銅鑼灣

Causeway Bay

Annex J
Water Supply Impact

[redacted]

From: terry_cw_law@wsd.gov.hk
Sent: 2024年3月19日星期二 10:58
To: Lai, Marco Tsz-Kin
Cc: [redacted]
Subject: RE: Basic Information of Eastern & No. 2 Fresh Water Service Reservoirs (I.L. No. 8945 CHR - Fresh s16 Application with LP Submission - Pre-submission)
Attachments: 285077_W001-LAYOUT.pdf; Residual Head Calculation.pdf

Dear Marco,

We have no further comment on your supplementary information provided in the emails below, for the subject Pre-submission. Please incorporate all those information onto formal submission.
Regards,
Terry LAW
E/P(SD2), System Planning

Construction Division, WSD
Tel: 2152 5737

[redacted]

[redacted]

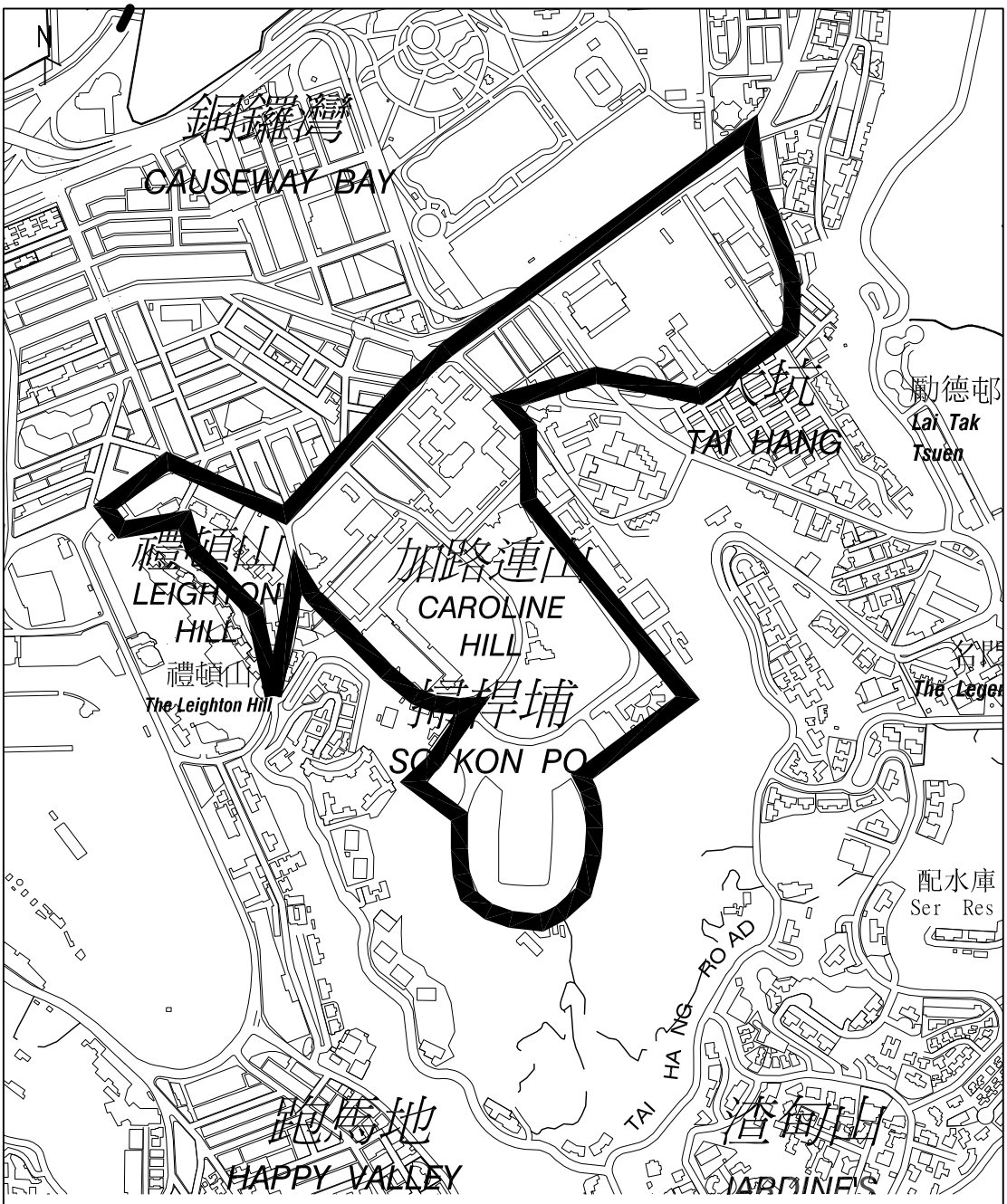
From: Chris Chan <Chris.Chan@arup.com>
Sent: 2024年3月18日星期一 16:34
To: tak_chuen_leung@wsd.gov.hk
Cc: [redacted]
Subject: RE:CHR Site IL No. 8945 Causeway Bay - Pressure for the Proposed DN200 Freshwater Main
Attachments: 285077_W001-LAYOUT.pdf

Dear Leung Sir (WSD),

We discussed today that the proposed DN200 freshwater main will be in a loop system to be connected to the existing DN450 freshwater main at Leighton Road and the existing DN150 freshwater main at Caroline Hill Road East near Lei Kwa Court.
The approximate pressure head as advised by you today would be approximate 80m at the DN450 freshwater main at Leighton Road and 70m at the DN150 freshwater main at Caroline Hill Road East near Lei Kwa Court.
Drawing is marked up as attached for easy reference. Thanks.

Regards,

Chris Chan
Arup
Level 5 Festival Walk, 80 Tat Chee Avenue,
Kowloon Tong, Kowloon, Hong Kong,
Main : +852 2528 3031
Direct: +852 2268 3510
Fax : +852 2268 3954
chris.chan@arup.com



Scheme Area
at Causeway Bay (3)

Plan No. PSA/CB3/10/001
Base Plan No. 11
Date 22.10.2010

Project Name: **Proposed Office Development at Caroline Hill Road, Causeway Bay**
Daily Water Demand Calculation

Calculation of Peak Daily Demand

1. AC Make-up Water

As per CT1A,
Estimated peak daily make-up water demand by T1T2 cooling tower = 843.02 m^3/day

As per CT1A,
Estimated peak daily make-up water demand by T3 cooling tower = 21.36 m^3/day

Total peak daily make-up water demand of CHR = 864.38 m^3/day

2. Water Consumption Estimation for Proposed Development

(Based on EPD Guidelines for Estimating Sewage Flows for Sewage Infrastructure Planning)

Design Assumption:

Global Unit Flow Factors as per Tables T-2 and T-3
Catchment Inflow Factor for Wan Chai (PCIF = 1.0) as per Table T-4

Estimated Water Consumption for Caroline Hill Road		**Estimation**
(1)	GFA (m^2) for Office use	85,300
(2)	Assumed 60% for Usable Floor Area	51,180
(3)	Worker Density (No. of Worker per 100m^2)	3.2
(4)	No. of Employee	1,638
(5)	Unit flow factor (m^3/person/day) - J6 Financial, Insurance, Real Estate & Business Services	0.08
(6)	Sub-total Daily Water Consumption (m^3/day)	131.0
(7)	GFA (m^2) for Non Domestic	10,000
(8)	Assumed 60% for Usable Floor Area	6,000
(9)	50% GFA (m^2) for F&B	3,000
(10)	Worker Density (No. of Worker per 100m^2)	5.1
(11)	No. of Employee	153
(12)	Unit flow factor (m^3/person/day) - J10 Restaurant & Hotels	1.58
(13)	Sub-total Daily Water Consumption (m^3/day)	241.7
(14)	50% GFA (m^2) for Retail	3,000
(15)	Worker Density (No. of Worker per 100m^2)	2.1
(16)	No. of Employee	63
(17)	Unit flow factor (m^3/person/day) - J4 Wholesale & Retail	0.28
(18)	Sub-total Daily Water Consumption (m^3/day)	17.6
(19)	GFA (m^2) for GIC	3,100
(20)	Assumed 60% for Usable Floor Area	1,860
(21)	Worker Density (No. of Worker per 100m^2)	2.3
(22)	No. of Employee	43
(23)	Unit flow factor (m^3/person/day) - J11 Community, Social & Personal Services	0.28
(24)	Sub-total Daily Water Consumption (m^3/day)	12.0
(25)	**Total Daily Water Consumption (6)+(13)+(18)+(24), (m^3/day)**	402.4

3.Total Water Consumption Estimation for Proposed Development

AC Make-up Water **+** Daily water Consumption = 864.38 + 3x 402.4 (as per DI-1309, item 19 requirement)
= 2071.52 m^3/d

Calculation of Pipe Capacity

DN150 Water PE Pipe Capacity

Nominal Diameter (mm)	Internal Diameter (mm)	Pipe Material
200	200	DI
150	147	PE100 (OD180)

Q = AV
DN150 Water Pipe Capacity = $\pi (0.0736)^2$ (1.5) 1.5m/s as per WSD DI1309 requirement
(Assume 1.5 m/s) = 0.0255 m^3/s
= 2205.52 m^3/d

DN150 Water Pipe Capacity = $\pi (0.0736)^2$ (2.0)
(Assume 2.0 m/s) = 0.0340 m^3/s
= 2940.69 m^3/d

DN200 Water Ductile Iron Pipe Capacity

Q = AV
Ø200 Water Pipe Capacity = $\pi (0.100)^2$ (1.5) 1.5m/s as per WSD DI1309 requirement
(Assume 1.5 m/s) = 0.0471 m^3/s
= 4071.50 m^3/d

Ø150 Water Pipe Capacity = $\pi (0.100)^2$ (2.0)
(Assume 2.0 m/s) = 0.0628 m^3/s
= 5428.67 m^3/d

Since 2071.518 m^3/d < 2205.52 m^3/d therefore DN150 Water pipe is enough for the whole CHR development

Project: Proposed Commercial Redevelopment, I.L. 8945 at Caroline Hill Road, Causeway bay, Hong Kong

Title: AC Make Up Water and Bleed-off Water Sizing

Assumption:

Condenser Water Inlet Temperature	Ti	=	38.5	℃
Condenser Water Inlet Temperature	To	=	33.5	℃
Temperature Differential	DT= Ti-To	=	5	℃
Specific Heat Capacity	Cp	=	4.18	KJ/Kg-K
Total Evaporation Losses	Ls	=	0.835	%
Drift Rate		=	0.05	%

Note: according to section 3.6.5 of the COP (part 1) by EMSD

Cooling Tower Information:

Cooling Tower Capacity	1085	TR
No. of Cooling Tower	8	

Calculation:

(A) Circulation Rate (L/s) = Cooling Tower (duty) heat rejection capacity in kW / (4.18 X 5)
= (1085 x 3.517 x 8) / (4.18 x 5)
= 1460.65 L/s

(B) Evaporation Rate (L/s) = 0.835% x A
= 0.00835 x 1460.65
= 12.196 L/s

Note: Default is 0.835% of circulation rate

(C) Drift Rate (L/s) = 0.005% x A
= 0.00005 x 1460.65
= 0.073 L/s

(D) Cycle of Concentration = 6

Note: Cycle of concentration shall be maintained at 6 for fresh water type cooling tower according to section 3.4.3.2 of the COP (part 3) by EMSD

(E) Bleed-off Rate (L/s) = {Evaporation loss - [(Cycle of concentration - 1) x Drift Loss]} / (Cycle of concentration - 1)
= {B - [(D - 1) x C]} / (D - 1)
= {12.196 - [(6 - 1) x 0.073]} / (6 - 1)
= 2.37 L/s

(F) Make-up Water (L/s) = (B + C + E)
= (12.196 + 0.073 + 2.37)
= 14.636 L/s

(G) Operation Hours for Cooling Tower = 16 Hours

Remark: Average daily consumption is assumed as 50% of daily peak consumption

Estimated average daily make-up water consumption
= (F x G x 3600) x 50% / 1000
= (14.636 x 16 x 3600) x 50% / 1000
= 421.51 m3 / day =281m^3/day (mean daily consumption)

Estimated peak daily bleed-off water volume
= (E x G x 3600) x 50% / 1000
= (2.37 x 16 x 3600) x 50% / 1000
= 68.15 m3 / day

Note: capacity of the bleed-off tank shall be designed to store water for not less than 2 hours operation according to section 5.2.4 of the COP (part 1) by EMSD

Project: District Health Center at Proposed Commercial Redevelopment, I.L. 8945 at Caroline Hill Road, Causeway bay, Hong Kong

Title: AC Make Up Water and Bleed-off Water Sizing

Assumption:

Condenser Water Inlet Temperature	Ti	=	37	°C
Condenser Water Inlet Temperature	To	=	32	°C
Temperature Differential	DT= Ti-To	=	5	°C
Specific Heat Capacity	Cp	=	4.18	KJ/Kg-K
Total Evaporation Losses	Ls	=	0.835	%
Drift Rate		=	0.05	%

Note: according to section 3.6.5 of the COP (part 1) by EMSD

Cooling Tower Information:

Cooling Tower Capacity	110 TR
No. of Cooling Tower	2

Calculation:

(A) Circulation Rate (L/s) = Cooling Tower (duty) heat rejection capacity in kW / (4.18 X 5)
= (110 x 3.517 x 2) / (4.18 x 5)
= 37.02 L/s

(B) Evaporation Rate (L/s) = 0.835% x A
= 0.00835 x 37.02
= 0.309 L/s

Note: Default is 0.835% of circulation rate

(C) Drift Rate (L/s) = 0.005% x A
= 0.00005 x 37.02
= 0.002 L/s

(D) Cycle of Concentration = 6

Note: Cycle of concentration shall be maintained at 6 for fresh water type cooling tower according to section 3.4.3.2 of the COP (part 3) by EMSD

(E) Bleed-off Rate (L/s) = {Evaporation loss - [(Cycle of concentration - 1) x Drift Loss]} / (Cycle of concentration - 1)
= {B - [(D - 1) x C]} / (D - 1)
= {0.309 - [(6 - 1) x 0.002]} / (6 - 1)
= 0.06 L/s

(F) Make-up Water (L/s) = (B + C + E)
= (0.309 + 0.002 + 0.06)
= 0.371 L/s

(G) Operation Hours for Cooling Tower = 16 Hours

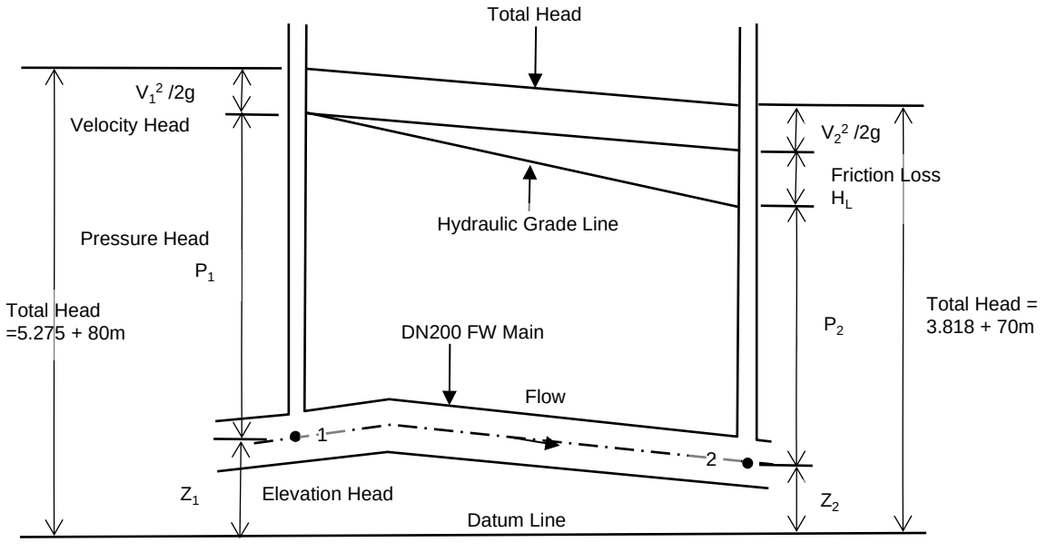
Remark: Average daily consumption is assumed as 50% of daily peak consumption

Estimated average daily make-up water consumption
= (F x G x 3600) x 50% / 1000
= (0.371 x 16 x 3600) x 50% / 1000
= 10.68 m3 / day =7.12m^3/day (mean daily consumption)

Estimated peak daily bleed-off water volume
= (E x G x 3600) x 50% / 1000
= (0.06 x 16 x 3600) x 50% / 1000
= 1.73 m3 / day

Note: capacity of the bleed-off tank shall be designed to store water for not less than 2 hours operation according to section 5.2.4 of the COP (part 1) by EMSD

ARUP	Job No.	Sheet No.	Rev.
	285077	1	
	Member/Location		
Job Title: Development on IL No.8945	Drg. Ref.	W/001 and W/002	
Calculation: Calculation for DN200 Residual Head	Made by: CC	Date: 18/03/2024	Chd.: HWC



	Ch. (m)	Z (m)	Total Head (m)	Remark
1	0	5.275	85.275	As given by WSD, the approx Head at DN450 = 80m
2	262.9	3.818	73.818	As given by WSD, the approx Head at DN450 = 70m

1 - Connection at DN450

2 - Connection at DN150

Assume the worst case when the DN200 fresh water main runs at peak velocity of 1.5m/s.

Friction Loss by Hazen-Williams Equation

$H_L = 10.583\ L\ Q^{1.85} / C^{1.85}\ d^{4.87}$

Where
- H_L = Friction loss (m)
- L = Length of pipe run (m)
- Q = Peak flow (m^3/s)
- C = Hazen-Williams Coefficient = 140 (for DI pipe with cement lining)
- d = Pipe diameter (m)

	Ch. (m)	Z (m)	V (m/s)	d (m)	$V^2/2g$ (m)	Q (m^3/s)	H_L (m)	P (m)
1	0.000	5.275	1.500	0.200	0.115	0.047	0.000	79.885
2	262.900	3.818	1.500	0.200	0.115	0.047	2.652	67.234

Therefore, the residual head along the proposed DN200 freshwater main during peak flow condition will have sufficient residual head more than 20m head.

A0
DO NOT SCALE DRAWING. CHECK ALL DIMENSIONS ON SITE.
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B.D. REFERENCE No.
KEY PLAN
VICTORIA PARK
TIME SQUARE
THE SITE
CAROLINE HILL
HAPPY VALLEY
Pressure at the DN450 Freshwater Main = 80m
Pressure at the DN150 Freshwater Main = 70m
EXISTING WSD 150DIA FRESHWATER MAIN, VALVE CHAMBERS AND STREET HYDRANT AT EXISTING FOOTPATH TO BE ABANDONED DUE TO CHANGES TO CARRIAGEWAY (DEPTH OF MAIN AS PER UU SURVEY ABOUT 0.70m BELOW FOOTPATH)
PROPOSED SALTWATER CROSSING MAIN AND CONNECTION TO EXISTING 150SW TO BE CARRIED OUT BY WSD, CIVIL WORKS INCLUDING EXCAVATION, BACKFILLING, ROAD REINSTATEMENT, TTA AND PERMITS APPLICATION BY DEVELOPER'S CONTRACTOR (TENTATIVELY WORK COMMENCEMENT IN SEPTEMBER 2024 TO FEBRUARY 2025 BY NIGHT WORK)
PROPOSED FRESHWATER CROSSING MAIN AND CONNECTION TO EXISTING 450FW TO BE CARRIED OUT BY WSD, CIVIL WORKS INCLUDING EXCAVATION, BACKFILLING, ROAD REINSTATEMENT, TTA AND PERMITS APPLICATION BY DEVELOPER'S CONTRACTOR (TENTATIVELY WORK COMMENCEMENT IN OCTOBER 2023 TO AUGEST 2024 BY NIGHT WORK)
EXISTING WSD 1500DIA FRESHWATER MAIN AND VALVE CHAMBERS AT EXISTING FOOTPATH TO BE ABANDONED DUE TO CHANGES TO CARRIAGEWAY (DEPTH OF MAIN AS PER UU SURVEY ABOUT 0.70m BELOW FOOTPATH)
NEW WSD 200DIA FRESHWATER MAIN AND 100DIA SALTWATER MAIN LAYING AT NEW FOOTPATH AND CARRIAGEWAY TO BE CARRIED OUT BY THE DEVELOPER'S CONTRACTOR UNDER HBP1 SCHEME
EXISTING WSD FRESHWATER MAIN LEAD IN EXISTING FOOTPATH TO BE CAPPED OFF BY WSD
PROPOSED WATER LEAD IN FROM LEFT TO RIGHT DN80 SALTWATER, DN150 FRESHWATER AND DN150 FIRE SERVICES
EXISTING WSD 50DIA FRESHWATER MAIN AT EXISTING FOOTPATH TO BE ABANDONED BY WSD DUE TO CHANGES TO CARRIAGEWAY (DEPTH OF MAIN AS PER UU SURVEY ABOUT 0.65m BELOW FOOTPATH)
DN150 FW RESERVED TEE WITH CROSSING PIPE TO BE ADDED BY WSD
DN100 SW RESERVED TEE WITH CROSSING PIPE TO BE ADDED BY WSD
THIS PORTION OF MAINLAYING WORK IS TO BE CARRIED OUT BY DEVELOPER'S CONTRACTOR IN 2025 TENTATIVELY
GREEN AREA BOUNDARY
PINK HATCHED BLUE BOUNDARY
PINK HATCHED BLUE STIPPLED GREEN AREA
DN200/dn150 TAPER
EVA
WIP Mar 2021
LEIGHTON ROAD
禮頓道
CAROLINE HILL ROAD
加路連山道
SUNNING ROAD
HAVEN STREET
希雲街
力寶禮頓大廈 Lippo Leighton Tower 103
利園六期 Lee Garden Six 111
禮信大廈 Leishun Court 106-126
加路連大廈 Caroline Hill Court 3-15
禮希大廈 Lei Ha Court 7-19
禮加大廈 Lei Kwa Court 17-21
禮雲大廈 Lei Wen Court 23-33
Haven Court 2-30
Park Haven 38
公理堂大樓 Congregation House 119
職員宿舍 Staff Quarters
力生軒 Silverwood 109
Caroline Height
保良局 Po Leung Kuk 66
Playground
RCP
EXISTING WSD FRESHWATER MAIN LEAD IN EXISTING FOOTPATH TO BE CAPPED OFF BY WSD

NOTES:

1. THE PROPOSED WATER MAIN DIVERSION IS TO BE CARRIED BY THE DEVELOPER'S CONTRACTOR UNDER HBP1 SCHEME INCLUDING ALL CIVIL WORKS SUCH AS EXCAVATION, BACKFILLING, TTA AND PERMITS APPLICATION EXCEPT THE PROPOSED CROSSINGS AT LEIGHTON ROAD AND CAROLINE HILL ROAD AND CONNECTION TO EXISTING WATER MAINS TO BE CARRIED OUT BY WSD (REFER TO MARKUP ON PLAN).
2. ALL PROPOSED WATER MAINS SHOULD HAVE MINIMUM COVER OF 1000mm MEASURED FROM FINISHED ROAD LEVEL AND 600mm MEASURED FROM FINISHED FOOTPATH LEVEL.
3. PROPOSED WATERWORKS SHALL FOLLOW DETAILS FROM LATEST WSD STANDARD DRAWINGS.

LEGENDS:

Symbol	Description
100FW	EXISTING FRESH WATER MAIN
100SW	EXISTING SALT WATER MAIN
100SW	PROPOSED DN100 PE100 SALT WATER MAIN
200FW	PROPOSED DN200 DUCTILE IRON FRESH WATER MAIN
SFH	PROPOSED FRESH WATER STREET FIRE HYDRANT
100 DAV	PROPOSED DN100 DOUBLE AIR VALVE

Mark	Date	By	Rev.
A	05/23	EC	REVISED
–	03/23	EC	TENDER ADDENDUM

Plot by : Eric Cheung Chun-Wai
Plot Time : 18/12/2009 2:54
PLOTTING SCALE = 1 : 1

Job Title: COMMERCIAL DEVELOPMENT ON IL NO.8945 CAUSEWAY BAY, HONG KONG

Drawing Title: PROPOSED FRESHWATER AND SALTWATER MAIN DIVERSION LAYOUT PLAN

ARUP

Scale 1:250 @A0, 1:500 @A2
Drn. EC Date 03/2023 Chd. CC Passed JY

Drawing Status: REVISED

Job No. 285077 Drawing No. W/001 Rev. A