

INAA ANALYSIS OF NEAR-SHORE
DON RIVER SEDIMENTS

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A thesis submitted in conformity with
the requirements for the degree
of Bachelor of Applied Science
in the University of Toronto

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and Applied Chemistry
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ABSTRACT

Instrumental neutron activation analysis was used to detect and determine the presence of twenty trace elements in nearshore samples taken from the Don River. A number of samples were taken for two geographically distinct locations and analyses were carried out to determine: if selected elemental concentrations varied between different layers of sediment; and to verify whether a given element's source was crustal or anthropogenic in nature.

All twenty trace elements were detected, but quantitative results were not acquired for Cs, I or Zn. The concentration of Cu was determined in only one sample.

Elemental concentrations were found to vary with sample depth, but conclusions could only be made on a specific element specific site basis.

Nine trace elements showed evidence of being present in the Don River due to human activity. Five trace elements, including Al, Ca, K, Na and Mg were shown to be present mainly due to crustal sources. Fe and Sc may be present in Don River sediments due to both human activity and crustal sources.

INTRODUCTION

1.1) The Importance of Trace Elements in Sediments

Since the early 1970's a large number of sediment research studies have been undertaken both in North America (32) and Australia (30) (31). There is no longer any doubt that the study of trace element concentrations in sediment can aid in the detection of sources of pollution in aquatic systems. Pollution sources may even be detected some time after the input has ceased. All of this is compounded by the fact that the investigations of sediment particles can provide a more accurate technique as trace element concentrations in sediment may be 1000 to 100,000 times higher than in the associated aqueous phase (7).

Since contaminated sediments are now viewed as a potential source of contamination of earth's water resources, much time and energy is being spent on: determining the extent of sediment contamination; and developing a series of analytical techniques which will allow the determination of trace element biological availability. These two enterprises will ultimately lead to a more meaningful set of guidelines which can be followed when trying to assess the potential dangers of a contaminated sediment site.

For the purposes of this work, a trace element is defined as any element whose weight accounts for only a small fraction of the overall weight of the sample under investigation.

1.2) Purpose of this Research

The scope of this research is limited to three areas of investigation. First, the concentration of twenty trace elements was determined for a number of sampling sites at two separate locations on the Don River. Second, the possible variation of element concentration between different layers of sediment was investigated. It was anticipated that this portion of the research may reveal trace element loading variations. Finally, for elements for which enough empirical data was acquired, an attempt was made to verify whether a given element's source was crustal or anthropogenic.