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Caritas Chan Chun Ha Field Studies Centre

Managing River & Stream Quality

Student Name: _____ **Group no.:** _____

Course Date: _____

OBJECTIVES

- Knowledge: To understand the fluvial processes with the characteristics of the river courses.
  To analyze how human factors affect the fluvial process and water quality.
  To study the management strategies of river systems.
- Skill: To use different equipment to collect data of channel characteristics and water quality and conduct laboratory work.
  To draw the cross section.
- Value To concern the effects of urban encroachment on rural environment.
  To aware the importance of water quality to water resources of China and H.K.

Relevance to the DSE geography curriculum

Managing River Environment: A continuing challenge

Stage1: Planning & Preparation

- Key point of fieldwork: The differences of fluvial processes and water quality in different river courses.

- My hypothesis: based on upper, middle and lower courses

What are the differences in fluvial processes in different river courses? Comparing with lower course:

- Gradient: it is ***steeper / gentler*** in upper course
- Average velocity: it is ***faster / slower*** in upper course
- Channel width: it is ***wider / narrower*** in upper course
- Channel depth: it is ***deeper / shallower*** in upper course
- Size of bed load: it is ***larger / smaller*** in upper course

What are the differences in water quality in different river courses?

- pH value : it is ***lower / similar / higher*** in upper course.
- Dissolved oxygen: it is ***lower / similar / higher*** in upper course.
- Salinity: it is ***lower / similar / higher*** in upper course.
- Amount of *E.coli*: it is ***lower / similar / higher*** in upper course.
- Conductivity: it is ***lower / similar / higher*** in upper course.

What factors would you consider in choosing the fieldwork date?

- When to collect data?

Date: _____	Time:_____ to _____
Today weather warning: ☐ Very Hot Weather Warning ☐ Cold Weather Warning ☐ Thunderstorm Warning	
Precipitation within last 2 days: heavy rain / drizzle / never rain	

- Where to collect data?

River:	River Silver	Wang Tong
Site:	A / B / C / D	E / F / G / H

What factors should be considered in choosing filed sites?

- What data to be collected?
  Refer to p. 4 and match the appropriate primary data collection methods and equipment to the research items.

Research items	Primary data collection methods	Required equipment / Tool (if any)	Need to take sample? (✓/✗)	Operational precautions
Fluvial processes & characteristics				
Cross section of channel (include channel width and depth)				
River bed				
River velocity				
Channel gradient				
Size & shape of bed load				
Water quality				
Smell, water colour & turbidity				
Floating matters, green algae & sewage fungi				
Salinity				
Nutrient				
E.coli				
Total suspended solid				
pH value				
Conductivity				
Dissolved oxygen				
Human influences				
River management strategies				
Surrounding land use				

Primary data collection methods

A. Observation	**B. Measurement**	**C. Counting**	**D. Category**	**E. Distribution (Mapping)**
F. Scoring	**G. Field sketching**	**H. Questionnaire**	**I. In-depth interview**	

Equipment / Tools

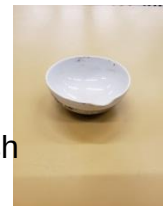
1. conductivity meter & pH meter

2. white tile with 'X' mark

3. table tennis ball

4. sampling bottle (transparent)

5. evaporating dish

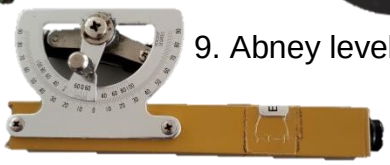


6. stop watch

7. measuring tape

8. meter ruler

9. Abney level



10. filter funnel & filter paper

11. sampling bottle

12. bucket

13. spectrophotometer

14. dissolved oxygen meter

15. *E.coli* testing kit

16. balance

17. salinity meter

18. digital salinity meter

GROUP: _____

River: River Silver

Field site: A / B / C / D

Stage 2: Data Collection

PART A—FLUVIAL PROCESSES & CHARACTERISTICS

Cross section of channel

Equipment: ✓ measuring tape
✓ meter ruler

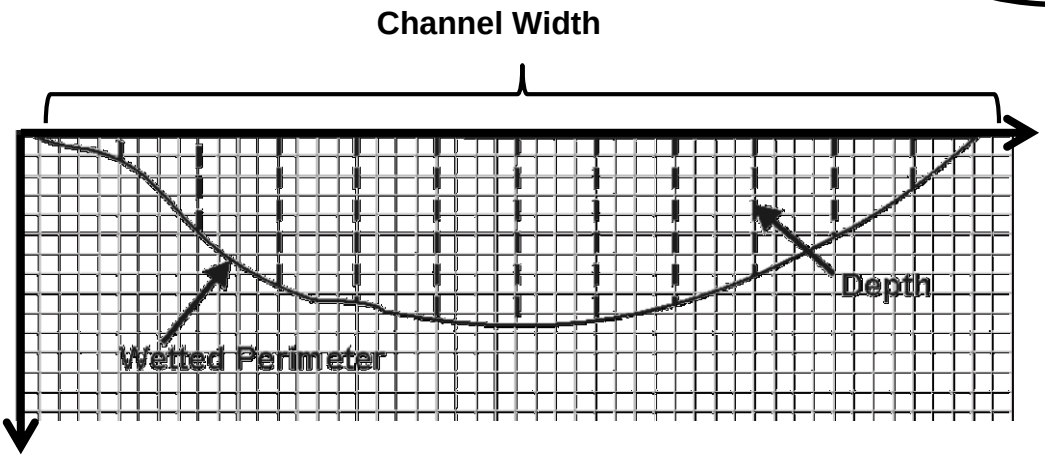
- Channel width: _____m

Channel depth (measure the channel depth in 0.5m interval):

Location	Depth (cm)	Location	Depth (cm)	Location	Depth (cm)	Location	Depth (cm)
0.0m		4.0m		8.0m		12.0m	
0.5m		4.5m		8.5m		12.5m	
1.0m		5.0m		9.0m		13.0m	
1.5m		5.5m		9.5m		13.5m	
2.0m		6.0m		10.0m		14.0m	
2.5m		6.5m		10.5m		14.5m	
3.0m		7.0m		11.0m		15.0m	
3.5m		7.5m		11.5m		15.5m	

- The deepest depth: _____cm
- The average depth: _____cm

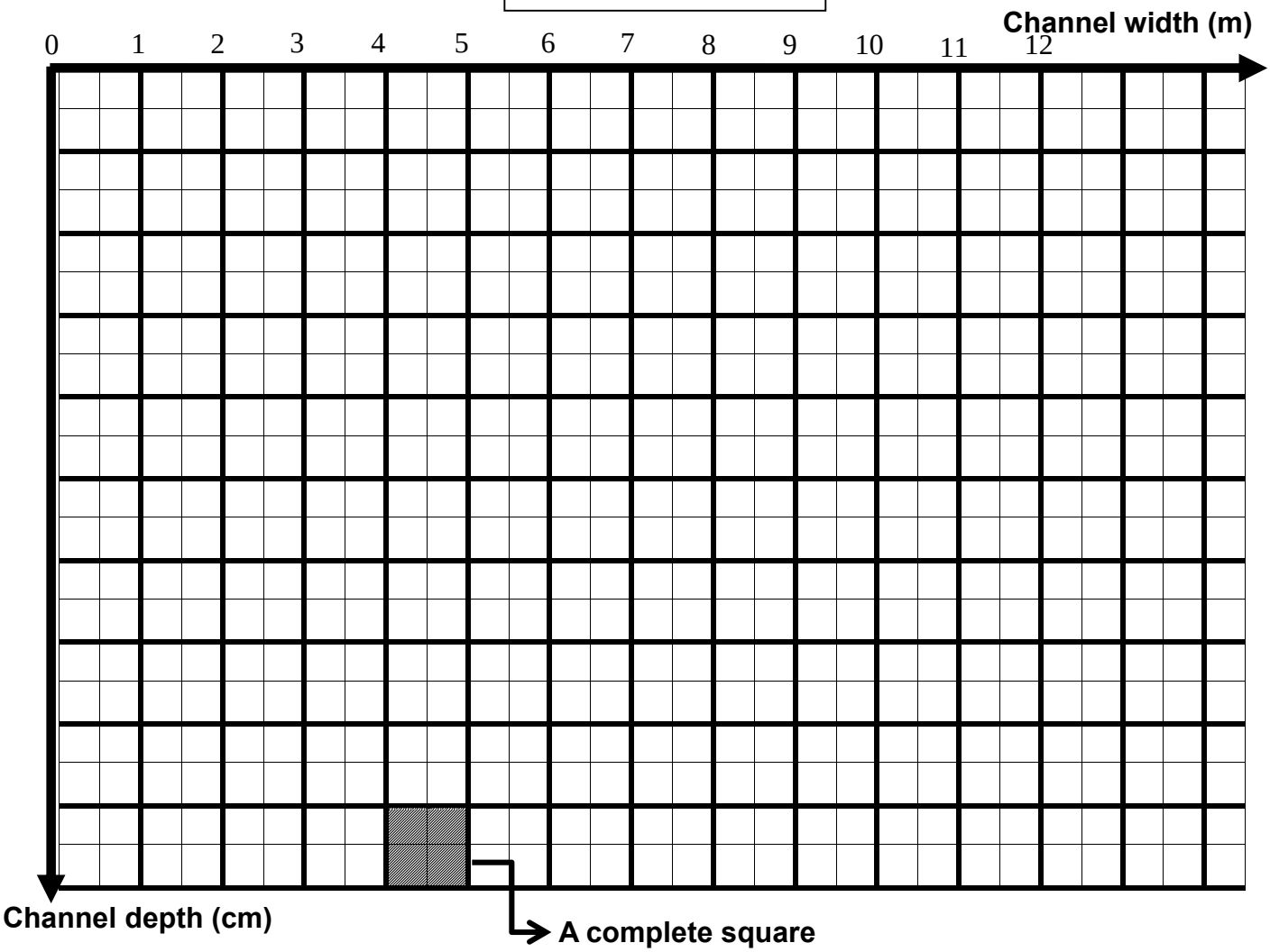
What sampling method is used in measuring river depth?



↑ Figure 1: Cross-section of a river channel.

Draw a cross-section of River Silver.
(refer to figure 1)

Site _____



- Use “counting squares” method to find out the channel cross-sectional area.

	Area	Total no. of square(s)
A complete square:	_____ X _____=_____ m^2	
An incomplete square:	Area of a complete square/ 2 = _____ m^2	

The channel cross-sectional area is _____m^2

- Another method to calculate the channel cross-sectional area:

Channel width(m) X Average Channel depth (m) = _____m X _____m = _____m^2

Calculate the river discharge by using the channel data collected. Show your calculation steps.

- The river discharge = velocity (m/s)* X cross section area (m^2)

= _____ m^3/s

* refer to p.7

Velocity of channel

Equipment: ✓ meter ruler ✓ a float (table tennis ball)
✓ stop watch

What difficulties did you face in measuring velocity?

Table tennis ball travelling time for 1 meter (seconds)		River Velocity (m/s) *(rounded to 2 decimal places)*	Adjust the result by the "float fudge factor"
e.g.	20 seconds	1 m / 20 s = 0.05 m/s	
1			● Average River Velocity = Average **x 0.8** = _____ m/s **x 0.8** = _____ m/s *(rounded off to 2 decimal places)*
2			
3			
4			
5			

Average：_____ m/s

Why is the result adjusted?

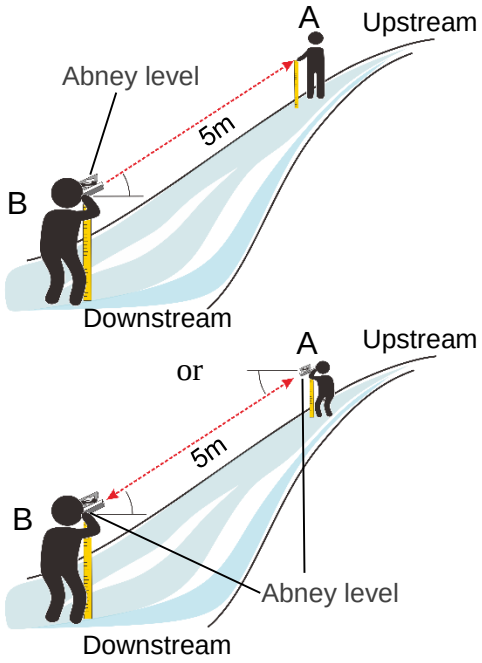
Channel Gradient

Equipment: ✓ measuring tape
✓ Abney level

Find a five-meter interval by the measuring tape. Holding the Abney level on the top of meter rule, student B at downstream finds out the angle by observing the top of another meter ruler held by student A standing in upstream. If there are two groups in the same field site, one group measures the angle of elevation from downstream and another group measures the angle of depression from upstream.

	Example	Gradient
slope angle(∘)	20∘	
tan (slope angle)	0.36 (36%)	
Typical gradient	(0.36÷0.36 : 1÷0.36) 1 : 2.8	
Description of steepness	Fairly steep	

Figure 2: How to measure channel gradient



Description of slope steepness

Slope angle (°)	Typical gradient	Description of steepness
< 1°	---	Level
1°-3°	1 in 60 (1.7%)	Flat
3°-6°	1 in 20 (5%)	Gentle
6°-12°	1 in 10 (10%)	Moderate
12°-20°	1 in 3 (33%)	Fairly steep
20°-35°	1 in 2 (50%)	Steep
35°-45°	1 in 1	Extremely steep

Size and shape of bed load

Equipment: ✓ measuring tape/ meter ruler

■ River Bed : rocky / sandy / muddy / weedy

■ Size of bed load (pick up 5 bed load with typical size in your site) :

Sample	1	2	3	4	5	Average diameter (mm)	Major types of bedload
Diameter(mm) *							

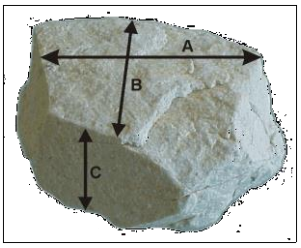
*Diameter is axis B. (refer to figure 3)

*Mark as "<1mm" for those grains which have diameter of less than 1mm

What should you pay attention when taking samples?

Classification of river bedload

Type of bedload	Boulder	Cobble	Pebble	Granule	Sand
Diameter(mm) *	>256	>64-256	>4-64	>2-4	0.06-2

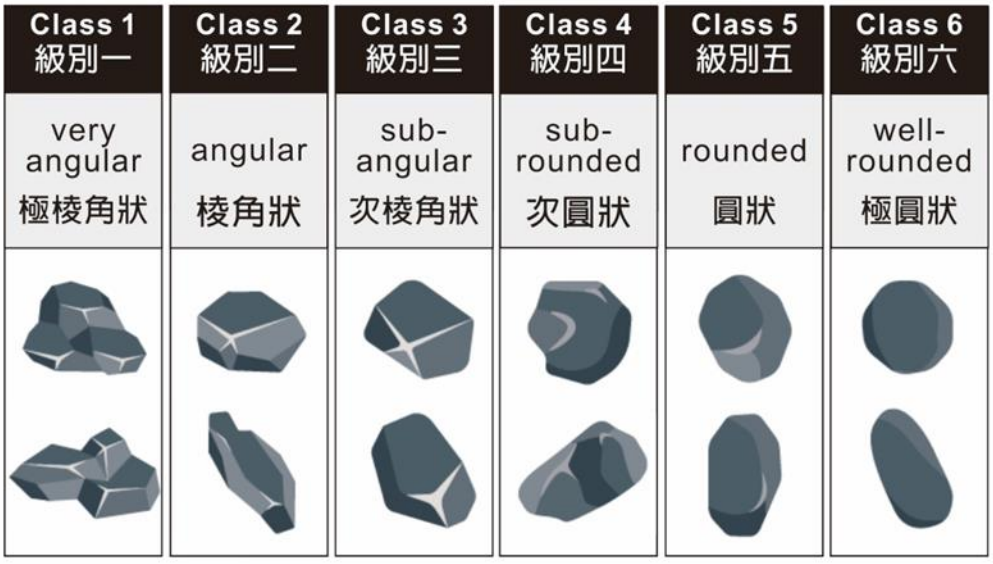


←Figure 3: How to measure a bed load (appropriate for pebble or bigger)

Axis A is the longest axis.
Axis C is the shortest axis.
Axis B is the axis perpendicular to axis A.

■ Shape of bedload (roundness class): _____ (refer to figure 4)

🡻 Figure 4: Powers Scale of Roundness



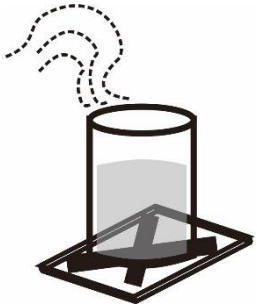
PART B—WATER QUALITY

[FIELDWORK]

According to **Table 1a** (p.12) and **3a** (p.13), assess the water quality at your study area by **observation**.

Smell, Water Colour and Turbidity

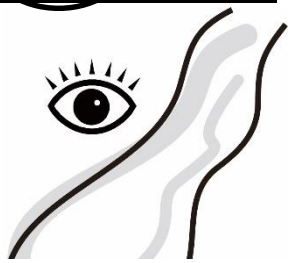
Equipment: ✓ Sampling bottle (transparent)
✓ White tile with "X" mark



Procedures:
1. Fill a transparent samling bottle with water sample and put it on a while tile with "X" mark.
2. Smell the water sample and observe the water colour.
3. View the "X" mark from the top of the transparent sampling bottle to determine water turbidity.
4. Assess the smell, water colour and turbidity of the river by using 4-point scale in Table 1a (p.12) and 3a (p.13).

What should you pay attention when using 4-point scale?

Floating Matters, Green Algae and Sewage Fungi



Procedures:
1. Referring to figure 5, observe if there are any floating matters, green algae and sewage fungi in the river.
2. Assess the water quality by using 4-point scale in Table 1a (p.12) and 3a (p.13).

↓ Figure 5: Examples of floating matters, green algae and sewage fungi.

e.g. oil, foam and faecal matter.		
Floating matters	**Green algae**	**Sewage fungi**

According to **Table 2a** (p.12) and **4a** (p.13), assess the water chemical and biological properties at your study area by **measurement** and **laboratory work (refer to p.11)**.

Salinity, Nutrient and *E.coli* (water sampling for laboratory work)

Equipment: ✓ Sampling bottle (100ml)

100ml bottle

Procedures:

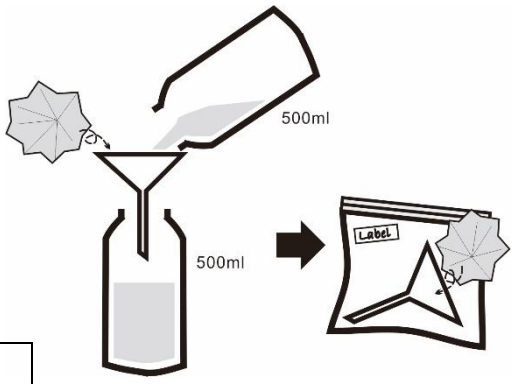
1. Immerse the samplong bottle with its mouth placed in the opposite direction of water flow. (*or collect water sample by a bucket*)
2. After filling up the 100ml sampling bottle, screw the lid of the bottle tightly before taking it out of water.
3. Invert the sampling bottle to check whether there is air bubble or leakage.

Total Suspended Solids (TSS) (filtration for laboratory work)

Equipment: ✓ bucket ✓ sampling bottle (500ml) ✓ filter funnel with filter paper

Procedures:

1. Weigh a pre-dried filter paper.
2. Collect water by using a bucket. Fill up a 500ml sampling bottle.
3. Filter 500ml water sample into another 500ml sampling bottle by using a filter funnel with a filter paper.
4. Put the **filter funnel with filter paper** into a zip bag after filtration.



P.S.
- ✪ *Maximize the surface area of the filter paper during filtration.*
- ✪ *Invert the sampling bottle several times before filtration.*

pH value and Conductivity

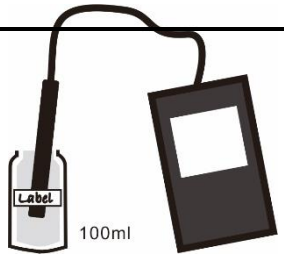
Equipment: ✓ conductivity meter and pH meter

Procedures:

1. Insert the pH and conductivity meter into the water sample. Stir it gently.
2. Wait until the reading becomes steady. Complete Table 2a (p.12) and 4a (p.13).

Dissolved oxygen (DO)

Equipment: ✓ DO meter (shared)



Procedures:

1. Insert the dissolved oxygen meter into the water sample of the100ml plastic bottle.
2. Wait until the reading becomes steady. Complete Table 2a (p.12) and 4a (p.13).

Difficulties in collecting data (if any):

[LABORATORY WORK]

Salinity Test

Equipment: ✓ salinity meter

Procedures:

1. Insert the salinity meter into the water sample.
2. Wait until the reading becomes steady. Complete Table 2a (p.12) and 4a (p.13).

Nutrient Test: Ammonia & Phosphate

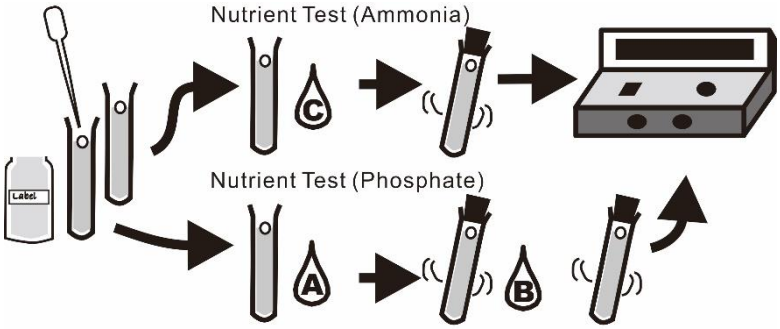
Equipment: ✓ dropper ✓ cuvette ✓ spectrophotometer
✓ solution A (ammonium molybdate / H2SO4 solution), B (5% stannous chloride solution) and C (Nessler's reagent)

Procedures:

1. Pipette the water sample into a cuvette until it reaches the white mark.
2. Add solution into the cuvette. Agitate the mixture.

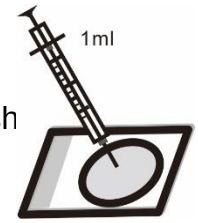
➢ For ammonia test:	-	Add 1 drop of solution C.
	-	A YELLOW colour indicates the presence of ammonia ions.
➢ For phosphate test:	-	Add 1 drop of solution A and 1 drop of solution B
	-	A BLUE colour indicates the presence of phosphate.

3. Measure the concentration of ammonia/phosphate by using the spectrophotometer and the corresponding graph provided. Complete Table 2a (p.12) and 4a (p.13).



E. Coli Test

Equipment: ✓ petri dish ✓syringe ✓ oven



Procedures:

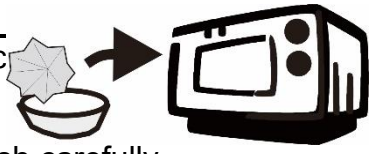
1. Use a syringe to place 1 ml of water sample onto the middle of the petri dish samples will self-diffuse evenly over the whole plate.
2. Incubate the plate in a 35℃(+ / - 2℃) oven for 16 hours.
3. Count the number of colonies (*E. coil* forms blue colonies). Complete Table 2a (p.12) and 4aa (p.13).

Cfu*/ 100ml = no. of blue colonies x 100

*Cfu: colony-forming-unit

Total suspended solids (TSS)

Equipment: ✓ evaporating dish ✓ forceps ✓ oven ✓ balanc



Procedures:

1. Use forceps to place the used filter paper into an evaporating dish carefully.
2. Dry in a 105℃ oven overnight and reweigh. Complete Table 2a (p.12) and 4a (p.13).

ppm = mg/L = [the increase in mass (g)] × 2 x 1000 *ppm=part per million*

GROUP: _____

River: **River Silver**

Field site: A / B / C / D

DATA SHEET: PART B—WATER QUALITY (1)

Any observable sewage discharge point(s)? Yes / No

■ Table 1a: Water quality by observation（4-Point Scale）

Assessment Score	0	1	2	3
1. Floating matter (e.g. _____)	None	Little	Some	Abundant
2. Green algae	None	Little	Some	Abundant
3. Sewage fungus	None	Little	Some	Abundant
4. Smell	None	Slight	Moderate	Strong
5. Water colour	Clear	Milky	Brown	Black
6. Turbidity	Extremely clear	Fairly clear	Murky	Extremely murky

■ Table 1b: Assessment Score of Water Quality by Observation

Items	Results
Total score of the water quality by observation (N_A):	
Mean Assessment Score ($\bar{A}$) of water quality by observation:	

■ Table 2a: River Chemical & Biological Properties Analysis（4-Point Scale）

Assessment Score		0	1	2	3
	Data				
1. DO(mg/l)		Very High (>7.0)	High (5.1-7.0)	Low (3.0-5.0)	Very Low (<3.0)
2. pH value		Neutral (6.75-7.24)	Slightly Acidic (4.95 - 6.74) Slightly Alkaline (7.25 - 8.04)	Acidic (4.05 - 4.94) Alkaline (8.05 - 9.04)	Strongly Acidic (< 4.05) Strongly Alkaline (> 9.04)
3. Conductivity (ppm)		Very Low (≦30)	Low (31- 50)	High (51- 100)	Very High (> 100)
4. *Salinity (‰)		Very Low (< 3)	Low (3 - 5)	High (6 - 8)	Very High (> 8)
5. *Ammonia (ppm)		Very Low (< 2.5)	Low (2.5 - 5.0)	High (5.1 - 7.5)	Very High (> 7.5)
6. *Phosphate (ppm)		Very Low (< 3.0)	Low (3.0 - 6.0)	High (6.1 - 9.0)	Very High (> 9.0)
7. *TSS (ppm)		Very Low (< 15)	Low (15-30)	High (31-45)	Very High (> 45)
8. **E.coli* (cfu/100ml)		Very Low (< 200)	Low (200 - 399)	High (400 - 599)	Very High (> 599)

**laboratory work*

■ Table 2b: Assessment Score of Water Chemical & Biological Properties Analysis

Items	Results
Total score of the water chem. & bio. properties analysis (N_B):	
Mean Assessment Score ($\bar{B}$) of the water chem. & bio. properties analysis:	

GROUP: _____

River: **Wang Tong**

Field site: E/ F/ G/ H

DATA SHEET: PART B—WATER QUALITY (2)

Any observable sewage discharge point(s)? _Yes / No_

■ Table 3a: Water quality by observation（4-Point Scale）

Assessment Score	0	1	2	3
1. Floating matter (e.g. _____)	None	Little	Some	Abundant
2. Green algae	None	Little	Some	Abundant
3. Sewage fungus	None	Little	Some	Abundant
4. Smell	None	Slight	Moderate	Strong
5. Water colour	Clear	Milky	Brown	Black
6. Turbidity	Extremely clear	Fairly clear	Murky	Extremely murky

■ Table 3b: Assessment Score of Water Quality by Observation

Items	Results
Total score of the water quality by observation (N_A):	
Mean Assessment Score ($\overline{A}$) of water quality by observation:	

■ Table 4a: Water Chemical & Biological Properties Analysis（4-Point Scale）

Assessment Score		0	1	2	3
	Data				
1. DO(mg/l)		Very High (>7.0)	High (5.1-7.0)	Low (3.0-5.0)	Very Low (<3.0)
2. pH value		Neutral (6.75-7.24)	Slightly Acidic (4.95 - 6.74) Slightly Alkaline (7.25 - 8.04)	Acidic (4.05 - 4.94) Alkaline (8.05 - 9.04)	Strongly Acidic (< 4.05) Strongly Alkaline (> 9.04)
3. Conductivity (ppm)		Very Low (≦30)	Low (31- 50)	High (51- 100)	Very High (> 100)
4. *Salinity (‰)		Very Low (< 3)	Low (3 - 5)	High (6 - 8)	Very High (> 8)
5. *Ammonia (ppm)		Very Low (< 2.5)	Low (2.5 - 5.0)	High (5.1 - 7.5)	Very High (> 7.5)
6. *Phosphate (ppm)		Very Low (< 3.0)	Low (3.0 - 6.0)	High (6.1 - 9.0)	Very High (> 9.0)
7. *TSS (ppm)		Very Low (< 15)	Low (15-30)	High (31-45)	Very High (> 45)
8. **E.coli* (cfu/100ml)		Very Low (< 200)	Low (200 - 399)	High (400 - 599)	Very High (> 599)

**laboratory work*

■ Table 4b: Assessment Score of Water Chemical & Biological Properties Analysis

Items	Results
Total score of the water chem. & bio. properties analysis (N_B):	
Mean Assessment Score ($\overline{B}$) of the water chem. & bio. properties analysis:	

GROUP: _____

River: both

Field site: all

River Management Strategies

Record the management strategies of river systems in each field site. ("✓" as appropriate)

	River Silver-tributary I				Wang Tong			
	A	B	C	D	E	F	G	H
a) Channelisation 								
b) Weir 								
c) Concrete frame with soil sacks 								
d) Gabion 								
e) Fish ladder 								
f) Remote Monitoring System 								
g) Monitoring and warning signs								
h) Other (if any, please specify)								

Surrounding Land Use

Categorize the land use along the way. "✓" the land use which you can find around the field site and circle the one with the largest proportion.

	River Silver-tributary I				Wang Tong			
	Around A	Upstream of B	Upstream of C	Upstream of D	Around E	Upstream of F	Upstream of G	Upstream of H
Agricultural								
Abandoned land								
Vacant land								
Residential								
Recreational								
G/C/I *								
Commercial								
Work in progress								
Industrial								

**G/C/I= Government/ Community/ Institution*

Stage 3: Data Processing & Presentation

1. Draw the channel cross section(p.6) and calculate the cross sectional area and discharge(p.6)

2. Calculate the average velocity of channel(p.7)

3. Calculate the channel gradient(p.7)

4. Calculate the mean diameter of bed load(p.8)

5. Fill in the data summary of fluvial process & characteristics of River Silver (p.16)

6. Fill in the data summary of water quality of River Silver and Wang Tong (p.17)

7. Calculate the degree of water pollution in River Silver and Wang Tong (p.18)

The data summary of fluvial process & characteristics of River Silver

Site		1. Channel width (m)	2. The deepest depth (cm)	3. Channel average depth (m)	4. channel cross-sectional area (m^2)	5. Average river velocity (m/s)	6. Channel discharge (m^3/s)	7. River bed	8. Mean bed load diameter (mm)	9. Shape of bed load
A1	Upper course									
A2										
B1										
B2										
C1	Middle course									
C2										
D1	Lower course									
D2										
Compare with fluvial process of a typical river		similar / different	similar / different	similar / different	similar / different	similar / different	similar / different	similar / different	similar / different	similar / different

The Data Summary of Water Quality

	Site	Floating matter	Green algae	Sewage fungus	Smell	Water colour	Turbidity	DO (mg/l)	pH value	Conductivity (ppm)	Salinity (‰)	Ammonia (ppm)	Phosphate (ppm)	*TSS (ppm)	**E.coli* (cfu/ 100ml)
River Silver	A														
	B														
	C														
	D														
Wang Tong	E														
	F														
	G														
	H														

The degree of water pollution

According to the assessment results in table 1b and table 2b, use weighted average assessment score (WAAS) to evaluate the degree of water pollution in your field sites and share the data with other groups.

$$Weighted\ Average\ Assessment\ Score\ (WAAS) = \frac{N_A \overline{A} + N_B \overline{B}}{N_A + N_B} \times 2$$

The weighted average is a calculation of the average based on the difference in weights

Degree of Pollution

WAAS	Pollution Magnitude
0.00 - 1.50	Clean
1.51 - 3.00	Slightly Polluted
3.01 - 4.50	Moderately Polluted
4.51 - 6.00	Severely Polluted

River	Site	Direction of water flow	WAAS	Pollution Magnitude
River Silver	**A**	↓		
	B			
	C			
	D			
Wang Tong	**E**	↓		
	F			
	G			
	H			

Stage 4: Interpretation & Conclusion

1. With reference to the data summary of fluvial process & characteristics of River Silver (p.16), explain whether the hypotheses in p.2 are correct:
   a) gradient
   b) average velocity
   c) channel width
   d) channel average depth
   e) size of bed load
2. Referring to the data summary of water quality (p.17) and the Weighted Average Assessment Score (WAAS) (p. 18) of River Silver and Wang Tong River, evaluate the validity of the following statement:

   "The degree of river pollution increases downstream in the study area.".
3. Identify the major changes of land use in study area by using Mui Wo's aerial photos of different years. Explain how these changes affect the water quality of both River Silver and Wang Tong River.
4. Compare and explain the locations of channelization in River Silver and Wang Tong River.

Stage 5: Evaluation

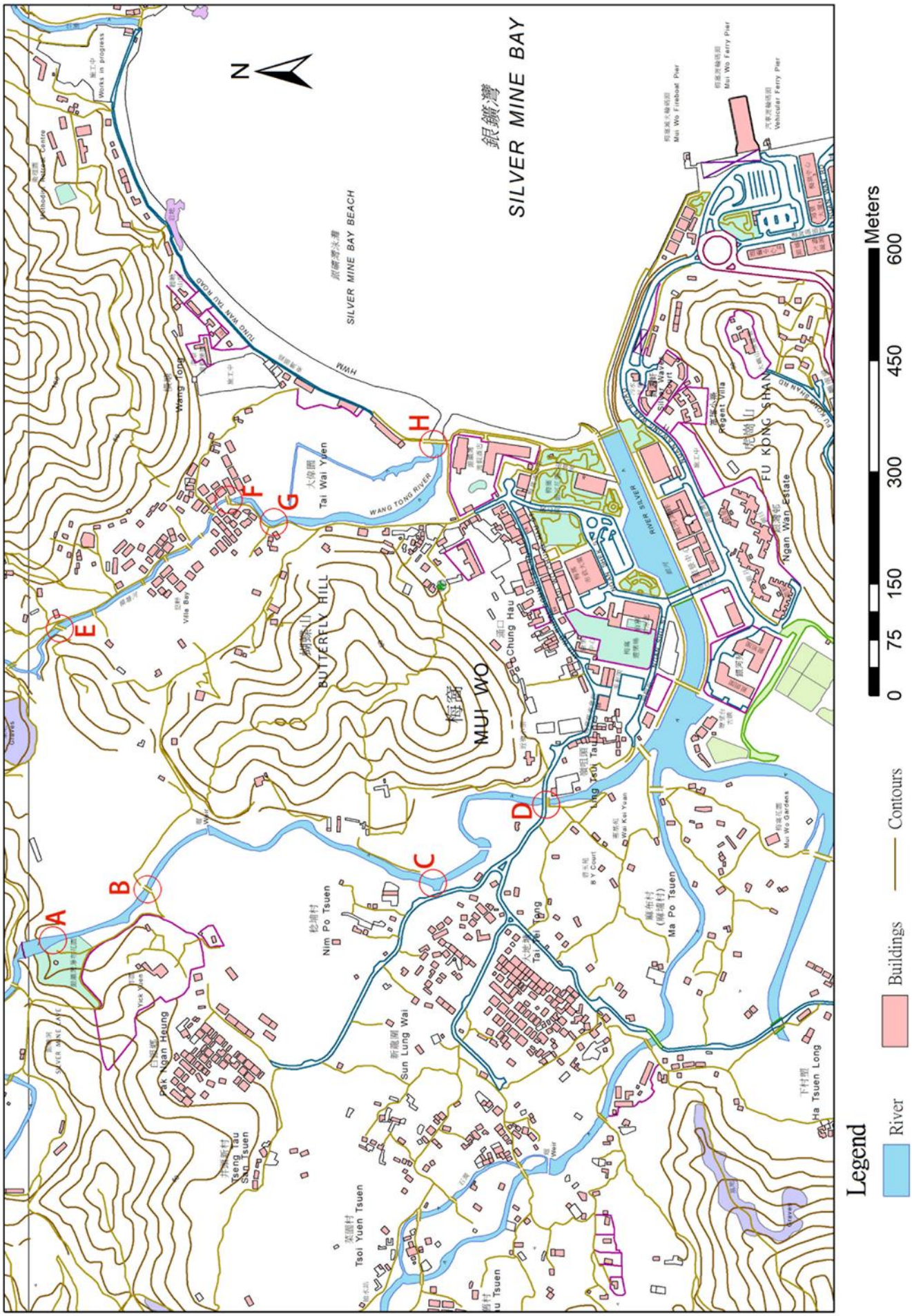
1. Does the data collected respond to the enquiry question?
   i. Analyze the drawbacks of the data collection process and how such drawbacks affect the validity and reliability of data.
   ii. Propose ways to tackle the influences brought by the above drawbacks.

Factors affecting the data reliability and validity		Suggestion for improvement
Fieldwork date/ time ◆ Fieldwork date and time representative? ◆ Any impact by today's weather condition?		
Field site/ study area ◆ Field sites match with research topic? ◆ Field study area adequate?		
Location of data collection (Sampling) ◆ Sampling method in choosing field site appropriate? ◆ Location of measurement representative? ◆ Sample size sufficient?		
Data collection items/ methods ◆ Data collection items adequate to respond the enquiry questions? ◆ Are the data obtained from the data collection method(s) objective and without bias? ◆ Any inadequacy about the equipment/ instruments? ◆ Measurer using the equipment/ instruments correctly?		

2. Point out one advantage and one limitation for conducting field work today on water quality in River Silver and Wang Tong River. How can you alleviate this limitation?

3. Other than the data collected in this fieldwork, what other data and information would help for the further investigate the river environment and pollution. Explain your answer.

Homework:
After the fieldwork, please organize this fieldwork experience in field trip diary on p.22-23, as a reference for the revision of field-based question.


N
SILVER MINE BAY
銀鑛灣
SILVER MINE BAY BEACH
銀鑛灣泳灘
TUNG WAN TAU ROAD
WMH
WANG TONG RIVER
Wang Tong
Tai Wai Yuen
大圍園
BUTTERFLY HILL
蝴蝶山
MUI WO
梅窩
Chung Hau
Villa Bay
Nim Po Tsuen
Pak Ngan Heung
Tseng Tau San Tsuen
Sun Lung Wai
Tsoi Yuen Tsuen
Ma Po Tsuen
Ha Tsuen Long
Mui Wo Ferry Pier
Vehicular Ferry Pier
Silvermine Bay Resort
Regent Villas
FU KONG SHAN
Ngan Wan Estate
Mui Wo Gardens
Wah Kui Yuen
Lung Tsoi Tau
Tai Tang
Works in progress
A
B
C
D
E
F
G
H
Legend
River
Buildings
Contours
0 75 150 300 450 600
Meters

My Field Trip Diary

- Related modules: **Managing River and Coastal Environment : A continuing challenge**
- Key point of fieldwork/topic: _____

▪ Date:_____ (Weekday/ Public holiday) ▪ Time:_____ ▪ Field site: _____	▪ Weather condition:
Is the above planning appropriate for the fieldwork?	

- Primary data:

Data collection method	Data collected	Equipment/ Material (if any)	Merits☺/Demerits☹ of the data collection method (give examples)	Suggestion for improvement (give explanations)

- Secondary data:

Data collected	Use	Data obtained from
Apart from the above, what other secondary data could be used for further investigation?		

- Sampling method (if any):

Sampling method	Applied in the following	Merits☺/ Demerits☹

- Data processing and presentation:

Type of graph/ chart	Content shown and function of graph/chart	Merits☺/ Demerits☹

- For deeper learning or further study, I suggest modify the following aspects.

		Suggestion (give examples)
❑	Key point of fieldwork/ topic	
❑	Data to be collected and method of data collection	
❑	Date and time of fieldwork	
❑	Field site	

Data collection methods

Data collection methods	Explanations		Examples
A) Observation	● Using sensory observation to explore the details of research subject (people, things or environment) in a purposive and planned way. Data are recorded using text, photos, sketch, map, etc. (Refer to other data collection methods listed below)		● Identification of surrounding environmental of a field site
B) Measurement	● To estimate or measure the physical quantity of the research subject. It usually requires the use of equipment or tools. Data are usually shown in certain standard, weights or measures.		● Measurement of the width of street and the building height
C) Counting	● To record the number of occurrence of a single item.		● Statistics of pedestrian flow at the pier
D) Category	● To classify based on the nature, characteristics and uses: ♦ to group the same or similar things; ♦ to separate different things.		● Types of goods sold in supermarket ● Customers (serving local residents and tourists) of different shops
E) Distribution (mapping)	● To group similar things according to the research topic (similar to "**D. Category"**); ● Only suitable for spatial representation (different from category); ● Useful in showing the mode of occurrence of research subject in a complex environment.		● Distribution of shops selling big fish balls in Cheung Chau
F) Scoring	● To quantify abstract or subjective concepts; ● To merge various data for easy comparison; ● Scoring items should include different aspects.		● Risk index of Cheung Chau to natural hazards ● Air Quality Health Index (AQHI)
G) Field sketching	● To make simplified drawing of the field site to show what the data collectors observed. Annotations related to the research subject are added to provide key feature or additional information.		● Draw the characteristics and formation of weathering landforms
H) Questionnaire	● Forms: face-to-face, telephone, written, etc.; ● Using questionnaire to understand the opinion of research subject; ● Larger sample size than "**I. in-depth interview"**; ● Mainly closed questions (with options available).	● To collect information by questioning; ● To obtain information which is difficult to be obtained through observations; ● To understand the rationales and opinions of interviewees.	● The major reasons for tourists to visit Cheung Chau ● The level of satisfaction among residents regarding the revitalization project
I) In-depth Interview	● To obtain information through face-to-face/ telephone interview; ● Smaller sample size than "**H. Questionnaire"**; ● Mainly open questions and forthcoming questions will change upon the answer of respondents.		● Opinions of District Council members on the future development of that district

Sampling Methods

	Probabilistic sampling methods ➢ *Need to know the size of population;* ➢ *Few differences among individuals;* ➢ *Individual has equal chance of being selected;* ➢ *Representativeness of data depends on sampling percentage.*			**Non-probabilistic sampling methods** ➢ *Size of population might not be relevant to the research objective;* ➢ *Chance of individual being selected is unknown;* ➢ *Representativeness of the results depends on the judgment of researcher in sample selection (Such as the correlation between samples and research targets).*		
Methods	**Simple random Sampling** (簡單隨機抽樣)	**Systematic sampling** (系統抽樣)	**Stratified Sampling** (分層抽樣)	**Quota Sampling** (配額抽樣/定額抽樣)	**Convenience Sampling** (便利抽樣/方便抽樣)	**Purposive sampling** (立意抽樣)
Explanations	To select sample from the **whole population randomly**. (using computer program, bamboo slip or random number table)	Each member of the whole population is sequentially numbered, then selected according to a **fixed, periodic interval**.	The whole population are classified according to the variable and divided into separate stratum. Then samples are selected randomly by proportion from each stratum.	The whole population are classified according to the variable and divided into separate stratum. Then desired number (quota) of samples are selected from each stratum.	Research subjects are selected due to convenience of recruitment.	Samples are selected according to research objectives and special requirements.
Examples	To choose a certain number of students to conduct questionnaires/ surveys according to the class number.	To measure the noise level of a street in a regular interval.	To group buildings according to their ages (e.g. above or below 50), and select a certain number of buildings in each group randomly.	To select a certain number of male and female customers, then record the amount spent in a shop.	To interview a certain number of relatives who work in mainland China To interview a certain number of passersby on the street	To conduct an in-depth interview with a district councilor about the social problems of that district.
Remarks	Suitable for small population and few variations among samples (for relevant research objectives).	Suitable for large population (hidden cyclic ordering which may affect the representativeness of data).	Effectively show the relationship / effect between variables.	Effectively show the relationship / effect of variables, but the characteristics and size of samples are judged subjectively.	Should not generalize the data to larger population	Suitable for qualitative research (data is easily influenced by the subjective judgment of researcher)