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Foreword

The Geo-mapping for Energy and Minerals (GEM) program is laying the foundation for sustainable economic development in the North. The Program provides modern, public geoscience that will set the stage for long-term decision making related to investment in responsible resource development. Geoscience knowledge produced by GEM supports evidence-based exploration for new energy and mineral resources, and enables northern communities to make informed decisions about their land, economy, and society. Building upon the success of its first five-year program, GEM has been renewed until 2020 to continue to increase geoscience knowledge by producing new, publically accessible, regional-scale geological maps and data sets for Canada's North.

During the summer of 2016, the GEM program successfully carried out 17 research activities including geological, geochemical, and geophysical surveying. These activities have been undertaken in collaboration with provincial and territorial governments, northerners and their institutions, academia, and the private sector. The GEM program will continue to work with these key collaborators as the program advances.

Activity Summary

The Tehery-Wager activity, conducted as part of the second phase of Natural Resources Canada's Geo-mapping for Energy and Minerals (GEM-2) Rae project, is a collaborative effort between the Geological Survey of Canada (GSC) and the Canada-Nunavut Geoscience Office (CNGO), with participants from Canadian universities. The study area comprises all or parts of eight National Topographic System (NTS) map areas between Chesterfield Inlet and Wager Bay in Nunavut (NTS 46D, 46E, 56A, 56B, 56C, 56F, 56G, and 56H). The main objective of the work is to increase the level of geological knowledge in this poorly known and under-explored region of the Canadian Shield through targeted bedrock geology mapping, surficial geology studies, surface and stream sediment sampling, ground-gravity transects, and other thematic studies. The gathered information will be used to better evaluate this frontier region's potential for a variety of commodities, including diamonds and other gemstones, base and precious metals, industrial minerals, carving stone, and aggregate, and to assist all stakeholders, including northerners, in making future land-use decisions. This report summarizes results from the 2016 bedrock mapping in the western and northern parts of the study area that allow refinement of the spatial distribution of major rock units and structures, documentation of the geological histories in relative time, and a preliminary evaluation of the region's economic potential.

Introduction

Until recent years, significant geoscience knowledge gaps existed in several parts of the Rae craton owing largely to reconnaissance-scale or outdated mapping, and a lack of geochronological, isotopic, and geochemical information. The Tehery-Wager area (Fig. 1), one the least known and under-explored regions of Nunavut, was selected as part of the GEM-2 Rae project to increase our understanding of the geology and mineral potential of this frontier region by addressing the following scientific questions:

1) What is the tectonic architecture and history of the Rae Province, and how do they determine the distribution of mineral resources?

2) What is the nature, distribution, and significance of 2.6 Ga events in the Rae Province?

The work initiated in 2015 follows up on the reconnaissance field studies, data mining, and geochemical and geophysical surveys (Coyle and Kiss, 2012a, b; Day et al., 2013; Harris et al., 2013; McMartin et al., 2013; Wodicka et al., in prep.) conducted under the Geo-mapping Frontiers project of the GEM-1 program. Results from these studies highlighted the potential for base- and precious-metal mineralization in a folded supracrustal panel in the vicinity of a major but enigmatic fault structure, the Chesterfield fault zone, and identified prospective areas with potential ultramafic/mafic or kimberlite sources outside the known kimberlite field that was discovered by Peregrine Diamonds Ltd. (Fig. 2). Distinct Archean and Paleoproterozoic plutonic suites, as well as supracrustal packages of uncertain age and parentage, were also identified during the course of this reconnaissance work.

The GEM-2 field activities carried out by the GSC and CNGO in the Tehery-Wager area comprise several components, including targeted bedrock mapping (Steenkamp et al., 2015, in press; Wodicka et al., 2015, this study; Lawley et al., 2015), targeted surficial geology studies and glacial/stream sediment sampling (Byatt et al., 2015, 2016; McMartin et al., 2015a, 2015b, 2016a, 2016b; Randour et al., 2016, in press), and a potential field (gravity and magnetic) study (Tschirhart et al., in press). The present report summarizes the preliminary findings from the 2016 targeted bedrock mapping program, the second of two planned field seasons in the area. For greater detail on the bedrock geology in the study area, the reader is referred to the CNGO Summary of Activities field report by Steenkamp et al. (in press). Coupled with ongoing geochronological, geochemical, isotopic, and petrographic analyses, the main objectives of our mapping were to:

1) Document the nature and extent of Archean and Paleoproterozoic granitoid rocks across the study area and continue to evaluate the nature of their contacts with adjacent supracrustal rocks;

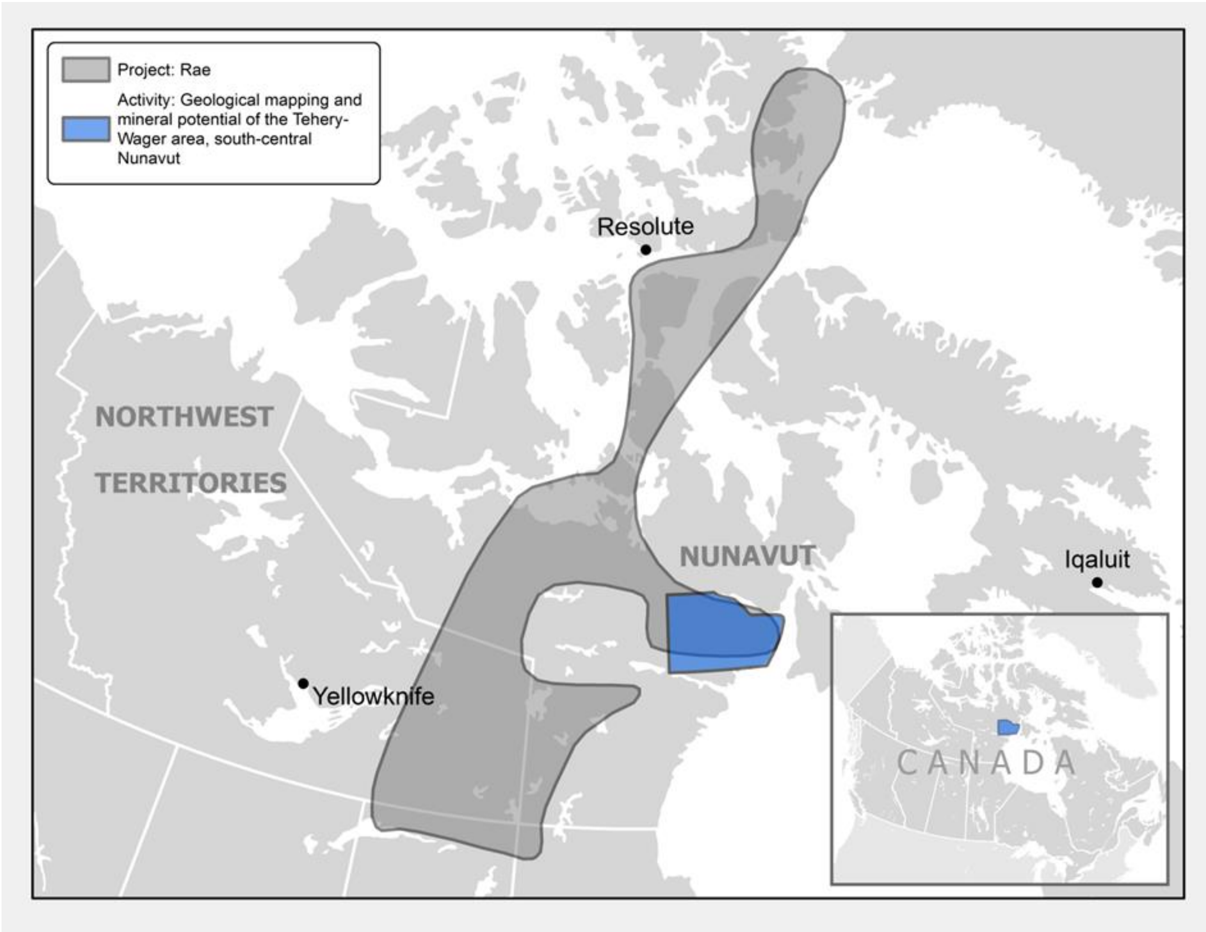

Figure 1. *Overview map of the GEM-2 Rae project and Tehery-Wager activity in northern Canada.*

2) Improve our understanding of the map distribution, parentage, and mineral potential of supracrustal rocks and constrain their depositional setting;

3) Document the nature, extent, and style of deformation along major fault structures to evaluate their potential for focusing mineralization;

4) Continue to document the degree and extent of metamorphism to elucidate the potential for contrasting metamorphic histories across the map area and between neighbouring regions; and

5) Increase our knowledge of the economic mineral and carving stone potential of the Tehery-Wager area.

Methodology

The 2016 mapping program involved fieldwork between June 27th and July 29th in the western and northern portions of the Tehery-Wager project area in parts of NTS map sheets 56B, 56C, 56F, 56G, and 56H (Fig. 2). The work was based out of a low-impact, temporary camp situated on the Lorillard River in map sheet 56G (Fig. 2) and was supported by a Bell 206L3 helicopter. Bedrock mapping was undertaken primarily by 2–12 km foot traverses, but also included strategic helicopter stops at remote sites or within areas heavily covered by surficial sediments. Field sites and traverses were primarily chosen based on archived information, good bedrock exposure, and magnetic anomalies.

Geological field observations, including rock types, mineral assemblages, and structural measurements, were taken at over 460 stations and recorded on air photos. All observations, along with station coordinates, sample and photo records, and magnetic susceptibility measurements were also recorded in small tablet computers equipped with the Ganfeld system (Shimamura et al., 2008). The gathered data were then downloaded on a daily basis to the master GIS geodatabase by the project data manager. A total of 610 samples were collected from representative lithologies for various purposes, including petrography, lithogeochemistry, assay geochemistry, U-Pb and Lu-Hf geochronology, thermochronology, Sm-Nd isotope geochemistry, and microstructural and metamorphic analysis.

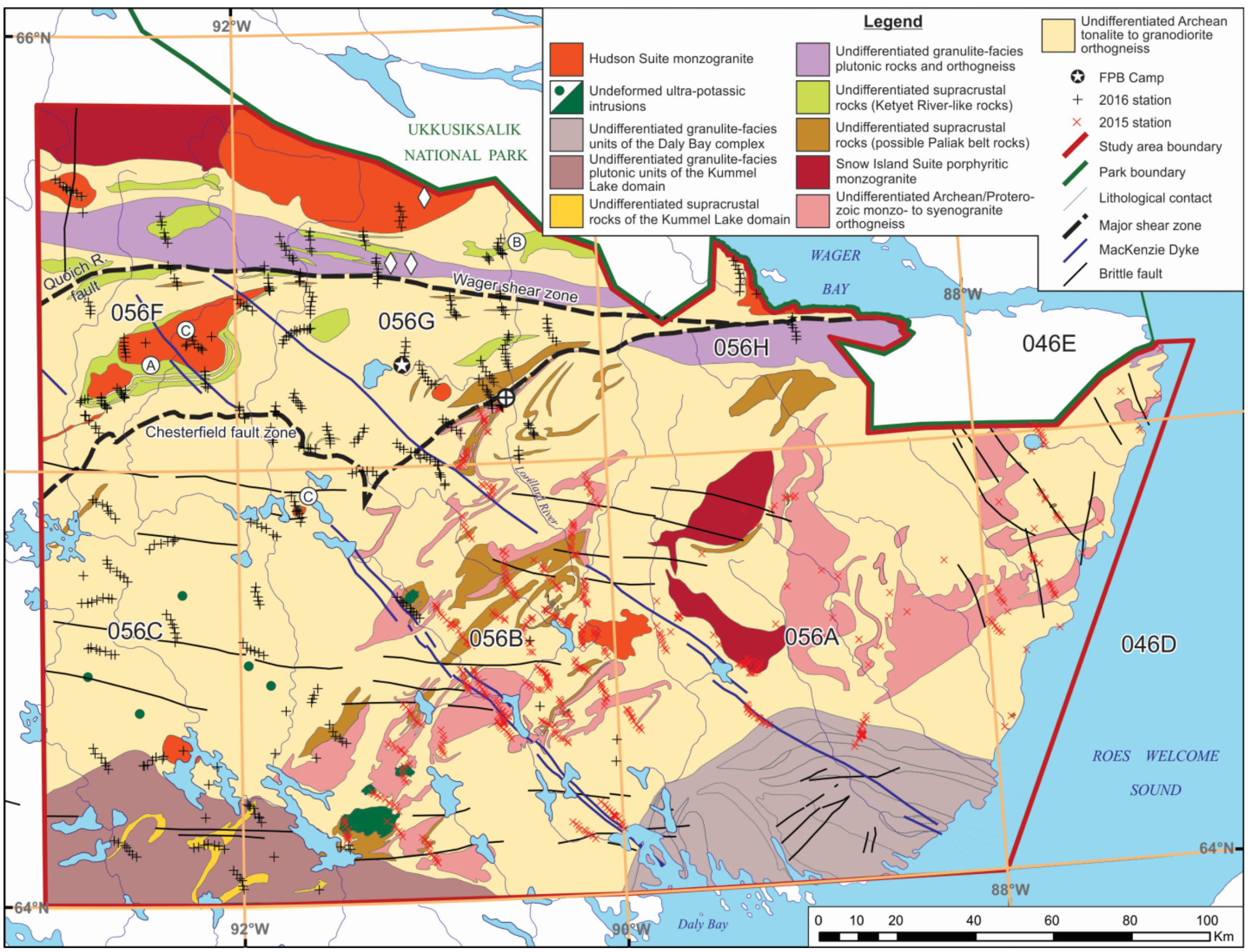

Figure 2. *Simplified geological map of the Tehery-Wager area (modified from Steenkamp et al., 2015) showing the location of 2016 stations, field camp, known kimberlite bodies from Peregrine Diamonds Ltd. (white diamonds), and anomalous concentrations of Ag, Cu, Bi, and Au (circled black cross) in surface till. See text for further details. Letters are locations discussed in the text.*

Results

The main highlights from our 2016 bedrock mapping include the following:

1) Archean granitoid rocks: Archean granitoid rocks underlie extensive portions of the area mapped in 2016 (Fig. 2) and mainly comprise gneissic to migmatitic Bt ± Hbl ± Ep ± Ttn (all mineral abbreviations follow Kretz, 1983) granodiorite to tonalite structurally intercalated with, or containing isolated inclusions and pods of, ultramafic (pyroxenite), mafic (gabbro, amphibolite), and intermediate (diorite) rocks. Transposed, mm- to m-scale veins and dykes of weakly foliated to undeformed Bt ± Mag monzogranite to syenogranite are ubiquitous within the gneissic rocks (Fig. 3A). In general, no clear compositional or textural distinction could be made between these gneissic rocks and those occurring to the east within the area mapped in 2015 (despite differences in Nd isotopic data; J. Whalen and T. Peterson, unpubl. data) or across the Wager shear zone or Chesterfield fault zone. Notable exceptions are the apparent greater abundance of migmatitic textures (Fig. 3B) south of the western segment of the Chesterfield fault zone (NTS 56C and west 56B) and the more sporadic occurrence of variably foliated, Bt ± Mag Kfs porphyritic monzogranite that forms mappable units in the eastern portion of the study area. Most of the gneissic rocks in the western and northern parts of the map area are likely ca. 2.70 Ga in age or older, but ca. 2.6 Ga Snow Island suite rocks are also present based on existing U-Pb age data in this region (van Breemen et al., 2007 and N. Wodicka, unpubl. data). Several samples were collected from representative Archean units for geochemical, Nd isotopic, and geochronological analyses to further characterize the age and parentage of different plutonic suites, and test the potential existence of two distinct Archean crustal domains in the region (e.g., Wodicka et al., 2016).

In several localities, a coarse-grained, white- to pink-weathering Hbl monzogranite clearly cuts the main fabric in the gneissic rocks, but also locally occurs as transposed veins or in extensional pull-apart structures (Fig. 3C). Contacts with the host gneiss are generally diffuse, suggesting that the monzogranite may have formed by partial melting of the igneous precursors. This unit is distinct from the transposed Bt-Mag monzogranite veins described above and the Hudson suite monzogranite described below, and will be dated to constrain, at least in part, regional deformation and metamorphism in the study area.

2) Supracrustal rocks: Most supracrustal rocks occurring north of the Chesterfield fault zone (green unit on Fig. 2) comprise thick (up to several hundred metres), white-weathering Sil ± Ms ± Grt quartzite (Fig. 3D) interlayered with Bt ± Ms ± Sil ± Grt ± Gr psammite, semipelite, and pelite, as well as Hbl ± Bt ± Grt mafic rocks of probable volcanic origin (Fig. 3E). Contacts with adjacent Archean gneissic rocks are generally highly tectonized and characterized by strong co-planar fabrics (Fig. 3F). In NTS sheet 56F (locality A on Fig. 2), the repetition of thin panels of strongly deformed Archean gneiss along the southern limb of the large synformal structure may result from parasitic folding of the reworked basement-cover contact.

The lithologies of the quartzite-dominated supracrustal panels are very similar to those of the Paleoproterozoic Ketyet River Group (Rainbird et al., 2010) exposed to the west of the map area, and are likely correlative with it (e.g., Panagapko et al., 2003; Ferderber et al., 2013). Based on our field

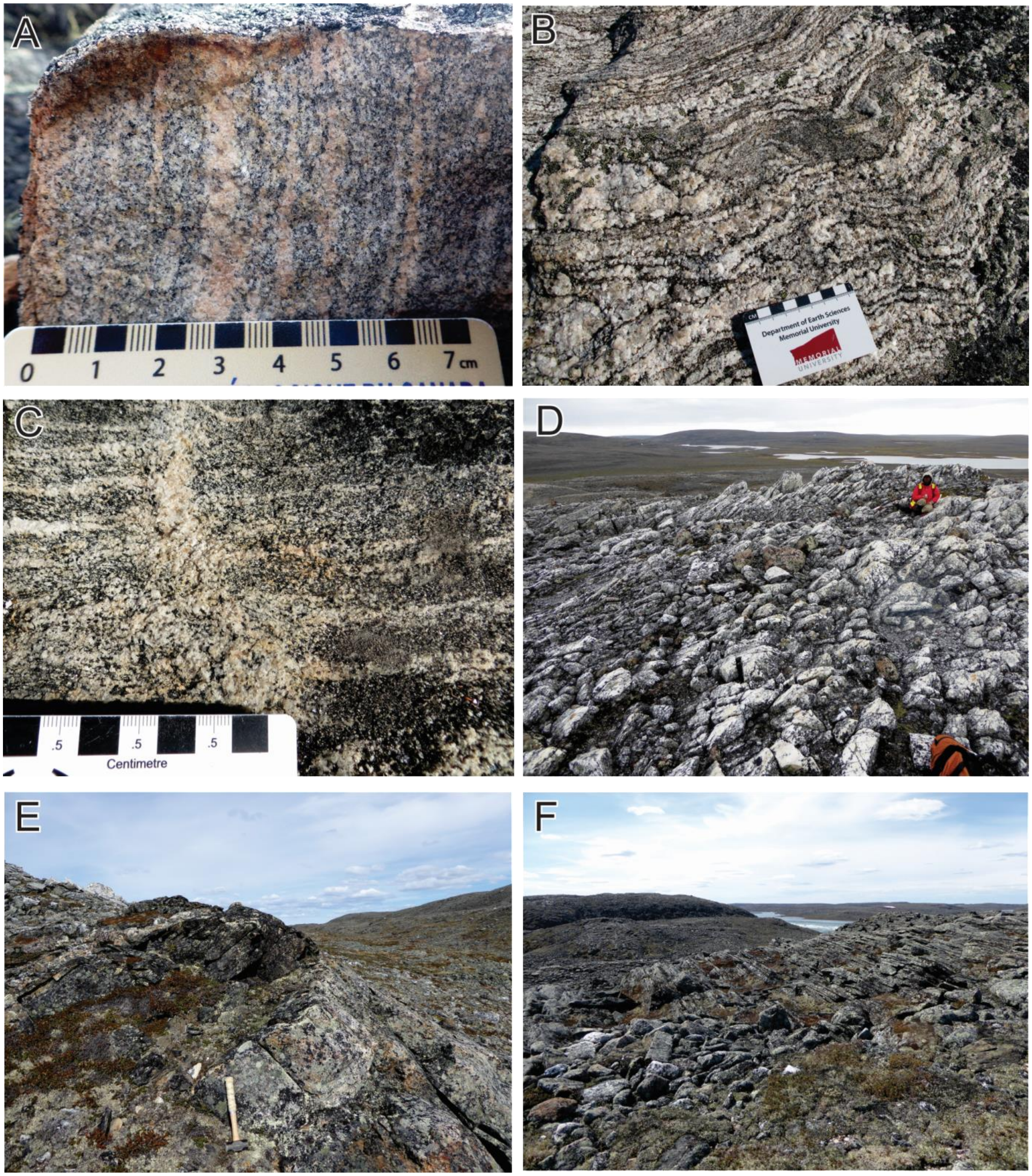

Figure 3. *Field photographs from the 2016 Tehery-Wager study area. A) Bt granodiorite gneiss (grey layers) with transposed, mm- to cm-thick, Bt-Mag monzogranite veins (pink). B) Strong migmatitic texture developed in a Bt granodiorite south of the Chesterfield fault zone. The white-weathering granitic leucosomes form greater than 20% of the outcrop and are Bt bearing. C) Coarse-grained, Hbl monzogranite occurring in an extensional pull-apart structure in a tonalite-diorite gneiss. Note diffuse contacts between the two units. D) Thick, white-weathering Sil quartzite thought to belong to the Ketyet River Group. E) Interbedded white quartzite and mafic rocks thought to belong to the Ketyet River Group. F) Typical flaggy Archean gneiss in contact with nearby, Ketyet River-like supracrustal panels.*

observations, these rocks do not appear to be exposed south of the Chesterfield fault zone in the area mapped in 2016.

Other supracrustal panels north of the Chesterfield fault zone contain more diverse or distinct lithologies, including garnetite, iron formation, strongly migmatitic psammitic to semipelitic gneiss, ultramafic boudins, and mafic rocks, that bear many similarities with supracrustal rocks mapped south of the Chesterfield fault zone (Steenkamp et al., 2015; Wodicka et al., 2015). These rocks either display strong deformation adjacent to Archean gneiss, or appear to occur as large xenoliths within it. In Figure 2, these supracrustal panels are tentatively differentiated from the Ketyet River-like rocks (brown vs green units, respectively), but the possibility that there is more than one package of supracrustal rocks within some of the panels cannot be excluded. One example is the supracrustal panel mapped in NTS 56G (locality B on Fig. 2), which contains thick white-weathering quartzite (Fig. 3D) in close contact with migmatitic Bt paragneiss. The latter lithology is more characteristic of the Paliak belt, which lies along strike from this panel and comprises mainly Bt ± Grt semipelitic gneiss with lesser amphibolite, ultramafic boudins, calc-silicate rocks, and iron formation, but lacks the thick, white-weathering quartzite units (Henderson et al., 1986; Jefferson et al., 1991). Correlation of the Paliak belt beyond this panel to the west, between the two fault zones, or south of the Chesterfield fault zone with broadly similar lithologies (e.g., brown units on Fig. 2) remains to be determined.

3) Kummel Lake domain: Field work in the southwestern part of the map area identified a large, ca. 3800 km^2 domain underlain by granulite-facies rocks (Fig. 2) that share similar lithological, metamorphic, and geophysical features with the granulite-facies complexes along the northern shoreline of Chesterfield Inlet, namely the Kramanituar complex (Sanborn-Barrie et al., 2001), Uvauk complex (Mills et al., 2007), Hanbury Island shear zone (Tella and Annesley, 1988), and Daly Bay complex (Gordon, 1988; Hanmer and Williams, 2001). Plutonic lithologies within the domain, herein referred to as the Kummel Lake domain, are dominated by Bt ± Mag ± Hbl ± Opx monzogranite to granodiorite with cm- to m-thick layers or boudins of Bt ± Hbl ± Cpx ± Mag ± Opx diorite to gabbro and subordinate Hbl + Cpx anorthositic rocks (Fig. 4A and B). In places, the foliated to gneissic monzogranite to granodiorite is cut by subconcordant veins or sheets of a more massive and coarser-grained Bt + Mag monzogranite. Opx is only locally visible in outcrop, but most plutonic rocks show a waxy-green or brown hue typical of granulite-facies conditions. Supracrustal rocks within the domain occur as narrow, folded panels and comprise mainly white-weathering Bt + Grt ± Crd psammite (Fig. 4C) and rusty semipelitic to pelitic gneiss with minor mafic granulite and Grt + Gru iron formation. Layer-parallel Bt + Grt monzogranite leucosomes and white-weathering Bt ± Mag monzogranite sheets are commonly associated with the metasedimentary rocks.

The Kummel Lake domain exhibits a distinctive aeromagnetic signature that defines major, northeast-trending fold structures (Fig. 5A). On the residual total magnetic field map, the supracrustal units are typically associated with negative anomalies, whereas plutonic lithologies are generally expressed as positive anomalies. The northeastern boundary of the domain is currently delineated on the basis of a) an abrupt change in aeromagnetic signature, i.e. from the well-defined and continuous anomalies within

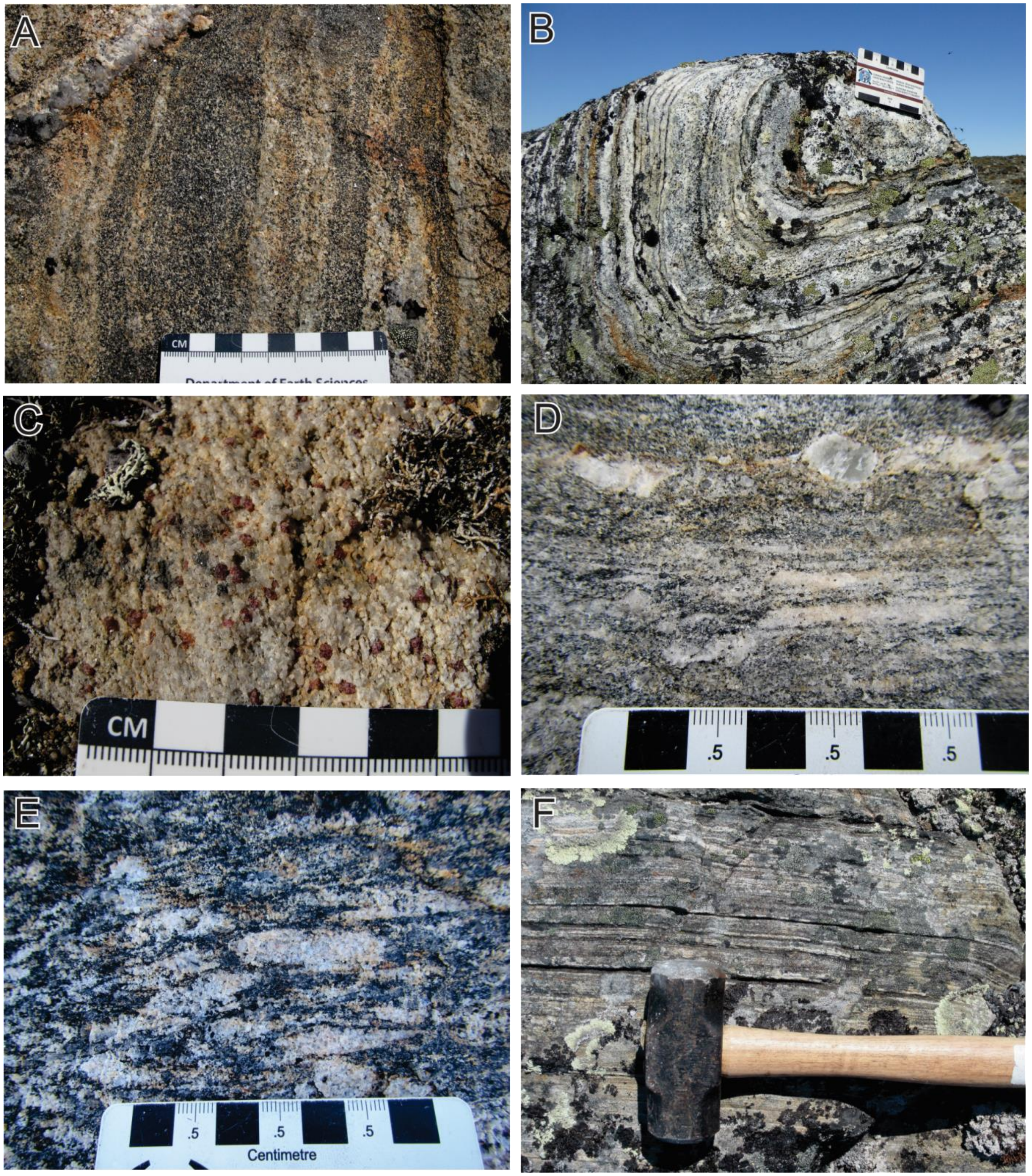

Figure 4. *A) Foliated, buff-weathering Bt-Mag monzogranite with cm-thick Bt-Hbl-Cpx gabbro layers, Kummel Lake domain. B) Folded Cpx-Mag leucogabbro from the Kummel Lake domain. C) White-weathering Grt psammite from the Kummel Lake domain. D) Delta-winged feldspar porphyroclast indicating dextral sense of shear in an annealed straight gneiss derived from tonalite, Wager shear zone. E) Typical Bt-rich Kfs porphyroclastic monzogranite from the Chesterfield fault zone. F) Mylonitic tonalite from the Chesterfield fault zone.*

the domain to more irregular or sporadic anomalies within neighbouring rocks to the north and northeast, and b) the local presence of extensively retrogressed granulite-facies rocks (to greenschist facies) or highly strained porphyroclastic rocks along the proposed boundary. Foliations within the curvilinear boundary and outside of the domain have moderate to steep dips to the northeast or northwest, and lineations generally plunge moderately to the northeast or north. Sense of shear along the boundary will be investigated through microstructural analysis of oriented samples.

The Kummel Lake domain also closely coincides with a significant positive anomaly on the regional Bouguer gravity map for the region (http://gdr.agg.nrcan.gc.ca/gdrdap/dap/search-eng.php; Fig. 5B), in a similar manner to the Daly Bay complex and most granulite-facies complexes along the traditional Snowbird Tectonic Zone (e.g., Gordon and Lawton, 1995; Gibb and Halliday, 1974; Gibb et al., 1983). However, unlike the Daly Bay Complex, the gravity high extends well beyond the proposed boundary of the Kummel Lake domain. One possible explanation for this apparent discrepancy is that the gravity anomaly broadly delineates the northeastern subsurface extent of the dense granulite-facies rocks beneath the adjacent amphibolite facies rocks, consistent with the outward-dipping boundary of the Kummel Lake domain. Alternatively, the lack of correlation between the proposed Kummel Lake domain boundary and the extent of the gravity anomaly may be a result of the low resolution of the regional gravity data. Across much of the study area, gravity measurements were spaced 12-15 km apart, while the Daly Bay Complex benefits from a much better coverage with a station spacing of 3-5 km (e.g., Gordon and Lawton, 1995). More work is required to define the crustal geometry of the Kummel Lake domain and determine whether the granulite-facies rocks were unroofed as a result of extension, such as proposed for the Kramanituar Complex (Sanborn-Barrie et al., 2001).

4) Major fault zones: Numerous foot traverses and two high-resolution ground-gravity transects (Tschirhart et al., in press) were conducted across the Wager shear zone and Chesterfield fault zone (Fig. 2) in order to better understand the nature, extent, kinematics, and subsurface geometry of these fault zones. Field observations along the aeromagnetically-defined central and western segments of the E-W-trending Wager shear zone (e.g., Broome, 1990; Henderson and Broome, 1990) confirm the presence of moderately- to steeply-dipping amphibolite-facies, annealed straight gneiss and local mylonite derived from various plutonic and metasedimentary protoliths (Fig. 4D). Subhorizontal shear-sense indicators are dominated by dextral asymmetry and include winged feldspar porphyroclasts with sigma or delta geometries (Fig. 4D), as well as shear bands, z-asymmetric drag folds, and asymmetrically pulled-apart boudins of granitic pegmatite. In many places the highly strained rocks are isoclinally folded. Similar features have been previously documented along the better-studied eastern segment of the <1808 ± 2 Ma, dextral transcurrent Wager shear zone on the southern coast of Wager Bay (Henderson et al., 1986; Henderson and Broome, 1990; Henderson and Roddick, 1990), except that mylonitic rocks in the eastern segment are more pervasively developed. The northern margin of the Wager shear zone west of Wager Bay appears to closely coincide with the southern edge of a 6-13 km wide magnetic high, but mylonitic rocks were also observed along the northern margin of this anomaly. The magnetic high broadly corresponds with a weakly foliated to massive Bt ± Cpx ± Mag monzogranite (purple unit on Fig. 2) that contains several strongly deformed inclusions of tonalitic and metasedimentary rocks, suggesting that

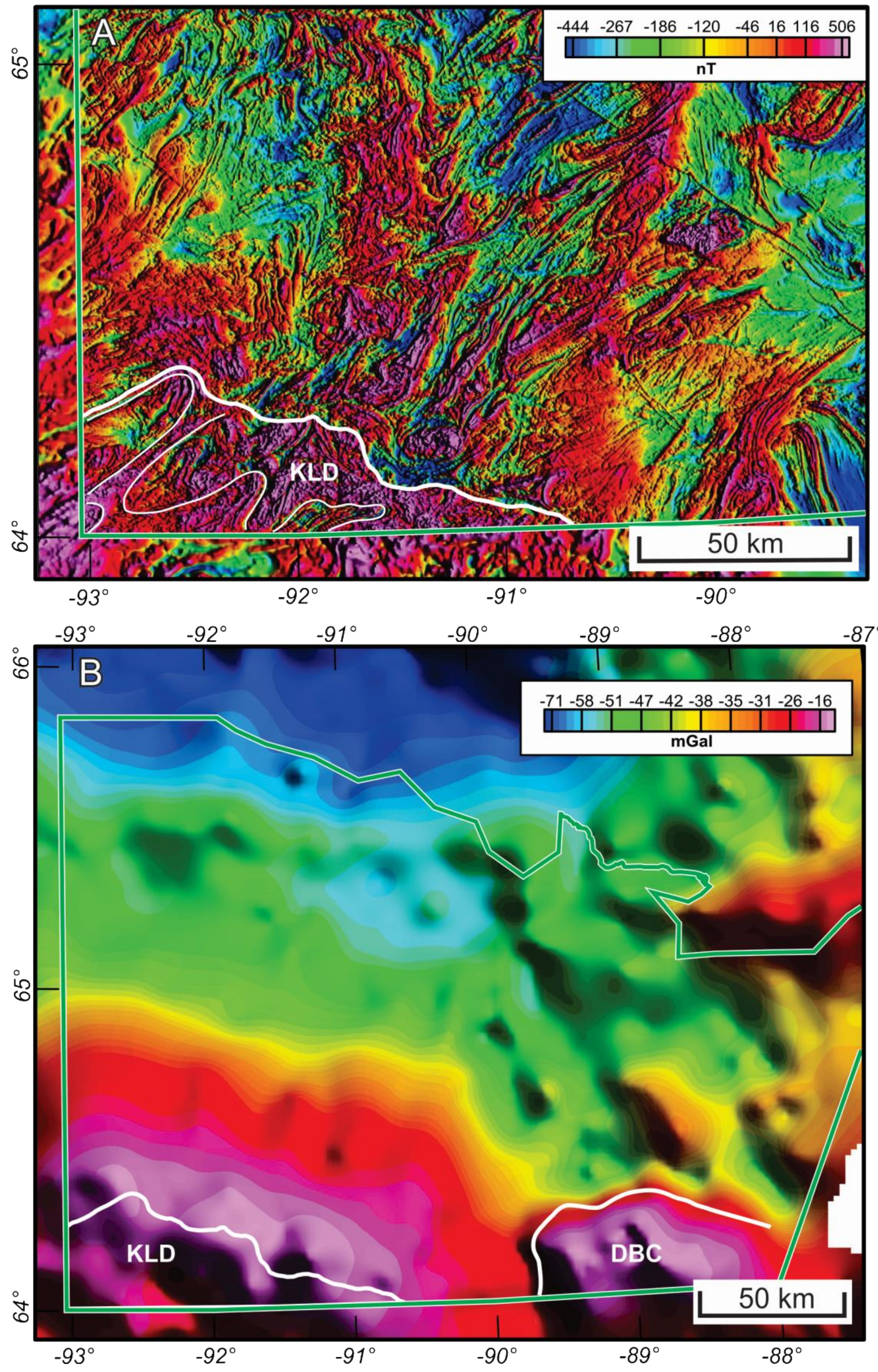

Figure 5: *Merged residual total magnetic field map (A) and regional Bouguer gravity map (B) for the Tehery-Wager study area with proposed boundaries of the Kummel Lake domain (KLD; this study) and Daly Bay Complex (DBC; as defined by Gordon, 1988, excluding the Outer shear zone) shown as thick white lines. The thin white lines in (A) delineate major fold structures in the KLD, and the green outlines in (A) and (B) delineate boundaries of the Tehery-Wager study area.*

the elongate monzogranite intruded along the shear zone. Although no Opx was observed in the field, the dark grey feldspar crystals in the monzogranite together with the brownish hue of tonalite inclusions suggest that these rocks reached granulite-facies conditions. Thin sections are being prepared to determine whether Opx was ever present in this unit. This high-grade unit has long been recognized on regional maps (e.g., Patterson and LeCheminant, 1985) and apparently extends to the northwest where it merges with the Amer Mylonite Zone (e.g., Broome, 1990). Its kinematic relationship with granulite-facies rocks along the southern margin of the Wager shear zone to the east is currently uncertain.

The Chesterfield fault zone was first documented by Schau (1983) north of Baker Lake where it comprises foliated to mylonitic granitoid rocks that dip steeply to the south or southeast. Panagapko et al. (2003) later suggested that the fault zone extends within the Tehery-Wager area to explain the structural juxtaposition of high-grade rocks to the south against lower-grade rocks to the north, but the fault zone in this area was never mapped in detail. Our field work has allowed a better delineation of the ductile fault zone, based primarily on the distribution of strongly foliated/lineated to mylonitic plutonic rocks. These rocks include a Bt-rich porphyroclastic monzogranite to granodiorite (Fig. 4E), broadly similar in composition to that described by Schau (1983), and Hbl + Bt + Grt ± Mag monzodiorite to leucogabbro. Deformation along the Chesterfield fault zone may have been broadly synchronous with emplacement of these plutonic rocks, given their apparent distribution along the fault zone. The strongly deformed rocks are typically cut by weakly foliated to undeformed monzogranite that is locally intrusive along late, small-scale shear zones or contains highly disrupted, rotated, and folded blocks of fine-grained, ribbon tonalite mylonite (Fig. 4F) and highly strained Grt-bearing leucogabbro. U-Pb geochronological samples from deformed and cross-cutting plutonic rocks were collected to constrain the timing of deformation along the Chesterfield fault zone.

Where mapped, the Chesterfield fault zone is ~1 to 3 km wide and displays a complex map pattern, particularly along its central-west segment in NTS 56B and 56G (Fig. 2). The highly strained units typically have a well-developed shallowly E- to NE- or W-plunging extension lineation and preserve both dextral and sinistral shear-sense indicators. Foliation attitudes within and immediately outside of the fault zone are moderately S- to SE-dipping or N- to NW-dipping, except within the V-shaped central segment where foliations trend almost N-S and variably dip to the W or E. The variable dips and kinematics along the Chesterfield fault zone suggest that it is folded, consistent with magnetotelluric modelling across the study area (Spratt et al., 2014).

5) Paleoproterozoic and younger rocks: The most common Paleoproterozoic plutonic rocks in the area mapped in 2016 are late, largely undeformed and equigranular monzogranite thought to belong to the Hudson suite (Peterson et al., 2002; van Breemen et al., 2005). Although the Bt ± Mag ± Ttn monzogranite occurs primarily as cm- to m-scale dykes and thick sill complexes, large mappable bodies are also present, particularly north of the Chesterfield fault zone (Fig. 2). The largest plutons typically preserve a weak foliation along their margins and contain rafts of country rocks, including older gneissic rocks, Kfs porphyritic monzogranite, and quartzite, whereas the cores are commonly massive and display the coarsest grain size (Fig. 6A). In a few localities, the monzogranite plutons occupy the cores of doubly-plunging fold structures (e.g., localities C on Fig. 2), where they are spatially associated with stocks of ultrapotassic rocks, including Phl clinopyroxenite, Bt + Cpx syenite, or Bt + Cpx ± Ol lamprophyre (Fig. 6B and C). The contrast in emplacement style of the Hudson suite monzogranite bodies across the map area, from dominantly small-scale dykes and thick sill complexes south of the Chesterfield fault zone (Steenkamp et al., 2015; Wodicka et al., 2015) to more abundant large intrusions north of it, suggests that different crustal levels are exposed across the fault zone. This hypothesis is consistent with differences in metamorphic assemblages in supracrustal rocks across the Chesterfield fault zone as originally highlighted by Panagapko et al. (2003) and will be tested through P-T work.

East-west-trending mafic dykes have been observed in a number of localities within and south of the Chesterfield fault zone, and are most abundant in the southern parts of NTS 56B and 56C. The dykes commonly contain feldspar phenocrysts and cross-cut all older lithologies and fabrics, including the Archean granodiorite to tonalite orthogneiss (Fig. 6D), the granulite-facies rocks of the Kummel Lake domain, and deformed rocks of the Chesterfield fault zone. Similarly trending dykes have been

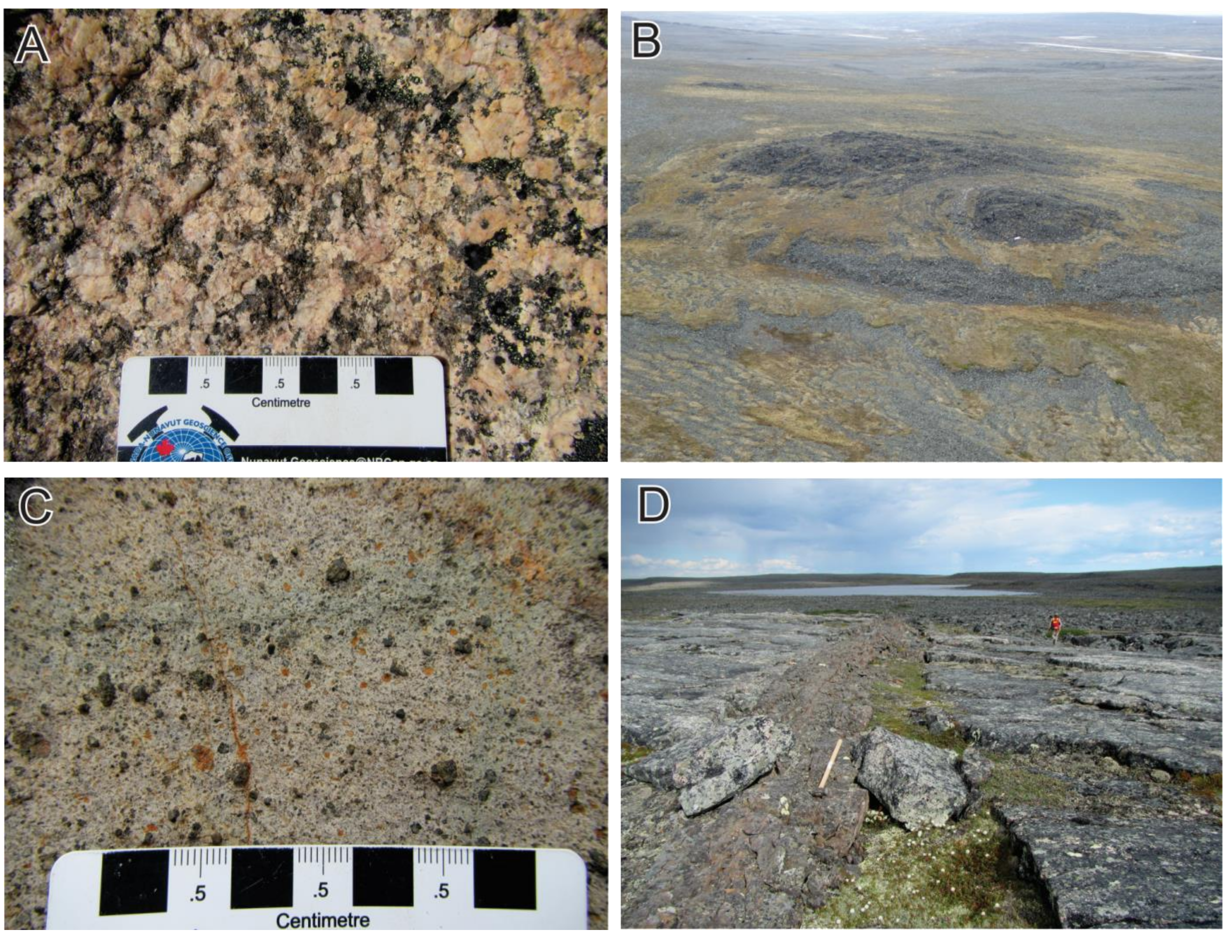

Figure 6. *A) Very coarse-grained, massive Bt-Mag-Ttn monzogranite from the core of a large Hudson suite pluton. B) Aerial view of two lamprophyre plugs in the core of the large synformal structure in NTS 56F. C) Close-up of Bt-Cpx-Ol-bearing lamprophyre showing a massive texture. D) Metre-scale, E-W-trending mafic dyke cutting the main fabric in host tonalitic gneiss.*

described elsewhere, for example in the nearby Hanbury Island shear zone (Tella and Annesley, 1988), and all of these dykes may be correlative with the ~075° to 080° Thelon River dyke swarm (Buchan and Ernst, 2004) exposed along strike to the west of the map area. Northwest-trending diabase dykes thought to belong to the ca. 1270 Ma Mackenzie dyke swarm (LeCheminant and Heaman, 1989) were also mapped in a few localities (Fig. 2).

5) Economic considerations: The Ketyet River-like rocks within the major synformal structure between the Chesterfield fault zone and Wager shear zone contain several gossanous horizons that can be traced, albeit discontinuously, for several kilometres along strike. These gossans have been recognized since the early reconnaissance mapping of Lord and Wright (1967) and co-workers in the area, but little is known about their significance. They primarily occur within highly altered Bt schist in close association with mafic rocks. Smaller gossanous horizons were mapped in several other supracrustal panels north of the Chesterfield fault zone. Most sites will be investigated for their economic prospectivity through whole-rock assay, till, and/or stream sediment geochemistry, and the field and analytical results will help to determine whether base- and precious-metal mineralization (e.g., Ag, Cu, Bi, and Au anomalies in a supracrustal panel immediately south of the Chesterfield fault zone; Day et al., 2013; McMartin et al., 2013; Fig. 2) is more extensive than previously thought.

Mafic-ultramafic layers in the supracrustal panels may represent favorable lithostratigraphic settings for Ni–Cu–platinum-group element mineralization. Small occurrences and boulders of serpentinized ultramafic rocks were found in a few localities and will be investigated for their carving stone potential. Finally, the antiquity of Archean crust in the study area and the composition of key units will be further investigated, concurrently with ongoing analysis of surficial materials, to better characterize the diamond potential of the Tehery-Wager area outside of the currently known kimberlite field held by Peregrine Diamonds Ltd. (Fig. 2).

Future work/next steps

Laboratory work planned for the Fall/Winter 2016/2017 includes lithogeochemistry, isotope geochemistry (Sm-Nd and/or Lu-Hf), geochronology (U-Pb and Lu-Hf), petrography, assay geochemistry, and multi-equilibria thermobarometry of key lithological units. The data will be used to a) establish or refine potential correlations of major plutonic suites within the study area and elsewhere in the Rae craton; b) elucidate the depositional setting, metamorphic history, and metallogeny of the major supracrustal belts and test the proposed correlations and spatial distribution of these units across the study area; c) test the correlation of the Kummel Lake domain with the better-studied granulite-facies complexes along the northern shore of Chesterfield Inlet, investigate its crustal geometry, and evaluate the nature and proposed location of its structural boundary with adjacent granitoid rocks; d) elucidate the timing and nature of the Chesterfield fault zone and western segment of the Wager shear zone, as well as their regional significance and potential for focusing mineralization; and e) improve our understanding of the distribution and occurrence of Paleoproterozoic and younger rocks and their relationship with regional deformation events. Some of these studies will be the focus of thesis work, including the ongoing Ph.D. thesis by Holly Steenkamp on the supracrustal rocks and an upcoming M.Sc. thesis starting in 2017 on the Wager shear zone. Combined with the field observations and structural analysis, the new datasets will also form the basis for the production of new Canada Geoscience Map series bedrock maps for all or parts of NTS sheets 56B, 56C, 56F, 56G, and 56H.

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