
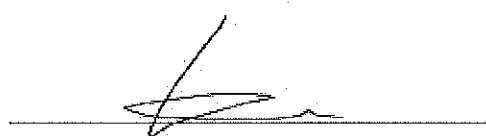


Drainage Services Department

**Contract No. SPW 09/2018
Environmental Team Baseline Surveys
for Sha Tin Cavern
Sewage Treatment Works**

**Baseline Survey Report on Egretry
(Version 2.0d)**

Certified By	 (Environmental Team Leader: Mr. KS Lee)
Prepared By	 (Qualified Ecologist: Mr. Bond Shum)

REMARKS:

The information supplied and contained within this report is, to the best of our knowledge, correct at the time of printing.

CINOTECH accepts no responsibility for changes made to this report by third parties

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Our ref.: LES/J2019-02/CS/L078
Date : 7 January 2021

Drainage Services Department
Special Task Division
Projects and Development Branch
44/F Revenue Tower
5 Gloucester Road
Wan Chai, Hong Kong

By Email

Attn. to: Mr. Tom KW CHAN (E/ST3)

Dear Sir,

**Contract No. SPW 25/2018
Environmental Team for
Relocation of Sha Tin Sewage Treatment Works to Caverns – Site Preparation and
Access Tunnel Construction**

**Submission of Baseline Survey Report on the Egretty Version 2.0d under Condition
2.17 of Environmental Permit No. EP-533/2017**

We have reviewed the details of Baseline Survey Report on the Egretty v2.0d received via email on 6 January 2021 and hereby certify the submission in accordance with condition 2.17 of EP-533/2017.

Should you have any queries, please contact the undersigned at 9108 0531.

Yours faithfully,
For and On Behalf Of
Lam Environmental Services Limited

Derek Lo
Environmental Team Leader

Encl.

c.c.	DSD	Mr. Kenneth Poon	Via email
	AECOM	Mr. Mr. Edward Poon	Via email
	AECOM (CRE Office)	Mr. Simon Leung	Via email
	Mott MacDonald Hong Kong Limited	Mr. Brandon Wong	Via email
	Cinotech Consultant Limited	Mr. K.S.Lee / Ms. Betty Choi	Via email
	Ramboll Hong Kong Limited	Mr. Y H Hui	Via email

Drainage Services Department
Special Task Division
Projects and Development Branch
44/F Revenue Tower
Gloucester Road
Wan Chai, Hong Kong

Attn: Mr. Tom K W CHAN (E/ST3)

Your Reference

Contract No. SPW 01/2020
Independent Environmental Checker for Relocation of Sha Tin Sewage Treatment Works to Caverns – Site Preparation and Access Tunnel Construction

Our Reference
EC/TC/BW/bw/T416871/
Correspondence/
Outgoing/L064

Environmental Permit No. EP-533/2017

3/F International Trade
Tower
348 Kwun Tong Road
Kowloon
Hong Kong

Baseline Survey Report on Egretty (Version 2.0)

8 January 2021

By Email

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Dear Sir,

I refer to the Baseline Survey Report on Egretty (Version 2.0) under the captioned Project, which has been certified on 7 January 2021 (ref: LES-J2019-02/CS/L078) by the Environmental Team Leader appointed under Condition 2.3 of Environmental Permit No. EP-533/2017 (hereafter referred to as "EP").

As the current Independent Environmental Checker appointed under EP Condition 2.8, I hereby verify the captioned report in accordance with EP Conditions 1.9 and 2.17.

Should you have any queries regarding the captioned or require any further information, please contact the undersigned at 2828 5875.

Yours faithfully
for MOTT MACDONALD HONG KONG LIMITED

Brandon Wong
Independent Environmental Checker
T +852 2828 5875
Brandon.Wong@mottmac.com

Encl.

c.c. DSD	Mr. Kenneth Poon	By Email
AECOM	Mr. Edward Poon	By Email
AECOM (CRE Office)	Mr. Simon Leung	By Email
Lam Environmental Services Limited	Mr. Derek Lo	By Email
Cinotech Consultants Limited	Mr. K S Lee / Ms. Betty Choi	By Email
Ramboll Hong Kong Limited	Mr. Y H Hui	By Email

Fw: ACE Member's comments are invited on the Baseline Survey Report on Egretty as per Specific Condition 2.17 under EP-533 /2017

kwchan08@dsd.gov.hk <kwchan08@dsd.gov.hk>

2021年1月22日 下午2:52

收件者: Betty Choi <betty.choi@cinotech.com.hk>, "Chan, Wai Long Justin" <Justin.Chan@aecom.com>

副本: Derek Lo <dereklo@lamenviro.com>, Brandon Wong <Brandon.Wong@mottmac.com>, William Yu <william.yu@stc-aecom.com>, cll@dsd.gov.hk, edward.poon@aecom.com, kyho03@dsd.gov.hk

Dear Betty,

Please officially submit the egretty report for EPD approval as ACE offer no comment.

Thank you for your attention.

Regards,

Tom CHAN

Engineer/Special Task 3

Special Task Division, Drainage Services Department

Tel:2594-7580/ 9101-7139



----- Forwarded by KW CHAN/STD/DSD/HKSARG on 22/01/2021 14:47 -----

From: Sally LY SHEK/EPD/HKSARG@EPD

To: KW CHAN/STD/DSD/HKSARG@DSD

Cc: Becky SL LAM/EPD/HKSARG@EPD, Ingrid HY SUEN/EPD/HKSARG@EPD, Ka Chung LEUNG/DSD/HKSARG@DSD, Chau Ling LO/DSD/HKSARG@DSD, Bernard SY LAU/DSD/HKSARG@DSD, Hao CAI/SPD/DSD/HKSARG@DSD, KEN KY HO/SPD/DSD/HKSARG@DSD, Nicholas HK TSANG/EPD/HKSARG@EPD, TT LUI/EPD/HKSARG@EPD

Date: 22/01/2021 14:39

Subject: ACE Member's comments are invited on the Baseline Survey Report on Egretty as per Specific Condition 2.17 under EP-533 /2017

Serial No.:

Dear Mr Chan,

Please be informed that ACE has no comment on the report attached in your preceding email below. Thank you.

Regards,

Sally Shek

ACE Secretariat

Tel: 2594 6324

From: KW CHAN/STD/DSD/HKSARG@DSD

To: Sally LY SHEK/EPD/HKSARG@EPD

Cc: Becky SL LAM/EPD/HKSARG@EPD, Ingrid HY SUEN/EPD/HKSARG@EPD, Ka Chung LEUNG/DSD/HKSARG@DSD, Chau Ling LO/DSD/HKSARG@DSD, Bernard SY LAU/DSD/HKSARG@DSD, Hao CAI/SPD/DSD/HKSARG@DSD, KEN KY HO/SPD/DSD/HKSARG@DSD, Nicholas HK TSANG/EPD/HKSARG@EPD

Date: 11/01/2021 11:01

Subject: ACE Member's comments are invited on the Baseline Survey Report on Egretty as per Specific Condition 2.17 under EP-533 /2017

Dear Sally,

In accordance to Specific Condition 2.17 of the Environmental Permit (EP-533 /2017) for the Project - Sha Tin Cavern Sewage Treatment Works, the Permit Holder (Drainage Services Department) shall conduct a baseline survey for the egretty in Penfold Park at Sha Tin Race Course no later than 1 year

before the demolition of the existing STSTW. A report on the survey results and appropriate measures to minimize the impacts on egretry shall be provided to the Advisory Council on the Environment (ACE) for comments before submitting to the Director for approval.

We therefore submit our report with an executive summary on the baseline survey results for the egretry in Penfold Park at Sha Tin Race Course with appropriate measures to minimize the impacts on egretry, such as by the adoption of best practices, avoidance of the breeding season, and use of better demolition technology to ACE for comments before submission to the Director of Environmental Protection. Please be advised that this Report has been certified by the ET Leader and verified by the IEC for the Project. ACE's Members' views/comments, if any would be incorporated into the Baseline Survey Report on Egrety.

Should you need further information, please feel to contact me.

Thank you for your attention.

Regards,

Tom CHAN

Engineer/Special Task 3

Special Task Division, Drainage Services Department

Tel:2594-7580/ 9101-7139

Zero 意外
ACCIDENT

地盤零意外 關礙建未來
Zero Accident, we Build, we Care


 **20200111_Baseline Survey Report on Egrety under EP-5332017 .pdf**
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1. INTRODUCTION

- 1.1. To support social and economic development in Hong Kong, there is a pressing need to optimize the supply of land for various uses by sustainable and innovative approaches. One possible approach is rock cavern development. The Policy Agenda of the 2016 Policy Address has stated that works for the relocation of the Sha Tin Sewage Treatment Works (STSTW) is to commence as soon as possible to release the existing site, of a size about 28 hectares, for development purpose.
- 1.2. The Relocation of Sha Tin Sewage Treatment Works (STSTW) to Caverns (the Project) is implemented so as to release the existing site, of a size about 28 hectares, for other uses.
- 1.3. The Project is a Designated Project under the Environmental Impact Assessment Ordinance (EIAO). An Environmental Impact Assessment (EIA) Report for the Project was approved under EIAO in November 2016 in accordance with the EIA Study Brief (No.ESB-273/2014) and the Technical Memorandum on Environmental Impact Assessment Process (EIAO-TM). The corresponding Environmental Permit was issued (EP no.: EP-533/2017) by the Director of Environmental Protection (DEP) in March 2017.
- 1.4. The Drainage Services Department (DSD) intends to commence demolition of the existing structures such as staff quarters in the existing Sha Tin Sewage Treatment Works (STSTW) before the overall decommissioning of STSTW while normal operation of the existing STSTW would not be affected. The tentative demolition of the existing STSTW was listed in **Table 1-1**. According to Condition 2.17 of the EP, the Permit Holder shall conduct a baseline survey for the egretry in Penfold Park at Sha Tin Race Course no later than 1 year before the demolition of the existing STSTW. No later than 1 month before the start of the demolition works, a report on the survey results and appropriate measures to minimize the impacts on egretry, such as by the adoption of best practices, avoidance of the breeding season, and use of better demolition technology shall be provided to the Advisory Council on the Environment (ACE) for comments before submitting to the Director for approval.

Table 1-1 Tentative Schedule for Demolition of Existing STSTW

Activities	Tentative Dates and Duration
Demolition of quarters as shown in Appendix E of report	From 2021 to 2022 (Block D & E) From 2022 to 2025 (Block A & B)
Demolition of existing mechanical workshop (4), sludge storage tanks (19) and final sedimentation tanks (10B) as shown in Appendix E of report	From 2022 to 2025
Demolition of Sha Tin Sewage Treatment Plants as shown in Appendix E of report	From 2030 to 2031 tentatively

- 1.5. Cinotech Consultants Limited (Cinotech) was commissioned by the Drainage Services Department (DSD) as the Environmental Team (ET) for baseline phase and to carry out a Baseline Survey for the Egretry. A qualified ecologist with over 10 years of relevant experience was engaged as part of the Environmental Team (ET) as per Condition 2.6 of the EP. His curriculum vitae is attached in **Appendix A**. The qualification and experience of the qualified ecologist has been certified by the ET Leader and verified by the Independent Environmental Checker (IEC).

- 1.6. This Egret Survey Report presents the findings from the 4-month survey conducted by the qualified ecologist and his team, which includes (1) flight line survey and (2) egret nest count. Based on the survey results, mitigation measures are proposed to minimize the impact on the egret during the demolition of the STSTW.

2. LITERATURE REVIEW

Egretty Counts in Hong Kong (Anon, 2016 - 2020)

- 2.1. Penfold Park was ranked sixth in the egretty counts 2019 by Hong Kong Bird Watching Society. In 2019, a total number of 4 ardeid species with 77 nests were recorded during the count. The most abundant species was Little Egret (*Egretta garzetta*) and Black-crowned Night Heron (*Nycticorax nycticorax*) (**Table 2-1**). The data from 2015 to 2018 and averaged number of species were also included in the table.

Table 2-1 Number of Nests of Different Ardeid Species in Penfold Park Egretty in 2015-2019

Number of Nests of Ardeid Species*	2015	2016	2017	2018	2019	Averaged
Great Egret	24	22	13	22	21	20
Little Egret	20	24	34	26	25	26
Black-crowned Night Heron	17	23	21	16	25	20
Chinese Pond Heron	3	7	6	9	6	6
Total	64	76	74	73	77	72*

* The highest nest count of each species for that year has been adopted

Sha Tin Cavern Sewage Treatment Works Environmental Impact Assessment (EIA-240/2016) (AECOM, 2016)

- 2.2. According to EIA on Sha Tin Cavern Sewage Treatment Works, a total number of 4 ardeid species with the maximum 44 nests were recorded in May 2015 during the count and the most abundant species was Little Egret (*Egretta garzetta*) (**Table 2-2**). Number of Nest in other months during breeding season was also presented in **Table 2-2**.

Table 2-2 Number of Nests of each Ardeid Species recorded from Monthly Nest Counts at Penfold Park Egretty in 2015

Number of Nests of Ardeid Species	March	April	May	July	Max
Great Egret	-	10	13	4	13
Little Egret	-	8	16	1	16
Black-crowned Night Heron	-	2	13	1	13
Chinese Pond Heron	-	3	2	-	3
Total	0	23	44	6	-

- 2.3. Flight Line Survey was conducted near Penfold Park to analyze the possible direct and indirect impact from the Shatin Carven Project to flight lines of Ardeid birds. Flight Heights of Ardeids that took off from Penfold Park were recorded and presented in **Table 2-3**. Most birds flew at height below 20m.

Table 2-3 Flight Heights of Ardeids that took off from Penfold Park Egretty in April, May and July 2015

Number of Nests of Ardeid Species	Number of Ardeids Recorded at Different Flight Heights				
	0-10m	10-20m	20-30m	30-40m	>40m
Great Egret	15	23	7	1	1
Little Egret	24	26	15	4	-
Black-crowned Night Heron	2	1	-	-	-
Chinese Pond Heron	2	3	1	-	-
Total	43	53	23	5	1

2.4. Five flight lines were identified (**Table 2-4**). Flight Line #3 was most frequently used by Ardeids (27.0%), seconded by #2 and #4. Both flight lines #2 and #3 crossed the existing STSTW. The patterns of the flight lines were presented in **Appendix B1**.

Table 2-4 Relative Percentage of Usage of Ardeids in Each Flight Line from March to July 2015

Flight Line	Number of Ardeids	Relative Percentage of Usage
1	26	18.4%
2	34	24.1%
3	38	27.0%
4	34	24.1%
5	9	6.4%

2.5. The EIA Report identified Shing Mun River and shorelines along Tolo Harbour as the foraging ground for the breeding ardeids. It also observed that the most frequently used flight lines were influenced by highways and human activities. Therefore, the study concluded that the impact due to demolition of the STSTW (e.g. human disturbance, noise and glare) could be minimized by implementation of good site practice.

Project Profile on Penfold Park Enhancement (Mott MacDonald, 2020)

2.6. According to the Project Profile for Penfold Park Enhancement (DIR-275/2020), a total of 4 ardeid species and 88 nests were recorded between April – August 2019 during the monthly nest count. The most abundant species was Little Egret (*Egretta garzetta*), with 42 nests recorded at April 2020. Number of Nest in other months during breeding season was also presented in **Table 2-5**.

Table 2-5 Number of Nests of each Ardeid Species recorded from Monthly Nest Counts at Penfold Park Egret in 2019

Date	No. of Nests					Total
	Little Egret	Great Egret	Chinese Pond Heron	Black-crowned Night Heron	Eastern Cattle Egret	
24 Apr	42	9	9	12	0	72
17 May	32	12	5	12	0	61
26 Jun	29	6	15	19	0	69
24 Jul	4	0	0	8	0	12
8 Aug	0	0	0	3	0	3
Highest Record	42	12	15	19	0	88*

* The highest nest count of each species for that year has been adopted

- 2.7. Flight Line Survey was conducted near Penfold Park to analyze the possible direct and indirect impact from the enhancement work to flight lines of Ardeid birds. Five flight lines and their percentage of usage were calculated (**Table 2-6**). Flight Line #3 was most frequently used in 2019 by Ardeids (34.9%), seconded by Flight Line #1 (34.8%). The former followed the Shing Mun River alignment while the latter directed towards the west of Tolo Harbour. The patterns of the flight lines were presented in **Appendix B2**.
- 2.8. The majority of ardeids headed northeastern to Tolo Harbour and other wetland habitats (e.g. Lake Ad Excellentiam in the Chinese University of Hong Kong, CUHK) which are suitable foraging habitats for ardeids. Results from the flight line surveys also showed that Shing Mun River supported many foraging ardeids. Ardeids foraging in Shing Mun River were mainly responsible for flight lines headed south from the egret.

Table 2-6 Relative Percentage of Usage of Ardeids in Each Flight Line in 2019

Flight Line	Mean Number of Ardeids	Relative Percentage of Usage
1	34.4	34.8%
2	19.4	19.6%
3	34.5	34.9%
4	3.4	3.4%
5	6.7	6.8%
Other	0.5	0.5%
Total	98.7	100.0%

3. SURVEY METHODOLOGY

Egretty Counts

- 3.1. The ecological survey team visited the Penfold Park and conducted egretty counts at monthly interval from April to July 2020. The surveyors checked all possible nesting areas inside the Penfold Park following the survey method adopted by the Hong Kong Bird Watching Society. A nest was considered active if incubating adults or chicks were observed. In addition to direct observation of the nests, nests hidden inside tree canopy were estimated by observing any repeated landing locations. At later stage of the survey when the chicks had grown, estimation of nests were based on observation of fledged birds in nest and fledged birds interacting with parent bird(s).
- 3.2. Species of nesting ardeids, number of active nests and exact location of the breeding site were recorded in this survey.

Flight-line Survey

- 3.3. Flight-line survey was conducted at a fixed vantage point that could provide clear view of the egretty and existing STSTW site. After site visits on 6th January and 2nd April 2020, the rooftop of Shatin Hospital Main Building was selected as the vantage point of this survey (**Figure 1**).
- 3.4. Two survey teams were arranged, led by the qualified ecologist and supported by trained surveyors with relevant background. One team looked at the egretty and Shing Mun River at V1, while the other one looked at the STSTW and Tolo Harbour on the other side of the building at V2 (**Figure 1**). They communicated in real-time to track the flying ardeids to ensure no blind spot along the Shing Mun River.
- 3.5. The flight-line survey was conducted at monthly interval from April to July 2020 which was the active period of the Penfold Park Egretty.

Identification of Peak Flight Period in April

- 3.6. In April 2020, the surveyors conducted a whole day daytime survey from sunrise to sunset (around 6am - 7pm) in order to collect sufficient baseline information of the flight-line and to determine the peak(s) of the ardeids' activity.
- 3.7. This survey provided baseline information for identifying the location of the ardeid breeding site, foraging habitats and flight paths. It was carried out on fine weather days with good visibility. A pair of 10x42 binoculars, telescope (20x – 60x magnification) and camera with telephoto lens were used to record all ardeid species flying in or out the egretty and existing STSTW site.
- 3.8. During the survey period, all flying and non-flying ardeids that appeared near the egretty and existing STSTW site were identified to species level. For each individual, flight direction, flight distance, approximate flight height, land locations and activities were recorded on a base map and record sheet.

Regular Flight-line Survey during Peak Flight Period from May - July

- 3.9. The flight-line survey in May – July covered a duration of not less than 2 hours with peak Ardeid's activity, following the same methodology adopted in April. The time period 07:00 – 09:00 had been selected based on the data collected at April 2020.

4. SURVEY RESULTS AND ANALYSIS

Egretty Survey

- 4.1. Number of Nests of Ardeids in 2020 in Penfold Park (78) is greater than the 5-year averaged and similar to that in 2019 (**Table 2-1**). Nests were occupied by five Ardeid species including Little Egret (*Egretta garzetta*), Great Egret (*Ardea alba*), Chinese Pond Heron (*Ardeola bacchus*), Black-crowned Night Heron (*Nycticorax nycticorax*) and a suspected record of Intermediate Egret (*Ardea intermedia*). The highest number of active nests was in May 2020 (77), followed by April (52), June (47) and July (20). Behaviours of Ardeids included incubation, feeding chick(s) and nest building. Details are summarized in **Table 4-1**. Representative photos are shown in **Appendix C**.

Table 4-1 Number of Nests in 2020

Month	No. of Nests					Total
	Little Egret	Great Egret	Chinese Pond Heron	Black-crowned Night Heron	Intermediate Egret [^]	
April 2020	19	16	2	15	0	52
May 2020	34	22	5	15	1	77
June 2020	17	11	6	13	0	47
July 2020	7	5	2	6	0	20
Highest Record	34	22	6	15	1	78*

* The highest nest count of each species for that year has been adopted

[^] Suspected record

- 4.2. The breeding season usually ends in July and August, resulting relatively low number of nests in July than other months. However, with reference to the egretty survey for Penfold Park Enhancement (DIR-275/2020), the nest number in June 2019 remained similar to that in May 2019. Influencing factors on the nest number in 2020 based on observations involved occasional events, such as Black Rainstorm Warning Signal hoisted on 6 June 2020, Tropical Storm Nuri passed through Hong Kong on 14 June 2020, and construction works in Penfold Park in July 2020.
- 4.3. Heavy rains and strong wind could damage Ardeids' nests and affect the survival rate of chicks. Damaged tree branches and empty nests in the egretty were observed in the survey conducted on 22 June 2020 and adverse weather was identified as the major reason for the decrease in nest number in June 2020 when compared to that in May 2020.
- 4.4. Breaking works were observed in the Penfold Park in July. Nevertheless, no abnormal response from the Ardeids was noted. In fact, the ardeids did not show noticeable response to the presence of the survey team throughout the survey period, indicating that they were adapted to human activities.

Flight-line Survey

Overall Flight-line Record

- 4.5. A whole day daytime flight-line survey was conducted in April 2020 to identify the peak flight period of Ardeids. Two peak hours of flight lines identified in April were 0700-0859 (193 nos.) and 1700-1859 (191nos.). 0700-0859 was proposed as the survey period in

May-July as it has a higher number of counts. The proposal was agreed by the ET, IEC and AFCD. Further interpretation of identification of peak hour(s) in April is appended in **Appendix D**.

- 4.6. Flight Line Surveys have been conducted once per month between April 2020 and July 2020 to analyse major flight lines of Ardeids in 0700-0900 in the assessment area. The basic information of the survey can be found at **Table 4-2**:

Table 4-2 Total Number of Flight Line by Month

Month	No. of Flight Line
April 2020	193
May 2020	229
June 2020	129
July 2020	116
Total	667

- 4.7. Overall, a total of 667 flight lines were recorded. Four (4) Ardeid species were observed, including Little Egret (*Egretta garzetta*), Great Egret (*Ardea alba*), Chinese Pond Heron (*Ardeola bacchus*) and Black-crowned Night Heron (*Nycticorax nycticorax*). The most abundant species was Little Egret (*Egretta garzetta*), with 379 individuals. The total number of each species recorded during peak flight period (0700-0900) from April – July 2020 is listed in **Table 4-3**:

Table 4-3 Total Numbers of Species

Species	No. of Individuals
Little Egret	379
Great Egret	177
Chinese Pond Heron	64
Black-crowned Night Heron	47
Total	667

* Although Grey Heron (*Ardea cinerea*), Cattle Egret (*Bubulcus ibis*) and Swinhoe's Egret (*Egretta eulophotes*) were also recorded in the April survey, these species were observed outside the peak flight period (0700-0900) and they did not have any breeding activity in the Penfold Park Egret.

- 4.8. Nine (9) major flight lines were identified, majority were in northeastern – southwestern direction to navigate between the Penfold Park Egret and Tolo Harbour. Three of them (A, B and C in **Figure 1**) passed through the Project boundary (Existing Shatin Sewage Treatment Works (STSTW)). **Figure 1** shows flight lines and landing points of Ardeids near Penfold Park Egret.
- 4.9. Some wandering behaviors for foraging were observed near Shing Mun River and frequency of utilizing landing points for resting (in scale of blue circle size in **Figure 1**) were identified. Usually, the majority of Ardeids rested near Shing Mun River for a period of time, whilst some (fewer than five individuals) occasionally or rarely rest on the existing DSD site or canopies of Kau To Shan.
- 4.10. The most frequently used flight line is A (22.34%), followed by B (17.84%) and X (15.74%), as shown in **Table 4-4**. This indicated that most ardeids adopted the flight line passing through the western side of STSTW. Flight lines were also sorted by direction in **Table 4-5**.

Table 4-4 Overall Flight Line Usage

Route	No. of Flight Lines	Percentage
A	149	22.34%
B	119	17.84%
C	52	7.80%
V	24	3.60%
W	21	3.15%
X	105	15.74%
Y	57	8.55%
Z	55	8.25%
O	85	12.74%
Total	667	100%

Table 4-5 Overall Flight Line Usage by Direction

Route	To Tai Wai Direction		To Tolo Harbor Direction		Total	
	No.	Percentage	No.	Percentage	No.	Percentage
A	56	17.83%	93	29.62%	149	22.34%
B	62	19.75%	57	18.15%	119	17.84%
C	20	6.37%	32	10.19%	52	7.80%
V	18	5.73%	6	1.91%	24	3.60%
W	N/A* ¹				21	3.15%
X	48	15.29%	57	18.15%	105	15.74%
Y	33	10.51%	24	7.64%	57	8.55%
Z	31	9.87%	24	7.64%	55	8.25%
O	46	14.65%	39	12.42%	85	12.74%
Total	314	100%	332	100%	667	100%

*1 Birds wandering in Route W shall not be counted by direction as they wandered in circle around the river.

- 4.11. In general, the most common flying height of Ardeids is 30-39mPD (28.49%), followed by 40-49mPD (17.09%) and 20-29mPD (14.99%). The details regarding flying height are shown in **Table 4-6**. It is noticed that the closer the route to the mountain (A and X), the higher the flying height is. On the other hand, the closer the route to Shing Mun River (Y and Z), the shorter the flying height is because of their behaviors of searching food.

Table 4-6 Overall Flying Height by Route

Height (mPD)	Route									Sum	Percentage
	A	B	C	V	W	X	Y	Z	O		
<10	0	0	0	1	7	0	34	22	16	80	11.99%
10-19	1	7	6	17	14	0	16	12	24	97	14.54%
20-29	3	21	14	5	0	4	5	19	29	100	14.99%
30-39	74	50	20	0	0	31	0	2	13	190	28.49%
40-49	36	30	8	0	0	37	0	0	3	114	17.09%
50-59	26	10	4	1	0	24	0	0	0	65	9.75%
60-69	7	1	0	0	0	8	1	0	0	17	2.55%
70-79	2	0	0	0	0	0	1	0	0	3	0.45%
80-89	0	0	0	0	0	1	0	0	0	1	0.15%
90-99	0	0	0	0	0	0	0	0	0	0	0.00%
≥100	0	0	0	0	0	0	0	0	0	0	0.00%
Sum	149	119	52	24	21	105	57	55	85	667	100%

Flight-line Taking-off from Egretry

- 4.12. Since the flight-line surveys in the EIA Report for STSTW (EIA-240/2016) and the Project Profile for Penfold Park Enhancement (DIR-275/2020) only considered the flight-lines taking off from the egretry, the survey result for this Project is further divided for fair comparison to other documents as shown below:

Table 4-7 Overall Flight Line Usage for Comparison with other Documents

Route	Flight Line taking off from the Egretry		Flight Line entering the Egretry		Other Flight Line	
	No. of Flight Lines	Percentage	No. of Flight Lines	Percentage	No. of Flight Lines	Percentage
A	93	29.52%	56	17.78%	N/A	
B	57	18.10%	62	19.68%		
C	32	10.16%	20	6.35%		
V	6	0.19%	18	5.71%		
W	N/A*1				21	26.92%
X	57	18.10%	48	15.24%	N/A	
Y	N/A*1				57	73.08%
Z	24	7.62%	31	9.84%	N/A	
O	46	14.60%	39	12.38%		
Total	315	100%	274	100%	78	100%

*1 Birds using Routes W and Y shall not be counted from/to the Egretry as they wandered in circle around the river and flew along the river without stopping respectively.

Table 4-8 Overall Flying Height by Route (Take-off from the Egretry)

Height (mPD)	Route										Sum	Percentage
	A	B	C	V	W	X	Y	Z	O			
<10	0	0	0	1	N/A	0	N/A	3	4	8	2.54%	
10-19	0	1	2	5		0		15	11	34	10.79%	
20-29	0	12	7	0		1		5	20	45	14.29%	
30-39	56	31	12	0		17		1	9	126	40.00%	
40-49	7	12	7	0		22		0	2	50	15.87%	
50-59	21	1	4	0		12		0	0	38	12.06%	
60-69	7	0	0	0		4		0	0	11	3.49%	
70-79	2	0	0	0		0		0	0	2	0.63%	
80-89	0	0	0	0		1		0	0	1	0.32%	
90-99	0	0	0	0		0		0	0	0	0.00%	
≥100	0	0	0	0		0		0	0	0	0.00%	
Sum	93	57	32	6		0		57	0	24	46	315

- 4.13. From **Table 4-7**, the most frequently used routes for leaving the egretry are A (29.52%), B (18.10%) and X (18.10%), which directed towards the northeastern part of the Tolo Harbour. These routes are similar to Flight Lines 2 and Flight Line 1 in EIA-240/2016 (See **Appendix B1**) and Flight Line 1 of DIR-275/2020 (See **Appendix B2**). Nevertheless, the birds also adopted Route O towards Tai Wai in the current survey, unlike the past studies which took the route to Shing Mun River as another preference (Flight Line 4 in EIA-240/2016 and Flight Line 3 in DIR-275/2020). Although there were variations in the flight line preference in different years, both routes to the northeastern Tolo Harbour and the Shing Mun River were mostly used among these three studies.

-
- 4.14. Difference in flying height had been recorded between the collected data and the data from EIA-240/2016. From **Table 4-8**, the data collected in this survey showed that the most frequent flying height was 30-39m (40.0%) as compared to 10-20m (42.4%) reported in the EIA study.
- 4.15. While there is no breakdown of the flying height for each flight line in the EIA Study for detailed analysis, the difference in height preference among the two studies may be related to the flight path preference. In the current study, >60% of the flight lines directed towards northeastern Tolo Harbour (Routes A, B & X). These routes predominantly adopted flying height >30m, while the remaining routes (such as Route Z along Shing Mun River) were generally at lower levels. In the EIA Study, the preference in the flight routes was less prominent (around 40% directed towards northeastern Tolo Harbour (Flight Lines 1 & 2) and similar usage (around 25%) of the path above the STSTW (Flight Line 3) and Shing Mun River (Flight Line 4)).

5. IMPACT ASSESSMENT

5.1. Flight lines during breeding season are crucial to their foraging and survival rate of their chicks. Disturbance may deter Ardeids from using their normal paths. If they need to take longer time to bypass or fly higher to avoid the disturbance in order to reach their expected destinations, this may result in greater energy exertion. The potential disturbance from the demolition of STSTW and their impacts are discussed below. The percentage used in this section is based on the total counts (all flights to and from and wandering near the egretry).

Direct Impact – Disruption of Ardeids’ Flight Lines by Powered Mechanical Equipment (PME)

5.2. Cranes and other tall construction equipment placed on roof top of the structure to be demolished may potentially interrupt the original flight paths (e.g. A, B & C) as these machines can reach the average height of flight line A, B and C (30-39mPD). However, demolition works will be divided into different stages and will last for a few years. The number of PME to be operated will be limited. During the survey, a mobile crane was operated near the southeastern corner of the STSTW. Even though the crane extended and turned around occasionally, the movement was slow and ardeids flying nearby was not seen to be startled or suddenly changed their flight path. With limited plant number and slow movement, the PME is not expected to cause physical blockage to the flight path.

5.3. **Figure 1** shows a minority (two to three individuals) of Chinese Pond Heron (*Ardeola bacchus*) stopped at a rooftop of DSD buildings. As the majority (over 90%) utilized landing points on sides of Shing Mun River and under bridges for resting, no significant impact due to loss of landing points in the STSTW is expected.

Indirect Impact – Noise Nuisance from Construction Works

5.4. Noise generated from demolition work at the STSTW may cause disturbance to the Egretry and egrets in the surrounding. As the Egretry is far away from the existing STSTW (about 750m), adverse noise impact on Penfold Park Egretry stemming from disturbance in the construction phase is not expected.

5.5. A certain number of Ardeids (15.74%) adopted Flight Line X which passes through a busy traffic highway - Tolo Highway and all routes to northern-east pass through Tate’s Cairn Highway. This reflects their certain tolerance to human activities and artificial structures. However, mitigation measures are proposed in **Chapter 6** below to minimize the noise impact as far as possible.

Indirect Impact – Energy Exertion due to Change of Flight Lines

5.6. Although Ardeids are well adapted to human disturbance and are not expected to be significantly affected by the demolition works, they can shift their routing at ease due to the similar length of the flight lines. Flight lines A, B and X (contributing to about 56% flight lines of Ardeids) are three similar, major and convenient routes to foraging sites in CUHK or Tolo Harbour, as well as C and Z (around 16% flight lines) are two convenient ways heading foraging places in Shing Mun River and Tolo Harbour. The distance difference between B & X and C & Z at the edge of the STSTW are less than 100m, energy

consumption should be similar. Therefore, energy consumption of parent Ardeids due to the change of flight lines and the Project is expected to be low.

Indirect Impact – Glare from Works Area

- 5.7. The demolition of the STSTW is tentatively carried out during normal working hours (7am – 7pm). In case of working at dusk or at night (after 7pm), the lights will be kept at a minimum level and turned off after the work as soon as possible. In addition, the egretty is located far away from the existing STSTW (about 750m). Nevertheless, glare impact from the construction light will be minimized by implementing measures in **Chapter 6** below.

6. RECOMMENDED MITIGATION MEASURES

- 6.1. The following measures are proposed to minimize the potential impact on the flying ardeids: (1) adoption of best practices, (2) avoidance of the peak flight hours during breeding season and (3) use of better demolition technology or method. Details of the proposed mitigation measures are listed below:

Adoption of Best Practice

- 6.2. General good site practices of noise control measures listed within EM&A Manual shall be implemented:
- Adopt movable noise barriers for particular PME;
 - Wrap acoustic materials around the noisy part of the PME;
 - Use quieter PMEs;
 - Only well-maintained plant should be operated on-site and plant should be serviced regularly during the demolition period;
 - Silencers or mufflers on PME should be utilised and should be properly maintained during the demolition period;
 - Mobile plant, if any, should be sited as far away from egretry as possible;
 - Machines and plant (such as trucks) that may be in intermittent use should be shut down between works periods or should be throttled down to a minimum;
 - Plant known to emit noise strongly in one direction should, wherever possible, be orientated so that the noise is directed away from the egretry.
- 6.3. A noise monitoring station (Point DM2 – Racecourse Garden) shall be set up near the egretry at Penfold Park in accordance to EM&A Manual. Despite the station was not set up for the egretry in Penfold Park, the monitoring data shall be used as a reference on the noise impact near the Park.
- 6.4. The Contractor shall avoid setting up resting stations nearby Shing Mun River to minimize disturbance from human activity. All workers shall be informed with the presence of egretry as well.

Avoidance of Construction Works during the Peak Hour (before 9am & after 5pm) of Breeding Season (1st March – 31st August)

Flight-lines above the Sha Tin Sewage Treatment Works (A, B & C)

- 6.5. The most commonly used flight height of flight lines A, B and C is around 30-39mPD. Therefore, it is recommended to adopt quiet plant (e.g. hydraulic crusher) throughout the breeding season (1st March – 31st August) as far as possible. An excavator-mounted breaker (sound power level (SWL): 122dB) is much noisier than a hydraulic crusher (SWL: ~100dB).
- 6.6. For demolition work that can only be completed with an excavator-mounted hydraulic breaker (e.g. removal of ground slab / substructure), the operation time of the breaker shall be kept to a minimum and no breaker can be operated during the peak hours during breeding season (before 9am and after 5pm each day).

Use of Better Demolition Technology or Method

Flight-lines along Shing Mun River (Y & Z)

- 6.7. The height of flight lines along Shing Mun River (e.g. Y and Z) are mainly lower than 10mPD. The ground level of the existing DSD site is 6.5mPD. Therefore, the demolition of structures near the Shing Mun River should be arranged in the last stage of the demolition programme where possible. These structures can act as substantial barriers to activities in the inner part of the STW.
- 6.8. To further reduce noise impact, it is recommended not to demolish structures taller than 20mPD (e.g. power house, administration building) during peak hours of the breeding season (before 9am and after 5pm each day). The height of the buildings can be found in **Appendix E**.

Screening of Site Activity

- 6.9. Site hoarding shall be erected along structures to be demolished within 50m from the southern side of the STSTW near Shing Mun River as per the code of practice for demolition of building by the Building Department. The hoarding should be provided with noise absorbing materials to further enhance the noise reduction effect. The location of the hoarding is shown in **Appendix E**. If the structures will be demolished in phases, the hoarding should extend 10m from both sides of the structures.
- 6.10. Bird curtain shall also be erected above the hoarding so that the overall height of the hoarding and curtain will be not less than 5m in height. The proposed bird curtain shall consist noise absorbing material and there shall be no gap between the hoarding and the bird curtain. This can screen the direct view of the construction activity from ardeids flying along Shing Mun River and resting at landing points near the STSTW (bridge columns of Tate's Cairn Highway and footbridge across the Shing Mun River).

Light Control in Works Area

6.11. All lights provided in the construction site should have the following features to minimize light spill outside the project area:

- The number of lighting should be kept minimum;
- The lux level should be designed just sufficient for safety purpose;
- Point light towards the Site to minimize light spill outside the project boundary;
- Shielded with hood to prevent sky glow;
- Aim light no greater than 70°;
- Where light has to be pointed upward, adjust the light direction to ensure no spillage outside the target.

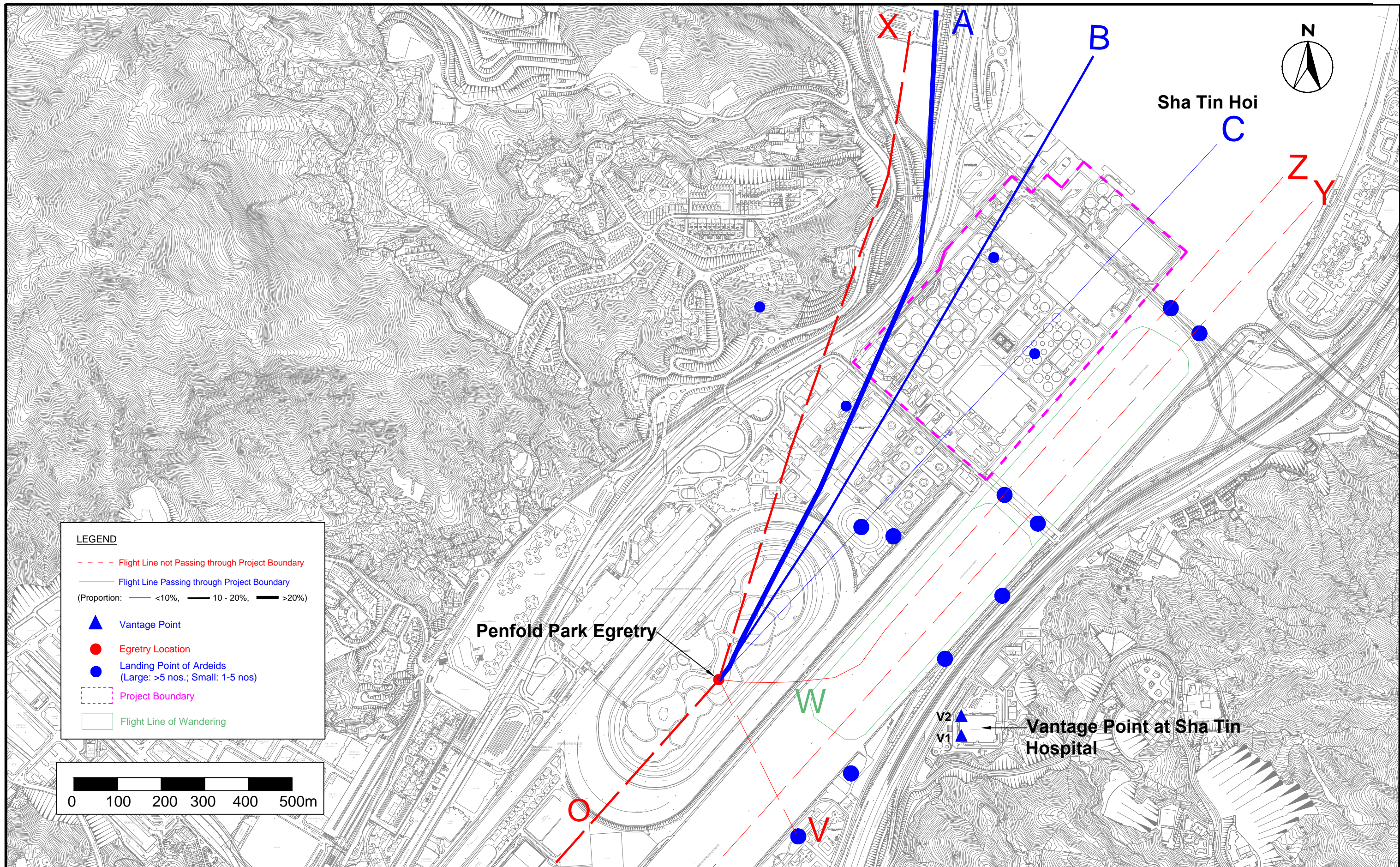
7. CONCLUSION

- 7.1. Egret and Flight Line Survey were conducted by a qualified ecologist once per month between April and July 2020.
- 7.2. Although the DIR-275/2020 recorded higher nest count in the Penfold Park in 2019 (88 nos.), the present survey results of nest count (78 nos.) was similar to the HKBWS's 5-year annual average (72 nos.). Nests of five species of Ardeids were found, with Intermediate Egret nest a suspected record.
- 7.3. The flight path preference was similar to DIR-275/2020 and the EIA of Sha Tin Cavern Treatment Works. Nine major flight lines and landing points were identified. Peak flight hours were 0700-0859 (1st) and 1700-1859 (2nd). The ardeids were found adapted to human disturbance (e.g. construction work in Penfold Park) and heavy traffic.
- 7.4. Potential impacts on Ardeids owing to the demolition works during breeding season were analysed. Direct and indirect impacts involved disruption of Ardeids' flight lines by PMEs, noise and light nuisance from construction works.
- 7.5. Recommended mitigation measures were proposed as follows:
- Adopt good site practice include erection of movable noise barrier for particular PME, utilization of quiet plant (e.g. hydraulic crusher), wrapping acoustic material around the noisy part of the PME etc.;
 - Avoid setting up resting station near the Shing Mun River;
 - The operation duration of breaker shall be kept to a minimum and no breaker can be operated during the peak hours of breeding season (before 9am and after 5pm from 31st March – 31st August);
 - Avoid demolishing structures over 20mPD during the peak hours of breeding season (before 9am and after 5pm from 31st March – 31st August);
 - Erect bird curtain and site hoarding with noise absorbing materials of not less than 5m in height when demolishing structures within 50m from the southern side of the STSTW near the Shing Mun River;
 - Minimize spillage from construction light.

8. REFERENCE

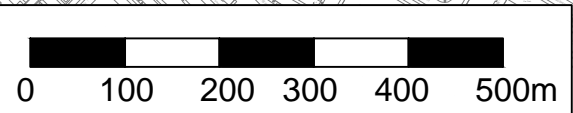
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Last Accessed: 20 October 2020.

FIGURES



LEGEND

- - - Flight Line not Passing through Project Boundary
- Flight Line Passing through Project Boundary
(Proportion: — <10%, — 10 - 20%, — >20%)
- ▲ Vantage Point
- Egretty Location
- Landing Point of Ardeids
(Large: >5 nos.; Small: 1-5 nos)
- Project Boundary
- Flight Line of Wandering



Title

Contract No. SPW 09/2018 Environmental Team Baseline Surveys
for Sha Tin Cavern Sewage Treatment Works

Fight Lines of Ardeids near Penfold Park Egretty

Scale
1 : 800

Date
AUG 20

Project
No. IA18064

Figure
No. 1



APPENDIX A
CURRICULUM VITAE OF ECOLOGIST

SHUM, TING WING

Independent Ecologist/ Certified Arborist

Position	Independent Ecologist
Education	MSc in Environmental Management, The University of Hong Kong, 2015 BSc (Hons) Environmental Life Science, The University of Hong Kong, 2009
Professional Registration/ Associations	Certified Arborist (HK-1422A) of International Society of Arboriculture since 2012 Core Member - White-bellied Sea Eagle Research Group - Hong Kong Bird Watching Society 2008 – present Chairman - Environmental Life Science Society, SS, HKUSU, 2007
Years of Experience	12

Key Experience

Shum is a field ecologist with over 12 years of experience in various plant and wildlife surveys in Hong Kong and overseas. Since, Shum started his career as a professional bird surveyor and the first major programme was the Nature Conservation Management for Long Valley.

As an experienced bird surveyor, Shum has been invited to be course coordinator of several advanced bird identification courses organized by the Hong Kong Bird Watching Society.

In 2011 – 2015, Shum has been involved in identification and monitoring every woody plant in a 20ha plot in in Tai Po Kau Nature Reserve under the Global Forest Observatory Programme, initiated by Smithsonian Tropical Research Institute – Center for Tropical Forest Science, Harvard University, and locally co-operated with the Kadoorie Farm and Botanic Garden.

Relevant Experiences:

Agreement No. EIA-223/2014 Expansion of Hong Kong International Airport into a Three-Runway System (2012-2013)

Ecologist responsible for the avifauna survey and flight line survey.

Proposed Residential Development in Lau Fau Shan (2017-2018)

Ecologist responsible monthly avifauna survey and flight line survey for monitoring the impact on egret nearby.

Agreement No. CE 48/2014(GE), Landslip Prevention and Mitigation Programme, 2014, Package E – Investigation, Design and Construction (2014)

TPRP – Tree Preservation and Removal Proposal for six man-made features with (TRA) Tree Risk Assessment for selected feature.

Arborist: responsible for inspection, endorsement, reporting and auditing.

Ecological Survey – Special focus on species of conservation importance on two man-made Features

Ecologist: responsible for day and night-time on various taxa group (including herpetofauna and avifauna), habitat and vegetation survey, reporting and providing recommendations.

Nature Conservation Management for Long Valley and Fishpond Conservation Scheme in Ramsar Site (2009-2016)

Part-time bird surveyor responsible for avifauna survey in the bird monitoring programme.

Agreement No. 02/LD/2019 Ecological Survey for Eco-Hydraulics Study on Green Channels – Stage 3 (2019 –present)

Ecologist: responsible for bird and vegetation survey for 26 sites in various seasons.

A Baseline Study of the Benefits of Eco-agriculture on Biodiversity in Hong Kong – the University of Hong Kong (2018-2019)

Senior Project Officer responsible for ecological surveys (including avifauna survey) in various farmlands in Hong Kong.

Contract No. IS/2017/01 Construction of Mountain Bike Training Ground and Expansion of Mountain Bike Trail Networks in Mui Wo and Chi Ma Wan, South Lantau (2017-2018)

Ecologist: responsible for day and night-time on various taxa group (including herpetofauna) and vegetation survey, reporting and providing recommendations.

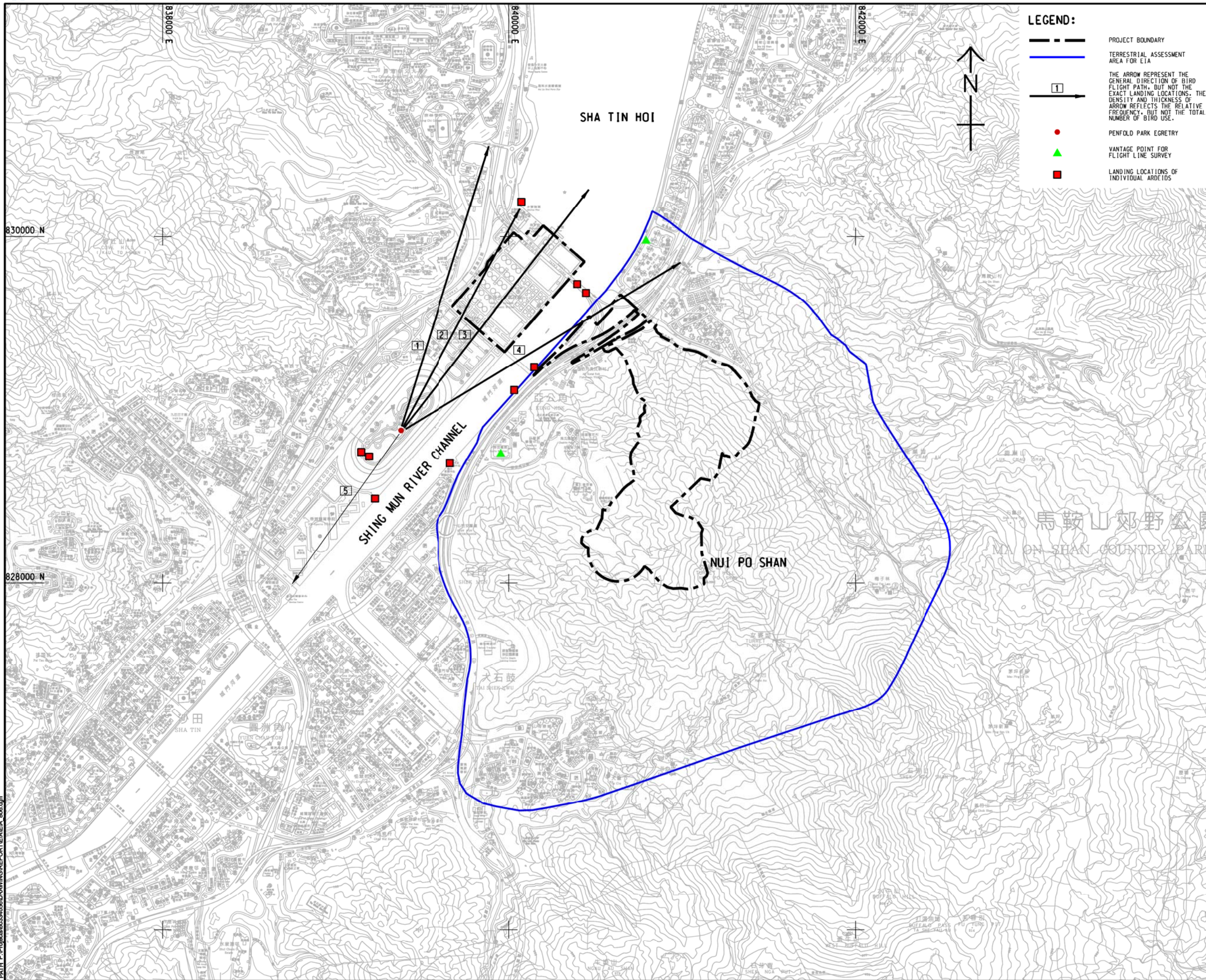
Global Forest Observatory – Project Officer (2011-2016) responsible for research co-ordination, managing the 20 ha plot woodland data analysis and public engagement.

Relevant Employment History

2009 – present	Independent Ecologist / Arborist
2009 – 2016	Project Officer, Kadoorie Institute, University of Hong Kong
2016 – present	Conservation Director, Outdoor Wildlife Learning Hong Kong
2018 – present	Senior Research Assistant, University of Hong Kong

APPENDIX B
FLIGHT LINES IN PAST STUDIES

ISO A1 594mm x 841mm
 Approved:
 Checked:
 Designer:
 Project Management Initials:
 2016/05/26
 P:\Project\60334056\DRAWING\REPORT\EIA\A1_806.dgn



LEGEND:

- PROJECT BOUNDARY
- TERRESTRIAL ASSESSMENT AREA FOR EIA
- THE ARROW REPRESENT THE GENERAL DIRECTION OF BIRD FLIGHT PATH, BUT NOT THE EXACT LANDING LOCATIONS. THE DENSITY AND THICKNESS OF ARROW REFLECTS THE RELATIVE FREQUENCY, BUT NOT THE TOTAL NUMBER OF BIRD USE.
- PENFOLD PARK EGRETTRY
- VANTAGE POINT FOR FLIGHT LINE SURVEY
- LANDING LOCATIONS OF INDIVIDUAL ARDEIDS

AECOM

PROJECT
項目

RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS: CAVERNS AND SEWAGE TREATMENT WORKS - INVESTIGATION, DESIGN AND CONSTRUCTION

CLIENT
業主

渠務署
Drainage Services Department

CONSULTANT
工程顧問公司

AECOM Asia Company Ltd.
www.aecom.com

SUB-CONSULTANTS
分門工程顧問公司

ISSUE/REVISION
修訂

IR	DATE	DESCRIPTION	CHK

STATUS
階段

SCALE
比例

DIMENSION UNIT
尺寸單位

A3 1 : 20000 METRES

KEY PLAN A3 1 : 1000000



PROJECT NO.
項目編號

CONTRACT NO.
合約編號

60334056 CE 30/2014 (DS)

SHEET TITLE
圖紙名稱

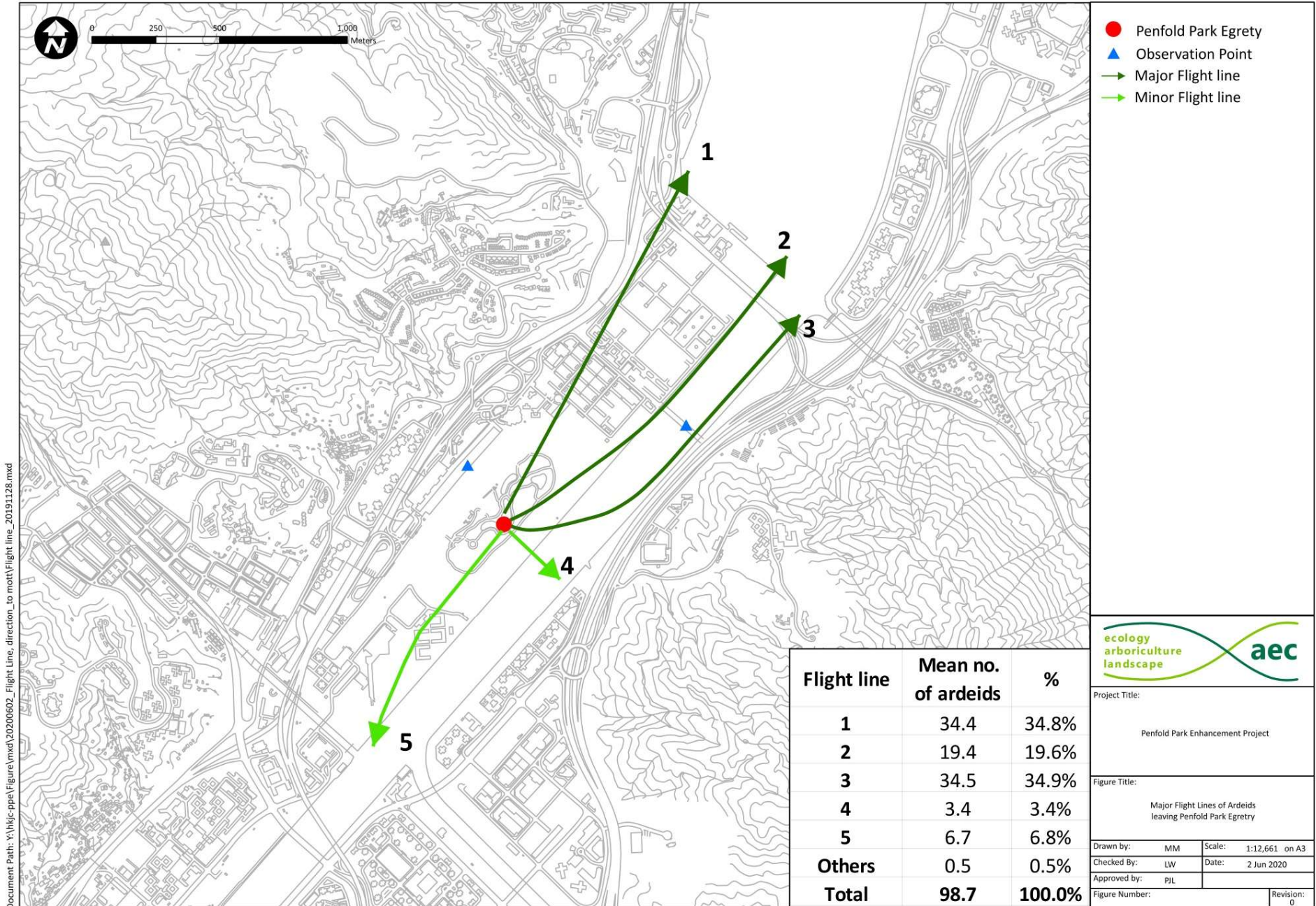
FLIGHT PATH OF ARDEIDS
IN PENFOLD PARK EGRETTRY

SHEET NUMBER
圖紙編號

60334056/EIA/8.06

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Appendix 2 - Flight Lines of Ardeids Leaving the Egretty identified from Breeding Season Ardeid Flight Line Survey



**APPENDIX C
PHOTOGRAPHIC RECORD OF
EGRETRY SURVEY**

Appendix C – Photographic Records of Egretty Survey



Photo 1 – Overview of the Penfold Park Egretty



Photo 2 – Nest of Little Egret



Photo 3 – Nest of the Suspected Intermediate Egret



Photo 4 – Great Egret

Appendix C – Photographic Records of Egretty Survey



Photo 5 – Chinese Pond Heron



Photo 6 – Nest of Black-crowned Night Heron



Photo 7 – Juvenile of Little Egret



Photo 8 – Juvenile of Chinese Pond Heron

Appendix C – Photographic Records of Egretry Survey



Photo 9 – Juvenile of Great Egret



Photo 10 – Juvenile of Black-crowned Night Heron



Photo 11 – Juvenile asking for Food



Photo 12 – Crane within the Proposed Demolition Site

**APPENDIX D
EXTRACT OF FLIGHT LINE SURVEY IN
APRIL**

1. SUMMARY OF THE FIRST FLIGHT LINE SURVEY (APRIL 2020)

- 1.1 A flight line survey was conducted on 28th April 2020 during breeding season of Ardeids to analyze major flight lines of Ardeids in the assessment area. The basic information of the survey can be found in **Table 1**.

Table 1 - General Information of the Flight Line Survey

Date	28 th April 2020
Duration	0630-1859
Vantage Point	Rooftop at Sha Tin Hospital
Number of Surveyors	4
Weather	Sunny
Temperature	22 - 30°C

- 1.2 Overall, 836 Ardeids and their 605 flight lines were recorded. Seven (7) Ardeid species was recorded, including Little Egret (*Egretta garzetta*), Great Egret (*Ardea alba*), Chinese Pond Heron (*Ardeola bacchus*), Black-crowned Night Heron (*Nycticorax nycticorax*), Grey Heron (*Ardea cinerea*), Cattle Egret (*Bubulcus ibis*) and Swinhoe's Egret (*Egretta eulophotes*). The most abundant species was Little Egret (*Egretta garzetta*), with 668 individuals.
- 1.3 Eight (8) major flight lines were identified, majority were in northeastern – southwestern direction to navigate between the Penfold Egretty and Tolo Harbour. Three of them (A, B and C in **Figure 1**) passed through the Project boundary (Existing Shatin Sewage Treatment Works (STSTW)). **Figure 1** shows flight lines and landing point of Ardeids near Penfold Park Egretty. Some wandering behaviors for foraging were observed near Shing Mun River and landing points for resting were identified.
- 1.4 Number of Flight lines in Route A, B and C against total flight lines was 257 (30.74%), 127 (15.19%) and 218 (26.08%) respectively, as shown in **Table 2**. Route A was thus the most frequently used route of flight lines during the survey period. This indicated that most ardeids adopted the flight line passing through the western side of STSTW.

Table 2 - Number of Flights and their Percentage in Different Flight Lines

Route	To Tolo Harbour Direction	%	To Tai Wai Direction	%	Overall	%
A	105	28.23%	152	32.76%	257	30.74%
B	66	17.74%	61	13.15%	127	15.19%
C	52	13.98%	166	35.78%	218	26.08%
V	11	2.96%	15	3.23%	26	3.11%
W	19	5.11%	0	0.00%	19	2.27%
X	12	3.23%	12	2.59%	24	2.87%
Y	30	8.06%	20	4.31%	50	5.98%
Z	72	19.35%	37	7.97%	109	13.04%
Other	5	1.34%	1	0.22%	6	0.72%

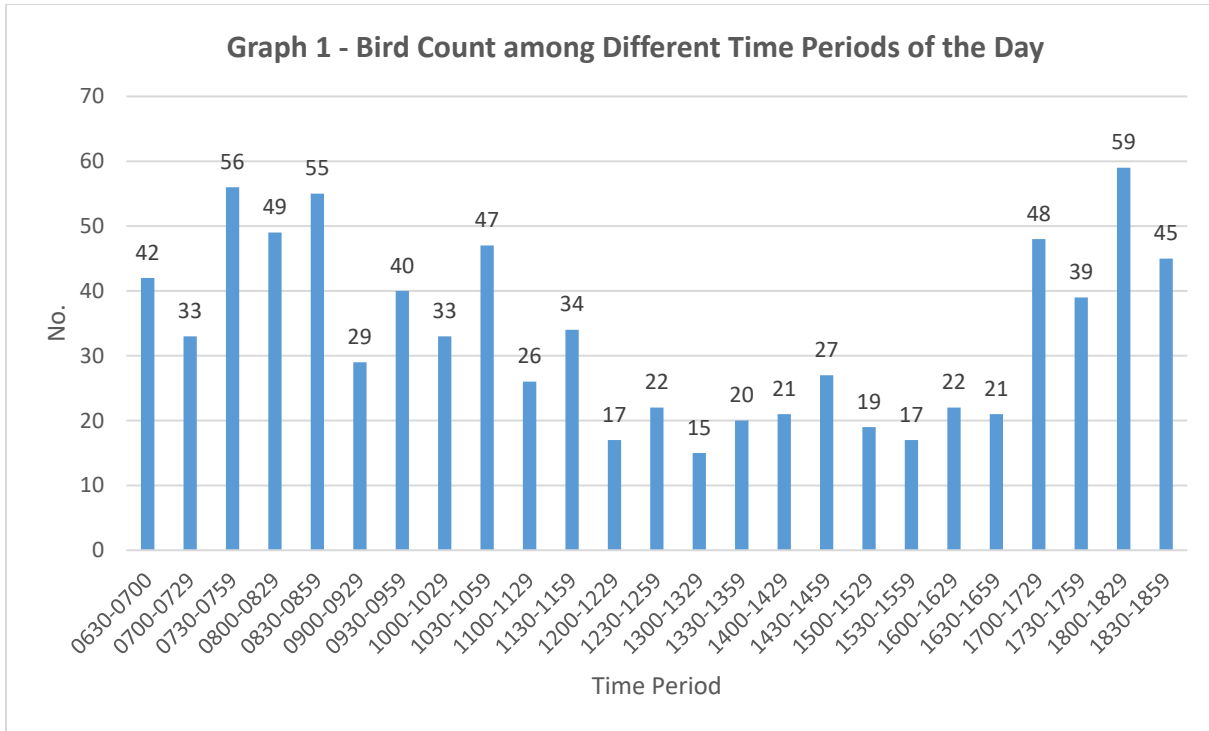
2. SURVEY RESULTS

Number of Ardeids/Flight Lines

2.1 In terms of numbers of individuals/flight lines (**Table 3** and **Graph 1**), the most abundant number of Ardeids was 59 (7.1%) in 1800-1829, seconded by 56(6.7%) and 55(6.6%) in the time period 0730-0759 and 0830-0859 respectively.

Table 3 - Numbers of Ardeids/Flight Lines in Each Time Period

Time Period	Route									
	Overall	%	A	%	B	%	C	%	A+B+C	%
0630-0700	42	5.0%	15	5.8%	2	1.6%	3	1.4%	20	3.3%
0700-0729	33	3.9%	14	5.4%	7	5.5%	2	0.9%	23	3.8%
0730-0759	56	6.7%	18	7.0%	14	11.0%	6	2.8%	38	6.3%
0800-0829	49	5.9%	26	10.1%	16	12.6%	2	0.9%	44	7.3%
0830-0859	55	6.6%	29	11.3%	4	3.1%	5	2.3%	38	6.3%
0900-0929	29	3.5%	1	0.4%	8	6.3%	7	3.2%	16	2.7%
0930-0959	40	4.8%	5	1.9%	15	11.8%	7	3.2%	27	4.5%
1000-1029	33	3.9%	4	1.6%	9	7.1%	10	4.6%	23	3.8%
1030-1059	47	5.6%	10	3.9%	12	9.4%	5	2.3%	27	4.5%
1100-1129	26	3.1%	6	2.3%	8	6.3%	4	1.8%	18	3.0%
1130-1159	34	4.1%	1	0.4%	13	10.2%	6	2.8%	20	3.3%
1200-1229	17	2.0%	3	1.2%	0	0.0%	6	2.8%	9	1.5%
1230-1259	22	2.6%	5	1.9%	0	0.0%	5	2.3%	10	1.7%
1300-1329	15	1.8%	2	0.8%	0	0.0%	9	4.1%	11	1.8%
1330-1359	20	2.4%	10	3.9%	0	0.0%	10	4.6%	20	3.3%
1400-1429	21	2.5%	6	2.3%	2	1.6%	10	4.6%	18	3.0%
1430-1459	27	3.2%	10	3.9%	0	0.0%	8	3.7%	18	3.0%
1500-1529	19	2.3%	2	0.8%	2	1.6%	13	6.0%	17	2.8%
1530-1559	17	2.0%	7	2.7%	0	0.0%	8	3.7%	15	2.5%
1600-1629	22	2.6%	5	1.9%	1	0.8%	9	4.1%	15	2.5%
1630-1659	21	2.5%	9	3.5%	3	2.4%	11	5.0%	23	3.8%
1700-1729	48	5.7%	8	3.1%	0	0.0%	37	17.0%	45	7.5%
1730-1759	39	4.7%	8	3.1%	11	8.7%	11	5.0%	30	5.0%
1800-1829	59	7.1%	32	12.5%	0	0.0%	11	5.0%	43	7.1%
1830-1859	45	5.4%	21	8.2%	0	0.0%	13	6.0%	34	5.6%
TOTAL	836		257		127		218		602	



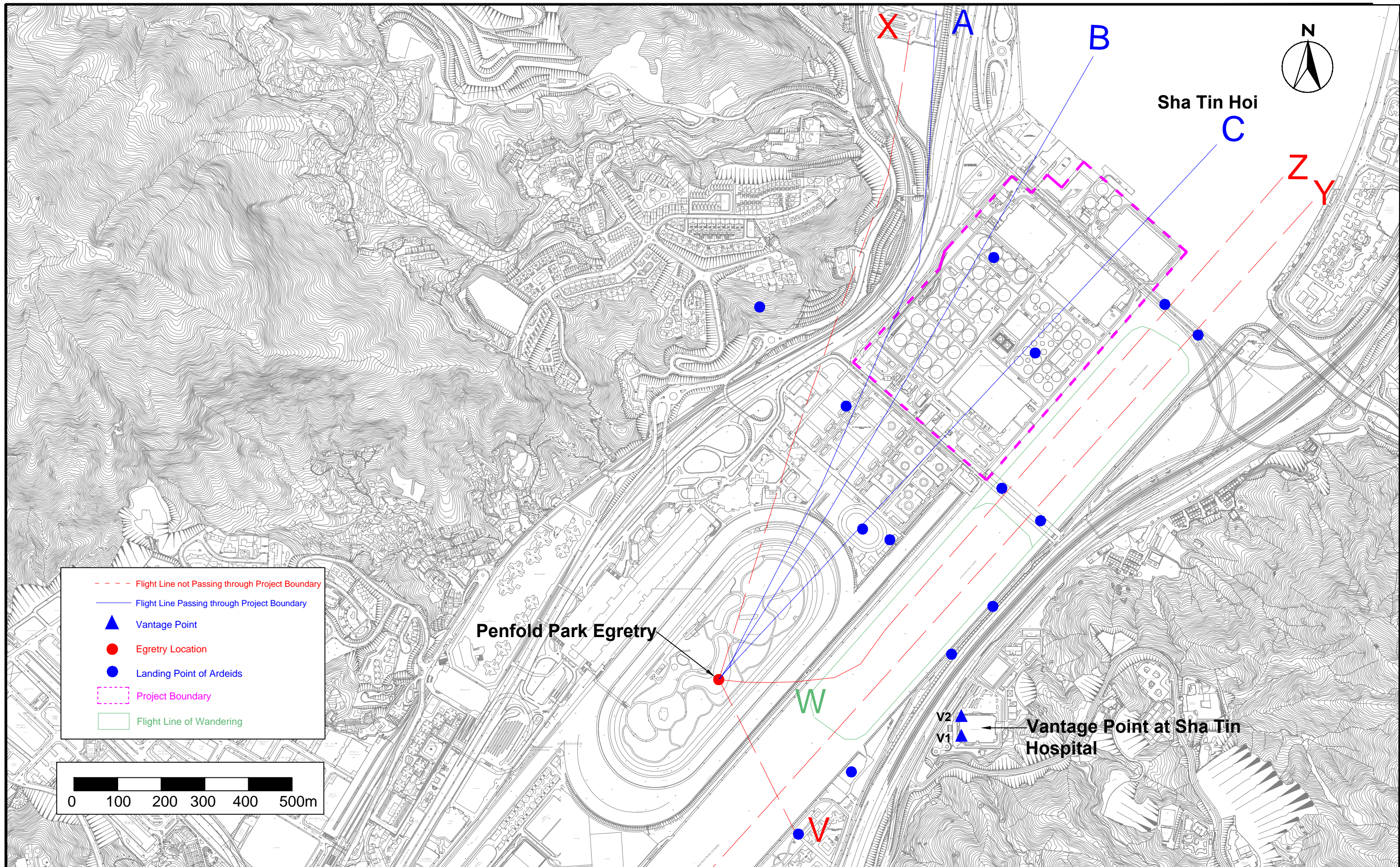
3. PROPOSED SURVEY TIME FOR FLIGHT-LINE SURVEY IN MAY - JULY

- 3.1 According to the approved Egretty Survey Plan, the flight-line survey in May – July will cover a duration of not less than two hours with peak Ardeid’s activity. Therefore, the survey results in April was analyzed in terms of two-hour interval (**Table 4**).

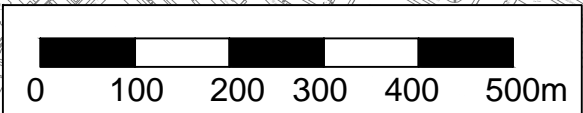
Table 4 – Data Analysis (2-hour interval)

Time Period	No. of Ardeids/Flight Path			
	Overall	%	Using Flight Paths A+B+C	%
0630-0829	180	21.5%	125	20.8%
0700-0859	193	23.1%	143	23.8%
0730-0929	189	22.6%	136	22.6%
0800-0959	173	20.7%	125	20.8%
0830-1029	157	18.8%	104	17.3%
0900-1059	149	17.8%	93	15.4%
0930-1129	146	17.5%	95	15.8%
1000-1159	140	16.7%	88	14.6%
1030-1229	124	14.8%	74	12.3%
1100-1259	99	11.8%	57	9.5%
1130-1329	88	10.5%	50	8.3%
1200-1359	74	8.9%	50	8.3%
1230-1429	78	9.3%	59	9.8%
1300-1459	83	9.9%	67	11.1%
1330-1529	87	10.4%	73	12.1%
1400-1559	84	10.0%	68	11.3%
1430-1629	85	10.2%	65	10.8%
1500-1659	79	9.4%	70	11.6%
1530-1729	108	12.9%	98	16.3%
1600-1759	130	15.6%	113	18.8%
1630-1829	167	20.0%	141	23.4%
1700-1859	191	22.8%	152	25.2%
Whole Day	836		602	

- 3.2 In terms of Ardeid number, two similar peak flight periods were identified: 0700-0859 in the morning (193 nos.) and 1700-1859 in the afternoon (191 nos.). However, there was a significant difference in the no. of flights between 2 peaks (139 nos. in the morning, 108 nos. in the afternoon). Therefore 0700-0859 is proposed as the survey period in the coming May-July.



- - - - Flight Line not Passing through Project Boundary
- Flight Line Passing through Project Boundary
- ▲ Vantage Point
- Egretty Location
- Landing Point of Ardeids
- Project Boundary
- Flight Line of Wandering



Title

Contract No. SPW 09/2018 Environmental Team Baseline Surveys
for Sha Tin Cavern Sewage Treatment Works

Fight Lines of Ardeids near Penfold Park Egretty

Scale
1 : 800

Date
MAY 20

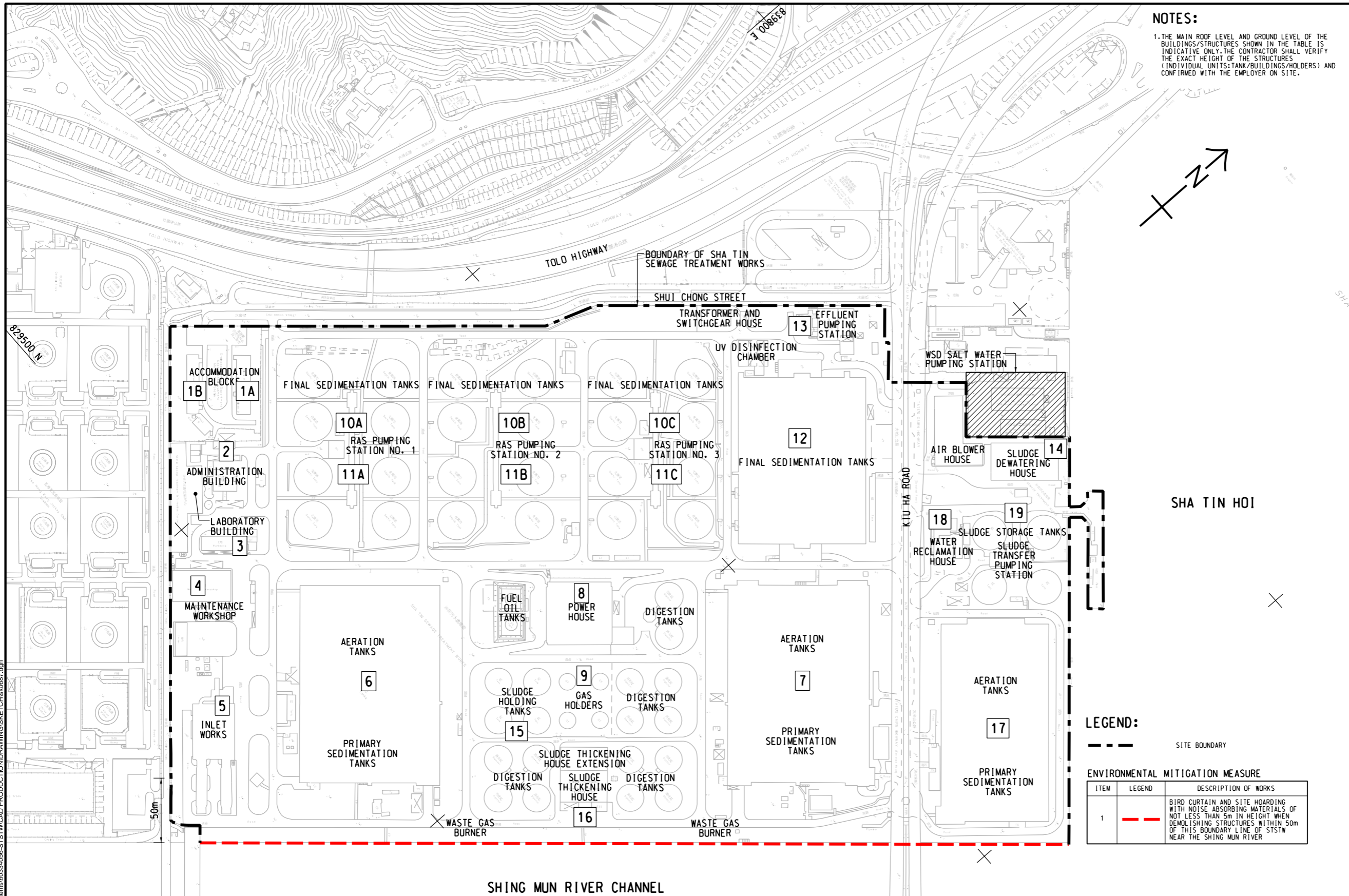
Project
No. IA18064

Figure
No. 1

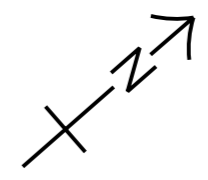


APPENDIX E
EXISTING STSTW LAYOUT PLAN

ISO A1 594mm x 841mm
 Approved: _____
 Checked: _____
 Designer: _____
 Project Management Initials: _____
 21-Feb-2020
 P:\A1\594x841\60334056-STSTW\CAD\PRODUCTION\DRAWING\SET\CHK\CHK087.dgn
 Plot File by: YangRO
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NOTES:
 1. THE MAIN ROOF LEVEL AND GROUND LEVEL OF THE BUILDINGS/STRUCTURES SHOWN IN THE TABLE IS INDICATIVE ONLY. THE CONTRACTOR SHALL VERIFY THE EXACT HEIGHT OF THE STRUCTURES (INDIVIDUAL UNITS: TANK/BUILDINGS/HOLDERS) AND CONFIRMED WITH THE EMPLOYER ON SITE.



PROJECT
 項目
RELOCATION OF SHA TIN SEWAGE TREATMENT WORKS TO CAVERNS

CLIENT
 客戶
 渠務署
 Drainage Services Department

CONSULTANT
 顧問公司
 AECOM Asia Company Ltd.
 www.aecom.com

SUB-CONSULTANTS
 分判工程師/公司

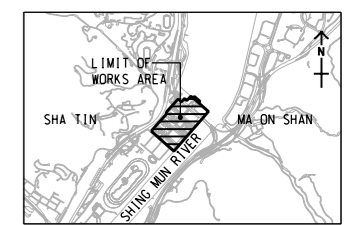
ISSUE/REVISION

NO.	DATE	DESCRIPTION	CHK.

STATUS
 狀態

SCALE
 比例尺
 A1 1:1500
DIMENSION UNIT
 尺寸單位
 METRES

KEY PLAN
 索引圖
 A1 1:50000



PROJECT NO.
 項目編號
 60334056
CONTRACT NO.
 合約編號

SHEET TITLE
 圖名
 EXISTING STSTW LAYOUT PLAN

SHEET NUMBER
 圖號
 60334056/SK0687

LEGEND:

--- SITE BOUNDARY

ENVIRONMENTAL MITIGATION MEASURE

ITEM	LEGEND	DESCRIPTION OF WORKS
1	---	BIRD CURTAIN AND SITE HOARDING WITH NOISE ABSORBING MATERIALS OF NOT LESS THAN 5m IN HEIGHT WHEN DEMOLISHING STRUCTURES WITHIN 50m OF THIS BOUNDARY LINE OF STSTW NEAR THE SHING MUN RIVER

Ref. No.	Major Building / Structure	Approx. Ground Level (mPD)	Approx. Main Roof Level (mPD)	Approx. Building Height (m)	Ref. No.	Major Building / Structure	Approx. Ground Level (mPD)	Approx. Main Roof Level (mPD)	Approx. Building Height (m)
1A	Staff Quarters of STSTW (Block D&E)	6.8	19.2	12.4	10A,B&C	Final Sedimentation Tanks	6.5	9.5	3.0
1B	Staff Quarters of STSTW (Block A&B)	6.8	22.6	15.8	11A,B&C	RAS Pumping Station	6.5	16.0	9.5
2	Administration Building	6.8	23.3	16.5	12	Final Sedimentation Tanks	6.0	8.9	2.9
3	Workshop	6.8	17.0	10.2	13	Effluent Pumping Station	6.0	20.0	14.0
4	Maintenance Workshop	6.5	16.2	9.7	14	Sludge Dewatering House	6.0	23.4	17.4
5	Inlet Works	5.6	19.0	13.4	15	Sludge Holding Tanks	6.6	14.7	8.1
6	Primary Sedimentation Tanks and Aeration Tanks	5.6	12.1	6.5	16	Sludge Thickening House	6.6	19.0	12.4
7	Primary Sedimentation Tanks and Aeration Tanks	5.6	13.0	7.4	17	Primary Sedimentation Tanks and Aeration Tanks	5.6	13.0	7.4
8	Power House	7.2	24.0	16.8	18	Water Reclamation House	6.0	14.0	8.0
9	Gas Holder	6.6	21.0	14.4	19	Sludge Storage Tanks	6.2	19.5	13.3

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