Windy McKinley terrane, Stevenson Ridge area (115JK), western Yukon: composition and proposed correlations, with implications for mineral potential

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ABSTRACT

Recent mapping in the 'Windy McKinley' terrane of Stevenson Ridge area of western Yukon defined two subdivisions of the terrane, an imbricated ophiolite and a succession of predominantly fine-grained, variably carbonaceous and calcareous clastic rocks extensively intruded by Middle Triassic gabbro. Further work in 2007 has revealed a third subdivision of felsic metavolcanic and carbonaceous clastic rocks, also spatially associated with voluminous gabbro. The two subdivisions of the terrane containing gabbro are reminiscent of the two subdivisions of the Delta district of Alaska, and gabbroic rocks from the two areas are coeval and geochemically similar. If the Stevenson Ridge successions correlate with those of the Alaska Range, the mineral potential of the Stevenson Ridge area would be appropriately increased.

RÉSUMÉ

Une récente cartographie du terrane de « Windy McKinley », dans la région de Stevenson Ridge, dans l'ouest du Yukon, a permis de le subdiviser en une ophiolite imbriquée et en une succession de roches clastiques à grain principalement fin, inégalement carbonées et calcaires, lesquelles sont pénétrées de manière importante par des gabbros du Trias moyen. D'autres travaux réalisés en 2007 ont permis d'en établir une troisième subdivision, celle-ci composée de roches clastiques carbonaées et métavolcaniques felsiques, qui sont elles aussi associées sur le plan spatial à un fort volume de gabbro. Les deux subdivisions du terrane renfermant du gabbro rappellent celles du district de Delta, en Alaska, et les roches gabbroïques de ces deux régions sont similaires sur le plan géochimique. Si les successions de Stevenson Ridge étaient corrélées avec celles de la chaîne de l'Alaska, leur potentiel minéral pourrait augmenter en conséquence.

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INTRODUCTION

Rocks underlying the poorly exposed western part of the Stevenson Ridge area (115JK) were thought to have similarities with both the Windy and McKinley terranes of Alaska on the basis of reconnaissance mapping in the early 1970s (Tempelman-Kluit, 1974), and have collectively been referred to as Windy McKinley terrane (Wheeler and McFeeley, 1991; Monger *et al.*, 1991; Silberling *et al.*, 1992; Gordey and Makepeace, 2001; Fig. 1). Until recently, owing to poor exposure and a lack of detailed information about these rocks, little could be concluded about either their role in the geological evolution of the Cordillera, or their potential to host economic mineralization. Since 2003, however, two new studies have been completed on rocks of Windy McKinley terrane (Canil and Johnston, 2003; Mortensen and Israel, 2006) and a new mapping program has been initiated by the Yukon Geological Survey (Murphy, 2007). This work has led to the recognition that none of the rocks in western Stevenson Ridge area resemble the type Windy and McKinley terranes of the Alaska Range, requiring a re-assessment of the terrane classification of the Stevenson Ridge rocks as a first step to better understanding their mineral potential and role in Cordilleran evolution. Murphy (2007) proposed that parts of what had been called Windy McKinley terrane correlate better with Pingston terrane of the Alaska Range, Yukon-Tanana terrane of western Yukon and eastern Alaska and the Chulitna terrane of the southern Alaska Range.

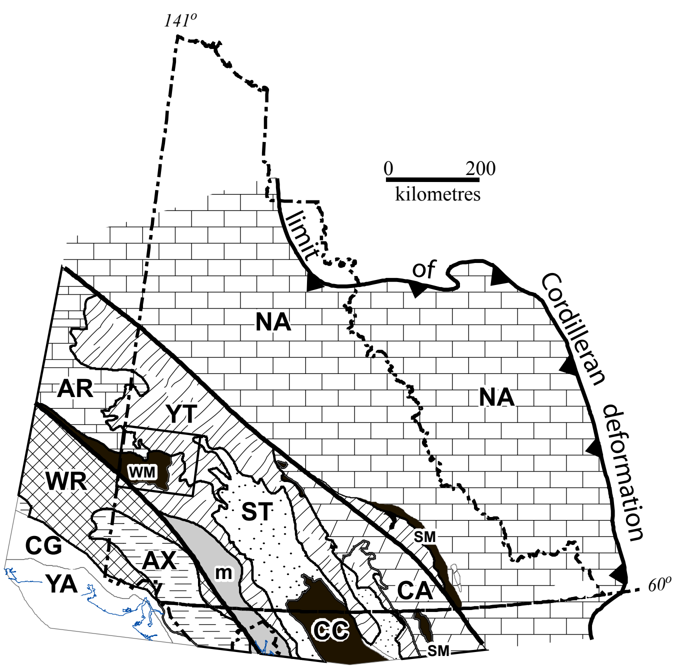

Figure 1. *Terrane map illustrating the distribution of Windy McKinley terrane in western Yukon and eastern Alaska (modified after Colpron et al., 2006). Stevenson Ridge map area is indicated by box. Laurentian elements: NA = Ancestral North American margin; CA = Cassiar terrane, North American continental margin displaced on Tintina fault; AR = Alaska Range, parautochthonous North American continental margin. Intermontane superterrane: SM = Slide Mountain terrane; YT = Yukon-Tanana terrane; ST = Stikinia; CC = Cache Creek terrane; WM = Windy McKinley terrane; m = undifferentiated metamorphic rocks. Insular superterrane: WR = Wrangellia; AX = Alexander terrane; CG = Chugach terrane; YA = Yakatat block.*

During the 2007 field season, nearly every accessible outcrop in western Stevenson Ridge area was visited, and these new data were combined with regional aeromagnetic data to produce a new bedrock geological compilation of the area (Murphy *et al.*, 2007). The purpose of this article is to present a status report on the nature and correlation of the rocks previously called Windy McKinley terrane, their role in Cordilleran evolution, and their potential to host economic mineralization.

GEOLOGY OF WESTERN STEVENSON RIDGE AREA

Fieldwork during 2007 documents that in addition to being underlain by rocks previously assigned to Windy McKinley terrane, western Stevenson Ridge area also includes rocks belonging to Yukon-Tanana terrane; a coarse-grained clastic succession of unknown age; extensive felsic to intermediate volcanic rocks of unknown age (the Donjek volcanics of Tempelman-Kluit, 1974); and several suites of foliated and unfoliated felsic to intermediate plutonic rocks (Fig. 2; Murphy, 2007; Murphy *et al.*, 2007). Rocks previously assigned to Windy McKinley terrane can be divided into three subdivisions (Fig. 3), the herein named White River and Mirror Creek formations, both of which are intruded or spatially associated with bodies of gabbro, and the Harzburgite Peak-Eikland Mountain ophiolite complex. These rock units are everywhere separated from surrounding rocks of Yukon-Tanana terrane by faults and shear zones. Two subdivisions of Yukon-Tanana terrane have been recognized, a lower, locally calcareous, quartz-rich metaclastic succession that resembles the regional

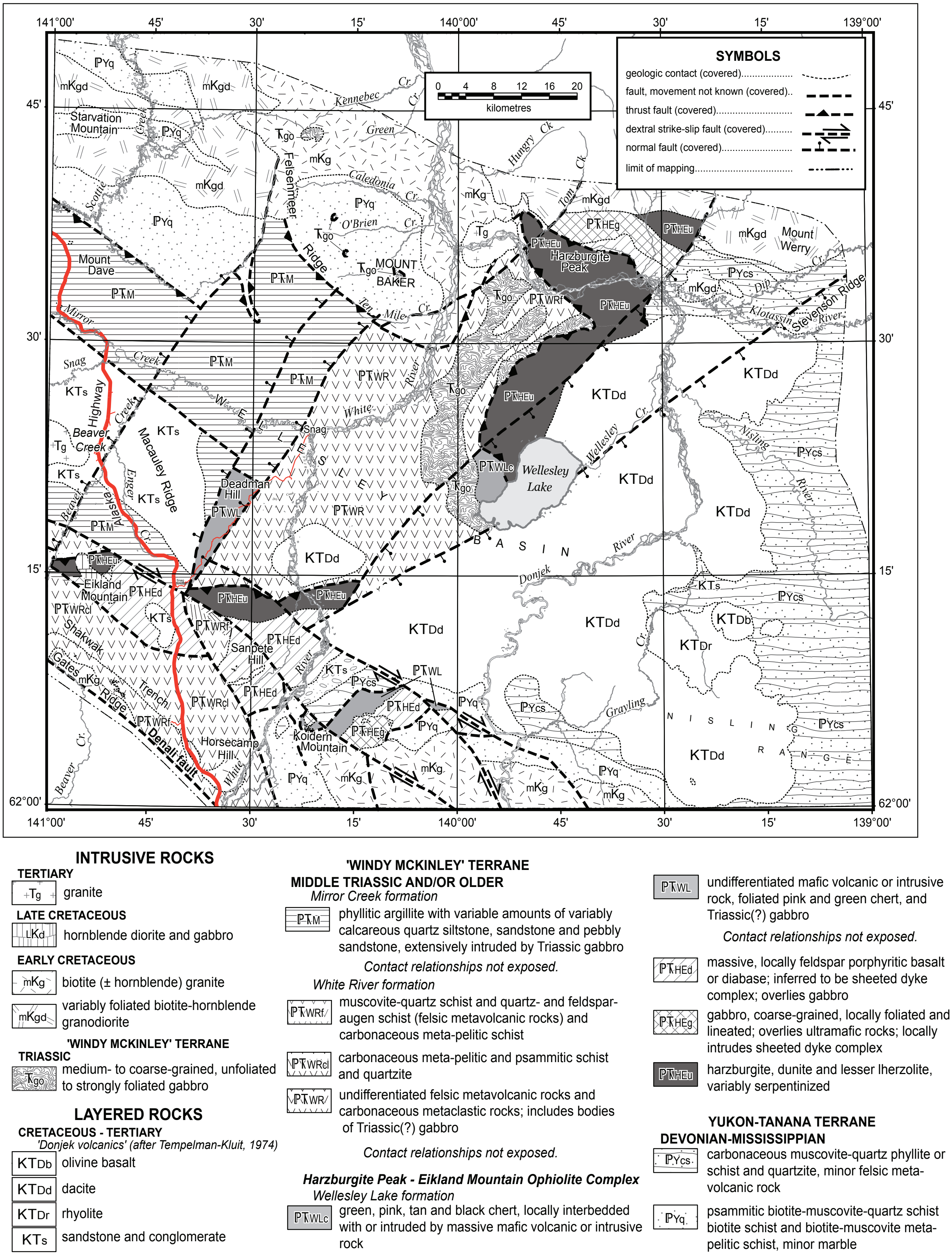

Figure 2. *Simplified geology of western Stevenson Ridge area, after Murphy et al. (2007).*

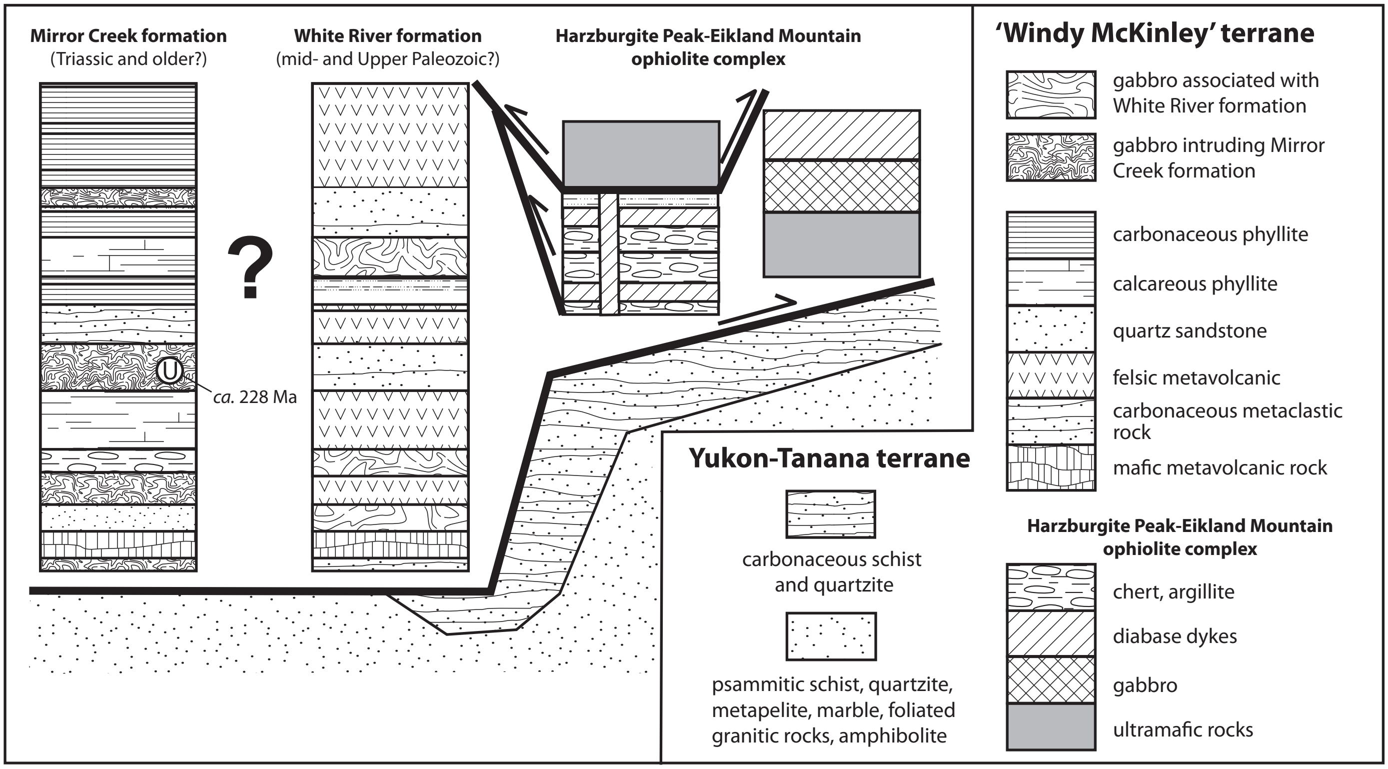

Figure 3. *Lithostratigraphic assemblages of western Stevenson Ridge area and their structural relationships.*

Snowcap assemblage (Colpron *et al.*, 2006) and an upper succession of siliceous, carbonaceous schist and quartzite interbedded with rare felsic and mafic metavolcanic rocks that resembles the regional Finlayson assemblage (*op. cit.*). The remaining map units are sedimentary or intrusive overlap assemblages onto or into the two basement terranes and as they are not the focus of this paper, they will be described in a subsequent publication.

THE FORMER WINDY MCKINLEY TERRANE

Harzburgite Peak-Eikland Mountain ophiolite complex

The prominent upland areas bordering the Wellesley Basin are underlain primarily by the fault-imbricated components of an ophiolite complex, herein named the Harzburgite Peak-Eikland Mountain ophiolite complex. The upper mantle (harzburgite) and lower crustal (cumulate dunite, peridotite and gabbro overlain by diabase and micro-gabbro sheeted dyke complexes) parts of the complex underlie two of the main mountainous massifs in the area: the massif surrounding Harzburgite Peak in the eastern part of the area, and in the west, the Eikland Mountain massif north of the Shakwak Trench. Geophysical data suggest that the highly magnetic ultramafic rocks of these two massifs continue through the poorly exposed ground intervening between them, and underlie younger rocks and unconsolidated sediments (Canil and Johnston, 2003). Massive diabase and micro-gabbro, inferred to be sheeted dykes, occur in these two massifs, but also in Sanpete Hill and the mountainous massif southeast of White River which includes Koidern Mountain (Fig. 2). Chert-bearing supracrustal sedimentary and possibly volcanic rocks, herein called the Wellesley Lake formation, occur west of Wellesley Lake, on Deadman Hill and in the Koidern mountain massif.

The Harzburgite Peak-Eikland Mountain ophiolite complex is internally imbricated and a continuous section of ophiolite, from the upper mantle to the sedimentary and volcanic supracrustal cover, has not been observed. Geological relationships near Harzburgite Peak suggest that mantle harzburgite and crustal cumulate peridotite and dunite are thrust to the northeast over crustal sheeted diabase and micro-gabbro dykes which lie at the top of what appears to be a continuous mantle-lower crustal section (Canil and Johnston, 2003). Near Wellesley Lake, mantle harzburgite is also inferred to be thrust to the southwest over the Wellesley Lake formation, the supracrustal cover of the ophiolite. In the Koidern Mountain massif, the Wellesley Lake formation is directly in thrust fault contact above rocks of Yukon-Tanana terrane without the lower crustal and mantle portions of the ophiolite.

Preliminary geochemical data show that diabase and gabbro from the ophiolitic rocks are similar in composition to normal mid-ocean ridge basalt (NMORB; Fig. 4). Massive diabase from San Pete Hill, Eikland Mountain and Koidern Mountain, and coarse-grained gabbro from Koidern Mountain have REE element compositions similar to that of the NMORB reference composition (Fig. 4; Sun and McDonough, 1989), although diabase is slightly enriched and gabbro somewhat depleted relative to the NMORB composition.

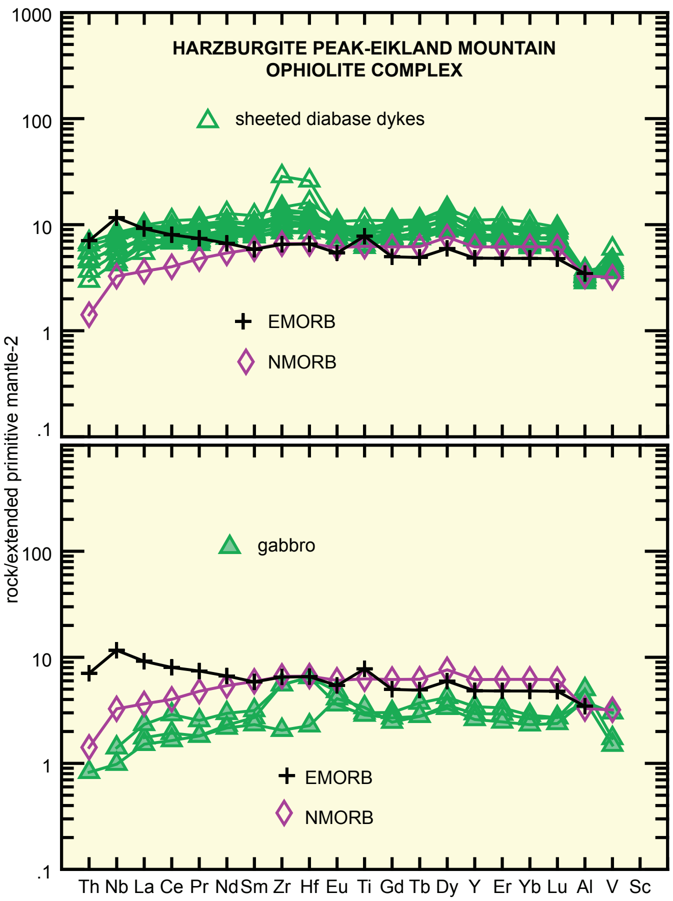

Figure 4. *Primitive mantle normalized trace element plot of data from diabase and gabbro of the Harzburgite Peak-Eikland Mountain ophiolite complex. The reference standards for normal (NMORB) and enriched (EMORB) mid-ocean ridge basalt from Sun and McDonough (1989) are also shown for comparison.*

The influence of subduction-related arc processes is not apparent in samples analysed to date. Data from a more comprehensive suite of samples is forthcoming.

The age of the Harzburgite Peak-Eikland Mountain ophiolite complex is not known. Dating studies are currently in progress to address this issue.

White River formation

The White River formation is a newly recognized unit of felsic metavolcanic and carbonaceous clastic rocks that occurs in two parts of the western Stevenson Ridge area (Fig. 2). Much of the upland region between Wellesley Lake and the White River (south of its confluence with the Donjek River) is underlain by the White River formation. In addition, it is found in the southwestern corner of the study area, northeast of the Denali fault, where it underlies part of Gates Ridge and Horsecamp Hill. Geophysical data suggest that the White River formation underlies the extensive lowland areas of the Shakwak Trench between Gates Ridge and the Eikland Mountain massif, and in the Wellesley Basin between Wellesley Lake and Macauley Ridge, in which there is virtually no bedrock exposure. The formation is spatially associated with extensive bodies of variably foliated gabbro (see below).

The White River formation comprises massive muscovite-quartz schist, strongly foliated quartz-muscovite schist, quartz and feldspar-augen schist and siliceous carbonaceous schist. Our interpretation of the varieties of felsic schist as metavolcanic rock is based on local preservation of primary features including fragmental and porphyritic textures. Massive, cherty, relatively weakly foliated siliceous schist is interpreted as coherent vent-facies flows or domes; siliceous schist with fragmental texture is inferred to represent autobreccia at the margins of flows/domes; and quartz-feldspar metaporphyry with lithic clasts is inferred to be crystal-lithic tuff.

The age of the White River formation is not known. Samples of felsic metavolcanic rock have been submitted for age determinations by U-Pb methods.

Mirror Creek formation (new)

Named after good exposures along the Alaska Highway north of Mirror Creek, the Mirror Creek formation is also exposed along the Alaska Highway northwest of Enger Lakes and in sporadic outcrops in the lowland areas of the Wellesley Basin along Snag Creek. Geophysical data and the occurrence of similar rocks directly across the border in Alaska (Richter, 1976) suggest that the unit underlies the unexposed area northwest of Enger Lakes. A large part of the map extent of the Mirror Creek formation is actually underlain by bodies of gabbro which intrude the Mirror Creek formation as exhibited in exposures along the Alaska Highway (Murphy, 2007). The lack of exposure throughout much of the area precludes outlining individual bodies of gabbro.

The Mirror Creek formation consists of folded and foliated, medium to dark-grey phyllitic argillite with variable amounts of interbedded tan-brown, variably calcareous, quartz siltstone, sandstone and pebbly sandstone. In the northern part of northern outcrop exposures, tightly folded and strongly foliated dark grey calcareous phyllite and argillaceous limestone predominate. Extensive bodies of dark, brown-green gabbro occur in outcrops along the Alaska Highway, intruding and imparting a hornfels texture on the host argillaceous rocks. Cherty, cream-coloured, green and pink calc-silicate rock, and spotted porphyroblastic meta-pelite occur near intrusive contacts.

The age of the Mirror Creek formation is not known. Gabbro intruding the formation has been dated as late Middle Triassic constraining the formation to be Middle Triassic or older (Mortensen and Israel, 2006).

Gabbro

Extensive bodies of medium to coarse-grained gabbro occur throughout the outcrop extent of both the Mirror Creek and White River formations. Gabbro is observed to be intrusive into the Mirror Creek formation (Murphy, 2007); the relationship of gabbro to the White River formation is less clear as contacts were never observed and gabbro spatially associated with the White River formation is generally more highly foliated than that intruding the Mirror Creek formation. The only body of gabbro large enough to be portrayed at 1:50 000 or smaller scale occurs as a thick foliation-parallel slab above the White River formation in the area between the White and Donjek rivers, south of their confluence (Fig. 2).

Owing to the lack of local age determinations, it is unclear if gabbro intruding the Mirror Creek formation is coeval with gabbro spatially associated with the White River formation. The former has been dated by the U-Pb TIMS method as *ca.* 228 Ma (Mortensen and Israel, 2006). The latter is undated locally. Preliminary geochemical data from gabbro bodies from both settings are virtually identical, however, suggesting that they represent the same magmatic episode (Fig. 5).

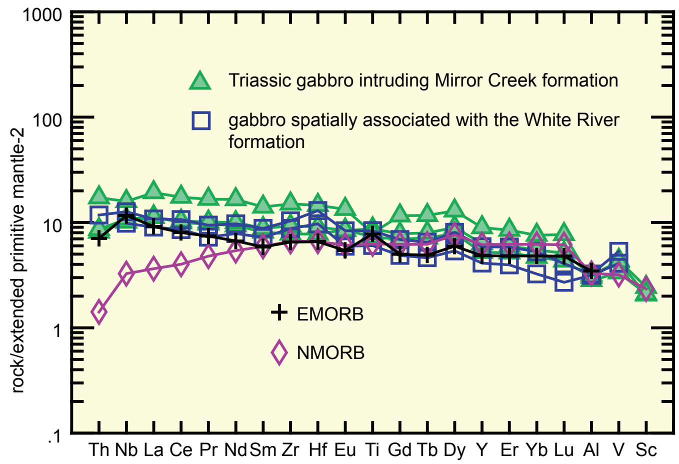

Figure 5. *Primitive-mantle-normalized trace-element plot of data from gabbro intruding the Mirror Creek formation and spatially associated with the White River formation. The similar geochemical fingerprints of gabbros from the two different settings affirm the possibility that they may be coeval. The reference standards for normal (NMORB) and enriched (EMORB) mid-ocean ridge basalt from Sun and McDonough (1989) are also shown for comparison.*

YUKON-TANANA TERRANE

Rocks of Yukon-Tanana terrane occur in fault contact to the north, east and south of rocks of the former Windy McKinley terrane. North and south of the rocks of the former Windy McKinley terrane, Yukon-Tanana terrane comprises strongly foliated, locally calcareous, siliceous schist and quartzite; meta-pelitic schist; and rare marble, amphibolite and biotite schist. Local domains of biotite-quartz-feldspar schist are inferred to be deformed intrusions. The siliceous schist of Yukon-Tanana terrane south of the rocks of the former Windy McKinley terrane passes to the east (upsection?) into an extensive region of siliceous carbonaceous schist and quartzite and rare light coloured pyritic muscovite-quartz schist inferred to be felsic metavolcanic rock. The siliceous schist unit resembles the regional Snowcap assemblage of Yukon-Tanana terrane and the carbonaceous unit resembles the regional Finlayson assemblage of the terrane. Dating studies are in process to better characterize the age and correlation of these units.

STRUCTURAL RELATIONSHIPS

The rocks of the former Windy McKinley terrane are separated from Yukon-Tanana terrane by a fault or faults with different characteristics in different places (Figs. 2 and 3). Along the northern boundary of the former Windy McKinley terrane, the Mirror Creek and White River formations are juxtaposed with rocks of the Snowcap assemblage along the Scottie Creek fault and its associated several-km-wide shear zone. Based on its map pattern, the Scottie Creek fault appears to change from steeply dipping in the west, to shallowly dipping along strike to the east. Klippen of the rocks of the former Windy McKinley terrane overlie with shallow dip the Snowcap assemblage in at least three places (Fig. 2; Murphy *et al.*, 2007). Along the southern boundary of the former Windy McKinley terrane, on Koidern Mountain, the supracrustal Wellesley Lake formation of the Harzburgite Peak-Eikland Mountain ophiolite complex overlies rocks of the Snowcap assemblage of Yukon-Tanana terrane across a shallowly north-northwest-dipping, south-southeast-vergent thrust fault and shear zone (Murphy, 2007). These two sections of the faulted contact are separated by areas in which younger sedimentary and volcanic rocks overlie, and plutons intrude the contact; hence the two sections cannot be connected directly.

The rocks of the former Windy McKinley terrane were juxtaposed with those of Yukon-Tanana terrane prior to the mid-Cretaceous. A granitic pluton with a preliminary U-Pb LA-ICPMS (laser ablation - induced coupled plasma mass spectrometer) age of *ca.* 98 Ma intrudes the fault contact on Koidern Mountain (R. Friedman and D.C. Murphy, unpublished data, 2007), providing a lower age limit on displacement. Preliminary Ar^{40}-Ar^{39} age determinations on fuchsite from meta-gabbro and muscovite from meta-pelitic schist of the Mirror Creek formation caught up in the Scottie Creek shear zone are *ca.* 109 Ma and *ca.* 114 Ma, respectively (T. Ullrich and D. Murphy, pers. comm., 2007). Kinematic studies are currently underway to determine the nature of Cretaceous displacement across the shear zone.

Faults are either observed or inferred to separate the subdivisions of the former Windy McKinley terrane. In the Harzburgite Peak massif, the Harzburgite Peak-Eikland Mountain ophiolite complex is internally imbricated: harzburgite and cumulate peridotite is thrust over a sheeted dyke complex which lies at the top of what appears to be a near complete transition from mantle harzburgite upwards through cumulate gabbro and peridotite to the sheeted dyke complex (Canil and Johnston, 2003). The Harzburgite Peak mantle section is also thrust to the southwest over the White River formation and Triassic(?) gabbro along the Donjek River thrust fault (Figs. 2 and 3). This fault is inferred to merge at depth with the Scottie Creek fault. It has been traced to the south and west to Wellesley Lake and geophysical data suggest that it continues under cover and across strike-slip faults to the Eikland Mountain massif. In this area, a geophysically inferred dextral strike-slip fault separates the ophiolitic rocks from the Mirror Creek formation and Triassic gabbro to the northeast. The nature of the boundary of the ophiolitic rocks with the White River formation and Triassic gabbro on the west and southwest side of the massif is unconstrained. Finally, the contacts between the White River and Mirror Creek formations coincide with geophysical and/or topographic lineaments that are inferred to be strike-slip or normal faults. The spatial association with gabbro (White River formation), or intrusive contacts with gabbro (Mirror Creek formation) suggests a possible primary linkage between the two formations, but this has not been directly observed in the field.

The structural relationships outlined above suggest that the Harzburgite Peak-Eikland Mountain ophiolite complex is an internally imbricated slice of oceanic crust that overlies Yukon-Tanana terrane. The White River and Mirror Creek formations are also inferred to be part of the same thrust sheet, mapped to the west of the ophiolite and above Yukon-Tanana terrane. This geometry suggests that the ophiolite lay between the rocks of Yukon-Tanana terrane and the components of the former Windy McKinley terrane prior to thrust imbrication and emplacement above Yukon-Tanana terrane.

DISCUSSION

With these new data from the various components of the former Windy McKinley terrane, some tentative correlations can be proposed. The assemblage of fine-grained, variably calcareous clastic rocks, felsic metavolcanic rocks and Triassic gabbro is similar to what is found in the Delta District of Alaska, which is about 200 km to the northwest along strike (Fig. 6). In the Delta District, an older, felsic metavolcanic-bearing succession, the Jarvis Glacier belt, is overlain by fine-grained, variably carbonaceous and calcareous meta-clastic rocks of the Hayes Glacier belt, and both are intruded by Middle to Late Triassic gabbro (Dashevsky *et al.*, 2003; Dusel-Bacon *et al.*, 2006). Available trace-element data from Delta District gabbro is somewhat limited in range and quality, but compares favourably with that from the Mirror Creek and White River gabbros (Fig. 7). Felsic metavolcanic

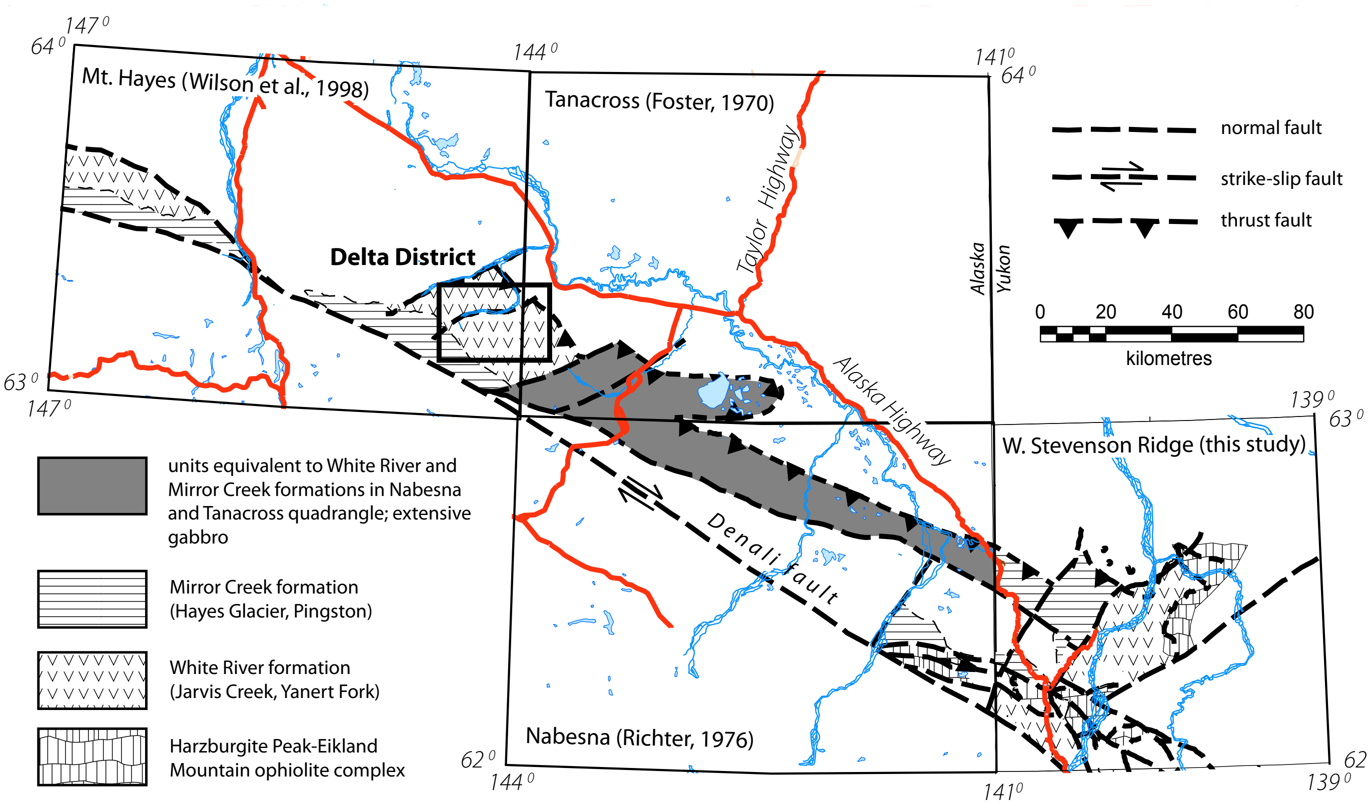

Figure 6. *Simplified geological compilation map of the region from Stevenson Ridge area, Yukon, to the Alaska Range, Alaska. Map units from Nabesna and Tanacross quadrangles, Alaska, have been interpreted from Richter (1976) and Foster (1970). The shaded map unit in these two areas comprises fine-grained schistose rocks associated with extensive bodies of gabbro that are herein correlated with the White River and Mirror Creek formations.*

rocks in the Jarvis Creek Belt are Late Devonian in age, with three U-Pb SHRIMP (Sensitive High Resolution Ion MicroProbe) age determinations of 358.6 ± 6.2 Ma, 364.2 ± 6.6 Ma and 372.0 ± 5.8 Ma (*op. cit.*). The age of the Hayes Glacier Belt has not been determined directly, but the upper part of the belt may correlate with rocks of the Pingston terrane, a lithologically similar succession in the Alaska Range from which Late Triassic fossils have been extracted (Till *et al.*, 2007). The Pingston terrane depositionally overlies the Yanert Fork sequence (Csejtey *et al.*, 1992), which has been correlated with the Jarvis Creek belt (Wilson *et al.*, 1998). If the rocks of the former Windy McKinley terrane correlate with those of the Delta District and Alaska Range, then they would range in age from Devonian to Late Triassic.

The Jarvis Creek and Hayes Glacier belts of the Delta District are considered to be part of Yukon-Tanana terrane (Dusel-Bacon *et al.*, 2006 and references therein). If the rocks of the former Windy McKinley terrane correlate with the Jarvis and Hayes Glacier belts of the Delta

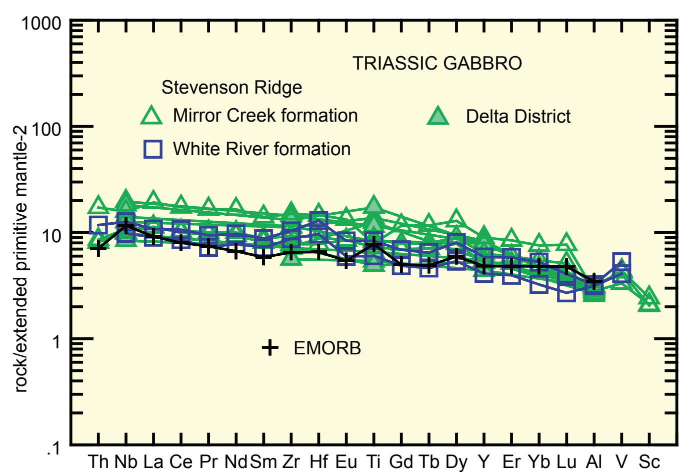

Figure 7. *Primitive-mantle-normalized trace-element plot of data from gabbro bodies in western Stevenson Ridge area (intruding the Mirror Creek formation and spatially associated with the White River formation) compared with more limited data from gabbro bodies intruding the Jarvis Creek and Hayes Glacier belts in the Delta District, Alaska (Dashevsky et al., 2003). The composition of primitive mantle is from Sun and McDonough (1989).*

District, then they too could potentially be part of Yukon-Tanana terrane. The presence of voluminous Triassic gabbro distinguishes the Stevenson Ridge and Delta District rocks from typical Yukon-Tanana terrane, however, and, in both areas, major faults and shear zones separate them from more typical rocks of Yukon-Tanana terrane (Elting Creek and Scottie Creek faults). If the Triassic gabbro-bearing Yukon-Tanana terrane was originally connected to the more typical Yukon-Tanana terrane, then it has experienced a different Early Mesozoic geological history.

The Harzburgite Peak-Eikland Mountain ophiolite complex eludes correlation. Murphy (2007) suggested that it may correlate with the mid-Paleozoic ophiolitic rocks of the Chulitna terrane in the southern Alaska Range, Alaska, on the opposite (south) side of the Denali fault. This correlation seems unlikely in light of the arc chemistry of basalt from the Chulitna terrane (Clautice *et al.*, 2001) and the apparent lack of arc influence in the trace element signatures of the Harzburgite Peak-Eikland Mountain diabase and gabbro.

Insufficient data are present to adequately constrain the nature of the original relationships between the three fault-bound components of Stevenson Ridge area ('normal' Yukon-Tanana terrane, Yukon-Tanana terrane with gabbro, and the Harzburgite Peak-Eikland Mountain ophiolite complex) and the geological evolution required for their juxtaposition. The presence of an imbricated ophiolite structurally between the two somewhat different assemblages of Yukon-Tanana terrane is difficult to reconcile without knowing the age of the ophiolitic rocks. One scenario being considered is that the ophiolitic rocks are coeval with the Triassic gabbro and both are manifestations of regional extension that culminated in the formation of oceanic crust between the two different blocks of Yukon-Tanana terrane. A viable tectonic setting for this extension could have been in the forearc of Stikinia/Quesnellia arc at its initiation during the Middle Triassic. These two blocks of Yukon-Tanana terrane were subsequently juxtaposed during mid-Cretaceous shortening, trapping the ophiolite between them. Other scenarios are also possible.

The observations presented in this study and in Murphy (2007) suggest that the name 'Windy McKinley terrane' should be discarded for the Stevenson Ridge area. Most of the rocks that had been assigned to Windy McKinley terrane in the past are now inferred to belong to Yukon-Tanana terrane, albeit with a distinct Early Mesozoic geological history. The only part of what had previously been called Windy McKinley terrane that can not be re-assigned to Yukon-Tanana terrane is the Harzburgite Peak-Eikland Mountain ophiolite complex. Although neither the age nor the correlation of the ophiolite is apparent, the ophiolite is unlike either Windy or McKinley terranes and therefore should not be labeled as such. It is also unlike any other terrane defined along the western margin of Yukon-Tanana terrane and may be unique to the area.

IMPLICATIONS FOR MINERAL POTENTIAL

The correlation with the Delta District proposed in this study has direct implications for mineral exploration in the area. Rocks of the Jarvis Creek belt in the Delta District host more than 40 volcanogenic massive sulphide (VMS) occurrences with similarities to Kuroko-style deposits (Dashevsky *et al.*, 2003). No mines have been developed in the Delta District, however, nine deposits have been outlined by drilling, ranging in size from the 0.3-million-ton (0.3-million-tonne) Nunatak deposit (0.3% Cu, 1.2% Pb, 2.8% Zn, 58 ppm Ag, 2.5 ppm Au), to the 7.2-million-ton (6.5-million tonne) MID deposit (0.4% Cu, 1.6% Pb, 4.5% Zn, 62 ppm Ag, 1.6 ppm Au; Dashevsky *et al.*, 2003). The recognition of the Delta District stratigraphy in Stevenson Ridge area increases the prospectivity of the area for VMS deposits. An area the approximate size of two 1:50 000-scale map sheets is underlain by felsic metavolcanic-bearing stratigraphy. Within this area, vent-facies metavolcanic rocks and fine-grained, carbonaceous schists have been observed, two key features of the geologic setting of Kuroko-style deposits. These observations further suggest that the appropriate environment for the formation of VMS deposits may exist in Stevenson Ridge area.

SUMMARY OF CONCLUSIONS

Rocks of the former Windy McKinley terrane comprise three subdivisions: the Harzburgite Peak-Eikland Mountain ophiolite complex of unknown age, the pre-Upper Triassic Mirror Creek formation, and the White River formation, possibly of Late Devonian to Early Mississippian age.

These three subdivisions are separated from surrounding rocks of Yukon-Tanana terrane by mid-Cretaceous, and possibly older, faults and shear zones.

The Harzburgite Peak-Eikland Mountain ophiolite complex does not appear to correlate with any other terrane in the region, and its role in Cordilleran evolution is therefore ambiguous.

The White River and Mirror Creek formations are lithologically similar to the two main subdivisions of the Delta District, Alaska, the Jarvis Creek and Hayes Glacier belts, respectively. Extensive gabbro in both areas is also geochronologically and geochemically identical. On this basis, we suggest that these two areas correlate.

The two subdivisions of the Delta District are considered to be part of Yukon-Tanana terrane; if so, then the correlative rocks of Stevenson Ridge area must also be part of Yukon-Tanana terrane. However, in both areas, the two subdivisions are separated from other parts of Yukon-Tanana terrane by faults and shear zones and, in addition, are associated with extensive bodies of Triassic gabbro, which do not occur in the other parts of Yukon-Tanana terrane. These two observations suggest that the correlative rocks of Stevenson Ridge area and the Delta District have a different Mesozoic history than that of the remainder of Yukon-Tanana terrane.

If the subdivisions of Stevenson Ridge area correlate with those of the Delta District, then the potential of the former to host mineral deposits is substantially increased.

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