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Choosing a Gauging Section

Overview:

Horizons Regional Council carries out several different types of gauging's across the region. As part of the Quality Assurance process of the gauging's, choosing the correct gauging section during gauging is critical to the overall quality of the gauging. This Standard Operating Procedure (SOP) details the specific criteria to choosing proper gauging sections during flow calculations using the current gauging equipment employed by Horizons.

The presumption is that the person(s) undertaken gauging's has been fully trained in the equipment's use and all the information is present and/or accounted for before gauging's are undertaken.

In general the location of the gauging will be along the stretch of stream channel downstream of the site water level recorder and ideally before the first stream confluence of significant size downstream from the site. From the viewpoint of usefulness, the gauging section should be established as close to the recorder site, but just enough downstream from the site to allow the flow to become fully uniform across the entire width of the stream. On the other hand the gauging section should not be located so far downstream that the flow of the gauged section may be affected by the flow of any inflowing streams, groundwater inputs or seepage. Between those upstream and downstream limits for locating the gauging section, the hydraulic features should be investigated to obtain a site that presents the best possible conditions for discharge measurements and for developing a stable stage-discharge relation.

The ideal gauging site satisfies the following criteria:

- The general course of the stream is straight with a uniform cross-section and non-turbulent flow across the entire width of the stream
- The total flow is confined to one channel and no flow bypasses the site as subsurface flow.
- The streambed free of aquatic growth, large rocks and other debris
- The gauging site is far enough upstream from the confluence with another stream to avoid erroneous flow measurements
- A satisfactory reach for measuring discharge at all stages is available within reasonable proximity of the recorder site.

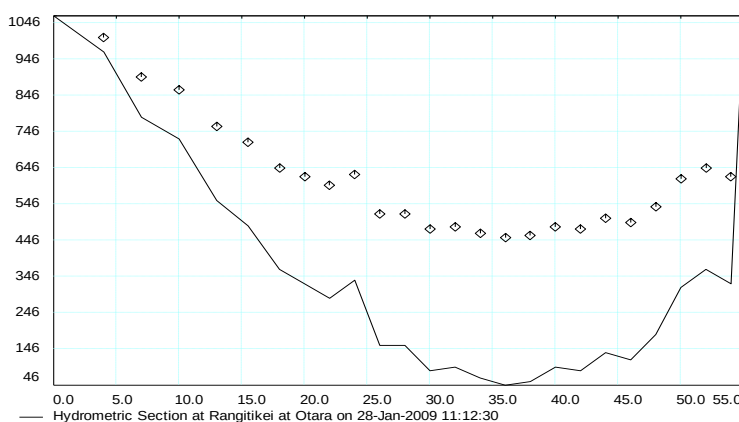


Figure 1: The prefect section. Straight channel, uniform cross-section, non-turbulent flow, confined to a single channel, and free of flow obstructions

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Rarely will an ideal site be found for a gauging location and judgment must be exercised in choosing between adequate sites, each of which has its own shortcomings. Often, too, adverse conditions exist at all possible sites and a poor site must be accepted. The reconnaissance for a gauging site properly starts in the office where the general area for the gage site is examined on topographic, geologic, and other maps, more so during Low Flow Project Work around streams that are unfamiliar.

With regard to low flow gauging runs, a stable well-defined low-water control section is ideal. In the absence of such a control, the feasibility of building an artificial low-water control should be investigated.



Figure 2a and b: a stable well-defined low-water control section, and b building an artificial low-water control / constriction for gauging low flows

The gauging section should also be located upstream from an area of water seepage in order to gauge as much of the surface flow as possible; the subsurface flow or underflow that results from channel seepage is not “lost” water, but is part of the total water resource.



Figure 3: Examples of poor gauging section a) Flow through deep papa guts resulting poor depth estimates, b) deep undercut banks with flow moving through them are difficult to access with current meters, c) Subsurface water lost to groundwater

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Figure 4: a) Gauging section with obstructions to flow, b) Highly turbulent flow not conducive to good gauging practice, c) Highly turbulent, high velocity, in-stream obstructions and fading light

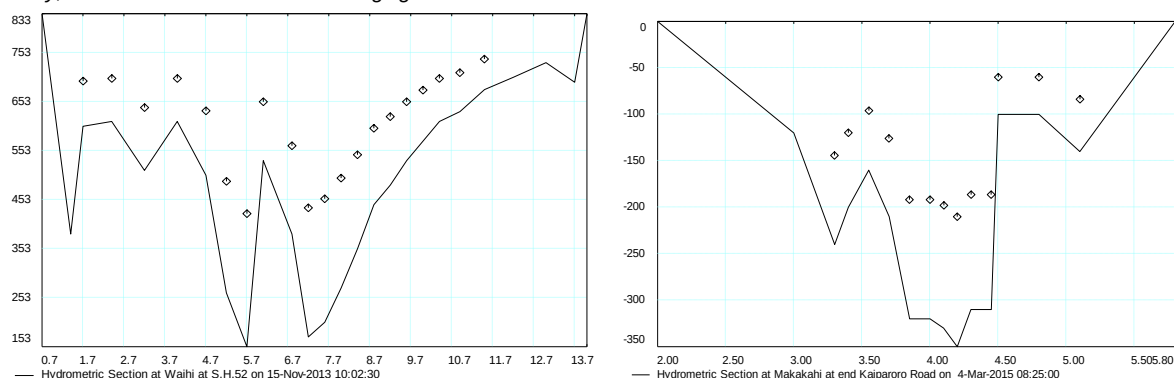


Figure 5: a) Cross-Section of Figure 3a and 4a

Ideally, the measurement cross section should be of fairly uniform in depth, flow lines should be parallel and the section fairly uniform in velocity throughout the cross section. The measurement section should be in reasonable proximity to the recorder site to avoid the need for adjusting measured discharge for change in storages.

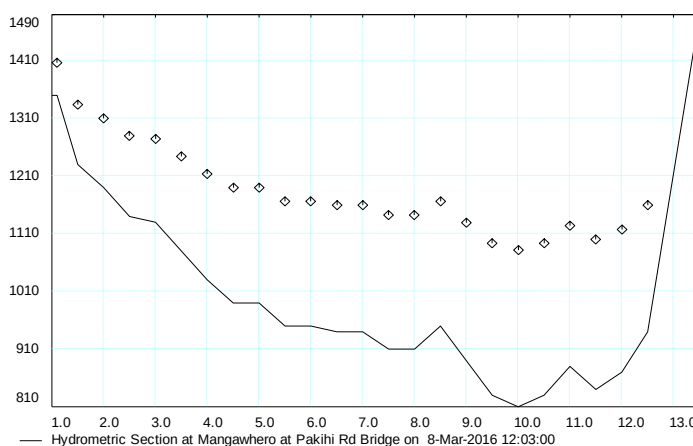


Figure 6: Ideal gauging section; uniform in depth, flow lines parallel, section uniform in velocity throughout the cross section and directly above site control

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Low-flow discharge measurements of all but the very large streams are made by wading. For flows that cannot be safely waded, ADCP's should be used from a bridge, cableway, Endless Loop or boat. It is most economical to use an existing bridge for that purpose, but in the absence of a bridge, or if the measuring section at a bridge site is poor, a suitable site should be selected for constructing an Endless Loop. If construction of an Endless Loop is not feasible because of excessive width of the river, high-water measurements will be made by boat when safe to do so.