A seismic reflection profile across the Petitcodiac River tidal flats at Moncton (Riverview), New Brunswick: a buried channel or "seismic artifact"?

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A 900 m shallow seismic reflection profile was shot across the tidal flats at Riverview, New Brunswick, over a three-day period in mid-August, 2001, as part of the Maritimes Groundwater Initiative (MGWI) program. The main objective of the seismic profile was to investigate the near-surface stratigraphy and shape of the buried bedrock valley.

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A Buffalo Gun firing 12-gauge blank shells in 1 m deep holes was used as the seismic source. A common midpoint (CMP) data set was acquired by firing shots every 3 m into a spread of 36 vertical 28 Hz geophones spaced at 3 m intervals. Successive shots were fired between the first 13 geophones, after which the geophones behind the last shot were "leapfrogged" to the end of the spread and the whole shooting sequence repeated. This asymmetrical survey procedure allowed geophone traces to be collected into CMP gathers varying between 12 and 24 fold.

Seismic refraction analyses indicated bedrock depths of approximately 10 m near the south valley wall, and 35 m at the north end of the line near the Petitcodiac River. Bedrock depths in the central part of the line appear to be greater than 35 m, as no clear bedrock refractions could be identified there, given the relatively short seismic reflection spread length.

For seismic reflection processing, a total of 344 shot records were processed using a VISTA™ processing software package. Although some records showed reflections between times of 50 to 90 milliseconds, no consistent reflectors were identified at earlier times from units within the overburden. Data processing challenges included the relatively low frequency (<100 Hz) content of the data (attributed to the effects of biogenic gas in the sediments) and bands of linear coherent noise which obscured many of the shot records. The CMP section produced after refraction static corrections, band pass filtering and R-T filtering, shows a pattern of flat lying intermittent bedrock reflectors, which is interrupted in the central part of the line by a 250 m long zone where reflectors appear to be "pushed down" by longer near surface travel times. A refraction tomography interpretation of first arrival times offers some support for the idea that this zone may represent a buried channel. There is, however, uncertainty associated with this interpretation given the limitations imposed by the short length of the seismic reflection spread and by lateral variations in seismic velocity related to variations in shallow gas content.