REVISITING THE DIAMETER OF THE WEST CLEARWATER LAKE IMPACT STRUCTURE, QUEBEC, CANADA. M. C. Kerrigan[1], G. R. Osinski[1], and L. L. Tornabene[1]. [1]Centre for Planetary Science and Exploration, Dept. of Earth Sciences, University of Western Ontario, 1151 Richmond St., London, ON, Canada, N6A 5B7 (mkerrig@uwo.ca)

Introduction: The Clearwater Lake complex (56°10N, 74°20W) in Quebec, Canada, is a double impact structure, expressed as two adjacent circular lakes (Fig. 1). East Clearwater Lake is approximately 21 km in diameter while West Clearwater Lake measures 32 km across. West Clearwater also has a prominent ring of islands 18 km across and some small, low-lying islands in the centre of the lake. In early studies of West Clearwater the 32 km diameter of the lake is used as the diameter of the crater whether the study described the crater as being of volcanic [1] or impact origin [2]. In this study we focus on West Clearwater Lake using remote sensing data to examine the surrounding terrain for structural features associated with an impact crater rim morphology outside of the lake area.

Crater Geology. The target lithology for this impact structure is Precambrian granitic gneiss of the Canadian Shield with small outcrops of Ordovician limestone [3]. The impact event is dated at ~290 Mya [4] and the geology of the lake islands display a sequence of lithic and impact melt-bearing breccias, and a fine-grained to clast-rich impact melt sheet [3].

Methodology: Several remote sensing datasets are utilised in this study including: a 1:50,000 Digital Elevation Model from Natural Resources of Canada, Landsat Enhanced Thematic Mapper+ (ETM+) and Advanced Spaceborne Thermal Emission and Reflection Radiometer (ASTER) visual-near infrared (VNIR) and short wavelength infrared (SWIR) data. The topographic, morphologic, and structural expression of the terrain surrounding the crater was assessed by eye mapped over a colourized shaded-relief map of the area within ArcGIS v.10 (Fig. 2).

Results and Discussion: An overall east-west direction of the topography and the many smaller lakes is apparent in the shaded-relief map. This is associated with westward flow during the Laurentide glaciation [5]. In some areas, however, particularly towards the south and west of the lake, ridges and valleys appear curvilinear and concentric with the shoreline, as well as others which trend more north-south. These may represent radial faults and fractures emanating from the centre of the crater. While some of these possible faults and fractures have been overprinted by the subsequent glaciations, they nevertheless form a faint "halo" feature surrounding the lake at a diameter of ~65 km from the centre of the lake (Fig. 2); this halo has also been observed in Radarsat 1 data [5]. Whether this represents the actual crater rim remains to be determined but this work highlights the difficulty in identifying the rim in eroded complex impact structures.

Fig. 1: True colour Landsat ETM+ image of Clearwater Lake complex. Note the general east-west lineation highlighted by small lakes throughout the region.

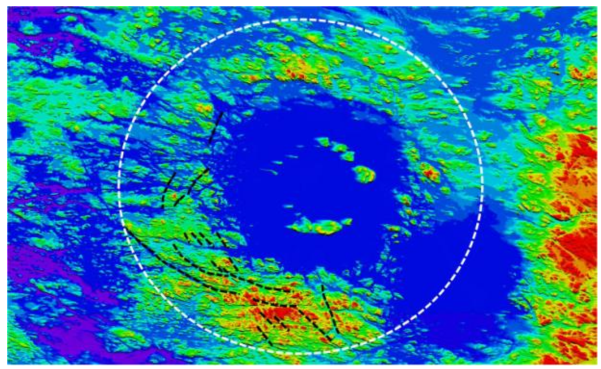

Fig. 2: Shaded-relief map of West Clearwater Lake generated using standard processing and mosaic techniques for Digital Elevation Models (DEMs) with the Environment for Visualizing Images (ENVI) software package. Possible faults are marked in black and potential crater rim limit highlighted with the white circle.

Future Work: Multiple radial topographic profiles across the impact structure, as well as multiple sun-angled shade-relief maps will be used to create ai improved structural map of the site. Spectral information and additional observations made from these remote sensing datasets will assist in the preparation for future fieldwork, geologic mapping, and planning traverses and locations where interpretations can be ground-truthed.

References: [1] Kranck S. H. and Sinclair G. W. (1963) *Geol. Survey Can. Bull. 100*. [2] Dence M. R. et al. (1965) *J. Roy. Astron. Soc. Can. 59,* 13–22. [3] Phinney W. C. et al. (1978) *Lunar and Planetary Sci. Conference Proceedings. 9,* 2659-2694. [4] McDonald I. (2002) *Meteoritics and Planetary Sci. 37*, 459-464. [5] Smith S. K. et al. (1999) *Canadian Journal of Remote Sensing. 25,* 218–228.