount in Total (Tonne per day)
	Battery	TV monitor	Computer Notebook	Tablet Computer	Printer	Scanner	
Glass (other than LCD Glass)	-	-	-	-	-	0.1	0.1
Lithium batteries	-	-	<0.1	0.1	-	-	0.1
Ink/ Toner Cartridges	-	-	-	-	0.1	-	0.1
Others (HDD, cables, sensors, sponge, etc)	-	-	<0.1	<0.1	<0.1	<0.1	<0.4

Chemical Waste

6.4.3 Chemical waste is expected to be generated from the extraction of coolant from batteries (e.g., electric vehicle (EV) batteries) and from the maintenance of plant and equipment during the operation of the facility. The volume produced will depend on the type of batteries recycled. It is anticipated that the main source of chemical waste will be the extraction of EV battery coolant, which mainly consists of ethylene glycol and is classified as a non-halogenated organic solvent and compound under the Waste Disposal (Chemical Waste) (General) Regulation (Cap. 354C), Schedule 1, Part B. The facility is expected to handle no more than 8 tonnes of EV batteries per day. Significant quantities of chemical waste are not anticipated to arise from recycling activities. The daily generation is expected to be no greater than 0.1 tonne. Nevertheless, the following practices are recommended during the operation of the facility.

- The Operator should register as a Chemical Waste Producer if any chemical waste is generated. A licensed collector shall be employed for the handling and disposal of chemical waste. In addition, any chemical waste generated should be handled in accordance with the EPD's *Code of Practice on the Packaging, Labelling and Storage of Chemical Waste*. Spent chemicals shall be stored and collected by an approved operator for disposal at a licensed facility in accordance with the *Chemical Waste (General) Regulation*.
- All chemical storage areas shall be provided with locks and be sited on sealed areas. These areas shall be surrounded by bunds with a capacity equal to 110% of the storage capacity of the largest tank to prevent spilled oil and chemicals from contaminating the ground
- Management of chemical waste is implemented through the control of waste storage, labelling, transportation, and treatment at an appropriate facility.

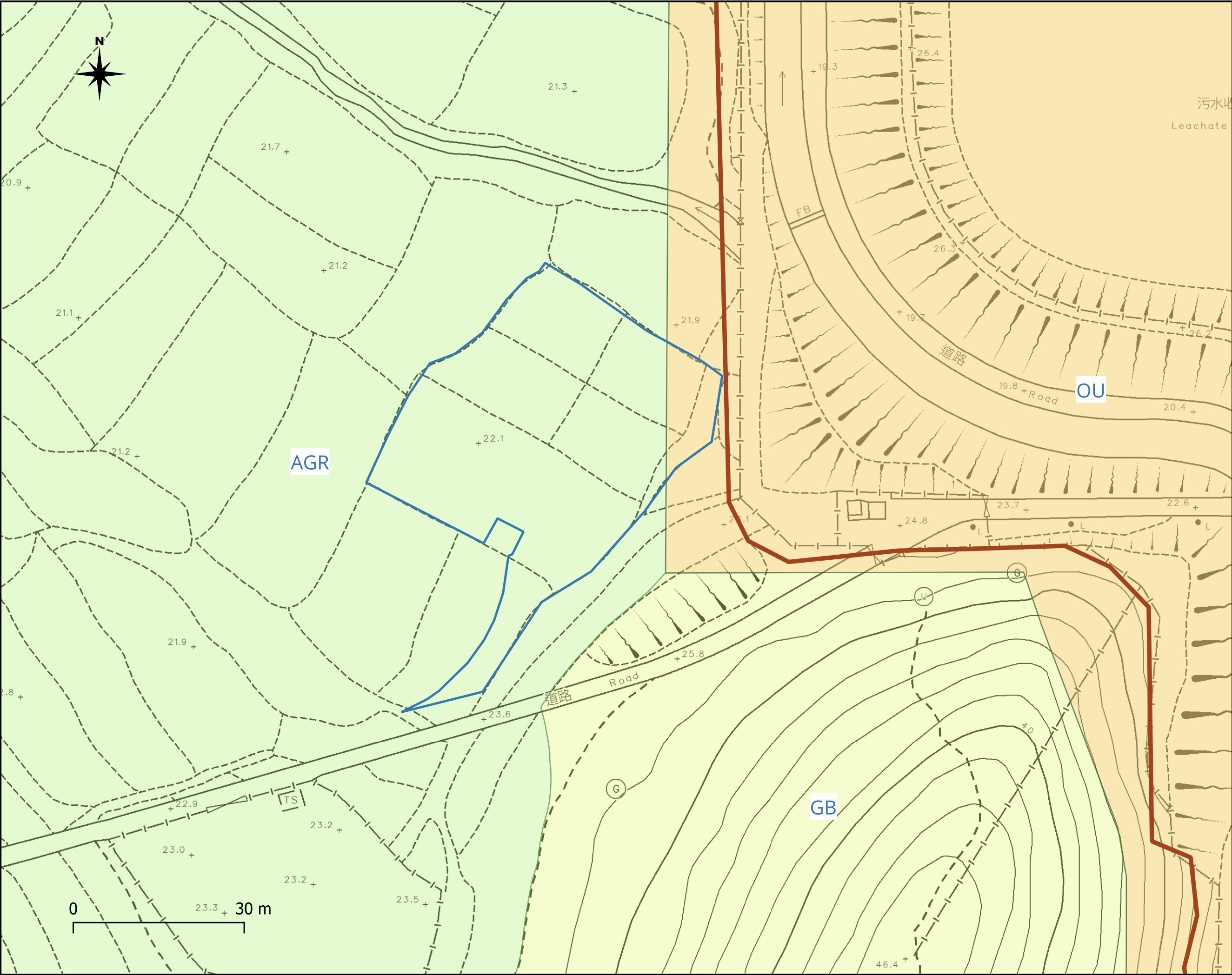
General Refuse

- 6.4.4 General refuse anticipated from the proposed development include daily operation of staffs.. Waste would include general food waste and other recyclable including paper, glass and metal containers, etc. According to the EPD's "Monitoring of Solid Waste in Hong Kong – Waste Statistics for 2024", the five-year average (2020 to 2024) per capita general refuse disposal rate is 1.46kg/person/day. It is assumed that a maximum of 60 workers for the operation. The quantity of general refuse generated per day is estimated to be 87.6 kg. All general refuse should be recycled wherever possible, and landfill disposal should only be adopted as a last resort. The recyclables will be properly sorted and stored within the Site for further collection. For food waste, the implementation of appropriate recycling measures will be considered during the operational phase, subject to further detailed feasibility study.
- 6.4.5 General refuse generated during the operational stage will be collected at the refuse collection point provided within the Site for further collection. The waste management practice will comply with the statutory requirements.
- 6.4.6 With the implementation of good waste management practices at the Site, adverse environmental impacts caused by storage, handling, transport and disposal of general refuse are not anticipated.

7 Conclusion

- 7.1.1 The potential environmental impacts during the construction and operation phase of proposed facility have been identified and evaluated in this Environmental Assessment Report. The EA report concludes that the construction and operation of the proposed facility would be environmentally acceptable and in compliance with the environmental legislation and standards. With the implementation of the recommended environmental mitigation measures, no adverse environment impact from the proposed development is anticipated.

FIGURES



Legend:

- Project site boundary
- Boundary of North New Territories (NENT) Landfill and its extension (NENTX)
- Temporary structure
- Footbridge
- Artificial slope
- Grave
- Burial urn
- Land use under outline zoning plans:
 - Agriculture
 - Other specific uses (Landfill)
 - Green belt

Drawing Title:

Site Layout Plan

Drawing No.:

Figure 2.1

Prepared by:

CL

Date:

28 Apr 2026

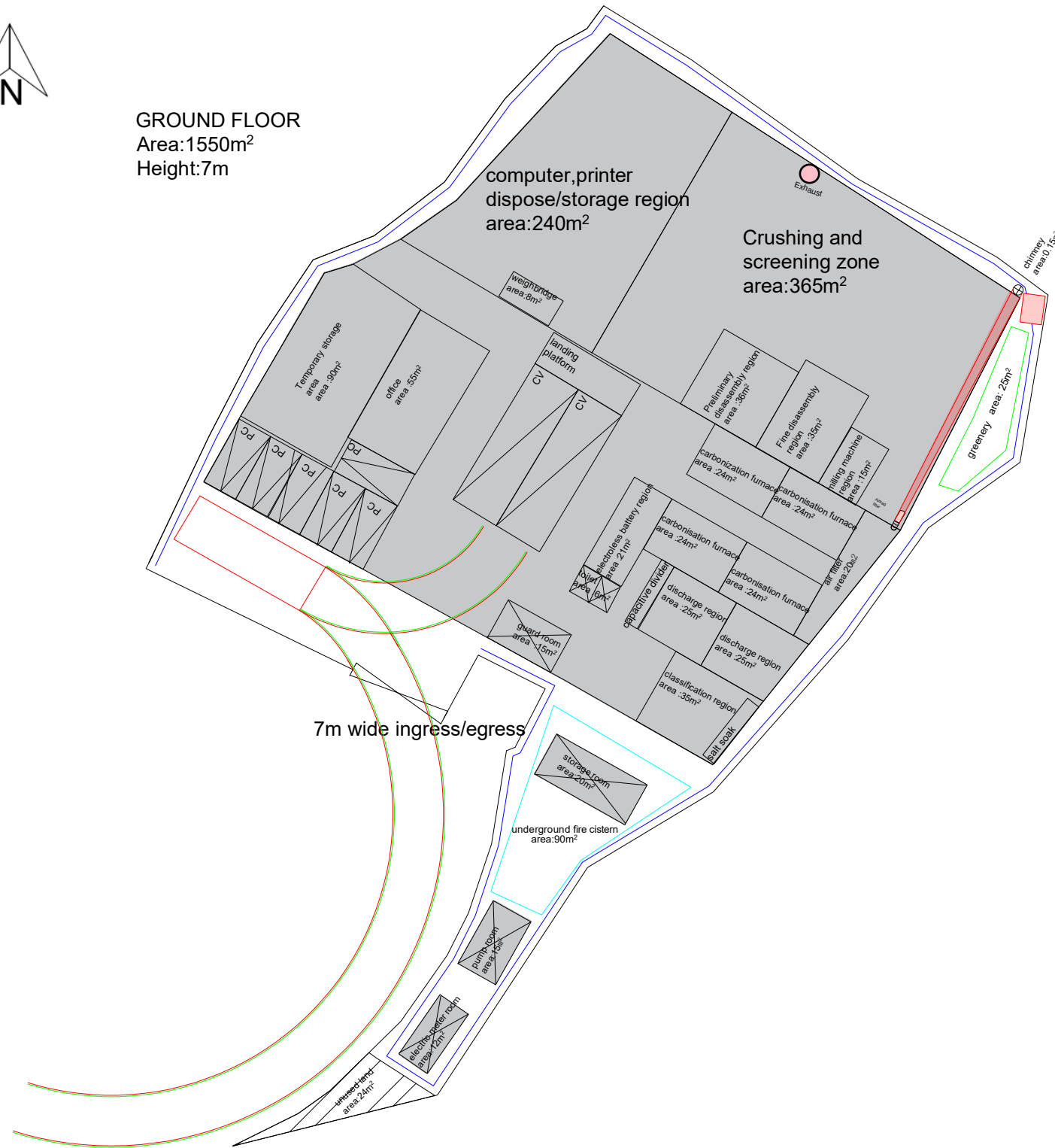
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GROUND FLOOR
Area:1550m²
Height:7m



Legend:

- Project site boundary
- Structure
- Workshop partition
- Parking space
- Loading/unloading space
- Swept path of vehicle
- Ingress/ egress
- Greenery
- Underground fire cistern
- Drainage channel
- Unused land
- Gas filtration system
- Chimney outlet (25m above the ground)
- Exhaust point for crushing line

Drawing Title:

Ground Floor Layout Plan

Drawing No.:

Figure 2.2a

Edited by:

CL

Date:

28 Apr 2026

Revision:

0



FIRST FLOOR
Area:1550m²
Height:3m

Elevator



Legend:

- Drainage
- ▨ Structure
- ▨ Workshop partition
- Elevator
- - - Storage region
- ✕ Ingress/ egress

Drawing Title:

First Floor Layout Plan

Drawing No.:

Figure 2.2b

Edited by:

CL

Date:

28 Apr 2026

Revision:

0

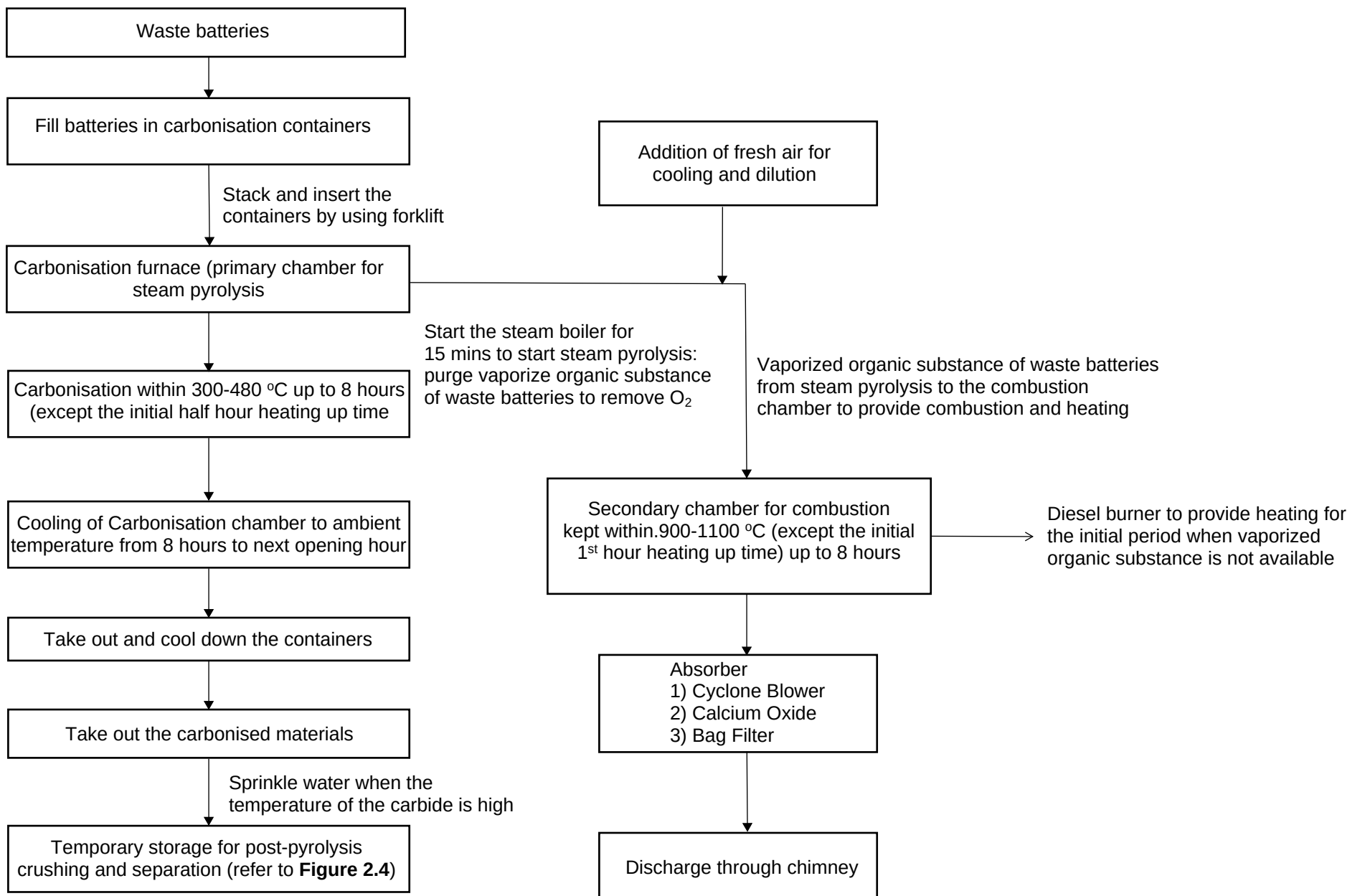
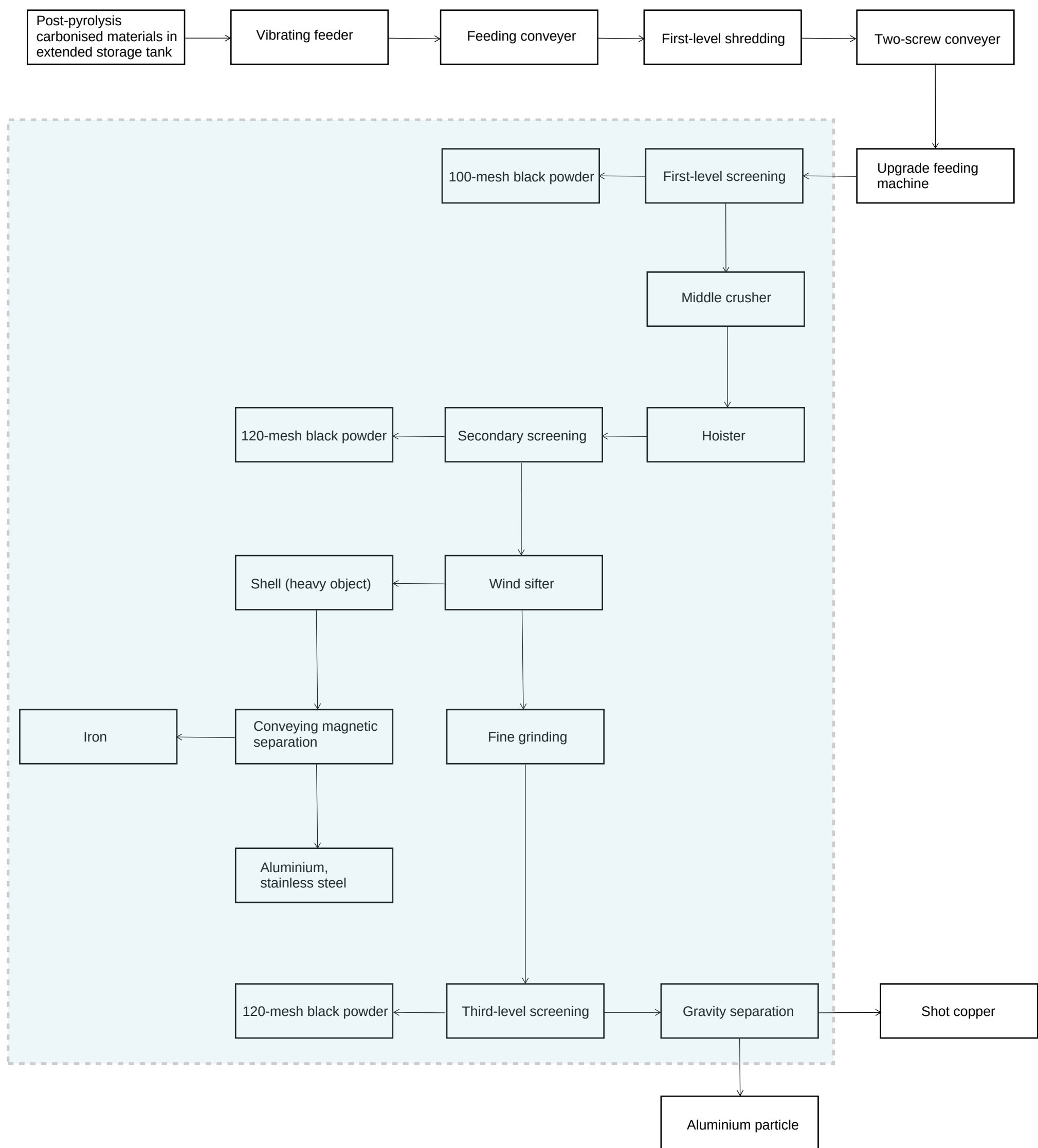


Figure 2.3 - Sequence of the Pyrolysis Process



Legend:  Central dust removal system

Figure 2.4 - Sequence of Post-pyrolysis Crushing and Separation

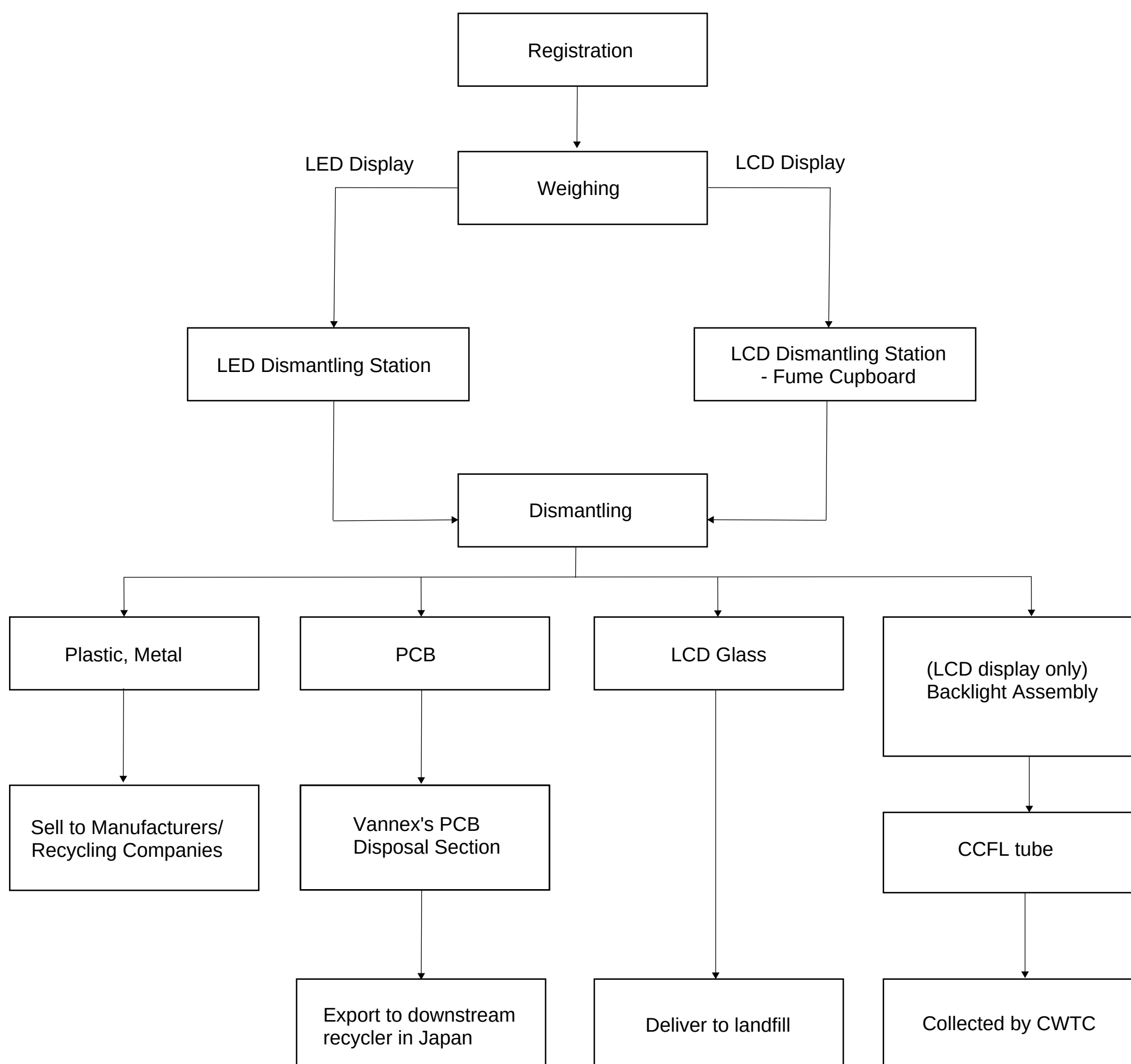


Figure 2.5 - Treatment Process for Recycle of Television and Monitor

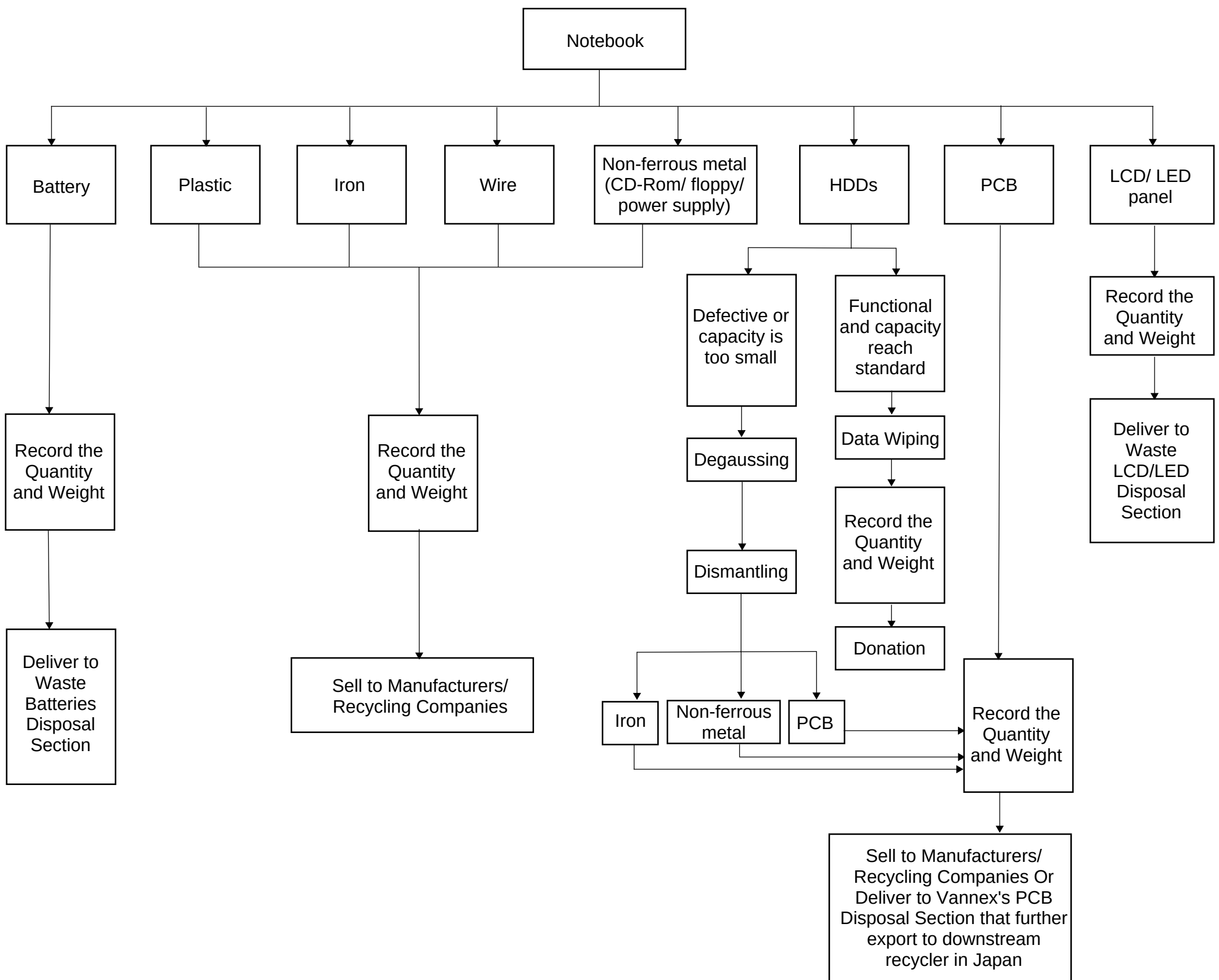


Figure 2.6 - Treatment Process for Recycle of Notebook Computer

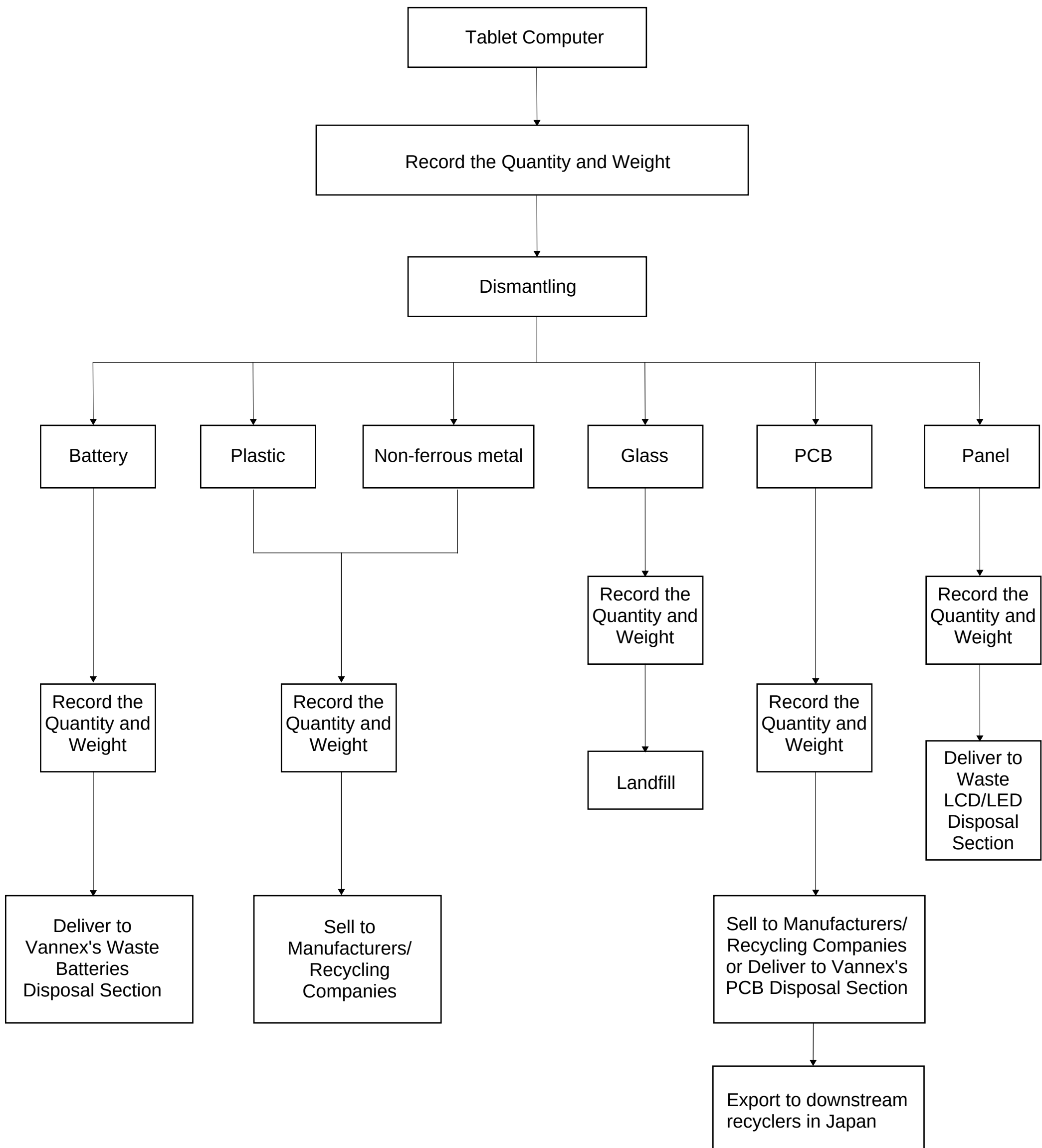


Figure 2.7 - Treatment Process for Recycle of Tablet Computer

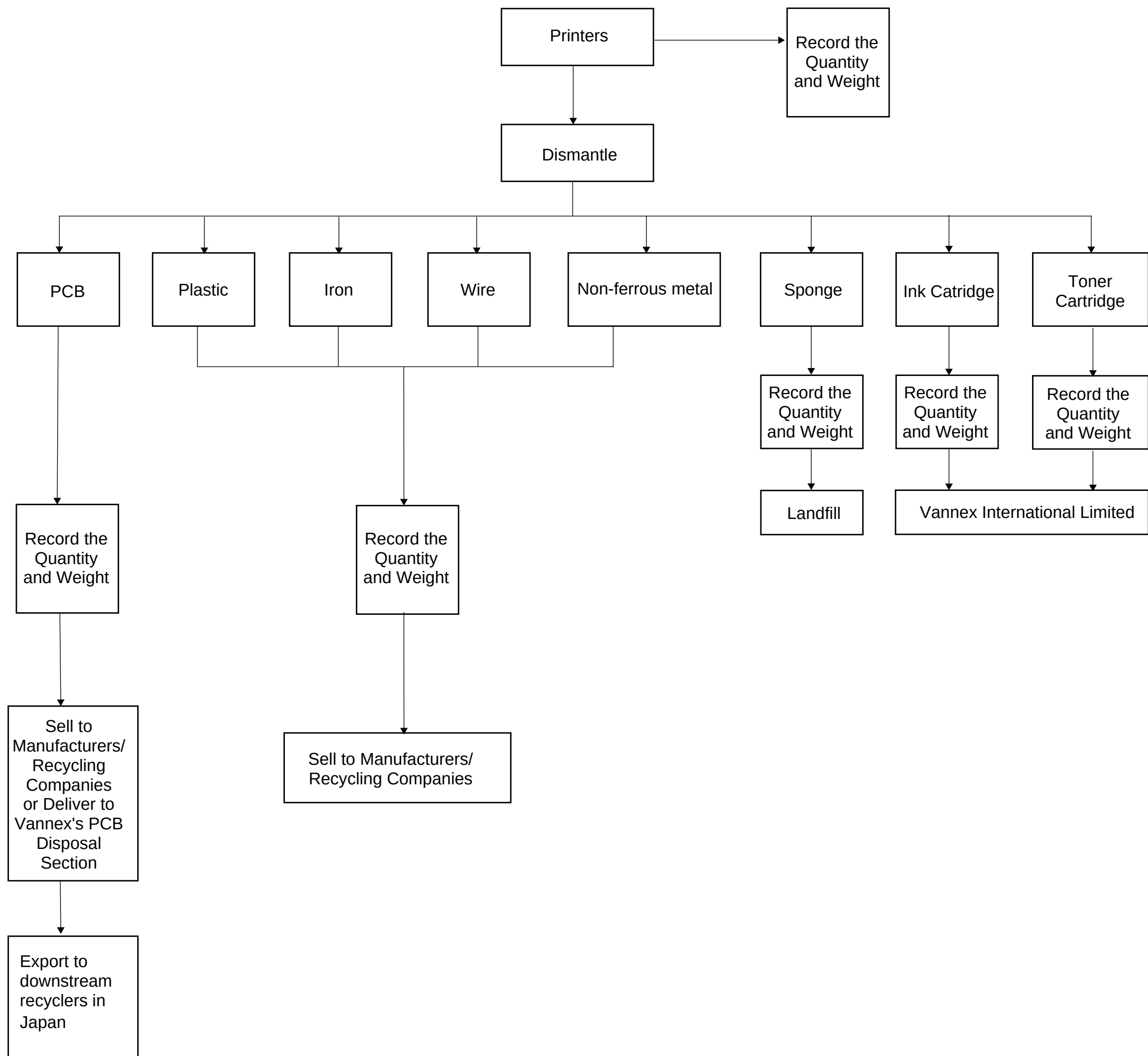


Figure 2.8 - Treatment Process for Recycle of Printer

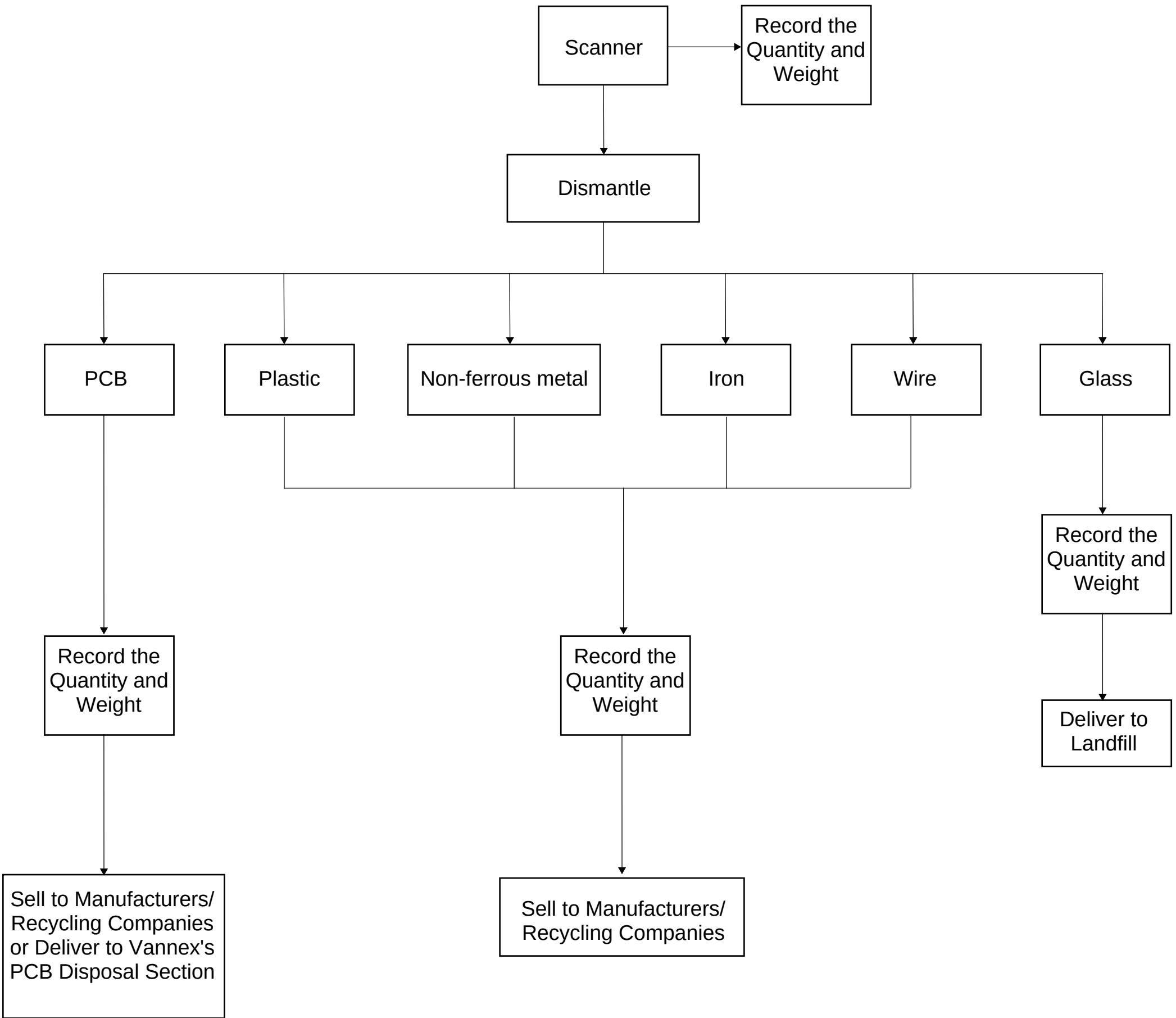
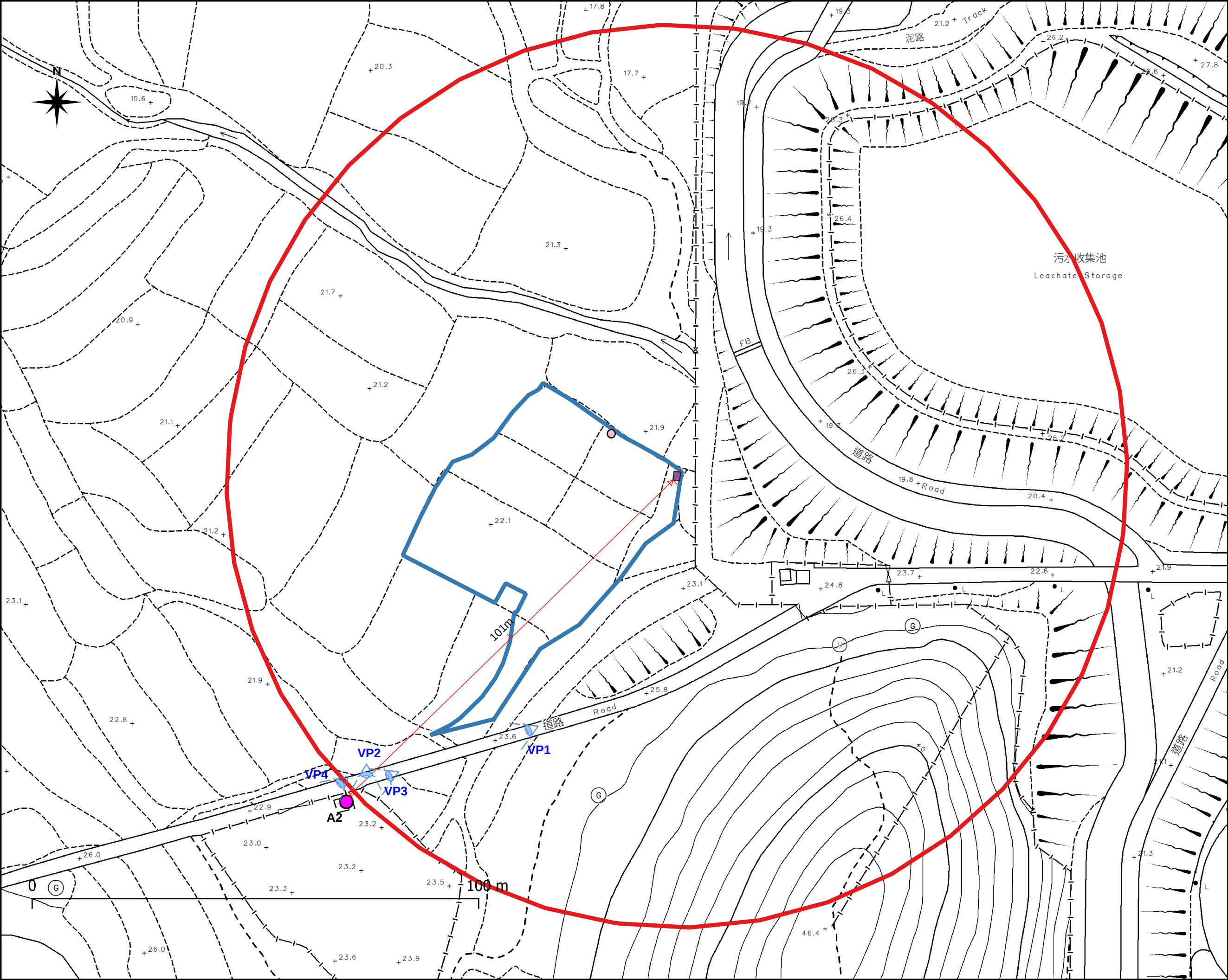


Figure 2.9 - Treatment Process for Recycle of Scanner



Legend:

- Project site boundary
- 100m from the chimney emission source
- Location of chimney emission source (25m above the ground)
- Crushing line exhaust
- Nearest Air Sensitive Receiver (ASR) - A2
- Viewpoint of ASR - A2

Drawing Title:
Location of Air Pollutant
Emission Sources and the
Nearest Air Sensitive
Receiver (A2)

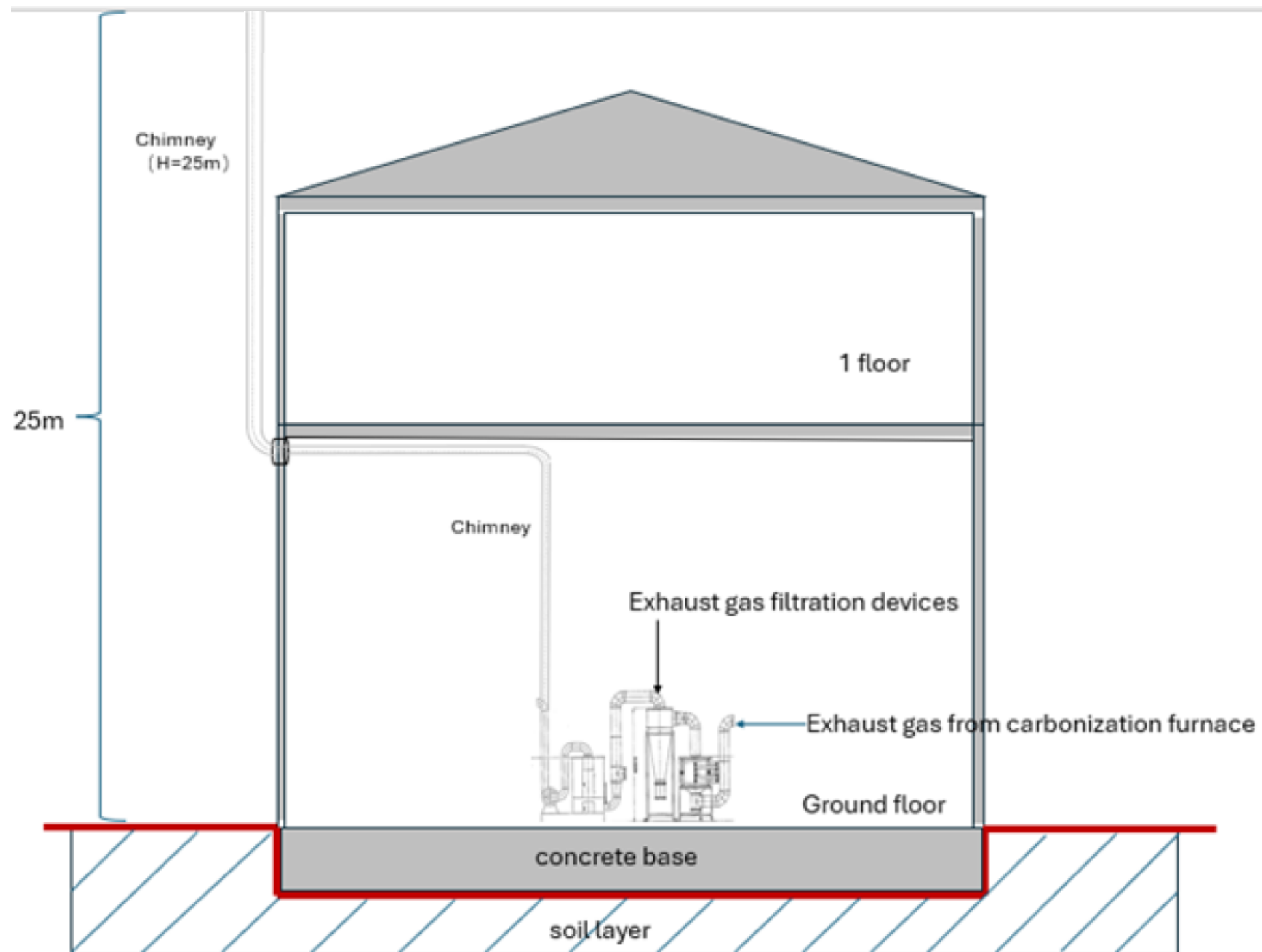
Drawing No.:
Figure 3.2a

Prepared by:
CL

Date:
28 Apr 2026

Revision:
0





(Note: The drawing is not to scale)

Figure 3.2b - Illustration of Section Showing the Vertical Position of the Chimney Outlet



A2 - Temporary Structure Near the South of the Project Boundary (At viewpoint VP1)



A2 - Temporary Structure Near the South of the Project Boundary (At viewpoint VP2)



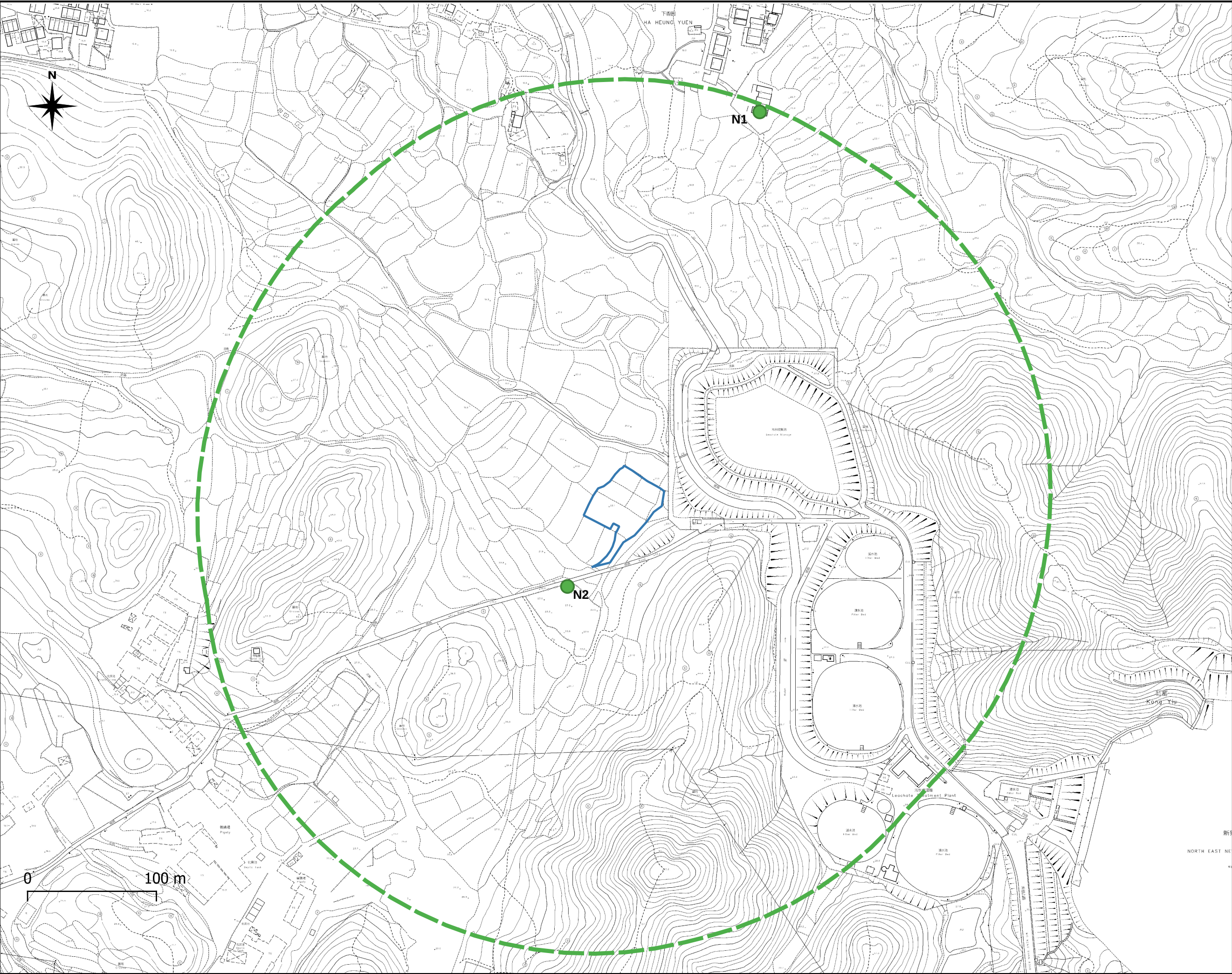
A2 - Temporary Structure Near the South of the Project Boundary (At viewpoint VP3)



A2 - Temporary Structure Near the South of the Project Boundary (At viewpoint VP4)

(Photos taken on 30 April 2026)

Figure 3.2c - Photos showing the potential Nearest ASR (A2 - Temporary Structure Near the South of the Project Boundary)



- Legend:
- Project site boundary
 - 300m study area from Project site boundary
 - Noise Sensitive Receiver (NSR)

Drawing Title:

Noise Sensitive Receiver within 300m Study Area from the Project Site Boundary

Drawing No.:

Figure 4.1

Prepared by:

CL

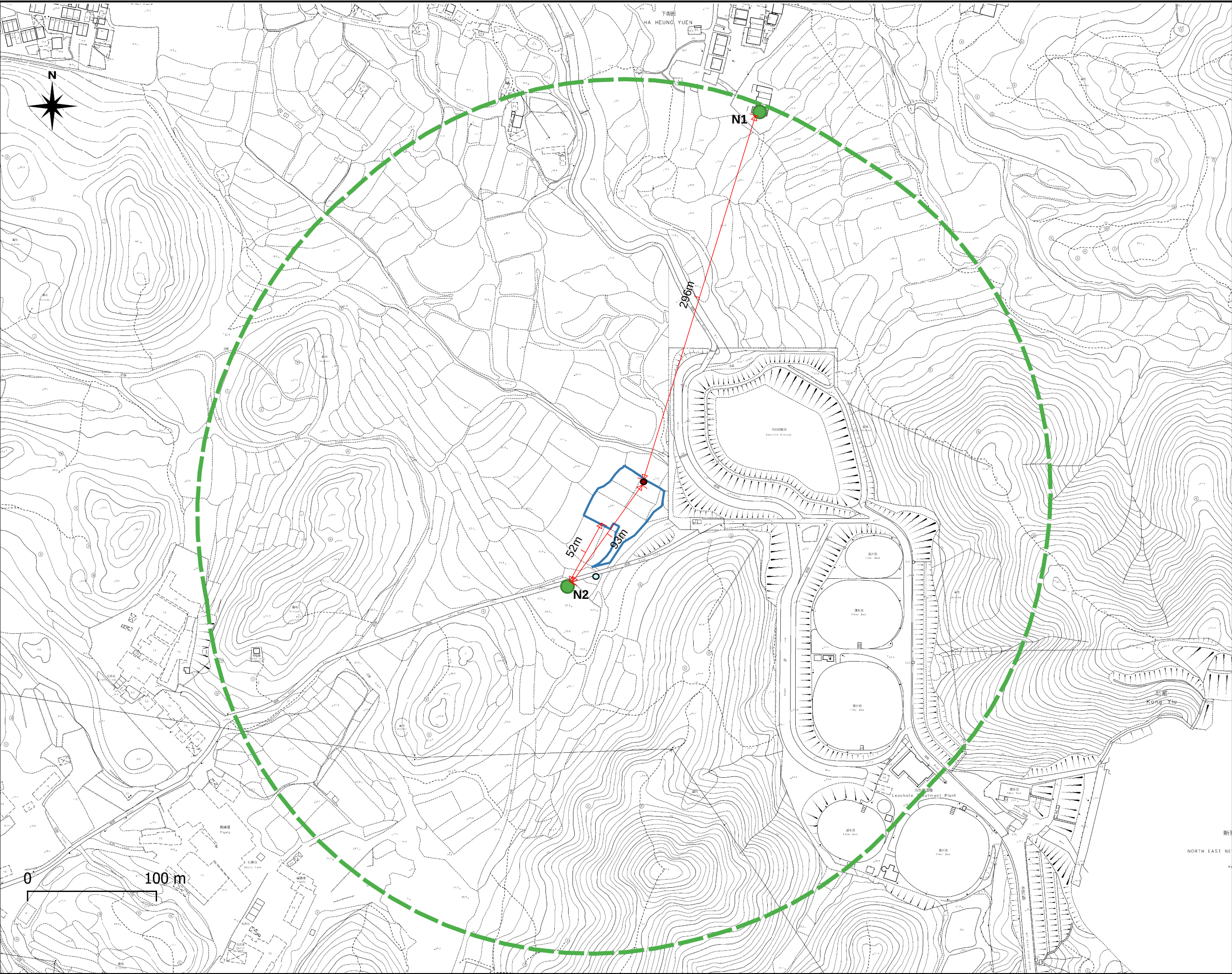
Date:

28 Apr 2026

Revision:

0





- Legend:
- Project site boundary
 - 300m study area from Project site boundary
 - Noise Sensitive Receiver (NSR)
 - Location of the louver of exhaust fans and outdoor unit of the air conditioner
 - Background noise measurement location

Drawing Title:
Horizontal Distance between Noise Sensitive Receiver and Fixed Plant Noise Sources

Drawing No.:
Figure 4.2

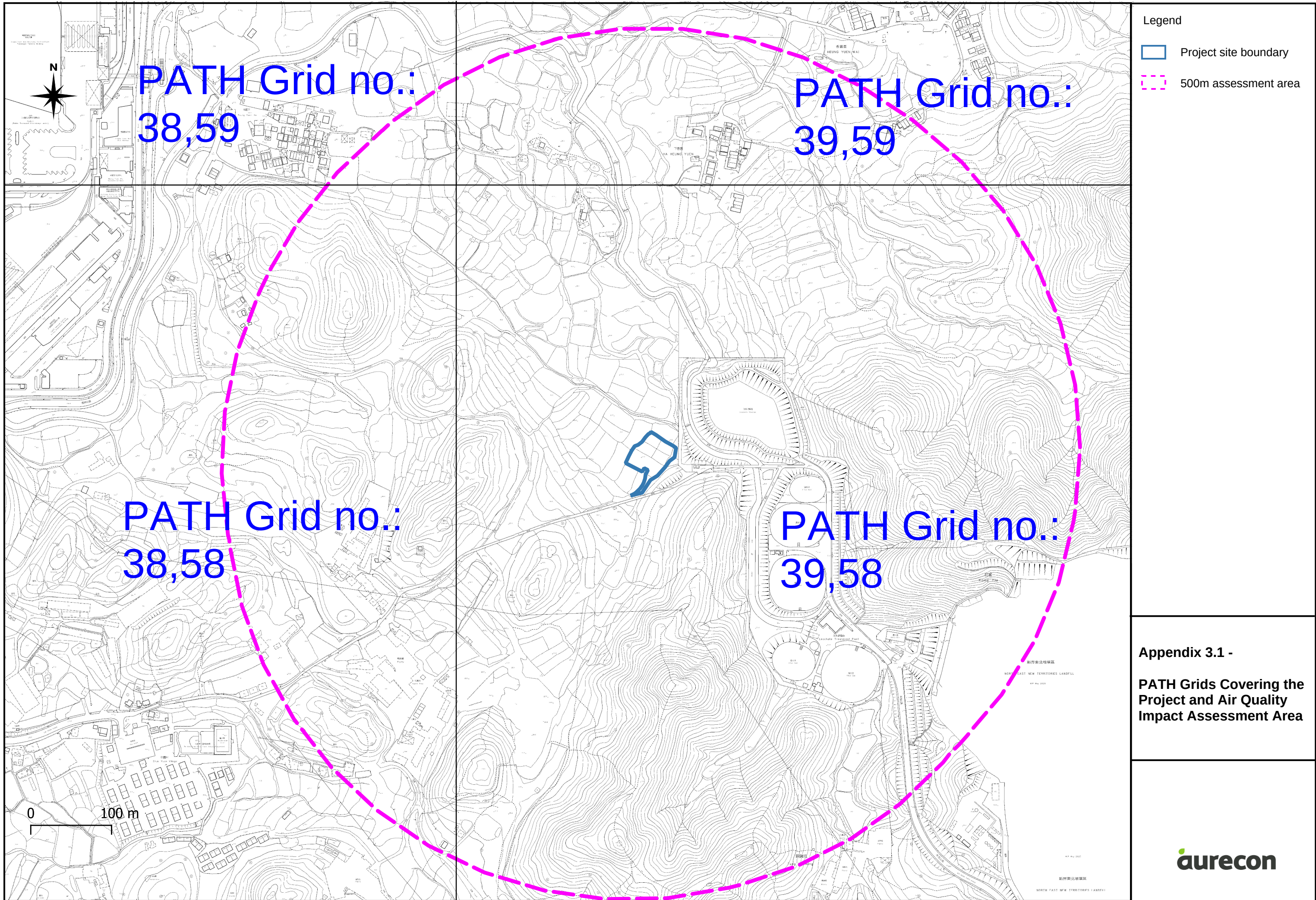
Prepared by:
CL

Date:
28 Apr 2026

Revision:
0



APPENDICES



Legend

- Project site boundary
- 500m assessment area

Appendix 3.1 -

PATH Grids Covering the
Project and Air Quality
Impact Assessment Area

Appendix 4.1 - Proposed Plant Inventory for Fixed Plant Noise Assessment

Noise Source	Equipment	SWL, dB(A)	Quantity	Total SWL, dB(A)	Reference Source
1	Exhaust Fan (Centrifugal fan for furnace) (11000W, flow rate: 19800m3/hour)	90	4	96	Note 1.
2	Air compressor, rated power < 36kW (with QPME label)	98	1	98	Note 2.
3	Furnace (2000W)	99	4	105	Note 3.
4	Steam boiler (≤38000W)	99	1	99	Note 3.
5	Forklift (electric), speed ≤ 5km/hr	84	1	84	Note 4.
6	Bucket elevator (3000W)	96	3	101	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of bucket elevator @1m from machinery surface.
7	Vibratory feeder (1500W) ^{Note 6}	101	2	104	Note 6. The SWL is made reference to the conversion of Sound Pressure Level of vibrating feeder for limestone @1m from machinery surface.
8	Twin shaft shredder (15000W) ^{Note 6}	106	1	106	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of crusher for shale @1m from machinery surface.
9	Hammer mill (37000W) ^{Note 6}	101	1	101	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of hammer crusher@1m from machinery surface.
10	Swing sifter (2200W)	101	2	104	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of vibrating screens@1m from machinery surface.
11	Rotary airlock (2200W)	80	3	85	Note 7.
12	Conveyor belt (1500W)	96	1	96	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of belt conveyor @1m from machinery surface.
13	Magnetic separator (1500W)	92	1	92	Note 8. The SWL is made reference to Section 2.3 and Table 1 for the SWL of Shaker Tables which the noise data (92 dB(A)) represents a combination of shaker table, magnetic separator and the material drop.
14	Negative Pressure Suction System - Cyclone (1500W)	101	1	101	Note 8. The SWL is made reference to Section 2.4 and Table 1 for the SWL of Cyclone (Overall).
15	Negative Pressure Suction System - Centrifugal fan (7000W)	88	1	88	Note 1.
16	Crusher (55000W) ^{Note 6}	106	1	106	Note 5. The SWL is made reference to the conversion of Sound Pressure Level of crusher fro shale @1m from machinery surface.
17	Gravity separator (6500W)	92	1	92	Note 8. The SWL is made reference to Section 2.3 and Table 1 for the SWL of Shaker Tables which the noise data (92 dB(A)) represents a combination of shaker table, magnetic separator and the material drop.
18	Cyclone dust collector (1100W)	92	1	92	Note 8. The SWL is made reference to Section 2.17 and Table 1 for the SWL of Dust Collector.
19	Dust exhaust centrifugal fan (22000W) (for central dust removal system of post-pyrolysis crushing line)	93	1	93	Note 1.
20	Grinding dust collector (for dismantling of electronic appliances)	92	1	92	Note 8. The SWL is made reference to Section 2.17 and Table 1 for the SWL of Dust Collector.
21	Dust exhaust centrifugal fan (22000W) (for grinding dust collector)	93	1	93	Note 1.
22	Outdoor AC units (for office type indoor spaces)	62	6	70	Note 9.

- Notes:
1. Guyer, J. P. (2013). An introduction to sound level data for mechanical and electrical equipment (Course No. M03-027). Continuing Education and Development, Inc. The SWL is made reference to Eq. 4.

2. "Sound power levels of other commonly used PME" issued by EPD. Source: https://www.epd.gov.hk/epd/sites/default/files/epd/english/application_for_licences/guidance/files/OtherSWLs_eng.pdf

3. Guyer, J. P. (2013). An introduction to sound level data for mechanical and electrical equipment (Course No. M03-027). Continuing Education and Development, Inc. The SWL is made reference to Table 5.

4. "Sound power levels of other commonly used PME" issued by EPD. Source: https://www.epd.gov.hk/epd/sites/default/files/epd/english/application_for_licences/guidance/files/OtherSWLs_eng.pdf

5. "Nyumba Ya Akiba SPRL – SEIA Report for 3,000 TPD Cement Project, Appendix 3.4 - FLS Noise Engineering Methods". Source: https://disclosuresservice.ifc.org/api/File/downloadfile?id=%5C34623_ESRS%5CAppendix%203.4,%20FLS%20Noise%20Engineering%20Methods

6. Quieter plants were considered for the vibratory feeder, twin shaft shredder, hammer mill, and crusher; SWLs were referenced from the Nyumba Ya Akiba SPRL – SEIA Report for 3,000 TPD Cement Project, Appendix 3.4 - FLS Noise Engineering Methods.

7. "Noise Management Plan, Appendix 6 of OEMP" issued by Boral Cement Limited. Source: <https://www.boral.com.au/sites/default/files/2024-07/Berrima%20Cement%20Works%20Noise%20Management%20Plan%20-%20May%202023.pdf>

8. "Acoustic Assessment Report" issued by Dillon Consulting Limited. Source: https://www.gov.mb.ca/sd/eal/registries/5684urbanmine/2023_12_urbanmine_acoustic_assessment_report.pdf

9. Reference Model: Daikin MKC70SVMN.

Appendix 4.2 - Fixed Plant Noise Calculation

N1 - No. 102 Ha Heung Yuen

Noise Source	Equipment	Total SWL ,dB(A)	NSR Height, mPD	Noise Source Height, mPD	Horizontal Distance, m	Slant Distance, m	Distance correction, dB(A)	Façade correction, dB(A)	Screening Correction, dB(A)	Noise Level, dB(A)
1	Exhaust Fan (Centrifugal fan for furnace) (11000W, flow rate: 19800m3/hour)	96	24	24	296	296	-57	3	0	42
2	Air compressor, rated power < 36kW (with QPME label)	98	24	24	296	296	-57	3	-20	24
3	Furnace (2000W)	105	24	24	296	296	-57	3	-20	31
4	Steam boiler (≤38000W)	99	24	24	296	296	-57	3	-20	25
5	Forklift (electric), speed ≤ 5km/hr	84	24	24	296	296	-57	3	-20	10
6	Bucket elevator (3000W)	101	24	24	296	296	-57	3	-20	26
7	Vibratory feeder (1500W)	104	24	24	296	296	-57	3	-20	30
8	Twin shaft shredder (15000W)	106	24	24	296	296	-57	3	-20	32
9	Hammer mill (37000W)	101	24	24	296	296	-57	3	-20	27
10	Swing sifter (2200W)	104	24	24	296	296	-57	3	-20	30
11	Rotary airlock (2200W)	85	24	24	296	296	-57	3	-20	10
12	Conveyor belt (1500W)	96	24	24	296	296	-57	3	-20	22
13	Magnetic separator (1500W)	92	24	24	296	296	-57	3	-20	18
14	Negative Pressure Suction System - Cyclone (1500W)	101	24	24	296	296	-57	3	-20	27
15	Negative Pressure Suction System - Centrifugal fan (7000W)	88	24	24	296	296	-57	3	0	34
16	Crusher (55000W)	106	24	24	296	296	-57	3	-20	32
17	Gravity separator (6500W)	92	24	24	296	296	-57	3	-20	18
18	Cyclone dust collector (1100W)	92	24	24	296	296	-57	3	-20	18
19	Dust exhaust centrifugal fan (22000W) (for central dust removal system of post-pyrolysis crushing	93	24	24	296	296	-57	3	0	39
20	Grinding dust collector (for dismantling of electronic appliances)	92	24	24	296	296	-57	3	-20	18
21	Dust exhaust centrifugal fan (22000W) (for grinding dust collector)	93	24	24	296	296	-57	3	0	39
22	Outdoor AC units (for office type indoor spaces)	70	24	24	296	296	-57	3	0	15
									Total Noise Level dB(A)	45.9

Note: 1.A 20 dB(A) attenuation is applied to the fixed plant noise sources, as they are fully enclosed within the building’s RC walls, except for noise sources #1, 15, 19, 21, and 22

Appendix 4.2 - Fixed Plant Noise Calculation

N2 - Temporary structure near the south of the project boundary

Noise Source	Equipment	Total SWL ,dB(A)	NSR Height, mPD	Noise Source Height, mPD	Horizontal Distance, m	Slant Distance, m	Distance correction, dB(A)	Façade correction, dB(A)	Screening Correction, dB(A)	Noise Level, dB(A)
1	Exhaust Fan (Centrifugal fan for furnace) (11000W, flow rate: 19800m3/hour)	96	24	24	93	93	-47	3	-20	32
2	Air compressor, rated power < 36kW (with QPME label)	98	24	24	52	52	-42	3	-20	39
3	Furnace (2000W)	105	24	24	52	52	-42	3	-20	46
4	Steam boiler (≤38000W)	99	24	24	52	52	-42	3	-20	40
5	Forklift (electric), speed ≤ 5km/hr	84	24	24	52	52	-42	3	-20	25
6	Bucket elevator (3000W)	101	24	24	52	52	-42	3	-20	41
7	Vibratory feeder (1500W)	104	24	24	52	52	-42	3	-20	45
8	Twin shaft shredder (15000W)	106	24	24	52	52	-42	3	-20	47
9	Hammer mill (37000W)	101	24	24	52	52	-42	3	-20	42
10	Swing sifter (2200W)	104	24	24	52	52	-42	3	-20	45
11	Rotary airlock (2200W)	85	24	24	52	52	-42	3	-20	25
12	Conveyor belt (1500W)	96	24	24	52	52	-42	3	-20	37
13	Magnetic separator (1500W)	92	24	24	52	52	-42	3	-20	33
14	Negative Pressure Suction System - Cyclone (1500W)	101	24	24	52	52	-42	3	-20	42
15	Negative Pressure Suction System - Centrifugal fan (7000W)	88	24	24	93	93	-47	3	-20	24
16	Crusher (55000W)	106	24	24	52	52	-42	3	-20	47
17	Gravity separator (6500W)	92	24	24	52	52	-42	3	-20	33
18	Cyclone dust collector (1100W)	92	24	24	52	52	-42	3	-20	33
19	Dust exhaust centrifugal fan (22000W) (for central dust removal system of post-pyrolysis crushing	93	24	24	93	93	-47	3	-20	29
20	Grinding dust collector (for dismantling of electronic appliances)	92	24	24	52	52	-42	3	-20	33
21	Dust exhaust centrifugal fan (22000W) (for grinding dust collector)	93	24	24	93	93	-47	3	-20	29
22	Outdoor AC units (for office type indoor spaces)	70	24	24	93	93	-47	3	-20	5
Total Noise Level dB(A)										54.2

Notes:

1.A 20 dB(A) attenuation is applied to the fixed plant noise sources, as they are fully enclosed within the building’s RC walls.

2. There is no direct line of sight between N2 and the noise sources #1, 15, 19, 21, and 22. A 20 dB(A) attenuation is applied to these noise sources for a conservative evaluation.

Appendix 4.3 - Background Noise Measurement Results

Date	Weather	Time Period	Time Period	LAeq 5 (min)	L10	L90	LAeq (30min)
30-Apr-2026	Fine	13:30-14:00	13:30-13:35	53.2	55.7	48.8	55.1
			13:35-13:40	54.8	56.3	51.1	
			13:40-13:45	58.7	62.1	51.1	
			13:45-13:50	54.4	57.6	50.2	
			13:50-13:55	53.3	56.0	48.6	
			13:55-14:00	53.4	56.0	49.2	
30-Apr-2026	Fine	19:30-20:00	19:30-19:35	61.4	66.5	53.9	57.2
			19:35-19:40	56.2	57.9	54.4	
			19:40-19:45	54.3	54.8	53.8	
			19:45-19:50	55.6	55.9	53.6	
			19:50-19:55	56.3	59.9	52.6	
			19:55-20:00	54.1	55.2	52.7	
30-Apr-2026	Fine	23:00-23:30	23:00-23:05	51.0	51.9	49.6	53.1
			23:05-23:10	50.5	51.5	49.4	
			23:10-23:15	50.8	51.5	49.2	
			23:15-23:20	54.2	57.1	49.2	
			23:20-23:25	54.0	57.6	49.5	
			23:25-23:30	55.4	57.1	50.2	

Note: Free-field noise measurement was conducted. Façade correction of +3dB(A) has been added to the measurement results



Background noise measurement location

Document prepared by

Aurecon Hong Kong Limited

Device Type	Percentage of Respondents
Smartphone	92%
Tablet	88%
Smartwatch	75%
Smart TV	68%
Smart Home Assistant	62%
Smart Car	55%
Smart Thermostat	48%
Smart Lock	42%
Smart Light Bulb	35%
Smart Plug	28%