Sapper Mappers do the DEW

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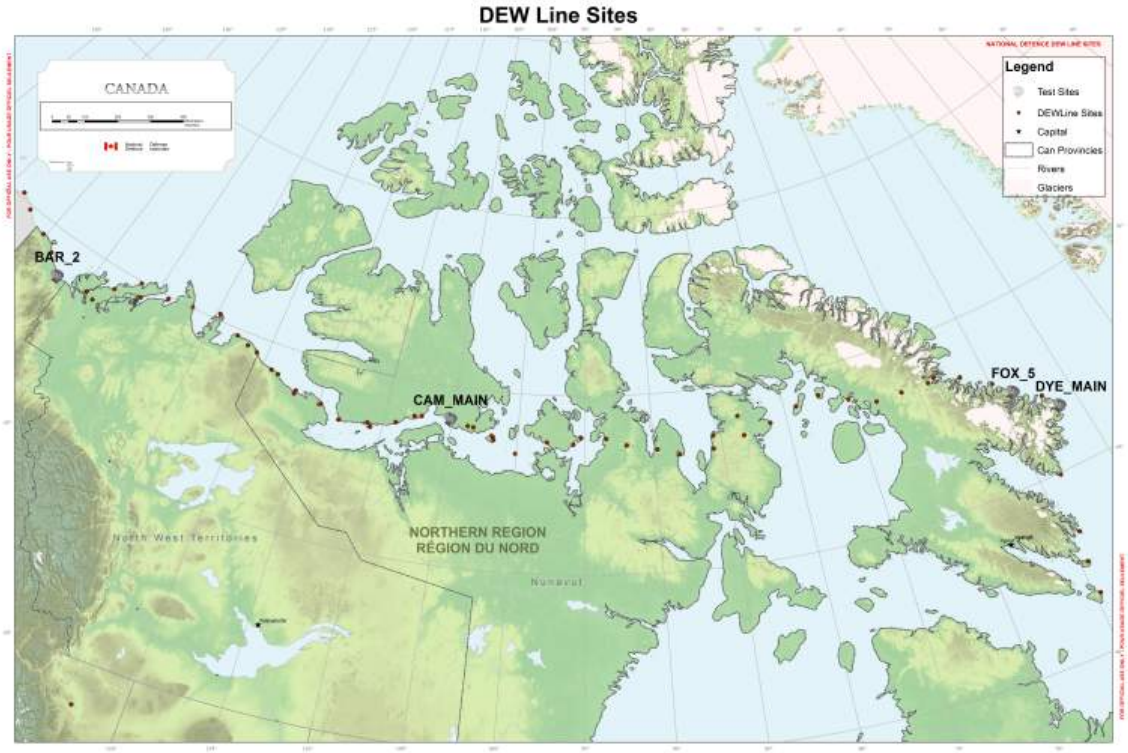
The Mapping and Charting Establishment's (MCE) Capabilities Development Section has taken on a unique challenge presented by the DEW Line Clean Up Project Manager (DLCUPM). A 'proof of concept' endeavours to prove whether environmental monitoring through remote sensing will be effective enough to replace the current method of monitoring which involves putting 'boots on the ground'. The objective is to collect remotely sensed information for four distinct DEW Line sites using Synthetic Aperture radar (SAR), other satellite imagery and air photos to evaluate whether environmental changes that may occur in the Arctic can be monitored using air photo, satellite imagery and SAR data. Theoretically, interferometry time series monitoring can detect deformation of the ground (cracks, holes, depressions) at the level required to confidently report whether there have been any changes in the remediated DEW Line sites. In a nutshell, if we can identify problems at the sites using imagery from space or aircraft, we may no longer need to put 'boots on the ground' that is proving to be expensive.



The DEW line clean up 'proof of concept', at first glance, probably appears to be a strange diversion from most projects undertaken at MCE. However, the terrain analysis and characterisation of the sites is exactly what geospatial technicians do on a daily basis in support of domestic and expeditionary operations. Analysing and describing the physical environment is our business.

So what is this DEW Line project all about?! (*skip this part if you know what the DEW line is*) The Distant Early Warning (DEW) Line, a product of the Cold War, was designed to give the Canadian and American military early warning of Soviet bombers or missile attacks 'over the North Pole'.[1] The DEW Line is a string of continental defence radars, stretching from Alaska, across the Canadian Arctic into Greenland.[2] Since being completed in the late 1950's much of the equipment used to build and maintain the sites were discarded on the landscape without regard to the environmental hazards they might precipitate. In the 1990's the last of the DEW line sites were left vacant or transformed into what is now known as the North Warning System (NWS).

DND has committed to cleaning up and remediating the environmental hazards left behind and this multi-million dollar investment in Canada's arctic is managed by the DEW Line Clean Up Project Office (DLCUPO).

Although the environmental monitoring component aligns well with the current controversy over Arctic sovereignty and the global attention being paid to climate change, MCE turned its focus to accepting this challenge by way of reinvigorating its Ariel survey and ground survey capabilities in the Arctic whilst venturing into the world of SAR processing. With the help of the DRDC Ottawa (Dr Secker, Dr Mattar, Dr

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1 http://www.pwnhc.ca/timeline/index_winIFix.asp?forward=http%3A//www.pwnhc.ca/timeline/1950/DEWline_1954.html#Scene_1

2 The Distant Early Warning (DEW) Line:A Bibliography and Documentary Resource List, P. Whitney Lackenbauer, Ph.D.Matthew J. Farish, Ph.D.Jennifer Arthur-Lackenbauer, M.Sc.

Schlingmeier, Dr Lui) MCE is at the cutting edge of technology and excited to be looking at new ways to utilize the Canadian Radarsat 2 asset.

The collected data is being used to evaluate whether environmental changes that may occur in the Arctic can be monitored using different analysis techniques using SAR Single Look Complex and/or Interferometery time series analysis. Very technical, but put simply, comparing Radarsat 2 images taken over a period of time to identify very small changes in the shape and integrity of the landfill surface.

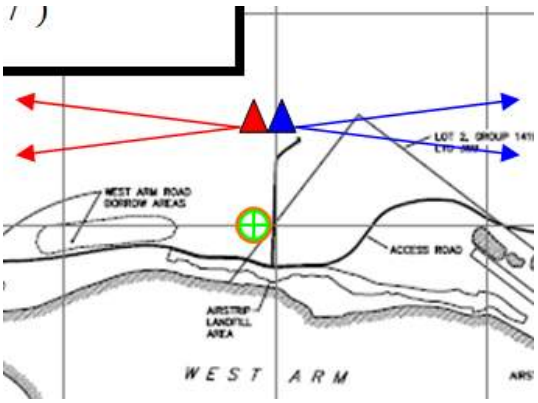
Of course, learning how to analyse the change detection algorithms should give us additional insight for how we can use SAR data to enhance our current terrain analysis and other products in support of other military operations.

Op Hunter was the first of two field collects that enabled us to commence ground truth work, collect baseline data, set up targets for radar and electro-optical imagery (EO) as well as enhance MCE's creative resourcefulness for troubleshooting.

The unit is currently at Phase 4 of the 9 Phase project and is processing and analyzing of the initial data collected in 2012. During the 1st field collection phase and ground truthing in the summer of 2012, MCE surveyors erected and accurately positioned aluminum corner reflectors to help calibrate the SAR imagery. DRDC Ottawa was able to

find and identify all of our corner reflectors that we placed in the field. This is what it looks like for CAM M, ascending look, for the western site:

(CamMwestTCRMap.jpg, preTCRCamM.jpg, PostTCRCamM.jpg WTCRascCamM.jpg, UFO.jpg)



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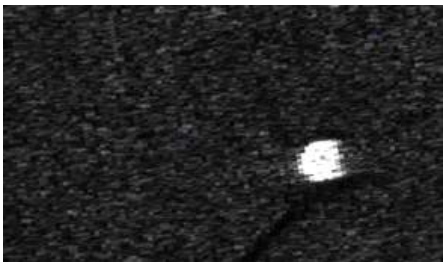

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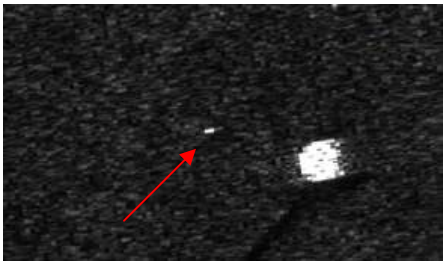

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The larger bright spot being a landed UFO….(or non-directional beacon) and the small spot being our Trihedral Corner Reflector that was surveyed in on August 7, 2012.

MCE is currently processing the data from this summer and is well into planning for the 2nd field collection in summer 2013. We continue to contribute and learn from this very exciting 'proof of concept'.