

RLCP Flow Gauging Survey

Survey overview

Volunteers use handheld flowmeters to measure the velocity of the river at even intervals across the channel. Two different models of flowmeter are used, resulting in repeat measurements at each interval. Each volunteer also measures average velocity of the river using the flowmeter lent by EA to determine the amount of variation in measurements that is due to individual differences.

Definitions

Left bank: the left-side riverbank, facing downstream (in the direction of flow)

Right bank: the right-side riverbank, facing downstream (in the direction of flow)

Geopacks: GeoPacks advanced flowmeter, which is folding and has a blue plastic carrying case

GWP: Global water probe flowmeter, lent to RLCP by EA. This model is metal and has a large black plastic carrying case.

Drop3: Kestrel Drop 3 ambient weather logger, which is hanging in a tree near the flow transect

Materials

- 5m flexible measuring tape (forestry tape works well)
- Spare yellow ground pegs
- Geopacks flowmeter
- GWP
- Stopwatch (can be a smartphone)
- Waterproof recording sheet
- Fine-tip permanent marker
- 2 extra AA batteries (for GeoPacks)
- 2 extra coin cell batteries (for GWP and barometric pressure logger)

Location

The transect starts on the left bank of the Linnet upstream of Sheepwash Bridge and is marked by a yellow plastic ground peg. The right bank marker is a secondary marker and flagged with blue ribbon.

Transect re-establishment

If the left bank ground peg is missing, a new one should be placed at 65m at 230° from the furthest upstream, left-bank brick corner of Sheepwash Bridge. There is an old metal gate in the river which forms a small rapid that provides enough drop to increase the water velocity just downstream to levels measurable with the handheld flowmeters. If the right bank ground

peg is missing, it should be replaced such that the transect is **perpendicular to the direction of flow**.

Survey Setup

1. Locate left and right bank ground peg markers. If missing, follow instructions under "Transect re-establishment".
2. Stretch the measuring tape between the two ground pegs as taut as possible, with the 0m mark on the left bank.
3. Assemble the GeoPacks flowmeter and power on. The battery may need to be removed if the display does not turn on, due to a manufacturing defect.
4. Decide which volunteer will take interval measurements using each flowmeter. If time allows, each volunteer may repeat the interval measurements with both the GeoPacks and GWP, provided that the transect is completed one at a time (each person must complete all measurement intervals across the channel for consistency). If multiple sets of interval measurements are taken, the results will be averaged. At least two different volunteers should measure average channel velocity using the GWP to help quantify "human error" in the flow surveys.
5. Decide which volunteer will record results for each survey. This person should prepare the data sheet with:
 - a. The date and time of the survey
 - b. Their initials
 - c. The initials of the volunteer surveyor(s) completing each survey transect (indicate the flowmeters used by each person, if multiple surveyors)

GeoPacks Incremental Velocity Survey

1. Press the down arrow on the GeoPacks when turned on until the display says "Done", then press the enter button. It is not necessary to adjust the settings, as they are not saved to the GeoPacks due to a manufacturing defect. The display should show the temperature in Celsius once the GeoPacks is ready for measurement, and you can toggle between temperature and instantaneous velocity using the arrow buttons.
2. Locate the first interval along the transect with water, starting from the left bank marker and moving in 0.2 m increments.
3. Measure the depth of water at the first wet interval. Multiply this number by 0.6 to determine the approximate velocity measurement depth. The water depth must be recorded on the data sheet. A space has also been included for the 60% depth measurement, to assist with completing the survey with the Global Water Probe. If the impeller will not be submerged at 60% depth, record zero velocity.
4. Ensure the in-stream volunteer remains standing downstream, and waders are not close to the impeller before taking flow measurements. Place the flowmeter with the impeller facing directly into the direction of flow (facing upstream), at the calculated measurement depth. This is not always parallel to the riverbank and may be at an angle greater or less than 90 degrees from the transect measuring tape. If there is a standing

wave or eddy causing backward movement of water in the location you are measuring, do your best to keep the impeller facing into the predominant direction of downstream flow.

5. The data recorder should set a timer for 30 seconds, and at 10, 20, and 30 seconds, ask the in-stream volunteer for the velocity shown on the GeoPacks. The GeoPacks measures only instantaneous velocity, and this changes rapidly. This is why 3 measurements are taken - it does not stabilise.
6. After the 30 seconds have passed, the data recorder should average the 3 velocity measurements and record this number on the data sheet.
7. Repeat steps 2-6 every 0.2 m until you reach the right bank.

GWP Incremental Velocity Survey

1. Ensure that the GWP is powered on, and in average velocity mode.
2. Repeat the velocity measurements at the same intervals used for the GeoPacks survey, at the same depths.
3. At each interval, reset the GWP by holding down the top button once it is at the desired measurement depth, and facing with the arrow on the white plastic impeller casing in the correct direction of flow. Allow the GWP to measure velocity for 5-10 seconds, then call out the average value displayed on the screen to be recorded on the data sheet.

GWP Average Channel Velocity Survey

1. The recording volunteer should set a timer for 40 seconds.
2. The in-stream volunteer can choose to start at either the left or right bank, and at any depth, as the entire channel will be measured at once.
3. When the in-stream volunteer is ready, they should reset the GWP by holding down the top button, and the recording volunteer should start the timer.
4. The in-stream volunteer should move the GWP impeller slowly and smoothly throughout the cross-section of the river channel, as if spray-painting.
5. When the 40 second timer sounds, the in-stream volunteer will obtain the average channel velocity on the GWP screen and this can be recorded on the data sheet.
6. Steps 1-5 should be repeated for a total of 3 average channel velocity readings for the first in-stream volunteer.
7. The recorder and in-stream volunteer should swap roles and obtain readings taken by at least two volunteers total, by repeating steps 1-5. If there are additional volunteers present, this can be repeated several times.

RLCP Incremental Flow Survey Datasheet

Date: _____ Time (GMT): _____ Recorder initials: _____ Surveyor initials: _____

Distance from left bank (m)	Water depth (m)	Measurement depth (m; 0.6 x water depth)	Total channel depth (m; optional)	Velocity (m/s)	
				GeoPacks	Global Water Probe
0.4					
0.6					
0.8					
1.0					
1.2					
1.4					
1.6					
1.8					
2.0					
2.2					
2.4					
2.6					
2.8					
3.0					
3.2					

RLCP Average Channel Velocity Datasheet

Average velocity (m/s)	Volunteer 1 initials:	Volunteer 2 initials:	Volunteer 3 initials:	Volunteer 4 initials:
1st pass				
2nd pass				
3rd pass				