Regional - Geology -- 677007 -- by Rob Cameron, May 89

The QR gold deposit is situated near the eastern edge of the Intermontane Belt in a northwesterly-trending assemblage of Upper Triassic-Lower Jurassic volcanic rocks often referred to as the Quesnel Trough or Quesnel Belt. The Quesnel Trough forms part of a volcanic belt that stretches from the 49th parallel to 57oN comprising rocks of the Nicola, Takla and Stuhini Groups. Detailed petrologic and stratigraphic studies were undertaken in the 1970's by Morton (1976) and Bailey (1976, 1978) in the Horsefly and Morehead Lake areas and more recently by Bailey (1987, 1988) and Panteleyev (1987, 1988).

In the vicinity of the QR gold deposit, a narrow belt of mafic and felsic volcanic rocks, comagmatic dioritic stocks, and a variety of sedimentary rocks form the Quesnel Trough. The belt is crudely symmetrical about a central axis of felsic volcanic rocks flanked to the east and west by mafic volcanics and flyschoid sediments respectively. The eastern margin is complexly deformed and represents a zone of thrusting where the Intermontane Belt has been thrust over the Omineca Crystalline Belt to the east (Rees, 1981). The western margin is in fault contact with the Cache Creek Group, possible along extensions of the Pinchi fault.

The oldest rocks are basaltic sandstone and conglomerate, minor volcanic breccia, limestone and argillite. These rocks make up much of the eastern flank. Overlying these sediments and comprising much of the volcanic belt are some 5,000 metres of alkalic mafic volcanic rocks. These rocks are green and maroon autobreccias, pillow breccias, pillow lavas and massive flows all overlain by a thin succession, as much as 300 metres thick, of shelf-like limestone, calcareous argillite, siltstone and calcite-cemented basaltic tuff and breccia. This sedimentary member is covered by a sequence of felsic breccia up to 2,500 metres thick in which massive flows and compact monolithologic tuff breccias predominate. These proximal rocks merge outward from eruptive centres to heterolithic epiclastic breccias and sediments.

A linear belt of alkalic stocks composed of diorite, monzonite and syenite, one of which hosts the QR deposit, lies within the volcanic strata and marks the eruptive centres of the felsic rocks. These stocks intrude their felsic extrusives and commonly alter the surrounding rocks. The stocks are the hosts for several alkalic suite porphyry style mineral deposits, namely Copper Mountain, Afton, and the Cariboo-Bell deposit, the latter located ten kilometres south of the QR property.

2.2.2 Property Geology

Local stratigraphy within the vicinity of the QR deposit consists of four main units that strike easterly and dip moderately south. Geological plans are given in Figures 2 and 3. The lowermost unit (Unit 1) consists of at least 850 metres of monolithologic alkali basalt in which chaotic autobreccias are common. Pillow breccias, pillow basalts, massive flows, and thin interbeds of basaltic wacke are less common. The most common rock is an intergranular porphyritic alkali basalt consisting of 20% euhedral augite phenocrysts and 10% tabular plagioclase phenocrysts enclosed by a fine grained matrix. Olivine and analcite phenocrysts are present in thick mafic-rich flows immediately to the northwest. Flows of hornblende-bearing basalt occur near the top of the basalt formation.

Unit 1 grades upwards into poorly sorted blocky basaltic conglomerate and breccia (Unit 5). Textures are dominantly epiclastic with large framework-supported clasts of basalt in a matrix of fine grained fragments and basaltic debris. The matrix contains grey, sparry calcite and fine grained framboidal and colloform pyrite. This unit varies from less than five metres to over 250 metres thick and locally grades upwards and laterally into calcite-cemented hydroclastic coarse tuffs and lapillistones (Unit 4). Volcanic textures within the fragments are commonly obscured by intense carbonate alteration. Pyritic content varies from 5% to over 20%. Delicate framboidal, colloform and banded textures are common. Rip-up clasts of banded pyrite suggest that pyritic deposition was contemporaneous with deposition of the volcanic sediments. This unit varies from four metres to 50 metres in thickness. A thinly bedded, fissile black argillite and siltstone unit at least 200 metres thick (Unit 6) overlies rocks of Unit 4. The unit is locally calcareous and contains variable amounts of fine grained disseminated pyrite and trace amounts of graphite.

The QR stock and related hornblende porphyry dykes and sills intrude and alter the above rocks. The QR stock is a body of medium grained, equigranular diorite measuring 1,000 metres by 1,500 metres. The stock consists of a diorite margin 100 metres thick enclosing a core of monzodiorite and rare syenite. The intrusive rocks typically consists of 15% augite, 20% biotite, 50% tabular subhedral plagioclase, 10% or less pink K-feldspar and variable amounts of magnetite. A potassium/argon date obtained from biotite collected by A. Panteleyev (1987) returned an age of 201 +/- 7 Ma.

Surrounding the stock is a halo of altered rock that extends up to 300 metres into the surrounding basalts and sediments. Basaltic rocks are variably propylitized and the siltstone is hornfelsed to a sericitic, bleached, massive, fine grained rock. Gold mineralization is located within the alteration zone in altered equivalents of Units 4 and 5 and in the hornfelsed sediments. These rocks are described in more detail in the following section.

The volcanic rocks and sediments are in most areas undeformed. Penetrative fabrics are absent and fold structures are rare. The main structural element of the deposit is a series of subparallel northwesterly trending, west-dipping normal faults. These faults lower the main basalt-siltstone contact progressively to the west.

The youngest structural features are two low angle faults, Wally's fault and the West zone fault. Wally's fault strikes northwesterly and dips 20o southwest. It is a reverse fault that truncates the main gold zone. The western hanging wall has been displaced about 240 metres to the southeast. The West zone fault is located 1,100 metres west of Wally's fault and also strikes northwesterly but is steeper with a 35o dip to the southwest. Absolute displacement has not been determined but movement of the hanging wall is estimated to be at least 500 metres to the northeast, making it dominantly a thrust fault. Both the West zone fault and Wally's fault are composed of anastomosing, foliated, chlorite-rich gouge zones and fracture zones up to a combined thickness of 30 metres. At surface they are the loci of narrow swamps, bogs and shallow depressions.

2.2.3 Mineralization

The QR gold deposit comprises three separate zones: the Main Zone, which was the initial discovery in 1977; the West Zone deposit discovered in 1983; and the Midwest Zone discovered in 1986. All zones are hosted by propylitically altered equivalents of pyrite, carbonate-altered basaltic rocks lying beneath the siltstone unit.

The Main Zone (Figures 3 and 4) is a discordant, north-dipping body approximately 300 metres long and up to 50 metres thick and 100 metres wide occurring at surface. Ore occurs in pyritic stockworks in propylitized basalts of Unit 2, and disseminated pyrite in massive, propylitized basaltic tuffs of Unit 3. Propylitic basalts of Unit 2 are mottled green, epidote-rich hornblende-augite porphyries that comprise the western part of the mineralized zone. In addition to the basalt mineralogy, these propylitized rocks consist of variable amounts of pyrite, chlorite, fine grained disseminated epidote, epidote-rich selvages on pyrite-carbonate veinlets, and thin pyrite-epidote coatings on fractures. Pyrite is abundant, commonly 2% to 5%, and forms disseminated grains, coarse aggregates and pyrite-rich stringers up to 3 mm thick.

Unit 3, which comprises the eastern portion of the mineralized zone, is a massive, epidote-pyrite-carbonate-chlorite rock (propylite) commonly interlayered with altered basalts of Unit 2 to the west. This unit is also interbedded with siltstones and greywackes of Unit 6. Rocks of the propylite unit are typically green, medium grained, massive lapillistone and coarse tuff consisting of equigranular aggregates of epidote, pyrite, carbonate, altered rock particles and lesser amounts of chlorite and andradite. Pyrite content varies from 2% to massive sulphide lenses containing up to 80% pyrite. Granular or clastic textures in which aggregates of epidote and pyrite enclose soft, sericite-rich lithic fragments 2 mm to 5 mm in size, are typical. Large clasts of propylitized basalt are equally common. Pyrite forms irregular aggregates up to 5 mm and occasionally rounded framboids. Chalcopyrite is present in amounts up to 5% but generally occurs as irregularly shaped masses comprising much less than 1% of the rock. Also present is traces of sphalerite, marcasite and galena.

Gold occurs at finely disseminated micron-sized particles along pyrite and chalcopyrite grain boundaries. The gold:silver ratio is 1:1. The best and most consistent gold assays are obtained within 50 metres of the alteration front. Isolated auriferous rocks occur well back of the alteration front and in the overlying sediments where the gold is fracture-related. Such zones, however, are discontinuous and gold tenor is erratic.

The West zone, a tabular body some 400 metres long, four metres thick and 50 metres wide lies 800 metres west of the Main zone deposit (Figure 5). An open syncline brings the deposit to surface at its northern terminus and a normal fault brings a section of it to surface at its southern end. Elsewhere, it lies approximately 50 metres below surface.

The West zone deposit, like the Main zone farther east, lies at the contact between well bedded siltstone and underlying variably altered basalt. Rocks of Unit 4 are three to five metres thick and are composed of pyritic, calcareous basaltic tuff, basaltic wacke, and breccia. The West zone deposit is composed of propylitized basaltic tuff, breccia, interbedded lenses of pyritic siltstone and discontinuous seams of massive sulphide all lying within a zone of propylitic rock surrounding a faulted remnant of the QR stock northeast of the deposit. Sulphides are mostly pyrite with lesser amounts of pyrrhotite, chalcopyrite and traces of arsenopyrite and galena. Coarse gold up to 1 mm in diameter has been observed in drill core. The best gold tenor is located close to the outer edge of the propylitized zone.

The Midwest Zone deposit is located three hundred metres west of the Main Zone. It is a thick tabular deposit 120 metres long, up to 15 metres thick and 80 metres wide dipping 53° to the south. It comes within 65 metres of surface. As with the Main and West Zones, it occurs within propylitic rocks at the basalt-siltstone contact. The Midwest Zone deposit is composed of propylitized basaltic wackes and lapillistones with local seams of massive sulphides. Sulphides are mostly pyrite with local concentrations of pyrrhotite and chalcopyrite. Coarse gold has been observed in drill core. The Midwest Zone is separated from the Main Zone by a series of northeasterly striking normal faults that consistently down drop the basalt-siltstone contact on the west. The intervening propylitized volcanics are erratically mineralized and of low gold tenor.

Two other targets still in the exploration stage include the North and East Zones. Both are located at depth in the footwall block of Wally's Fault at the favourable basalt-siltstone contact and have similar mineralogy to the Main Zone. No values of gold mineralized rock have yet been outlined in these targets. volumes

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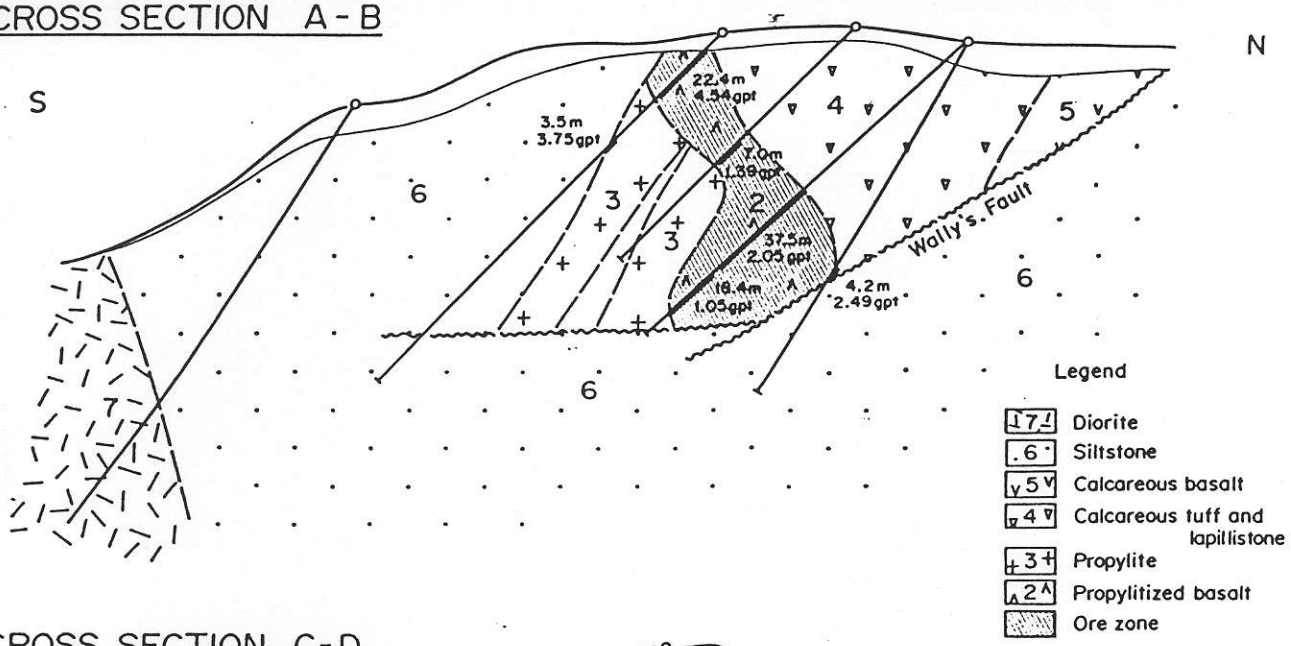

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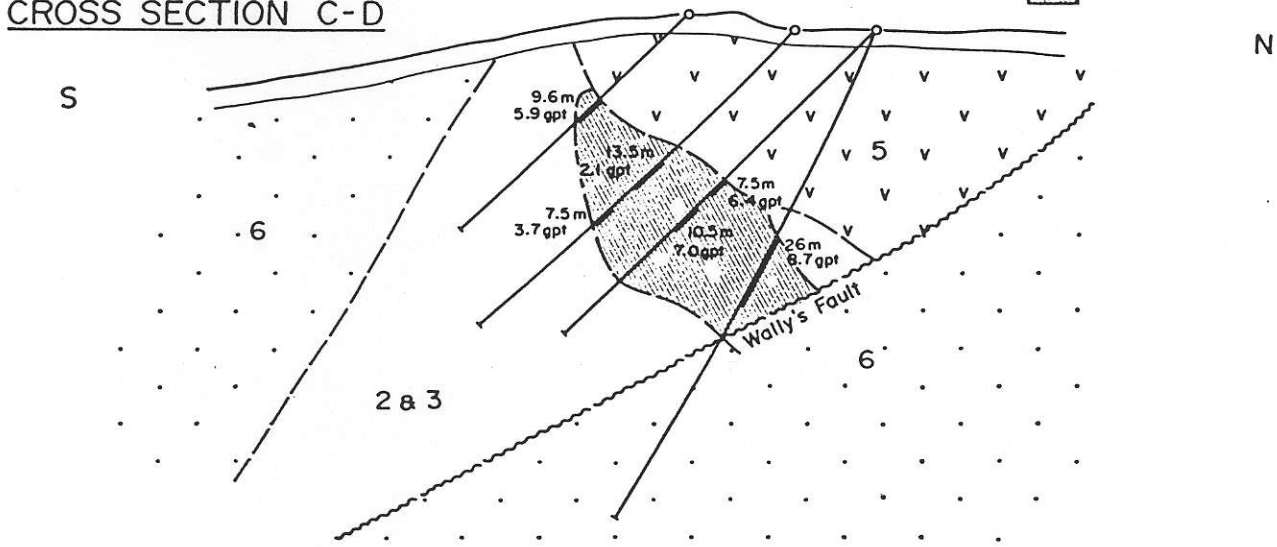

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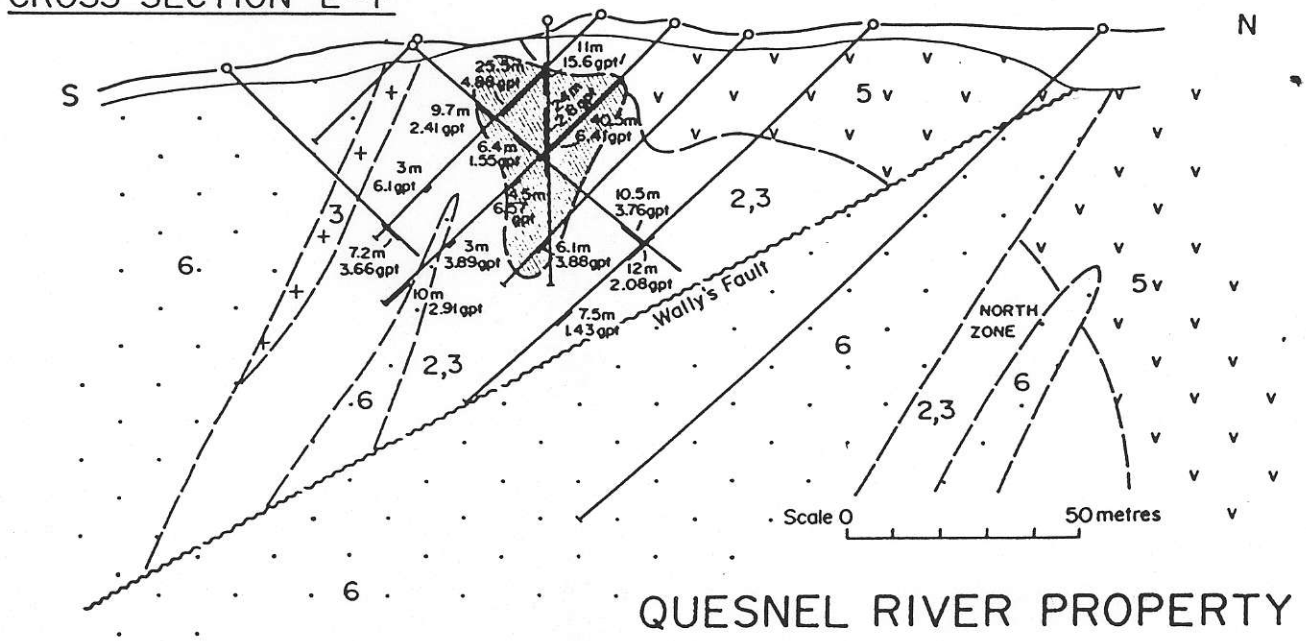
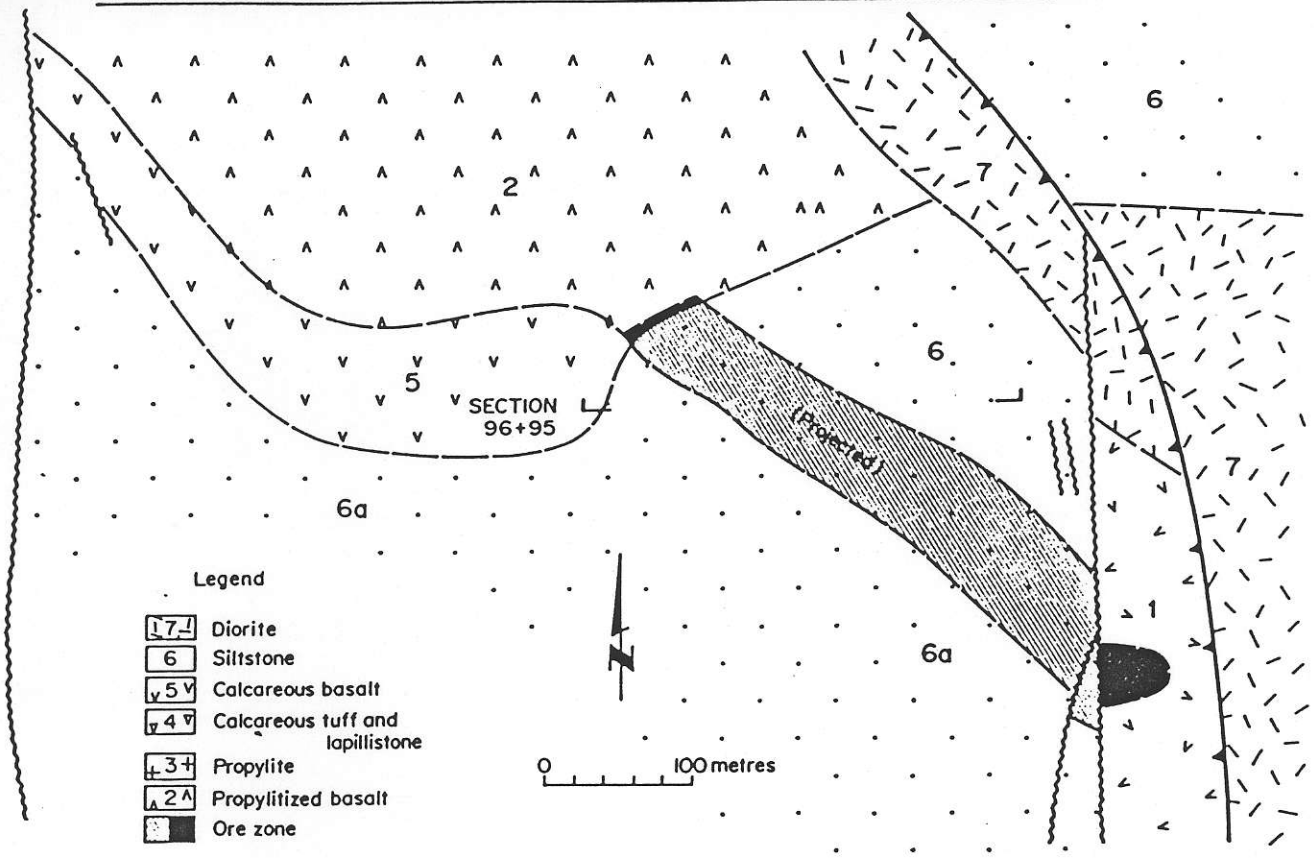
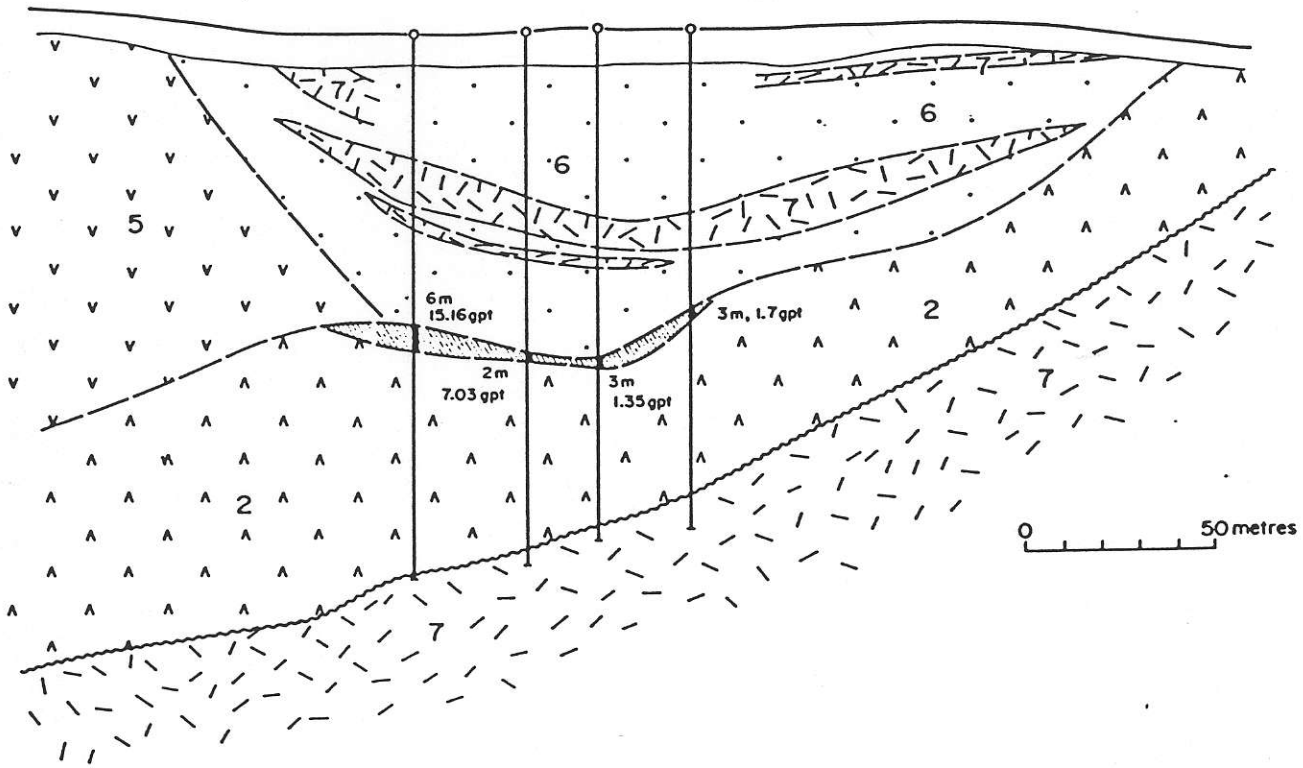


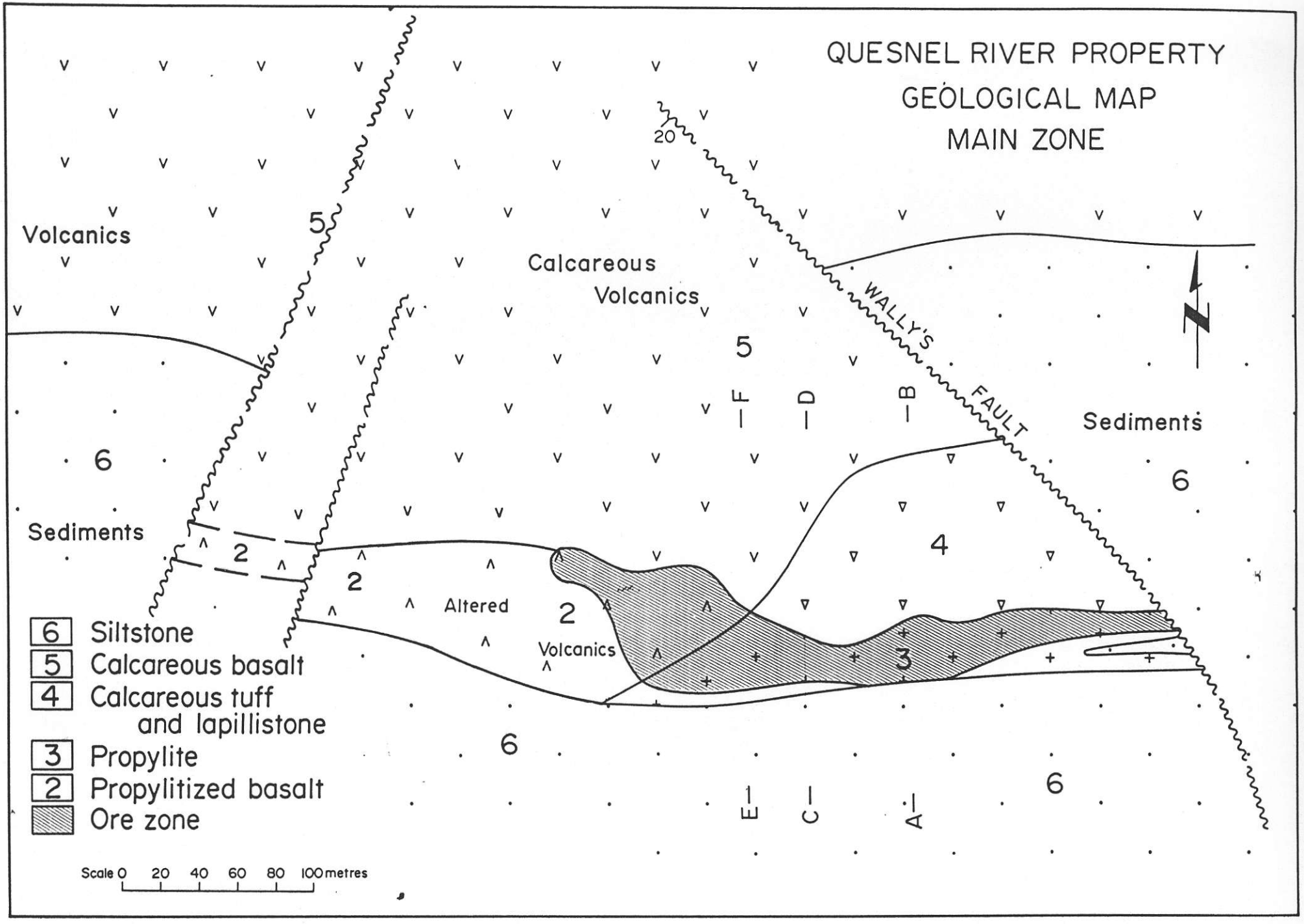
QUESNEL RIVER PROPERTY

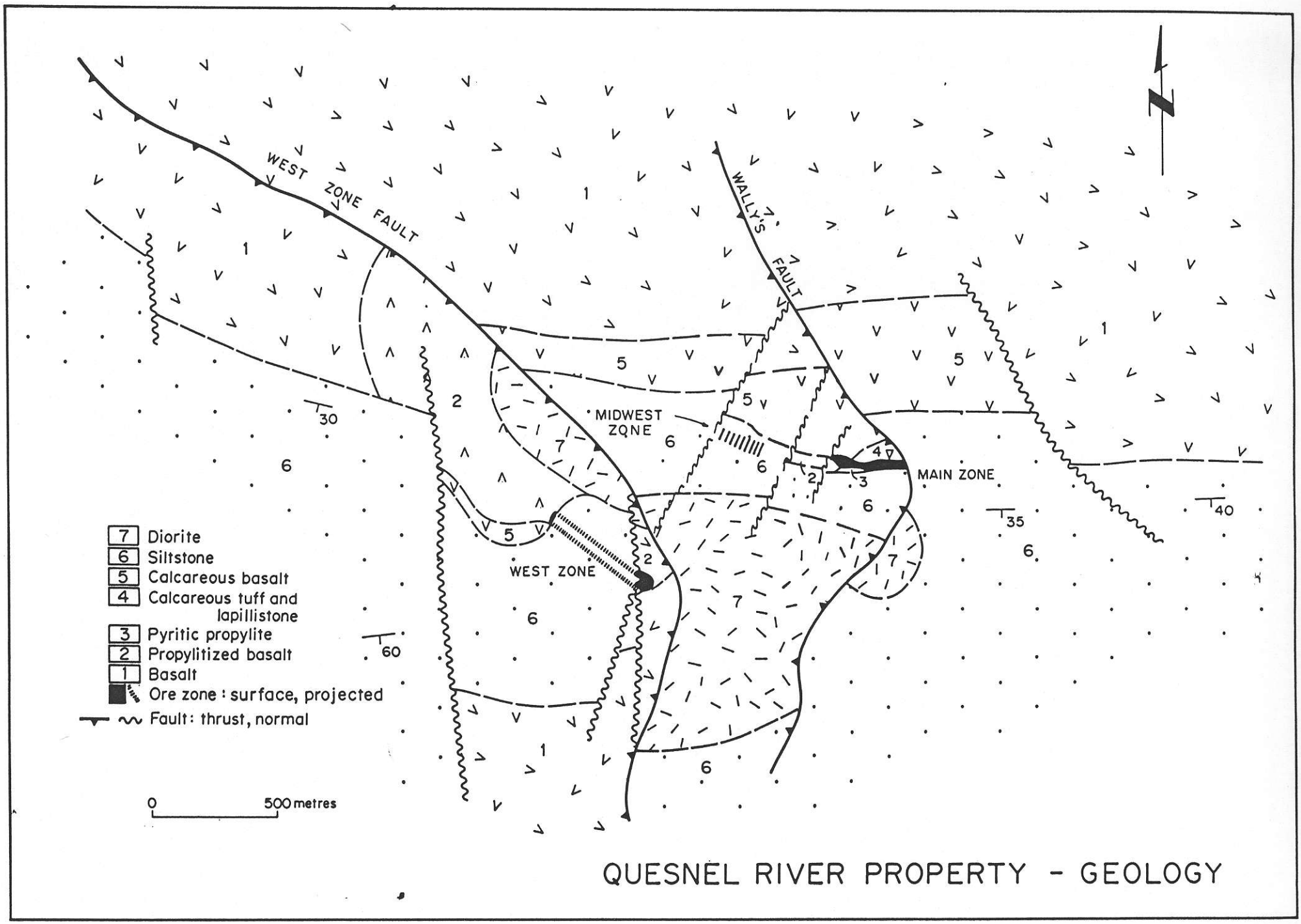
QUESNEL RIVER PROPERTY - WEST ZONE GEOLOGY



SECTION 96+95

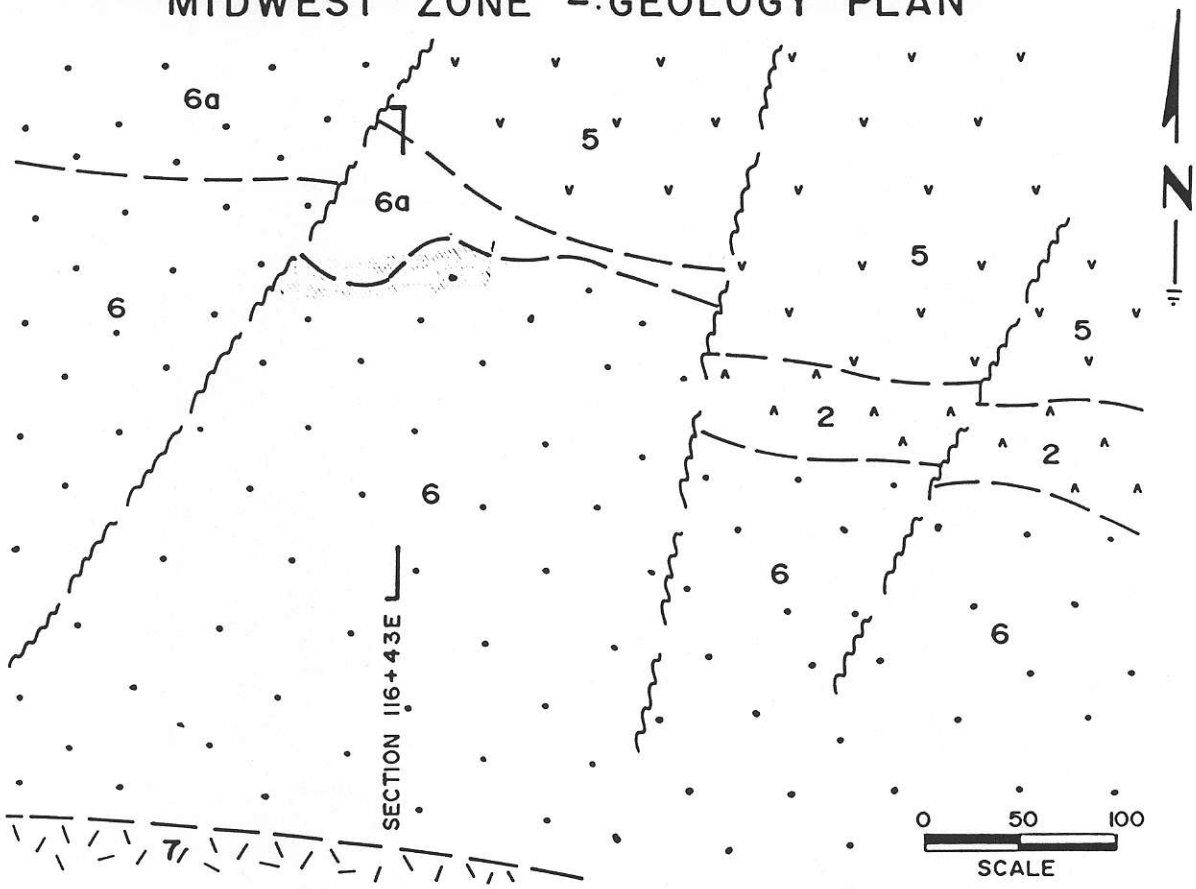



QUESNEL RIVER PROPERTY
GEOLOGICAL MAP
MAIN ZONE
Volcanics
Calcareous
Volcanics
Sediments
Sediments
Altered
Volcanics
WALLY'S
FAULT
20
F
D
B
E
C
A
6 Siltstone
5 Calcareous basalt
4 Calcareous tuff and lapillistone
3 Propylite
2 Propylitized basalt
Ore zone
Scale 0 20 40 60 80 100 metres



QUESNEL RIVER PROPERTY - GEOLOGY

MIDWEST ZONE - GEOLOGY PLAN



SECTION 116+43E