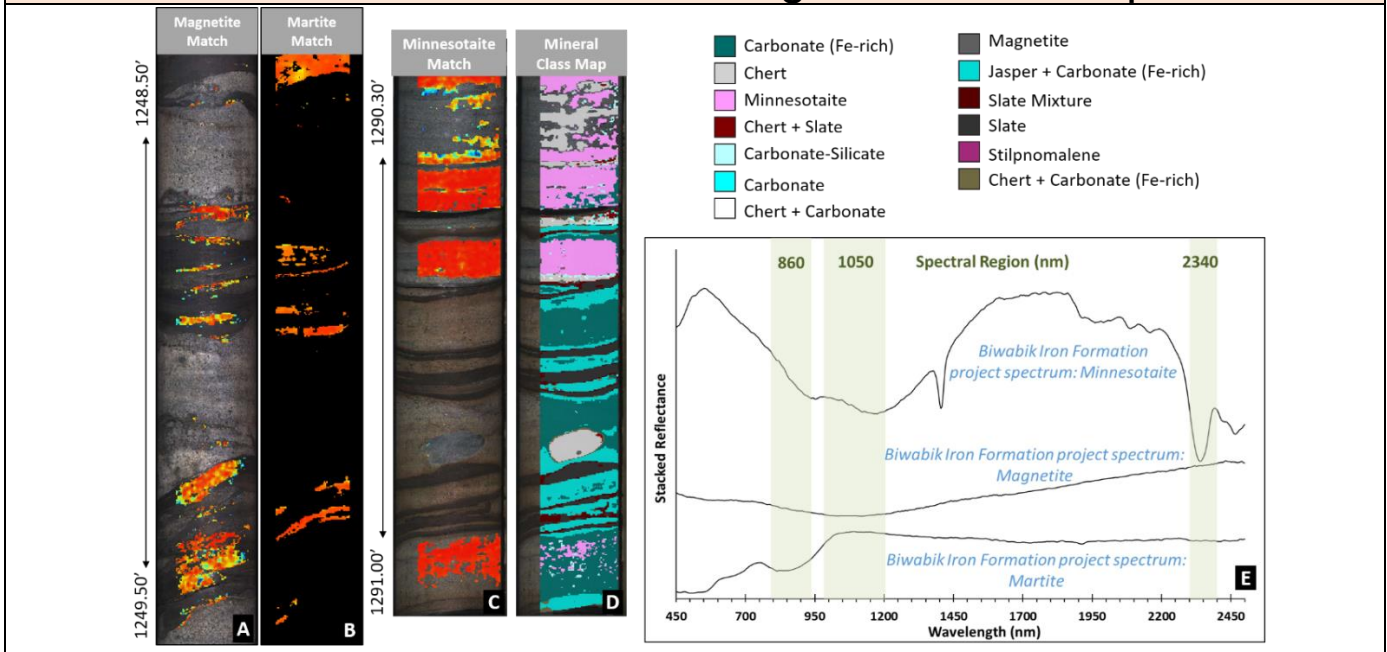


MnDNR Corescan Project

Biwabik Iron Formation/Mesabi Range Core – Example Results



Photography with superimposed hyperspectral mineral match (A,C), hyperspectral mineral match (B) and mineral class map (D) of DDH LWD-99-2. Inset spectra (E) shows examples of spectral regions used to differentiate the iron oxide species, such as magnetite and martite, from the gangue mineralogy such as minnesotaite.

<p>Hyperspectral-detected Mineralogy</p>	<p>These six drill cores transect the Biwabik Iron Fm, which is currently actively mined (cores also include intervals of Virginia Fm and Pokegama quartzite). The well-known mineralogy of this formation (see, for example, McSwiggen, 2008) is well identified in both VNIR (iron oxide species; i.e. goethite, martite, microplaty hematite, magnetite) and SWIR (carbonates, phyllosilicates and silicates) ranges. See associated Mineral Key for full list of identified mineralogy with the Corescan HCI-3 system.</p>
<p>Results</p>	<p>Martite-rich bands can be differentiated from the more magnetite-rich bands using the VNIR range which is an important criterion in the production of taconite pellets. Other types of iron oxides such as goethite and microplaty hematite are mapped. Mapped mineralogy is in concordance with the 25 “Rosetta” units described by Severson et al. (2009) and distinct mineral zoning can be observed within the same stratigraphic unit. Within the gangue mineralogy, variation in the composition of carbonate (calcium to iron-rich), chlorite (magnesium to iron-rich) and talc (magnesium to iron-rich) are also recognized based on absorption features. Finally, the hyperspectral mineralogy is able to highlight the contact between the Biwabik Iron Formation and the overlying Virginia Formation where previously unrecognized ammonium-bearing white mica is identified in the same location where Addison et al. (2005) identified an ~25 to ~58cm thick ejecta layer associated with the 1850Ma Sudbury impact event. Also, the ‘hematitic quartz’ class is associated with the contact of the iron formation with the underlying Pokegama formation.</p>

References:

Addison W.D., Brumpton G.R., Vallini D.A., McNaughton N.J., Davis D.W., Kissin S.A., Fralick P.W., and Hammond A.L., 2005. Discovery of distal ejecta from the 1850 Ma Sudbury impact event. *Geology* 33, pp.193-196.

McSwiggen, P.L. and Morey, G.B., 2008. Overview of the mineralogy of the Biwabik Iron Formation, Mesabi Iron Range, northern Minnesota. *Regulatory Toxicology and Pharmacology*, 52(1), pp.S11-S25.

Severson M.J., Heine, J.J., and Meinders Patelke M., 2009. *Geologic and Stratigraphic Controls of the Biwabik Iron Formation and the Aggregate Potential of the Mesabi Iron Range, Minnesota, NRRI, TR*